



Relion® 615 series

Motor Protection and Control REM615 DNP3 Point List Manual



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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

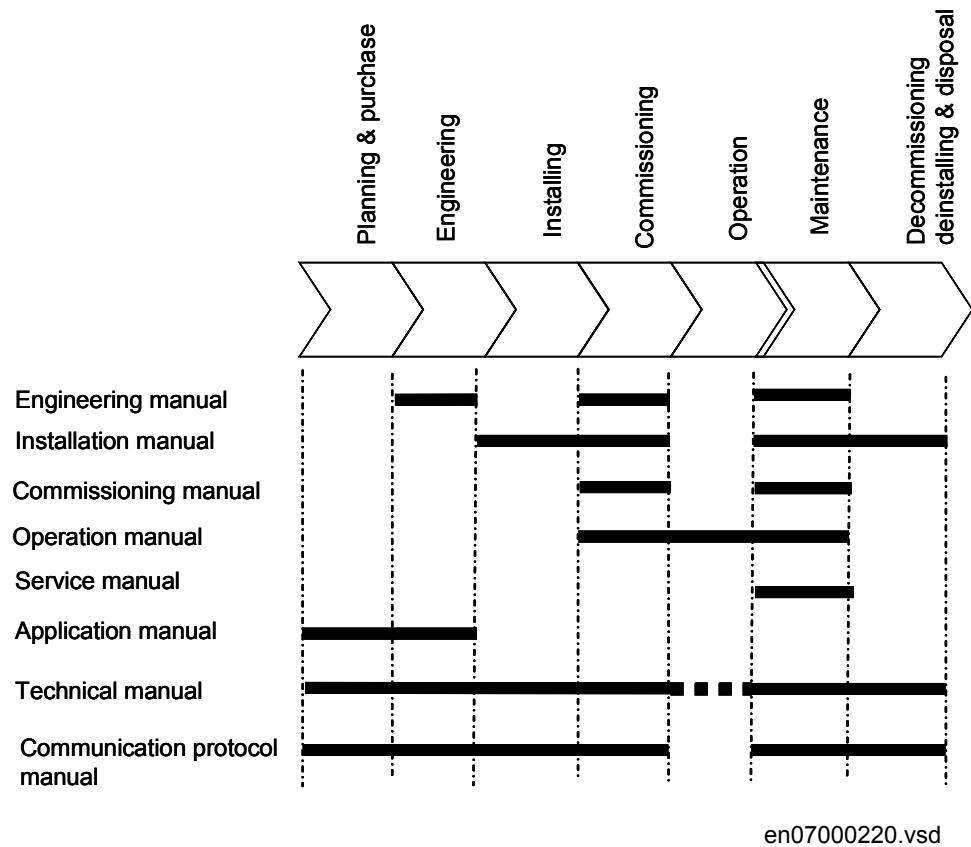


Figure 1: The intended use of manuals in different lifecycles

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: *REM615 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, instantaneous stage, instance 1 | PHIPTOC1 | 3I>>> (1) | 50P/51P (1) |
| Non-directional earth-fault protection, low stage, instance 1 | EFLPTOC1 | Io> (1) | 51N-1 (1) |
| Non-directional earth-fault protection, high stage, instance 1 | EFHPTOC1 | Io>> (1) | 51N-2 (1) |
| Directional earth-fault protection, low stage, instance 1 | DEFLPDEF1 | Io> -> (1) | 67N-1 (1) |
| Three-phase undervoltage protection, instance 1 | PHPTUV1 | 3U< (1) | 27 (1) |
| 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) |
| Negative-sequence overcurrent protection for motors, instance 1 | MNSPTOC1 | I2>M (1) | 46M (1) |
| Negative-sequence overcurrent protection for motors, instance 2 | MNSPTOC2 | I2>M (2) | 46M (2) |
| Loss of load supervision | LOFLPTUC1 | 3I< | 37 |
| Motor load jam protection | JAMPTOC1 | Ist> | 51LR |
| Motor start-up supervision | STTPMSU1 | Is2t n< | 49,66,48,51LR |
| Phase reversal protection | PREVPTOC1 | I2>> | 46R |
| Thermal overload protection for motors | MPTR1 | 3Ith>M | 49M |
| Circuit breaker failure protection | CCBRBRF1 | 3I>/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) |
| Table continues on next page | | | |

| Function | IEC 61850 | IEC 60617 | IEC-ANSI |
|--|-----------|----------------|----------------|
| 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 | DCSXSUI1 | I <-> O DC (1) | I <-> O DC (1) |
| Disconnecter position indication, instance 2 | DCSXSUI2 | I <-> O DC (2) | I <-> O DC (2) |
| Disconnecter position indication, instance 3 | DCSXSUI3 | I <-> O DC (3) | I <-> O DC (3) |
| Earthing switch indication | ESSXSUI1 | I <-> O ES | I <-> O ES |
| Emergency startup | ESMGAPC1 | ESTART | ESTART |
| Condition monitoring | | | |
| Circuit-breaker condition monitoring | SSCBR1 | CBCM | CBCM |
| Trip circuit supervision, instance 1 | TCSSCBR1 | TCS (1) | TCM (1) |
| Trip circuit supervision, instance 2 | TCSSCBR2 | TCS (2) | TCM (2) |
| Current circuit supervision | CCRDIF1 | MCS 3I | MCS 3I |
| Fuse failure supervision | SEQRUF1 | FUSEF | 60 |
| Runtime counter for machines and devices | MDSOPT1 | OPTS | OPTM |
| Measurement | | | |
| Disturbance recorder | RDRE1 | - | - |
| Three-phase current measurement, instance 1 | CMMXU1 | 3I | 3I |
| Sequence current measurement | CSMSQI1 | 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 | 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) |
| Frequency measurement | FMMXU1 | f | f |

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 REM615 Ver. 3.0. The data points are unmapped as a default. The point lists describe a superset of all data available through the standard configuration A, B, and C including the optional functionalities. The names of the standard configurations are ME01, ME02 and ME03 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 REM615 Ver.3.0 ME01-03

Table 2: Binary inputs

| IEC 61850 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 | 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.CBCILO1.IIByPss.stVal | CBXCBR1.ITL_BYPASS | CBXCBR1, ITL_BYPASS, stVal | 1 = Interlocking bypassed |
| CTRL.CBCSW11.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 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 |
| Current circuit supervision | | | |
| CTRL.CCRDIF1.Alm.stVal | CCRDIF1.ALARM | CCRDIF1, Alarm, stVal | 1 = Alarm |
| CTRL.CCRDIF1.Op.general | CCRDIF1.FAIL | 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 |
| Directional earth-fault protection | | | |
| LD0.DEFLPTOC1.Op.general | DEFLPDEF1.OPERATE | DEFLPDEF1, Operate, general | 1 = Operate |
| LD0.DEFLPTOC1.Str.general | DEFLPDEF1.START | DEFLPDEF1, Start, general | 1 = Start |
| Non-directional 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.EFLPTOC1.Op.general | - | EFLPTOC1, Operate, general | 1 = Operate |
| LD0.EFLPTOC1.Str.general | - | EFLPTOC1, Start, general | 1 = Start |
| Emergency start enable | | | |
| LD0.ESMGAPC1.Str.general | ESMGAPC1.ST_EMERG_ENA | ESMGAPC1, Emergency start, general | 1 = Start |
| Frequency protection, 2 stages | | | |
| LD0.FRPFRQ1.Op.general | - | FRPFRQ1, Operate 1 signal for frequency gradient | 1 = Operate |

| IEC 61850 name | AFL-Common SA name | IEC61850 LN desc, DO desc, DA name | Value |
|------------------------------------|--------------------|---|-------------------------|
| LD0.FRPRQ2.Op.general | - | FRPRQ2, Operate 2 signal for frequency gradient | 1 = Operate |
| LD0.FRPTOF1.Op.general | - | FRPRQ1, Operate 1 signal for overfrequency | 1 = Operate |
| LD0.FRPTOF2.Op.general | - | FRPRQ2, Operate 2 signal for overfrequency | 1 = Operate |
| LD0.FRPTRC1.Str.general | - | FRPRQ1, Stage 1 start | 1 = Start |
| LD0.FRPTRC2.Str.general | - | FRPRQ2, Stage 2 start | 1 = Start |
| LD0.FRPTUF1.Op.general | - | FRPRQ1, Operate 1 signal for underfrequency | 1 = Operate |
| LD0.FRPTUF2.Op.general | - | FRPRQ2, Operate 2 signal for underfrequency | 1 = Operate |
| Stalled motor protection | | | |
| LD0.JAMPTOC1.Op.general | JAMPTOC1.OPERATE | JAMPTOC1, Operate, general | 1 = Operate |
| 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 |
| Loss of load protection | | | |
| LD0.LOFLPTUC1.Op.general | LOFLPTUC1.OPERATE | LOFLPTUC1, Operate, general | 1 = Operate |
| LD0.LOFLPTUC1.Str.general | LOFLPTUC1.START | LOFLPTUC1, Start, general | 1 = Start |

Table continues on next page

| IEC 61850 name | AFL-Common SA name | IEC61850 LN desc, DO desc, DA name | Value |
|------------------------------|--------------------|---|-----------------------------|
| | | Multipurpose analog protection functions (3 stages) | |
| LD0.MAPGAPC1.Op | - | MAPGAPC1, Operate, general | 1 = Operate |
| LD0.MAPGAPC1.Str | - | MAPGAPC1, Start, general | 1 = Start |
| LD0.MAPGAPC2.Op | - | MAPGAPC2, Operate, general | 1 = Operate |
| LD0.MAPGAPC2.Str | - | MAPGAPC2, Start, general | 1 = Start |
| LD0.MAPGAPC3.Op | - | MAPGAPC3, Operate, general | 1 = Operate |
| LD0.MAPGAPC3.Str | - | MAPGAPC3, Start, general | 1 = Start |
| | | Generic operation time supervision | |
| LD0.MDSOPT1.OpTmAlm.stVal | MDSOPT1.ALARM | MDSOPT1, Operation time alarm, stVal | 1 = Alarm |
| LD0.MDSOPT1.OpTmWrn.stVal | MDSOPT1.WARNING | MDSOPT1, Operation time warning, stVal | 1 = Warning |
| | | Negative phase-sequence time overcurrent protection | |
| LD0.MNSPTOC1.Op.general | MNSPTOC1.OPERATE | MNSPTOC1, Operate, general | 1 = Operate |
| LD0.MNSPTOC1.Str.general | MNSPTOC1.START | MNSPTOC1, Start, general | 1 = Start |
| LD0.MNSPTOC2.Op.general | MNSPTOC2.OPERATE | MNSPTOC2, Operate, general | 1 = Operate |
| LD0.MNSPTOC2.Str.general | MNSPTOC2.START | MNSPTOC2, Start, general | 1 = Start |
| | | Motor thermal overload protection | |
| LD0.MPTTR1.AlmThm.general | MPTTR1.ALARM | MPTTR1, Thermal Alarm, general | 1 = Alarm |
| LD0.MPTTR1.Op.general | MPTTR1.OPERATE | MPTTR1, Operate, general | 1 = Operate |
| | | 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 overvoltage protection | |
| LD0.NSPTOV1.Op.general | NSPTOV1.OPERATE | NSPTOV1, Operate, general | 1 = Operate |
| LD0.NSPTOV1.Str.general | NSPTOV1.START | NSPTOV1, Start, general | 1 = Start |
| | | Phase overcurrent protection | |
| 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 undervoltage protection | |
| LD0.PHPTUV1.Op.general | PHPTUV1.OPERATE | PHPTUV1, Operate, general | 1 = Operate |
| LD0.PHPTUV1.Str.general | PHPTUV1.START | PHPTUV1, Start, general | 1 = Start |
| | | Phase reversal protection | |
| Table continues on next page | | | |

| IEC 61850 name | AFL-Common SA name | IEC61850 LN desc, DO desc, DA name | Value |
|-----------------------------|----------------------|--|-----------------------------|
| LD0.PREVP TOC1.Op.general | PREVP TOC1.OPERATE | PREVP TOC1, Operate, general | 1 = Operate |
| LD0.PREVP TOC1.Str.general | PREVP TOC1.START | PREVP TOC1, 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 |
| DR.RDRE1.RcdMade.stVal | - | Disturbance recorder, Recording made, stVal | 1 = Recording made |
| LD0.RESCMMXU1.HiAlm.stVal | RESCMMXU1.HIGH_ALARM | Residual current limit supervision | 1 = High alarm |
| LD0.RESCMMXU1.HiWrn.stVal | RESCMMXU1.HIGH_WARN | Residual voltage limit supervision | 1 = High warning |
| LD0.RESVMMXU1.HiAlm.stVal | RESVMMXU1.HIGH_ALARM | Residual voltage limit supervision | 1 = High alarm |
| LD0.RESVMMXU1.HiWrn.stVal | RESVMMXU1.HIGH_WARN | Residual voltage limit supervision | 1 = High warning |
| LD0.SEQRFUF1.Str.general | SEQRFUF1.FUSEF_U | Fuse failure protection | 1 = Start (general) |
| LD0.SEQRFUF1.Str3Ph.general | SEQRFUF1.FUSEF_3PH | SEQRFUF1, Three-phase start of function, general | 1 = Three phase start |
| LD0.SSCBR1.APwrAlm.stVal | SSCBR1.IPOW_ALM | Circuit-breaker condition monitoring | 1 = 1yt alarm limit |
| LD0.SSCBR1.APwrLO.stVal | SSCBR1.IPOW_LO | SSCBR1, Accumulated currents power (lyt),exceeded alarm limit, stVal | 1 = 1yt lockout limit |
| LD0.SSCBR1.CBLifAlm.stVal | SSCBR1.CB_LIFE_ALM | SSCBR1, Remaining life of CB exceeded alarm limit, stVal | 1 = Remaining life alarm |
| LD0.SSCBR1.ClsAlm.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.OphAlm.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.SprChaAlm.stVal | SSCBR1.SPR_CHR_ALM | SSCBR1, Spring charging time has crossed the set value, stVal | 1 = Spring charge alarm |
| LD0.STTPMSU1.Op.general | STTPMSU.OPR_STALL | Motor startup supervision (STTPMSU) | 1 = Stalling operate |
| LD0.STTPMSU1.Tr.general | STTPMSU.OPR_IIT | STTPMSU1, Operate/trip signal for thermal stress., general | 1 = Thermal stress operate |
| LD0.STTPMSU1.Str.general | STTPMSU.MOT_START | STTPMSU1, Signal to show that motor startup is in progress, general | 1 = Startup in progress |
| LD0.TCSSCBR1.CirAlm.stVal | TCSSCBR1.ALARM | Trip circuit supervision | 1 = Alarm |
| LD0.TCSSCBR2.CirAlm.stVal | TCSSCBR2.ALARM | Trip circuit supervision | 1 = Alarm |
| LD0.TRPPTRC1.Op.general | - | Global conditioning | 1 = Operate input |
| LD0.TRPPTRC1.Tr.general | - | TRPPTRC1, Operate input signal, general | 1 = Operate output |
| LD0.TRPPTRC2.Op.general | - | TRPPTRC1, General trip output signal, general | 1 = Operate input |
| | | TRPPTRC2, Operate input signal, general | |

Table continues on next page

| IEC 61850 name | AFL-Common SA name | IEC61850 LN desc, DO desc, DA name | Value |
|---------------------------------------|--------------------|---|--------------------|
| LD0.TRPP TRC2.Tr.general | - | TRPPTRC2, General trip output signal, general | 1 = Operate 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_WARN, 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_WARN, stVal | 1 = Low warning |
| XRGGIO1 alarm/warning | | | |
| LD0.XRGGIO130.Alm.stVal | - | XRGGIO1, Alarm, stVal | 1 = Alarm |
| LD0.XRGGIO130.Wrn.stVal | - | XRGGIO1, Warning, stVal | 1 = 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 |
| 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.XGGIO120.Ind1.stVal | - | X120 (AIM), X120-Input 1, stVal | 1 = ON, 0 = OFF |
| LD0.XGGIO120.Ind2.stVal | - | X120 (AIM), X120-Input 2, stVal | 1 = ON, 0 = OFF |
| LD0.XGGIO120.Ind3.stVal | - | X120 (AIM), X120-Input 3, stVal | 1 = ON, 0 = OFF |
| LD0.XGGIO120.Ind4.stVal | - | X120 (AIM), X120-Input 4, stVal | 1 = ON, 0 = OFF |

Table 3: Binary outputs

| IEC61850 name | AFL-Common SA name | IEC61850 LN Desc, DO Desc, DA name |
|-----------------------------------|--------------------|---|
| | | Circuit breaker control |
| CTRL.CBCSW1.Pos.Oper.ctiVal | - | CBXCBR1,CB control |
| | | Reset current max. demand values |
| LD0.CMSTA1.RecRs.Oper.ctiVal | - | CMMXU1, Reset CMMXU1 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 | - | Reset device |
| | | Reset accumulated energy values |
| LD0.PEIMMTR1.SupDmdRs.Oper.ctiVal | PEIMMXU1.RSTACM | PEIMMXU1, Reset of accumulated energy readings |
| | | Disturbance recorder, clear memory and trig recording |
| DR.RDRE1.MemCir.Oper.ctiVal | - | Disturbance recorder, Clear disturbance records |
| DR.RDRE1.RcdTrg.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.RsSprChaTm.Oper.ctiVal | SSCBR1.RST_SPR_T | SSCBR1, SSCBR1 Spring charge time alarm |
| LD0.SSCBR1.RsTrvTm.Oper.ctiVal | SSCBR1.RST_TRV_T | SSCBR1, SSCBR1 Travel time alarm |

Table 4: Analog inputs

| IEC 61850 name | AFL-Common SA name | Description | Scaling function | Argument 1 (min value) | Argument 2 (max value) | Argument 3 | Argument 4 |
|------------------------------------|---------------------|--|------------------|------------------------|------------------------|------------|------------|
| CTRL.CBCSW1.Pos.stVal | CBXCBR1.POSITION | CB Switch position (4-pole). stVal | Ratio | 0 | 3 | 0 | 3 |
| | | CB position | | | | | |
| | | Phase current measurements | | | | | |
| 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 |
| | | Local Remote | | | | | |
| CTRL.LLN0.LocRem.stVal | - | LR state monitoring | Ratio | 0 | 4 | 0 | 4 |
| | | Sequence of current measurements | | | | | |
| LD0.CSMSQ11.SeqA.c1.instCVal.mag.f | CMSQ11.I1_INST | Positive Sequence Current. c1.instCVal.mag.f | Ratio | 0 | 40 | 0 | 4000 |
| LD0.CSMSQ11.SeqA.c2.instCVal.mag.f | CMSQ11.I2_INST | Negative Sequence Current. c2.instCVal.mag.f | Ratio | 0 | 40 | 0 | 4000 |
| LD0.CSMSQ11.SeqA.c3.instCVal.mag.f | CMSQ11.I3_INST | Zero Sequence Current. c3.instCVal.mag.f | Ratio | 0 | 40 | 0 | 4000 |
| | | Disconnecter positions | | | | | |
| CTRL.DCSXSW11.Pos.stVal | DCSXSXSW11.POSITION | Disconnecter 1 position (4-pole). stVal | Ratio | 0 | 3 | 0 | 3 |
| CTRL.DCSXSW12.Pos.stVal | DCSXSXSW12.POSITION | Disconnecter 2 position (4-pole). stVal | Ratio | 0 | 3 | 0 | 3 |
| CTRL.DCSXSW13.Pos.stVal | DCSXSXSW13.POSITION | Disconnecter 3 position (4-pole). stVal | Ratio | 0 | 3 | 0 | 3 |
| CTRL.ESSXSW11.Pos.stVal | ESSXSXSW11.POSITION | Earth switch position (4-pole). stVal | Ratio | 0 | 3 | 0 | 3 |
| | | Frequency measurement | | | | | |
| LD0.FMMXU1.Hz.mag | - | Frequency metering | Ratio | 35 | 75 | 3500 | 7500 |
| | | Active parameter setting-group | | | | | |
| LD0.DNPGGIO1.ActSG.stVal | - | Active parameter setting-group value | Ratio | 1 | 6 | 1 | 6 |
| | | 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 |
| | | Thermal protection signals | | | | | |
| LD0.MPTTR1.TmpRI | MPTTR1.THERM_LEVEL | Thermal level. stVal | Ratio | -99 | 999 | -99 | 999 |
| | | Power and energy measurements | | | | | |
| LD0.PEMMTR1.DmdVAth.actVal | PEMMXU1.ER_RV_ACM | Forward reactive energy. actVal | Ratio | 0 | 999999999 | 0 | 999999999 |
| LD0.PEMMTR1.DmdWh.actVal | PEMMXU1.EA_RV_ACM | Forward active energy. actVal | Ratio | 0 | 999999999 | 0 | 999999999 |
| LD0.PEMMTR1.SupVAth.actVal | PEMMXU1.ER_FWD_ACM | Reverse reactive energy. actVal | Ratio | 0 | 999999999 | 0 | 999999999 |
| LD0.PEMMTR1.SupWh.actVal | PEMMXU1.EA_FWD_ACM | Reverse active energy. actVal | Ratio | 0 | 999999999 | 0 | 999999999 |

Table continues on next page

| IEC 61850 name | AFL-Common SA name | Description | Scaling function | Argument 1 (min value) | Argument 2 (max value) | Argument 3 | Argument 4 |
|---|--------------------|---|------------------|------------------------|------------------------|------------|------------|
| LD0.PEMMXU1.TotPF.instMag.f | PEMMXU1.PF_INST | Average Power factor (Total PF), instMag.f | Ratio | -1 | 1 | -100 | 100 |
| LD0.PEMMXU1.TotW.instMag.f | PEMMXU1.P_INST | Total Active Power (Total P), instMag.f | Ratio | -999999 | 999999 | -999999 | 999999 |
| LD0.PEMMXU1.TotVA.instMag.f | PEMMXU1.S_INST | Total Apparent Power (Total S), instMag.f | Ratio | -999999 | 999999 | -999999 | 999999 |
| LD0.PEMMXU1.TotVAr.instMag.f | PEMMXU1.Q_INST | Total Reactive Power (Total Q), instMag.f | Ratio | -999999 | 999999 | -999999 | 999999 |
| Disturbance recorder diagnostic | | | | | | | |
| DR.RDRE1.FINum.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 and voltage measurements | | | | | | | |
| LD0.RESCMMXU1.A.res.instCVal.mag.f | RESCMMXU1.I0_INST | Residual current, res.instCVal.mag.f | Ratio | 0 | 40 | 0 | 4000 |
| LD0.RESVMMXU1.PhV.res.instCVal.m ag.f | RESVMMXU1.U0_INST | Residual voltage, res.instCVal.mag.f | 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 |
| Phase-to-ground and phase-to-phase voltage measurements | | | | | | | |
| LD0.VMMXU1.PhV.phsA.cVal.mag.f | VMMXU1.U_DB_A | Phase to ground voltages, phsA.cVal.mag.f | Ratio | 0 | 4 | 0 | 400 |
| LD0.VMMXU1.PhV.phsB.cVal.mag.f | VMMXU1.U_DB_B | Phase to ground voltages, phsB.cVal.mag.f | Ratio | 0 | 4 | 0 | 400 |
| LD0.VMMXU1.PhV.phsC.cVal.mag.f | VMMXU1.U_DB_C | Phase to ground voltages, phsC.cVal.mag.f | Ratio | 0 | 4 | 0 | 400 |
| LD0.VMMXU1.PPV.phsAB.instCVal.m ag.f | VMMXU1.U_DB_AB | Phase to phase voltages, phsAB.instCVal.mag.f | Ratio | 0 | 4 | 0 | 400 |
| LD0.VMMXU1.PPV.phsBC.instCVal.m ag.f | VMMXU1.U_DB_BC | Phase to phase voltages, phsBC.instCVal.mag.f | Ratio | 0 | 4 | 0 | 400 |
| LD0.VMMXU1.PPV.phsCA.instCVal.m ag.f | VMMXU1.U_DB_CA | Phase to phase voltages, phsCA.instCVal.mag.f | Ratio | 0 | 4 | 0 | 400 |
| Sequence of voltage measurements | | | | | | | |
| LD0.VSMSQI1.SeqV.c1.instCVal.mag.f | VMSQI1.I1_DB | Positive Sequence Voltage, c1.instCVal.mag.f | Ratio | 0 | 4 | 0 | 400 |
| LD0.VSMSQI1.SeqV.c2.instCVal.mag.f | VMSQI1.I2_DB | Negative Sequence Voltage, c2.instCVal.mag.f | Ratio | 0 | 4 | 0 | 400 |
| LD0.VSMSQI1.SeqV.c3.instCVal.mag.f | VMSQI1.I3_DB | Zero Sequence Voltage, c3.instCVal.mag.f | 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: | REM615 |
| 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 |
| 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 |
| PCM600 | Protection and Control IED Manager |
| RTD | Resistance temperature detector |
| SBO | Select-before-operate |

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