Relion® Protection and Control

630 series
DNP3 Point List Manual

Power and productivity
for a better world™

Document ID: 1MRS756790
Issued: 2011-02-23
Revision: B
Product version: 1.1

Copyright

Trademarks

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

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

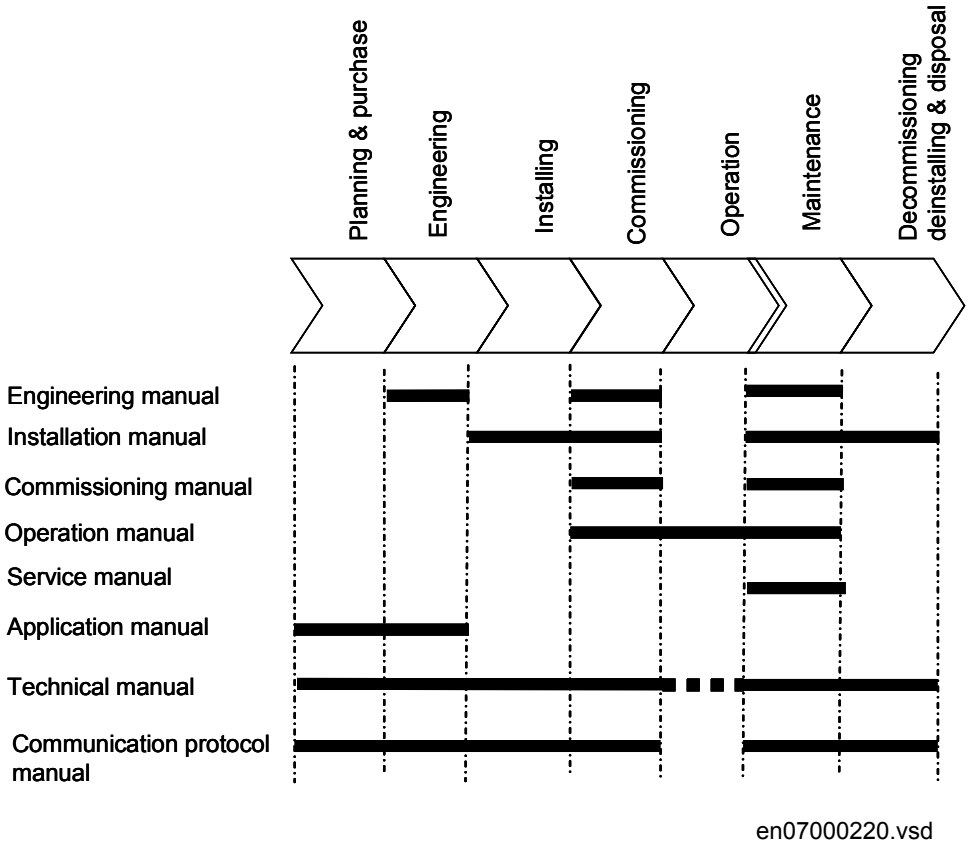

Figure 1: The intended use of manuals in different lifecycles

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 60870-5-103, IEC 61850 and DNP3.

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 descriptions of preconfigurations. The manual can be used as a reference for configuring control, protection, measurement, recording and LED functions. The manual can also be used when creating configurations according to specific application requirements.

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.

The service manual is not available yet.

1.3.2 Document revision history

Document revision/date	Product version	History
A/2009-09-15	1.0	First release
B/2011-02-23	1.1	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	1MRS756789

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 of 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 is necessary to understand that under certain operational conditions, operation of damaged equipment may 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.

- The ^ character in front of an input or output signal name in the function block symbol given for a function, indicates that the user can set an own signal name in PCM600.
- The * character after an input or output signal name in the function block symbol given for a function, indicates that the signal must be connected to another function block in the application configuration to achieve a valid application configuration.

1.4.3 Functions, codes and symbols

Table 1: Functions included in 630 series IEDs

Functionality	IEC 61850	IEC 60617	ANSI
Protection			
Three-phase non-directional overcurrent, low stage	PHLPTOC	3I>	51P-1
Three-phase non-directional overcurrent, high stage	PHHPTOC	3I>>	51P-2
Three-phase non-directional overcurrent, instantaneous stage	PHIPTOC	3I>>>	50P/51P
Three-phase directional overcurrent, low stage	DPHLPDOC	3I> →	67-1
Three-phase directional overcurrent, high stage	DPHHPDOC	3I>> →	67-2
Distance protection	DSTPDIS	Z<	21, 21P, 21N
Automatic switch-onto-fault logic	CVRSOF	SOTF	SOTF
Fault locator	SCEFRFLO	FLOC	21FL
Autoreclosing	DARREC	O → I	79
Non-directional earth-fault, low stage	EFLPTOC	I0>	51N-1
Non-directional earth-fault, high stage	EFHPTOC	I0>>	51N-2
Non-directional earth-fault, instantaneous stage	EFIPTOC	I0>>>	50N/51N
Directional earth-fault, low stage	DEFLPDEF	I0> →	67N-1
Directional earth-fault, high stage	DEFHPDEF	I0>> →	67N-2
Transient/intermittent earth-fault	INTRPTEF	I0> → IEF	67NIEF
Admittance-based earth-fault	EFPADM	Yo>->	21YN
Wattmetric earth-fault	WPWDE	Po>->	32N
Stabilised restricted earth-fault	LREFPNDF	dI0Lo>	87NL
High-impedance-based restricted earth-fault	HREFPDIF	dI0Hi>	87NH
Rotor earth-fault	MREFPTOC	Io>R	64R
Phase discontinuity	PDNSPTOC	I2/I1>	46PD
Negative-sequence overcurrent	NSPTOC	I2>	46

Table continues on next page

Functionality	IEC 61850	IEC 60617	ANSI
Negative-sequence overcurrent protection for motors	MNSPTOC	I2>M	46M
Phase reversal	PREVPTOC	I2>>	46R
Three-phase thermal overload protection for feeder	T1PTTR	3Ith>F	49F
Three-phase thermal overload protection for transformers	T2PTTR	3Ith>T	49T
Three-phase thermal overload protection for motors	MPTTR	3Ith>M	49M
Motor startup supervision	STTPMSU	Is2t n<	48,66,14,51LR
Motor load jam protection	JAMPTOC	Ist>	51LR
Emergency start	ESMGAPC	ESTART	ESTART
Loss of load supervision	LOFLPTUC	3I<	37
Three-phase current inrush detection	INRPHAR	3I2f>	68
Transformer differential protection for two-winding transformers	TR2PTDF	3dI>T	87T
High-impedance or flux-balance-based differential protection for machines	MHZPDIF	3dIHi>G/M	87GH/87MH
Stabilized differential protection for motors	MPDIF	3dI>M	87M
Three-phase overvoltage	PHPTOV	3U>	59
Three-phase undervoltage	PHPTUV	3U<	27
Positive-sequence overvoltage	PSPTOV	U1>	47O+
Positive-sequence undervoltage	PSPTUV	U1<	47U+
Negative-sequence overvoltage	NSPTOV	U2>	47O-
Residual overvoltage	ROVPTOV	U0>	59G
Frequency gradient	DAPFRC	df/dt>	81R
Overfrequency	DAPTOF	f>	81O
Underfrequency	DAPTUF	f<	81U
Load shedding	LSHDPFRQ	UFLS/R	81LSH
Overexcitation	OEPVPH	U/f>	24
Three-phase underexcitation	UEXPDIS	X<	40
Directional overpower	DOPPDPR	P>	32O
Three-phase underimpedance	UZPDIS	Z< GT	21GT
Circuit-breaker failure	CCBRBRF	3I>/I0>BF	51BF/51NBF
Tripping logic	TRPPTRC	I → O	94
Multipurpose analog protection	MAPGAPC	MAP	MAP
Protection-related functions			
Local acceleration logic	DSTPLAL	LAL	LAL
Communication logic for residual overcurrent	RESCPSCH	CLN	85N

Table continues on next page

Functionality	IEC 61850	IEC 60617	ANSI
Scheme communication logic	DSOCPSCH	CL	85
Current reversal and WEI logic	CRWPSCH	CLCRW	85CRW
Current reversal and WEI logic for residual overcurrent	RCRWPSCH	CLCRWN	85NCRW
Control			
Bay control	QCCBAY	CBAY	CBAY
Interlocking interface	SCILO	3	3
Circuit breaker/disconnector control	GNRLCSWI	I ↔ O CB/DC	I ↔ O CB/DC
Circuit breaker	DAXCBR	I ↔ O CB	I ↔ O CB
Disconnector	DAXSWI	I ↔ O DC	I ↔ O DC
Local/remote switch interface	LOCREM	R/L	R/L
Synchrocheck	SYNCRSYN	SYNC	25
Tap changer control with voltage regulator	OLATCC	COLTC	90V
Generic process I/O			
Single point control (8 signals)	SPC8GGIO		
Double point indication	DPGGIO		
Single point indication	SPGGIO		
Generic measured value	MVGGIO		
Logic rotating switch for function selection and LHMI presentation	SLGGIO		
Selector mini switch	VSGGIO		
Pulse counter for energy metering	PCGGIO		
Event counter	CNTGGIO		
Supervision and monitoring			
Circuit-breaker condition monitoring	SSCBR	CBCM	CBCM
Fuse failure supervision	SEQRFUF	FUSEF	60
Current circuit supervision	CCRDIF	MCS 3I	MCS 3I
Trip-circuit supervision	TCSSCBR	TCS	TCM
Station battery supervision	SPVNZBAT	U<>	U<>
Energy monitoring	EPDMMTR	E	E
Measured value limit supervision	MVEXP		
Tap position indication	TPOSSLTC	TPOSM	84M
Power quality			
Voltage variation	PHQVVR	PQMU	PQMV
Voltage unbalance	VSQVUB	PQMUBU	PQMUBV
Current harmonics	CMHAI	PQM3I	PQM3I
Voltage harmonics phase-to-phase	VPPMHAI	PQM3Upp	PQM3Vpp
Voltage harmonics phase-to-earth	VPHMHAI	PQM3Upe	PQM3Vpg

Table continues on next page

Functionality	IEC 61850	IEC 60617	ANSI
Measurement			
Three-phase current	CMMXU	3I	3I
Three-phase voltage (phase-to-earth)	VPHMMXU	3Upe	3Upe
Three-phase voltage (phase-to-phase)	VPPMMXU	3Upp	3Upp
Residual current	RESCMMXU	I0	I0
Residual voltage	RESVMMXU	U0	Vn
Power monitoring with P, Q, S, power factor, frequency	PWRMMXU	PQf	PQf
Sequence current	CSMSQI	I1, I2	I1, I2
Sequence voltage	VSMSQI	U1, U2	V1, V2
Disturbance recorder function			
Analog channels 1-10 (samples)	A1RADR	ACH1	ACH1
Analog channels 11-20 (samples)	A2RADR	ACH2	ACH2
Analog channels 21-30 (calc. val.)	A3RADR	ACH3	ACH3
Analog channels 31-40 (calc. val.)	A4RADR	ACH4	ACH4
Binary channels 1-16	B1RBDR	BCH1	BCH1
Binary channels 17-32	B2RBDR	BCH2	BCH2
Binary channels 33-48	B3RBDR	BCH3	BCH3
Binary channels 49-64	B4RBDR	BCH4	BCH4
Station communication (GOOSE)			
Binary receive	GOOSEBINRCV		
Double point receive	GOOSEDPRCV		
Interlock receive	GOOSEINTLKRCV		
Integer receive	GOOSEINTRCV		
Measured value receive	GOOSEMVRCV		
Single point receive	GOOSESPRCV		

Section 2 DNP3 data mappings

2.1 Overview

This document describes the DNP3 data points and structures available in REF630 / REM630 / RET630 Ver. 1.0. The data points are unmapped as a default. The point lists describe a superset of all data available including the optional functionalities.

The point tables show all the available DNP3 data points in these IEDs. The DNP3 points can be freely added, removed, reorganized and reconfigured using PCM600.

As a default, the class assignments are Class 0 and Class 3 for binary inputs and outputs and for double bit indications. The class assignment for analog inputs and for counters are Class 0 and Class 2. Analog values are provided with default scalings. The scalings can be freely modified.

This list represents the superset of DNP3 points. The actual set of available points depends on the product, optional functionalities and configuration.

See the engineering manual and DNP3 communication protocol manual for more information.

2.2 Point list for 630 series IEDs

Table 2: Signal point list

Function name	Signal type	Signal name	Description
Active Group (ACTVGRP)	Binary inputs	ACTVGRP.1.GRP1	Setting group 1 is active
		ACTVGRP.1.GRP2	Setting group 2 is active
		ACTVGRP.1.GRP3	Setting group 3 is active
		ACTVGRP.1.GRP4	Setting group 4 is active
Automation bits (AUTOBITS)	Binary outputs	AUTOBITS.1.CMDBIT1	Command out bit 1
		AUTOBITS.1.CMDBIT2	Command out bit 2
		AUTOBITS.1.CMDBIT3	Command out bit 3
		AUTOBITS.1.CMDBIT4	Command out bit 4
		AUTOBITS.1.CMDBIT5	Command out bit 5
		AUTOBITS.1.CMDBIT6	Command out bit 6
		AUTOBITS.1.CMDBIT7	Command out bit 7

Table continues on next page

Function name	Signal type	Signal name	Description
		AUTOBITS.1.CMDBIT8	Command out bit 8
		AUTOBITS.1.CMDBIT9	Command out bit 9
		AUTOBITS.1.CMDBIT10	Command out bit 10
		AUTOBITS.1.CMDBIT11	Command out bit 11
		AUTOBITS.1.CMDBIT12	Command out bit 12
		AUTOBITS.1.CMDBIT13	Command out bit 13
		AUTOBITS.1.CMDBIT14	Command out bit 14
		AUTOBITS.1.CMDBIT15	Command out bit 15
		AUTOBITS.1.CMDBIT16	Command out bit 16
		AUTOBITS.1.CMDBIT17	Command out bit 17
		AUTOBITS.1.CMDBIT18	Command out bit 18
		AUTOBITS.1.CMDBIT19	Command out bit 19
		AUTOBITS.1.CMDBIT20	Command out bit 20
		AUTOBITS.1.CMDBIT21	Command out bit 21
		AUTOBITS.1.CMDBIT22	Command out bit 22
		AUTOBITS.1.CMDBIT23	Command out bit 23
		AUTOBITS.1.CMDBIT24	Command out bit 24
		AUTOBITS.1.CMDBIT25	Command out bit 25
		AUTOBITS.1.CMDBIT26	Command out bit 26
		AUTOBITS.1.CMDBIT27	Command out bit 27
		AUTOBITS.1.CMDBIT28	Command out bit 28
		AUTOBITS.1.CMDBIT29	Command out bit 29
		AUTOBITS.1.CMDBIT30	Command out bit 30
		AUTOBITS.1.CMDBIT31	Command out bit 31
		AUTOBITS.1.CMDBIT32	Command out bit 32
Bool to Int (B16I)	Analog inputs	B16I.1.OUT	Output value
Breaker failure (CCBRBRF)	Binary inputs	CCBRBRF.1.CB_FAULT_AL	Delayed CB failure alarm
		CCBRBRF.1.TRBU	Back-up trip by breaker failure protection function
		CCBRBRF.1.TRRET	Retrip by breaker failure protection function
Current circuit supervision (CCRDIF)	Binary inputs	CCRDIF.1.FAIL	Detection of current circuit failure
Three-phase current measurements (CMMXU)	Analog inputs	CMMXU.1.I_DB_A (IL1)	Phase A amplitude, magnitude of reported value
		CMMXU.1.I_DB_B (IL2)	Phase B amplitude, magnitude of reported value
		CMMXU.1.I_DB_C (IL3)	Phase C amplitude, magnitude of reported value
		CMMXU.1.I_ANGL_A (IL1 angle)	Phase A angle, instantaneous value
		CMMXU.1.I_ANGL_B (IL2 angle)	Phase B angle, instantaneous value

Table continues on next page

Function name	Signal type	Signal name	Description
		CMMXU.1.I_ANGL_C (IL3 angle)	Phase C angle, instantaneous value
		CMMXU.1.I_RANGE_A	Phase A amplitude range
		CMMXU.1.I_RANGE_B	Phase B amplitude range
		CMMXU.1.I_RANGE_C	Phase C amplitudet range
Sequence current measurements (CSMSQI)	Analog inputs	CSMSQI.1.I1_DB	Positive sequence current amplitude, reported value
		CSMSQI.1.I1_ANGL_INST	Positive sequence current angle, instantaneous value
		CSMSQI.1.I2_DB	Negative sequence current amplitude, reported value
		CSMSQI.1.I2_ANGL_INST	Negative sequence current angle, instantaneous value
		CSMSQI.1.I1_RANGE	Positive sequence current I1 range
		CSMSQI.1.I2_RANGE	Negative sequence current I2 range
Event counters (CNTGGIO)	Counters	CNTGGIO.1.VALUE1	Output of counter 1
		CNTGGIO.1.VALUE2	Output of counter 2
		CNTGGIO.1.VALUE3	Output of counter 3
		CNTGGIO.1.VALUE4	Output of counter 4
		CNTGGIO.1.VALUE5	Output of counter 5
		CNTGGIO.1.VALUE6	Output of counter 6
Power monitoring function with P, Q, S, power factor (PWRMMXU)	Analog inputs	PWRMMXU.1.P_DB	Active Power magnitude of deadband value
		PWRMMXU.1.Q_DB	Reactive Power magnitude of deadband value
		PWRMMXU.1.S_DB	Apparent Power magnitude of deadband value
		PWRMMXU.1.F_DB	System frequency magnitude of deadband value
		PWRMMXU.1.PF_DB	Power Factor magnitude of deadband value
		PWRMMXU.1.S_RANGE	Apparent Power range
		PWRMMXU.1.P_RANGE	Active Power range
		PWRMMXU.1.Q_RANGE	Reactive Power range
		PWRMMXU.1.PF_RANGE	Apparent Power range
		PWRMMXU.1.F_RANGE	Apparent Power range
	Binary inputs	PWRMMXU.1.ILAG	Current is lagging voltage
		PWRMMXU.1.ILEAD	Current is leading voltage
Disturbance report (DRRDRE)	Analog inputs	DRRDRE.1.Fault number	Disturbance fault number
	Binary inputs	DRRDRE.1.RECMADE	Disturbance recording made
		DRRDRE.1.CLEARED	All disturbances in the disturbance report cleared

Table continues on next page

Function name	Signal type	Signal name	Description
		DRRDRE.1.DRPOFF	Disturbance report function turned off
		DRRDRE.1.MEMUSED	More than 80% of memory used
		DRRDRE.1.RECSTART	Disturbance recording started
DNP small disturbance report (DNPFREC)	Analog inputs	DNPFREC.1.Active setting group	Active setting group
		DNPFREC.1.Fault Freq	Fault Freq
		DNPFREC.1.Fault Location	Fault Location
		DNPFREC.1.Fault Number	Fault Number
		DNPFREC.1.Fault Type	Fault Type
		DNPFREC.1.No of faults in IED	No of faults in IED
		DNPFREC.1.Trig Signal Id	Trig Signal Id
		DNPFREC.1.Trigger Day	Trigger Day
		DNPFREC.1.Trigger Hour	Trigger Hour
		DNPFREC.1.Trigger Millisecond	Trigger Millisecond
		DNPFREC.1.Trigger Minute	Trigger Minute
		DNPFREC.1.Trigger Month	Trigger Month
		DNPFREC.1.Trigger Second	Trigger Second
		DNPFREC.1.Trigger Year	Trigger Year
		DNPFREC.1.Sig1 Fault Angle	Fault Angle
		DNPFREC.1.Sig1 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig1 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig1 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig2 Fault Angle	Fault Angle
		DNPFREC.1.Sig2 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig2 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig2 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig3 Fault Angle	Fault Angle
		DNPFREC.1.Sig3 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig3 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig3 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig4 Fault Angle	Fault Angle
		DNPFREC.1.Sig4 Fault Magnitude	Fault Magnitude

Table continues on next page

Function name	Signal type	Signal name	Description
		DNPFREC.1.Sig4 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig4 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig5 Fault Angle	Fault Angle
		DNPFREC.1.Sig5 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig5 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig5 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig6 Fault Angle	Fault Angle
		DNPFREC.1.Sig6 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig6 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig6 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig7 Fault Angle	Fault Angle
		DNPFREC.1.Sig7 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig7 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig7 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig8 Fault Angle	Fault Angle
		DNPFREC.1.Sig8 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig8 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig8 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig9 Fault Angle	Fault Angle
		DNPFREC.1.Sig9 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig9 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig9 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig10 Fault Angle	Fault Angle
		DNPFREC.1.Sig10 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig10 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig10 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig11 Fault Angle	Fault Angle

Table continues on next page

Function name	Signal type	Signal name	Description
		DNPFREC.1.Sig11 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig11 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig11 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig12 Fault Angle	Fault Angle
		DNPFREC.1.Sig12 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig12 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig12 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig13 Fault Angle	Fault Angle
		DNPFREC.1.Sig13 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig13 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig13 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig14 Fault Angle	Fault Angle
		DNPFREC.1.Sig14 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig14 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig14 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig15 Fault Angle	Fault Angle
		DNPFREC.1.Sig15 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig15 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig15 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig16 Fault Angle	Fault Angle
		DNPFREC.1.Sig16 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig16 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig16 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig17 Fault Angle	Fault Angle
		DNPFREC.1.Sig17 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig17 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig17 Prefault Magnitude	Prefault Magnitude

Table continues on next page

Function name	Signal type	Signal name	Description
		DNPFREC.1.Sig18 Fault Angle	Fault Angle
		DNPFREC.1.Sig18 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig18 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig18 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig19 Fault Angle	Fault Angle
		DNPFREC.1.Sig19 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig19 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig19 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig20 Fault Angle	Fault Angle
		DNPFREC.1.Sig20 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig20 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig20 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig21 Fault Angle	Fault Angle
		DNPFREC.1.Sig21 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig21 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig21 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig22 Fault Angle	Fault Angle
		DNPFREC.1.Sig22 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig22 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig22 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig23 Fault Angle	Fault Angle
		DNPFREC.1.Sig23 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig23 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig23 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig24 Fault Angle	Fault Angle
		DNPFREC.1.Sig24 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig24 Prefault Angle	Prefault Angle

Table continues on next page

Function name	Signal type	Signal name	Description
		DNPFREC.1.Sig24 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig25 Fault Angle	Fault Angle
		DNPFREC.1.Sig25 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig25 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig25 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig26 Fault Angle	Fault Angle
		DNPFREC.1.Sig26 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig26 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig26 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig27 Fault Angle	Fault Angle
		DNPFREC.1.Sig27 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig27 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig27 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig28 Fault Angle	Fault Angle
		DNPFREC.1.Sig28 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig28 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig28 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig29 Fault Angle	Fault Angle
		DNPFREC.1.Sig29 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig29 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig29 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig30 Fault Angle	Fault Angle
		DNPFREC.1.Sig30 Fault Magnitude	Fault Magnitude
		DNPFREC.1.Sig30 Prefault Angle	Prefault Angle
		DNPFREC.1.Sig30 Prefault Magnitude	Prefault Magnitude
		DNPFREC.1.Sig31 Magnitude at trig	Magnitude at trig
		DNPFREC.1.Sig32 Magnitude at trig	Magnitude at trig

Table continues on next page

Function name	Signal type	Signal name	Description
		DNPFREC.1.Sig33 Magnitude at trig	Magnitude at trig
		DNPFREC.1.Sig34 Magnitude at trig	Magnitude at trig
		DNPFREC.1.Sig35 Magnitude at trig	Magnitude at trig
		DNPFREC.1.Sig36 Magnitude at trig	Magnitude at trig
		DNPFREC.1.Sig37 Magnitude at trig	Magnitude at trig
		DNPFREC.1.Sig38 Magnitude at trig	Magnitude at trig
		DNPFREC.1.Sig39 Magnitude at trig	Magnitude at trig
		DNPFREC.1.Sig40 Magnitude at trig	Magnitude at trig
	Binary outputs	DNPFREC.1.Get first disturbance	Get first disturbance
		DNPFREC.1.Get next disturbance	Get next disturbance
		DNPFREC.1.Get previous disturbance	Get previous disturbance
Communication logic for residual OC (RESCPSCH)	Binary inputs	RESCPSCH.1.CS	Carrier Send by Communication Scheme Logic
		RESCPSCH.1.LCG	Loss of carrier guard signal output from communication scheme logic
		RESCPSCH.1.PRORX	Teleprotection signal received for a forward fault
		RESCPSCH.1.OPERATE	Trip by communication scheme logic
Current reversal and WEI logic for residual OC (RCRWPSCH)	Binary inputs	RCRWPSCH.1.CR	POR Carrier signal received from remote end
		RCRWPSCH.1.ECHO	Carrier send by WEI logic
		RCRWPSCH.1.OPR_WEI	Operation of WEI logic
Non-directional earth-fault protection, instantaneous stage (EFIPTOC)	Binary inputs	EFIPTOC.1.OPERATE	Started
		EFIPTOC.1.START	Operated
Non-directional earth-fault protection, high stage (EFHPTOC)	Binary inputs	EFHPTOC.1.OPERATE	Started
		EFHPTOC.1.START	Operated
Non-directional earth-fault protection, low stage (EFLPTOC)	Binary inputs	EFLPTOC.1.OPERATE	Started
		EFLPTOC.1.START	Operated

Table continues on next page

Function name	Signal type	Signal name	Description
Directional earth-fault protection, high stage (DEFHPDEF)	Analog inputs	DEFHPDEF.1.FAULT_DIR	Detected fault direction
	Binary inputs	DEFHPDEF.1.OPERATE	Operated signal
		DEFHPDEF.1.START	Started signal
Directional earth-fault protection, low stage (DEFLPDEF)	Analog inputs	DEFLPDEF.1.FAULT_DIR	Detected fault direction
	Binary inputs	DEFLPDEF.1.OPERATE	Operated signal
		DEFLPDEF.1.START	Started signal
Distance protection (DSTPDIS)	Analog inputs	DSTPDIS.1.DIR_E_FLT	Earth-fault direction (low imp. earthed), GFC
		DSTPDIS.1.CONFLICT_Z1	Tilt angle validity check, Zone Z1
		DSTPDIS.1.CONFLICT_Z2	Tilt angle validity check, Zone Z2
		DSTPDIS.1.CONFLICT_Z3	Tilt angle validity check, Zone Z3
		DSTPDIS.1.CONFLICT_ZAR1	Tilt angle validity check, Zone AR1
		DSTPDIS.1.CONFLICT_ZAR2	Tilt angle validity check, Zone AR2
		DSTPDIS.1.DIRECTION	Direction of fault or load
		DSTPDIS.1.1 DIR_LOOP_X AR1	Record data of bank 1 for direction reactance, Zone AR1
		DSTPDIS.1.1 DIR_LOOP_X AR2	Record data of bank 1 for direction reactance, Zone AR2
		DSTPDIS.1.1 DIR_LOOP_X Z1	Record data of bank 1 for direction reactance, Zone Z1
		DSTPDIS.1.1 DIR_LOOP_X Z2	Record data of bank 1 for direction reactance, Zone Z2
		DSTPDIS.1.1 DIR_LOOP_X Z3	Record data of bank 1 for direction reactance, Zone Z3
		DSTPDIS.1.2 DIR_LOOP_X AR1	Record data of bank 2 for direction reactance, Zone AR1
		DSTPDIS.1.2 DIR_LOOP_X AR2	Record data of bank 2 for direction reactance, Zone AR2
		DSTPDIS.1.2 DIR_LOOP_X Z1	Record data of bank 2 for direction reactance, Zone Z1
		DSTPDIS.1.2 DIR_LOOP_X Z2	Record data of bank 2 for direction reactance, Zone Z2
		DSTPDIS.1.2 DIR_LOOP_X Z3	Record data of bank 2 for direction reactance, Zone Z3
		DSTPDIS.1.3 DIR_LOOP_X AR1	Record data of bank 3 for direction reactance, Zone AR1
		DSTPDIS.1.3 DIR_LOOP_X AR2	Record data of bank 3 for direction reactance, Zone AR2
		DSTPDIS.1.3 DIR_LOOP_X Z1	Record data of bank 3 for direction reactance, Zone Z1
		DSTPDIS.1.3 DIR_LOOP_X Z2	Record data of bank 3 for direction reactance, Zone Z2

Table continues on next page

Function name	Signal type	Signal name	Description
		DSTPDIS.1.3 DIR_LOOP_X Z3	Record data of bank 3 for direction reactance, Zone Z3
		DSTPDIS.1.1 DIR_LOOP_R AR1	Record data of bank 1 for direction resistance, Zone AR1
		DSTPDIS.1.1 DIR_LOOP_R AR2	Record data of bank 1 for direction resistance, Zone AR2
		DSTPDIS.1.1 DIR_LOOP_R Z1	Record data of bank 1 for direction resistance, Zone Z1
		DSTPDIS.1.1 DIR_LOOP_R Z2	Record data of bank 1 for direction resistance, Zone Z2
		DSTPDIS.1.1 DIR_LOOP_R Z3	Record data of bank 1 for direction resistance, Zone Z3
		DSTPDIS.1.2 DIR_LOOP_R AR1	Record data of bank 2 for direction resistance, Zone AR1
		DSTPDIS.1.2 DIR_LOOP_R AR2	Record data of bank 2 for direction resistance, Zone AR2
		DSTPDIS.1.2 DIR_LOOP_R Z1	Record data of bank 2 for direction resistance, Zone Z1
		DSTPDIS.1.2 DIR_LOOP_R Z2	Record data of bank 2 for direction resistance, Zone Z2
		DSTPDIS.1.2 DIR_LOOP_R Z3	Record data of bank 2 for direction resistance, Zone Z3
		DSTPDIS.1.3 DIR_LOOP_R AR1	Record data of bank 3 for direction resistance, Zone AR1
		DSTPDIS.1.3 DIR_LOOP_R AR2	Record data of bank 3 for direction resistance, Zone AR2
		DSTPDIS.1.3 DIR_LOOP_R Z1	Record data of bank 3 for direction resistance, Zone Z1
		DSTPDIS.1.3 DIR_LOOP_R Z2	Record data of bank 3 for direction resistance, Zone Z2
		DSTPDIS.1.3 DIR_LOOP_R Z3	Record data of bank 3 for direction resistance, Zone Z3
		DSTPDIS.1.1 FLTLOOP_XFST AR1	Record data of bank 1 for PE-loop reactance (1st), Zone AR1
		DSTPDIS.1.1 FLTLOOP_XFST AR2	Record data of bank 1 for PE-loop reactance (1st), Zone AR2
		DSTPDIS.1.1 FLTLOOP_XFST Z1	Record data of bank 1 for PE-loop reactance (1st), Zone Z1
		DSTPDIS.1.1 FLTLOOP_XFST Z2	Record data of bank 1 for PE-loop reactance (1st), Zone Z2
		DSTPDIS.1.1 FLTLOOP_XFST Z3	Record data of bank 1 for PE-loop reactance (1st), Zone Z3
		DSTPDIS.1.2 FLTLOOP_XFST AR1	Record data of bank 2 for PE-loop reactance (1st), Zone AR1
		DSTPDIS.1.2 FLTLOOP_XFST AR2	Record data of bank 2 for PE-loop reactance (1st), Zone AR2
		DSTPDIS.1.2 FLTLOOP_XFST Z1	Record data of bank 2 for PE-loop reactance (1st), Zone Z1

Table continues on next page

Function name	Signal type	Signal name	Description
		DSTPDIS.1.2 FLTLOOP_XFST Z2	Record data of bank 2 for PE-loop reactance (1st), Zone Z2
		DSTPDIS.1.2 FLTLOOP_XFST Z3	Record data of bank 2 for PE-loop reactance (1st), Zone Z3
		DSTPDIS.1.3 FLTLOOP_XFST AR1	Record data of bank 3 for PE-loop reactance (1st), Zone AR1
		DSTPDIS.1.3 FLTLOOP_XFST AR2	Record data of bank 3 for PE-loop reactance (1st), Zone AR2
		DSTPDIS.1.3 FLTLOOP_XFST Z1	Record data of bank 3 for PE-loop reactance (1st), Zone Z1
		DSTPDIS.1.3 FLTLOOP_XFST Z2	Record data of bank 3 for PE-loop reactance (1st), Zone Z2
		DSTPDIS.1.3 FLTLOOP_XFST Z3	Record data of bank 3 for PE-loop reactance (1st), Zone Z3
		DSTPDIS.1.1 FLTLOOP_XSND AR1	Record data of bank 1 for PE-loop reactance (2nd), Zone AR1
		DSTPDIS.1.1 FLTLOOP_XSND AR2	Record data of bank 1 for PE-loop reactance (2nd), Zone AR2
		DSTPDIS.1.1 FLTLOOP_XSND Z1	Record data of bank 1 for PE-loop reactance (2nd), Zone Z1
		DSTPDIS.1.1 FLTLOOP_XSND Z2	Record data of bank 1 for PE-loop reactance (2nd), Zone Z2
		DSTPDIS.1.1 FLTLOOP_XSND Z3	Record data of bank 1 for PE-loop reactance (2nd), Zone Z3
		DSTPDIS.1.2 FLTLOOP_XSND AR1	Record data of bank 2 for PE-loop reactance (2nd), Zone AR1
		DSTPDIS.1.2 FLTLOOP_XSND AR2	Record data of bank 2 for PE-loop reactance (2nd), Zone AR2
		DSTPDIS.1.2 FLTLOOP_XSND Z1	Record data of bank 2 for PE-loop reactance (2nd), Zone Z1
		DSTPDIS.1.2 FLTLOOP_XSND Z2	Record data of bank 2 for PE-loop reactance (2nd), Zone Z2
		DSTPDIS.1.2 FLTLOOP_XSND Z3	Record data of bank 2 for PE-loop reactance (2nd), Zone Z3
		DSTPDIS.1.3 FLTLOOP_XSND AR1	Record data of bank 3 for PE-loop reactance (2nd), Zone AR1
		DSTPDIS.1.3 FLTLOOP_XSND AR2	Record data of bank 3 for PE-loop reactance (2nd), Zone AR2
		DSTPDIS.1.3 FLTLOOP_XSND Z1	Record data of bank 3 for PE-loop reactance (2nd), Zone Z1
		DSTPDIS.1.3 FLTLOOP_XSND Z2	Record data of bank 3 for PE-loop reactance (2nd), Zone Z2
		DSTPDIS.1.3 FLTLOOP_XSND Z3	Record data of bank 3 for PE-loop reactance (2nd), Zone Z3
		DSTPDIS.1.1 FLTLOOP_RFST AR1	Record data of bank 1 for PE-loop resistance (1st), Zone AR1
		DSTPDIS.1.1 FLTLOOP_RFST AR2	Record data of bank 1 for PE-loop resistance (1st), Zone AR2

Table continues on next page

Function name	Signal type	Signal name	Description
		DSTPDIS.1.1 FLTLOOP_RFST Z1	Record data of bank 1 for PE-loop resistance (1st), Zone Z1
		DSTPDIS.1.1 FLTLOOP_RFST Z2	Record data of bank 1 for PE-loop resistance (1st), Zone Z2
		DSTPDIS.1.1 FLTLOOP_RFST Z3	Record data of bank 1 for PE-loop resistance (1st), Zone Z3
		DSTPDIS.1.2 FLTLOOP_RFST AR1	Record data of bank 2 for PE-loop resistance (1st), Zone AR1
		DSTPDIS.1.2 FLTLOOP_RFST AR2	Record data of bank 2 for PE-loop resistance (1st), Zone AR2
		DSTPDIS.1.2 FLTLOOP_RFST Z1	Record data of bank 2 for PE-loop resistance (1st), Zone Z1
		DSTPDIS.1.2 FLTLOOP_RFST Z2	Record data of bank 2 for PE-loop resistance (1st), Zone Z2
		DSTPDIS.1.2 FLTLOOP_RFST Z3	Record data of bank 2 for PE-loop resistance (1st), Zone Z3
		DSTPDIS.1.3 FLTLOOP_RFST AR1	Record data of bank 3 for PE-loop resistance (1st), Zone AR1
		DSTPDIS.1.3 FLTLOOP_RFST AR2	Record data of bank 3 for PE-loop resistance (1st), Zone AR2
		DSTPDIS.1.3 FLTLOOP_RFST Z1	Record data of bank 3 for PE-loop resistance (1st), Zone Z1
		DSTPDIS.1.3 FLTLOOP_RFST Z2	Record data of bank 3 for PE-loop resistance (1st), Zone Z2
		DSTPDIS.1.3 FLTLOOP_RFST Z3	Record data of bank 3 for PE-loop resistance (1st), Zone Z3
		DSTPDIS.1.1 FLTLOOP_RSND AR1	Record data of bank 1 for PE-loop resistance (2nd), Zone AR1
		DSTPDIS.1.1 FLTLOOP_RSND AR2	Record data of bank 1 for PE-loop resistance (2nd), Zone AR2
		DSTPDIS.1.1 FLTLOOP_RSND Z1	Record data of bank 1 for PE-loop resistance (2nd), Zone Z1
		DSTPDIS.1.1 FLTLOOP_RSND Z2	Record data of bank 1 for PE-loop resistance (2nd), Zone Z2
		DSTPDIS.1.1 FLTLOOP_RSND Z3	Record data of bank 1 for PE-loop resistance (2nd), Zone Z3
		DSTPDIS.1.2 FLTLOOP_RSND AR1	Record data of bank 2 for PE-loop resistance (2nd), Zone AR1
		DSTPDIS.1.2 FLTLOOP_RSND AR2	Record data of bank 2 for PE-loop resistance (2nd), Zone AR2
		DSTPDIS.1.2 FLTLOOP_RSND Z1	Record data of bank 2 for PE-loop resistance (2nd), Zone Z1
		DSTPDIS.1.2 FLTLOOP_RSND Z2	Record data of bank 2 for PE-loop resistance (2nd), Zone Z2
		DSTPDIS.1.2 FLTLOOP_RSND Z3	Record data of bank 2 for PE-loop resistance (2nd), Zone Z3
		DSTPDIS.1.3 FLTLOOP_RSND AR1	Record data of bank 3 for PE-loop resistance (2nd), Zone AR1

Table continues on next page

Function name	Signal type	Signal name	Description
		DSTPDIS.1.3 FLTLOOP_RSND AR2	Record data of bank 3 for PE-loop resistance (2nd), Zone AR2
		DSTPDIS.1.3 FLTLOOP_RSND Z1	Record data of bank 3 for PE-loop resistance (2nd), Zone Z1
		DSTPDIS.1.3 FLTLOOP_RSND Z2	Record data of bank 3 for PE-loop resistance (2nd), Zone Z2
		DSTPDIS.1.3 FLTLOOP_RSND Z3	Record data of bank 3 for PE-loop resistance (2nd), Zone Z3
		DSTPDIS.1.1 FLTLOOP_XPP AR1	Record data of bank 1 for PP-loop reactance, Zone AR1
		DSTPDIS.1.1 FLTLOOP_XPP AR2	Record data of bank 1 for PP-loop reactance, Zone AR2
		DSTPDIS.1.1 FLTLOOP_XPP Z1	Record data of bank 1 for PP-loop reactance, Zone Z1
		DSTPDIS.1.1 FLTLOOP_XPP Z2	Record data of bank 1 for PP-loop reactance, Zone Z2
		DSTPDIS.1.1 FLTLOOP_XPP Z3	Record data of bank 1 for PP-loop reactance, Zone Z3
		DSTPDIS.1.2 FLTLOOP_XPP AR1	Record data of bank 2 for PP-loop reactance, Zone AR1
		DSTPDIS.1.2 FLTLOOP_XPP AR2	Record data of bank 2 for PP-loop reactance, Zone AR2
		DSTPDIS.1.2 FLTLOOP_XPP Z1	Record data of bank 2 for PP-loop reactance, Zone Z1
		DSTPDIS.1.2 FLTLOOP_XPP Z2	Record data of bank 2 for PP-loop reactance, Zone Z2
		DSTPDIS.1.2 FLTLOOP_XPP Z3	Record data of bank 2 for PP-loop reactance, Zone Z3
		DSTPDIS.1.3 FLTLOOP_XPP AR1	Record data of bank 3 for PP-loop reactance, Zone AR1
		DSTPDIS.1.3 FLTLOOP_XPP AR2	Record data of bank 3 for PP-loop reactance, Zone AR2
		DSTPDIS.1.3 FLTLOOP_XPP Z1	Record data of bank 3 for PP-loop reactance, Zone Z1
		DSTPDIS.1.3 FLTLOOP_XPP Z2	Record data of bank 3 for PP-loop reactance, Zone Z2
		DSTPDIS.1.3 FLTLOOP_XPP Z3	Record data of bank 3 for PP-loop reactance, Zone Z3
		DSTPDIS.1.1 FLTLOOP_RPP AR1	Record data of bank 1 for PP-loop resistance, Zone AR1
		DSTPDIS.1.1 FLTLOOP_RPP AR2	Record data of bank 1 for PP-loop resistance, Zone AR2
		DSTPDIS.1.1 FLTLOOP_RPP Z1	Record data of bank 1 for PP-loop resistance, Zone Z1
		DSTPDIS.1.1 FLTLOOP_RPP Z2	Record data of bank 1 for PP-loop resistance, Zone Z2
		DSTPDIS.1.1 FLTLOOP_RPP Z3	Record data of bank 1 for PP-loop resistance, Zone Z3

Table continues on next page

Function name	Signal type	Signal name	Description
		DSTPDIS.1.2 FLTLOOP_RPP AR1	Record data of bank 2 for PP-loop resistance, Zone AR1
		DSTPDIS.1.2 FLTLOOP_RPP AR2	Record data of bank 2 for PP-loop resistance, Zone AR2
		DSTPDIS.1.2 FLTLOOP_RPP Z1	Record data of bank 2 for PP-loop resistance, Zone Z1
		DSTPDIS.1.2 FLTLOOP_RPP Z2	Record data of bank 2 for PP-loop resistance, Zone Z2
		DSTPDIS.1.2 FLTLOOP_RPP Z3	Record data of bank 2 for PP-loop resistance, Zone Z3
		DSTPDIS.1.3 FLTLOOP_RPP AR1	Record data of bank 3 for PP-loop resistance, Zone AR1
		DSTPDIS.1.3 FLTLOOP_RPP AR2	Record data of bank 3 for PP-loop resistance, Zone AR2
		DSTPDIS.1.3 FLTLOOP_RPP Z1	Record data of bank 3 for PP-loop resistance, Zone Z1
		DSTPDIS.1.3 FLTLOOP_RPP Z2	Record data of bank 3 for PP-loop resistance, Zone Z2
		DSTPDIS.1.3 FLTLOOP_RPP Z3	Record data of bank 3 for PP-loop resistance, Zone Z3
		DSTPDIS.1.1 DIRECTION	Record data of bank 1 for direction
		DSTPDIS.1.2 DIRECTION	Record data of bank 2 for direction
		DSTPDIS.1.3 DIRECTION	Record data of bank 3 for direction
		DSTPDIS.1.1 DIR_E_FLT GFC	Record data of bank 1 for EF-direction, GFC
		DSTPDIS.1.2 DIR_E_FLT GFC	Record data of bank 2 for EF-direction, GFC
		DSTPDIS.1.3 DIR_E_FLT GFC	Record data of bank 3 for EF-direction, GFC
		DSTPDIS.1.1 RELEASE_PE GFC	Record data of bank 1 for release PE-loops, GFC
		DSTPDIS.1.2 RELEASE_PE GFC	Record data of bank 2 for release PE-loops, GFC
		DSTPDIS.1.3 RELEASE_PE GFC	Record data of bank 3 for release PE-loops, GFC
		DSTPDIS.1.1 RELEASE_PP GFC	Record data of bank 1 for release PP-loops, GFC
		DSTPDIS.1.2 RELEASE_PP GFC	Record data of bank 2 for release PP-loops, GFC
		DSTPDIS.1.3 RELEASE_PP GFC	Record data of bank 3 for release PP-loops, GFC
		DSTPDIS.1.1 Zones OPERATE	Record data of bank 1 for operate signals of all zones
		DSTPDIS.1.2 Zones OPERATE	Record data of bank 2 for operate signals of all zones

Table continues on next page

Function name	Signal type	Signal name	Description
		DSTPDIS.1.3 Zones OPERATE	Record data of bank 3 for operate signals of all zones
	Binary inputs	DSTPDIS.1.OPERATE_GFC	Time delayed operate-signal, GFC
		DSTPDIS.1.START_GFC	General start-signal, GFC –
		DSTPDIS.1.ST_GFC_A	Event start phase A, GFC
		DSTPDIS.1.ST_GFC_B	Event start phase B, GFC
		DSTPDIS.1.ST_GFC_C	Event start phase C, GFC
		DSTPDIS.1.RELEASE_A	Event release phase A to earth fault
		DSTPDIS.1.RELEASE_B	Event release phase B to earth fault
		DSTPDIS.1.RELEASE_C	Event release phase C to earth fault
		DSTPDIS.1.RELEASE_AB	Event release phase A to phase B
		DSTPDIS.1.RELEASE_BC	Event release phase B to phase C
		DSTPDIS.1.RELEASE_CA	Event release phase C to phase A
		DSTPDIS.1.RELEASE_ABC	Event release 3-phase fault
		DSTPDIS.1.EARTH_FLT	Indication of a single phase earth fault, GFC
		DSTPDIS.1.XC_FLT	Indication of a cross-country-fault (high imp. earthed), GFC
		DSTPDIS.1.CONFLICT_GFC	Conflict with PSL-function and voltage measuring principle
		DSTPDIS.1.OPERATE_Z1	Time delayed operate signal, Zone Z1
		DSTPDIS.1.START_Z1	General start-signal, Zone Z1
		DSTPDIS.1.ST_Z1_A	Event start phase A, Zone Z1
		DSTPDIS.1.ST_Z1_B	Event start phase B, Zone Z1
		DSTPDIS.1.ST_Z1_C	Event start phase C, Zone Z1
		DSTPDIS.1.OPERATE_Z2	Time delayed operate signal, Zone Z2
		DSTPDIS.1.START_Z2	General start-signal, Zone Z2
		DSTPDIS.1.ST_Z2_A	Event start phase A, Zone Z2
		DSTPDIS.1.ST_Z2_B	Event start phase B, Zone Z2
		DSTPDIS.1.ST_Z2_C	Event start phase C, Zone Z2
		DSTPDIS.1.OPERATE_Z3	Time delayed operate signal, Zone Z3
		DSTPDIS.1.START_Z3	General start-signal, Zone Z3
		DSTPDIS.1.ST_Z3_A	Event start phase A, Zone Z3
		DSTPDIS.1.ST_Z3_B	Event start phase B, Zone Z3
		DSTPDIS.1.ST_Z3_C	Event start phase C, Zone Z3

Table continues on next page

Function name	Signal type	Signal name	Description
		DSTPDIS.1.OPERATE_ZAR1	Time delayed operate signal, Zone AR1
		DSTPDIS.1.START_ZAR1	General start-signal, Zone AR1
		DSTPDIS.1.ST_ZAR1_A	Event start phase A, Zone AR1
		DSTPDIS.1.ST_ZAR1_B	Event start phase B, Zone AR1
		DSTPDIS.1.ST_ZAR1_C	Event start phase C, Zone AR1
		DSTPDIS.1.OPERATE_ZAR2	Time delayed operate signal, Zone AR2
		DSTPDIS.1.START_ZAR2	General start-signal, Zone AR2
		DSTPDIS.1.ST_ZAR2_A	Event start phase A, Zone AR2
		DSTPDIS.1.ST_ZAR2_B	Event start phase B, Zone AR2
		DSTPDIS.1.ST_ZAR2_C	Event start phase C, Zone AR2
		DSTPDIS.1.1 EARTH_FLT GFC	Record data of bank 1 for earth fault, GFC
		DSTPDIS.1.2 EARTH_FLT GFC	Record data of bank 2 for earth fault, GFC
		DSTPDIS.1.3 EARTH_FLT GFC	Record data of bank 3 for earth fault, GFC
		DSTPDIS.1.1 XC_FLT GFC	Record data of bank 1 for cross country fault, GFC
		DSTPDIS.1.2 XC_FLT GFC	Record data of bank 2 for cross country fault, GFC
		DSTPDIS.1.3 XC_FLT GFC	Record data of bank 3 for cross country fault, GFC
High impedance based restricted earth-fault (HREFPDIF)	Binary inputs	HREFPDIF.1.START	High impedance restricted earth-fault protection start
		HREFPDIF.1.OPERATE	High impedance restricted earth-fault protection operate
Three-phase voltage (phase-to-earth voltages) (RMS) (VPHMMXU)	Analog inputs	VPHMMXU.1.U_DB_A (UL1)	Phase A amplitude, magnitude of reported value
		VPHMMXU.1.U_DB_B (UL2)	Phase B amplitude, magnitude of reported value
		VPHMMXU.1.U_DB_C (UL3)	Phase C amplitude, magnitude of reported value
		VPHMMXU.1.U_ANGL_A (UL1 angle)	Phase A angle
		VPHMMXU.1.U_ANGL_B (UL1 angle)	Phase B angle
		VPHMMXU.1.U_ANGL_C (UL1 angle)	Phase C angle
		VPHMMXU.1.U_RANGE_A	Phase A amplitude range
		VPHMMXU.1.U_RANGE_B	Phase B amplitude range
		VPHMMXU.1.U_RANGE_C	Phase C amplitude range

Table continues on next page

Function name	Signal type	Signal name	Description
Three-phase voltage (phase-to-phasevoltages) (RMS) (VPPMMXU)	Analog inputs	VPPMMXU.1.V_DB_AB (UL12)	Phase A to B amplitude, magnitude of reported value
		VPPMMXU.1.V_DB_BC (UL23)	Phase B to C amplitude, magnitude of reported value
		VPPMMXU.1.V_DB_CA (UL31)	Phase C to A amplitude, magnitude of reported value
		VPPMMXU.1.V_ANGL_AB (U12 angle)	Phase A to B angle
		VPPMMXU.1.V_ANGL_BC (U23 angle)	Phase B to C angle
		VPPMMXU.1.V_ANGL_CA (U31 angle)	Phase C to A angle
		VPPMMXU.1.U_RANGE_AB	Phase AB amplitude range
		VPPMMXU.1.U_RANGE_BC	Phase BC amplitude range
		VPPMMXU.1.U_RANGE_CA	Phase CA amplitude range
Sequence voltage (VSMSQI)	Analog inputs	VSMSQI.1.U1_DB	Positive sequence voltage amplitude, reported value
		VSMSQI.1.U2_DB	Negative sequence voltage amplitude, reported value
		VSMSQI.1.U1_ANGL_INST	Positive sequence voltage angle, instantaneous value
		VSMSQI.1.U2_ANGL_INST	Negative sequence voltage angle, instantaneous value
		VSMSQI.1.U1_RANGE	Positive sequence voltage U1 range
		VSMSQI.1.U2_RANGE	Negative sequence voltage U2 range
Residual current (RESCMMXU)	Analog inputs	RESCMMXU.1.I0_DB (I0)	Residual current RMS, magnitude of reported value
		RESCMMXU.1.I0_ANGL (I0 angle)	Residual current angle
		RESCMMXU. 1.I0_RMS_RANGE	Residual current IG RMS range
Residual voltage (RESVMMXU)	Analog inputs	RESVMMXU.1.U0_MAG_DB	Residual voltage Amplitude, magnitude of reported value
		RESVMMXU.1.U0_ANGL_INST (U0 angle)	Residual voltage angle, instantaneous value
		RESVMMXU.1.U0_RMS_DB (U0)	Residual voltage RMS, magnitude of reported value
		RESVMMXU. 1.U0_RMS_RANGE	Residual voltage RMS range
		RESVMMXU. 1.U0_MAG_RANGE	Residual voltage MAG range
Three-phase non-directional overcurrent, low stage (PHLPTOC)	Binary inputs	PHLPTOC.1.ST_A	Started phase A
		PHLPTOC.1.ST_B	Started phase B

Table continues on next page

Function name	Signal type	Signal name	Description
		PHLPTOC.1.ST_C	Started phase C
		PHLPTOC.1.START	Started signal
		PHLPTOC.1.OPR_A	Operated phase A
		PHLPTOC.1.OPR_B	Operated phase B
		PHLPTOC.1.OPR_C	Operated phase C
		PHLPTOC.1.OPERATE	Operated
Three-phase non-directional overcurrent, high stage (PHHPTOC)	Binary inputs	PHHPTOC.1.ST_A	Started phase A
		PHHPTOC.1.ST_B	Started phase B
		PHHPTOC.1.ST_C	Started phase C
		PHHPTOC.1.START	Started signal
		PHHPTOC.1.OPR_A	Operated phase A
		PHHPTOC.1.OPR_B	Operated phase B
		PHHPTOC.1.OPR_C	Operated phase C
		PHHPTOC.1.OPERATE	Operated
Three-phase non-directional overcurrent, instantaneous stage (PHIPTOC)	Binary inputs	PHIPTOC.1.ST_A	Started phase A
		PHIPTOC.1.ST_B	Started phase B
		PHIPTOC.1.ST_C	Started phase C
		PHIPTOC.1.START	Started signal
		PHIPTOC.1.OPR_A	Operated phase A
		PHIPTOC.1.OPR_B	Operated phase B
		PHIPTOC.1.OPR_C	Operated phase C
		PHIPTOC.1.OPERATE	Operated
Negative-sequence overcurrent (NSPTOC)	Binary inputs	NSPTOC.1.START	Start Signal
		NSPTOC.1.OPERATE	Operate Signal
Phase discontinuity (PDNSPTOC)	Binary inputs	PDNSPTOC.1.START	Phase discontinuity protection started
		PDNSPTOC.1.OPERATE	Phase discontinuity protection operated.
Three-phase thermal overload for feeder (T1PTTR)	Binary inputs	T1PTTR.1.OPERATE	Operate Signal
		T1PTTR.1.START	Start Signal
		T1PTTR.1.BLK_CLOSE	Thermal overload indicator. To inhibit reclose
		T1PTTR.1.ALARM	Alarm signal
Negative-sequence overvoltage (NSPTOV)	Binary inputs	NSPTOV.1.START	Start signal for Negative Sequence Overvoltage logic
		NSPTOV.1.OPERATE	Operate signal for Negative Sequence Overvoltage logic

Table continues on next page

Function name	Signal type	Signal name	Description
Three-phase overvoltage (PHPTOV)	Binary inputs	PHPTOV.1.ST_A	Start signal, phase 1
		PHPTOV.1.ST_B	Start signal, phase 2
		PHPTOV.1.ST_C	Start signal, phase 3
		PHPTOV.1.START	Start signal, combined
		PHPTOV.1.OPR_A	Operate signal, phase 1
		PHPTOV.1.OPR_B	Operate signal, phase 2
		PHPTOV.1.OPR_C	Operate signal, phase 3
		PHPTOV.1.OPERATE	Operate signal, combined
Three-phase undervoltage (PHPTUV)	Binary inputs	PHPTUV.1.ST_A	Start signal, phase 1
		PHPTUV.1.ST_B	Start signal, phase 2
		PHPTUV.1.ST_C	Start signal, phase 3
		PHPTUV.1.START	Start signal, combined
		PHPTUV.1.OPR_A	Operate signal, phase 1
		PHPTUV.1.OPR_B	Operate signal, phase 2
		PHPTUV.1.OPR_C	Operate signal, phase 3
		PHPTUV.1.OPERATE	Operate signal, combined
Positive-sequence overvoltage (PSPTOV)	Binary inputs	PSPTOV.1.START	Start signal for Positive Sequence Overvoltage logic
		PSPTOV.1.OPERATE	Operate signal for Positive Sequence Overvoltage logic
Positive-sequence undervoltage (PSPTUV)	Binary inputs	PSPTUV.1.START	Start signal for Positive Sequence Undervoltage logic
		PSPTUV.1.OPERATE	Operate signal for Positive Sequence Undervoltage protection
Three phase directional overcurrent, low stage (DPHLPDOC)	Analog inputs	DPHLPDOC.1.FAULT_DIR	Detected fault direction, general
		DPHLPDOC.1.FLT_DIR_A	Detected fault direction, phase A
		DPHLPDOC.1.FLT_DIR_B	Detected fault direction, phase B
		DPHLPDOC.1.FLT_DIR_C	Detected fault direction, phase C
	Binary inputs	DPHLPDOC.1.START	Started signal
		DPHLPDOC.1.OPERATE	Operated
		DPHLPDOC.1.ST_A	Started phase A
		DPHLPDOC.1.ST_B	Started phase B
		DPHLPDOC.1.ST_C	Started phase C
		DPHLPDOC.1.OPR_A	Operated phase A
		DPHLPDOC.1.OPR_B	Operated phase B
		DPHLPDOC.1.OPR_C	Operated phase C
Residual overvoltage (ROVPTOV)	Binary inputs	ROVPTOV.1.START	Start signal for residual overvoltage logic

Table continues on next page

Function name	Signal type	Signal name	Description
		ROVPTOV.1.OPERATE	Operate signal for residual overvoltage logic
Three phase directional overcurrent, high stage (DPHHPDOC)	Analog inputs	DPHHPDOC.1.FAULT_DIR	Detected fault direction, general
		DPHHPDOC.1.FLT_DIR_A	Detected fault direction, phase A
		DPHHPDOC.1.FLT_DIR_B	Detected fault direction, phase B
		DPHHPDOC.1.FLT_DIR_C	Detected fault direction, phase C
	Binary inputs	DPHHPDOC.1.START	Started signal
		DPHHPDOC.1.OPERATE	Operated
		DPHHPDOC.1.ST_A	Started phase A
		DPHHPDOC.1.ST_B	Started phase B
		DPHHPDOC.1.ST_C	Started phase C
		DPHHPDOC.1.OPR_A	Operated phase A
		DPHHPDOC.1.OPR_B	Operated phase B
		DPHHPDOC.1.OPR_C	Operated phase C
Fault locator (SCEFRFLO)	Analog inputs	SCEFRFLO.1.1 A Flt angle PhA	Record data of bank 1 for phase A current angle during fault
		SCEFRFLO.1.1 A Flt angle PhB	Record data of bank 1 for phase B current angle during fault
		SCEFRFLO.1.1 A Flt angle PhC	Record data of bank 1 for phase C current angle during fault
		SCEFRFLO.1.1 A Flt value PhA	Record data of bank 1 for phase A current amplitude during fault
		SCEFRFLO.1.1 A Flt value PhB	Record data of bank 1 for phase B current amplitude during fault
		SCEFRFLO.1.1 A Flt value PhC	Record data of bank 1 for phase C current amplitude during fault
		SCEFRFLO.1.1 A Pre angle PhA	Record data of bank 1 for phase A pre-fault current angle
		SCEFRFLO.1.1 A Pre angle PhB	Record data of bank 1 for phase B pre-fault current angle
		SCEFRFLO.1.1 A Pre angle PhC	Record data of bank 1 for phase C pre-fault current angle
		SCEFRFLO.1.1 A Pre value PhA	Record data of bank 1 for phase A pre-fault current amplitude
		SCEFRFLO.1.1 A Pre value PhB	Record data of bank 1 for phase B pre-fault current amplitude
		SCEFRFLO.1.1 A Pre value PhC	Record data of bank 1 for phase C pre-fault current amplitude

Table continues on next page

Function name	Signal type	Signal name	Description
		SCEFRFLO.1.1 EF_VALIDITY	Record data of bank 1 for validity of earth-fault location
		SCEFRFLO.1.1 FAULT_LOOP	Record data of bank 1 for fault loop
		SCEFRFLO.1.1 FLT_DISTANCE	Record data of bank 1 for fault distance
		SCEFRFLO.1.1 IFLT_PER_ILD	Record data of bank 1 for ratio between fault current and load current
		SCEFRFLO.1.1 PhV Flt angle PhA	Record data of bank 1 for phase A voltage angle during fault
		SCEFRFLO.1.1 PhV Flt angle PhB	Record data of bank 1 for phase B voltage angle during fault
		SCEFRFLO.1.1 PhV Flt angle PhC	Record data of bank 1 for phase C voltage angle during fault
		SCEFRFLO.1.1 PhV Flt value PhA	Record data of bank 1 for phase A voltage amplitude during fault
		SCEFRFLO.1.1 PhV Flt value PhB	Record data of bank 1 for phase B voltage amplitude during fault
		SCEFRFLO.1.1 PhV Flt value PhC	Record data of bank 1 for phase C voltage amplitude during fault
		SCEFRFLO.1.1 PhV Pre angle PhA	Record data of bank 1 for phase A pre-fault voltage angle
		SCEFRFLO.1.1 PhV Pre angle PhB	Record data of bank 1 for phase B pre-fault voltage angle
		SCEFRFLO.1.1 PhV Pre angle PhC	Record data of bank 1 for phase C pre-fault voltage angle
		SCEFRFLO.1.1 PhV Pre value PhA	Record data of bank 1 for phase A pre-fault voltage amplitude
		SCEFRFLO.1.1 PhV Pre value PhB	Record data of bank 1 for phase B pre-fault voltage amplitude
		SCEFRFLO.1.1 PhV Pre value PhC	Record data of bank 1 for phase C pre-fault voltage amplitude
		SCEFRFLO.1.1 RF	Record data of bank 1 for fault resistance
		SCEFRFLO.1.1 RFLOOP	Record data of bank 1 for fault loop resistance
		SCEFRFLO.1.1 S_CALC	Record data of bank 1 for equivalent load distance
		SCEFRFLO.1.1 XC0F_CALC	Record data bank1 feeder phase-to-earth capacitive reactance

Table continues on next page

Function name	Signal type	Signal name	Description
		SCEFRFLO.1.1 XFLOOP	Record data of bank 1 for fault loop reactance
		SCEFRFLO.1.2 A Flt angle PhA	Record data of bank 1 for phase A current angle during fault
		SCEFRFLO.1.2 A Flt angle PhB	Record data of bank 1 for phase B current angle during fault
		SCEFRFLO.1.2 A Flt angle PhC	Record data of bank 1 for phase C current angle during fault
		SCEFRFLO.1.2 A Flt value PhA	Record data of bank 1 for phase A current amplitude during fault
		SCEFRFLO.1.2 A Flt value PhB	Record data of bank 1 for phase B current amplitude during fault
		SCEFRFLO.1.2 A Flt value PhC	Record data of bank 1 for phase C current amplitude during fault
		SCEFRFLO.1.2 A Pre angle PhA	Record data of bank 1 for phase A pre-fault current angle
		SCEFRFLO.1.2 A Pre angle PhB	Record data of bank 1 for phase B pre-fault current angle
		SCEFRFLO.1.2 A Pre angle PhC	Record data of bank 1 for phase C pre-fault current angle
		SCEFRFLO.1.2 A Pre value PhA	Record data of bank 1 for phase A pre-fault current amplitude
		SCEFRFLO.1.2 A Pre value PhB	Record data of bank 1 for phase B pre-fault current amplitude
		SCEFRFLO.1.2 A Pre value PhC	Record data of bank 1 for phase C pre-fault current amplitude
		SCEFRFLO.1.2 EF_VALIDITY	Record data of bank 1 for validity of earth-fault location
		SCEFRFLO.1.2 FAULT_LOOP	Record data of bank 1 for fault loop
		SCEFRFLO.1.2 FLT_DISTANCE	Record data of bank 1 for fault distance
		SCEFRFLO.1.2 IFLT_PER_ILD	Record data of bank 1 for ratio between fault current and load current
		SCEFRFLO.1.2 PhV Flt angle PhA	Record data of bank 1 for phase A voltage angle during fault
		SCEFRFLO.1.2 PhV Flt angle PhB	Record data of bank 1 for phase B voltage angle during fault

Table continues on next page

Function name	Signal type	Signal name	Description
		SCEFRFLO.1.2 PhV Flt angle PhC	Record data of bank 1 for phase C voltage angle during fault
		SCEFRFLO.1.2 PhV Flt value PhA	Record data of bank 1 for phase A voltage amplitude during fault
		SCEFRFLO.1.2 PhV Flt value PhB	Record data of bank 1 for phase B voltage amplitude during fault
		SCEFRFLO.1.2 PhV Flt value PhC	Record data of bank 1 for phase C voltage amplitude during fault
		SCEFRFLO.1.2 PhV Pre angle PhA	Record data of bank 1 for phase A pre-fault voltage angle
		SCEFRFLO.1.2 PhV Pre angle PhB	Record data of bank 1 for phase B pre-fault voltage angle
		SCEFRFLO.1.2 PhV Pre angle PhC	Record data of bank 1 for phase C pre-fault voltage angle
		SCEFRFLO.1.2 PhV Pre value PhA	Record data of bank 1 for phase A pre-fault voltage amplitude
		SCEFRFLO.1.2 PhV Pre value PhB	Record data of bank 1 for phase B pre-fault voltage amplitude
		SCEFRFLO.1.2 PhV Pre value PhC	Record data of bank 1 for phase C pre-fault voltage amplitude
		SCEFRFLO.1.2 RF	Record data of bank 1 for fault resistance
		SCEFRFLO.1.2 RFLOOP	Record data of bank 1 for fault loop resistance
		SCEFRFLO.1.2 S_CALC	Record data of bank 1 for equivalent load distance
		SCEFRFLO.1.2 XC0F_CALC	Record data bank1 feeder phase-to-earth capacitive reactance
		SCEFRFLO.1.2 XFLOOP	Record data of bank 1 for fault loop reactance
		SCEFRFLO.1.3 A Flt angle PhA	Record data of bank 1 for phase A current angle during fault
		SCEFRFLO.1.3 A Flt angle PhB	Record data of bank 1 for phase B current angle during fault
		SCEFRFLO.1.3 A Flt angle PhC	Record data of bank 1 for phase C current angle during fault
		SCEFRFLO.1.3 A Flt value PhA	Record data of bank 1 for phase A current amplitude during fault

Table continues on next page

Function name	Signal type	Signal name	Description
		SCEFRFLO.1.3 A Flt value PhB	Record data of bank 1 for phase B current amplitude during fault
		SCEFRFLO.1.3 A Flt value PhC	Record data of bank 1 for phase C current amplitude during fault
		SCEFRFLO.1.3 A Pre angle PhA	Record data of bank 1 for phase A pre-fault current angle
		SCEFRFLO.1.3 A Pre angle PhB	Record data of bank 1 for phase B pre-fault current angle
		SCEFRFLO.1.3 A Pre angle PhC	Record data of bank 1 for phase C pre-fault current angle
		SCEFRFLO.1.3 A Pre value PhA	Record data of bank 1 for phase A pre-fault current amplitude
		SCEFRFLO.1.3 A Pre value PhB	Record data of bank 1 for phase B pre-fault current amplitude
		SCEFRFLO.1.3 A Pre value PhC	Record data of bank 1 for phase C pre-fault current amplitude
		SCEFRFLO.1.3 EF_VALIDITY	Record data of bank 1 for validity of earth-fault location
		SCEFRFLO.1.3 FAULT_LOOP	Record data of bank 1 for fault loop
		SCEFRFLO.1.3 FLT_DISTANCE	Record data of bank 1 for fault distance
		SCEFRFLO.1.3 IFLT_PER_ILD	Record data of bank 1 for ratio between fault current and load current
		SCEFRFLO.1.3 PhV Flt angle PhA	Record data of bank 1 for phase A voltage angle during fault
		SCEFRFLO.1.3 PhV Flt angle PhB	Record data of bank 1 for phase B voltage angle during fault
		SCEFRFLO.1.3 PhV Flt angle PhC	Record data of bank 1 for phase C voltage angle during fault
		SCEFRFLO.1.3 PhV Flt value PhA	Record data of bank 1 for phase A voltage amplitude during fault
		SCEFRFLO.1.3 PhV Flt value PhB	Record data of bank 1 for phase B voltage amplitude during fault
		SCEFRFLO.1.3 PhV Flt value PhC	Record data of bank 1 for phase C voltage amplitude during fault
		SCEFRFLO.1.3 PhV Pre angle PhA	Record data of bank 1 for phase A pre-fault voltage angle
		SCEFRFLO.1.3 PhV Pre angle PhB	Record data of bank 1 for phase B pre-fault voltage angle

Table continues on next page

Function name	Signal type	Signal name	Description
		SCEFRFLO.1.3 PhV Pre angle PhC	Record data of bank 1 for phase C pre-fault voltage angle
		SCEFRFLO.1.3 PhV Pre value PhA	Record data of bank 1 for phase A pre-fault voltage amplitude
		SCEFRFLO.1.3 PhV Pre value PhB	Record data of bank 1 for phase B pre-fault voltage amplitude
		SCEFRFLO.1.3 PhV Pre value PhC	Record data of bank 1 for phase C pre-fault voltage amplitude
		SCEFRFLO.1.3 RF	Record data of bank 1 for fault resistance
		SCEFRFLO.1.3 RFLOOP	Record data of bank 1 for fault loop resistance
		SCEFRFLO.1.3 S_CALC	Record data of bank 1 for equivalent load distance
		SCEFRFLO.1.3 XC0F_CALC	Record data bank1 feeder phase-to-earth capacitive reactance
		SCEFRFLO.1.3 XFLOOP	Record data of bank 1 for fault loop reactance
	Binary inputs	SCEFRFLO.1.TRIGG_OUT	Signal indicating function triggering
		SCEFRFLO.1.1 ALARM	Record data of bank 1 for alarm signal
		SCEFRFLO.1.2 ALARM	Record data of bank 2 for alarm signal
		SCEFRFLO.1.3 ALARM	Record data of bank 3 for alarm signal
Frequency gradient (DAPFRC)	Binary inputs	DAPFRC.1.START	Start signal for frequency gradient
		DAPFRC.1.OPERATE	Operate signal for frequency gradient
		DAPFRC.1.LOWAMPL_BLKD	Blocking indication due to low amplitude.
Overfrequency (DAPTOF)	Binary inputs	DAPTOF.1.START	Start signal for overfrequency protection
		DAPTOF.1.OPERATE	Operate signal for overfrequency protection
		DAPTOF.1.LOWAMPL_BLKD	Blocking indication due to low amplitude.
Underfrequency (DAPTUF)	Binary inputs	DAPTUF.1.START	Start signal for underfrequency protection
		DAPTUF.1.OPERATE	Operate signal for underfrequency protection
		DAPTUF.1.LOWAMPL_BLKD	Blocking indication due to low amplitude.
		DAPTUF.1.RESTORE	Restore signal for load restoring purposes.

Table continues on next page

Function name	Signal type	Signal name	Description
Load shedding (LSHDPFRQ)	Binary inputs	LSHDPFRQ.1.ST_FRQ	Pick-Up signal for under frequency detection
		LSHDPFRQ.1.ST_FRG	Pick-Up signal for high df/dt detection
		LSHDPFRQ.1.START	General start. Under frequency or high df/dt detected
		LSHDPFRQ.1.RESTORE	Restore signal for load restoring purposes
		LSHDPFRQ.1.ST_REST	Restore frequency attained and restore timer started
		LSHDPFRQ. 1.LOWAMPL_BLKD	Signal indicating internal blocking due to low amplitude
		LSHDPFRQ.1.OPR_FRQ	Operate signal for under frequency
		LSHDPFRQ.1.OPR_FRG	Operate signal for high df/dt
		LSHDPFRQ.1.OPERATE	Operation of load shedding
Circuit breaker (DAXCBR)	Binary inputs	DAXCBR.1.UPD_BLKD	The update of position indication is blocked
		DAXCBR.1.CLOSEPOS	Apparatus closed position
		DAXCBR.1.OPENPOS	Apparatus open position
		DAXCBR.1.OP_BLKD	Indication that the function is blocked for open commands
		DAXCBR.1.CL_BLKD	Indication that the function is blocked for close commands
	Counters	DAXCBR.1.CNT_VAL	The value of the operation counter
	Double bit indications	DAXCBR.1.POSITION	Apparatus position indication
Autorecloser (DARREC)	Analog inputs	DARREC.1.PROT_DISA	A word type signal for disabling protection functions
		DARREC.1.SHOT_PTR	Shot pointer value
	Binary inputs	DARREC.1.OPEN_CB	Open command for circuit breaker
		DARREC.1.CLOSE_CB	Close (reclose) command for circuit breaker
		DARREC.1.CMD_WAIT	Wait for master command
		DARREC.1.INPRO	Reclosing shot in progress, activated during dead time
		DARREC.1.LOCKED	Signal indicating that AR is locked out
		DARREC.1.PROT_CRD	A signal for coordination between the AR and the protection
		DARREC.1.UNSUC_RECL	Indicates an unsuccessful reclosing sequence
		DARREC.1.FRQ_OPR_AL	Frequent operation counter alarm
		DARREC.1.AR_ON	Autoreclosing allowed

Table continues on next page

Function name	Signal type	Signal name	Description
		DARREC.1.READY	Indicates that the AR is ready for a new sequence
		DARREC.1.ACTIVE	Reclosing sequence is in progress
		DARREC.1.INPRO_1	Reclosing shot in progress, shot 1
		DARREC.1.INPRO_2	Reclosing shot in progress, shot 2
		DARREC.1.INPRO_3	Reclosing shot in progress, shot 3
		DARREC.1.INPRO_4	Reclosing shot in progress, shot 4
		DARREC.1.INPRO_5	Reclosing shot in progress, shot 5
		DARREC.1.DISCR_INPRO	Signal indicating that discrimination time is inprogress
		DARREC.1.CUTOUT_INPRO	Signal indicating that cut-out time is in progress
		DARREC.1.UNSUC_CB	Indicates an unsuccessful CB closing
		DARREC.1.MAN_CB_CL	Indicates CB manual closing during reclosing sequence
		DARREC.1.SOTF	Switch-onto-fault
	Counters	DARREC.1.FRQ_OPR_CNT	Frequent operation counter
		DARREC.1.CNT_SHOT1	Resetable operation counter, shot 1
		DARREC.1.CNT_SHOT2	Resetable operation counter, shot 2
		DARREC.1.CNT_SHOT3	Resetable operation counter, shot 3
		DARREC.1.CNT_SHOT4	Resetable operation counter, shot 4
		DARREC.1.CNT_SHOT5	Resetable operation counter, shot 5
		DARREC.1.COUNTER	Resetable operation counter, all shots
Synchrocheck (SYNCRSYN)	Analog inputs	SYNCRSYN.1.U_DIFF_MEAS	Calculated difference in voltage
		SYNCRSYN.1.FR_DIFF_MEAS	Calculated difference in frequency
		SYNCRSYN.1.PH_DIFF_MEAS	Calculated difference of phase angle
	Binary inputs	SYNCRSYN.1.AUTO_REL	Automatic release
		SYNCRSYN.1.AU_ENERG_OK	Automatic energizing check OK
		SYNCRSYN.1.MAN_REL	Manual release
		SYNCRSYN. 1.MAN_ENERG_OK	Manual energizing check OK
		SYNCRSYN.1.SYN_OK	Synchronizing OK output

Table continues on next page

Function name	Signal type	Signal name	Description
		SYNCRSYN.1.SYN_INPRO	Synchronizing in progress
		SYNCRSYN.1.SYN_FAIL	Synchronizing failed
		SYNCRSYN.1.B1_SEL	Bus1 selected
		SYNCRSYN.1.B2_SEL	Bus2 selected
		SYNCRSYN.1.LN1_SEL	Line1 selected
		SYNCRSYN.1.LN2_SEL	Line2 selected
Bay control (QCCBAY)	Binary inputs	QCCBAY.1.UPD_BLKD	Update of position is blocked
		QCCBAY.1.CMD_BLKD	Function is blocked for commands
		QCCBAY.1.LOC	Local operation allowed
		QCCBAY.1.REM	Remote operation allowed
Disconnector (DAXSWI)	Binary inputs	DAXSWI.1.OP_BLKD	Indication that the function is blocked for open commands
		DAXSWI.1.CL_BLKD	Indication that the function is blocked for close commands
		DAXSWI.1.UPD_BLKD	The update of position indication is blocked
		DAXSWI.1.OPENPOS	Apparatus open position
		DAXSWI.1.CLOSEPOS	Apparatus closed position
	Counters	DAXSWI.1.CNT_VAL	The value of the operation counter
	Double bit indications	DAXSWI.1.POSITION	Apparatus position indication
Circuit breaker / disconnector control (GNRLCSWI)	Analog inputs	GNRLCSWI.1.L_CAUSE	Latest value of the error indication during command
	Binary inputs	GNRLCSWI.1.CMD_BLKD	Commands are blocked
		GNRLCSWI.1.SELECTED	Commands are blocked
	Binary outputs	GNRLCSWI.1.CLOSE_CMD	Close command parameter for DNP3 protocol
		GNRLCSWI.1.OPEN_CMD	Open command parameter for DNP3 protocol
	Double bit indications	GNRLCSWI.1.POSITION	Position indication
Interlocking (interface) (SCILO)	Binary inputs	SCILO.1.EN_CLOSE	Close operation at open or intermediate or bad position is enabled
		SCILO.1.EN_OPEN	Open operation at closed or intermediate or bad position is enabled
Trip circuit supervision (TCSSCBR)	Binary inputs	TCSSCBR.1.ALARM	Trip circuit fault indication
Tripping logic (TRPPTRC)	Binary inputs	TRPPTRC.1.CL_LKOUT	Circuit breaker lockout output (set until reset)
		TRPPTRC.1.TRIP	General trip output signal
Fusefailure supervision (SEQRFUF)	Binary inputs	SEQRFUF.1.FUSEF_3PH	Three-phase start of function
		SEQRFUF.1.FUSEF_U	General start of function

Table continues on next page

Function name	Signal type	Signal name	Description
		SEQRFUF.1.FUSEF_Z	Start of current and voltage controlled function
Circuit breaker condition monitoring (SSCBR)	Binary inputs	SSCBR.1.CB_LIFE_ALM	Remaining life of CB reduced to Life alarm level
		SSCBR.1.CLOSEPOS	CB is in closed position
		SSCBR.1.INVALIDPOS	CB is in invalid position (not positively open or closed)
		SSCBR.1.IPOW_ALM	Accumulated currents power (Iyt),exceeded alarm limit
		SSCBR.1.IPOW_LO	Accumulated currents power (Iyt),exceeded lockout limit
		SSCBR.1.MON_ALM	CB 'not operated for long time' alarm
		SSCBR.1.OPENPOS	CB is in open position
		SSCBR.1.OPR_ALM	Number of CB operations exceeds alarm limit
		SSCBR.1.OPR_LO	Number of CB operations exceeds lockout limit
		SSCBR.1.PRES_ALM	Pressure below alarm level
		SSCBR.1.PRES_LO	Pressure below lockout level
		SSCBR.1.SPR_CHR_ALM	Spring charging time has crossed the set value
		SSCBR.1.TRV_T_CL_ALM	CB close travel time exceeded set value
		SSCBR.1.TRV_T_OP_ALM	CB open travel time exceeded set value
	Counters	SSCBR.1.NO_OPR	Number of CB operation cycle
Station battery supervision (SPVNZBAT)	Binary inputs	SPVNZBAT.1.AL_UHIGH	Alarm when voltage has exceeded higher limit for a set time
		SPVNZBAT.1.AL_ULOW	Alarm when voltage has been below lower limit for a set time
		SPVNZBAT.1.ST_ULOW	Start signal when battery voltage drops below lower limit
		SPVNZBAT.1.ST_UHIGH	Start signal when battery voltage exceeds upper limit
Automatic switch onto fault logic (CVRSOF)	Binary inputs	CVRSOF.1.OPERATE	Operate
Local accelerat. logic (DSTPLAL)	Binary inputs	DSTPLAL.1.OPR_LOSSLOAD	Operate by loss of load
		DSTPLAL.1.OPR_Z_EXTN	Operate by zone extension
Scheme communic. logic (DSOCPSCH)	Binary inputs	DSOCPSCH.1.CS	Carrier Send signal
		DSOCPSCH.1.LCG	Loss of carrier guard signal
		DSOCPSCH.1.OPERATE	Trip output
		DSOCPSCH.1.PRORX	Carrier signal received or missing carrier guard signal

Table continues on next page

Function name	Signal type	Signal name	Description
Current reversal and WEI logic (CRWPSCH)	Binary inputs	CRWPSCH.1.OPR_WEI_C	Operation of WEI logic in phase C
		CRWPSCH.1.OPR_WEI_B	Operation of WEI logic in phase B
		CRWPSCH.1.OPR_WEI_A	Operation of WEI logic in phase A
		CRWPSCH.1.OPR_WEI	Operation of WEI logic
		CRWPSCH.1.ECHO	Carrier send by WEI logic
		CRWPSCH.1.CR	POR Carrier signal received from remote end
Energy monitoring (EPDMMTR)	Analog inputs	EPDMMTR.1.EAFDMD_BCR	Last forward active energy value for set interval (BCR)
		EPDMMTR.1.EARDMD_BCR	Last reverse active energy value for set interval (BCR)
		EPDMMTR.1.ERFDMD_BCR	Last forward reactive energy value for set interval (BCR)
		EPDMMTR.1.ERRDMD_BCR	Last reverse reactive energy value for set interval (BCR)
		EPDMMTR.1.EAFACM	Accumulated forward active energy value in Ws
		EPDMMTR.1.EARACM	Accumulated reverse active energy value in Ws
		EPDMMTR.1.ERFACM	Accumulated forward reactive energy value in VArS
		EPDMMTR.1.ERRACM	Accumulated reverse reactive energy value in VArS
		EPDMMTR.1.PAFDMD	Last forward active power demand value for set interval
		EPDMMTR.1.PARDMD	Last reverse active power demand value for set interval
		EPDMMTR.1.PRFDMD	Last forward reactive power demand value for set interval
		EPDMMTR.1.PRRDMD	Last reverse reactive power demand value for set interval
		EPDMMTR.1.MAXPAFDMD	Maximum forward active power demand value for set interval
		EPDMMTR.1.MAXPARDMD	Maximum reverse active power demand value for set interval
		EPDMMTR.1.MAXPRFDMD	Maximum forward reactive power demand value for set interval
		EPDMMTR.1.MAXPRRDMD	Maximum reverse reactive power demand value for set interval
	Binary inputs	EPDMMTR.1.EAFAL	Alarm for active forward energy exceed limit in set interval
		EPDMMTR.1.EARAL	Alarm for active reverse energy exceed limit in set interval

Table continues on next page

Function name	Signal type	Signal name	Description
		EPDMMTR.1.ERFAL	Alarm for reactive forward energy exceed limit in set interval
		EPDMMTR.1.ERRAL	Alarm for reactive reverse energy exceed limit in set interval
Transformer differential protection of 2 winding transformers (TR2PTDF)	Binary inputs	TR2PTDF.1.OPERATE	Operate signal, combined (all phases, both stages)
		TR2PTDF.1.OPR_A	Operate signal phase A
		TR2PTDF.1.OPR_B	Operate signal phase B
		TR2PTDF.1.OPR_C	Operate signal phase C
		TR2PTDF.1.BLKD2H	Status from 2nd harmonic restraint block, combined
		TR2PTDF.1.BLKD5H	Status from 5th harmonic restraint blocking, combined
		TR2PTDF.1.BLKDWAV	Status from waveform blocking, combined
		TR2PTDF.1.OPR_HS	Operate signal from high set (instantaneous) stage
		TR2PTDF.1.OPR_LS	Operate signal from low set (biased) stage
		TR2PTDF.1.BLKD2H_A	Status from 2nd harmonic restraint block, phase A
		TR2PTDF.1.BLKD2H_B	Status from 2nd harmonic restraint block, phase B
		TR2PTDF.1.BLKD2H_C	Status from 2nd harmonic restraint block, phase C
		TR2PTDF.1.BLKD5H_A	Status from 5th harmonic restraint blocking, phase A
		TR2PTDF.1.BLKD5H_B	Status from 5th harmonic restraint blocking, phase B
		TR2PTDF.1.BLKD5H_C	Status from 5th harmonic restraint blocking, phase C
		TR2PTDF.1.BLKDWAV_A	Status from waveform blocking, phase A
		TR2PTDF.1.BLKDWAV_B	Status from waveform blocking, phase B
		TR2PTDF.1.BLKDWAV_C	Status from waveform blocking, phase C
Three-phase thermal overload for transformers (T2PTTR)	Binary inputs	T2PTTR.1.BLK_CLOSE	Thermal overload indicator. To inhibite reclose.
		T2PTTR.1.ALARM	The calculated temperature is over Alarm level Temperature limit
		T2PTTR.1.START	Signal indicating current that will raise temperature above operate level if prolonged
		T2PTTR.1.OPERATE	Operate signal

Table continues on next page

Function name	Signal type	Signal name	Description
Three-phase thermal overload for motors (MPTTR)	Binary inputs	MPTTR.1.BLK_RESTART	Thermal overload indicator, to inhibit restart
		MPTTR.1.ALARM	Alarm signal when thermal load exceeds alarm setting
		MPTTR.1.OPERATE	Operate signal when thermal load exceeds operate setting
Stabilised restricted earth-fault (LREFPNDF)	Binary inputs	LREFPNDF.1.START	Low impedance restricted earth-fault protection start
		LREFPNDF.1.OPERATE	Low impedance restricted earth-fault protection operate
		LREFPNDF.1.BLK2H	Signal to indicate second harmonic blocking when the second harmonic has been enabled
Emergency start (ESMGAPC)	Binary inputs	ESMGAPC.1.ST_EMERG_ENA	Emergency start signal
Motor startup supervision (STTPMSU)	Binary inputs	STTPMSU.1.MOT_START	Signal to show that motor startup is in progress
		STTPMSU.1.OPR_IIT	Operate/trip signal for thermal stress.
		STTPMSU.1.LOCK_START	Lock out condition for restart of motor.
		STTPMSU.1.OPR_STALL	Operate/trip signal for stalling protection.
	Counters	STTPMSU.1.START_CNT	Number of motor start-ups occurred
Phase reversal (PREVPTOC)	Binary inputs	PREVPTOC.1.START	Started signal
		PREVPTOC.1.OPERATE	Operated signal
Loss of load supervision (LOFLPTUC)	Binary inputs	LOFLPTUC.1.START	Loss of load protection started
		LOFLPTUC.1.OPERATE	Loss of load protection operated
Motor stall protection (JAMPTOC)	Binary inputs	JAMPTOC.1.START	Started signal
		JAMPTOC.1.OPERATE	Operated
Negative-phase-sequence time overcurrent protection (MNSPTOC)	Binary inputs	MNSPTOC.1.START	Started
		MNSPTOC.1.OPERATE	Operated
		MNSPTOC.1.BLK_RESTART	Signal for blocking reconnection of an overheated machine
Tap position indication (TPOSSLTC)	Analog inputs	TPOSSLTC.1.TAP_POS	Tap position value as integer
	Binary inputs	TPOSSLTC.1.TAP_POS_IV	TAP_POS invalidity status
Three-phase inrush current detector (INRPHAR)	Binary inputs	INRPHAR.1.BLK2H	Second harmonic based block
		INRPHAR.1.BLK2H_A	Second harmonic based block, phase A
		INRPHAR.1.BLK2H_B	Second harmonic based block, phase B

Table continues on next page

Function name	Signal type	Signal name	Description
		INRPHAR.1.BLK2H_C	Second harmonic based block, phase C
Transient/intermittent earth-fault (INTRPTEF)	Binary inputs	INTRPTEF.1.START	Start signal
		INTRPTEF.1.OPERATE	Operate signal
		INTRPTEF.1.BLK_EF	Block signal for EF to indicate opposite direction peaks
Versatile Switch (VSGGIO)	Binary inputs	VSGGIO.1.POS1	Position 1 indication, logical signal
		VSGGIO.1.POS2	Position 2 indication, logical signal
	Double bit indications	VSGGIO.1.POSITION	
Wattmetric earth-fault (WPWDE)	Analog inputs	WPWDE.1.FAULT_DIR	Wattmetric directional earth-fault protection, fault direction
	Binary inputs	WPWDE.1.START	Wattmetric directional earth-fault protection, start
		WPWDE.1.OPERATE	Wattmetric directional earth-fault protection, directional trip
Earth-fault admittance (EFPADM)	Analog inputs	EFPADM.1.FAULT_DIR	Earth-fault admittance protection, fault direction
		EFPADM.1.CONFLICT	Earth-fault admittance protection, overlaping admittance boundary line settings
		EFPADM.1.1 FAULT_DIR	Earth-fault admittance protection, record data of bank 1 for detected fault direction
		EFPADM.1.1 COND_RES (Go)	Earth-fault admittance protection, record data of bank 1 for real part of neutral admittance
		EFPADM.1.1 SUS_RES (Bo)	Earth-fault admittance protection, record data of bank 1 for imaginary part of neutral admittance
		EFPADM.1.1 I_AMPL_RES Pre Flt	Earth-fault admittance protection, record data of bank 1 for magnitude of pre-fault residual current
		EFPADM.1.1 I_ANGL_RES Pre Flt	Earth-fault admittance protection, record data of bank 1 for angle of pre-fault residual current
		EFPADM.1.1 U_AMPL_RES Pre Flt	Earth-fault admittance protection, record data of bank 1 for magnitude of pre-fault residual voltage
		EFPADM.1.1 U_ANGL_RES Pre Flt	Earth-fault admittance protection, record data of bank 1 for angle of pre-fault residual voltage

Table continues on next page

Function name	Signal type	Signal name	Description
		EFPADM.1.1 I_AMPL_RES fault	Earth-fault admittance protection, record data of bank 1 for magnitude of fault-state residual current
		EFPADM.1.1 I_ANGL_RES fault	Earth-fault admittance protection, record data of bank 1 for angle of fault-state residual current
		EFPADM.1 U_AMPL_RES fault	Earth-fault admittance protection, record data of bank 1 for magnitude of fault-state residual voltage
		EFPADM.1.1 U_ANGL_RES fault	Earth-fault admittance protection, record data of bank 1 for angle of fault-state residual voltage
		EFPADM.1.1 START_DUR	Earth-fault admittance protection, record data of bank 1 for ratio of started time / operate time
		EFPADM.1.2 FAULT_DIR	Earth-fault admittance protection, record data of bank 2 for detected fault direction
		EFPADM.1.2 COND_RES (Go)	Earth-fault admittance protection, record data of bank 2 for real part of neutral admittance
		EFPADM.1.2 SUS_RES (Bo)	Earth-fault admittance protection, record data of bank 2 for imaginary part of neutral admittance
		EFPADM.1.2 I_AMPL_RES Pre Flt	Earth-fault admittance protection, record data of bank 2 for magnitude of pre-fault residual current
		EFPADM.1.2 I_ANGL_RES Pre Flt	Earth-fault admittance protection, record data of bank 2 for angle of pre-fault residual current
		EFPADM.1.2 U_AMPL_RES Pre Flt	Earth-fault admittance protection, record data of bank 2 for magnitude of pre-fault residual voltage
		EFPADM.1.2 U_ANGL_RES Pre Flt	Earth-fault admittance protection, record data of bank 2 for angle of pre-fault residual voltage
		EFPADM.1.2 I_AMPL_RES fault	Earth-fault admittance protection, record data of bank 2 for magnitude of fault-state residual current
		EFPADM.1.2 I_ANGL_RES fault	Earth-fault admittance protection, record data of bank 2 for angle of fault-state residual current

Table continues on next page

Function name	Signal type	Signal name	Description
		EFPADM.1.2 U_AMPL_RES fault	Earth-fault admittance protection, record data of bank 2 for magnitude of fault-state residual voltage
		EFPADM.1.2 U_ANGL_RES fault	Earth-fault admittance protection, record data of bank 2 for angle of fault-state residual voltage
		EFPADM.1.2 START_DUR	Earth-fault admittance protection, record data of bank 2 for ratio of started time / operate time
		EFPADM.1.3 FAULT_DIR	Earth-fault admittance protection, record data of bank 3 for detected fault direction
		EFPADM.1.3 COND_RES (Go)	Earth-fault admittance protection, record data of bank 3 for real part of neutral admittance
		EFPADM.1.3 SUS_RES (Bo)	Earth-fault admittance protection, record data of bank 3 for imaginary part of neutral admittance
		EFPADM.1.3 I_AMPL_RES Pre Flt	Earth-fault admittance protection, record data of bank 3 for magnitude of pre-fault residual current
		EFPADM.1.3 I_ANGL_RES Pre Flt	Earth-fault admittance protection, record data of bank 3 for angle of pre-fault residual current
		EFPADM.1.3 U_AMPL_RES Pre Flt	Earth-fault admittance protection, record data of bank 3 for magnitude of pre-fault residual voltage
		EFPADM.1.3 U_ANGL_RES Pre Flt	Earth-fault admittance protection, record data of bank 3 for angle of pre-fault residual voltage
		EFPADM.1.3 I_AMPL_RES fault	Earth-fault admittance protection, record data of bank 3 for magnitude of fault-state residual current
		EFPADM.1.3 I_ANGL_RES fault	Earth-fault admittance protection, record data of bank 3 for angle of fault-state residual current
		EFPADM.1.3 U_AMPL_RES fault	Earth-fault admittance protection, record data of bank 3 for magnitude of fault-state residual voltage
		EFPADM.1.3 U_ANGL_RES fault	Earth-fault admittance protection, record data of bank 3 for angle of fault-state residual voltage

Table continues on next page

Function name	Signal type	Signal name	Description
		EFPADM.1.3 START_DUR	Earth-fault admittance protection, record data of bank 3 for ratio of started time / operate time
	Binary inputs	EFPADM.1.START	Earth-fault admittance protection, start
		EFPADM.1.OPERATE	Earth-fault admittance protection, directional trip
Under excitation protection (UEXPDIS)	Binary inputs	UEXPDIS.1.START	Under excitation protection, start
		UEXPDIS.1.OPERATE	Under excitation protection, trip
Rotor EF protection (MREFPTOC)	Binary inputs	MREFPTOC.1.START	Rotor EF protection, start
		MREFPTOC.1.OPERATE	Rotor EF protection, trip
		MREFPTOC.1.ALARM	Rotor EF protection, alarm
Voltage sag, swell and interruption monitoring (PHQVVR)	Analog inputs	PHQVVR.1.1 Variation type	Voltage sag, swell and interruption monitoring, Voltage variation type
		PHQVVR.1.1 Varn A PhA	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase A current magnitude
		PHQVVR.1.1 Varn A PhB	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase B current magnitude
		PHQVVR.1.1 Varn A PhC	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase C current magnitude
		PHQVVR.1.1 Varn Dur PhA	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase A or AB variation duration
		PHQVVR.1.1 Varn Dur PhB	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase B or BC variation duration
		PHQVVR.1.1 Varn Dur PhC	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase C or CA variation duration
		PHQVVR.1.1 Varn V PhA	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase A or AB voltage magnitude
		PHQVVR.1.1 Varn V PhB	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase B or BC voltage magnitude

Table continues on next page

Function name	Signal type	Signal name	Description
		PHQVVR.1.1 Varn V PhC	Voltage sag, swell and interruption monitoring, Record data of bank 1 for phase C or CA voltage magnitude
		PHQVVR.1.2 Variation type	Voltage sag, swell and interruption monitoring, Voltage variation type
		PHQVVR.1.2 Varn A PhA	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase A current magnitude
		PHQVVR.1.2 Varn A PhB	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase B current magnitude
		PHQVVR.1.2 Varn A PhC	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase C current magnitude
		PHQVVR.1.2 Varn Dur PhA	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase A or AB variation duration
		PHQVVR.1.2 Varn Dur PhB	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase B or BC variation duration
		PHQVVR.1.2 Varn Dur PhC	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase C or CA variation duration
		PHQVVR.1.2 Varn V PhA	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase A or AB voltage magnitude
		PHQVVR.1.2 Varn V PhB	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase B or BC voltage magnitude
		PHQVVR.1.2 Varn V PhC	Voltage sag, swell and interruption monitoring, Record data of bank 2 for phase C or CA voltage magnitude
		PHQVVR.1.3 Variation type	Voltage sag, swell and interruption monitoring, Voltage variation type
		PHQVVR.1.3 Varn A PhA	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase A current magnitude
		PHQVVR.1.3 Varn A PhB	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase B current magnitude

Table continues on next page

Function name	Signal type	Signal name	Description
		PHQVVR.1.3 Varn A PhC	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase C current magnitude
		PHQVVR.1.3 Varn Dur PhA	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase A or AB variation duration
		PHQVVR.1.3 Varn Dur PhB	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase B or BC variation duration
		PHQVVR.1.3 Varn Dur PhC	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase C or CA variation duration
		PHQVVR.1.3 Varn V PhA	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase A or AB voltage magnitude
		PHQVVR.1.3 Varn V PhB	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase B or BC voltage magnitude
		PHQVVR.1.3 Varn V PhC	Voltage sag, swell and interruption monitoring, Record data of bank 3 for phase C or CA voltage magnitude
	Binary inputs	PHQVVR.INTST	Voltage sag, swell and interruption monitoring, Voltage interruption active
		PHQVVR.INTOPR	Voltage sag, swell and interruption monitoring, Voltage interruption detected
		PHQVVR.DIPST	Voltage sag, swell and interruption monitoring, Voltage dip active
		PHQVVR.DIPOPR	Voltage sag, swell and interruption monitoring, Voltage dip detected
		PHQVVR.DIPSWELLOPR	Voltage sag, swell and interruption monitoring, Concurrent voltage dip and voltage swell detected
		PHQVVR.SWELLST	Voltage sag, swell and interruption monitoring, Voltage swell active
		PHQVVR.SWELLOPR	Voltage sag, swell and interruption monitoring, Voltage swell detected
		PHQVVR.ST_A	Voltage sag, swell and interruption monitoring, Voltage variation present on phase A or AB

Table continues on next page

Function name	Signal type	Signal name	Description
		PHQVVR.ST_B	Voltage sag, swell and interruption monitoring, Voltage variation present on phase B or BC
		PHQVVR.ST_C	Voltage sag, swell and interruption monitoring, Voltage variation present on phase C or CA
	Counters	PHQVVR.1.INTCNT	Voltage sag, swell and interruption monitoring, Counter for detected voltage interruptions
		PHQVVR.1.DIPCNT	Voltage sag, swell and interruption monitoring, Counter for detected voltage dips
		PHQVVR.1.SWELLCNT	Voltage sag, swell and interruption monitoring, Counter for detected voltage swells
Voltage Imbalance monitoring function (VSQVUB)	Analog inputs	VSQVUB.1.10MIN_MN_UNB	Voltage Imbalance monitoring function, Sliding 10 minutes mean value of voltage unbalance
		VSQVUB.1.3S_MN_UNB	Voltage Imbalance monitoring function, Sliding 3 second mean value of voltage unbalance
		VSQVUB.1.1 AL_UNB_VAL	Voltage Imbalance monitoring function, Record data of bank1 for maximum 3 sec voltage unbalance
		VSQVUB.1.2 AL_UNB_VAL	Voltage Imbalance monitoring function, Record data of bank2 for maximum 3 sec voltage unbalance
		VSQVUB.1.3 AL_UNB_VAL	Voltage Imbalance monitoring function, Record data of bank3 for maximum 3 sec voltage unbalance
	Binary inputs	VSQVUB.1.MN_UNB_AL	Voltage Imbalance monitoring function, Alarm active when 3 sec voltage unbalance exceeds the limit
High-impedance or Flux-balance based differential protection (MHZPDIF)	Binary inputs	MHZPDIF.1.START	High-impedance or Flux-balance based differential protection for machines, start
		MHZPDIF.1.ST_A	High-impedance or Flux-balance based differential protection for machines, start phase A
		MHZPDIF.1.ST_B	High-impedance or Flux-balance based differential protection for machines, start phase B

Table continues on next page

Function name	Signal type	Signal name	Description
		MHZPDIF.1.ST_C	High-impedance or Flux-balance based differential protection for machines, start phase C
		MHZPDIF.1.OPERATE	High-impedance or Flux-balance based differential protection for machines, trip
		MHZPDIF.1.OPR_A	High-impedance or Flux-balance based differential protection for machines, trip phase A
		MHZPDIF.1.OPR_B	High-impedance or Flux-balance based differential protection for machines, trip phase B
		MHZPDIF.1.OPR_C	High-impedance or Flux-balance based differential protection for machines, trip phase C
Voltage control (OLATCC)	Analog inputs	OLATCC.1.TIMER_STS	Voltage control, Timer T1, T2 or fast lower timer active
		OLATCC.1.OPR_MODE_STS	Voltage control, The acting operation mode of the function block
		OLATCC.1.BLK_STATUS	Voltage control, Bit-coded output showing the blocking status for the next operation
		OLATCC.1.ALARM_REAS	Voltage control, Status and reason for alarm
		OLATCC.1.FAIL_FLLW	Voltage control, Failed followers
		OLATCC.1.TR0_I_ AMPL	Voltage control, Current magnitude from own transformer
		OLATCC.1.TR0_I_ ANGL	Voltage control, Current phase angle from own transformer
		OLATCC.1.U_MEAS	Voltage control, Phase-to-phase voltage , average filtered
		OLATCC.1.ANGL_UA_IA	Voltage control, Measured angle value between phase A voltage and current
		OLATCC.1.U_CTL	Voltage control, Control voltage, Up, target voltage level
		OLATCC.1.UD_CTL	Voltage control, Voltage difference between measured and control Voltage
		OLATCC.1.I_CIR	Voltage control, Calculated circulating current - calculated in operation modes NRP and MCC
		OLATCC.1.LDC	Voltage control, Calculated line drop compensation

Table continues on next page

Function name	Signal type	Signal name	Description
		OLATCC.1.FLLW1_CTL	Voltage control, Lower/Raise for follower 1 in the Master/ Follower mode
		OLATCC.1.FLLW2_CTL	Voltage control, Lower/Raise for follower 2 in the Master/ Follower mode
		OLATCC.1.FLLW3_CTL	Voltage control, Lower/Raise for follower 3 in the Master/ Follower mode
		OLATCC.1.TAP_POS	Voltage control, tap changer position
	Binary inputs	OLATCC.1.ALARM	Voltage control, Alarm status
		OLATCC.1.RAISE _OWN	Voltage control, Raise command for own transformer
		OLATCC.1.LOWER_OWN	Voltage control, Lower command for own transformer
		OLATCC.1.PAR_FAIL	Voltage control, Parallel failure detected
		OLATCC.1.PARALLEL	Voltage control, Parallel mode or not
		OLATCC.1.AUTO	Voltage control, Acting automatic/manual
		OLATCC.1.BLKD_I_LOD	Voltage control, Indication of load current blocking
		OLATCC.1.BLKD_U_UN	Voltage control, Indication of under voltage blocking
		OLATCC.1.BLKD_I_CIR	Voltage control, Indication of high circulating current blocking
		OLATCC.1.BLKD_LTCBLK	Voltage control, Indication of external blocking
		OLATCC.1.BLKD_RAISE	Voltage control, Indication of extreme raise position caused blocking
		OLATCC.1.BLKD_LOWER	Voltage control, Indication of extreme lower position caused blocking
		OLATCC.1.RNBK_U_OV	Voltage control, Indication of runback raise voltage
		OLATCC.1.LTC_BLOCK	Voltage control, External signal for blocking of automatic operation, status of input LTC_BLOCK
		OLATCC.1.RSV	Voltage control, RSV input status
	Counters	OLATCC.1.OPR_CNT	Voltage control, Total number of commands given, manual and automatic
		OLATCC.1.OP_TM_NUM_H	Voltage control, Number of controls for own tap changer during last hour

Table continues on next page

Function name	Signal type	Signal name	Description
Directional over power protection (DOPPDPR)	Analog inputs	DOPPDPR.1.S	Directional over power protection, apparent power
		DOPPDPR.1.Q	Directional over power protection, reactive power
		DOPPDPR.1.P	Directional over power protection, active power
		DOPPDPR.1.PF_ANGL	Directional over power protection, Angle between apparent power and active power
	Binary inputs	DOPPDPR.1.START	Directional over power protection, start
		DOPPDPR.1.OPERATE	Directional over power protection, trip
Three-phase underimpedance protection (UZPDIS)	Binary inputs	UZPDIS.1.START	Three-phase underimpedance protection, start
		UZPDIS.1.OPERATE	Three-phase underimpedance protection, trip
Motor differential proteciton (MPDIF)	Binary inputs	MPDIF.1.OPERATE	Motor differential proteciton, Operate signal, combined (all phases, both stages)
		MPDIF.1.OPR_A	Motor differential proteciton, Operate signal, Phase A
		MPDIF.1.OPR_B	Motor differential proteciton, Operate signal, Phase B
		MPDIF.1.OPR_C	Motor differential proteciton, Operate signal, Phase C
		MPDIF.1.INT_BLKD	Motor differential proteciton, Protection internally blocked, combined
		MPDIF.1.INT_BLKD_A	Motor differential proteciton, Protection internally blocked, Phase A
		MPDIF.1.INT_BLKD_B	Motor differential proteciton, Protection internally blocked, Phase B
		MPDIF.1.INT_BLKD_C	Motor differential proteciton, Protection internally blocked, Phase C
		MPDIF.1.OPR_HS	Motor differential proteciton, Operate signal from high set (instantaneous) stage
		MPDIF.1.OPR_LS	Motor differential proteciton, Operate signal from low set (biased) stage
Three-phase underimpedance protection (OEPVPH)	Binary inputs	OEPVPH.1.START	Three-phase underimpedance protection, start
		OEPVPH.1.OPERATE	Three-phase underimpedance protection, trip
		OEPVPH.1.BLK_RESTART	Three-phase underimpedance protection, block restart

Table continues on next page

Function name	Signal type	Signal name	Description
		OEPVPH.1.COOL_ACTIVE	Three-phase underimpedance protection, cooling active
Current harmonics (CMHAI)	Analog inputs	CMHAI.1.NO_ALM_MN_H	Current harmonics, Highest harmonic that exceeded its alarm limit
		CMHAI.1.MONITORED_PH	Current harmonics, Indicates the actual phase monitored 1=Ph A, 2=Ph B, 3=Ph C
	Binary inputs	CMHAI.1.ALM_MN_TDD	Current harmonics, Alarm signal when TDD value is greater than limit
		CMHAI.1.ALM_MN_THD	Current harmonics, Alarm signal when THD value is greater than limit
		CMHAI.1.ALM_MN_H	Current harmonics, Alarm signal when harmonic RMS value is greater than limit
Phase-to-earth voltage harmonics (VPHMHAI)	Analog inputs	VPHMHAI.1.NO_ALM_MN_H	Phase-to-earth voltage harmonics, Highest harmonic that exceeded its alarm limit
		VPHMHAI.1.MONITORED_PH	Phase-to-earth voltage harmonics, Indicates the actual phase monitored 1=Ph A, 2=Ph B, 3=Ph C
	Binary inputs	VPHMHAI.1.ALM_MN_TDD	Phase-to-earth voltage harmonics, Alarm signal when TDD value is greater than limit
		VPHMHAI.1.ALM_MN_THD	Phase-to-earth voltage harmonics, Alarm signal when THD value is greater than limit
		VPHMHAI.1.ALM_MN_H	Phase-to-earth voltage harmonics, Alarm signal when harmonic RMS value is greater than limit
Phase-to-phase voltage harmonics (VPPMHAI)	Analog inputs	VPPMHAI.1.NO_ALM_MN_H	Phase-to-phase voltage harmonics, Highest harmonic that exceeded its alarm limit
		VPPMHAI.1.MONITORED_PH	Phase-to-phase voltage harmonics, Indicates the actual phase monitored 1=Ph A, 2=Ph B, 3=Ph C
	Binary inputs	VPPMHAI.1.ALM_MN_TDD	Phase-to-phase voltage harmonics, Alarm signal when TDD value is greater than limit
		VPPMHAI.1.ALM_MN_THD	Phase-to-phase voltage harmonics, Alarm signal when THD value is greater than limit
		VPPMHAI.1.ALM_MN_H	Phase-to-phase voltage harmonics, Alarm signal when harmonic RMS value is greater than limit
Multipurpose analogue protection function (MAPGAPC)	Binary inputs	MAPGAPC.1.START	Multipurpose analogue protection function, start

Table continues on next page

Function name	Signal type	Signal name	Description
		MAPGAPC.1.OPERATE	Multipurpose analogue protection function, trip
Selector switch (SLGGIO)	Analog inputs	SLGGIO.1.SWPOSN	Selector switch, switch position as integer
Generic measured value (MVGGIO)	Analog inputs	MVGGIO.1.IN	Generic measured value, analog input value
Single point indication (SPGGIO)	Analog inputs	SPGGIO.1.IN	Single point indication, input status

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. While it is referred to in the DNP3 Subset Definitions as a document, 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 3: Device profile document

DNP3 device profile document	
Vendor name:	ABB Oy
Device name:	630 series IED
Highest DNP level supported: For requests: Level + For responses: Level +	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 are responded with qualifiers 00 or 01.** 16-bit, 32-bit and Floating point analog change events with time may be requested. Floating point analog output status and output block objects 40 and 41 are not supported. Sequential file transfer, object 70, variations 2 through 7, are not supported. Octet string and string event objects 110 and 111 are not supported. Virtual terminal output and event objects 112 and 113 are not supported. Device attribute object 0 is not supported. Data set objects 85-88 are not supported.	
Maximum data link frame size (octets): Transmitted: 292 Received: 292	Maximum application fragment size (octets): Transmitted: Configurable up to 2048 (ApLayMaxTxSize for each master session) Received: Configurable up to 2048 (ApLayMaxRxSize for each Master session)
Maximum data link retries: • None ○ Fixed ○ Configurable (0...65535) (DLinkRetries for each channel)	Maximum application layer retries: • None ○ Configurable
Requires data link layer confirmation: ○ Never ○ Always ○ Sometimes	

Table continues on next page

DNP3 device profile document								
	• Configurable as: only when reporting event data (DLinkConfirm for each channel)							
Requires application layer confirmation:								
	○ Never							
	○ Always							
	○ When reporting event data (slave devices only)							
	○ When sending multi-fragment responses (slave devices only)							
	○ Sometimes							
	• Configurable as: "Only when reporting event data" or "When reporting event data or multi-fragment messages." (ConfMultiFrag for each master session)							
Timeouts while waiting for:								
Data link confirm: (tDLinkTimeout on DNP3Channel in PST)	• None	○	Fixed at ____	○	Variable	○	Configurable	
Complete appl. fragment:	○ None	○	Fixed at ____	○	Variable	○	Configurable	
Application confirm: (tApplConfTout on DNP3Master in PST)	○ None	○	Fixed at ____	○	Variable	•	Configurable	
Complete appl. response:	• None	○	Fixed at ____	○	Variable	○	Configurable	
Others:	• Transmission delay, configurable (tRxToTxMinDel for each channel). • Selecting/Operating arm timeout, configurable (tSelectTimeout for each master session). • Need time interval, configurable (tSynchTimeout for each master session). • Unsolicited notification delay, configurable (tUREvBufTout1, tUREvBufTout2, tUREvBufTout3 for each master session). • Unsolicited response retry delay, configurable (tURRetryDelay for each master session). • Unsolicited offline iInterval, configurable (tUROfflRtryDel for each master session). **Change events in the IED are generated by the device's internal event system; they are not polled at a protocol-specific scan rate. The periodicity for each point depends on the point's data rate in the IED.** **Binary change event scan period – see above** **Double bit change event scan period – see above** **Analog change event scan period – see above** **Counter change event scan period – see above**							
Sends/Executes Control Operations:								
WRITE binary outputs	• Never	○	Always	○	Sometimes	○	Configurable	
SELECT/ OPERATE	○ Never	•	Always	○	Sometimes	○	Configurable	
DIRECT OPERATE	○ Never	○	Always	○	Sometimes	•	Configurable	
DIRECT OPERATE - NO ACK	○ Never	○	Always	○	Sometimes	•	Configurable	

Table continues on next page

DNP3 device profile document

Count > 1	○	Never	○	Always	●	Sometimes	○	Configurable
Pulse on	○	Never	○	Always	●	Sometimes	○	Configurable
Pulse off	○	Never	○	Always	●	Sometimes	○	Configurable
Latch on	○	Never	○	Always	●	Sometimes	○	Configurable
Latch off	○	Never	○	Always	●	Sometimes	○	Configurable
Queue	●	Never	○	Always	○	Sometimes	○	Configurable
Clear queue	●	Never	○	Always	○	Sometimes	○	Configurable

Explanation of "Sometimes" above: Supported binary output control operations depend on the type of point. Please consult the binary output point list description.

Reports binary input change events when no specific variation requested:	Reports time-tagged binary input change events when no specific variation requested:
○ Never	○ Never
○ Only when time-tagged	○ Binary input change with time
○ Only non-time-tagged	○ Binary input change with relative time
● Configurable to send one or the other (Obj2DefVar on DNP3Master)	● Configurable (Obj2DefVar on DNP3Master)

Sends unsolicited responses:	Sends static data in unsolicited responses:
○ Never	● Never
● Configurable (UREnable on DNP3Master)	○ When device restarts
○ Only certain objects	○ When status flags change
○ Sometimes (attach explanation)	
● ENABLE/DISABLE UNSOLICITED function codes supported	No other options are permitted.

Default counter object/variation:	Counters roll over at:
○ No counters reported	○ No counters reported
● Configurable (obj20DefVar and obj22DefVar in DNP3Master)	○ Configurable (attach explanation)
○ Default object Default variation:	○ 16 bits
○ Point-by-point list attached	● 32 bits
	○ Other value: _____
	○ Point-by-point list attached

Sends multi-fragment responses:

○ Yes

○ No

● Configurable (ApplMultFrgRes on DNP3Master)

Deadbanding is not performed in the DNP protocol stack. Any deadbanding is a property of the IED’s underlying data and is configured through the IED configuration tools.

● = Selected,○ = Not selected

3.2 DNP3 implementation table

The following table identifies which object variations, function codes and qualifiers the IED supports in both request messages and in 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.

Table 4: Implementation table

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave 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, 27, 28 (index)		
1	1 (default) [1)]	Binary input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 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, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
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	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)
3	0	Double bit input – any variation	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17 ,27, 28 (index)		
3	1	Double bit output	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
3	2	Double bit input with status	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
4	0	Double bit input change - any variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
4	1	Double bit input change without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
4	2	Double bit input change with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
4	3	Double bit input change with relative time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)

Table continues on next page

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
10	0	Binary output status — any variation	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
10	1	Binary output	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
10	2	Binary output status	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index)
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
20	0	Binary counter —any variation	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)		
20	1	32–bit binary counter (with flag)	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
20	2	16–bit binary counter (with flag)	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
20	5	32–bit binary counter without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
20	6	16–bit binary counter without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
22	0	Counter change event — any variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
22	1	32–bit counter change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
22	2	16–bit counter change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
22	3	32–bit delta counter change event without time				
22	4	16–bit delta counter change event without time				
22	5	32–bit counter change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
22	6	16–bit counter change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)

Table continues on next page

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
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, 27, 28 (index)		
30	1	32–bit analog input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	2	16–bit analog input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	3	32–bit analog input without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	4	16–bit analog input without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	5	Short floating point	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
30	6	Long floating point	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 27, 28 (index)	129 (response)	00,01 (start-stop) 17, 28 (index)
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	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)
32	5	Short floating point 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	6	Long floating point 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	7	Short floating point 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	8	Long floating point 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	Time and date	1 (read)	07, (limited qty = 1)	129 (response)	07 (limited qty = 1)
			2 (write)	07, (limited qty = 1)		

Table continues on next page

OBJECT			REQUEST (Slave will parse)		RESPONSE (Slave will respond with)	
50	3	Time and date last recorded time	2 (write)	07 (limited qty)		
51	1	Time and date CTO			129 (response) 130 (unsol. resp)	07 (limited qty) (qty = 1)
51	2	Unsynchronized time and date CTO			129 (response) 130 (unsol. resp)	07 (limited qty) (qty = 1)
52	1	Time delay coarse			129 (response)	07 (limited qty) (qty = 1)
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) 07, 08 (limited qty)		
			20 (enbl. unsol.) 21 (dab.unsol.) 22 (assign class)	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) 20 (enbl. unsol.) 21 (dab.unsol.) 22 (assign class)	06 (no range, or all) 06 (no range, or all) 07, 08 (limited qty)		
80	1	Internal indications	1 (read)	00, 01 (start-stop)	129 (response)	00,01 (start-stop)
			2 (write) [3]	00 (start-stop) index=7		
No object (function code only)			13 (cold restart)			
No object (function code only)			14 (warm restart)			
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. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07 or 08 are responded with qualifiers 00 or 01. (For change event objects, qualifiers 17 or 28 are always responded.)
3) Writings of internal indications are only supported for index 7 (Restart IIn1–7).

Section 4 Glossary

CB	Circuit breaker
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.
EMC	Electromagnetic compatibility
GFC	General fault criteria
HMI	Human-machine interface
IEC	International Electrotechnical Commission
IEC 60870-5-103	Communication standard for protective equipment; A serial master/slave protocol for point-to-point communication
IEC 61850	International standard for substation communication and modeling
IED	Intelligent electronic device
LED	Light-emitting diode
LHMI	Local human-machine interface
PCM600	Protection and Control IED Manager
PST	Parameter Setting tool in PCM600
REF630	Feeder protection and control IED
REM630	Motor protection and control IED
RET630	Transformer protection and control IED
WEI	Weak-end infeed logic

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

Power and productivity
for a better world™