

Easergy P5

User Manual

Communication

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Version: P5/EN M/33C



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Table of Contents

Safety information and password protection	5
Introduction	6
Protocols used and data exchanged	6
Architecture	7
Serial network architecture	7
Ethernet network architectures	7
Communication ports	10
Ethernet communication slot	10
Serial communication slot	13
Port hardening configuration	13
Communication protocols	15
IEC 61850 communication	15
Presentation	15
Capability	15
Configuration of IEC 61850 communication	16
Configuration of GOOSE communication	28
GOOSE performance	31
Conformance statements	31
DNP3	32
Presentation	32
Function description	32
Device profile document	35
Implementation table	37
Supported function codes	39
Configuration parameters	41
Data configuration	43
Data model of DNP3	46
IEC 60870-5-101	48
Presentation	48
IEC 60870-5-101 configuration	48
Data model of IEC 60870-5-101	55
IEC 60870-5-103	57
Presentation	57
IEC 60870-5-103 configuration	58
Data model of IEC 60870-5-103	67
Modbus slave	91
Presentation	91
Function description	91
Modbus serial RTU mode configuration	93
Modbus TCP mode configuration	94
Disturbance Recorder transfer	95
Read exception status	95
Read device identification	96
Latch status feature for PDM Modbus	96
Events	97
Clock synchronisation	140
Point list	140
Modbus master	238

Function description	238
Main configuration parameters	238
Modbus master analog inputs	239
Modbus master digital inputs	240
Modbus master digital outputs	240
Measurements	241
Modbus master names configuration	242
EtherNet/IP	244
Presentation	244
Function description	246
EtherNet/IP main configuration	250
Data point configuration	252
Generating an EDS File with eSetup Easergy Pro	253
Data model of EtherNet/IP	253
Redundancy protocols	282
Parallel Redundancy Protocol (PRP)	282
High-availability Seamless Redundancy (HSR)	285
Rapid Spanning Tree Protocol (RSTP)	288
Generic functions for all redundant Ethernet modules	289
Precision Time Protocol (PTP)	290
Introduction to the PTP standards	290
PTP implementation	290
Simple Network Time Protocol (SNTP)	291
Communication SCADA	292
Presentation	292
Communication SCADA configuration	292
Client IP address filter	293
Scope	293
Rules	293
Configuration parameters	294
Process	295
Secure communication with the eSetup Easergy Pro via the Ethernet interface	296
Revision history	297
Appendix 1: Abbreviation	299
Appendix 2: IEC 61850 Edition 1 conformance statement	301
Appendix 3: IEC 61850 Edition 2 conformance statement	359

Safety information and password protection

Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in death or serious injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Failure to follow these instructions will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury, or equipment damage.

Failure to follow these instructions can result in injury or equipment damage.

NOTICE

NOTICE is used to address practices not related to physical injury.

Failure to follow these instructions can result in equipment damage.

Introduction

Protocols used and data exchanged

The Easergy P5 protection relays have been designed for easy data exchange and integration in any system architecture with serial links (daisy chain) or Ethernet.

The protocols used for exchange of data on the Easergy P5 protection relay are as follows:

- IEC 61850
- DNP3
- IEC 60870-5-101
- IEC 60870-5-103
- EtherNet/IP
- Modbus slave
- Modbus master

The data types that can be exchanged through these protocols are listed:

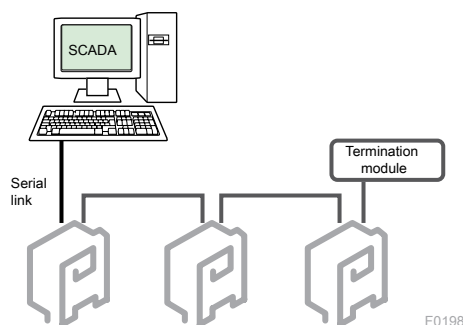
Port	Ethernet					
Protocol	IEC 61850	EtherNet/IP	sFTP	DNP3	Modbus slave	GetSet
Real time data						
Measurement	✓	✓		✓	✓	✓
Alarms and status	✓	✓		✓	✓	✓
Controls	✓	✓		✓	✓	✓
Time-stamped events	✓	✓		✓	✓	✓
Logged data						
Disturbance records	✓		✓	✓		
Sequence of event record files			✓			
Device management						
Setting group change	✓	✓		✓	✓	✓
Settings	✓				✓	✓

Port	Serial				
Protocol	DNP3	Modbus slave	Modbus master	IEC 60870-5-103	IEC 60870-5-101
Real time data					
Measurement	✓	✓	✓	✓	✓
Alarms and status	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓
Time-stamped events	✓	✓	✓	✓	✓
Logged data					
Disturbance records	✓			✓	
Sequence of event record files					
Device management					
Setting group change	✓	✓		✓	✓
Settings		✓		✓	

Architecture

Serial network architecture

This architecture allows the connection of HMI/SCADA to a set of Easergy P5 protection relays using a multi-drop serial communication link with master-slave communication.



Ethernet network architectures

This architecture allows the connection of a set of Easergy P5 protection relays directly on an Ethernet network.

NOTE: It is possible to mix any three of four Ethernet protocols, including the IEC 61850 protocol, on the same Ethernet network.

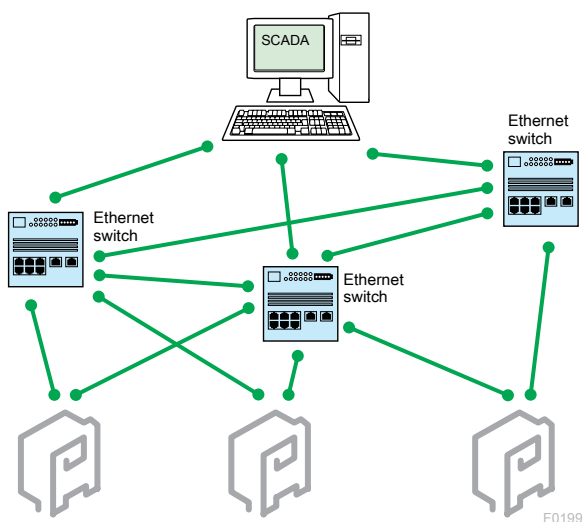
This allows to use the Generic Object Oriented Substation Event (GOOSE) messages between relays together with another protocol for communication to Supervisory Control and Data Acquisition (SCADA).

It is also possible to connect Easergy P5 protection relays to more than one control system, using the same Ethernet communication port with one of the chosen protocols.

Easergy P5 protection relays handle the IEC 61850 station bus, in compliance with standards IEC 61850-6, 7-1, 7-2, 7-3, 7-4 and 8-1 Edition 1 or Edition 2, according to configuration.

Other supported protocols:

- Secured File Transfer Protocol (sFTP) for file transfer
- Simple Network Management Protocol (SNMP) for network management
- Simple Network Time Protocol (SNTP) for time synchronisation
- Secured Hypertext Transfer Protocol (HTTPS) for Web HMI
- GetSet, which is an ASCII protocol used by eSetup Easergy Pro, which is secured by TLS



Connections

The Easergy P5 protection relays can be connected to an Ethernet switch or a router by using:

- 10/100BASE-T copper wire (radial connection).
- 100BASE-FX multi-mode fibre optic (radial or ring connection).

NOTE: Only one of the three IP addresses can connect to the router. The other two IP gateways should be set to 255.255.255.255.

To optimise system performance, Schneider Electric recommends:

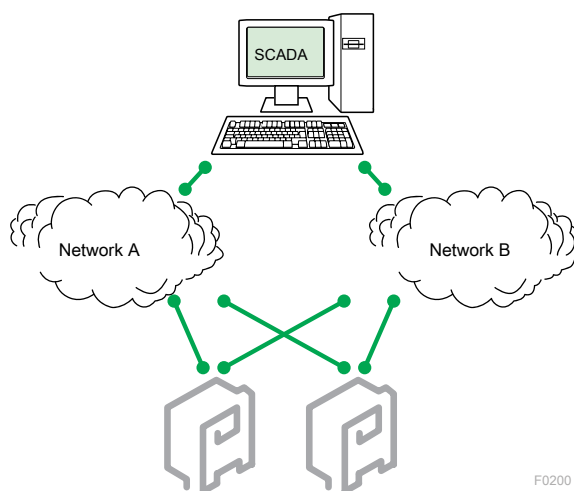
- to build a fault-tolerant communications backbone by implementing a fibre optic ring
- to use IEC 61850 compatible managed switches
- to use VLANs for prioritised messages
- to configure meaningful destination MAC address and APPID to enable network filtering
- to minimise the content of GOOSE datasets

Parallel Redundancy Protocol (PRP)

The principle of Parallel Redundancy Protocol (PRP) is to transmit frames in parallel on two independent network infrastructures: A and B.

The receiving device is in charge of discarding the second (redundant) frame once it is received.

PRP provides a 0 ms recovery time in case of a communication failure, but this quality is achieved at the cost of a double communication network.

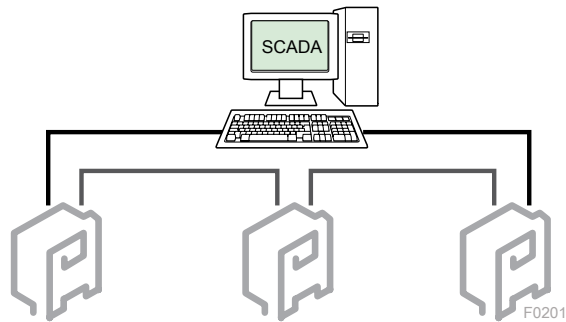


High-availability Seamless Redundancy (HSR)

High-availability Seamless Redundancy (HSR) is typically used in ring architectures.

Frames are transmitted on the ring on both directions and the receiving device discards the redundant frames.

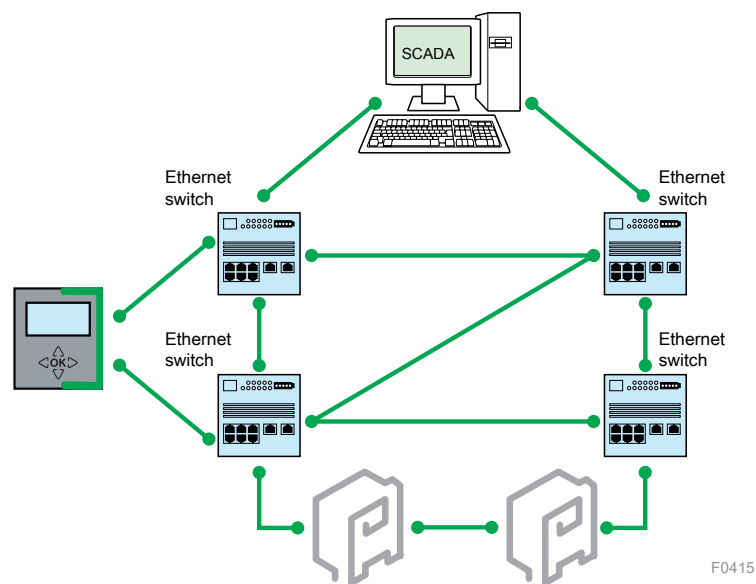
HSR provides a 0 ms recovery time and is a cheaper alternative compared to PRP.



Rapid Spanning Tree Protocol (RSTP)

The principle of Rapid Spanning Tree Protocol (RSTP) is to virtually switch off all links that are not necessary at a given time, changing the meshed topology into a tree topology.

The main advantage of RSTP is that it is widespread, and works on any network topology. On the other hand, RSTP may take a considerable time to reconfigure the network in case of a network failure, which may exceed the requirements of automations.



Communication ports

Ethernet communication slot

The Ethernet communication slot can accommodate one of the following options:

- Dual port copper (RJ45) Ethernet module with RSTP redundancy management.
- Dual port fibre optic (multimode glass fibre) Ethernet module with RSTP redundancy management.
- Dual port fibre optic (multimode glass fibre) Ethernet module with PRP/HSR advanced redundancy management (this option is a double width module which spans over the serial slot space and is therefore not compatible with the use of a serial communication module).

Communication module	IP selection	
	RSTP = 1	RSTP = 0
1 Ethernet module (Slot M)	IP1	IP1, IP2
1 Ethernet module (Slot L)	IP3	
2 Ethernet modules (Slot M, Slot L)	IP1, IP3	IP1, IP2, IP3
1 PRP/HSR module (Slot M and N)	IP1	
1 PRP/HSR module, 1 Ethernet module (Slot M and N, Slot L)	IP1, IP3	

Each IP address includes network number and host number. For example, when IP = 192.168.1.21, the network number is 192.168.1 and the host number is 21. The network number of IP1, IP2 and IP3 shall not be the same for Easergy P5 communication configuration. For example, IP1 = 192.168.1.21, IP2 = 192.168.2.31 and IP3 = 192.168.10.31 are workable, while IP1 = 192.168.1.21 and IP2 = 192.168.1.31 are incorrect.

Ethernet port configuration

The parameters for the port can be set from the front panel, from the COMMUNICATION menu of eSetup Easergy Pro, or from the Web HMI. Up to 3 different protocols can be used simultaneously, using the same IP address and MAC address but different IP port numbers.

Ethernet Protocol 1

Ethernet port protocol:	IEC-61850	
IP port for protocol 1:	102	
Set protocol default IP port:	-	
Message counter:	0	Clear
Error counter:	0	Clear
Timeout counter:	0	Clear
IP address selection:	IP 1	

Table 1 - Ethernet protocol 1 configuration parameters

Parameter	Value	Description	Note
Ethernet port protocol	None ModBusTcps DNP3 IEC-61850 EtherNet/IP	Select the protocol of the Ethernet port	Set
IP port for protocol 1		Set the IP port number of the protocol 1	Set
Set protocol default IP port	– Default	Select the default IP port number: 502 for ModBus Tcps 20000 for DNP3 102 for IEC 61850 44818 for EtherNet/IP	Set
IP address selection	IP1 IP2 IP3	Choose the Ethernet module to be used ¹	Set

Set = an editable parameter (password needed)

Ethernet (Slot M)

MAC address: 0080f4cc14a9

IP Address: 

Network mask:

Gateway: 

MAC2 address: 0080f4cc14aa

IP Address: 

Network mask:

Gateway: 

Ethernet port 1 status: Link on

Ethernet port 2 status: Link off

Enable HTTPS server

Enable HTTPS server: ☐ 

IP address selection: 

NTP server

NTP server: 

NTP server (Backup): 

IP address selection: 

TCP keep alive interval

TCP keep alive interval: s 

1. IP1/IP2 means to select the Ethernet module to be used on Slot M; IP3 means to select the Ethernet module to be used on Slot L. If Slot M is used as RSTP mode or PRP/HSR module is selected, then IP2 is invisible.

Table 2 - Ethernet port configuration parameters

Parameter	Value	Description	Note
MAC address		Display the MAC address	
Enable DHCP service	Yes / No	If enabled, the IP address of the device is defined by the DHCP server of the network. NOTE: DHCP service can only support IP3 configured with ModBusTCPs.	Set
IP Address	n.n.n.n	IP address	Set ²
Network mask	n.n.n.n	Network mask	Set ²
Gateway	n.n.n.n	Gateway IP address	Set ²
Ethernet port 1 status	Link on / Link off	Display the link status of Ethernet Port 1	
Ethernet port 2 status	Link on / Link off	Display the link status of Ethernet Port 2	
Enable HTTPS server	Yes / No	If this option is enabled, HTTP server can be used	Set
IP address selection	IP1 IP2 IP3	Choose the Ethernet module to be used ³	Set
NTP server	n.n.n.n	Network time protocol server	Set
NTP server (Backup)	n.n.n.n	Network time protocol server to be used if NTP server does not respond	Set
IP address selection	IP1 IP2 IP3	Choose the Ethernet module to be used ³	Set
TCP keep alive interval	0 - 20 s	TCP keepalive interval in seconds	Set ⁴

If Ethernet module with PRP/HSR is selected, then additional parameters are shown.

ETHERNET PORT IP1 (PRP/HSR)

MAC address	0080f4cc24bd	
IP Address	10.22.91.22	
Gateway	255.255.255.0	
FPGA version	1.11	
Port 1 Status	Link on	
Port 2 Status	Link on	
Get Mode	HSR	
Mode Switch	HSR	

2. Cannot be set when DHCP service is enabled.
3. IP1/IP2 means to select the Ethernet module to be used on Slot M; IP3 means to select the Ethernet module to be used on Slot L. If Slot M is used as RSTP mode or PRP/HSR module is selected, then IP2 is invisible.
4. Keepalive: The Keepalive parameter sets the time in seconds between two keepalive packets which are sent from the IED. The setting range for this parameter is between zero (0) and 20 seconds; with the exception that zero (0) means actually 120 seconds (2 minutes). The purpose of a keep alive's packet is to send a probe packet to a connected client for checking the status of the TCP-connection when no other packet is being sent, e.g. the client does not poll data from the IED. If the keepalive packet is not acknowledged, the packet continues to be transmitted 10 times with an interval of 2 seconds. If still not acknowledged, IED will close the TCP connection. For example, if the "TCP keep alive interval" is set to 10s, the time to drop the connection to Easergy P5 is 10s + 2s * 10 = 30s. The connection must be restarted from the client side.

Table 3 - Additional Ethernet port configuration parameters for channel redundancy

Parameter	Value	Description	Note
FPGA version		Display the Field Programmable Gate Array (FPGA) version of the Ethernet module	
Get mode		Display the used protocol	
Mode Switch	PRP / HSR	Switch the protocol to be used	Set

Serial communication slot

The Serial communication slot can accommodate one of the following options:

- RS-485 (two and four wires) serial communication module, with RJ45 connection
- Fibre optic serial communication module

Serial port configuration

The parameters for the remote port can be set from the front panel or via protocol, using COMMUNICATION menu of eSetup Easergy Pro or Web HMI.

Only one serial port can be used and one serial communication protocol can be selected.

Remote port

Remote port protocol: IEC-101

Baud rate: 9600/8N2

Message counter: ☐ 0

Error counter: ☐ 0

Timeout counter: ☐ 0

Table 4 - Serial port configuration parameters

Parameter	Value	Description	Note
Remote port protocol	None ModBusSlv IEC-103 MdbmsMstr DNP3 IEC-101	Select the protocol of the serial port	Set

Port hardening configuration

It is possible to disable a communication port – either via the front panel or via protocol, using COMMUNICATION menu of eSetup Easergy Pro or Web HMI with the correct access rights.

This allows the user to take control of the physical ports limiting the exposure of ports to only those that are needed.

Figure 1 - Port hardening configuration parameters (depending on the communication modules used)

Port hardening config.		
Disable USB-B Port:	☐	
Disable Serial Port:	☐	
Disable Ethernet Port IP1:	☐	
Disable Ethernet Port IP2:	☐	
Disable Ethernet Port IP3:	☐	
Disable 1st protocol on Ethernet:	☐	
Disable 2nd protocol on Ethernet:	☐	
Disable 3rd protocol on Ethernet:	☐	

If the ports or the protocols on Ethernet module are disabled or enabled, then a reboot is needed.

Communication protocols

NOTICE

CYBER SECURITY HAZARD

- Except for the private GetSet protocol via secured communication (SSH), the device does not have the capability to transmit data encrypted using the following protocols: IEC 61850, DNP3 over Ethernet, Modbus slave over Ethernet, EtherNet/IP, Modbus slave serial, Modbus master serial, DNP3 serial, IEC 60870-5-103 serial, IEC 60870-5-101 serial, IEEE 1588 and SNTP.
- If other users gained access to your network, transmitted information can be disclosed or be subject to tampering.
- For transmitting data over an internal network, physically or logically segment the network. The access to the internal network needs to be restricted by using standard controls, such as firewalls, and other relevant features supported by your device, such as IPTable whitelisting.
- For transmitting data over an external network, encrypt protocol transmissions over all external connections using an encrypted tunnel, TLS wrapper or a similar solution.

Failure to follow these instructions can increase the risk of unauthorised access.

IEC 61850 communication

Presentation

IEC 61850 is a series of standards for communication networks and systems of power utility automation. Easergy P5 protection relays, used as a server, can be connected to an IEC 61850 station bus according to Edition 1 and Edition 2 of:

- IEC 61850-6
- IEC 61850-7-1 to 7-4
- IEC 61850-8-1

Based on the Ethernet protocol, the IEC 61850 communication standard helps to ensure:

- High communication speeds and versatile communication architectures
- Interoperability between manufacturers

Capability

Easergy P5 protection relays provide a built-in solution for demanding IEC 61850 applications:

- IEC 61850 logical nodes and configurable data sets to fit the needs of the Edge control system/SCADA system
- Peer-to-peer communication capabilities on Easergy P5 protection relays using GOOSE messages to enhance the protection and control system without the need of additional wiring
- Up to 8 simultaneous IEC 61850 client-server associations

The IEC 61850 protocol can be used to read/write static data from/to the Easergy P5 protection relays, to receive events, to send controls, and to receive/send GOOSE messages to other relays.

The IEC 61850 server interface is capable of:

- Configurable pre-defined data sets

- Dynamic data sets created by clients, which can be assigned to Buffered and Unbuffered Report Control Blocks
- Reporting function with Buffered and Unbuffered Report Control Blocks
- Supported control models:
 - Status-only
 - Direct control with normal security
 - Direct control with enhanced security
 - Select before operate with normal security
 - Select before operate with enhanced security
- Supported horizontal communication with GOOSE
 - Configurable GOOSE publisher data sets
 - Configurable filters for GOOSE subscriber inputs (i.e. MAC Address, APPID....)
- Sending and receiving analogue or binary values over GOOSE
- Setting modification
 - Editing a setting value in the setting group
 - Changing the active setting group

Setting groups are selectable using the Setting Group Control Block class, (SGCB). The Active Setting Group can be selected using the Relay/LLN0.SP.SGCB.ActSG data attribute in Logical Device 'Relay'.
- File transfer
 - Extracting disturbance records from Easergy P5 relays by file transfer, as ASCII format COMTRADE files
 - All disturbance record files are accessible from the folder /COMTRADE/DR.
 - Deleting files in the /COMTRADE/DR folder is not supported.

Configuration of IEC 61850 communication

Configuration tools

The Easergy P5 protection relays IEC 61850 solution can be configured with:

- eSetup Easergy Pro used as a setting and operating software to help ensure straightforward configuration and to send IEC 61850 configuration to Easergy P5 protection relays
- CET850 software used as a configuration tool to adapt the communication profile of Easergy P5 protection relays to the precise needs of the system

Configuration files

The IEC 61850 configuration process uses and generates several types of System Configuration description Language (SCL) files; a selection is introduced here:

- ICD - IED (Intelligent Electronic Device) Capability Description

An ICD file exists for each type of Easergy P5 protection relay. It describes the data model and communication services available in the referred-to Easergy P5 device model.

ICD files are provided in a library together with the CET850 configuration tool, and are used as template models in the configuration process.

The ICD files can be obtained from the ICD folder under eSetup EasergyPro or generated by the "Export ICD/SCL file" command by eSetup EasergyPro.
- IID - Instantiated IED Description

The IID file describes the project-specific configuration of a single IED in a system.

It is used as an exchange file between the CET850 configuration tool and other IEC 61850 system configuration tools to exchange the configuration data of a single IED instantiated specifically for a project.

- CID - Configured IED Description

For every configured Easergy P5 protection relays there is a CID file which describes the IEC 61850 configuration of the device.

A CID file is created by the IED configuration tools. The CID file is then loaded into the device to configure it.

- SCD - System Configuration Description

An SCD file contains the configuration data for the IEC 61850 system including the communication configuration settings for all related IEC 61850 devices.

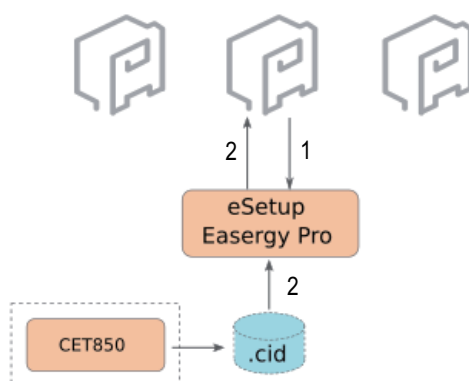
eSetup Easergy Pro for IEC 61850 configuration

The Easergy P5 protection relays setting and operating software, eSetup Easergy Pro, is used to create and to send IEC 61850 configuration to the Easergy P5 protection relay.

eSetup Easergy Pro is used to:

1. Get the information from Easergy P5 protection relays connected to the IEC 61850 network. This can be done automatically by the eSetup Easergy Pro polling the network to find connected devices (with IP address and port number).
2. Import a CID file to the Easergy P5 relay through eSetup Easergy Pro (see eSetup Easergy Pro user manual).

NOTE: The CID file name shall not include any whitespace or non-latin characters.



IEC 61850 main configuration

The IEC 61850 protocol is activated by setting it as the port protocol for an Ethernet port on the device. This setting can be found by navigating to the COMMUNICATION menu.

Table 5 - IEC 61850 main configuration parameters

Parameter	Description	Note
Edition	IEC 61850 standard edition to be used (1 or 2), Edition 2 is the default.	Set
Control model	Selects the control model to be used with the controllable Objects. • Status-only (StatusOnly) • Direct control with normal security (DirNorSec) • Select before operate with normal security (SBONorSec) • Direct control with enhanced security (DirEnhSec) • Select before operate with enhanced security (SBOEnhSec)	Set

Table 5 - IEC 61850 main configuration parameters (Continued)

Parameter	Description	Note
Deviation-time integ calculation	Indicates for Deviation-time integral calculation for deadband: - Yes: for Deviation-time integral calculation - No: for normal calculation	Set
Min supervision time	Minimum timeout for indicating invalid status of GOOSE network inputs due to no incoming GOOSE messages (exceeded supervision time or time allowed to live from the last GOOSE message, whichever is greater).	Set
Active connections	The number of active connections.	
Client x	The IP addresses of the IEC 61850 clients with active connection	

When the setting “Deviation-time integ calculation” is not selected, regular formula is executed. The deadband value is calculated as below:

- For magnitude: **deadband = db × (rangeC.max – rangeC.min)/100000**
- For angle: **deadband = dbAng × (rangeAngC.max – rangeAngC.min)/100000**

The data change in the IEC 61850 is generated with the following condition:

$$\text{abs (value2 – value1)} > \text{deadband}$$

When the setting “Deviation-time integ calculation” is selected, additional condition to update analog values is applied. The value of 'db' or 'dbAng' shall be represented as 0.001% s.

The data change in the IEC 61850 is generated with the following condition:

- For magnitude: **abs (value2 – value1) × (t2 – t1) > db × (rangeC.max – rangeC.min) × 1s/100000**
- For angle: **abs (value2 – value1) × (t2 – t1) > dbAng × (rangeAngC.max – rangeAngC.min) × 1s/100000**

Here value2 means the current value, value1 means the last report value; t2 means the current time, t1 means the time of the last report value changed. The unit for t2 and t1 are seconds.

The DAs, “db”, “dbAng”, “rangeC.max”, “rangeC.min”, “rangeAngC.min” and “rangeAngC.max”, can be configured in the cid file. Other DAs like “hhLim”, “hLim”, “lLim” and “llLim” cannot be edited and their default values are set to zero.

IEC 61850 generic events

Regardless from the modelling of information in IEC 61850-7-4, generic events can be configured via navigating to the COMMUNICATION menu and IEC 61850 generic events view in the eSetup Easergy Pro or Web HMI.

This provides means to map any events (i.e. protection trip, digital input change, port hardening change, ...) of the relay to maximum 8 indication data objects of the P5EVTGGIO1 logical node of the IEC 61850 interface. The status of the indication data object is determined by ON and OFF events set for the corresponding index.

IEC 61850 generic events

Index	ON event channel ↱	ON event code ↱	OFF event channel ↱	OFF event code ↱
1	69	1	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0

Table 6 - IEC 61850 generic events

Parameter	Description	Note
Ind idx	Index of the LN P5EVTGGIO1 indication	
ON event channel	Channel number of the ON event	Set
ON event code	Event code of state ON	Set
OFF event channel	Channel number of the OFF event	Set
OFF event code	Event code of state OFF	Set

The above screenshot features an example, where the status of Virtual Input 1 (event channel 69) is mapped to the generic events table. If the value of Virtual Input 1 is changed, then the value stored in the IEC 61850 address P5EVTGGIO1.Ind1.stVal indicates the current value of the Virtual Input 1. If only an “ON event” is defined for an indication then the transition to OFF state is generated automatically after reporting the ON state (momentary ON state). And the same applies if only an “OFF event” is defined for an indication (momentary OFF state).

GOOSE configuration

The publisher settings GoCBx enable False/True can be found on the local panel HMI via **General** menu/**IEC 61850** sub-menu. Initial values are defined in the cid file.

IEC 61850		1/1
Enable		
GOOSE CB1 Enable		False
GOOSE CB2 Enable		False
GOOSE CB3 Enable		False
GOOSE CB4 Enable		False

The four private DOs, GoEnaCB1-4, which can be edited by SCT/ICT freely, are defined under LN LLN0. When importing a cid file, the value of GoCB Enabled in the firmware will be updated to the same value as GoEnaCB1-4 in the cid file. The default value of GoEnaCB1-4 in the cid file is true.

GOOSE subscriber: data points

The GOOSE subscriber 128 binary data and 8 analog data can be monitored by navigating to the COMMUNICATION menu and GOOSE Subscriber: data points view in eSetup Easergy Pro or Web HMI.

GOOSE Subscriber: data points

GOOSE NI Global Error: OK

Subscriber binary data

Network input	Value	Status
1	0	NO DATA
2	0	NO DATA
3	0	NO DATA

Subscriber analog data

NI	Value	Unit	Status
1	0.00	°C	NO DATA
2	0.00	°C	NO DATA
3	0.00	°C	NO DATA

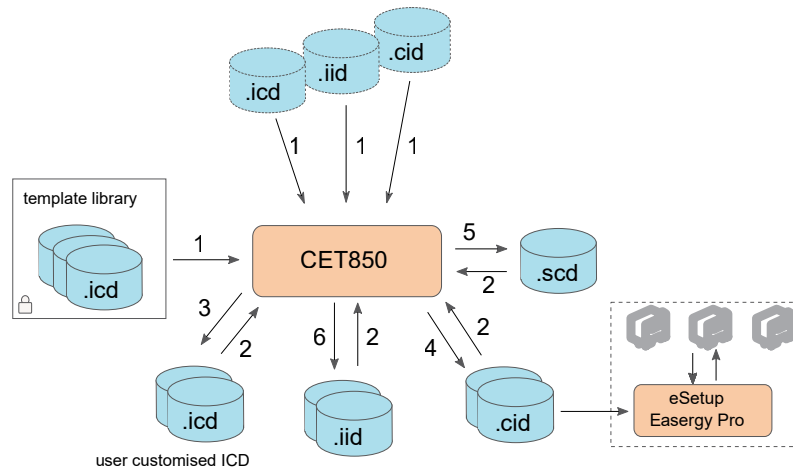
Table 7 - GOOSE subscriber: data points

Parameter	Description
GOOSE NI Global Error	Global error status of the GOOSE subscription
Network input	Index of the GOOSE data points. Input data can be binary or analogue. Binary NIs can be used as inputs for the user-defined logic blocks or as control inputs in the other functions of the relay (e.g. the output matrix).
Value	Data value received in the GOOSE data packet
Status	Status of the GOOSE data (OK / OLD / BAD TYPE / NO DATA / NEEDS COM / TEST / NDSCM TEST)
Unit	Unit of the incoming analogue data (configured in the cid file)

NI = Network Input

CET850 for IEC 61850 configuration

IEC 61850 configuration software CET850 is used to create, display, modify or optimise an IEC 61850 configuration.



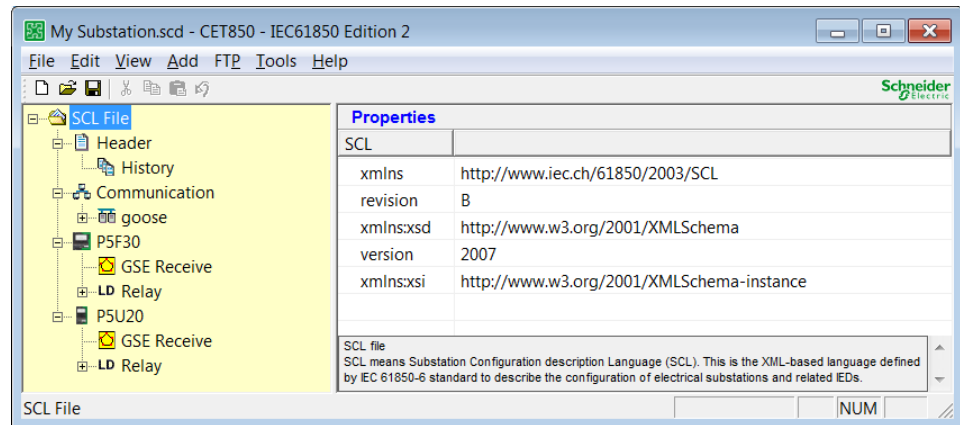
P533NXA

CET850 can be used to:

- Create an IEC 61850 configuration using an ICD, SCD, IID or CID file as an input.
- Edit an existing CID, SCD, IID or user-customised ICD file to modify its contents by :
 - Adding or removing Easergy P5 protection relays, in case of SCD
 - Displaying the configuration
 - Modifying communication parameter values
 - Optimising configuration by creating or modifying datasets and Report Control Blocks
 - Configuring or optimising the GOOSE communication by creating or modifying the GOOSE messages publication and subscription
- Generate a user-customised ICD file using an Easergy P5 protection relays IED template from the factory ICD library.
- Generate a CID file for storing the configuration of one device which can then be uploaded to the Easergy P5 protection relays using eSetup Easergy Pro.
- Generate SCD file for storing the configuration of an IEC 61850 system which can then be used by other IEC 61850 configuration tools.
- Generate an IID file for storing the specific configuration of an instantiated IED which can then be used by other IEC 61850 system configuration tools.

Graphical SCL editor

CET850 is a graphical tool that enables to browse an SCL file using a tree view that displays the content of the file in a hierarchical format.



Tree view

The following main sections are displayed in the tree view:

- Header and history
The Header section identifies the SCL configuration file and its version.
- Communication
This section contains the definition of all sub-networks defined in the IEC 61850 system, with the list of the connected IEDs. Both Client/Server and peer-to-peer communication access points are displayed.
- List of IEDs
This section contains the definition of all IEDs defined in the IEC 61850 system. Each IED is displayed with all its contents:
 - Logical Devices (LD)
 - Logical Nodes (LN)
 - Datasets (DS)
 - Report Control Blocks (RCB)
 - GOOSE Control Blocks (GoCB)
 - GOOSE subscription

Property view

When an item is selected in the tree view, the property view displays details of the selected item. The user can activate editing operations from the tool bar and contextual menu. There are also specific dialogue interfaces to guide you.

Device configuration

Adding and removing a device in an IEC 61850 system consists of making the change in the associated SCD file.

Adding an IED

CET850 enables the addition of an IED to an IEC 61850 system using its ICD description file, or the addition of a device already defined by a CID file. A specific dialog interface requests a name for the IED and then its description. The description is provided from an ICD file, a CID file or from an IID file.

Procedure:

- Create a new SCL file for a substation system (e.g. My Substation.scd).
- From the tree view, select the SCL root element
- In the menu bar or in the contextual menu, click Add > IED
- Set the IED Identification and optionally the address parameters according to the following descriptions

- Click OK to validate the operation

IED identification:

- ICD/CID file

Select the IEC 61850 description of the IED to add to an ICD or a CID. The user can select a device from a library or an other device with an external ICD file.

- IED name

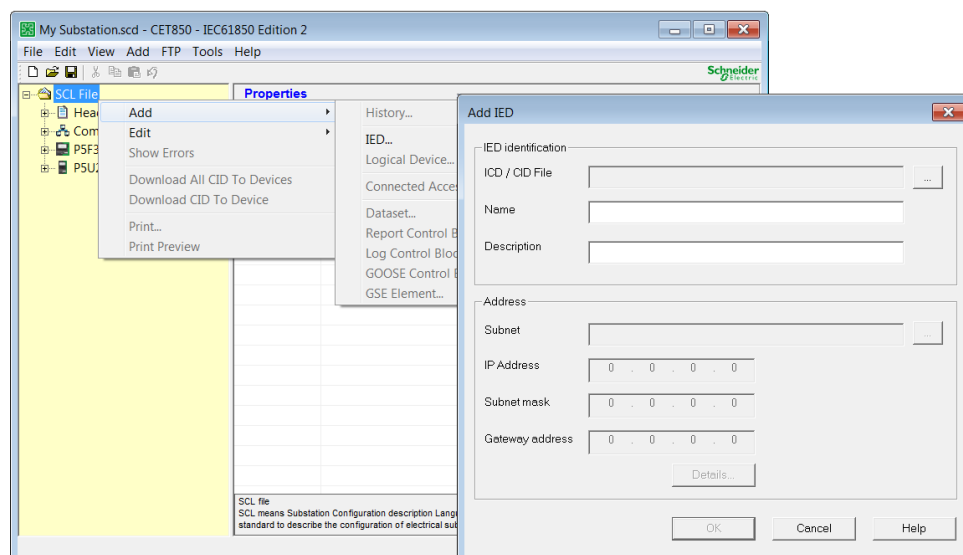
Assign a name to the IED. The name of the IED must be unique in the IEC 61850 system. Its length is restricted to a maximum of 64 characters, and consists of alphanumeric and underscore (_) characters, beginning with a letter. It must not included a space character.

- IED description

This is a free ASCII string where the user can write comments about the device.

Address:

Address parameters are set to connect to the IED in the communication network. Connecting the IED can be done at this stage or later using the Add > Connected Access Point menu.



Removing an IED

An IED can be removed from an SCD file. This function is available when an IED is selected in the tree view. After confirming that the IED is to be deleted, the tree view and the content of the SCD file are updated.

Connecting a device in IEC 61850

An IEC 61850 IED uses an Access Point (AP) to communicate. This AP is connected to a subnetwork. CET850 provides the following set of functions to manage the communication architecture of an IEC 61850 System:

- Adding or removing a Subnet to the system
- Adding or removing an Access Point on a Subnet

IED configuration

The configuration of an IED described in an ICD, CID or SCD file can be modified so that its communication profile and behaviour are adjusted to the needs of the system. Refer to the CET850 user manual for more information.

Create, modify or delete a dataset

With Easergy P5 protection relays, a dataset is a collection of references to Data Attributes (DA) grouped together to increase communication efficiency for reports and GOOSE messages.

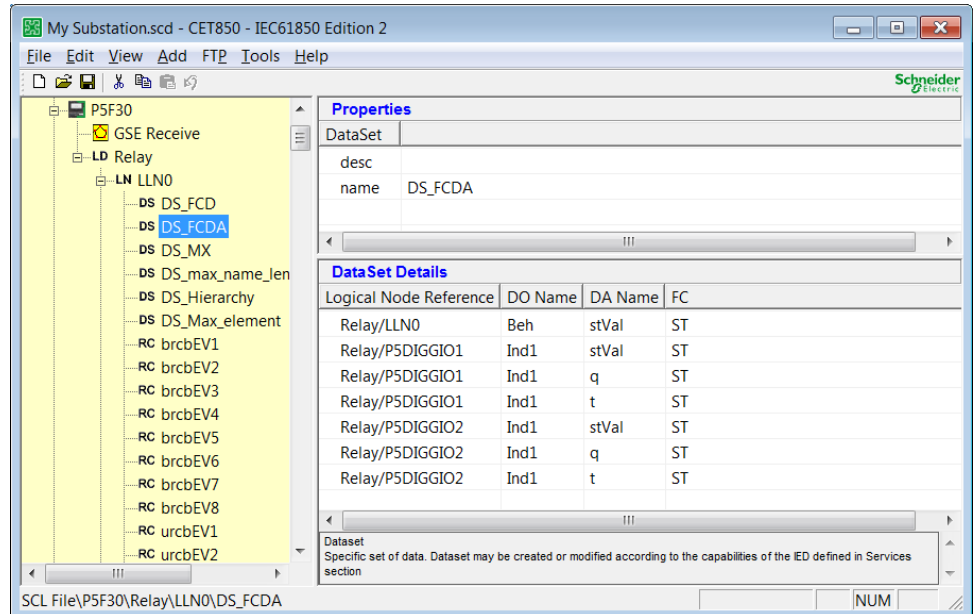
Datasets can be modified by the user and new dataset can be added, depending on the capabilities of the IED.

Any data produced by Easergy P5 protection relays may be referred-to in a dataset to be sent via a GOOSE message. Nevertheless, only data from the following types are applicable for GOOSE communication between Easergy P5 protection relays: Single Point Status (SPS), Double Point Status (DPS), Double Point Control (DPC), Complex Measured Value (CMV), and Measured Value (MV).

CET850 provides an easy way to create or edit a dataset inside LLN0. When creating a dataset, CET850 prompts the user for its name and description. A specific dialog interface allows the user to select which data is to be added to, or removed from the dataset.

The available data that can be selected is displayed in a hierarchical tree with collapse and expand facilities, from their host Logical Node down to the data attributes. Individual and multiple selections are possible.

After completing the definition of the dataset in the dialog interface, the changes to the dataset are reflected in the current SCL file and the CET850 display is updated: A newly created dataset is displayed in the tree view; a deleted dataset is removed from the tree view. The content of the dataset is updated in the property view.



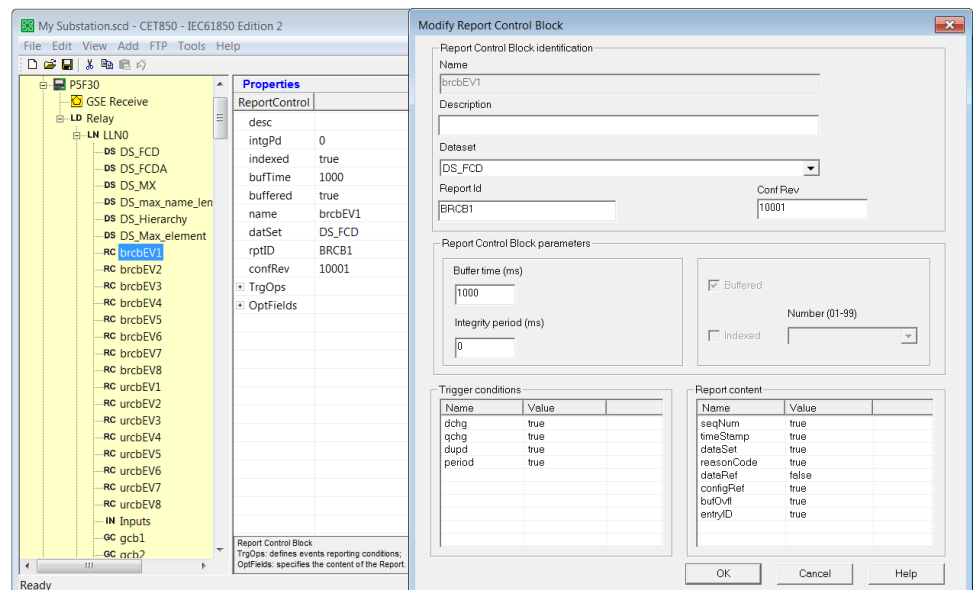
Modify Report Control Block (RCB)

Easergy P5 protection relays provide up to 16 buffered and 8 unbuffered RCBs inside LLN0.

CET850 provides a specific dialog interface for creating or modifying a Report Control Block. When creating an RCB, CET850 prompts the user for the name and description of the RCB. A specific dialog interface allows the user to select the dataset to be associated with the RCB and to define all settings concerning the report generation.

The most common trigger options for an RCB instance are:

- **Data Change** : the Report is triggered by changes to the value of the data which are referenced in the dataset
- **Quality Change**: the Report is triggered by changes to the quality of the data which are referenced in the dataset
- **Integrity**: the Report is triggered periodically, according to an Integrity period specified



Modify GOOSE Control Block (GoCB)

The GOOSE message service is an efficient real-time communication service for peer-to-peer exchanges between IEDs.

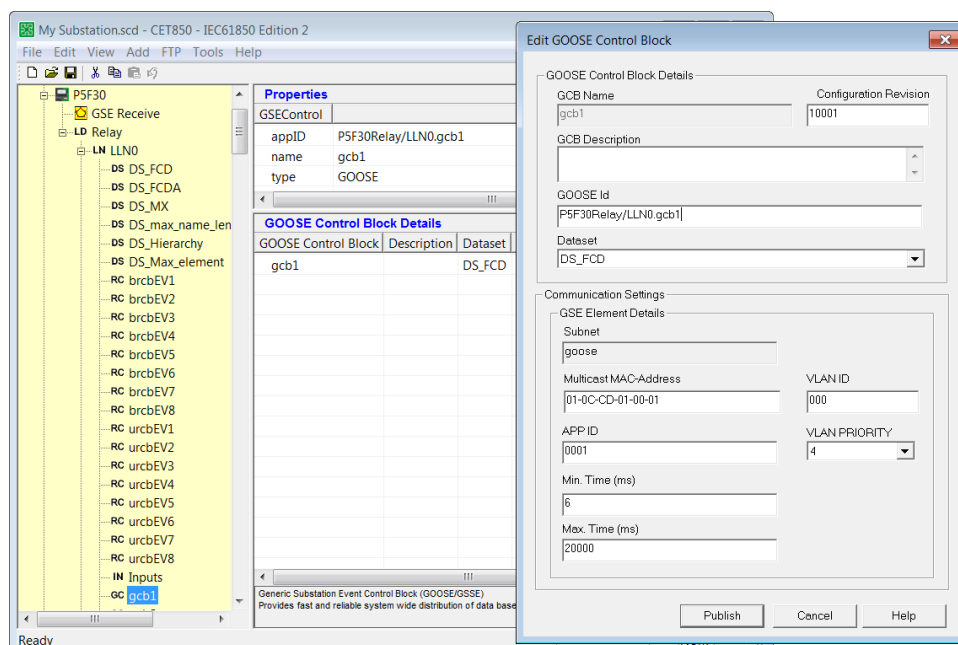
A GOOSE Control Block (GoCB) manages how information referenced in a dataset is transmitted in a GOOSE message. A GoCB can only be created inside the Logical Node 0 (LLN0). The Easergy P5 protection relay provides up to 4 GoCBs.

CET850 provides a specific dialog interface for modifying a GOOSE Control Block. A specific dialog interface allows the user to select the dataset whose referenced information shall be transmitted as a GOOSE message. Then, the user needs to enter the settings for publishing the GOOSE message.

This includes:

- Multicast MAC address to which the GOOSE message is transmitted to
- Time for the first retransmission of the GOOSE message (the fastest retransmission is after 4 ms)
- Maximum retransmission interval (heartbeat cycle time)

After completing the definition of the GoCB in the dialog interface, the changes to the GoCB are reflected in the current SCL file and the CET850 display is updated: A newly created GoCB is displayed in the tree view; a deleted GoCB is removed from the tree view. The GoCB settings are displayed in the property view.



The four private DOs, GoEnaCB1-4, which can be edited by SCT/ICT freely, are defined under LN LLN0. When importing a cid file, the value of GoCB Enabled in the firmware will be updated to the same value as GoEnaCB1-4 in the cid file. The default value of GoEnaCB1-4 in the cid file is true.

GoCB disabled/enabled initial state can be modified in the cid file. Related DO "GoEnCbx" is dedicated for every published GoCB. After importing the cid file to the P5 relay, GoCB status can be changed via IEC 61850 or the local panel HMI. This change will be preserved after relay power cycle.

Subscribe to GOOSE messages and assign GOOSE inputs

The capability of the Easergy P5 protection relay to receive GOOSE messages is defined in the ICD file. If GOOSE messages are to be subscribed to, a GOOSE Receive element is defined at the beginning of the IED section, in the tree view displayed by CET850.

Editing the GOOSE Receive element allows the user to:

- Select the GOOSE messages and the data to which the IED subscribes
- Assign the subscribed data to Easergy P5 protection relays GOOSE inputs

CET850 provides a specific dialog interface to edit the GOOSE Receive. The dialog is organised in two parts:

- GOOSE message and data subscription
- GOOSE Inputs assignment

Refer to [Configuring the subscriber side](#), page 29 for a detailed description.

Deadband configuration in the cid file

The DAs, “db”, “dbAng”, “rangeC.max”, “rangeC.min”, “rangeAngC.min” and “rangeAngC.max”, can be configured in the cid file. Other DAs like “hhLim”, “hLim”, “lLim” and “lLim” cannot be edited and their default values are set to zero.

SNTP server IP address configuration in the cid file

The DA “TimSrcSet1” defines the main IP address of SNTP. “TimSrcSet2” defines the backup IP address of SNTP. The default values for “TimSrcSet1” and “TimSrcSet2” are “0.0.0.0”.

Generating, editing, validating of an SCL file

Generating CID files

When an SCD file is opened in the tool, CET850 can generate the CID file of a specific IED or all the CID files for all IEDs defined in the SCD file.

Generating a CID file is available when an IED is selected from the tree view and if this IED is connected to a subnet. A specific dialog interface box asks the user to enter the location and the name of the output CID file. By default, the name of the CID file is based on the name of the IED.

Generating all CID files is available if the SCD file includes at least one IED that is connected to a subnet. A specific dialog interface box asks the user to enter the location of the output CID files. The name of each CID file is based on the name of the IED.

Editing CID files

CET850 allows the editing of an existing CID file. This CID file is an advanced configuration file generated during a previous use of CET850, or a standard configuration file generated by eSetup Easergy Pro.

Validating SCL files

The validate function includes two kinds of verification:

- Verification of the structure and content of the SCL file

The System Configuration description Language is based on Extensible Markup Language (XML). The structure and the content of an SCL file is fully specified by the IEC 61850 standard using an XML Schema (XSD files). CET850 is delivered with the set of XSD files defined by the IEC 61850 standard. Using the Xerces™ parser, CET850 checks the validity of SCL files against the IEC 61850 XML Schema.

- Verification of the consistency of the GOOSE communication.

The following checks are made:

- The dataset defined for a GOOSE messages meets a specific size constraint.
- The data sent by a publishing IED is consistent with the data expected and subscribed by the subscribing IED.

CET850 provides two ways to validate an SCL file:

- Schema validation
- Check XML syntax at file saving

Automatic validation is enabled or disabled using a specific option in the CET850 User Preferences.

Configuration of GOOSE communication

To configure the GOOSE communication, the following software are used:

- CET850 software to configure GOOSE communication in the IEC 61850 system
- eSetup Easergy Pro software to assign GOOSE Inputs to Easergy P5 protection relays control and monitoring functions for the precise needs of the system

Configuring GOOSE communication involves first configuring the publisher that sends the messages and then configuring the subscriber that receives the message. The GOOSE communication configuration is saved in an SCD file.

Configuring the GOOSE publisher side

To configure the GOOSE publisher side, the user needs to:

- Create a dataset (refer to IED configuration, page 24.)
- Configure a GOOSE Control Block to define the publishing of the data referenced in the dataset as a GOOSE message on the communication network

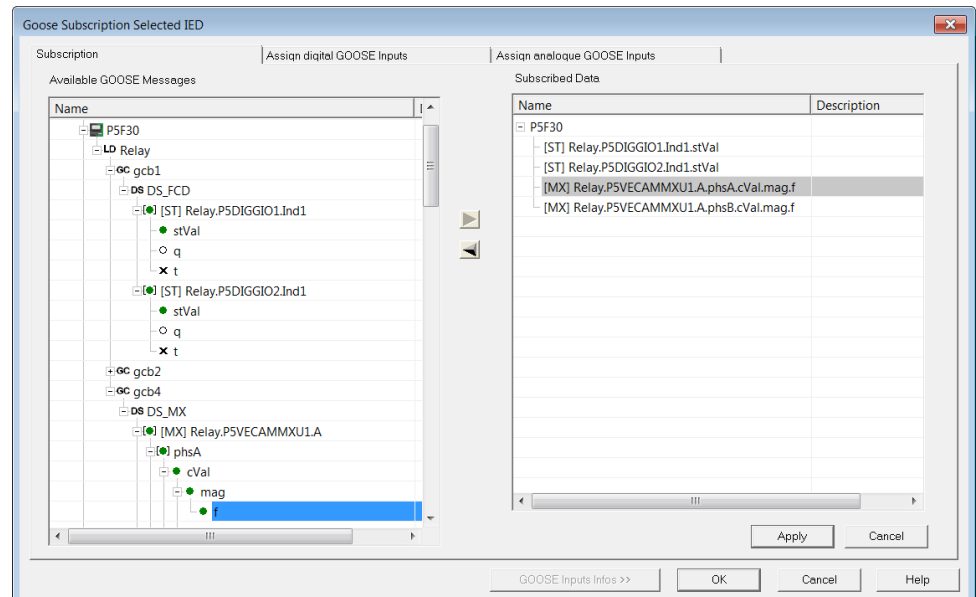
Any dataset may be attached to a GOOSE Control Block, provided its size is compatible with the size of one Ethernet frame. When creating a dataset, CET850 calculates the size of the dataset and informs the user if it is GOOSE compatible or not. When creating a GOOSE Control Block, CET850 allows the selection of GOOSE compatible datasets only.

Configuring the subscriber side

Procedure

1. Select from the published GOOSE messages which Data Attributes (DAs)/ Data Objects (DOs) the device shall subscribe to.
2. Assign subscribed DAs/DOs to GOOSE network inputs.

The Easergy P5 protection relay provides 128 digital GOOSE inputs and 8 analogue GOOSE inputs that can be used by control logic functions.



Assignment table

The subscribed DAs are assigned to Easergy P5 protection relays GOOSE network inputs in an assignment table. The assignment table gives in rows the list of all the subscribed DAs and in columns the list of the Easergy P5 protection relays GOOSE network inputs to which the DAs can be assigned/de-assigned. Assignment/de-assignment is done by selecting the appropriate cells in the table. Several DAs can be assigned to the same GOOSE network input. In this case, Easergy P5 protection relays apply a wired-OR logic operation to these DAs.

The below figure shows the assignment of subscribed DAs to Easergy P5 protection relays GOOSE digital network inputs.

Goose Subscription Selected IED

Subscription | Assign digital GOOSE Inputs | Assign analogue GOOSE Inputs

Assign GOOSE Inputs

IED Name: All IED

IED Name	DA	Description	NI1	NI2	NI3	NI4	NI5	NI6	NI7	NI8	NI9	NI10	NI11	NI12	NI13	NI14	NI15	NI16	NI17
P5F30	[ST] Relay.P5DIGGIO1.Ind1.stVal		X																
P5F30	[ST] Relay.P5DIGGIO2.Ind1.stVal			X															

Right-click on matrix cell to edit assignment attributes

Apply Cancel Clear All

GOOSE Inputs Info >> OK Cancel Help

The below figure shows the assignment of subscribed DAs to Easergy P5 protection relays GOOSE analog inputs.

Goose Subscription Selected IED

Subscription | Assign digital GOOSE Inputs | Assign analogue GOOSE Inputs

Assign GOOSE Inputs

IED Name: All IED

IED Name	DA	Description	ANI1	ANI2	ANI3	ANI4	ANI5	ANI6	ANI7	ANI8
P5F30	[MX] Relay.P5VECAMMXU1.A.phsA.cVal.mag.f		X							
P5F30	[MX] Relay.P5VECAMMXU1.A.phsB.cVal.mag.f			X						

Apply Cancel Clear All

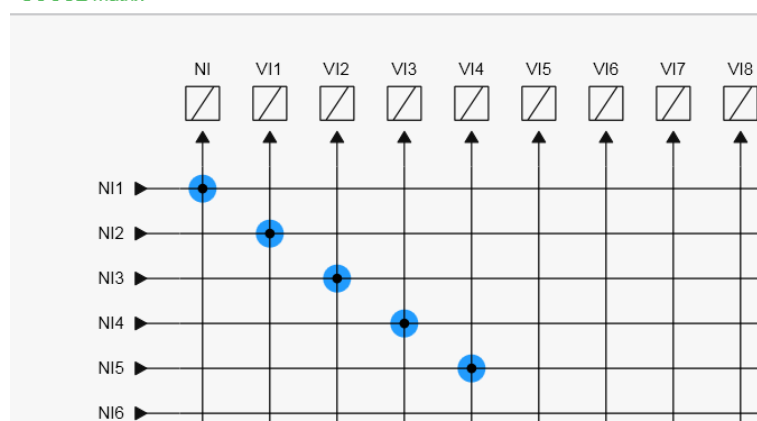
GOOSE Inputs Info >> OK Cancel Help

GOOSE matrix

All Easergy P5 protection relays GOOSE network inputs NI 1-128 can be mapped to NI or Virtual inputs VI 1-20 in COMMUNICATION menu and GOOSE matrix view in eSetup Easergy Pro or Web HMI.

Using the GOOSE matrix the user is able to map the GOOSE network inputs to Virtual inputs which can be processed by the relay applications. The same network input can be mapped to more than one Virtual input and it is also possible to map more than one GOOSE network input to the same Virtual input. Easergy Pro P5 protection relays apply a wired-OR logic operation on these mappings.

GOOSE matrix



GOOSE performance

According to IEC 61850-5 and IEC 61850-10 Edition 2, the GOOSE performance of Easergy P5 protection relays is compliant with Class P2 (< 10 ms). For more information, visit www.se.com.

Conformance statements

This manual includes, in its appendix, two conformance statement documents that describe the conformity to IEC 61850 edition 1 and IEC 61850 edition 2. They do not describe the standard itself, but indicate the choices that have been made when implementing the standard in the Easergy P5 protection relay, in terms of services, modeling, exceptions, extensions and adaptations.

The conformance statement documents are:

- Conformance Statement with IEC 61850 Edition 1 (Appendix 2)
- Conformance Statement with IEC 61850 Edition 2 (Appendix 3)

Each conformance statement document is made up of the following chapters:

- Protocol Implementation Conformance Statement (PICS):
Describes choices made in protocol implementation.
- Model Implementation Conformance Statement (MICS):
Describes how the information model is implemented.
- Protocol Implementation Extra Information for Testing (PIXIT):
Gives any additional implementation specific information not found in the previous standardised documents. Despite the name, this information is useful for operation of the devices.
- Tissues Conformance Statement (TICS):
Describes which Technical Issues (TISSUES) are considered in the device implementation.

DNP3

Presentation

DNP3 communication enables Easergy P5 protection relay units to be connected to a supervisor or other device featuring a DNP3 communication channel.

Communication is based on the master/slave principle:

- Easergy P5 protection relay is always a slave device.
- The master is the supervisor, which is another device.

The DNP3 protocol specifies the coding of data and the rules for exchanging this data between a slave device and a master device (supervision and control device or RTU). DNP3 is an open (non-proprietary) protocol, which can be implemented by any communicating device without any restrictions.

The DNP3 protocol was developed from the basic standards prepared by IEC Technical Committee 57 (Power systems management and associated communications).

DNP3 was chosen by IEEE Task Force C.2 as the IEEE Recommendation for communication between RTUs and IEDs.

For more information on the Intelligent Electronic Device protocol can be obtained from the DNP3 User Group (www.dnp.org).

The following data types from the DNP3 protocol are supported:

- Binary input
- Binary input change
- Double-bit input
- Binary output
- Analog input
- Counter

Easergy P5 protection relays also support the division of data into classes.

Function description

Transmission mode

Easergy P5 protection relays can communicate using DNP, in two transmission modes:

- Serial port mode
- TCP/IP mode

The maximum number of clients for DNP3 is 8. The client and master can be connected by either:

- a serial port connection
- a TCP connection via an Ethernet port

The Easergy P5 protection relays can be configured to support the serial port mode and TCP/IP mode together at the same time and work at maximum 3 IP addresses.

Status polling

Easergy P5 protection relays allow the polling of current status values on master request with class 0.

The contents of binary input for polling, group number and variation number are configurable.

The function code for polling is 1 [READ].

Status reporting

Easergy P5 protection relays allow the reporting of data change events which are derived from:

- Polled value status change
- Control command status change

The status to be reported is configurable.

The event class can be configured as class 1, class 2 or class 3.

Status report entries are stored in a circular buffer with access provided to the most recent ones.

It is possible for a master to query the availability of status reports, in order that the master can determine whether it is necessary to read the available status reports from the slave.

Easergy P5 protection relays may be configured to support unsolicited responses.

Measurement polling

Easergy P5 protection relays support the polling of static measurement values on master request with class 0.

The list of measurement values for polling, group number and variation number are configurable.

The function code for polling is 1[READ].

The data type of each measurement value is configurable.

Measurement event polling (Reporting)

Easergy P5 protection relays support the polling of measurements event values on master request.

The list of measurement event values for polling is configurable.

The function code for polling is 1[READ].

The data type of each measurement event value is configurable.

The deadband values for managing measurement events reported by Easergy P5 protection relays are configurable.

Remote control

Easergy P5 protection relays support both remote control command requests and polling command status requests from a master.

Remote control command requests can be used with data types: binary output.

The remote control commands supported are listed below:

- Select
- Operate
- Direct operate
- Direct operate with no ACK

Both DC (Direct Control) and SBO (Select Before Operate) control models are supported. The DNP3 checks whether the point to be controlled has been configured only. DNP3 doesn't check whether the value is correct or not.

Easergy P5 protection relays implement an SBO timeout of 60s.

Easergy P5 protection relays send response frame to client according to the real control command response.

Counter management

Easergy P5 protection relays support the polling of counter values on master request.

The list of the counter values for polling is configurable.

The function code for polling is 1[READ].

General interrogation

The general interrogation functions for Easergy P5 protection relays mean to poll class 0 data for DNP3 master.

When Easergy P5 protection relays receive the general interrogation command from DNP3 master, the Easergy P5 protection relays report all the point's static data values (except for the point's class is not assigned to one of the four classes) in one frame or multi-frame.

Generally, the group number 60 and variation number 1 is used for general interrogation for all profiles.

Time synchronisation

The time of Easergy P5 protection relays corresponds to Universal Coordinated Time (UTC).

Easergy P5 protection relays support time synchronisation command requests and the polling of current date and time information from a DNP3 master.

It's possible for master to verify the correctness of system time.

The function code for actioning the time synchronisation command is 2 [WRITE].

The function code for polling the current date and time information is 1 [READ].

The time synchronisation procedure for TCP and serial is different.

Easergy P5 protection relays do not retry time synchronisation messages at either the Application or Data Link layers for these application layer function codes.

- DELAY_MEASURE request from master and corresponding response (RESPONSE function code) from outstation
- WRITE requests from master with an Absolute Time object, group 50, variation 1
- WRITE requests from master with a Last Recorded Time object, group 50, variation 3

When Easergy P5 protection relays detect that the time synchronisation request has not been received within the configured timeout, the IIN1.4 [NEED_TIME] bit is set in the response message. The master must send the time synchronisation request after receiving a response with this bit set.

Application identifier

The application identifier uses the function code 16[INITIALIZE_APPL], 17 [START_APPL], 18[STOP_APPL].

When Easergy P5 protection relays receive a request related with application identifier, nothing internally is performed.

Cold restart and warm restart

When an Easergy P5 relay receives a cold or warm restart request, it immediately triggers the cold/warm restart sequence. A response frame containing the Delay Time DNP3 object, with a value of 10 seconds is generated. The response indicates the time when the relay will be available again. Hence during this period the Easergy P5 relay does not respond to requests from the DNP3 client.

IED file extraction

The Easergy P5 protection relay supports IED file extraction, which can be used to transfer the disturbance record file to clients. The file operations of the Easergy P5 protection relay include:

- Open file
- Close file
- Get file/folder information
- Read file
- Abort file

File authentication is not supported. The Easergy P5 can only have one file open at a time.

The file operations above can act on the folder '/COMTRADE' and all its sub-folders.

Device profile document

DNP 3.0				
Device Profile Document				
Vendor Name: Schneider Electric				
Device Name: Easergy P5 Protection Relay				
Highest DNP Level Supported: For Requests: Level 2 For Responses: Level 2		Device Function: Master ✓ Slave		
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the DNP Implementation table):				
Maximum Data Link Frame Size (octets): Transmitted: 292 Received: 292		Maximum Application Fragment Size (octets): Transmitted: 2048 Received: 2048		
Maximum Data Link Re-tries: None Fixed ✓ Configurable from 0 to 255		Maximum Application Layer Re-tries: None ✓ Configurable		
Requires Data Link Layer Confirmation: Never Always Sometimes ✓ Configurable with confirmation type selector, default NO ACK				
Requires Application Layer Confirmation: Never Always Sometimes ✓ 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.”				
Timeouts while waiting for:				
Data Link Confirm:	None	Fixed at	Variable	✓ Configurable
Complete Appl. Fragment:	✓ None	Fixed at	Variable	Configurable
Application Confirm:	None	Fixed at	Variable	✓ Configurable
Complete Appl. Response:	✓ None	Fixed at	Variable	Configurable

DNP 3.0**Device Profile Document**Vendor Name: **Schneider Electric**

Device Name: Easergy P5 Protection Relay

Sends/Executes Control Operations:

WRITE Binary Outputs	✓ Never	Always	Sometimes	Configurable
SELECT/OPERATE	Never	✓ Always	Sometimes	Configurable
DIRECT OPERATE	Never	✓ Always	Sometimes	Configurable
DIRECT OPERATE – NO ACK	Never	✓ Always	Sometimes	Configurable
Count > 1	✓ 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	Never	Sometimes	Configurable
Clear Queue	✓ Never	Never	Sometimes	Configurable

Reports Binary Input Change Events when no specific variation requested:

- Never
- Only time-tagged
- Only non-time-tagged
- ✓ **Configurable to send one or the other**

Reports time-tagged Binary Input Change Events when no specific variation requested:

- Never
- ✓ **Binary Input Change With Time**
- Binary Input Change With Relative Time
- Configurable

Sends Unsolicited Responses:

- Never
- ✓ **Configuration**
- Only certain Objects
- Sometimes
- ✓ **ENABLE/DISABLE UNSOLICITED**
- Function codes supported**

Sends Static Data in Unsolicited Responses:

- ✓ **Never**
- When Device Restarts
- When Status Flags Change
- No other options are permitted.

Default Counter Object/Variation:

- No Counters Reported
- Configurable
- ✓ **Default Object: 20**
- ✓ **Default Variation: 1**
- Point-by-point list attached

Counters Roll Over at:

- No Counters Reported
- Configurable
- ✓ **16 Bits, but roll-over bits not used**
- 32 Bits
- Other Value: _____
- Point-by-point list attached

Sends Multi-Fragment Responses:

- ✓ **Yes**
- No
- Configuration

Sequential File Transfer Support:

Append File Mode	Yes	✓ No
Custom Status Code Strings	Yes	✓ No
Permissions Field	✓ Yes	No
File Events Assigned to Class	Yes	✓ No
File Events Send Immediately	✓ Yes	No
Multiple Blocks in a Fragment	Yes	✓ No
Max Number of Files Open	1	

Implementation table

DNP Object Group and Variation			Request (Master may issue Outstation parses)		Response (Master parses Outstation may issue)	
Group Num	Var Num	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (dec)
1	0	Binary Input – Any Variation	1 (read)	00, 01 (start-stop) 06 (no range, or all)		
1	1	Binary Input – Packed format	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01, 17, 28
1	2	Binary Input – With flags	1 (read)	00, 01 (start-stop) 06 (no range, or all)	129 (response)	00, 01, 17, 28
2	0	Binary Input Event – Any Variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
2	1	Binary Input Event – 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 Event – With absolute time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
3	0	Double-bit Binary Input – Any Variation	1 (read)	00, 01, 06		
3	1	Double-bit Binary Input – Packed format	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
3	2	Double-bit Binary Input – With flags	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
4	0	Double-bit Binary Input – Any Variation	1 (read)	00, 01, 06		
4	1	Double-bit Binary Input Event – 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 Binary Input Event – With absolute time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
10	0	Binary Output – Any Variation	1 (read)	00, 01, 06		
10	2	Binary Output – Output status with flags		00, 01, 06	129 (response)	00, 01, 17, 28
12	1	Binary Command – Control relay output block (CROB)	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, no ack)	00, 01, 17, 28	129 (response)	00, 01, 17, 28
20	0	Counter – Any Variation	1 (read)	00, 01, 06		
20	1	Counter – 32-bit with flag	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
20	2	Counter – 16-bit with flag	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
20	5	Counter – 32-bit without flag	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
20	6	Counter – 16-bit without flag	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28

DNP Object Group and Variation			Request (Master may issue Outstation parses)		Response (Master parses Outstation may issue)	
Group Num	Var Num	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (dec)
30	0	Analog Input – Any Variation	1 (read)	06 (no range, or all)		
30	1	Analog Input – 32-bit with flag	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
30	2	Analog Input – 16-bit with flag	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
30	3	Analog Input – 32-bit without flag	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
30	4	Analog Input – 16-bit without flag	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
30	5	Analog Input – Short float	1 (read)	00, 01, 06	129 (response)	00, 01, 17, 28
32	0	Analog Input Event – Any Variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
32	1	Analog Input Event – 32-bit without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	2	Analog Input Event – 16-bit without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	3	Analog Input Event – 32-bit with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	4	Analog Input Event – 16-bit with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	5	Short Float Ana. Change Ev. without Time	1	6, 7, 8	129 (response) 130 (unsol. resp)	17, 28 (index)
50	0	Time and Date	1 (read)	06, 07, 08	129 (response)	17, 28
50	1	Time and Date – Absolute time	1 (read) 2 (write)	06, 07, 08 07, 08	129 (response) 129 (response)	17, 28
52	2	Time Delay – Fine	23	07	129 (response)	07 (limited qty) (qty = 1)
60	0	Class Objects – Class 0, 1, 2, 3	1 (read)	06		
60	1	Class Objects – Class 0 data	1 (read)	06 (no range, or all)		
60	2	Class Objects – Class 1 data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
60	3	Class Objects – Class 2 data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
60	4	Class Objects – Class 3 data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
70	3	File Command Object -initiate Open or Delete operations	25, 27	5b		
70	4	File Command Status Object	26, 30	5b	129, 130	5b
70	5	File Transport Object	1	5b	129, 130	5b
70	6	File Transport Status Object			129, 130	5b
70	7	File Description Object	28	5b	129, 130	5b
80	1	Internal Indications – Packed format	2 (write)	00 (start-stop) index=7	129	
90	1	Application Identifier	16, 17, 18	0	129	
		No Object (function code only)	13 (cold restart)			
		No Object (function code only)	14 (warm restart)			

Supported function codes

The table below is the application layer function codes that DNP3 slave supported.

Code	Function	Description	Supported
Transfer function codes			
0	Confirm	Message fragment confirmation No response	Yes
1	Read	Request objects from outstation Response with requested objects	Yes
2	Write	Store specified objects to outstation Respond with status of operation	Yes
Control function codes			
3	Select	Select output point of outstation Respond with status of control point	Yes
4	Operate	Set output that has previously selected Respond with status of control point	Yes
5	Direct operate	Set output directly Respond with status of control point	Yes
6	Direct operate	Set output directly No response	Yes
Freeze function codes			
7	Immediate freeze	Copy specified objects to freeze buffer Respond with status of operation	No
8	Immediate freeze	Copy specified objects to freeze buffer No respond	No
9	Freeze and clear	Copy specified objects to freeze buffer and clear objects Respond with status of operation	No
10	Freeze and clear -NO ACK	Copy specified objects to freeze buffer and clear objects No respond	No
11	Freeze with time	Copy specified objects to freeze buffer at specified time Respond with status of operation	No
12	Freeze with time -NO ACK	Copy specified objects to freeze buffer at specified time No respond	No

Code	Function	Description	Supported
Application control function codes			
13	Cold restart	Perform desired reset sequence Respond with a time object	Yes
14	Warm restart	Perform desired partial reset operation Respond with a time object	Yes
16	Initialize application	Ready the specified application to run Respond with status of operation	No
17	Start application	Start the specified application to run Respond with status of operation	Yes
18	Stop application	Stop the specified application to run Respond with status of operation	Yes
Configuration function codes			
19	Save configuration	Save configuration Respond with status of operation	No
20	Enable unsolicited messages	Enable unsolicited messages Respond with status of operation	Yes
21	Disable unsolicited messages	Disable unsolicited messages Respond with status of operation	Yes
22	Assign class	Assign specified objects to a class Respond with status of operation	No
Time synchronization function codes			
23	Delay measurement	Perform propagation delay measurement	Yes
24	Record current time	For LAN networks only	No
File transfer			
25	Open file		Yes
26	Close file		Yes
27	Delete file		No
28	get file information		Yes
29	Authenticate file		No
30	Abort file		Yes
31	Activate configuration		No
Response function codes			
0	Confirm	Message fragment confirmation	Yes
129	Response	Response to request message	Yes
130	Unsolicited message	Spontaneous message without request	Yes

Configuration parameters

Parameter	Value	Description
Bit rate	1200, 4800, 9600, 19200, 38400, 57600, 115200 bps	The communication speed, bits per second.
Parity	None, Even, Odd	The type of parity bit used.
Wire number	2, 4	The wires number for serial port.
Poll line	False, True	Polarized line.
Frame Gap	10...500	Specifies the amount of time (calculated by bits) to determine that a frame has been completed.
Slave unit	1...65519	The address of the device (slave address).
Master unit	1...65534	The address of the master.
Linklayer Confirmation Timeout	0 ms 1...65535 ms	Link layer confirmation disabled. Timeout for link layer confirmation.
Linklayer Retry Count	1...255	Link layer retries if Link layer confirmation is enabled.
Appl.layer Confirmation Timeout	0...65535 ms	Timeout for application layer confirmation.
Appl.layer Confirmation Mode	EvOnly All	Confirmation requested for application layer messages containing event information only. Confirmation requested for all application layer messages.
Double-Bit Input Support	No Yes	Double-Bit input is not supported. Double-Bit input is supported.
ClockSync Mode	0 1...64000 s	Clock synchronisation is requested only at startup. Interval for clock synchronisation request.
Float precision enable flag	No Yes	Integer variation carries values with same precision as float variation. (i.e. voltage 230.4 V as integer: 2304, as float: 2304.0) Float variation has bigger precision than integer variation. (i.e. voltage 230.4V as integer: 230, as float: 230.4)
Deadband calculation method	Disabled Fixed Integrated	No deadband, no AI events generated. An Event is generated when the AI value change exceeds given deadband. Integrating deadband used.
Deadband integrating time	1...200 s	Integrating time setting used when the Deadband calculation method is Integrated.
Unsolicited resp. mode	Disabled +Empty&Ena +Empty Enabled	Unsolicited responses not in use. Unsolicited response enabled, empty UR sent first, waiting for Enable UR from master. Unsolicited response enabled, empty UR sent first, not waiting for master Enable UR before proceeding. Unsolicited response enabled, starts sending UR's directly.

Parameter	Value	Description
Unsolicited resp. event delay	0...200 s	Unsolicited responses are delayed by this amount of seconds from first event.
Unsolicited resp. event count	1...10	Unsolicited responses are delayed until this many events are available. Used together with previous parameter.
Unsolicited resp. max event cnt	1...100	Maximum number of events in one unsolicited response.
Collision avoidance enable flag	No, Yes	Collision avoidance off/on.
Collision avoidance fixed delay	1...200 s	Delay setting used in next parameter.
Collision avoidance slots number	1...255	Number of bus access slots available for random bus access. If the line is busy, the slave waits for: fixed delay + random (slots), after the bus becomes idle before accessing the bus.
File Handle timeout	Range: 1 to 3600 second	Timeout for no activity references a file handle to close the file and send a File Transport Status Object (group 70 var 6) using a status code value of file handle expired (0x02). Range: 1 to 3600 second. Default 60 s.
Default Variation BI	1, 2	1: Single-bit packed. 2: Single-bit with flag.
Default Variation BI event	1, 2	1: Without time. 2: With absolute time.
Default Variation BO	2	2: Binary output status.
Default Variation DBI	1, 2	1: Without flag. 2: With flag.
Default Variation DBI event	1, 2	1: Without time. 2: With absolute time.
Default Variation Counter	1...6	1: 32-bit with flag. 2: 16-bit with flag. 3: Not supported. 4: Not supported. 5: 32-bit without flag. 6: 16-bit without flag.
Default Variation AI	1...5	1: 32-bit with flag. 2: 16-bit with flag. 3: 32-bit without flag. 4: 16-bit without flag. 5: Single precision, floating point without time.
Default Variation AI event	1...5	1: 32-bit without time. 2: 16-bit without time. 3: 32-bit with time. 4: 16-bit with time. 5: Single precision, floating point without time.

Data configuration

In Easergy P5 protection relays, data is mapped to five different categories:

- Binary inputs (BI)
- Double-bit inputs (DBI)
- Analog inputs (AI)
- Counters (CNTRS)
- Binary outputs (BO)

The configuration of these is described in the following subsections.

Binary inputs

Binary inputs are found in the DNP3: data points – BI view of COMMUNICATION menu in eSetup Easergy Pro or Web HMI.

DNP3: data points - BI

Binary inputs

Index	Class		UR		Item	
0	1		☐		DI1(B)	
1	1		☐		DI2(B)	
2	1		☐		DI3(B)	
3	1		☐		DI4(B)	
4	1		☐		SGrp1	
5	1		☐		SGrp2	
6	1		☐		SGrp3	
7	1		☐		SGrp4	
8	1		☐		TCS alarm	
9	1		☐		Logic2	
10	1		☐		Logic3	
11	1		☐		Logic4	
12	1		☐		Logic5	
13	1		☐		Logic6	
14	1		☐		VI1	
15	1		☐		VI2	
16	1		☐		VI3	

Table 8 - DNP3 data points – BI

Parameter	Description
Index	The index of the data item in the list.
Class	Which class the data point belongs to. (Class 1, 2 or 3).
UR	Controls whether changes in the value of the data point generates unsolicited responses or not.
Item	The data point.

Double-bit inputs

DNP3: data points – DBI view of COMMUNICATION menu contains the configuration of Double-bit Inputs.

DNP3: data points - DBI						
Double-bit Inputs						
Index	Class		UR		Item	
0	1		☐		Object1	
1	1		☐		Object2	
2	1		☐		Object3	
3	1		☐		Object4	
4	1		☐		Object5	
5	1		☐		Object6	
6	1		☐		Object7	
7	1		☐		Object8	

The configuration of these points is analogous to that of Binary Inputs, see DNP3 data points – BI, page 43.

Analog inputs

Analog inputs are configured in the DNP3: data points – AI view of COMMUNICATION menu.

DNP3: data points - AI

Analog inputs

Index	Class		UR 	Deadband 	Item 
0	2		☐ 1		PS1 value
1	2		☐ 1		PS2 value
2	2		☐ 1		PS3 value
3	2		☐ 1		PS4 value
4	2		☐ 1		PS5 value
5	2		☐ 1		PS6 value
6	2		☐ 1		PS7 value
7	2		☐ 1		PS8 value

Table 9 - DNP3 data points – AI

Parameter	Description
Index	The index of the data item in the list.
Class	Which class the data point belongs to. (Class 1, 2 or 3).
UR	Controls whether changes in the value of the data point generates unsolicited responses or not.
Deadband	The amount of change in value needed before a change is registered. The range of this setting is 1...4200000000.
Item	The data point.

Counters

The configuration of counters is found in the DNP3: data points – CNTRS view of COMMUNICATION menu.

DNP3: data points - CNTRS		
Counters		
Index	Item	
0	DI1(B)	
1	DI2(B)	
2	DI3(B)	
3	DI4(B)	
4	None	
5	None	

Binary outputs

Binary outputs are found in the DNP3: data points – BO view of COMMUNICATION menu.

DNP3: data points - BO		
Binary outputs		
Index	Item	
0	Object1	
1	Object2	
2	Object3	
3	Object4	
4	Object5	
5	Object6	

The structure of this configuration table is simple: only an index for the data items (data points) and an Item field, which determines which data point is found at the corresponding index. The data points are edited by clicking on an element in the Item column and selecting the desired output.

Data model of DNP3

The default Binary Inputs, Double-bit Inputs, Analog Inputs, Counts and Binary Outputs of Easergy P5 protection relays pre-configured in DNP3 can be found in following tables.

Binary inputs

Default Index	Default Class	Item
0	1	DI1
1	1	DI2
2	1	DI3
3	1	DI4
4	1	Setting group 1
5	1	Setting group 2
6	1	Setting group 3
7	1	Setting group 4
8	1	TCS alarm
9	1	Logic2
10	1	Logic3
11	1	Logic4
12	1	Logic5
13	1	Logic6
14	1	VI1
15	1	VI2
16	1	VI3
17	1	VI4
18	1	VI5
19	1	VI6

Double-bit inputs

Default Index	Default Class	Item
0	1	Object1
1	1	Object2
2	1	Object3
3	1	Object4
4	1	Object5
5	1	Object6
6	1	Object7
7	1	Object8

Analog inputs

Default Index	Default Class	Item
0	2	PS1 value
1	2	PS2 value
2	2	PS3 value
3	2	PS4 value
4	2	PS5 value
5	2	PS6 value
6	2	PS7 value
7	2	PS8 value

Counters

Default Index	Item
0	DI1
1	DI2
2	DI3
3	DI4

Binary outputs

Default Index	Item
0	Object1
1	Object2
2	Object3
3	Object4
4	Object5
5	Object6

IEC 60870-5-101

Presentation

IEC 60870-5-101 is an accompanying standard for the standards in the IEC 60870-5 series. It defines communication between protection devices and the various devices in a control system (supervisor or RTU) in a substation.

Easergy P5 protection relays using IEC 60870-5-101 work as controlled outstation (slave) units in unbalanced mode. Supported application functions include:

- Process data transmission
- Event transmission
- Command transmission
- General interrogation
- Clock synchronisation
- Transmission of integrated totals
- Acquisition of transmission delay

The IEC 60870-5-101 communication in Easergy P5 protection relays is only command and event driven. Therefore only Class 1 data is reported. Class 2 is not be used.

Class 1 data is handled in the following priority order:

- Command responses
- Events (binary events, analog events, counter value change events)
The event buffer size of IEC 60870-5-101 is 250.
- General Interrogation data

Chronology between events and requested data are always maintained. For lists of default data mappings in Easergy P5 protection relays, refer to [Data model of IEC 60870-5-101](#), page 55.

IEC 60870-5-101 configuration

This section explains how to configure Easergy P5 protection relays to use the IEC 60870-5-101 protocol.

General configuration

The IEC 60870-5-101 protocol is activated by setting it as the port protocol for a serial port on the device. This setting can be found by navigating to the COMMUNICATION menu and Protocol configuration view in the eSetup Easergy Pro or Web HMI.

The IEC 60870-5-101 protocol is activated on the Remote port as follows:

Protocol configuration

Remote port

Remote port protocol	IEC-101	 Clear Clear Clear
	None	
	ModBusSlv	
Message counter	IEC-103	
Error counter	DNP3	
Timeout counter	IEC-101	
	0	

NOTE: Setting a protocol to any port requires a reboot of the device for the changes to take effect. eSetup Easergy Pro will prompt for a reboot.

Once the protocol has been activated, it can be configured. This is done with eSetup Easergy Pro in the IEC 60870-5-101 main config view. All values shown are defaults.

IEC 60870-5-101 main config

Bit rate	9600	bps	
Parity	None		
Wire number	2		
Poll line	False		
Frame Gap (bits)	100		

Link layer address	1	
Link layer address size	1	
ASDU address	1	
ASDU address size	2	
IO address size	2	
Cause of transmission size	1	
Time tag format	Short	
Measurements format	Float	

Deadband enable flag	☐	
Deadband cycle	1000	ms

Table 10 - IEC 60870-5-101 main configuration parameters

Parameter	Value	Description
Bit rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps	Communication speed
Parity	None, Even, Odd	Parity used for serial communication
WireNum	2, 4	Number of wire connection
PolLine	False, True	Polarity of the wire connection
FrameGap	10...500	Specifies the amount of time (calculated by bits) to use to determine that a frame has been completed
Link layer address	1 byte: 1...254 2 bytes: 1...65534	Device address
Link layer address size	1 or 2 bytes	Size of the device address
ASDU address	1 byte: 1...254 2 bytes: 1...65534	Address of data segment on the same device address
ASDU address size	1 or 2 bytes	Size of the ASDU
IO address size	2 or 3 bytes	Size of Information Object address
Cause of transmission size	1 byte	Size of the code for the reason why a message is sent
Time tag format	Short, Full	Determines the time tag format: 3-octet time tag of 7- octet time tag
Measurements format	Scaled, Normalised, Float	Determines the data format for measurements, float, normalised or scaled values
Deadband enable flag	On, Off	Enabling of deadband measurements and event generation
Deadband cycle	100...10000 ms	The interval of deadband calculations

Data configuration

Data and commands are mapped to six different tables: Single point information (SPI), Double point information (DPI), Analog inputs (AI), Analog events (AE), Integrated totals (IT) and Commands (CMD). The settings for these categories are described in the following subsections.

Single and double point information

Single point information (SPI) objects are one-bit data items (range 0...1). Double point information objects are two-bit data items (range 0...3). Default SPI and DPI mapping are shown in figures below.

A description of the column elements for SPI and DPI objects is given in the table.

IEC 60870-5-101: SPI

Single point information

Index	GI	Event	Item
2	☒	☒	DI1(B)
3	☒	☒	DI2(B)
4	☒	☒	DI3(B)
5	☒	☒	DI4(B)
6	☒	☒	SGrp1
7	☒	☒	SGrp2
8	☒	☒	SGrp3
9	☒	☒	SGrp4
10	☒	☒	TCS alarm
11	☒	☒	Logic2
12	☒	☒	Logic2
13	☒	☒	Logic3
14	☒	☒	Logic4
			Logic5

IEC 60870-5-101: DPI

Double point information

Index	GI	Event	Item
4097	☒	☒	Object1
4098	☒	☒	Object2
4099	☒	☒	Object3
4100	☒	☒	Object4
4101	☒	☒	Object5
4102	☒	☒	Object6
4103	☒	☒	Object7
4104	☒	☒	Object8
4105	☐	☐	None
4106	☐	☐	None
4107	☐	☐	None
4108	☐	☐	None
4109	☐	☐	None

NOTE: Information object address (Index) 1 is reserved for an SPI object: Class 1 buffer overflow indication (BOV1).

Table 11 - SPI and DPI mapping table

Parameter	Description
Index	Information object address
GI	Determines whether the object is included in response to General Interrogation request message (Enabled/Disabled)
Event	Determines whether change events for the object are put into Class 1 buffer (Enabled/Disabled)
Item	The data item which is configured on the row (for instance, DI1)

Analog inputs

Analog inputs are measurement values that are float, scaled or normalised. Scaling is done according to the scaling settings found under the list item Modbus and IEC 60870-5-101 specific scalings in eSetup Easergy Pro or Web HMI (it applies to IEC 60870-5-101 if the protocol is configured to use scaled values). When using float for measurement values, no scaling is needed.

IEC 60870-5-101: AI

Analog inputs

Index	GI	Event	Deadband	Max	Item
16385	☒	☒	1.000	1000	PS1 value
16386	☒	☒	1.000	1000	PS2 value
16387	☒	☒	1.000	1000	PS3 value
16388	☒	☒	1.000	1000	PS4 value
16389	☒	☒	1.000	1000	PS5 value
16390	☒	☒	1.000	1000	PS6 value
16391	☒	☒	1.000	1000	PS7 value
16392	☒	☒	1.000	1000	PS8 value

NOTE: Measurement values have no time tags when read upon request. Change events (based on deadband supervision) are sent with time tags with cause of transmission spontaneous in Class 1. The time tag format is determined by the interface configuration (general time tag format selection parameter).

Table 12 - AI mapping table

Parameter	Description
Index	Information object address
GI	Determines whether the object is included in response to General Interrogation request message (Enabled/Disabled)
Event	Determines whether change events for the object are put into Class 1 buffer (Enabled/Disabled)
Deadband	Deadband value for change supervision and change event generation (valid only if Event is Enabled).
Max	Maximum value for defining the value range as –Max...+Max. This range is transformed to the range -1...+1 if the protocol measurement format is set to "Normalised"
Item	The data item which is configured on the row

Analog events

These analog values are fault event and are sent with time tags. The values are float, normalised or scaled measured values. A part of the default data mapping is shown in following figure.

IEC 60870-5-101: AE

Analog events

Index	Event	Item
18433	☐	PS1 value
18434	☐	PS2 value
18435	☐	PS3 value
18436	☐	PS4 value
18437	☐	PS5 value
18438	☐	PS6 value
18439	☐	PS7 value
18440	☐	PS8 value

Table 13 - AE mapping table

Parameter	Description
Index	Information object address
Event	Determines whether change events for the object are put into Class 1 buffer (Enabled/Disabled)
Item	The data item which is configured on the row

Integrated totals

Integrated totals are energy and pulse counter values. the following figure is a part of the mapping table in eSetup Easergy Pro.

IEC 60870-5-101: IT

Integrated totals

Index	CI	Item
20481	☐	DI1(B)
20482	☐	DI2(B)
20483	☐	DI3(B)
20484	☐	DI4(B)

Table 14 - Integrated totals mapping table

Parameter	Description
Index	Information object address
CI Counter Interrogation	Determines whether the object is included in responses to Counter Interrogation messages (Enabled/Disabled)
Item	The data item which is configured on the row

Command items

The commands are divided into two categories: Select Before Operate and Direct Operate.

IEC 60870-5-101: CMD

Select Before Oper. table

Index	Item
34817	Object1
34818	Object2
34819	Object3
34820	Object4
34821	Object5
34822	Object6
34823	None
34824	None

Digital Output table

Index	Item
32769	SGrp1
32770	SGrp2
32771	SGrp3
32772	SGrp4
32773	Object1
32774	Object2
32775	Object3
32776	Object4

Table 15 - Description of command items

Parameter	Description
Index	Information object address
Item	The data item which is configured on the row

Scaling

Measured values that transferred as signed integers of 16 bits are in the range: $-2^{15} \dots 2^{15} - 1 = -32768 \dots 32767$. Thus values that exceed this range are scaled in order to be successfully sent over an IEC 101 data link.

The scaling is determined by the float value of corresponding specific scalings. It is common to use scaling factors with base ten (0.100, 1.000, 10.000, 100.000...). In such cases, only the decimals are removed from the original measurements and such values are easy to read and rescale to actual values on the client side after transmission. Different settings for scaling can be used for the power-, power factor-, tan phi-, voltage- and frequency scaling. These settings for scaling can be set by navigating to the Modbus and IEC 60870-5-101 specific scalings view in the COMMUNICATION menu in eSetup Easergy Pro or Web HMI.

A short example: The frequency is internally (in the Easergy P5 protection relays) stored as an integer value which also holds three decimal places, that is, 50.000 Hz is represented as 50000. This is a value too large to be represented with 16 bits (signed integer). However, frequency is multiplied by default scaled value 0.1, enabling it to be sent over the data line.

Thus, the value on the receiving side (the scaled value) is:

$$\text{valueScaled} = k \cdot \text{valueInternal} = 0.1 \cdot 50000 = 5000$$

NOTE: It is highly recommended to scale values so that they are kept in the interval 0 –32768 to avoid overflow.

Normalisation

When using normalisation for measured values, the normalised value is calculated using the Max parameter, which determines the range for the data (- Max ... + Max).

An example:

The frequency is internally (in the Easergy P5 protection relays) stored as an integer value which also holds three decimal places, that is, 50.000 Hz is represented as 50000. If normalisation is activated and the Max value set to 100000, the value sent over the data link is (in the ideal case):

$$\text{value Normalised} = \text{valueInternal}/\text{Max} = 50000/100000 = 0.5$$

Currently, however, the scaling is also performed before normalisation. This means that the scaling is always active.

The equation is therefore:

$$\text{value Normalised} = \text{valueScaled}/\text{Max} = 0.1 \times 50000/100000 = 0.05$$

Float

When using Float for measured values, no scaling will be used. An example: 50.000 Hz is represented as 50, just use the raw value to transfer.

Event buffer size

The event buffer size is defined as 250. That means IEC 60870-5-101 can store maximum 250 events internally.

Data model of IEC 60870-5-101

The default Single Point Information, Double Point Information, Analog Inputs, Analog Events, Intergrated Totals and Command of Easergy P5 protection relays pre-configured in IEC 60870-5-101 can be found in following tables.

Default single and double point information

Table 16 - Single point information

Default Index	Item
2	DI1
3	DI2
4	DI3
5	DI4
6	Setting group 1
7	Setting group 2
8	Setting group 3
9	Setting group 4
10	TCS alarm
11	Logic2
12	Logic3
13	Logic4
14	Logic5
15	Logic6

Table 17 - Double point information

Default Index	Item
4097	Object1
4098	Object2
4099	Object3
4100	Object4
4101	Object5
4102	Object6
4103	Object7
4104	Object8

Analog inputs

Default Index	Deadband	Max	Item
16385	1.000	1000	PS1 value
16386	1.000	1000	PS2 value
16387	1.000	1000	PS3 value
16388	1.000	1000	PS4 value
16389	1.000	1000	PS5 value
16390	1.000	1000	PS6 value
16391	1.000	1000	PS7 value
16392	1.000	1000	PS8 value

Analog events

Default Index	Item
18433	PS1 value
18434	PS2 value
18435	PS3 value
18436	PS4 value
18437	PS5 value
18438	PS6 value
18439	PS7 value
18440	PS8 value

Integrated totals

Default Index	Item
20481	DI1
20482	DI2
20483	DI3
20484	DI4

Default command

Table 18 - Select Before Operate table

Default	Item
34817	Object1
34818	Object2
34819	Object3
34820	Object4
34821	Object5
34822	Object6

Table 19 - Digital Output table

Default Index	Item
32769	Setting group 1
32770	Setting group 2
32771	Setting group 3
32772	Setting group 4
32773	Object1
32774	Object2
32775	Object3
32776	Object4
32777	Object5
32778	Object6

IEC 60870-5-103

Presentation

IEC 60870-5-103 is an accompanying standard for the standards in the IEC 60870-5 series. It defines communication between protection devices and the various devices in a control system (supervisor or RTU) in a substation.

The unbalanced transmission mode of the protocol is used, and the device functions as a secondary station (slave) in the communication. Data is transferred to the primary system using the "data acquisition by polling" principle.

The Easergy P5 protection relay supports the following IEC 61870-5-103 application functions:

- Data acquisition by polling
- General initialisation
- Station initialisation
- General interrogation
- Clock synchronisation
- Command transmission
- Transmission of disturbance data
- Read and write setting data

The following functions are not supported:

- Generic services
- Test mode
- Blocking in monitoring direction

The following ASDU (Application Service Data Unit) types are used in communication from the Easergy P5 protection relays:

- ASDU 1: Time tagged message
- ASDU 3: Measurands I
- ASDU 4: Time-tagged measurands with relative time
- ASDU 5: Identification message
- ASDU 6: Time synchronisation
- ASDU 8: Termination of general interrogation
- ASDU 9: Measurands II

Easergy P5 protection relays accept:

- ASDU 6: Time synchronisation
- ASDU 7: Initiation of general interrogation
- ASDU 20: General command

The ASDUs from 23 to 31 are used for disturbance data transmission.

The ASDU 140, ASDU 144, ASDU 17, ASDU 201, ASDU 169, ASDU 49 are used to write and read setting data.

The ASDU 135, which is related with SPA-bus, is not supported.

The data in a message frame is identified by:

- Type identification
- Function type (TYP)
- Information number (INF)

For more information on the IEC 60870-5-103 protocol, visit www.iec.ch.

IEC 60870-5-103 configuration

This section explains how to configure Easergy P5 protection relays to use the IEC 60870-5-103 protocol.

General configuration

The IEC 60870-5-103 protocol is activated by setting it as the port protocol for a serial port on the device. This setting can be found by navigating to the COMMUNICATION menu and Protocol configuration view in the eSetup Easergy Pro or Web HMI. IEC 60870-5-103 protocol is activated on the Remote port.

Remote port

Remote port protocol	IEC-103	
-	9600/8E1	
Message counter	0	Clear
Error counter	0	Clear
Timeout counter	0	Clear

NOTE: Setting a protocol to any port will require a reboot of the device for the changes to take effect. eSetup Easergy Pro will prompt for a reboot.

Once the protocol has been activated, it can be configured. This is done with eSetup Easergy Pro in the IEC 60870-5-103 main config view. All values shown are defaults.

IEC 60870-5-103 main config

IEC-103 slave number:	1	
Speed of transmission:	9600	bps
Wire number:	2	
Poll line:	False	
Frame Gap (bits):	100	
Measure sending interval:	200	ms
ASDU6 response time mode:	Sync+Proc	
Include start and restart:	☐	

IEC60870-5-103 Dist.Record

Enable record info message:	☐
Record samples in message:	25
Record reading timeout:	600 s
Fault number of active record:	0
Tags read position:	INITIAL
Active channel:	0
Channel read position:	0

Table 20 - IEC 60870-5-103 main configuration parameters

Parameter	Value	Description
IEC-103 slave number	1 ... 254	A unique address within the system setup
Speed of transmission	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps	Communication speed
Wire number	2, 4	Number of wire connection
Poll line	False, True	Polarity of the wire connection
Frame Gap (bits)	10 ... 500	Specifies the amount of time (calculated by bits) to use to determine that a frame has been completed
Measure sending interval	200 ... 10000 ms	Minimum measurement response interval
ASDU6 response time mode	Sync;	The time in the slave's response = the master's time.
	Sync + Proc;	The time in the slave's response = the master's time + internal processing time (standard).
	Msg;	The time in the slave's response = the slave's time at the moment when the clock sync message arrived.
	Msg + Proc	The time in the slave's response = the slave's time at the moment when the clock sync message arrived + internal processing time.
Include start and restart	On, Off	

Table 21 - IEC 60870-5-103 disturbance recorder parameter

Parameter	Value	Description
Enable record info message	On, Off	Enable record information messages
Record samples in message	1 ... 25	Record samples in one message
Record reading timeout	10 ... 10000 s	Record reading timeout
Fault number of active record	(not editable)	The fault number of the current record. This is a number which is given by Easergy P5 protection relays, incrementally and is what identifies faults.
Tags read position	(not editable)	Tags are indications of change in the value of digital data. The current tag read position shows which such item is being read.
Active channel	(not editable)	"Channel" refers to the channels in Easergy P5 protection relays Disturbance recorder, which can be found in the DISTURBANCE RECORDER view in eSetup Easergy Pro. The active channel indicates which channel is being read.
Channel read position	(not editable)	A channel contains sampled analog values. The current read position indicates which of these entries in the active channel is being read.

Data configuration

The data points available through the IEC 60870-5-103 protocol interface in Easergy P5 protection relays can be configured in the IEC 60870-5-103: Data config view. It is divided into two categories, Digital data points (1-bit values) and Analog data points.

Digital data

The parameters, by which digital data points are defined, are explained below. In order to change the value of an existing data item, click on the row. This brings up an item configuration window, in which the parameters can be set. Pressing Save in the window will save the item set, pressing Remove will remove the item from the list and pressing Cancel will close the popup window without making any changes to the digital item configuration.

In order to add new items to the list, press the ADD Item row furthest down in the list. Doing so will add a new item at the end of the list. New items will be set to Digital Input 1 by default. The new item is configured as explained in the previous paragraph.

Digital

Index	FUN	INF	GI	EVENT	CONTROL	Item
000	55	161	☒	☒	☐	CB Open_DI1

Item:
☒ GI

FUN:
☒ EVENT

INF:
☐ CONTROL

001	55	162	☒	☒	☐	CB Close_DI2
002	55	163	☒	☒	☐	DI3(B)
003	55	164	☒	☒	☐	External trip_DI4
004	55	181	☒	☒	☐	Object1 state

Table 22 - Description of digital data configuration parameters

Parameter	Description
Index	Index of the data item in the list
FUN	Function type
INF	Information number
GI	Item included in General Interrogation (Enabled/Disabled) and data acquisition by polling
EVENT	Events enabled for change of item value (Enabled/Disabled)
CONTROL	Item value can be set by command (Enabled/Disabled)
Item	The data item which is configured on the row (for instance, Digital Input 1)

NOTE: Changes will not take effect if they are not explicitly written to the device using the Write changes to device button in eSetup Easergy Pro. This will require a reboot.

NOTE: The read command for digital data according to FUN and INF is not supported. If the GI parameter is disabled, the item value will not be included in response message by GI command. The value changing event is reported only by polling command.

Analog data

The parameters, by which analog data points are defined, are explained below. In order to change the value of an existing data item, click on the row. This brings up an item configuration window, in which the parameters can be set. Pressing Save in the window will save the item set, pressing Remove will remove the item from the list and pressing Cancel will close the popup window without making any changes to the analog item configuration.

In order to add new items to the list, press the ADD Item row furthest down in the list. Doing so will add a new item at the end of the list. The new item is configured as explained in the previous paragraph.

Analog

Index	FUN ↕	INF ↕	ASDU ↕	Items ↕
049	160	65	4	Frequency

ASDU: ASDU4 ▼

FUN: 160

INF: 65

Measurands:

Frequency ▼

Save Remove Cancel

Add

Table 23 - Description of analog data configuration parameters

Parameter	Description
Index	Index of the data item in the list
FUN	Function type
INF	Information number
ASDU	Application service data unit to be used to send the data item: ASDU 3.1: analog data 1 value ASDU 3.2: analog data 2 values ASDU 3.3: analog data 4 values ASDU 3.4: analog data 2 values ASDU 4: analog data floating point value ASDU 9: analog data 9 values
Items	The data item which is configured on the row

NOTE: Changes will not take effect if they are not explicitly written to the device using the Write changes to device button in eSetup Easergy Pro. This will require a reboot.

Measurement data

Analog measurements are transferred in two different formats, as integers and as floating point values. The value format depends on the application message type, ASDU. The following ASDU types are available for measurement values:

Table 24 - ASDU types for measurement values

ASDU	Number of measurements in one message	Format
3.1	1	Integer
3.2	2	
3.3	4	
3.4	2	
9	9	
4	1	Float

Integer value scaling

Integer scaled values in ASDU 3.x and 9 are transferred in 12 bit + sign integer format. The raw 12 bit values (-4096 ... +4095) are relative to 2.4 x nominal values. The following table shows the scaling for different measurements. The values of scaling settings can be found in the SCALING view in eSetup Easergy Pro.

NOTE: Integer RTD value is specially relative to 0.24 x nominal values (32768).

Table 25 - Integer scaled values

Type	Measurement	Scaling
Current	IL1 ... IL3 IoCalc	$2.4 \times I_N$
Residual current	I _r	$2.4 \times I_{rN}$
	I _r vs	$2.4 \times I_{rvsN}$
Voltage	VL1...VL3 U12...U13	$2.4 \times U_N$
Residual voltage	U _r	$2.4 \times U_{rN}$
Power	P, Q, S	$2.4 \times I_N \times U_N \times \sqrt{3}$
Other	DI counters	1:1
	PF, Cos Phi	2.4:1

An example:

The device transfers phase 1 current, IL1, with ASDU 3.1.

The scaling setting is as follows: CT primary = 500 A.

The measured value $M = 321$ A.

Thus, the value sent, $B = M \times (4096 / (2.4 \times 500)) = 321 \times (4096 / (2.4 \times 500)) = 1095$

The protocol master receives the value: $B = 1095$

OVF (Overflow bit in frame): No

Valid: Yes

This value is converted back to the measured value:

$M = B \times ((2.4 \times 500) / 4096) = 1095 \times ((2.4 \times 500) / 4096) = 320.8 \approx 321$ A

An example:

The device transfers phase 1 current, IL1, with ASDU 3.1.

The scaling setting is as follows: CT primary = 500 A.

The measured value $M = 1321$ A.

Thus, the value sent, $B = M \times (4096 / (2.4 \times 500)) = 1321 \times (4096 / (2.4 \times 500)) = 4509$, is too large a value to fit into twelve bits. Thus, the value is sent as $B = 4095$ (the largest value that can be sent with twelve bits) and the OVF (Overflow flag) set.

The protocol master receives the value: $B = 4095$

OVF (Overflow bit in frame): Yes

Valid: Yes

This value is converted back to the measured value: $M \geq 2.4 \times 500$ A, so $M \geq 1200$ A

Floating point values

Values transferred in ASDU 4 need not be scaled. Most of the measurements are sent as primary scaled values, but some values can be sent as per unit (PU) values. This setting can be changed via the local panel on the Easergy P5 protection relays.

Measurement	Format
Fault current I>	PU or A
Fault current I>>	PU or A
Fault current I>>>	PU or A
Fault reactance	Ω
Exported energy	MWh
Exported reactive energy	Mvarh

Write and read setting data

ASDU types description

These are the ASDU types available:

- ASDU 140 in the control direction – setting read request
- ASDU 143 in the control direction – setting write request (8 bits)
- ASDU 144 in the control direction – setting write request (16 bits)
- ASDU 201 in the control direction – setting write request (32 bits)
- ASDU 49 in the monitor direction – reject setting read/write request (8 bits)
- ASDU 168 in the monitor direction – answer to setting read/write request (8 bits)
- ASDU 17 in the monitor direction – answer to setting read/write request (16 bits)
- ASDU 169 in the monitor direction – answer to setting read/write request (32 bits)

ASDU 140 (8CH): Control Direction**Table 26 - ASDU 140 for IEC 60870-5-103 setting**

Type identification	8CH (Read protection parameter)
Variable Struct. Qualifier	81H
Cause of Transmission	14H
Device address	Common address of ASDU
Function byte (FUN)	Parameter y-Value
Information number (INF)	Parameter x-Value

ASDU 143 (8FH): Control Direction**Table 27 - ASDU 143 for IEC 60870-5-103 setting**

Type identification	8FH (Write analog protection parameter)
Variable Struct. Qualifier	81H
Cause of transmission	14H
Device address	Common address of ASDU
Function byte (FUN)	Parameter y-Value
Information number (INF)	Parameter x-Value
Value byte	byte

ASDU 144 (90H): Control Direction**Table 28 - ASDU 144 for IEC 60870-5-103 setting**

Type identification	90H (Write analog protection parameter)
Variable Struct. Qualifier	81H
Cause of transmission	14H
Device address	Common address of ASDU
Function byte (FUN)	Parameter y-Value
Information number (INF)	Parameter x-Value
Value low-byte	word (low)
Value high-byte	word (high)

ASDU 201 (C9H): Control Direction**Table 29 - ASDU 201 for IEC 60870-5-103 setting**

Type identification	C9H (Write analog protection parameter)
Variable Struct. Qualifier	81H
Cause of transmission	14H
Device address	Common address of ASDU
Function byte (FUN)	Parameter y-Value
Information number (INF)	Parameter x-Value
Byte 1	Low word (low)
Byte 2	Low word (high)
Byte 3	High word (low)
Byte 4	High word (high)

Type identification 49 (31H): Monitor direction**Table 30 - ASDU 49 for IEC 60870-5-103 setting**

Type identification	31H (Analog protection signal)
Variable Struct. Qualifier	81H
Cause of transmission	15H
Device address	Common address of ASDU
Function byte (FUN)	Parameter y-Value
Information number (INF)	Parameter x-Value
Value low-byte	MW (low)
Value high-byte	MW (high)
TT (Time tag)	ms low
	ms high
	IV 0 m m m m m m
	SU 0 h h h h h h

Reject the read request or write request with special Fun and INF values as below.

Special values **Function byte (FUN)** = 7FH and **Information number (INF)** = FFH shall be used as a negative response on a command message ("Rejection telegram"): in this case MW contains the error code, so the cause of rejection.

The list of causes of rejection possibly used is as follows:

Cause of rejection	Meaning
80H 00H	OK
80H 07H	Unknown parameter address
80H 08H	Wrong data
80H 09H	Wrong frame data length
80H 30H	Wrong data in message

ASDU 168 (A8H): Monitor direction**Table 31 - ASDU 168 for IEC 60870-5-103 setting**

Type identification	A8H (Analog protection parameter)
Variable Struct. Qualifier	81H
Cause of transmission (COT)	14H
Device address	Common address of ASDU
Function byte (FUN)	Parameter y-Value
Information number (INF)	Parameter x-Value
Byte 1	byte
TT (Time tag)	ms low
	ms high
	IV 0 m m m m m m
	SU 0 h h h h h h

ASDU 17 (11H): Monitor direction**Table 32 - ASDU 17 for IEC 60870-5-103 setting**

Type identification	11H (Analog protection parameter)
Variable Struct. Qualifier	81H
Cause of Transmission	14H
Device address	Common address of ASDU
Function byte (FUN)	Parameter y-Value
Information number (INF)	Parameter x-Value
Value low-byte	word (low)
Value high-byte	word (high)
TT (Time tag)	ms low
	ms high
	IV 0 m m m m m m
	SU 0 h h h h h

ASDU 169 (A9H): Monitor direction**Table 33 - ASDU 169 for IEC 60870-5-103 setting**

Type identification	A9H (Analog protection parameter)
Variable Struct. Qualifier	81H
Cause of transmission (COT)	14H
Device address	Common address of ASDU
Function byte (FUN)	Parameter y-Value
Information number (INF)	Parameter x-Value
Byte 1	Low word (low)
Byte 2	Low word (high)
Byte 3	High word (low)
Byte 4	High word (high)
TT (Time tag)	ms low
	ms high
	IV 0 m m m m m m
	SU 0 h h h h h

COT Meaning (Cause of Transmission):

In a response to a write command only:

= 14H - Positive acknowledge to a read/write command.

= 15H - Negative acknowledge to a write command.

(All the frame structure may be changed according to last design.)

Setting data addressing

All setting data are addressed by y-Value (FUN) / x-Value (INF) corresponding to each protection and item.

The list of setting parameters displayed on eSetup Easergy Pro for each function are not editable. The user can select setting items by using the parameters FUN, INF and ASDU (for writing different types). Each item's FUN and INF can't been changed. The Master uses ASDU140 for all value types' reading requests.

Figure 2 - IEC 60870-5-103 setting data points

IEC 60870-5-103: Data setting				
Setting				
OverCurrent I> setting				
	Item	FUN	INF	ASDU
[1]	Enable for I>	1	0	143
[2]	Pick-up setting	1	1...4	201
[3]	Delay curve family	1	5...8	143
[4]	Delay type	1	9...12	143
[5]	Operation delay	1	13...16	201
[6]	Inv. time coefficient	1	17...20	201
[7]	Reset time	1	21...24	201
[8]	Inrush status for I>	1	25...28	143
[9]	SOL use by I>	1	29...32	143
[10]	SOL Operation delay	1	33...36	201
[11]	SOL Inv. time coefficient	1	37...40	201
[12]	CLP status for I>	1	41...44	143
[13]	CLP Pick-up setting	1	45...48	201
[14]	CLP Operation delay	1	49...52	201
[15]	CLP Inv. time coefficient	1	53...56	201
[16]	Include harmonics	1	57	143

Table 34 - IEC 60870-5-103 setting parameters

Parameter	Description
Item	Db item
FUN	Function type(y-Value)
INF	Information number(x-Value)
ASDU	Application service data unit to be used to send the data item: ASDU 140: read request for master ASDU 143: write 8 bits type request for master ASDU 144: write 16 bits type request for master ASDU 201: write 32 bits type request for master

Data model of IEC 60870-5-103

The default digital and analog data of Easergy P5 protection relays preconfigured in IEC 60870-5-103 can be found in following tables.

Default digital configuration

Default Index	FUN	INF	Item
000	55	161	CB Open_DI1
001	55	162	CB Close_DI2
002	55	163	Digital input 3
003	55	164	Digital input 4
004	55	181	Object1 state
005	55	182	Object2 state
006	55	183	Object3 state
007	55	184	Object4 state
008	55	185	Object5 state

Default Index	FUN	INF	Item
009	55	186	Object6 state
010	55	187	Object7 state
011	55	188	Object8 state
012	160	20	TCS alarm on
013	160	21	Logic output 2 on
014	160	22	Logic output 3 on
015	160	23	Logic output 4 on
016	160	24	Logic output 5 on
017	160	25	Logic output 6 on
018	160	26	Logic output 7 on
019	160	27	Logic output 8 on
020	160	28	Logic output 9 on
021	160	29	Logic output 10 on
022	160	130	Virtual input 1
023	160	131	Virtual input 2
024	160	132	Virtual input 3
025	160	133	Virtual input 4
026	160	134	Virtual input 5
027	160	135	Virtual input 6
028	160	136	Virtual input 7
029	160	137	Virtual input 8
030	160	138	Virtual input 9
031	160	139	Virtual input 10
032	160	140	CB Fail 1 Trip On
033	160	141	CB Fail 2 Trip On
034	55	23	Setting group 1
035	55	24	Setting group 2
036	55	25	Setting group 3
037	55	26	Setting group 4
038	160	103	Prg1 start
039	160	105	Prg1 trip
040	160	98	Prg2 start
041	160	100	Prg2 trip
042	160	99	Prg3 start
043	160	101	Prg3 trip
044	160	180	Prg4 start
045	160	181	Prg4 trip
046	160	69	Prg5 start
047	160	70	Prg5 trip
048	160	71	Prg6 start
049	160	19	Prg6 trip

Default analog configuration parameters

Default Index	FUN	INF	ASDU	Item
050	160	65	4	Frequency

Setting data

The setting values that can be configured in IEC 60870-5-103 on the Easergy P5 protection relay is listed in the table below:

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
ARC setting items									
I>int. pick-up value	1	0	201	1.00 xIn = 100				■	■
Io>int. pick-up value	1	1	201	1.00 xIn = 100				■	■
Arc stage 1 enabled	1	2	143	Off=0;On=1				■	■
Arc stage 2 enabled	1	3	143	Off=0;On=1				■	■
Arc stage 3 enabled	1	4	143	Off=0;On=1				■	■
Arc stage 4 enabled	1	5	143	Off=0;On=1				■	■
Arc stage 5 enabled	1	6	143	Off=0;On=1				■	■
Arc stage 6 enabled	1	7	143	Off=0;On=1				■	■
Arc stage 7 enabled	1	8	143	Off=0;On=1				■	■
Arc stage 8 enabled	1	9	143	Off=0;On=1				■	■
Stage 1 Mode	1	10	143	Light=0;Light&Current= 1				■	■
Stage 2 Mode	1	11	143	Light=0;Light&Current= 1				■	■
Stage 3 Mode	1	12	143	Light=0;Light&Current= 1				■	■
Stage 4 Mode	1	13	143	Light=0;Light&Current= 1				■	■
Stage 5 Mode	1	14	143	Light=0;Light&Current= 1				■	■
Stage 6 Mode	1	15	143	Light=0;Light&Current= 1				■	■
Stage 7 Mode	1	16	143	Light=0;Light&Current= 1				■	■
Stage 8 Mode	1	17	143	Light=0;Light&Current= 1				■	■
Trip 1 delay [x1ms]	1	18	143	1 = 1				■	■
Trip 2 delay [x1ms]	1	19	143	1 = 1				■	■
Trip 3 delay [x1ms]	1	20	143	1 = 1				■	■
Trip 4 delay [x1ms]	1	21	143	1 = 1				■	■
Trip 5 delay [x1ms]	1	22	143	1 = 1				■	■
Trip 6 delay [x1ms]	1	23	143	1 = 1				■	■
Trip 7 delay [x1ms]	1	24	143	1 = 1				■	■
Trip 8 delay [x1ms]	1	25	143	1 = 1				■	■
Min. hold time [x1ms]	1	26	201	1 = 1				■	■
Min. hold time2 [x1ms]	1	27	201	1 = 1				■	■
Min. hold time3 [x1ms]	1	28	201	1 = 1				■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Min. hold time4 [x1ms]	1	29	201	1 = 1				■	■
Min. hold time5 [x1ms]	1	30	201	1 = 1				■	■
Min. hold time6 [x1ms]	1	31	201	1 = 1				■	■
Min. hold time7 [x1ms]	1	32	201	1 = 1				■	■
Min. hold time8 [x1ms]	1	33	201	1 = 1				■	■
Inrush setting									
Enable for Inrush	2	0	143	Off=0;On=1	■	■		■	■
Max inrush current	2	1	201	1.00 xIn = 100	■	■		■	■
Pickup for 2nd harmonic	2	2	201	1 % = 1	■	■		■	■
OverCurrent I> setting									
Enable for I>	3	0	143	Off=0;On=1	■	■		■	■
Pick-up value	3	1...4	201	1.00 xIn = 100	■	■		■	■
Delay curve family	3	5...8	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■	■		■	■
Delay type	3	9...12	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■	■		■	■
Operation delay	3	13...16	201	1.00 s = 100	■	■		■	■
Inv. time coefficient	3	17...20	201	1.000 = 1000	■	■		■	■
Reset time	3	21...24	201	1.00 s = 100	■	■		■	■
Inrush status for I>	3	25...28	143	Off=0;On=1	■	■		■	■
SOL use by I>	3	29...32	143	Off=0;On=1	■	■		■	■
SOL Operation delay	3	33...36	201	1.00 s = 100	■	■		■	■
SOL Inv. time coefficient	3	37...40	201	1.000 = 1000	■	■		■	■
CLPU status for I>	3	41...44	143	Off=0;On=1	■	■		■	■
CLPU Pick-up value	3	45...48	201	1.00 xIn = 100	■	■		■	■
CLPU Operation delay	3	49...52	201	1.00 s = 100	■	■		■	■
CLPU Inv. time coefficient	3	53...56	201	1.000 = 1000	■	■		■	■
Include harmonics	3	57	143	Off=0;On=1	■	■		■	■
Reset type	3	58...61	143	DT=0;IDMT=1	■	■		■	■
OverCurrent I>> setting									
Enable for I>>	4	0	143	Off=0;On=1	■	■		■	■
Pick-up value	4	1...4	201	1.00 xIn = 100	■	■		■	■
Delay curve family	4	5...8	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■	■		■	■
Delay type	4	9...12	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■	■		■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Operation delay	4	13...16	201	1.00 s = 100	■	■		■	■
Inv. time coefficient	4	17...20	201	1.000 = 1000	■	■		■	■
Inrush status for I>>	4	21...24	143	Off=0;On=1	■	■		■	■
SOL use by I>>	4	25...28	143	Off=0;On=1	■	■		■	■
SOL Operation delay	4	29...32	201	1.00 s = 100	■	■		■	■
SOL Inv. time coefficient	4	33...36	201	1.000 = 1000	■	■		■	■
CLPU status for I>>	4	37...40	143	Off=0;On=1	■	■		■	■
CLPU Pick-up value	4	41...44	201	1.00 xIn = 100	■	■		■	■
CLPU Operation delay	4	45...48	201	1.00 s = 100	■	■		■	■
CLPU Inv. time coefficient	4	49...52	201	1.000 = 1000	■	■		■	■
Include harmonics	4	53	143	Off=0;On=1	■	■		■	■
Reset type	4	54...57	143	DT=0;IDMT=1	■	■		■	■
Reset time	4	58...61	201	1.00 s = 100	■	■		■	■
OverCurrent I>>> setting									
Enable for I>>>	5	0	143	Off=0;On=1	■	■		■	■
Pick-up value	5	1...4	201	1.00 xIn = 100	■	■		■	■
Operation delay	5	5...8	201	1.00 s = 100	■	■		■	■
Inrush status for I>>>	5	9...12	143	Off=0;On=1	■	■		■	■
SOL use by I>>>	5	13...16	143	Off=0;On=1	■	■		■	■
SOL Operation delay	5	17...20	201	1.00 s = 100	■	■		■	■
CLPU status for I>>>	5	21...24	143	Off=0;On=1	■	■		■	■
CLPU Pick-up value	5	25...28	201	1.00 xIn = 100	■	■		■	■
CLPU Operation delay	5	29...32	201	1.00 s = 100	■	■		■	■
SOTF setting									
Enable for SOTF	6	0	143	Off=0;On=1	■	■		■	■
Pick-up value	6	1	201	1.00 xIn = 100	■	■		■	■
Dead line detection delay	6	2	201	1.00 s = 100	■	■		■	■
SOTF active Timer	6	3	201	1.00 s = 100	■	■		■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Dead line detection input	6	4	144	Value ⁵	■	■		■	■
Iφ> setting									
Enable for Iφ>	7	0	143	Off=0;On=1	■			■	■
Pick-up value	7	1...4	201	1.00 xIn = 100	■			■	■
Direction mode	7	5...8	143	Dir+Backup=0;Undir=1; Dir=2	■			■	■
Angle offset	7	9...12	144	1° = 1	■			■	■
Delay curve family	7	13...16	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■			■	■
Delay type	7	17...20	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■			■	■
Operation delay	7	21...24	201	1.00 s = 100	■			■	■
Inv. time coefficient	7	25...28	201	1.000 = 1000	■			■	■
Reset time	7	29...32	201	1.00 s = 100	■			■	■
Inrush status for Iφ>	7	33...36	143	Off=0;On=1	■			■	■
SOL status for Iφ>	7	37...40	143	Off=0;On=1	■			■	■
SOL Operation delay	7	41...44	201	1.00 s = 100	■			■	■
SOL Inv. time coefficient	7	45...48	201	1.000 = 1000	■			■	■
CLPU status for Iφ>	7	49...52	143	Off=0;On=1	■			■	■
CLPU Pick-up value	7	53...56	201	1.00 xIn = 100	■			■	■
CLPU Operation delay	7	57...60	201	1.00 s = 100	■			■	■
CLPU Inv. time coefficient	7	61...64	201	1.000 = 1000	■			■	■
Reset type	7	65...68	143	DT=0;IDMT=1	■			■	■
Iφ>> setting									
Enable for Iφ>>	8	0	143	Off=0;On=1	■			■	■
Pick-up value	8	1...4	201	1.00 xIn = 100	■			■	■
Direction mode	8	5...8	143	Dir+Backup=0;Undir=1; Dir=2	■			■	■

5. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35;Watchdog=36;Watchdog=37;Watchdog=38;Watchdog=39;Watchdog=40;Watchdog=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAl=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;VO3=57;VO4=58;VO5=59;VO6=60;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;F1=85;F2=86;F3=87;F4=88;F5=89;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;Watchdog=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;NI3=131;NI4=132;NI5=133;NI6=134;NI7=135;NI8=136;NI9=137;NI10=138;NI11=139;NI12=140;NI13=141;NI14=142;NI15=143;NI16=144;NI17=145;NI18=146;NI19=147;NI20=148;NI21=149;NI22=150;NI23=151;NI24=152;NI25=153;NI26=154;NI27=155;NI28=156;NI29=157;NI30=158;NI31=159;NI32=160;NI33=161;NI34=162;NI35=163;NI36=164;NI37=165;NI38=166;NI39=167;NI40=168;NI41=169;NI42=170;NI43=171;NI44=172;NI45=173;NI46=174;NI47=175;NI48=176;NI49=177;NI50=178;NI51=179;NI52=180;NI53=181;NI54=182;NI55=183;NI56=184;NI57=185;NI58=186;NI59=187;NI60=188;NI61=189;NI62=190;NI63=191;NI64=192;POC1=193;POC2=194;POC3=195;POC4=196;POC5=197;POC6=198;POC7=199;POC8=200;POC9=201;POC10=202;POC11=203;POC12=204;POC13=205;POC14=206;POC15=207;POC16=208;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240;VO7=257;VO8=258;VO9=259;VO10=260;VO11=261;VO12=262;VO13=263;VO14=264;VO15=265;VO16=266;VO17=267;VO18=268;VO19=269;VO20=270;NI65=289;NI66=290;NI67=291;NI68=292;NI69=293;NI70=294;NI71=295;NI72=296;NI73=297;NI74=298;NI75=299;NI76=300;NI77=301;NI78=302;NI79=303;NI80=304;NI81=305;NI82=306;NI83=307;NI84=308;NI85=309;NI86=310;NI87=311;NI88=312;NI89=313;NI90=314;NI91=315;NI92=316;NI93=317;NI94=318;NI95=319;NI96=320;NI97=321;NI98=322;NI99=323;NI100=324;NI101=325;NI102=326;NI103=327;NI104=328;NI105=329;NI106=330;NI107=331;NI108=332;NI109=333;NI110=334;NI111=335;NI112=336;NI113=337;NI114=338;NI115=339;NI116=340;NI117=341;NI118=342;NI119=343;NI120=344;NI121=345;NI122=346;NI123=347;NI124=348;NI125=349;NI126=350;NI127=351;NI128=352

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Angle offset	8	9...12	144	1 ° = 1	■			■	■
Delay curve family	8	13...16	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■			■	■
Delay type	8	17...20	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■			■	■
Operation delay	8	21...24	201	1.00 s = 100	■			■	■
Inv. time coefficient	8	25...28	201	1.000 = 1000	■			■	■
Reset time	8	29...32	201	1.00 s = 100	■			■	■
Inrush status for I ϕ >>	8	33...36	143	Off=0;On=1	■			■	■
SOL status for I ϕ >>	8	37...40	143	Off=0;On=1	■			■	■
SOL Operation delay	8	41...44	201	1.00 s = 100	■			■	■
SOL Inv. time coefficient	8	45...48	201	1.000 = 1000	■			■	■
CLPU status for I ϕ >>	8	49...52	143	Off=0;On=1	■			■	■
CLPU Pick-up value	8	53...56	201	1.00 xIn = 100	■			■	■
CLPU Operation delay	8	57...60	201	1.00 s = 100	■			■	■
CLPU Inv. time coefficient	8	61...64	201	1.000 = 1000	■			■	■
Reset type	8	65...68	143	DT=0;IDMT=1	■			■	■
I ϕ >>> setting									
Enable for I ϕ >>>	9	0	143	Off=0;On=1	■			■	■
Pick-up value	9	1...4	201	1.00 xIn = 100	■			■	■
Direction mode	9	5...8	143	Dir+Backup=0;Undir=1; Dir=2	■			■	■
Angle offset	9	9...12	144	1 ° = 1	■			■	■
Operation delay	9	13...16	201	1.00 s = 100	■			■	■
Inrush status for I ϕ >>>	9	17...20	143	Off=0;On=1	■			■	■
SOL status for I ϕ >>>	9	21...24	143	Off=0;On=1	■			■	■
SOL Operation delay	9	25...28	201	1.00 s = 100	■			■	■
CLPU status for I ϕ >>>	9	29...32	143	Off=0;On=1	■			■	■
CLPU Pick-up value	9	33...36	201	1.00 xIn = 100	■			■	■
CLPU Operation delay	9	37...40	201	1.00 s = 100	■			■	■
I ϕ >>>> setting									
Enable for I ϕ >>>>	10	0	143	Off=0;On=1	■			■	■
Pick-up value	10	1...4	201	1.00 xIn = 100	■			■	■
Direction mode	10	5...8	143	Dir+Backup=0;Undir=1; Dir=2	■			■	■
Angle offset	10	9...12	144	1 ° = 1	■			■	■
Operation delay	10	13...16	201	1.00 s = 100	■			■	■
Inrush status for I ϕ >>>>	10	17...20	143	Off=0;On=1	■			■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
SOL status for $I\phi>>>>$	10	21...24	143	Off=0;On=1	■			■	■
SOL Operation delay	10	25...28	201	1.00 s = 100	■			■	■
CLPU status for $I\phi>>>>$	10	29...32	143	Off=0;On=1	■			■	■
CLPU Pick-up value	10	33...36	201	1.00 xIn = 100	■			■	■
CLPU Operation delay	10	37...40	201	1.00 s = 100	■			■	■
P< setting									
Enable for P<	11	0	143	Off=0;On=1	■			■	■
Pick-up value	11	1...4	201	1 %Sn = 1	■			■	■
Operation delay	11	5...8	201	1.0 s = 10	■			■	■
P<< setting									
Enable for P<<	12	0	143	Off=0;On=1	■			■	■
Pick-up value	12	1...4	201	1 %Sn = 1	■			■	■
Operation delay	12	5...8	201	1.0 s = 10	■			■	■
I< setting									
Enable for I<	13	0	143	Off=0;On=1	■	■			■
Pick-up value	13	1...4	201	1.00 %In = 100	■	■			■
Operation delay	13	5...8	201	1.0 s = 10	■	■			■
I2>I1 setting									
Enable for I2/I1>	14	0	143	Off=0;On=1	■	■		■	■
Pick-up value	14	1...4	201	1 % = 1	■	■		■	■
Operation delay	14	5...8	201	1.00 s = 100	■	■		■	■
I2> setting									
Enable for I2>	16	0	143	Off=0;On=1	■	■		■	■
Pick-up value	16	1...4	201	1.00 xIn = 100	■	■		■	■
Delay curve family	16	5...8	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■	■		■	■
Delay type	16	9...12	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■	■		■	■
Operation delay	16	13...16	201	1.00 s = 100	■	■		■	■
Inv. time coefficient	16	17...20	201	1.000 = 1000	■	■		■	■
Reset type	16	21...24	143	DT=0;IDMT=1	■	■		■	■
Reset time	16	25...28	201	1.00 s = 100	■	■		■	■
Ist> setting									
Enable for Ist>	17	0	143	Off=0;On=1	■	■			■
Delay type	17	1	143	DT=0;INV=1	■	■			■
Motor start time	17	2	201	1.0 s = 10	■	■			■
Ilr> setting									
Enable for Ilr>	18	0	143	Off=0;On=1	■	■			■
Pick-up value	18	1	201	1.0 % = 10	■	■			■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Delay type	18	2	143	DT=0;INV=1	■	■			■
Operation delay	18	3	201	1.0 s = 10	■	■			■
N> setting									
Enable for N>	19	0	143	Off=0;On=1	■	■			■
Max motor Hot starts	19	1	201	1 = 1	■	■			■
Max motor cold starts	19	2	201	1 = 1	■	■			■
Min time between motor starts	19	3	201	1.0 min = 10	■	■			■
Reference period	19	4	201	1.0 min = 10	■	■			■
Hot Status Limit	19	5	201	1.0 % = 10	■	■			■
Motor T> setting									
Enable for Motor T>	20	0	143	Off=0;On=1	■	■			■
Basic current setting	20	1...4	201	1.00 xIn = 100	■	■			■
Max permissive I factor	20	5...8	201	1.00 = 100	■	■			■
Heating time constant	20	9...12	201	1.0 min = 10	■	■			■
Time constant for motor starting	20	13...16	201	1.0 min = 10	■	■			■
Cooling time constant	20	17...20	201	1.0 min = 10	■	■			■
Unbalance factor	20	21...24	201	1.0 = 10	■	■			■
Thermal alarm value	20	25...28	201	1 % = 1	■	■			■
Reserve time thermal alarm	20	29...32	201	1.0 min = 10	■	■			■
Temperature based mode	20	33...36	143	Current=0;Ambient=1	■	■			■
Nominal ambient temp	20	37...40	144	1 °C = 1 / 1 °F = 1	■	■			■
Max object temperature	20	41...44	144	1 °C = 1 / 1 °F = 1	■	■			■
Alarm temperature	20	45...48	144	1 °C = 1 / 1 °F = 1	■	■			■
Min ambient temperature	20	49...52	144	1 °C = 1 / 1 °F = 1	■	■			■
Default ambient temperature	20	53...56	144	1 °C = 1 / 1 °F = 1	■	■			■
Feeder T> setting									
Enable for feeder T>	21	0	143	Off=0;On=1	■	■		■	
Basic current setting	21	1...4	201	1.00 xIn = 100	■	■		■	
Max permissive I factor	21	5...8	201	1.00 = 100	■	■		■	
Heating time constant	21	9...12	201	1.0 min = 10	■	■		■	
Thermal alarm value	21	13...16	201	1 % = 1	■	■		■	
Reserve time thermal alarm	21	17...20	201	1.0 min = 10	■	■		■	
Temperature based mode	21	21...24	143	Current=0;Ambient=1	■	■		■	
Nominal ambient temp	21	25...28	144	1 °C = 1 / 1 °F = 1	■	■		■	
Max object temperature	21	29...32	144	1 °C = 1 / 1 °F = 1	■	■		■	

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Alarm temperature	21	33...36	144	1 °C = 1 / 1 °F = 1	■	■		■	
Min ambient temperature	21	37...40	144	1 °C = 1 / 1 °F = 1	■	■		■	
Default ambient temperature	21	41...44	144	1 °C = 1 / 1 °F = 1	■	■		■	
lo> setting									
Enable for lo>	22	0	143	Off=0;On=1	■	■		■	■
Pick-up value	22	1...4	201	1.000 pu = 1000	■	■		■	■
Delay curve family	22	5...8	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■	■		■	■
Delay type	22	9...12	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■	■		■	■
Operation delay	22	13...16	201	1.00 s = 100	■	■		■	■
Inv. time coefficient	22	17...20	201	1.000 = 1000	■	■		■	■
Network earthing	22	21...24	143	Res=0;Cap=1	■	■		■	■
Reset time	22	25...28	201	1.00 s = 100	■	■		■	■
Inrush status for lo>	22	29...32	143	Off=0;On=1	■	■		■	■
SOL use for lo>	22	33...36	143	Off=0;On=1	■	■		■	■
SOL Operation delay	22	37...40	201	1.00 s = 100	■	■		■	■
SOL Inv. time coefficient	22	41...44	201	1.000 = 1000	■	■		■	■
CLPU status for lo>	22	45...48	143	Off=0;On=1	■	■		■	■
CLPU Pick-up value	22	49...52	201	1.00 xln = 100	■	■		■	■
CLPU Operation delay	22	53...56	201	1.00 s = 100	■	■		■	■
CLPU Inv. time coefficient	22	57...60	201	1.000 = 1000	■	■		■	■
Reset type	22	61...64	143	DT=0;IDMT=1	■	■		■	■
Enable faulty phase detection	22	65	143	Off=0;On=1	■	■		■	■
Phase currents change limit	22	66	143	1 % = 1	■	■		■	■
lo>> setting									
Enable for lo>>	23	0	143	Off=0;On=1	■	■		■	■
Pick-up value	23	1...4	201	1.00 pu = 100	■	■		■	■
Delay curve family	23	5...8	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■	■		■	■
Delay type	23	9...12	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■	■		■	■
Operation delay	23	13...16	201	1.00 s = 100	■	■		■	■
Inv. time coefficient	23	17...20	201	1.000 = 1000	■	■		■	■
Network earthing	23	21...24	143	Res=0;Cap=1	■	■		■	■
Inrush status for lo>>	23	25...28	143	Off=0;On=1	■	■		■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
SOL use for Io>>	23	29...32	143	Off=0;On=1	■	■		■	■
SOL Operation delay	23	33...36	201	1.00 s = 100	■	■		■	■
SOL Inv. time coefficient	23	37...40	201	1.000 = 1000	■	■		■	■
CLPU status for Io>>	23	41...44	143	Off=0;On=1	■	■		■	■
CLPU Pick-up value	23	45...48	201	1.00 xIn = 100	■	■		■	■
CLPU Operation delay	23	49...52	201	1.00 s = 100	■	■		■	■
CLPU Inv. time coefficient	23	53...56	201	1.000 = 1000	■	■		■	■
Reset type	23	57...60	143	DT=0;IDMT=1	■	■		■	■
Reset time	23	61...64	201	1.00 s = 100	■	■		■	■
Enable faulty phase detection	23	65	143	Off=0;On=1	■	■		■	■
Phase currents change limit	23	66	143	1 % = 1	■	■		■	■
Io>>> setting									
Enable for Io>>>	24	0	143	Off=0;On=1	■	■		■	■
Pick-up value	24	1...4	201	1.00 pu = 100	■	■		■	■
Operation delay	24	5...8	201	1.00 s = 100	■	■		■	■
Network earthing	24	9...12	143	Res=0;Cap=1		■		■	■
Inrush status for Io>>>	24	13...16	143	Off=0;On=1		■		■	■
SOL use for Io>>>	24	17...20	143	Off=0;On=1		■		■	■
SOL Operation delay	24	21...24	201	1.00 s = 100		■		■	■
CLPU status for Io>>>	24	25...28	143	Off=0;On=1		■		■	■
CLPU Pick-up value	24	29...32	201	1.00 xIn = 100		■		■	■
CLPU Operation delay	24	33...36	201	1.00 s = 100		■		■	■
Enable faulty phase detection	24	37	143	Off=0;On=1		■		■	■
Phase currents change limit	24	38	143	1 % = 1		■		■	■
Io>>>> setting									
Enable for Io>>>>	25	0	143	Off=0;On=1		■		■	■
Pick-up value	25	1...4	201	1.00 pu = 100		■		■	■
Operation delay	25	5...8	201	1.00 s = 100		■		■	■
Network earthing	25	9...12	143	Res=0;Cap=1		■		■	■
Inrush status for Io>>>>	25	13...16	143	Off=0;On=1		■		■	■
SOL use for Io>>>>	25	17...20	143	Off=0;On=1		■		■	■
SOL Operation delay	25	21...24	201	1.00 s = 100		■		■	■
CLPU status for Io>>>>	25	25...28	143	Off=0;On=1		■		■	■
CLPU Pick-up value	25	29...32	201	1.00 xIn = 100		■		■	■
CLPU Operation delay	25	33...36	201	1.00 s = 100		■		■	■
Enable faulty phase detection	25	37	143	Off=0;On=1		■		■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Phase currents change limit	25	38	143	1 % = 1		■		■	■
lo>>>> setting									
Enable for lo>>>>	26	0	143	Off=0;On=1		■		■	■
Pick-up value	26	1...4	201	1.00 pu = 100		■		■	■
Operation delay	26	5...8	201	1.00 s = 100		■		■	■
loφ> setting									
Enable for loφ>	27	0	143	Off=0;On=1	■			■	■
Direction mode	27	1...4	143	ResCap=0;Sector=1; Undir=2	■			■	■
Char ctrl. in ResCap mode	27	5...8	143	Value ⁶	■			■	■
Pick-up value	27	9...12	201	1.000 pu = 1000	■			■	■
Uo setting for loφ> stage	27	13...16	201	1.0 % = 10	■			■	■
Angle offset	27	17...20	144	1 ° = 1	■			■	■
Pick up sector size	27	21...24	144	1 ± ° = 1	■			■	■
Delay curve family	27	25...28	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■			■	■
Delay type	27	29...32	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■			■	■
Operation delay	27	33...36	201	1.00 s = 100	■			■	■
Inv. time coefficient	27	37...40	201	1.000 = 1000	■			■	■
Reset type	27	41...44	143	DT=0;IDMT=1	■			■	■
Reset time	27	45...48	201	1.00 s = 100	■			■	■
loφ>> setting									
Enable for loφ>>	28	0	143	Off=0;On=1	■			■	■
Direction mode	28	1...4	143	ResCap=0;Sector=1; Undir=2	■			■	■
Char ctrl. in ResCap mode	28	5...8	143	Value ⁶	■			■	■
Pick-up value	28	9...12	201	1.000 pu = 1000	■			■	■
Uo setting for loφ>> stage	28	13...16	201	1.0 % = 10	■			■	■
Angle offset	28	17...20	144	1 ° = 1	■			■	■
Pick up sector size	28	21...24	144	1 ± ° = 1	■			■	■
Delay curve family	28	25...28	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■			■	■
Delay type	28	29...32	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■			■	■

6. Res=0;Cap=1;DI1(B)=2;DI2(B)=3;DI3(B)=4;DI4(B)=5;DI1(C)=6;DI2(C)=7;DI3(C)=8;DI4(C)=9;DI5(C)=10;DI6(C)=11;DI1(D)=12;DI2(D)=13;DI3(D)=14;DI1(E)=15;DI2(E)=16;DI3(E)=17;DI4(E)=18;DI5(E)=19;DI6(E)=20;DI20=21;Arc1=26;Arc2=27;BI=28;VI1=30;VI2=31;VI3=32;VI4=33;DI21=66;DI22=67;DI23=68;DI24=69;DI25=70;DI26=71;DI27=72;DI28=73;DI29=74;DI30=75;DI31=76;DI32=77;DI33=78;DI34=79;DI35=80;DI36=81;DI37=82;DI38=83;DI39=84;DI40=85;VI5=226;VI6=227;VI7=228;VI8=229;VI9=230;VI10=231;VI11=232;VI12=233;VI13=234;VI14=235;VI15=236;VI16=237;VI17=238;VI18=239;VI19=240;VI20=241

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Operation delay	28	33...36	201	1.00 s = 100	■			■	■
Inv. time coefficient	28	37...40	201	1.000 = 1000	■			■	■
Reset type	28	41...44	143	DT=0;IDMT=1	■			■	■
Reset time	28	45...48	201	1.00 s = 100	■			■	■
Ioφ>>>setting									
Enable for Ioφ>>>	29	0	143	Off=0;On=1	■			■	■
Direction mode	29	1...4	143	ResCap=0;Sector=1; Undir=2	■			■	■
Char ctrl. in ResCap mode	29	5...8	143	Value ⁷	■			■	■
Pick-up value	29	9...12	201	1.000 pu = 1000	■			■	■
Uo setting for Ioφ>>> stage	29	13...16	201	1.0 % = 10	■			■	■
Angle offset	29	17...20	144	1 ° = 1	■			■	■
Pick up sector size	29	21...24	144	1 ± ° = 1	■			■	■
Delay curve family	29	25...28	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7	■			■	■
Delay type	29	29...32	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9; CO8=10;RI=11;RXIDG=12	■			■	■
Operation delay	29	33...36	201	1.00 s = 100	■			■	■
Inv. time coefficient	29	37...40	201	1.000 = 1000	■			■	■
Reset type	29	41...44	143	DT=0;IDMT=1	■			■	■
Reset time	29	45...48	201	1.00 s = 100	■			■	■
IoUo> setting									
Enable for IoUo>	30	0	143	Off=0;On=1				■	■
Direction mode	30	1...4	143	Forward=0;Reverse=1				■	■
Inhibit ctrl.	30	5...8	143	Value ⁸				■	■
Timer instant delay ctrl.	30	9...12	143	Value ⁸					■
Pick-up value	30	13...16	201	1.00 %Pno = 100				■	■
Uo pick-up value	30	17...20	201	1.0 % = 10				■	■
Pick-up sector size	30	21...24	144	1 ± ° = 1				■	■
Operation delay	30	25...28	201	1.00 s = 100				■	■
SOL Mode	30	29...32	143	Off=0;On=1					■
SOL Operation delay	30	33...36	201	1.00 s = 100					■
Memory Mode	30	37...40	143	None=0;Voltage=1; Time=2;Both=3				■	■
Uo pick-up value	30	41...44	201	1.0 % = 10				■	■

7. Res=0;Cap=1;DI1(B)=2;DI2(B)=3;DI3(B)=4;DI4(B)=5;DI1(C)=6;DI2(C)=7;DI3(C)=8;DI4(C)=9;DI5(C)=10;DI6(C)=11;DI1(D)=12;DI2(D)=13;DI3(D)=14;DI1(E)=15;DI2(E)=16;DI3(E)=17;DI4(E)=18;DI5(E)=19;DI6(E)=20;DI20=21;Arc1=26;Arc2=27;BI=28;VI1=30;VI2=31;VI3=32;VI4=33;DI21=66;DI22=67;DI23=68;DI24=69;DI25=70;DI26=71;DI27=72;DI28=73;DI29=74;DI30=75;DI31=76;DI32=77;DI33=78;DI34=79;DI35=80;DI36=81;DI37=82;DI38=83;DI39=84;DI40=85;VI5=226;VI6=227;VI7=228;VI8=229;VI9=230;VI10=231;VI11=232;VI12=233;VI13=234;VI14=235;VI15=236;VI16=237;VI17=238;VI18=239;VI19=240;VI20=241
8. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Memory time	30	45...48	201	1.00 s = 100				■	■
Reset time	30	49	201	1.00 s = 100				■	■
IoUo>> setting									
Enable for IoUo>>	31	0	143	Off=0;On=1				■	■
Direction mode	31	1...4	143	Forward=0;Reverse=1				■	■
Input for inhibit control	31	5...8	143	Value ⁹				■	■
Timer instant delay ctrl.	31	9...12	143	Value ⁹				■	■
Pick-up value	31	13...16	201	1.00 %Pno = 100				■	■
Uo pick-up value	31	17...20	201	1.0 % = 10				■	■
Pick up sector size	31	21...24	144	1 ±° = 1				■	■
Operation delay	31	25...28	201	1.00 s = 100				■	■
SOL Mode	31	29...32	143	Off=0;On=1				■	■
SOL Operation delay	31	33...36	201	1.00 s = 100				■	■
Memory Mode	31	37...40	143	None=0;Voltage=1; Time=2;Both=3				■	■
Uo memory value	31	41...44	201	1.0 % = 10				■	■
Memory time	31	45...48	201	1.00 s = 100				■	■
Reset time	31	49	201	1.00 s = 100				■	■
U> setting									
Enable for U>	32	0	143	Off=0;On=1	■		■	■	■
Pick-up value	32	1...4	201	1.0 %Un = 10	■		■	■	■
Operation delay	32	5...8	201	1.00 s = 100	■		■	■	■
Reset time	32	9	201	1.00 s = 100	■		■	■	■
Hysteresis	32	10	201	1.0 % = 10	■		■	■	■
U>> setting									
Enable for U>>	33	0	143	Off=0;On=1	■		■	■	■
Pick-up value	33	1...4	201	1.0 %Un = 10	■		■	■	■
Operation delay	33	5...8	201	1.00 s = 100	■		■	■	■
Hysteresis	33	9	201	1.0 % = 10	■		■	■	■
U>>> setting									
Enable for U>>>	34	0	143	Off=0;On=1	■		■	■	■
Pick-up value	34	1...4	201	1.0 %Un = 10	■		■	■	■
Operation delay	34	5...8	201	1.00 s = 100	■		■	■	■
Hysteresis	34	9	201	1.0 % = 10	■		■	■	■
U< setting									
Enable for U<	35	0	143	Off=0;On=1	■		■	■	■
Pick-up value	35	1...4	201	1.0 %Un = 10	■		■	■	■
Operation delay	35	5...8	201	1.00 s = 100	■		■	■	■

9. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Reset time	35	9	201	1.00 s = 100	■		■	■	■
Hysteresis	35	10	201	1.0 % = 10	■		■	■	■
U<< setting									
Enable for U<<	36	0	143	Off=0;On=1	■		■	■	■
Pick-up value	36	1...4	201	1.0 %Un = 10	■		■	■	■
Operation delay	36	5...8	201	1.00 s = 100	■		■	■	■
Hysteresis	36	9	201	1.0 % = 10	■		■	■	■
U<<< setting									
Enable for U<<<	37	0	143	Off=0;On=1	■		■	■	■
Pick-up value	37	1...4	201	1.0 %Un = 10	■		■	■	■
Operation delay	37	5...8	201	1.00 s = 100	■		■	■	■
Hysteresis	37	9	201	1.0 % = 10	■		■	■	■
U1< setting									
Enable for U1<	38	0	143	Off=0;On=1			■		■
Pick-up value	38	1...4	201	1 %Vn = 1			■		■
Operation delay	38	5...8	201	1.00 s = 100			■		■
Low voltage blocking	38	9	201	1.0 %Un = 10			■		■
U1<< setting									
Enable for U1<<	39	0	143	Off=0;On=1			■		■
Pick-up value	39	1...4	201	1 %Vn = 1			■		■
Operation delay	39	5...8	201	1.00 s = 100			■		■
Low voltage blocking	39	9	201	1.0 %Un = 10			■		■
Uo> setting									
Enable for Uo>	40	0	143	Off=0;On=1	■		■	■	■
Pick-up value	40	1...4	201	1 % = 1	■		■	■	■
Operation delay	40	5...8	201	1.00 s = 100	■		■	■	■
Reset time	40	9...12	201	1.00 s = 100	■		■	■	■
Uo>> setting									
Enable for Uo>>	41	0	143	Off=0;On=1	■		■	■	■
Pick-up value	41	1...4	201	1 % = 1	■		■	■	■
Operation delay	41	5...8	201	1.00 s = 100	■		■	■	■
Reset time	41	9...12	201	1.00 s = 100	■		■	■	■
Uo>>> setting									
Enable for Uo>>>	42	0	143	Off=0;On=1	■		■	■	■
Pick-up value	42	1...4	201	1 % = 1	■		■	■	■
Operation delay	42	5...8	201	1.00 s = 100	■		■	■	■
Reset time	42	9...12	201	1.00 s = 100	■		■	■	■
fX setting									
Enable for fX	43	0	143	Off=0;On=1	■		■	■	■
Pick-up value	43	1...4	201	50.00 Hz = 5000	■		■	■	■
Operation delay	43	5...8	201	1.00 s = 100	■		■	■	■
Low voltage blocking	43	9	201	1.0 %Un = 10	■		■	■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
fXX setting									
Enable for fXX	44	0	143	Off=0;On=1	■		■	■	■
Pick-up value	44	1...4	201	50.00 Hz = 5000	■		■	■	■
Operation delay	44	5...8	201	1.00 s = 100	■		■	■	■
Low voltage blocking	44	9	201	1.0 %Un = 10	■		■	■	■
f< setting									
Enable for f<	45	0	143	Off=0;On=1	■		■	■	■
Pick-up value	45	1...4	201	50.00 Hz = 5000	■		■	■	■
Operation delay	45	5...8	201	1.00 s = 100	■		■	■	■
Low voltage blocking	45	9	201	1.0 %Un = 10	■		■	■	■
f<< setting									
Enable for f<<	46	0	143	Off=0;On=1	■		■	■	■
Pick-up value	46	1...4	201	50.00 Hz = 5000	■		■	■	■
Operation delay	46	5...8	201	1.00 s = 100	■		■	■	■
Low voltage blocking	46	9	201	1.0 %Un = 10	■		■	■	■
CBFail setting									
Enable for CB fail	47	0	143	Off=0;On=1	■	■	■	■	■
Enable CBF timer1	47	1	143	Off=0;On=1	■	■	■	■	■
Timer1 Operation Delay	47	2	201	1.00 s = 100	■	■	■	■	■
Enable CBF timer2	47	3	143	Off=0;On=1	■	■	■	■	■
Timer2 Operation Delay	47	4	201	1.00 s = 100	■	■	■	■	■
Noncurrent CBF reset mode	47	5	143	I<Only=0;PoleDead=1; ProtRst=2	■	■	■	■	■
Ext. CBF reset mode	47	6	143	I<Only=0;PoleDead=1; ProtRst=2	■	■	■	■	■
I< current set	47	7	201	1.00 xIn = 100	■	■		■	■
Io< current set	47	8	201	1.000 pu = 1000	■	■		■	■
Io'< current set	47	9	201	1.000 pu = 1000		■		■	■
Ih5> setting									
Enable for Ih5>	49	0	143	Off=0;On=1	■	■		■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Pick-up value	49	1	201	1 % = 1	■	■		■	■
Operation delay	49	2	201	1.00 s = 100	■	■		■	■
CT setting									
Enable for CT supervision	50	0	143	Off=0;On=1	■	■		■	■
CTS Operate mode	50	1	143	3I only=0;I0&U0=1; Both=2	■	■		■	■
CTS reset input	50	2	144	Value ¹⁰	■	■		■	■
Operation delay	50	3	201	1.00 s = 100	■	■		■	■
Residual current >	50	4	201	1.00 xIn = 100	■			■	■
Residual voltage <	50	5	201	1.0 %Un = 10	■			■	■
VT setting									
Enable for VTS	51	0	143	Off=0;On=1	■		■	■	■
U2> setting	51	1	201	1.0 %Vn = 10	■			■	■
I2< setting	51	2	201	1.00 xIn = 100	■			■	■
Operation delay	51	3	201	1.00 s = 100	■			■	■
Inhibit ctrl.	51	4	144	Value ¹¹	■			■	■
DI for MCB position	51	5	144	Value ¹²	■		■	■	■
I>(min) setting	51	6	201	1.00 xIn = 100	■			■	■
I<(max) setting	51	7	201	1.00 xIn = 100	■			■	■
Io'> setting									
Enable for Io'>	52	0	143	Off=0;On=1		■		■	■
Pick-up value	52	1...4	201	1.000 pu = 1000		■		■	■
Delay curve family	52	5...8	143	DT=0;IEC=1;IEEE=2; IEEE2=3;Others=4; Prg1=5;Prg2=6;Prg3=7		■		■	■
Delay type	52	9...12	143	DT=0;NI=1;VI=2;EI=3; LTI=4;LTEI=5;LTVI=6; MI=7;STI=8;STEI=9;		■		■	■

10. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35;Watchdog=36;Watchdog=37;Watchdog=38;Watchdog=39;Watchdog=40;Watchdog=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAI=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;VO3=57;VO4=58;VO5=59;VO6=60;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;F1=85;F2=86;F3=87;F4=88;F5=89;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;Watchdog=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;NI3=131;NI4=132;NI5=133;NI6=134;NI7=135;NI8=136;NI9=137;NI10=138;NI11=139;NI12=140;NI13=141;NI14=142;NI15=143;NI16=144;NI17=145;NI18=146;NI19=147;NI20=148;NI21=149;NI22=150;NI23=151;NI24=152;NI25=153;NI26=154;NI27=155;NI28=156;NI29=157;NI30=158;NI31=159;NI32=160;NI33=161;NI34=162;NI35=163;NI36=164;NI37=165;NI38=166;NI39=167;NI40=168;NI41=169;NI42=170;NI43=171;NI44=172;NI45=173;NI46=174;NI47=175;NI48=176;NI49=177;NI50=178;NI51=179;NI52=180;NI53=181;NI54=182;NI55=183;NI56=184;NI57=185;NI58=186;NI59=187;NI60=188;NI61=189;NI62=190;NI63=191;NI64=192;POC1=193;POC2=194;POC3=195;POC4=196;POC5=197;POC6=198;POC7=199;POC8=200;POC9=201;POC10=202;POC11=203;POC12=204;POC13=205;POC14=206;POC15=207;POC16=208;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240;VO7=257;VO8=258;VO9=259;VO10=260;VO11=261;VO12=262;VO13=263;VO14=264;VO15=265;VO16=266;VO17=267;VO18=268;VO19=269;VO20=270;NI65=289;NI66=290;NI67=291;NI68=292;NI69=293;NI70=294;NI71=295;NI72=296;NI73=297;NI74=298;NI75=299;NI76=300;NI77=301;NI78=302;NI79=303;NI80=304;NI81=305;NI82=306;NI83=307;NI84=308;NI85=309;NI86=310;NI87=311;NI88=312;NI89=313;NI90=314;NI91=315;NI92=316;NI93=317;NI94=318;NI95=319;NI96=320;NI97=321;NI98=322;NI99=323;NI100=324;NI101=325;NI102=326;NI103=327;NI104=328;NI105=329;NI106=330;NI107=331;NI108=332;NI109=333;NI110=334;NI111=335;NI112=336;NI113=337;NI114=338;NI115=339;NI116=340;NI117=341;NI118=342;NI119=343;NI120=344;NI121=345;NI122=346;NI123=347;NI124=348;NI125=349;NI126=350;NI127=351;NI128=352
11. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240
12. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;DI21=21;DI22=22;DI23=23;DI24=24;DI25=25;DI26=26;DI27=27;DI28=28;DI29=29;DI30=30;DI31=31;DI32=32;DI33=33;DI34=34;DI35=35;DI36=36;DI37=37;DI38=38;DI39=39;DI40=40

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
				CO8=10;RI=11;RXIDG=12					
Operation delay	52	13...16	201	1.00 s = 100		■		■	■
Inv. time coefficient	52	17...20	201	1.000 = 1000		■		■	■
Network grounding	52	21...24	143	Res=0;Cap=1		■		■	■
Reset time	52	25...28	201	1.00 s = 100		■		■	■
Inrush status for Io>	52	29...32	143	Off=0;On=1		■		■	■
SOL status for Io>	52	33...36	143	Off=0;On=1		■		■	■
SOL Operation delay	52	37...40	201	1.00 s = 100		■		■	■
SOL Inv. time coefficient	52	41...44	201	1.000 = 1000		■		■	■
CLPU status for Io>	52	45...48	143	Off=0;On=1		■		■	■
CLPU Pick-up value	52	49...52	201	1.00 xIn = 100		■		■	■
CLPU Operation delay	52	53...56	201	1.00 s = 100		■		■	■
CLPU Inv. time coefficient	52	57...60	201	1.000 = 1000		■		■	■
Reset type	52	61...64	143	DT=0;IDMT=1		■		■	■
Enable faulty phase detection	52	65	143	Off=0;On=1		■		■	■
Phase currents change limit	52	66	143	1 % = 1		■		■	■
Io>> setting									
Enable for Io>>	53	0	143	Off=0;On=1		■		■	■
Pick-up value	53	1...4	201	1.000 pu = 1000		■		■	■
Delay curve family	53	5...8	143	DT=0;IEC=1;IEEE=2;IEEE2=3;Others=4;Prg1=5;Prg2=6;Prg3=7		■		■	■
Delay type	53	9...12	143	DT=0;NI=1;VI=2;EI=3;LTI=4;LTEI=5;LTVI=6;MI=7;STI=8;STEI=9;CO8=10;RI=11;RXIDG=12		■		■	■
Operation delay	53	13...16	201	1.00 s = 100		■		■	■
Inv. time coefficient	53	17...20	201	1.000 = 1000		■		■	■
Network earthing	53	21...24	143	Res=0;Cap=1		■		■	■
Inrush status for Io>>	53	25...28	143	Off=0;On=1		■		■	■
SOL status for Io>>	53	29...32	143	Off=0;On=1		■		■	■
SOL Operation delay	53	33...36	201	1.00 s = 100		■		■	■
SOL Inv. time coefficient	53	37...40	201	1.000 = 1000		■		■	■
CLPU status for Io>>	53	41...44	143	Off=0;On=1		■		■	■
CLPU Pick-up value	53	45...48	201	1.00 xIn = 100		■		■	■
CLPU Operation delay	53	49...52	201	1.00 s = 100		■		■	■
CLPU Inv. time coefficient	53	53...56	201	1.000 = 1000		■		■	■
Reset type	53	57...60	143	DT=0;IDMT=1		■		■	■
Reset time	53	61...64	201	1.00 s = 100		■		■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Enable faulty phase detection	53	65	143	Off=0;On=1		■		■	■
Phase currents change limit	53	66	143	1 % = 1		■		■	■
Io'>>> setting									
Enable for Io'>>>	54	0	143	Off=0;On=1		■		■	■
Pick-up value	54	1...4	201	1.000 pu = 1000		■		■	■
Operation delay	54	5...8	201	1.00 s = 100		■		■	■
Network grounding	54	9...12	143	Res=0;Cap=1		■		■	■
Inrush status for Io'>>>	54	13...16	143	Off=0;On=1		■		■	■
SOL status for Io'>>>	54	17...20	143	Off=0;On=1		■		■	■
SOL Operation delay	54	21...24	201	1.00 s = 100		■		■	■
CLPU status for Io'>>>	54	25...28	143	Off=0;On=1		■		■	■
CLPU Pick-up value	54	29...32	201	1.00 xIn = 100		■		■	■
CLPU Operation delay	54	33...36	201	1.00 s = 100		■		■	■
Enable faulty phase detection	54	37	143	Off=0;On=1		■		■	■
Phase currents change limit	54	38	143	1 % = 1		■		■	■
Uc> setting									
Enable for Uc>	55	0	143	Off=0;On=1		■		■	
Pick-up value	55	1...4	201	1.00 xUcLN = 100		■		■	
Operation delay	55	5...8	201	1.0 s = 10		■		■	
df/dt> setting									
Enable for df/dt>	56	0	143	Off=0;On=1	■		■	■	
Direction of change	56	1...4	143	Negative=0;Positive=1; Either=2	■		■	■	
Pick-up value	56	5...8	201	1.0 Hz/s = 10	■		■	■	
Operation delay	56	9...12	201	1.00 s = 100	■		■	■	
Low voltage blocking	56	13	201	1.0 %Un = 10	■		■	■	
df/dt>> setting									
Enable for df/dt>>	57	0	143	Off=0;On=1	■		■	■	
Direction of change	57	1...4	143	Negative=0;Positive=1; Either=2	■		■	■	
Pick-up value	57	5...8	201	1.0 Hz/s = 10	■		■	■	
Operation delay	57	9...12	201	1.00 s = 100	■		■	■	
Low voltage blocking	57	13	201	1.0 %Un = 10	■		■	■	
IoInt> setting									
Enable for IoInt>	58	0	143	Off=0;On=1				■	
Direction mode	58	1...4	143	Forward=0;Reverse=1				■	
Uo pick-up value	58	5...8	201	1 % = 1				■	
Operation delay	58	9...12	201	1.00 s = 100				■	
Min number of peaks	58	13...16	143	1 = 1				■	

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Reset delay	58	17...20	201	1.00 s = 100				■	
Intermittent time	58	21	201	1.00 s = 100				■	
Feeder Fault Locator setting									
Pick-up value	59	0	201	1.00 xIn = 100				■	
Triggering digital input	59	1	144	Value ¹³				■	
Line reactance/unit	59	2	201	1.000 ohm = 1000				■	
Earth factor	59	3	201	1.000 = 1000				■	
Earth factor angle	59	4	144	1 ° = 1				■	
Event enabling	59	5	143	Off=0;On=1				■	
Average voltage limit	59	6	201	1.0 %Un = 10				■	
Io limit	59	7	201	1.00 xIn = 100				■	
DI timeout	59	8	201	1.00 s = 100				■	
Release timeout	59	9	201	1.00 s = 100				■	
Synchro-check 1 setting									
Enable for Synchro check 1	60	0	143	Off=0;On=1	■		■	■	■
CB object 1	60	1	143	Object 1=1;Object 2=2; Object 3=3;Object 4=4; Object 5=5;Object 6=6	■		■	■	■
CB object 2	60	2	143	Object 1=1;Object 2=2; Object 3=3;Object 4=4; Object 5=5;Object 6=6	■		■	■	■
Input for selecting Object2	60	3	144	Value ¹³	■		■	■	■
Inhibit closing unselected CB	60	4	143	Off=0;On=1	■		■	■	■
Synchronization mode	60	5	143	Off=0;Async=1;Sync=2	■		■	■	■
Voltage check mode	60	6	143	DD=1;DL=2;LD=3;DD/ DL=4;DD/LD=5;DL/LD=6; DD/DL/LD=7	■		■	■	■
CB closing time	60	7	201	1.00 s = 100	■		■	■	■
Bypass DI	60	8	144	Value ¹³	■		■	■	■
Bypass	60	9	143	1 = 1	■		■	■	■
Ok pulse length	60	10	144	1 ms = 1	■		■	■	■

13. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35;Watchdog=36;Watchdog=37;Watchdog=38;Watchdog=39;Watchdog=40;Watchdog=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAl=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;VO3=57;VO4=58;VO5=59;VO6=60;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;F1=85;F2=86;F3=87;F4=88;F5=89;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;Watchdog=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;NI3=131;NI4=132;NI5=133;NI6=134;NI7=135;NI8=136;NI9=137;NI10=138;NI11=139;NI12=140;NI13=141;NI14=142;NI15=143;NI16=144;NI17=145;NI18=146;NI19=147;NI20=148;NI21=149;NI22=150;NI23=151;NI24=152;NI25=153;NI26=154;NI27=155;NI28=156;NI29=157;NI30=158;NI31=159;NI32=160;NI33=161;NI34=162;NI35=163;NI36=164;NI37=165;NI38=166;NI39=167;NI40=168;NI41=169;NI42=170;NI43=171;NI44=172;NI45=173;NI46=174;NI47=175;NI48=176;NI49=177;NI50=178;NI51=179;NI52=180;NI53=181;NI54=182;NI55=183;NI56=184;NI57=185;NI58=186;NI59=187;NI60=188;NI61=189;NI62=190;NI63=191;NI64=192;POC1=193;POC2=194;POC3=195;POC4=196;POC5=197;POC6=198;POC7=199;POC8=200;POC9=201;POC10=202;POC11=203;POC12=204;POC13=205;POC14=206;POC15=207;POC16=208;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240;VO7=257;VO8=258;VO9=259;VO10=260;VO11=261;VO12=262;VO13=263;VO14=264;VO15=265;VO16=266;VO17=267;VO18=268;VO19=269;VO20=270;NI65=289;NI66=290;NI67=291;NI68=292;NI69=293;NI70=294;NI71=295;NI72=296;NI73=297;NI74=298;NI75=299;NI76=300;NI77=301;NI78=302;NI79=303;NI80=304;NI81=305;NI82=306;NI83=307;NI84=308;NI85=309;NI86=310;NI87=311;NI88=312;NI89=313;NI90=314;NI91=315;NI92=316;NI93=317;NI94=318;NI95=319;NI96=320;NI97=321;NI98=322;NI99=323;NI100=324;NI101=325;NI102=326;NI103=327;NI104=328;NI105=329;NI106=330;NI107=331;NI108=332;NI109=333;NI110=334;NI111=335;NI112=336;NI113=337;NI114=338;NI115=339;NI116=340;NI117=341;NI118=342;NI119=343;NI120=344;NI121=345;NI122=346;NI123=347;NI124=348;NI125=349;NI126=350;NI127=351;NI128=352

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Udead limit setting	60	11...14	201	1.0 %Un = 10	■		■	■	■
Ulive limit setting	60	15...18	201	1.0 %Un = 10	■		■	■	■
Frequency difference	60	19...22	201	50.00 Hz = 5000	■		■	■	■
Voltage difference	60	23...26	201	1.0 %Un = 10	■		■	■	■
Phase angle difference	60	27...30	144	1 ° = 1	■		■	■	■
Request timeout	60	31...34	201	1.0 s = 10	■		■	■	■
CB Monitoring setting									
Enable for CB monitoring	61	0	143	Off=0;On=1	■	■		■	■
Alarm level	61	1...2	201	1.00 kA = 100	■	■		■	■
Limit for operation left	61	3...4	201	1000 = 1000	■	■		■	■
High limit (primary value)	61	5...8	201	1.0 kA = 10	■	■		■	■
Motor status									
Motor status	62	0	143	Off=0;On=1	■	■			■
Nom motor start current	62	1	201	1.00 xIn = 100	■	■			■
Motor start detection current	62	2	201	1.00 xIn = 100	■	■			■
Motor start detection mode	62	3	143	CB Position=0;Current=1;CB & Current=2	■	■			■
Enable motor speed detection	62	4	143	Off=0;On=1	■	■			■
Motor speed input DI	62	5	144	Slot C DI1=0;Slot D DI1=1;Slot E DI1=2	■	■			■
Rated motor speed Ω_n	62	6	201	1 rpm = 1	■	■			■
Pulse per rotation	62	7	201	1 = 1	■	■			■
Zero speed confirm time	62	8	201	1 s = 1	■	■			■
SOL setting									
Enable for SOL	63	0	143	Off=0;On=1	■	■		■	■
SOL signal number	63	1	143	1=0;2=1	■	■		■	■
CB Trip Clearing time	63	2	201	1.00 s = 100	■	■		■	■
Admittance E/F Io/Uo> setting									
Enable for Io/Uo>	64	0	143	Off=0;On=1				■	■
Io input	64	1	143	Io=0;Io CSH=1;localc=2;Io'=3					■
Uo pick-up value	64	2...5	201	1.0 % = 10				■	■
Correction angle	64	6...9	144	1 ° = 1				■	■
Admittance E/F Io/Uo> YN>									
Enable for YN>	65	0	143	Off=0;On=1				■	■
Pick-up value	65	1...4	201	1.0 Yn% = 10				■	■

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Input for inhibit control	65	5...8	143	Value ¹⁴				■	■
Operation delay	65	9...12	201	1.00 s = 100				■	■
Reset time	65	13...16	201	1.00 s = 100				■	■
SOL Mode	65	17...20	143	Off=0;On=1				■	■
SOL Operation delay	65	21...24	201	1.00 s = 100				■	■
Admittance E/F Io/Uo> GN>									
Enable for GN>	66	0	143	Off=0;On=1				■	■
Pick-up value	66	1...4	201	1.0 Gn% = 10				■	■
Input for inhibit control	66	5...8	143	Value ¹⁴				■	■
Direction mode	66	9...12	143	Udir=0;Forward=1; Reverse=2				■	■
Operation delay	66	13...16	201	1.00 s = 100				■	■
Reset time	66	17...20	201	1.00 s = 100				■	■
SOL Mode	66	21...24	143	Off=0;On=1				■	■
SOL Operation delay	66	25...28	201	1.00 s = 100				■	■
Admittance E/F Io/Uo> BN>									
Enable for BN>	67	0	143	Off=0;On=1				■	■
Pick-up value	67	1...4	201	1.0 Bn% = 10				■	■
Input for inhibit control	67	5...8	143	Value ¹⁴				■	■
Direction mode	67	9...12	143	Udir=0;Forward=1; Reverse=2				■	■
Operation delay	67	13...16	201	1.00 s = 100				■	■
Reset time	67	17...20	201	1.00 s = 100				■	■
SOL Mode	67	21...24	143	Off=0;On=1				■	■
SOL Operation delay	67	25...28	201	1.00 s = 100				■	■
Admittance E/F Io/Uo>> setting									
Enable for Io/Uo>>	68	0	143	Off=0;On=1				■	■
Io input	68	1	143	Io=0;Io CSH=1;localc=2;Io'=3					■
Uo pick-up value	68	2...5	201	1.0 % = 10				■	■
Angle correction	68	6...9	144	1 ° = 1				■	■
Admittance E/F Io/Uo> YN>>									
Enable for YN>>	69	0	143	Off=0;On=1				■	■
Pick-up value	69	1...4	201	1.0 Yn% = 10				■	■
Input for inhibit control	69	5...8	143	Value ¹⁴				■	■
Operation delay	69	9...12	201	1.00 s = 100				■	■
Reset time	69	13...16	201	1.00 s = 100				■	■
SOL Mode	69	17...20	143	Off=0;On=1				■	■
SOL Operation delay	69	21...24	201	1.00 s = 100				■	■

14. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Admittance E/F Io/Uo>> GN>									
Enable for GN>>	70	0	143	Off=0;On=1				■	■
Pick-up value	70	1...4	201	1.0 Gn% = 10				■	■
Input for inhibit control	70	5...8	143	Value ¹⁵				■	■
Direction mode	70	9...12	143	Undir=0;Forward=1; Reverse=2				■	■
Operation delay	70	13...16	201	1.00 s = 100				■	■
Reset time	70	17...20	201	1.00 s = 100				■	■
SOL Mode	70	21...24	143	Off=0;On=1				■	■
SOL Operation delay	70	25...28	201	1.00 s = 100				■	■
Admittance E/F Io/Uo>> BN>									
Enable for BN>>	71	0	143	Off=0;On=1				■	■
Pick-up value	71	1...4	201	1.0 Bn% = 10				■	■
Input for inhibit control	71	5...8	143	Value ¹⁵				■	■
Direction mode	71	9...12	143	Undir=0;Forward=1; Reverse=2				■	■
Operation delay	71	13...16	201	1.00 s = 100				■	■
Reset time	71	17...20	201	1.00 s = 100				■	■
SOL Mode	71	21...24	143	Off=0;On=1				■	■
SOL Operation delay	71	25...28	201	1.00 s = 100				■	■
U2> setting									
Enable for U2>	72	0	143	Off=0;On=1	■		■	■	■
VTS Operating Mode	72	1...4	143	NO ACTION=0; BLOCKING=1	■		■	■	■
Pick-up value	72	5...8	201	1.0 %Un = 10	■		■	■	■
Delay type	72	9...12	143	DT=0;INV=1	■		■	■	■
Operation delay	72	13...16	201	1.00 s = 100	■		■	■	■
Reset time	72	17...20	201	1.00 s = 100	■		■	■	■
U2>> setting									
Enable for U2>>	73	0	143	Off=0;On=1	■		■	■	■
VTS Operating Mode	73	1...4	143	NO ACTION=0; BLOCKING=1	■		■	■	■
Pick-up value	73	5...8	201	1.0 %Un = 10	■		■	■	■
Delay type	73	9...12	143	DT=0;INV=1	■		■	■	■
Operation delay	73	13...16	201	1.00 s = 100	■		■	■	■
Reset time	73	17...20	201	1.00 s = 100	■		■	■	■
Motor overspeed Ω>									
Enable for Ω>	74	0	143	Off=0;On=1	■	■			■
Pick-up value	74	1	201	1 %Ωn = 1	■	■			■
Operation delay	74	2	201	1 s = 1	■	■			■

15. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240

Name	FUN	INF	ASDU	Scaling	P5U20 LPCT/LPVT	P5U20	P5V20	P5F30	P5M30
Motor overspeed $\Omega >>$									
Enable for $\Omega >$	75	0	143	Off=0;On=1	■	■			■
Pick-up value	75	1	201	1 % Ω_n = 1	■	■			■
Operation delay	75	2	201	1 s = 1	■	■			■
Motor underspeed Ω									
Enable for $\Omega <<$	76	0	143	Off=0;On=1	■	■			■
Pick-up value	76	1	201	1 % Ω_n = 1	■	■			■
Operation delay	76	2	201	1 s = 1	■	■			■
Motor underspeed $\Omega <$									
Enable for $\Omega <<$	77	0	143	Off=0;On=1	■	■			■
Pick-up value	77	1	201	1 % Ω_n = 1	■	■			■
Operation delay	77	2	201	1 s = 1	■	■			■
Motor Anti-backspin ABS									
Enable motor anti-backspin	78	0	143	Off=0;On=1	■	■			■
Measured Zero Speed Mode	78	1	143	Off=0;On=1	■	■			■
Zero speed external mode	78	2	143	Off=0;On=1	■	■			■
Zero speed input DI	78	3	144	Value ¹⁶	■	■			■
Anti-backspin Time	78	4	201	1 s = 1	■	■			■
Cold load pick-up CLPU									
Enable for CLPU	79	0	143	Off=0;On=1	■	■			■
Idle current	79	1	201	1.00 xIn = 100	■	■			■
Pickup current	79	2	201	1.00 xIn = 100	■	■			■
CLPU dead time	79	3	201	1.00 s = 100	■	■			■
CLPU time delay	79	4	201	1.00 s = 100	■	■			■

16. DI1(B)=1;DI2(B)=2;DI3(B)=3;DI4(B)=4;DI1(C)=5;DI2(C)=6;DI3(C)=7;DI4(C)=8;DI5(C)=9;DI6(C)=10;DI1(D)=11;DI2(D)=12;DI3(D)=13;DI1(E)=14;DI2(E)=15;DI3(E)=16;DI4(E)=17;DI5(E)=18;DI6(E)=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35;Watchdog=36;Watchdog=37;Watchdog=38;Watchdog=39;Watchdog=40;Watchdog=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAl=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;VO3=57;VO4=58;VO5=59;VO6=60;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;F1=85;F2=86;F3=87;F4=88;F5=89;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;Watchdog=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;NI3=131;NI4=132;NI5=133;NI6=134;NI7=135;NI8=136;NI9=137;NI10=138;NI11=139;NI12=140;NI13=141;NI14=142;NI15=143;NI16=144;NI17=145;NI18=146;NI19=147;NI20=148;NI21=149;NI22=150;NI23=151;NI24=152;NI25=153;NI26=154;NI27=155;NI28=156;NI29=157;NI30=158;NI31=159;NI32=160;NI33=161;NI34=162;NI35=163;NI36=164;NI37=165;NI38=166;NI39=167;NI40=168;NI41=169;NI42=170;NI43=171;NI44=172;NI45=173;NI46=174;NI47=175;NI48=176;NI49=177;NI50=178;NI51=179;NI52=180;NI53=181;NI54=182;NI55=183;NI56=184;NI57=185;NI58=186;NI59=187;NI60=188;NI61=189;NI62=190;NI63=191;NI64=192;POC1=193;POC2=194;POC3=195;POC4=196;POC5=197;POC6=198;POC7=199;POC8=200;POC9=201;POC10=202;POC11=203;POC12=204;POC13=205;POC14=206;POC15=207;POC16=208;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240;VO7=257;VO8=258;VO9=259;VO10=260;VO11=261;VO12=262;VO13=263;VO14=264;VO15=265;VO16=266;VO17=267;VO18=268;VO19=269;VO20=270;NI65=289;NI66=290;NI67=291;NI68=292;NI69=293;NI70=294;NI71=295;NI72=296;NI73=297;NI74=298;NI75=299;NI76=300;NI77=301;NI78=302;NI79=303;NI80=304;NI81=305;NI82=306;NI83=307;NI84=308;NI85=309;NI86=310;NI87=311;NI88=312;NI89=313;NI90=314;NI91=315;NI92=316;NI93=317;NI94=318;NI95=319;NI96=320;NI97=321;NI98=322;NI99=323;NI100=324;NI101=325;NI102=326;NI103=327;NI104=328;NI105=329;NI106=330;NI107=331;NI108=332;NI109=333;NI110=334;NI111=335;NI112=336;NI113=337;NI114=338;NI115=339;NI116=340;NI117=341;NI118=342;NI119=343;NI120=344;NI121=345;NI122=346;NI123=347;NI124=348;NI125=349;NI126=350;NI127=351;NI128=352

Modbus slave

Presentation

The Modbus interface is a master/slave protocol defined by the Modbus organisation.

For more information on the Modbus protocol, visit www.modbus.org.

It is used to exchange information between a master and one or more slave units, identified by a number. It implements request-reply dialog, where requests are always initiated by the master. Modbus exists in ASCII and binary (RTU mode) formats. Data is exchanged in the form of 16-bit words (also called registers¹⁷) or simply bits. Each piece of information (bit or register) has a 16-bit address. Modbus is a data-transmission protocol in charge of communication using serial link or Ethernet links.

Modbus TCP/IP offers the same functionality as Modbus over a serial link, as well as compatibility with multi-master architectures. Each TCP/IP can be configured as Modbus slave mode. The maximum number of Modbus slaves in the device is 4 (3 Modbus TCP/IP plus 1 Modbus over a serial link). All the connections are on the same Modbus slave address.

Function description

The Modbus slave can communicate with masters using either of two transmission modes:

- Serial RTU mode
- TCP/IP mode

The Modbus slave can communicate with the master through the serial port and Ethernet port at the same time.

The Modbus slave can be configured to work at max. 3 IP addresses.

The maximal number of clients for Modbus slave is 8. The client and master can be connected by either:

- a serial port connection
- a TCP connection via an Ethernet port

The Modbus slave supports the following functions and services:

- Binary status
- Measurement values
- Remote control
- Time synchronisation
- Event record
- Diagnostics
- Setting
- File transfer

Modbus protocol data unit

Every Modbus request or response frame includes a Modbus PDU (protocol data unit) made up of 2 fields.

- Function code (1 byte): indicates the type of request (1 to 127)
- Data (0 to n bytes): depends on the function code

The function codes in the reply and in the request are identical.

17. The register address sent via Modbus is one less than that indicated by a Easergy P5 protection relay.

Function codes

The function codes listed in the table below are supported.

Table 35 - Modbus function codes

Function Codes	Address Space
03	Read Holding Registers
04	Read Input Registers
06	Write single register
07 ¹⁸	Read Exception Status
08 ¹⁸	Diagnostic
11	Get Comm Event Counter
16	Write multiple registers
23	Read/Write multiple registers
43/14	Read Device Identification

The following function codes are not supported, as the binary status value are treated as register and there is no area for them.

- 1 - Read coils
- 2 - Read discrete inputs
- 5 - Write single coil
- 15 - Write multiple coils

The sub-function of diagnostic supported are listing below:

- 0 - Return Query Data (Only the first two bytes' data are returned)
- 1 - Restart Communications Option
- 2 - Return Diagnostic Register (always zero)
- 4 - Force Listen Only Mode

Modbus serial link frames

All the frames exchanged have the same structure, made up of 3 parts:

- Slave address (1 byte): from 1 to 247 (0 for broadcasting)
- Modbus PDU: as previously described
- Check (2 bytes): CRC16 used to check frame integrity

The slave addresses in the reply and in the request are identical.

The maximum size of a frame is 256 bytes.

Synchronisation of exchanges

Any character that is received after a silence of more than 3.5 characters is considered as the beginning of a new frame. A minimum silence of 3.5 characters is always observed between two frames.

A slave disregards all frames:

- Received with a physical error for 1 or more characters (format error, parity error, etc.)
- With an incorrect CRC16 result
- For which it is not the recipient.

The slave addresses in the reply and in the request are identical.

18. This function code is only available for serial communication.

The maximum size of a frame is 256 bytes.

Broadcasting

The master can also address all slaves using the conventional address 0. This type of exchange is called broadcasting. Slaves do not respond to broadcast messages. As a result, only messages that do not require the transmission of data by the slaves can be broadcast.

Response time

The communication coupler response time (T_r) is less than 15 ms, including a 3-character silence (approximately 3 ms at 9600 bauds).

This time is given with the following parameters:

- 9600 bauds
- Format: 8 bits, odd parity, 1 stop bit

Modbus serial RTU mode configuration

The Modbus RTU protocol is activated by selecting the 'ModBusSlv' option for the 'Remote port protocol' of the Easergy P5 protection relay serial port. This setting can be found by navigating to the Protocol configuration view in the COMMUNICATION menu in eSetup Easergy Pro. The following figures show how to enable the Modbus protocol on the Remote port of an Easergy P5 protection relay.

Protocol configuration

Remote port

Remote port protocol	ModBusSlv	Clear Clear Clear
Message counter	IEC-103	
Error counter	DNP3	
Timeout counter	IEC-101	
	0	

The protocol can also be enabled via the front panel or Web HMI.

Once the protocol has been activated, it can be configured. This is done in the Modbus main configuration view of the COMMUNICATION menu. In the Modbus main configuration view, the Modbus Slave Address (or number), the bit rate, the parity of the connection, the wire number and polling line can be set. The frame gap is fixed.

Figure 3 - Modbus slave main configuration

Modbus slave main configuration

Slave number:	1	
Speed of transmission:	9600	bps ↺
Parity:	Even	↺
Number of wires:	2	↺
Poll line activation:	False	↺
Frame Gap (bits):	38	
Enable Legacy points:	☐	↺

Table 36 - Modbus slave main configuration parameters

Parameter	Value	Description
Slave number	1...247	The Modbus slave address
Speed of transmission	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps	The communication speed, bits per second
Parity	None, Even, Odd	The type of parity bit used
Number of wires	2, 4	The number of wire connection
Poll line activation	False, True	The polarity of the wire connection
Frame Gap		Specifies the amount of time (calculated by bits) to use to determine that a frame has been completed. For Modbus RTU this value is fixed at 38 bits.
Enable legacy points	On, Off	The standard point list will show-up once checked.

NOTE: The parity and bit rate are set to the same value on all devices connected to the same data link.

Modbus TCP mode configuration

Modbus TCP (or Modbus TCP/IP) is simply the Modbus RTU protocol with a TCP interface that runs on Ethernet. TCP/IP refers to the Transmission Control Protocol and Internet Protocol which provide the transmission medium for Modbus TCP/IP messaging. In practice, Modbus TCP embeds a standard Modbus data frame into a TCP frame.

One advantage over serial Modbus (RTU or ASCII) is that the number of nodes is not limited to 247 on one data link, since the addressing of nodes is done with the Internet Protocol. Furthermore, several devices can be connected to one IP address, provided the appropriate equipment is used (some Modbus TCP-to-Modbus RTU bridge). These devices are differentiated from each other with a Unit Identifier, in the TCP frame, which corresponds to the Slave ID. The range of the Unit Identifier is also 1-247. In Easergy P5 protection relays the Modbus Slave ID corresponds to the Unit Identifier when Modbus TCP is used, see [Modbus slave main configuration](#), page 93.

The Modbus TCP protocol is activated by first configuring the Ethernet port settings in the **Ethernet (Slot M)** element view which can be found in the **COMMUNICATION** menu / **Protocol configuration** sub-menu via eSetup Easergy Pro. First, the IP address, Subnet mask and Gateway are set, and require a static IP address to be configured. This is considered before connecting a relay to an existing network, so that no conflicts emerge.

Once these settings have been configured, one of the Ethernet port protocol selections can be set to "ModBusTCPs" (Modbus TCP, slave). Before the protocol is activated, a device reboot is required.

NOTE: There are three Ethernet protocols, "Ethernet Protocol 1", "Ethernet Protocol 2" and "Ethernet Protocol 3", that is, three independent sockets for three different protocols. The default TCP IP port for Modbus TCP is 502.

Ethernet Protocol 1

Ethernet port protocol:
ModBusTCPs

IP port for protocol 1:
502

Set protocol default IP port:
-

Message counter:
0
Clear

Error counter:
0
Clear

Timeout counter:
0
Clear

IP address selection:
IP 1

Ethernet Protocol 2

Ethernet port protocol 2nd inst:
EtherNet/IP

IP port for protocol 2:
44818

Set protocol default IP port:
-

Message counter:
0
Clear

Error counter:
0
Clear

Timeout counter:
0
Clear

IP address selection:
IP 1

Data access, such as reading and writing to holding registers, event reading, clock synchronisation and scaling work, with the addition that clock synchronisation also can be done by using Simple Network Time Protocol (SNTP). This requires a NTP server, the address of which is set in the Protocol configuration view in eSetup Easergy Pro or Web HMI.

Disturbance Recorder transfer

Modbus slave supports Disturbance Recorder (DR) (including two COMTRADE files, .cfg and .dat) transfer to Modbus master. These two files are downloaded by SCADA with the file read function (Modbus function code 20).

Steps for how to read the waveforms are as follows:

1. Check at regular intervals the waveform header register.
2. Read header registers to determine the file number(s) of the new waveform(s) to be downloaded.
3. Download the waveform files with the file read method.

NOTE:

The maximum number of registers that can be read in a Modbus file record is 124 and the first register is reserved for recording the metadata. The maximum number of records in a file is 65536 and each register is 2 bytes. Therefore, the maximum file size is $65536 \times 123 \times 2 = 16,121,856$ bytes = 15.375 MB. So Modbus slave will refuse to transfer any COMTRADE file whose size is larger than 15.375 MB.

Read exception status

This function code 7 is used to read the contents of eight exception status. Eight bits make up one byte.

The following table shows the status supported:

Table 37 - Read exception status

Bit	Status	Description
0	Test Mode	If test mode is not in normal, set bit 0.
1	Time Synchronisation	If the synchronising source is internal, set bit 1.
2	New Event	If a new event is generated, set bit 2.
3	Hardware Status	If the hardware has problem, set bit 3.
4...7	Reserved	

Read device identification

Both basic and regular device identification are supported though function code 43 and 14. The Modbus slave will respond with the exception code 3 if receive the unsupported category.

Table 38 - Read device identification

Object ID	Object Name	Value
0x00	VendorName	Schneider Electric
0x01	ProductCode	If P5U20: 16700 If P5V20: 16701 If P5M30: 16702 If P5F30: 16703 If P5U20 LPCT/LPVT: 16707
0x02	MajorMinorRevision	11 chars, e.g. 001.300.003
0x03	VendorUrl	http://www.se.com
0x04	ProductName (product range)	Easergy P5
0x05	ModelName	P5U20 / P5V20 / P5F30 / P5M30 / P5U20 LPCT/LPVT depending on type
0x06	UserApplicationName	If P5U20: Universal current protection If P5V20: Voltage and Frequency protection If P5F30: Directional Feeder and Transformer protection If P5M30: Motor protection If P5U20 LPCT/LPVT: Universal current protection with LPCT/LPVT

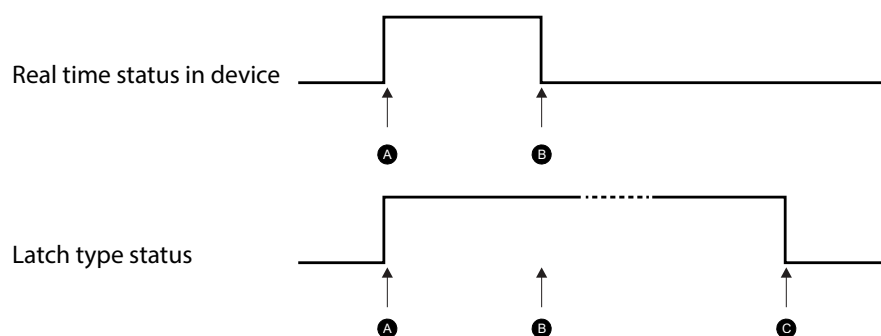
Latch status feature for PDM Modbus

Because of the latch type status registers, the user can see the status of the trip signal until the register is reset.

Latch type status registers remain in active when the real status of the trip signal is true or the latch status registers are not released. When the real time status in the P5 device is inactive, latch status registers can be released in two ways:

- Release all the latch status registers by writing “0” to the register named “release all latch status”.
- Release individual latch status by writing “0” to the individual latch status register.

Latch statuses registers are not stored in Non-Volatile Memory. They will be reset after the reboot.



P533P9A

A Trip occurs

B Trip condition is false

C User releases latched status

Events

Events for standard Modbus

The event buffer of Easergy P5 protection relays can be read via the Modbus Protocol. This is done by reading one event at a time, from holding registers 2101...2105. The event registers contain the latest event, and are cleared when they are read. Only 49 latest events can be extracted via the Modbus Protocol. The registers are then updated to contain the following event from the event buffer. A description of the registers is shown in the table. The Event buffer view can be found by navigating to LOGS menu in eSetup Easergy Pro.

Table 39 - Description of events in holding registers

Holding Register ¹⁹	Content
2101	Event code Refer to event code list table for details.
2102	Event timestamp Bits 15-6 = milliseconds Bits 5-0 = seconds
2103	Event timestamp Upper byte = minute Lower byte = hour
2104	Event timestamp Upper byte = day Lower byte = month
2105	Event timestamp, year

Events for PDM Modbus

Power Data Model (PDM) needs specific format to record event logs and maintains a table to memory event logs. The table contains a table descriptor and a list of events. PDM defines 100 logs for the events as First Input First Output (FIFO). Each event log has 12 registers. The user can poll the table descriptor registers to check whether a new event is created.

19. The register address sent via Modbus is one less than that indicated by a Easergy P5 protection relay. To clarify: if the holding register address 2101 is sent over a Modbus data link, the frame will indicate that the address of the holding register is 2100.

Table 40 - Description of events in holding registers

Holding Register ²⁰	Content
23401	Event log version
23402	Event buffer size
23403	Actual number of events Starts from 0 and increases up to the maximum capacity
23404	Most recent event entry number
23405	Most recent event entry position
23406	Oldest event position
23407-24606	Events

The format of the event log is as below:

Table 41 - The structure of an event log

Address	Size	Field description
Word1	1	Entry number (log index)
Word2	4	Date and time of the event
Word3		
Word4		
Word5		
Word6	1	Reserved
Word7	1	Event code
Word8	4	Reserved
Word9		
Word10		
Word11		
Word12	1	Reserved

An event record is defined by three elements:

- Entry number
This is a log index that is incremented by one at each time there is a new event. It is an unsigned 16 bits integer. It will return to 0x0000 after reaching 0xFFFF.
- Timestamp
This identifies the occurrence of this event. The format is consistent with above date/time format.
- Event code
This identifies the event code of this event.

Event code list

The event code list indicates the events of Easergy P5 protection relays sent via Modbus. The event code is shown in Event buffer view of eSetup Easergy Pro with the format of xEy. The decimal value of event code sent via Modbus is: $x * 64 + y$.

For example, the event “DI1(C) on” is generated in Easergy P5 protection relay. The event code is 00E9, so the code value 9 ($00 * 64 + 9 = 9$) is sent via Modbus.

20. The register address sent via Modbus is one less than that indicated by a Easergy P5 protection relay. To clarify: if the holding register address 2101 is sent over a Modbus data link, the frame will indicate that the address of the holding register is 2100.

The following list applies to both standard Modbus and PDM Modbus.

Table 42 - Event code list

Event code	Description	Alarm	Code value (decimal)
00E1	DI1 on		1
00E2	DI1 off		2
00E3	DI2 on		3
00E4	DI2 off		4
00E5	DI3 on		5
00E6	DI3 off		
00E7	DI4 on		7
00E8	DI4 off		8
00E9	DI5 on		9
00E10	DI5 off		10
00E11	DI6 on		11
00E12	DI6 off		12
00E13	DI7 on		13
00E14	DI7 off		14
00E15	DI8 on		15
00E16	DI8 off		16
00E17	DI9 on		17
00E18	DI9 off		18
00E19	DI10 on		19
00E20	DI10 off		20
00E21	DI11 on		21
00E22	DI11 off		22
00E23	DI12 on		23
00E24	DI12 off		24
00E25	DI13 on		25
00E26	DI13 off		26
00E27	DI14 on		27
00E28	DI14 off		28
00E29	DI15 on		29
00E30	DI15 off		30
00E31	DI16 on		31
00E32	DI16 off		32
00E33	DI17 on		33
00E34	DI17 off		34
00E35	DI18 on		35
00E36	DI18 off		36
00E37	DI19 on		37
00E38	DI19 off		38
00E39	DI20 on		39
00E40	DI20 off		40
00E42	Comtrade file ready		42
00E43	Disturbance rec. deleted		43

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
00E44	Disturbance rec. overwritten		44
00E45	LED state changed		45
00E46	Disturbance rec. memory freed		46
00E47	Disturbance rec. memory full		47
00E48	Disturbance recording		48
00E49	Xfault1 distance	Yes	49
00E50	Device restart		50
00E56	SelfDiag alarm		56
00E57	SelfDiag alarm off		57
00E58	L1 Trip		58
00E59	L1 Trip off		59
00E60	L2 Trip		60
00E61	L2 Trip off		61
00E62	L3 Trip		62
00E63	L3 Trip off		63
01E01	I> Start On		65
01E02	I> Trip On	Yes	66
01E03	I> Start Off		67
01E04	I> Trip off		68
02E01	I>> Start On		129
02E02	I>> Trip On	Yes	130
02E03	I>> Start Off		131
02E04	I>> Trip off		132
03E01	I>>> Start On		193
03E02	I>>> Trip On	Yes	194
03E03	I>>> Start Off		195
03E04	I>>> Trip off		196
05E01	I2/I1 Start On		321
05E02	I2/I1 Trip On	Yes	322
05E03	I2/I1 Start Off		323
05E04	I2/I1 Trip off		324
08E01	I ϕ > Start On		513
08E02	I ϕ > Trip On	Yes	514
08E03	I ϕ > Start Off		515
08E04	I ϕ > Trip off		516
09E01	I ϕ >> Start On		577
09E02	I ϕ >> Trip On	Yes	578
09E03	I ϕ >> Start Off		579
09E04	I ϕ >> Trip off		580
10E01	I ϕ >>> Start On		641
10E02	I ϕ >>> Trip On	Yes	642

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
10E03	I ϕ >>> Start Off		643
10E04	I ϕ >>> Trip off		644
11E01	I ϕ >>>> Start On		705
11E02	I ϕ >>>> Trip On	Yes	706
11E03	I ϕ >>>> Start Off		707
11E04	I ϕ >>>> Trip off		708
13E01	I< Start On		833
13E02	I< Trip On	Yes	834
13E03	I< Start Off		835
13E04	I< Trip off		836
14E01	T> Start On		897
14E02	T> Trip On	Yes	898
14E03	T> Start Off		899
14E04	T> Trip off		900
14E11	Thm.level feeder alarm	Yes	907
14E12	Thm.level feeder alarm off		908
14E13	Thm.rsv feeder alarm	Yes	909
14E14	Thm.rsv feeder alarm off		910
14E15	Feeder heating alarm	Yes	911
14E16	Feeder heating alarm off		912
16E01	Ist> Start On		1025
16E02	Ist> Trip On	Yes	1026
16E03	Ist> Start Off		1027
16E04	Ist> Trip off		1028
19E1	Overcurrent alarm		1217
19E2	Overcurrent Trip		1218
19E3	Overcurrent alarm off		1219
19E4	O/C Trip off		1220
19E5	E/F alarm		1221
19E6	E/F Trip		1222
19E7	E/F alarm off		1223
19E8	E/F Trip off		1224
19E10	L1 alarm		1226
19E11	L1 alarm off		1227
19E12	L2 alarm		1228
19E13	L2 alarm off		1229
19E14	L3 alarm		1230
19E15	L3 alarm off		1231
20E01	Io> Start On		1281
20E02	Io> Trip On	Yes	1282
20E03	Io> Start Off		1283
20E04	Io> Trip off		1284

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
21E01	Io>> Start On		1345
21E02	Io>> Trip On	Yes	1346
21E03	Io>> Start Off		1347
21E04	Io>> Trip off		1348
22E01	Io>>>> Start On		1409
22E02	Io>>>> Trip On	Yes	1410
22E03	Io>>>> Start Off		1411
22E04	Io>>>> Trip off		1412
23E01	Ioφ> Start On		1473
23E02	Ioφ> Trip On	Yes	1474
23E03	Ioφ> Start Off		1475
23E04	Ioφ> Trip off		1476
24E01	Ioφ>> Start On		1537
24E02	Ioφ>> Trip On	Yes	1538
24E03	Ioφ>> Start Off		1539
24E04	Ioφ>> Trip off		1540
25E01	Io>>> Start On		1601
25E02	Io>>> Trip On	Yes	1602
25E03	Io>>> Start Off		1603
25E04	Io>>> Trip off		1604
25E11	Io>>> Trig unbalance	Yes	1611
25E12	Io>>> Trig off unbalance	Yes	1612
26E01	Io>>>> Start On		1665
26E02	Io>>>> Trip On	Yes	1666
26E03	Io>>>> Start Off		1667
26E04	Io>>>> Trip off		1668
26E11	Io>>>> Trig unbalance	Yes	1675
26E12	Io>>>> Trig off unbalance	Yes	1676
30E01	U> Start On		1921
30E02	U> Trip On	Yes	1922
30E03	U> Start Off		1923
30E04	U> Trip off		1924
31E01	U>> Start On		1985
31E02	U>> Trip On	Yes	1986
31E03	U>> Start Off		1987
31E04	U>> Trip off		1988
32E01	U< Start On		2049
32E02	U< Trip On	Yes	2050
32E03	U< Start Off		2051
32E04	U< Trip off		2052
33E01	U<< Start On		2113

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
33E02	U<< Trip On	Yes	2114
33E03	U<< Start Off		2115
33E04	U<< Trip off		2116
34E01	U1< Start On		2177
34E02	U1< Trip On	Yes	2178
34E03	U1< Start Off		2179
34E04	U1< Trip off		2180
35E01	U1<< Start On		2241
35E02	U1<< Trip On	Yes	2242
35E03	U1<< Start Off		2243
35E04	U1<< Trip off		2244
36E01	Uo> Start On		2305
36E02	Uo> Trip On	Yes	2306
36E03	Uo> Start Off		2307
36E04	Uo> Trip off		2308
37E01	Uo>> Start On		2369
37E02	Uo>> Trip On	Yes	2370
37E03	Uo>> Start Off		2371
37E04	Uo>> Trip off		2372
38E01	U>>> Start On		2433
38E02	U>>> Trip On	Yes	2434
38E03	U>>> Start Off		2435
38E04	U>>> Trip off		2436
39E01	U<<< Start On		2497
39E02	U<<< Trip On	Yes	2498
39E03	U<<< Start Off		2499
39E04	U<<< Trip off		2500
40E01	P< Start On		2561
40E02	P< Trip On	Yes	2562
40E03	P< Start Off		2563
40E04	P< Trip off		2564
41E01	P<< Start On		2625
41E02	P<< Trip On	Yes	2626
41E03	P<< Start Off		2627
41E04	P<< Trip off		2628
46E01	Prg1 Start On		2945
46E02	Prg1 Trip On	Yes	2946
46E03	Prg1 Start Off		2947
46E04	Prg1 Trip off		2948
47E01	Prg2 Start On		3009
47E02	Prg2 Trip On	Yes	3010

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
47E03	Prg2 Start Off		3011
47E04	Prg2 Trip off		3012
48E01	Prg3 Start On		3073
48E02	Prg3 Trip On	Yes	3074
48E03	Prg3 Start Off		3075
48E04	Prg3 Trip off		3076
49E01	Prg4 Start On		3137
49E02	Prg4 Trip On	Yes	3138
49E03	Prg4 Start Off		3139
49E04	Prg4 Trip off		3140
50E01	fX Start On		3201
50E02	fX Trip On	Yes	3202
50E03	fX Start Off		3203
50E04	fX Trip off		3204
51E01	fXX Start On		3265
51E02	fXX Trip On	Yes	3266
51E03	fXX Start Off		3267
51E04	fXX Trip off		3268
52E01	f< Start On		3329
52E02	f< Trip On	Yes	3330
52E03	f< Start Off		3331
52E04	f< Trip off		3332
53E01	f<< Start On		3393
53E02	f<< Trip On	Yes	3394
53E03	f<< Start Off		3395
53E04	f<< Trip off		3396
54E01	df/dt Start On		3457
54E02	df/dt Trip On	Yes	3458
54E03	df/dt Start Off		3459
54E04	df/dt Trip off		3460
56E01	Prg5 Start On		3585
56E02	Prg5 Trip On	Yes	3586
56E03	Prg5 Start Off		3587
56E04	Prg5 Trip off		3588
57E01	Prg6 Start On		3649
57E02	Prg6 Trip On	Yes	3650
57E03	Prg6 Start Off		3651
57E04	Prg6 Trip off		3652
58E01	Prg7 Start On		3713
58E02	Prg7 Trip On	Yes	3714
58E03	Prg7 Start Off		3715

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
58E04	Prg7 Trip off		3716
59E01	Prg8 Start On		3777
59E02	Prg8 Trip On	Yes	3778
59E03	Prg8 Start Off		3779
59E04	Prg8 Trip off		3780
60E1	CB Fail 1 Trip On	Yes	3841
60E2	CB Fail 2 Trip On	Yes	3842
60E3	CB Fail 1 Trip Off		3843
60E4	CB Fail 2 Trip Off		3844
61E1	AR request 1	Yes	3905
61E2	AR request 2	Yes	3906
61E3	AR request 3	Yes	3907
61E4	AR request 4	Yes	3908
61E5	AR request 5		3909
61E6	AR shot 1 start	Yes	3910
61E7	AR shot 2 start	Yes	3911
61E8	AR shot 3 start	Yes	3912
61E9	AR shot 4 start	Yes	3913
61E10	AR shot 5 start		3914
61E11	Direct trip AR request	Yes	3915
61E12	Recloser locked	Yes	3916
61E13	Recloser running	Yes	3917
61E14	Final trip	Yes	3918
61E15	AR1 req end	Yes	3919
61E16	AR2 req end	Yes	3920
61E17	AR3 req end	Yes	3921
61E18	AR4 req end	Yes	3922
61E19	AR5 req end		3923
61E20	AR shot 1 end	Yes	3924
61E21	AR shot 2 end	Yes	3925
61E22	AR shot 3 end	Yes	3926
61E23	AR shot 4 end	Yes	3927
61E24	AR shot 5 end	Yes	3928
61E25	Direct final AR end	Yes	3929
61E26	Auto-Recloser unlocked	Yes	3930
61E27	Auto-Recloser stopped	Yes	3931
61E28	Final trip end	Yes	3932
61E29	AR enabled	Yes	3933
61E30	AR disabled	Yes	3934
61E31	AR direct trip	Yes	3935
61E32	AR1 final trip	Yes	3936

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
61E33	AR2 final trip	Yes	3937
61E34	AR3 final trip	Yes	3938
61E35	AR4 final trip	Yes	3939
61E36	Crit. final trip off		3940
61E37	AR1 final trip off	Yes	3941
61E38	AR2 final trip off	Yes	3942
61E39	AR3 final trip off	Yes	3943
61E40	AR4 final trip off	Yes	3944
62E1	N> alarm on		3969
62E2	Motor start disable		3970
62E3	N> alarm off		3971
62E4	Motor start enable		3972
63E1	Motor starting		4033
63E2	Motor running		4034
63E3	Motor zero speed		4035
63E4	Motor stopped		4036
63E5	Motor zero speed Off		4037
64E1	Voltage int. on		4097
64E2	Voltage int. off		4098
64E10	Voltage sag on		4106
64E11	Voltage sag off		4107
64E12	Voltage swell on		4108
64E13	Voltage swell off		4109
64E14	Voltage sag timeout		4110
64E15	Voltage swell timeout		4111
64E28	Start of DST		4124
64E29	End of DST		4125
64E30	EF Distance on		4126
64E31	EFD calc. ready	Yes	4127
64E32	Xfault2 distance	Yes	4128
64E40	Manual timer control		4136
64E41	Manual timer ctrl off		4137
64E42	Timer 1 on		4138
64E43	Timer 1 off		4139
64E44	Timer 2 on		4140
64E45	Timer 2 off		4141
64E46	Timer 3 on		4142
64E47	Timer 3 off		4143
64E48	Timer 4 on		4144
64E49	Timer 4 off		4145
65E1	TCS alarm on		4161
65E2	TCS alarm off		4162

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
65E3	Logic output 2 on		4163
65E4	Logic output 2 off		4164
65E5	Logic output 3 on		4165
65E6	Logic output 3 off		4166
65E7	Logic output 4 on		4167
65E8	Logic output 4 off		4168
65E9	Logic output 5 on		4169
65E10	Logic output 5 off		4170
65E11	Logic output 6 on		4171
65E12	Logic output 6 off		4172
65E13	Logic output 7 on		4173
65E14	Logic output 7 off		4174
65E15	Logic output 8 on		4175
65E16	Logic output 8 off		4176
65E17	Logic output 9 on		4177
65E18	Logic output 9 off		4178
65E19	Logic output 10 on		4179
65E20	Logic output 10 off		4180
65E21	Logic output 11 on		4181
65E22	Logic output 11 off		4182
65E23	Logic output 12 on		4183
65E24	Logic output 12 off		4184
65E25	Logic output 13 on		4185
65E26	Logic output 13 off		4186
65E27	Logic output 14 on		4187
65E28	Logic output 14 off		4188
65E29	Logic output 15 on		4189
65E30	Logic output 15 off		4190
65E31	Logic output 16 on		4191
65E32	Logic output 16 off		4192
65E33	Logic output 17 on		4193
65E34	Logic output 17 off		4194
65E35	Logic output 18 on		4195
65E36	Logic output 18 off		4196
65E37	Logic output 19 on		4197
65E38	Logic output 19 off		4198
65E39	Logic output 20 on		4199
65E40	Logic output 20 off		4200
163E01	IoUo> Start On		10433
163E02	IoUo> Trip On	Yes	10434

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
163E03	IoUo> Start Off		10435
163E04	IoUo> Trip off		10436
163E11	IoUo> Alarm operation On		10443
163E12	IoUo> Alarm operation off		10444
163E13	IoUo> Alarm non operation On		10445
163E14	IoUo> Alarm non operation off		10446
163E15	IoUo> Inhibit On		10447
163E16	IoUo> Inhibit off		10448
164E01	IoUo>> Start On		10497
164E02	IoUo>> Trip On	Yes	10498
164E03	IoUo>> Start Off		10499
164E04	IoUo>> Trip off		10500
164E11	IoUo>> Alarm operation On		10507
164E12	IoUo>> Alarm operation off		10508
164E13	IoUo>> Alarm non operation On		10509
164E14	IoUo>> Alarm non operation off		10510
164E15	IoUo>> Inhibit On		10511
164E16	IoUo>> Inhibit off		10512
189E01	Io/UoYN> Start On		12097
189E02	Io/UoYN> Trip On	Yes	12098
189E03	Io/UoYN> Start Off		12099
189E04	Io/UoYN> Trip off		12100
189E11	Io/UoYN> Inhibit On		12107
189E12	Io/UoYN> Inhibit off		12108
190E01	Io/UoGN> Start On		12161
190E02	Io/UoGN> Trip On	Yes	12162
190E03	Io/UoGN> Start Off		12163
190E04	Io/UoGN> Trip off		12164
190E11	Io/UoGN> Inhibit On		12171
190E12	Io/UoGN> Inhibit off		12172
191E01	Io/UoBN> Start On		12225
191E02	Io/UoBN> Trip On	Yes	12226
191E03	Io/UoBN> Start Off		12227
191E04	Io/UoBN> Trip off		12228
191E11	Io/UoBN> Inhibit On		12235
191E12	Io/UoBN> Inhibit off		12236
193E01	Io/UoYN>> Start On		12353
193E02	Io/UoYN>> Trip On	Yes	12354
193E03	Io/UoYN>> Start Off		12355
193E04	Io/UoYN>> Trip off		12356
193E11	Io/UoYN>> Inhibit on		12363
193E12	Io/UoYN>> Inhibit off		12364

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
194E01	Io/UoGN>> Start On		12417
194E02	Io/UoGN>> Trip On	Yes	12418
194E03	Io/UoGN>> Start Off		12419
194E04	Io/UoGN>> Trip off		12420
194E11	Io/UoGN>> Inhibit on		12427
194E12	Io/UoGN>> Inhibit off		12428
195E01	Io/UoBN>> Start On		12481
195E02	Io/UoBN>> Trip On	Yes	12482
195E03	Io/UoBN>> Start Off		12483
195E04	Io/UoBN>> Trip off		12484
195E11	Io/UoBN>> Inhibit on		12491
195E12	Io/UoBN>> Inhibit off		12492
187E1	SOL1 Trip on	Yes	11969
187E2	SOL2 Trip on	Yes	11970
187E3	SOL1 Trip off		11971
187E4	SOL2 Trip off		11972
79E1	Cold load pickup on		5057
79E2	Cold load pickup off		5058
79E3	CLPU enabled		5059
79E4	CLPU disabled		5060
198E1	Inrush on		12673
198E2	Inrush off		12674
198E3	Inrush enabled		12675
198E4	Inrush disabled		12676
198E5	Phase L1 Inrush on		12677
198E6	Phase L1 Inrush off		12678
198E7	phase L2 Inrush on		12679
198E8	phase L2 Inrush off		12680
198E9	phase L3 Inrush on		12681
198E10	phase L3 Inrush off		12682
196E1	CB op. number alarm 1 on	Yes	12545
196E2	CB op. number alarm 1 off		12546
196E3	CB op. number alarm 2 on	Yes	12547
196E4	CB op. number alarm 2 off		12548
196E5	CB broken curr. alarm on	Yes	12549
196E6	CB broken curr. alarm off		12550
196E7	CB mon. open log updated		12551
196E8	CB mon. close log updated		12552
196E9	CB mon. charge log updated		12553
201E1	Maint. event triggered		12865
201E2	Port 1 Link up on COM	Yes	12866

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
201E3	Port 1 Link down on COM	Yes	12867
201E4	Port 2 Link up on COM	Yes	12868
201E5	Port 2 Link down on COM	Yes	12869
201E6	IP conflict on COM	Yes	12870
201E7	IP conflict on COM1 IP	Yes	12871
201E10	File system error in CAN board	Yes	12874
201E11	Internal Temperature on		12875
201E12	Internal Temperature off		12876
210E01	$\Omega>$ Start On		13441
210E02	$\Omega>$ Trip On	Yes	13442
210E03	$\Omega>$ Start Off		13443
210E04	$\Omega>$ Trip off		13444
211E01	$\Omega>>$ Start On		13505
211E02	$\Omega>>$ Trip On	Yes	13506
211E03	$\Omega>>$ Start Off		13507
211E04	$\Omega>>$ Trip off		13508
212E01	$\Omega<$ Start On		13569
212E02	$\Omega<$ Trip On	Yes	13570
212E03	$\Omega<$ Start Off		13571
212E04	$\Omega<$ Trip off		13572
213E01	$\Omega<<$ Start On		13633
213E02	$\Omega<<$ Trip On	Yes	13634
213E03	$\Omega<<$ Start Off		13635
213E04	$\Omega<<$ Trip off		13636
225E1	Alarm 1 AI17 on	Yes	14401
225E2	Alarm 1 AI17 off	Yes	14402
225E3	Alarm 1 AI18 on	Yes	14403
225E4	Alarm 1 AI18 off	Yes	14404
225E5	Alarm 1 AI19 on	Yes	14405
225E6	Alarm 1 AI19 off	Yes	14406
225E7	Alarm 1 AI20 on	Yes	14407
225E8	Alarm 1 AI20 off	Yes	14408
225E9	Alarm 1 AI21 on	Yes	14409
225E10	Alarm 1 AI21 off	Yes	14410
225E11	Alarm 1 AI22 on	Yes	14411
225E12	Alarm 1 AI22 off	Yes	14412
225E13	Alarm 1 AI23 on	Yes	14413
225E14	Alarm 1 AI23 off	Yes	14414
225E15	Alarm 1 AI24 on	Yes	14415
225E16	Alarm 1 AI24 off	Yes	14416
225E17	Alarm 1 AI25 on	Yes	14417
225E18	Alarm 1 AI25 off	Yes	14418

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
225E19	Alarm 1 AI26 on	Yes	14419
225E20	Alarm 1 AI26 off	Yes	14420
225E21	Alarm 1 AI27 on	Yes	14421
225E22	Alarm 1 AI27 off	Yes	14422
225E23	Alarm 1 AI28 on	Yes	14423
225E24	Alarm 1 AI28 off	Yes	14424
225E25	Alarm 1 AI29 on	Yes	14425
225E26	Alarm 1 AI29 off	Yes	14426
225E27	Alarm 1 AI30 on	Yes	14427
225E28	Alarm 1 AI30 off	Yes	14428
225E29	Alarm 1 AI31 on	Yes	14429
225E30	Alarm 1 AI31 off	Yes	14430
225E31	Alarm 1 AI32 on	Yes	14431
225E32	Alarm 1 AI32 off	Yes	14432
227E1	Alarm 1 AI33 on	Yes	14529
227E2	Alarm 1 AI33 off	Yes	14530
227E3	Alarm 1 AI34 on	Yes	14531
227E4	Alarm 1 AI34 off	Yes	14532
227E5	Alarm 1 AI35 on	Yes	14533
227E6	Alarm 1 AI35 off	Yes	14534
227E7	Alarm 1 AI36 on	Yes	14535
227E8	Alarm 1 AI36 off	Yes	14536
227E9	Alarm 1 AI37 on	Yes	14537
227E10	Alarm 1 AI37 off	Yes	14538
227E11	Alarm 1 AI38 on	Yes	14539
227E12	Alarm 1 AI38 off	Yes	14540
227E13	Alarm 1 AI39 on	Yes	14541
227E14	Alarm 1 AI39 off	Yes	14542
227E15	Alarm 1 AI40 on	Yes	14543
227E16	Alarm 1 AI40 off	Yes	14544
227E17	Alarm 1 AI41 on	Yes	14545
227E18	Alarm 1 AI41 off	Yes	14546
227E19	Alarm 1 AI42 on	Yes	14547
227E20	Alarm 1 AI42 off	Yes	14548
227E21	Alarm 1 AI43 on	Yes	14549
227E22	Alarm 1 AI43 off	Yes	14550
227E23	Alarm 1 AI44 on	Yes	14551
227E24	Alarm 1 AI44 off	Yes	14552
227E25	Alarm 1 AI45 on	Yes	14553
227E26	Alarm 1 AI45 off	Yes	14554
227E27	Alarm 1 AI46 on	Yes	14555
227E28	Alarm 1 AI46 off	Yes	14556
227E29	Alarm 1 AI47 on	Yes	14557
227E30	Alarm 1 AI47 off	Yes	14558

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
227E31	Alarm 1 AI48 on	Yes	14559
227E32	Alarm 1 AI48 off	Yes	14560
226E1	Alarm 2 AI17 on	Yes	14465
226E2	Alarm 2 AI17 off	Yes	14466
226E3	Alarm 2 AI18 on	Yes	14467
226E4	Alarm 2 AI18 off	Yes	14468
226E5	Alarm 2 AI19 on	Yes	14469
226E6	Alarm 2 AI19 off	Yes	14470
226E7	Alarm 2 AI20 on	Yes	14471
226E8	Alarm 2 AI20 off	Yes	14472
226E9	Alarm 2 AI21 on	Yes	14473
226E10	Alarm 2 AI21 off	Yes	14474
226E11	Alarm 2 AI22 on	Yes	14475
226E12	Alarm 2 AI22 off	Yes	14476
226E13	Alarm 2 AI23 on	Yes	14477
226E14	Alarm 2 AI23 off	Yes	14478
226E15	Alarm 2 AI24 on	Yes	14479
226E16	Alarm 2 AI24 off	Yes	14480
226E17	Alarm 2 AI25 on	Yes	14481
226E18	Alarm 2 AI25 off	Yes	14482
226E19	Alarm 2 AI26 on	Yes	14483
226E20	Alarm 2 AI26 off	Yes	14484
226E21	Alarm 2 AI27 on	Yes	14485
226E22	Alarm 2 AI27 off	Yes	14486
226E23	Alarm 2 AI28 on	Yes	14487
226E24	Alarm 2 AI28 off	Yes	14488
226E25	Alarm 2 AI29 on	Yes	14489
226E26	Alarm 2 AI29 off	Yes	14490
226E27	Alarm 2 AI30 on	Yes	14491
226E28	Alarm 2 AI30 off	Yes	14492
226E29	Alarm 2 AI31 on	Yes	14493
226E30	Alarm 2 AI31 off	Yes	14494
226E31	Alarm 2 AI32 on	Yes	14495
226E32	Alarm 2 AI32 off	Yes	14496
228E1	Alarm 2 AI33 on	Yes	14593
228E2	Alarm 2 AI33 off	Yes	14594
228E3	Alarm 2 AI34 on	Yes	14595
228E4	Alarm 2 AI34 off	Yes	14596
228E5	Alarm 2 AI35 on	Yes	14597
228E6	Alarm 2 AI35 off	Yes	14598
228E7	Alarm 2 AI36 on	Yes	14599
228E8	Alarm 2 AI36 off	Yes	14600
228E9	Alarm 2 AI37 on	Yes	14601
228E10	Alarm 2 AI37 off	Yes	14602

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
228E11	Alarm 2 AI38 on	Yes	14603
228E12	Alarm 2 AI38 off	Yes	14604
228E13	Alarm 2 AI39 on	Yes	14605
228E14	Alarm 2 AI39 off	Yes	14606
228E15	Alarm 2 AI40 on	Yes	14607
228E16	Alarm 2 AI40 off	Yes	14608
228E17	Alarm 2 AI41 on	Yes	14609
228E18	Alarm 2 AI41 off	Yes	14610
228E19	Alarm 2 AI42 on	Yes	14611
228E20	Alarm 2 AI42 off	Yes	14612
228E21	Alarm 2 AI43 on	Yes	14613
228E22	Alarm 2 AI43 off	Yes	14614
228E23	Alarm 2 AI44 on	Yes	14615
228E24	Alarm 2 AI44 off	Yes	14616
228E25	Alarm 2 AI45 on	Yes	14617
228E26	Alarm 2 AI45 off	Yes	14618
228E27	Alarm 2 AI46 on	Yes	14619
228E28	Alarm 2 AI46 off	Yes	14620
228E29	Alarm 2 AI47 on	Yes	14621
228E30	Alarm 2 AI47 off	Yes	14622
228E31	Alarm 2 AI48 on	Yes	14623
228E32	Alarm 2 AI48 off	Yes	14624
229E1	Alarm 1 AI49 on	Yes	14657
229E2	Alarm 1 AI49 off	Yes	14658
229E3	Alarm 1 AI50 on	Yes	14659
229E4	Alarm 1 AI50 off	Yes	14660
229E5	Alarm 1 AI51 on	Yes	14661
229E6	Alarm 1 AI51 off	Yes	14662
229E7	Alarm 1 AI52 on	Yes	14663
229E8	Alarm 1 AI52 off	Yes	14664
229E9	Alarm 1 AI53 on	Yes	14665
229E10	Alarm 1 AI53 off	Yes	14666
229E11	Alarm 1 AI54 on	Yes	14667
229E12	Alarm 1 AI54 off	Yes	14668
229E13	Alarm 1 AI55 on	Yes	14669
229E14	Alarm 1 AI55 off	Yes	14670
229E15	Alarm 1 AI56 on	Yes	14671
229E16	Alarm 1 AI56 off	Yes	14672
229E17	Alarm 1 AI57 on	Yes	14673
229E18	Alarm 1 AI57 off	Yes	14674
229E19	Alarm 1 AI58 on	Yes	14675
229E20	Alarm 1 AI58 off	Yes	14676
229E21	Alarm 1 AI59 on	Yes	14677
229E22	Alarm 1 AI59 off	Yes	14678

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
229E23	Alarm 1 AI60 on	Yes	14679
229E24	Alarm 1 AI60 off	Yes	14680
229E25	Alarm 1 AI61 on	Yes	14681
229E26	Alarm 1 AI61 off	Yes	14682
229E27	Alarm 1 AI62 on	Yes	14683
229E28	Alarm 1 AI62 off	Yes	14684
229E29	Alarm 1 AI63 on	Yes	14685
229E30	Alarm 1 AI63 off	Yes	14686
229E31	Alarm 1 AI64 on	Yes	14687
229E32	Alarm 1 AI64 off	Yes	14688
230E1	Alarm 2 AI49 on	Yes	14721
230E2	Alarm 2 AI49 off	Yes	14722
230E3	Alarm 2 AI50 on	Yes	14723
230E4	Alarm 2 AI50 off	Yes	14724
230E5	Alarm 2 AI51 on	Yes	14725
230E6	Alarm 2 AI51 off	Yes	14726
230E7	Alarm 2 AI52 on	Yes	14727
230E8	Alarm 2 AI52 off	Yes	14728
230E9	Alarm 2 AI53 on	Yes	14729
230E10	Alarm 2 AI53 off	Yes	14730
230E11	Alarm 2 AI54 on	Yes	14731
230E12	Alarm 2 AI54 off	Yes	14732
230E13	Alarm 2 AI55 on	Yes	14733
230E14	Alarm 2 AI55 off	Yes	14734
230E15	Alarm 2 AI56 on	Yes	14735
230E16	Alarm 2 AI56 off	Yes	14736
230E17	Alarm 2 AI57 on	Yes	14737
230E18	Alarm 2 AI57 off	Yes	14738
230E19	Alarm 2 AI58 on	Yes	14739
230E20	Alarm 2 AI58 off	Yes	14740
230E21	Alarm 2 AI59 on	Yes	14741
230E22	Alarm 2 AI59 off	Yes	14742
230E23	Alarm 2 AI60 on	Yes	14743
230E24	Alarm 2 AI60 off	Yes	14744
230E25	Alarm 2 AI61 on	Yes	14745
230E26	Alarm 2 AI61 off	Yes	14746
230E27	Alarm 2 AI62 on	Yes	14747
230E28	Alarm 2 AI62 off	Yes	14748
230E29	Alarm 2 AI63 on	Yes	14749
230E30	Alarm 2 AI63 off	Yes	14750
230E31	Alarm 2 AI64 on	Yes	14751
230E32	Alarm 2 AI64 off	Yes	14752
231E1	DO1(B) on		14785
231E2	DO1(B) off		14786

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
231E3	DO2(B) on		14787
231E4	DO2(B) off		14788
231E5	DO3(B) on		14789
231E6	DO3(B) off		14790
231E7	DO4(B) on		14791
231E8	DO4(B) off		14792
231E9	DO1(C) on		14793
231E10	DO1(C) off		14794
231E11	DO2(C) on		14795
231E12	DO2(C) off		14796
231E13	DO3(C) on		14797
231E14	DO3(C) off		14798
231E15	DO4(C) on		14799
231E16	DO4(C) off		14800
231E17	DO5(C) on		14801
231E18	DO5(C) off		14802
231E19	DO1(D) on		14803
231E20	DO1(D) off		14804
231E21	DO2(D) on		14805
231E22	DO2(D) off		14806
231E23	DO3(D) on		14807
231E24	DO3(D) off		14808
231E25	DO4(D) on		14809
231E26	DO4(D) off		14810
231E27	DO5(D) on		14811
231E28	DO5(D) off		14812
231E29	DO1(E) on		14813
231E30	DO1(E) off		14814
231E31	DO2(E) on		14815
231E32	DO2(E) off		14816
231E33	DO3(E) on		14817
231E34	DO3(E) off		14818
231E35	DO4(E) on		14819
231E36	DO4(E) off		14820
231E37	DO5(E) on		14821
231E38	DO5(E) off		14822
231E39	CB trip on		14823
231E40	CB trip off		14824
232E1	Logic output 1(t) on		14849
232E2	Logic output 1(t) off		14850

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
232E3	Logic output 2(t) on		14851
232E4	Logic output 2(t) off		14852
232E5	Logic output 3(t) on		14853
232E6	Logic output 3(t) off		14854
232E7	Logic output 4(t) on		14855
232E8	Logic output 4(t) off		14856
232E9	Logic output 5(t) on		14857
232E10	Logic output 5(t) off		14858
232E11	Logic output 6(t) on		14859
232E12	Logic output 6(t) off		14860
232E13	Logic output 7(t) on		14861
232E14	Logic output 7(t) off		14862
232E15	Logic output 8(t) on		14863
232E16	Logic output 8(t) off		14864
232E17	Logic output 9(t) on		14865
232E18	Logic output 9(t) off		14866
232E19	Logic output 10(t) on		14867
232E20	Logic output 10(t) off		14868
232E21	Logic output 11(t) on		14869
232E22	Logic output 11(t) off		14870
232E23	Logic output 12(t) on		14871
232E24	Logic output 12(t) off		14872
232E25	Logic output 13(t) on		14873
232E26	Logic output 13(t) off		14874
232E27	Logic output 14(t) on		14875
232E28	Logic output 14(t) off		14876
232E29	Logic output 15(t) on		14877
232E30	Logic output 15(t) off		14878
232E31	Logic output 16(t) on		14879
232E32	Logic output 16(t) off		14880
232E33	Logic output 17(t) on		14881
232E34	Logic output 17(t) off		14882
232E35	Logic output 18(t) on		14883
232E36	Logic output 18(t) off		14884
232E37	Logic output 19(t) on		14885
232E38	Logic output 19(t) off		14886
232E39	Logic output 20(t) on		14887
232E40	Logic output 20(t) off		14888
66E1	CB wear alarm 1 on		4225
66E2	CB wear alarm 1 off		4226

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
66E3	CB wear alarm 2 on		4227
66E4	CB wear alarm 2 off		4228
67E2	Delay CT supervision on	Yes	4290
67E4	Delay CT supervision off		4292
67E3	Instantaneous CT supervision on	Yes	4291
67E5	Instantaneous CT supervision off		4293
68E2	VT supervisor on	Yes	4354
68E4	VT supervisor off		4356
68E3	Instantaneous VT supervision on		4355
68E5	Instantaneous VT supervision off		4357
68E15	VTS Inhibit On		4367
68E16	VTS Inhibit Off		4368
69E1	VI1 on		4417
69E2	VI1 off		4418
69E3	VI2 on		4419
69E4	VI2 off		4420
69E5	VI3 on		4421
69E6	VI3 off		4422
69E7	VI4 on		4423
69E8	VI4 off		4424
69E9	VI5 on		4425
69E10	VI5 off		4426
69E11	VI6 on		4427
69E12	VI6 off		4428
69E13	VI7 on		4429
69E14	VI7 off		4430
69E15	VI8 on		4431
69E16	VI8 off		4432
69E17	VO1 on		4433
69E18	VO1 off		4434
69E19	VO2 on		4435
69E20	VO2 off		4436
69E21	VO3 on		4437
69E22	VO3 off		4438
69E23	VO4 on		4439
69E24	VO4 off		4440
69E25	VO5 on		4441
69E26	VO5 off		4442
69E27	VO6 on		4443
69E28	VO6 off		4444
69E29	VO7 on		4445
69E30	VO7 off		4446
69E31	VO8 on		4447

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
69E32	VO8 off		4448
69E33	VO9 on		4449
69E34	VO9 off		4450
69E35	VO10 on		4451
69E36	VO10 off		4452
69E37	VO11 on		4453
69E38	VO11 off		4454
69E39	VO12 on		4455
69E40	VO12 off		4456
69E41	VO13 on		4457
69E42	VO13 off		4458
69E43	VO14 on		4459
69E44	VO14 off		4460
69E45	VO15 on		4461
69E46	VO15 off		4462
69E47	VO16 on		4463
69E48	VO16 off		4464
69E49	VO17 on		4465
69E50	VO17 off		4466
69E51	VO18 on		4467
69E52	VO18 off		4468
69E53	VO19 on		4469
69E54	VO19 off		4470
69E55	VO20 on		4471
69E56	VO20 off		4472
70E1	Remote		4481
70E2	Local		4482
70E3	Password open Panel		4483
70E4	Password close Panel		4484
70E5	Password open PC serial port		4485
70E6	Password close PC serial port		4486
70E7	Setting change Panel	Yes	4487
70E8	Setting change PC serial port	Yes	4488
70E9	Firmware Update		4489
70E10	Comm. active REMOTE	Yes	4490
70E11	Comm. inactive REMOTE	Yes	4491
70E12	Comm. active EXTENSION		4492
70E13	Comm. inactive EXTENSION		4493
70E14	Comm. active slot M		4494
70E15	Comm. inactive slot M		4495
70E16	Comm. active slot N		4496
70E17	Comm. inactive slot N		4497
70E18	Comm. active slot L		4498

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
70E19	Comm. inactive slot L		4499
70E20	Comm. active COM4		4500
70E21	Comm. inactive COM4		4501
70E22	Comm. active COM5		4502
70E23	Comm. inactive COM5		4503
70E24	Comm. active COM6		4504
70E25	Comm. inactive COM6		4505
70E26	Firmware update failure		4506
71E1	Object1 open		4545
71E2	Object1 closed		4546
71E3	Object1 undefined (11)		4547
71E4	Object1 undefined (00)		4548
71E5	Object1 open output on		4549
71E6	Object1 open output off		4550
71E7	Object1 close output on		4551
71E8	Object1 close output off		4552
71E9	Object1 interlocked		4553
71E10	Object1 open timeout		4554
71E11	Object1 close timeout		4555
71E12	Object1 ready timeout		4556
71E13	Object1 final trip		4557
71E14	Object1 final trip off		4558
71E15	Object1 open blocking on		4559
71E16	Object1 open blocking off		4560
71E17	Object1 close blocking on		4561
71E18	Object1 close blocking off		4562
71E19	Object1 inactivity alarm on		4563
71E20	Object1 inactivity alarm off		4564
71E21	Object1 control fail		4565
72E1	Object2 open		4609
72E2	Object2 closed		4610
72E3	Object2 undefined (11)		4611
72E4	Object2 undefined (00)		4612
72E5	Object2 open output on		4613
72E6	Object2 open output off		4614
72E7	Object2 close output on		4615
72E8	Object2 close output off		4616
72E9	Object2 interlocked		4617
72E10	Object2 open timeout		4618
72E11	Object2 close timeout		4619

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
72E12	Object2 ready timeout		4620
72E13	Object2 final trip		4621
72E14	Object2 final trip off		4622
72E15	Object2 open blocking on		4623
72E16	Object2 open blocking off		4624
72E17	Object2 close blocking on		4625
72E18	Object2 close blocking off		4626
72E19	Object2 inactivity alarm on		4627
72E20	Object2 inactivity alarm off		4628
72E21	Object2 control fail		4629
73E1	Object3 open		4673
73E2	Object3 closed		4674
73E3	Object3 undefined (11)		4675
73E4	Object3 undefined (00)		4676
73E5	Object3 open output on		4677
73E6	Object3 open output off		4678
73E7	Object3 close output on		4679
73E8	Object3 close output off		4680
73E9	Object3 interlocked		4681
73E10	Object3 open timeout		4682
73E11	Object3 close timeout		4683
73E12	Object3 ready timeout		4684
73E13	Object3 final trip		4685
73E14	Object3 final trip off		4686
73E15	Object3 open blocking on		4687
73E16	Object3 open blocking off		4688
73E17	Object3 close blocking on		4689
73E18	Object3 close blocking off		4690
73E19	Object3 inactivity alarm on		4691
73E20	Object3 inactivity alarm off		4692
73E21	Object3 control fail		4693
74E1	Object4 open		4737
74E2	Object4 closed		4738
74E3	Object4 undefined (11)		4739
74E4	Object4 undefined (00)		4740
74E5	Object4 open output on		4741
74E6	Object4 open output off		4742
74E7	Object4 close output on		4743
74E8	Object4 close output off		4744
74E9	Object4 interlocked		4745

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
74E10	Object4 open timeout		4746
74E11	Object4 close timeout		4747
74E12	Object4 ready timeout		4748
74E13	Object4 final trip		4749
74E14	Object4 final trip off		4750
74E15	Object4 open blocking on		4751
74E16	Object4 open blocking off		4752
74E17	Object4 close blocking on		4753
74E18	Object4 close blocking off		4754
74E19	Object4 inactivity alarm on		4755
74E20	Object4 inactivity alarm off		4756
74E21	Object4 control fail		4757
75E1	Object5 open		4801
75E2	Object5 closed		4802
75E3	Object5 undefined (11)		4803
75E4	Object5 undefined (00)		4804
75E5	Object5 open output on		4805
75E6	Object5 open output off		4806
75E7	Object5 close output on		4807
75E8	Object5 close output off		4808
75E9	Object5 interlocked		4809
75E10	Object5 open timeout		4810
75E11	Object5 close timeout		4811
75E12	Object5 ready timeout		4812
75E13	Object5 final trip		4813
75E14	Object5 final trip off		4814
75E15	Object5 open blocking on		4815
75E16	Object5 open blocking off		4816
75E17	Object5 close blocking on		4817
75E18	Object5 close blocking off		4818
75E19	Object5 inactivity alarm on		4819
75E20	Object5 inactivity alarm off		4820
75E21	Object5 control fail		4821
76E1	Object6 open		4865
76E2	Object6 closed		4866
76E3	Object6 undefined (11)		4867
76E4	Object6 undefined (00)		4868
76E5	Object6 open output on		4869
76E6	Object6 open output off		4870
76E7	Object6 close output on		4871

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
76E8	Object6 close output off		4872
76E9	Object6 interlocked		4873
76E10	Object6 open timeout		4874
76E11	Object6 close timeout		4875
76E12	Object6 ready timeout		4876
76E13	Object6 final trip		4877
76E14	Object6 final trip off		4878
76E15	Object6 open blocking on		4879
76E16	Object6 open blocking off		4880
76E17	Object6 close blocking on		4881
76E18	Object6 close blocking off		4882
76E19	Object6 inactivity alarm on		4883
76E20	Object6 inactivity alarm off		4884
76E21	Object6 control fail		4885
77E1	Object7 open		4929
77E2	Object7 closed		4930
77E3	Object7 undefined (11)		4931
77E4	Object7 undefined (00)		4932
78E1	Object8 open		4993
78E2	Object8 closed		4994
78E3	Object8 undefined (11)		4995
78E4	Object8 undefined (00)		4996
81E1	External DI1 on	Yes	5185
81E2	External DI1 off	Yes	5186
81E3	External DI2 on	Yes	5187
81E4	External DI2 off	Yes	5188
81E5	External DI3 on	Yes	5189
81E6	External DI3 off	Yes	5190
81E7	External DI4 on	Yes	5191
81E8	External DI4 off	Yes	5192
81E9	External DI5 on	Yes	5193
81E10	External DI5 off	Yes	5194
81E11	External DI6 on	Yes	5195
81E12	External DI6 off	Yes	5196
81E13	External DI7 on	Yes	5197
81E14	External DI7 off	Yes	5198
81E15	External DI8 on	Yes	5199
81E16	External DI8 off	Yes	5200
81E17	External DI9 on	Yes	5201
81E18	External DI9 off	Yes	5202
81E19	External DI10 on	Yes	5203

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
81E20	External DI10 off	Yes	5204
81E21	External DI11 on	Yes	5205
81E22	External DI11 off	Yes	5206
81E23	External DI12 on	Yes	5207
81E24	External DI12 off	Yes	5208
81E25	External DI13 on	Yes	5209
81E26	External DI13 off	Yes	5210
81E27	External DI14 on	Yes	5211
81E28	External DI14 off	Yes	5212
81E29	External DI15 on	Yes	5213
81E30	External DI15 off	Yes	5214
81E31	External DI16 on	Yes	5215
81E32	External DI16 off	Yes	5216
81E33	External DI17 on	Yes	5217
81E34	External DI17 off	Yes	5218
81E35	External DI18 on	Yes	5219
81E36	External DI18 off	Yes	5220
82E1	Alarm 1 AI1 on	Yes	5249
82E2	Alarm 1 AI1 off	Yes	5250
82E3	Alarm 1 AI2 on	Yes	5251
82E4	Alarm 1 AI2 off	Yes	5252
82E5	Alarm 1 AI3 on	Yes	5253
82E6	Alarm 1 AI3 off	Yes	5254
82E7	Alarm 1 AI4 on	Yes	5255
82E8	Alarm 1 AI4 off	Yes	5256
82E9	Alarm 1 AI5 on	Yes	5257
82E10	Alarm 1 AI5 off	Yes	5258
82E11	Alarm 1 AI6 on	Yes	5259
82E12	Alarm 1 AI6 off	Yes	5260
82E13	Alarm 1 AI7 on	Yes	5261
82E14	Alarm 1 AI7 off	Yes	5262
82E15	Alarm 1 AI8 on	Yes	5263
82E16	Alarm 1 AI8 off	Yes	5264
82E17	Alarm 1 AI9 on	Yes	5265
82E18	Alarm 1 AI9 off	Yes	5266
82E19	Alarm 1 AI10 on	Yes	5267
82E20	Alarm 1 AI10 off	Yes	5268
82E21	Alarm 1 AI11 on	Yes	5269
82E22	Alarm 1 AI11 off	Yes	5270
82E23	Alarm 1 AI12 on	Yes	5271
82E24	Alarm 1 AI12 off	Yes	5272
82E25	Alarm 1 AI13 on	Yes	5273
82E26	Alarm 1 AI13 off	Yes	5274
82E27	Alarm 1 AI14 on	Yes	5275

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
82E28	Alarm 1 AI14 off	Yes	5276
82E29	Alarm 1 AI15 on	Yes	5277
82E30	Alarm 1 AI15 off	Yes	5278
82E31	Alarm 1 AI16 on	Yes	5279
82E32	Alarm 1 AI16 off	Yes	5280
83E1	Alarm 2 AI1 on	Yes	5313
83E2	Alarm 2 AI1 off	Yes	5314
83E3	Alarm 2 AI2 on	Yes	5315
83E4	Alarm 2 AI2 off	Yes	5316
83E5	Alarm 2 AI3 on	Yes	5317
83E6	Alarm 2 AI3 off	Yes	5318
83E7	Alarm 2 AI4 on	Yes	5319
83E8	Alarm 2 AI4 off	Yes	5320
83E9	Alarm 2 AI5 on	Yes	5321
83E10	Alarm 2 AI5 off	Yes	5322
83E11	Alarm 2 AI6 on	Yes	5323
83E12	Alarm 2 AI6 off	Yes	5324
83E13	Alarm 2 AI7 on	Yes	5325
83E14	Alarm 2 AI7 off	Yes	5326
83E15	Alarm 2 AI8 on	Yes	5327
83E16	Alarm 2 AI8 off	Yes	5328
83E17	Alarm 2 AI9 on	Yes	5329
83E18	Alarm 2 AI9 off	Yes	5330
83E19	Alarm 2 AI10 on	Yes	5331
83E20	Alarm 2 AI10 off	Yes	5332
83E21	Alarm 2 AI11 on	Yes	5333
83E22	Alarm 2 AI11 off	Yes	5334
83E23	Alarm 2 AI12 on	Yes	5335
83E24	Alarm 2 AI12 off	Yes	5336
83E25	Alarm 2 AI13 on	Yes	5337
83E26	Alarm 2 AI13 off	Yes	5338
83E27	Alarm 2 AI14 on	Yes	5339
83E28	Alarm 2 AI14 off	Yes	5340
83E29	Alarm 2 AI15 on	Yes	5341
83E30	Alarm 2 AI15 off	Yes	5342
83E31	Alarm 2 AI16 on	Yes	5343
83E32	Alarm 2 AI16 off	Yes	5344
83E33	Ext. AI short circuit on	Yes	5345
83E34	Ext. AI short circuit off	Yes	5346
83E35	Ext. AI disconn. error on	Yes	5347
83E36	Ext. AI disconn. error off	Yes	5348
87E1	Synchro-check 1 request		5569
87E2	Synchro-check 1 request off		5570

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
87E3	Synchro-check 1 OK on		5571
87E4	Synchro-check 1 OK off		5572
87E5	Synchro-check 1 bypass		5573
87E6	Synchro-check 1 bypass off		5574
87E7	Synchro-check 1 Failed		5575
87E8	Synchro-check 1 Fail off		5576
89E1	Set group 1 on		5697
89E2	Set group 1 off		5698
89E3	Set group 2 on		5699
89E4	Set group 2 off		5700
89E5	Set group 3 on		5701
89E6	Set group 3 off		5702
89E7	Set group 4 on		5703
89E8	Set group 4 off		5704
90E1	DI21 on		5761
90E2	DI21 off		5762
90E3	DI22 on		5763
90E4	DI22 off		5764
90E5	DI23 on		5765
90E6	DI23 off		5766
90E7	DI24 on		5767
90E8	DI24 off		5768
90E9	DI25 on		5769
90E10	DI25 off		5770
90E11	DI26 on		5771
90E12	DI26 off		5772
90E13	DI27 on		5773
90E14	DI27 off		5774
90E15	DI28 on		5775
90E16	DI28 off		5776
90E17	DI29 on		5777
90E18	DI29 off		5778
90E19	DI30 on		5779
90E20	DI30 off		5780
90E21	DI31 on		5781
90E22	DI31 off		5782
90E23	DI32 on		5783
90E24	DI32 off		5784
90E25	DI33 on		5785
90E26	DI33 off		5786
90E27	DI34 on		5787
90E28	DI34 off		5788

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
90E29	DI35 on		5789
90E30	DI35 off		5790
90E31	DI36 on		5791
90E32	DI36 off		5792
90E33	DI37 on		5793
90E34	DI37 off		5794
90E35	DI38 on		5795
90E36	DI38 off		5796
90E37	DI39 on		5797
90E38	DI39 off		5798
90E39	DI40 on		5799
90E40	DI40 off		5800
96E01	Uc> Start On		6145
96E02	Uc> Trip On	Yes	6146
96E03	Uc> Start Off		6147
96E04	Uc> Trip off		6148
107E01	IoInt> Start On		6849
107E02	IoInt> Trip On	Yes	6850
107E03	IoInt> Start Off		6851
107E04	IoInt> Trip off		6852
116E01	Uo>>> Start On		7425
116E02	Uo>>> Trip On	Yes	7426
116E03	Uo>>> Start Off		7427
116E04	Uo>>> Trip off		7428
121E01	U2> Start On		7745
121E02	U2> Trip On	Yes	7746
121E03	U2> Start Off		7747
121E04	U2> Trip off		7748
122E01	U2>> Start On		7809
122E02	U2>> Trip On	Yes	7810
122E03	U2>> Start Off		7811
122E04	U2>> Trip off		7812
125E1	Arc stage 1 act on	Yes	8001
125E2	Arc stage 1 act off		8002
126E1	Arc stage 2 act on	Yes	8065
126E2	Arc stage 2 act off		8066
127E1	Arc stage 3 act on	Yes	8129
127E2	Arc stage 3 act off		8130
128E1	Arc stage 4 act on	Yes	8193
128E2	Arc stage 4 act off		8194
129E1	Arc stage 5 act on	Yes	8257
129E2	Arc stage 5 act off		8258

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
130E1	Arc stage 6 act on	Yes	8321
130E2	Arc stage 6 act off		8322
131E1	Arc stage 7 act on	Yes	8385
131E2	Arc stage 7 act off		8386
132E1	Arc stage 8 act on	Yes	8449
132E2	Arc stage 8 act off		8450
133E1	Local Arc sensor 1 on	Yes	8513
133E11	Local Arc sensor 1 off	Yes	8523
133E2	Local Arc sensor 2 on	Yes	8514
133E12	Local Arc sensor 2 off	Yes	8524
133E3	Local Arc sensor 3 on	Yes	8515
133E13	Local Arc sensor 3 off	Yes	8525
133E4	Local Arc sensor 4 on	Yes	8516
133E14	Local Arc sensor 4 off	Yes	8526
133E5	Local Arc sensor 5 on	Yes	8517
133E15	Local Arc sensor 5 off	Yes	8527
133E6	Local Arc sensor 6 on	Yes	8518
133E16	Local Arc sensor 6 off	Yes	8528
133E31	Arc I>int. on		8543
133E33	Arc I>int. off		8545
133E32	Arc Io1>int. on		8544
133E34	Arc Io1>int. off		8546
134E1	Arc sensor 1 not conn. error		8577
134E11	Arc sensor 1 not conn. err off		8587
134E2	Arc sensor 2 not conn. error		8578
134E12	Arc sensor 2 not conn. err off		8588
134E3	Arc sensor 3 not conn. error		8579
134E13	Arc sensor 3 not conn. err off		8589
134E4	Arc sensor 4 not conn. error		8580
134E14	Arc sensor 4 not conn. err off		8590
134E5	Arc sensor 5 not conn. error		8581
134E15	Arc sensor 5 not conn. err off		8591
134E6	Arc sensor 6 not conn. error		8582
134E16	Arc sensor 6 not conn. err off		8592
134E21	Arc sensor 1 short circuit error		8597
134E31	Arc sensor 1 short circ. err off		8607
134E22	Arc sensor 2 short circuit error		8598
134E32	Arc sensor 2 short circ. err off		8608
134E23	Arc sensor 3 short circuit error		8599
134E33	Arc sensor 3 short circ. err off		8609
134E24	Arc sensor 4 short circuit error		8600
134E34	Arc sensor 4 short circ. err off		8610
134E25	Arc sensor 5 short circuit error		8601

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
134E35	Arc sensor 5 short circ. err off		8611
134E26	Arc sensor 6 short circuit error		8602
134E36	Arc sensor 6 short circ. err off		8612
134E41	Arc sensor 1 daylight error		8617
134E51	Arc sensor 1 daylight error off		8627
134E42	Arc sensor 2 daylight error		8618
134E52	Arc sensor 2 daylight error off		8628
134E43	Arc sensor 3 daylight error		8619
134E53	Arc sensor 3 daylight error off		8629
134E44	Arc sensor 4 daylight error		8620
134E54	Arc sensor 4 daylight error off		8630
134E45	Arc sensor 5 daylight error		8621
134E55	Arc sensor 5 daylight error off		8631
134E46	Arc sensor 6 daylight error		8622
134E56	Arc sensor 6 daylight error off		8632
135E41	Arc sensor 1 not inst. error		8681
135E51	Arc sensor 1 not inst. error off		8691
135E42	Arc sensor 2 not inst. error		8682
135E52	Arc sensor 2 not inst. error off		8692
135E43	Arc sensor 3 not inst. error		8683
135E53	Arc sensor 3 not inst. error off		8693
135E44	Arc sensor 4 not inst. error		8684
135E54	Arc sensor 4 not inst. error off		8694
135E45	Arc sensor 5 not inst. error		8685
135E55	Arc sensor 5 not inst. error off		8695
135E46	Arc sensor 6 not inst. error		8686
135E56	Arc sensor 6 not inst. error off		8696
138E1	5. Harm Start On		8833
138E2	5. Harm Trip On	Yes	8834
138E3	5. Harm Start Off		8835
138E4	5. Harm Trip Off		8836
139E1	Ethernet port1 link up		8897
139E2	Ethernet port1 link down		8898
139E3	Ethernet port2 link up		8899
139E4	Ethernet port2 link down		8900
139E5	Ethernet re-init		8901
139E10	RSTP Bridge not root		8906
139E11	RSTP bridge root		8907
139E20	RSTP Port1 role disabled		8916
139E21	RSTP Port1 role designated		8917
139E22	RSTP Port1 role root		8918
139E23	RSTP Port1 role alternate		8919

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
139E24	RSTP Port1 role backup		8920
139E30	RSTP Port1 state link down		8926
139E31	RSTP Port1 state blocked		8927
139E32	RSTP Port1 state forwarding		8928
139E33	RSTP Port1 state learning		8929
139E34	RSTP Port1 State ForLearn		8930
139E35	RSTP Port1 state Unknown		8931
139E40	RSTP Port2 role disabled		8936
139E41	RSTP Port2 role designated		8937
139E42	RSTP Port2 role root		8938
139E43	RSTP Port2 role alternate		8939
139E44	RSTP Port2 role backup		8940
139E50	RSTP Port2 state link down		8946
139E51	RSTP Port2 state blocked		8947
139E52	RSTP Port2 state forwarding		8948
139E53	RSTP Port2 state learning		8949
139E54	RSTP Port2 State ForLearn		8950
139E55	RSTP Port2 state unknown		8951
139E58	PRP Port1 state link down		8954
139E59	PRP Port1 state conn. OK		8955
139E60	PRP Port1 state wrong LAN		8956
139E61	PRP Port2 state link down		8957
139E62	PRP Port2 state conn. OK		8958
139E63	PRP Port2 state wrong LAN		8959
144E1	NI1 Change		9217
144E2	NI2 Change		9218
144E3	NI3 Change		9219
144E4	NI4 Change		9220
144E5	NI5 Change		9221
144E6	NI6 Change		9222
144E7	NI7 Change		9223
144E8	NI8 Change		9224
144E9	NI9 Change		9225
144E10	NI10 Change		9226
144E11	NI11 Change		9227
144E12	NI12 Change		9228
144E13	NI13 Change		9229
144E14	NI14 Change		9230
144E15	NI15 Change		9231
144E16	NI16 Change		9232
144E17	NI17 Change		9233

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
144E18	NI18 Change		9234
144E19	NI19 Change		9235
144E20	NI20 Change		9236
144E21	NI21 Change		9237
144E22	NI22 Change		9238
144E23	NI23 Change		9239
144E24	NI24 Change		9240
144E25	NI25 Change		9241
144E26	NI26 Change		9242
144E27	NI27 Change		9243
144E28	NI28 Change		9244
144E29	NI29 Change		9245
144E30	NI30 Change		9246
144E31	NI31 Change		9247
144E32	NI32 Change		9248
145E1	NI33 Change		9281
145E2	NI34 Change		9282
145E3	NI35 Change		9283
145E4	NI36 Change		9284
145E5	NI37 Change		9285
145E6	NI38 Change		9286
145E7	NI39 Change		9287
145E8	NI40 Change		9288
145E9	NI41 Change		9289
145E10	NI42 Change		9290
145E11	NI43 Change		9291
145E12	NI44 Change		9292
145E13	NI45 Change		9293
145E14	NI46 Change		9294
145E15	NI47 Change		9295
145E16	NI48 Change		9296
145E17	NI49 Change		9297
145E18	NI50 Change		9298
145E19	NI51 Change		9299
145E20	NI52 Change		9300
145E21	NI53 Change		9301
145E22	NI54 Change		9302
145E23	NI55 Change		9303
145E24	NI56 Change		9304
145E25	NI57 Change		9305

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
145E26	NI58 Change		9306
145E27	NI59 Change		9307
145E28	NI60 Change		9308
145E29	NI61 Change		9309
145E30	NI62 Change		9310
145E31	NI63 Change		9311
145E32	NI64 Change		9312
160E1	NI65 Change		10241
160E2	NI66 Change		10242
160E3	NI67 Change		10243
160E4	NI68 Change		10244
160E5	NI69 Change		10245
160E6	NI70 Change		10246
160E7	NI71 Change		10247
160E8	NI72 Change		10248
160E9	NI73 Change		10249
160E10	NI74 Change		10250
160E11	NI75 Change		10251
160E12	NI76 Change		10252
160E13	NI77 Change		10253
160E14	NI78 Change		10254
160E15	NI79 Change		10255
160E16	NI80 Change		10256
160E17	NI81 Change		10257
160E18	NI82 Change		10258
160E19	NI83 Change		10259
160E20	NI84 Change		10260
160E21	NI85 Change		10261
160E22	NI86 Change		10262
160E23	NI87 Change		10263
160E24	NI88 Change		10264
160E25	NI89 Change		10265
160E26	NI90 Change		10266
160E27	NI91 Change		10267
160E28	NI92 Change		10268
160E29	NI93 Change		10269
160E30	NI94 Change		10270
160E31	NI95 Change		10271
160E32	NI96 Change		10272
161E1	NI97 Change		10305

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
161E2	NI98 Change		10306
161E3	NI99 Change		10307
161E4	NI100 Change		10308
161E5	NI101 Change		10309
161E6	NI102 Change		10310
161E7	NI103 Change		10311
161E8	NI104 Change		10312
161E9	NI105 Change		10313
161E10	NI106 Change		10314
161E11	NI107 Change		10315
161E12	NI108 Change		10316
161E13	NI109 Change		10317
161E14	NI110 Change		10318
161E15	NI111 Change		10319
161E16	NI112 Change		10320
161E17	NI113 Change		10321
161E18	NI114 Change		10322
161E19	NI115 Change		10323
161E20	NI116 Change		10324
161E21	NI117 Change		10325
161E22	NI118 Change		10326
161E23	NI119 Change		10327
161E24	NI120 Change		10328
161E25	NI121 Change		10329
161E26	NI122 Change		10330
161E27	NI123 Change		10331
161E28	NI124 Change		10332
161E29	NI125 Change		10333
161E30	NI126 Change		10334
146E1	GOOSE NI Group 1 OK		9345
146E2	GOOSE NI Group 1 Error		9346
146E3	GOOSE NI Group 2 OK		9347
146E4	GOOSE NI Group 2 Error		9348
146E37	GCB1 Needs commissioning On		9381
146E38	GCB1 Needs commissioning Off		9382
146E39	GCB2 Needs commissioning On		9383
146E40	GCB2 Needs commissioning Off		9384
146E41	VAI1 Quality		9385
146E42	VAI2 Quality		9386
146E43	VAI3 Quality		9387

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
146E44	VAI4 Quality		9388
146E45	VAI5 Quality		9389
146E46	VAI6 Quality		9390
146E47	VAI7 Quality		9391
146E48	VAI8 Quality		9392
146E50	Global trip On		9394
146E51	Global trip Off		9395
146E56	GCB3 Needs commissioning On		9400
146E57	GCB3 Needs commissioning Off		9401
146E58	GCB4 Needs commissioning On		9402
146E59	GCB4 Needs commissioning Off		9403
148E1	Software diagnostic		9473
150E01	loφ>>> Start On		9601
150E02	loφ>>> Trip On	Yes	9602
150E03	loφ>>> Start Off		9603
150E04	loφ>>> Trip off		9604
151E01	llr Start On		9665
151E02	llr Trip On	Yes	9666
151E03	llr Start Off		9667
151E04	llr Trip off		9668
154E1	VI9 on		9857
154E2	VI9 off		9858
154E3	VI10 on		9859
154E4	VI10 off		9860
154E5	VI11 on		9861
154E6	VI11 off		9862
154E7	VI12 on		9863
154E8	VI12 off		9864
154E9	VI13 on		9865
154E10	VI13 off		9866
154E11	VI14 on		9867
154E12	VI14 off		9868
154E13	VI15 on		9869
154E14	VI15 off		9870
154E15	VI16 on		9871
154E16	VI16 off		9872
154E17	VI17 on		9873
154E18	VI17 off		9874
154E19	VI18 on		9875
154E20	VI18 off		9876
154E21	VI19 on		9877
154E22	VI19 off		9878

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
154E23	VI20 on		9879
154E24	VI20 off		9880
154E25	Frequency out of range	Yes	9881
154E26	Frequency OK	Yes	9882
156E02	SOTF Trip On	Yes	9986
156E04	SOTF Trip off		9988
161E31	NI127 Change		10335
161E32	NI128 Change		10336
162E01	Io'> Start On		10369
162E02	Io'> Trip On	Yes	10370
162E03	Io'> Start Off		10371
162E04	Io'> Trip off		10372
165E01	Io'>> Start On		10561
165E02	Io'>> Trip On	Yes	10562
165E03	Io'>> Start Off		10563
165E04	Io'>> Trip off		10564
166E01	Io'>>> Start On		10625
166E02	Io'>>> Trip On	Yes	10626
166E03	Io'>>> Start Off		10627
166E04	Io'>>> Trip off		10628
167E01	I2> Start On		10689
167E02	I2> Trip On	Yes	10690
167E03	I2> Start Off		10691
167E04	I2> Trip off		10692
168E01	Motor T> Start On		10753
168E02	Motor T> Trip On	Yes	10754
168E03	Motor T> Start Off		10755
168E04	Motor T> Trip off		10756
168E11	Thm. level Motor Alarm	Yes	10763
168E12	Thm. level Motor Alarm Off		10764
168E13	Thm. Rsv Motor Alarm	Yes	10765
168E14	Thm. Rsv Motor Alarm Off		10766
168E15	Thm. Temp Motor Alarm	Yes	10767
168E16	Thm. T° Motor Alarm Off		10768
168E17	Block CB close on	Yes	10769
168E18	Block CB close off		10770
168E19	τ1 active		10771
168E20	τ1 inactive		10772
168E21	τ2 active		10773
168E22	τ2 inactive		10774
168E23	Hot status	Yes	10775
168E24	Cold status		10776

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
200E1	Easergy P5 mode in Normal		12801
200E2	Easergy P5 mode in Test		12802
200E3	Easergy P5 mode in Test Block		12803
200E52	VM Status is Idle		12852
200E53	VM Status is Data Off		12853
200E54	VM Status is Data On		12854
200E55	VM Status is Data Error		12855
170E1	T°1 alarm on	Yes	10881
170E2	T°1 alarm off		10882
170E3	T°1 operate on	Yes	10883
170E4	T°1 operate off		10884
170E5	RTD1 open-circuit fault on	Yes	10885
170E6	RTD1 short-circuit fault on	Yes	10886
170E7	RTD1 fault off		10887
171E1	T°2 alarm on	Yes	10945
171E2	T°2 alarm off		10946
171E3	T°2 operate on	Yes	10947
171E4	T°2 operate off		10948
171E5	RTD2 open-circuit fault on	Yes	10949
171E6	RTD2 short-circuit fault on	Yes	10950
171E7	RTD2 fault off		10951
172E1	T°3 alarm on	Yes	11009
172E2	T°3 alarm off		11010
172E3	T°3 operate on	Yes	11011
172E4	T°3 operate off		11012
172E5	RTD3 open-circuit fault on	Yes	11013
172E6	RTD3 short-circuit fault on	Yes	11014
172E7	RTD3 fault off		11015
173E1	T°4 alarm on	Yes	11073
173E2	T°4 alarm off		11074
173E3	T°4 operate on	Yes	11075
173E4	T°4 operate off		11076
173E5	RTD4 open-circuit fault on	Yes	11077
173E6	RTD4 short-circuit fault on	Yes	11078
173E7	RTD4 fault off		11079
174E1	T°5 alarm on	Yes	11137
174E2	T°5 alarm off		11138
174E3	T°5 operate on	Yes	11139
174E4	T°5 operate off		11140
174E5	RTD5 open-circuit fault on	Yes	11141
174E6	RTD5 short-circuit fault on	Yes	11142
174E7	RTD5 fault off		11143

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
175E1	T°6 alarm on	Yes	11201
175E2	T°6 alarm off		11202
175E3	T°6 operate on	Yes	11203
175E4	T°6 operate off		11204
175E5	RTD6 open-circuit fault on	Yes	11205
175E6	RTD6 short-circuit fault on	Yes	11206
175E7	RTD6 fault off		11207
176E1	T°7 alarm on	Yes	11265
176E2	T°7 alarm off		11266
176E3	T°7 operate on	Yes	11267
176E4	T°7 operate off		11268
176E5	RTD7 open-circuit fault on	Yes	11269
176E6	RTD7 short-circuit fault on	Yes	11270
176E7	RTD7 fault off		11271
177E1	T°8 alarm on	Yes	11329
177E2	T°8 alarm off		11330
177E3	T°8 operate on	Yes	11331
177E4	T°8 operate off		11332
177E5	RTD8 open-circuit fault on	Yes	11333
177E6	RTD8 short-circuit fault on	Yes	11334
177E7	RTD8 fault off		11335
178E1	T°9 alarm on	Yes	11393
178E2	T°9 alarm off		11394
178E3	T°9 operate on	Yes	11395
178E4	T°9 operate off		11396
178E5	RTD9 open-circuit fault on	Yes	11397
178E6	RTD9 short-circuit fault on	Yes	11398
178E7	RTD9 fault off		11399
179E1	T°10 alarm on	Yes	11457
179E2	T°10 alarm off		11458
179E3	T°10 operate on	Yes	11459
179E4	T°10 operate off		11460
179E5	RTD10 open-circuit fault on	Yes	11461
179E6	RTD10 short-circuit fault on	Yes	11462
179E7	RTD10 fault off		11463
180E1	T°11 alarm on	Yes	11521
180E2	T°11 alarm off		11522
180E3	T°11 operate on	Yes	11523
180E4	T°11 operate off		11524
180E5	RTD11 open-circuit fault on	Yes	11525
180E6	RTD11 short-circuit fault on	Yes	11526
180E7	RTD11 fault off		11527

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
181E1	T°12 alarm on	Yes	11585
181E2	T°12 alarm off		11586
181E3	T°12 operate on	Yes	11587
181E4	T°12 operate off		11588
181E5	RTD12 open-circuit fault on	Yes	11589
181E6	RTD12 short-circuit fault on	Yes	11590
181E7	RTD12 fault off		11591
182E1	T°13 alarm on	Yes	11649
182E2	T°13 alarm off		11650
182E3	T°13 operate on	Yes	11651
182E4	T°13 operate off		11652
182E5	RTD13 open-circuit fault on	Yes	11653
182E6	RTD13 short-circuit fault on	Yes	11654
182E7	RTD13 fault off		11655
183E1	T°14 alarm on	Yes	11713
183E2	T°14 alarm off		11714
183E3	T°14 operate on	Yes	11715
183E4	T°14 operate off		11716
183E5	RTD14 open-circuit fault on	Yes	11717
183E6	RTD14 short-circuit fault on	Yes	11718
183E7	RTD14 fault off		11719
184E1	T°15 alarm on	Yes	11777
184E2	T°15 alarm off		11778
184E3	T°15 operate on	Yes	11779
184E4	T°15 operate off		11780
184E5	RTD15 open-circuit fault on	Yes	11781
184E6	RTD15 short-circuit fault on	Yes	11782
184E7	RTD15 fault off		11783
185E1	T°16 alarm on	Yes	11841
185E2	T°16 alarm off		11842
185E3	T°16 operate on	Yes	11843
185E4	T°16 operate off		11844
185E5	RTD16 open-circuit fault on	Yes	11845
185E6	RTD16 short-circuit fault on	Yes	11846
185E7	RTD16 fault off		11847
186E01	df/dt>> Start On		11905
186E02	df/dt>> Trip On	Yes	11906
186E03	df/dt>> Start Off		11907
186E04	df/dt>> Trip Off		11908
215E2	Anti back spin alarm on	Yes	13762
215E4	Anti back spin alarm off		13764
200E6	Port USB Disabled		12806

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
200E7	Port USB Enabled		12807
200E8	Port mini USB Disabled		12808
200E9	Port mini USB Enabled		12809
200E10	Serial Port Disabled		12810
200E11	Serial Port Enabled		12811
200E12	Ethernet Port slot M Disabled		12812
200E13	Ethernet Port slot M Enabled		12813
200E14	Ethernet Port slot L Disabled		12814
200E15	Ethernet Port slot L Enabled		12815
200E16	Ethernet Protocol 1 Disabled		12816
200E17	Ethernet Protocol 1 Enabled		12817
200E18	Ethernet Protocol 2 Disabled		12818
200E19	Ethernet Protocol 2 Enabled		12819
200E20	Extersion Port Disabled		12820
200E21	Extersion Port Enabled		12821
200E22	Time Sync Source is IEEE1588		12822
200E23	Time Sync Source is IRIG-B		12823
200E24	Time Sync Source is SNTP		12824
200E25	Time Sync Source is SNTP Backup		12825
200E26	Time Sync Source is Pulse Signal		12826
200E27	Time Sync Source is 1 PPS		12827
200E28	Time Sync Source is Modbus		12828
200E29	Time Sync Source is IEC101		12829
200E30	Time Sync Source is IEC103		12830
200E31	Time Sync Source is DNP3		12831
200E32	Time Sync Source is Internal		12832
200E33	LPCT cable is connected	Yes	12833
200E34	LPCT cable is disconnected	Yes	12834
200E35	LPVT1 cable is connected	Yes	12835
200E36	LPVT1 cable is disconnected	Yes	12836
200E37	LPVT2 cable is connected	Yes	12837
200E38	LPVT2 cable is disconnected	Yes	12838
200E39	Software error		12839
200E40	Slot L mismatch	Yes	12840
200E41	Slot L board is missing	Yes	12841
200E42	Slot L is not configured	Yes	12842
200E43	Slot M mismatch	Yes	12843
200E44	Slot M board is missing	Yes	12844
200E45	Slot M is not configured	Yes	12845
200E46	Slot N mismatch	Yes	12846
200E47	Slot N board is missing	Yes	12847
200E48	Slot N is not configured	Yes	12848

Table 42 - Event code list (Continued)

Event code	Description	Alarm	Code value (decimal)
200E49	Slot P mismatch	Yes	12849
200E50	Slot P board is missing	Yes	12850
200E51	Slot P is not configured	Yes	12851
200E56	Reset CS to factory OK		12856
200E57	Reset CS to factory fail		12857
200E58	Eth. protocol 3 disabled		12858
200E59	Eth. protocol 3 enabled		12859
200E60	Eth. port slot N enabled		12860
200E61	Eth. port slot N disabled		12861

Clock synchronisation

The internal clock of Easergy P5 protection relays can be synchronised via the Modbus protocol. Note this is not a native feature of the Modbus protocol. Therefore, this is an Easergy P5 protection relay specific feature. The accuracy of the clock synchronisation is in the scale of a few hundred milliseconds.

The clock can be synchronised either completely (all fields: seconds, minutes, hours, days, month and year) or by synchronising only the minutes, which in turn will set the seconds and milliseconds to zero.

An example of how minute synchronisation can be done: when the reference clock (the clock which is assumed to be correct) is exactly seven minutes past (any hour), a minute synchronisation is performed. The result will be that the internal clock of the Easergy P5 protection relays will be set to HH:07:00.000 ("Hours: Minutes:Seconds.Milliseconds") "HH" will not be changed.

These two ways of synchronising the clock are denoted "Set RTC", where "RTC" stands for "Real-Time Clock" and "Synchronise Minutes" in the data map.

Clock synchronisation for standard Modbus

The holding registers allocated to the Set RTC synchronisation for standard Modbus are:

Table 43 - Description of holding registers allocated to Set RTC synchronisation for standard Modbus

Holding Register	Content
2504	Lower byte: seconds, milliseconds will be zero
2505	Upper byte: minutes Lower byte: hours
2506	Upper byte: day Lower byte: month
2507	Year

Clock synchronisation for PDM Modbus

The holding registers allocated to the Set RTC synchronisation for PDM Modbus are:

Table 44 - Description of holding registers allocated to Set RTC synchronisation for PDM Modbus

Holding Register	Content
22591	Bit 0 to bit 6: year (from 2000-01-01 to 2127-12-31)
22592	Bit 0 to bit 4: date Bit 8 to bit 11: month
22593	Bit 0 to bit 5: minutes Bit 8 to bit 12: hours
22594	Milliseconds

Point list

Point list for standard Modbus

By default, only PDM point list is available. If the user wants to use the standard point list, the setting "Enable legacy points", which can be configured in the **Communication** menu/**Modbus slave main configuration** sub-menu via the eSetup Easergy Pro, needs to be enabled.

Scalings

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
1001	CT primary (In)	1	0	3	1 A = 1			■		■	■
1002	CT secondary	1	0	3	1 A = 1			■		■	■
1003	Nominal current (In)	1	0	3	1.00 A = 100	LPCT/VT scaling	■			■	■
1004	LPCT rated primary current (Ipr)	1	0	3	1 A = 1		■			■	■
1005	Current factor	1	0	3	0.25=0;0.5=1;1=2;1.25=3;1.33=4;2=5;2.5=6;3.2=7;4=8;5=9;6.3=10;6.66=11;10=12;16=13;20=14;25=15;31.5=16		■			■	■
1006	Earth CT primary	1	0	3	1 A = 1			■		■	■
1007	Earth CT secondary	1	0	3	1.0 A = 10			■		■	■
1008	Io primary CSH rate	1	0	3	1 A = 1		■	■		■	■
1009	Io secondary	1	0	3	1.0 A = 10		■	■		■	■
1010	Earth fault input (CSH)	1	0	3	1.0 A = 10		■	■		■	■
1011	Earth CT' primary	1	0	3	1 A = 1			■		■	■
1012	Earth CT' secondary	1	0	3	1.0 A = 10			■		■	■
1013	VT primary (Un)	1	0	3	1.000 kV = 1000	VT primary scaling			■	■	■
1014	Nominal voltage (Un)	1	0	3	1.00 V = 100	LPVT/VT scaling	■			■	■
1015	LPVT or VT rated primary voltage	1	0	3	1.000 kV = 1000	LPVT/VT scaling	■			■	■
1016	VT secondary	1	0	3	1 V = 1				■	■	■
1017	VTy secondary	1	0	3	1 V = 1				■	■	
1018	VTo primary	1	0	3	1.000 kV = 1000	VTo primary scaling			■	■	■
1019	VTo secondary	1	0	3	1.000 V = 100	VTo secondary scaling			■	■	■
1020	Voltage factor	1	0	3	1.000 = 1000		■			■	■
1021	Phase Rotation	1	0	3	1-2-3=0;1-3-2=1		■	■	■	■	■
1022	Voltage measurement mode	1	0	3	Value ²¹		■		■	■	■
1023	Nominal frequency	1	0	3	50 Hz = 50		■	■	■	■	■
1024	Power direction	1	0	3	Outgoing=0; Incoming=1		■			■	■
1025	Number of connected phase CT	1	0	3	I1/I2/I3=0;I1/I3=1			■		■	■
1026	VL1 magnitude correction	1	0	3	1.000 = 10000		■			■	■

21. 2LL+Uo=0;3LN=1;1LL+Uo/LLy=2;2LL/LLy=3;LL/LLy/LLz=4;1LL=5;1LN=6;3LL=8;3LN/LNy=9;3LN/LLy=10;2LL+Uo/LNy=11;2LL+Uo+LLy=12;3LN+Uo=13;LL+Uo/y/z=14;LN+Uo/y/z=15;LL/LLy=16;3LN/2LNy=17

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
1027	VL2 magnitude correction	1	0	3	1.000 = 10000		■			■	■
1028	VL3 magnitude correction	1	0	3	1.000 = 10000		■			■	■
1029	VL1 Angle correction	1	0	3	1.000 ° = 10000	LPCT/VT scaling	■			■	■
1030	VL2 Angle correction	1	0	3	1.000 ° = 10000	LPCT/VT scaling	■			■	■
1031	VL3 Angle correction	1	0	3	1.000 ° = 10000	LPCT/VT scaling	■			■	■
1032	VL1y magnitude correction	1	0	3	1.000 = 10000		■			■	■
1033	VL1y Angle correction	1	0	3	1.000 ° = 10000	LPCT/VT scaling	■			■	■
1034	VL2y magnitude correction	1	0	3	1.000 = 10000		■			■	■
1035	VL2y Angle correction	1	0	3	1.000 ° = 10000	LPCT/VT scaling	■			■	■
1036	VT type	1	0	3	VT+Adapter=0; LPVT=1		■			■	■
1037	VT secondary	1	0	3	1 V = 1		■			■	■
1038	VL1 adapter mag correction	1	0	3	1.000 = 1000	LPCT/VT scaling	■			■	■
1039	VL2 adapter mag correction	1	0	3	1.000 = 1000	LPCT/VT scaling	■			■	■
1040	VL3 adapter mag correction	1	0	3	1.000 = 1000	LPCT/VT scaling	■			■	■
1041	VTy secondary	1	0	3	1 V = 1		■			■	■
1042	VL1y adapter mag correction	1	0	3	1.000 = 1000	LPCT/VT scaling	■			■	■
1044	VTo secondary	1	0	3	1 V = 1		■			■	■
1045	Uo adapter mag correction	1	0	3	1.000 = 1000	LPCT/VT scaling	■			■	■

Read and command

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
2001	Alive indicator	1	0	3	1 = 1		■	■	■	■	■
2006	Digital Inputs 01...16	1	0	3	1 = 1		■	■	■	■	■
2007	Digital Inputs 17...32	1	0	3	1 = 1					■	■
2008	Digital Inputs 33...40	1	0	3	1 = 1					■	■
2042	Object1 state	1	0	3	Open=0;Close=1; Undef=2		■	■	■	■	■
2043	Object2 state	1	0	3	Open=0;Close=1; Undef=2		■	■	■	■	■
2044	Object3 state	1	0	3	Open=0;Close=1; Undef=2		■	■	■	■	■
2045	Object4 state	1	0	3	Open=0;Close=1; Undef=2		■	■	■	■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
2046	Object5 state	1	0	3	Open=0;Close=1; Undef=2		■	■	■	■	■
2047	Object6 state	1	0	3	Open=0;Close=1; Undef=2		■	■	■	■	■
2048	Object7 state	1	0	3	Open=0;Close=1; Undef=2		■	■	■	■	■
2049	Object8 state	1	0	3	Open=0;Close=1; Undef=2		■	■	■	■	■
2057	Run hours/10^0	1	0	3	1 = 1		■	■	■	■	■
2058	Run hours/10^4	1	0	3	1 = 1		■	■	■	■	■
2059	Engine running (in seconds)	1	1	3, 6	1 s = 1		■	■	■	■	■
2060	Start counter	1	1	3, 6	1 = 1		■	■	■	■	■
2101... 2105	Events	1	0	3	1 = 1		■	■	■	■	■
2301	Mode of use	1	0	3	Normal=0;Test=1; Test Block=2		■	■	■	■	■
2302	Remote/Local State	1	0	3	REMOTE=0; LOCAL=1		■	■	■	■	■
2303	Port 1 status (Slot M)	1	0	3	Link off=0; Link on=1		■	■	■	■	■
2304	Port 2 status (Slot M)	1	0	3	Link off=0; Link on=1		■	■	■	■	■
2305	Port 1 status (Slot L)	1	0	3	Link off=0; Link on=1		■	■	■	■	■
2306	Port 2 status (Slot L)	1	0	3	Link off=0; Link on=1		■	■	■	■	■
2307	Port 1 status (Slot M&N)	1	0	3	Link off=0; Link on=1		■	■	■	■	■
2308	Port 2 status (Slot M&N)	1	0	3	Link off=0; Link on=1		■	■	■	■	■
2351	External AI1	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2352	External AI2	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2353	External AI3	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2354	External AI4	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2355	External AI5	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2356	External AI6	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2357	External AI7	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2358	External AI8	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2359	External AI9	1	0	3	Value ²²	External AI scaling	■	■	■	■	■
2360	External AI10	1	0	3	Value ²²	External AI scaling	■	■	■	■	■

22. 1 °C = 1 / 1 F = 1 / 1 K = 1 / 1 V/A = 1 / 1 mA = 1 / 1 Ohm = 1 / 1 A = 1 / 1 V = 1 / 1 kW = 1 / 1 kVA = 1 / 1 kvar = 1 / 1 - = 1

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
2361	External AI11	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2362	External AI12	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2363	External AI13	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2364	External AI14	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2365	External AI15	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2366	External AI16	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2367	External AI17	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2368	External AI18	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2369	External AI19	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2370	External AI20	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2371	External AI21	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2372	External AI22	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2373	External AI23	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2374	External AI24	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2375	External AI25	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2376	External AI26	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2377	External AI27	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2378	External AI28	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2379	External AI29	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2380	External AI30	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2381	External AI31	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2382	External AI32	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2383	External AI33	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2384	External AI34	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2385	External AI35	1	0	3	Value ²³	External AI scaling	■	■	■	■	■
2386	External AI36	1	0	3	Value ²³	External AI scaling	■	■	■	■	■

23. 1 °C = 1 / 1 F = 1 / 1 K = 1 / 1 V/A = 1 / 1 mA = 1 / 1 Ohm = 1 / 1 A = 1 / 1 V = 1 / 1 kW = 1 / 1 kVA = 1 / 1 kvar = 1 / 1 - = 1

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
2387	External AI37	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2388	External AI38	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2389	External AI39	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2390	External AI40	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2391	External AI41	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2392	External AI42	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2393	External AI43	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2394	External AI44	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2395	External AI45	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2396	External AI46	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2397	External AI47	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2398	External AI48	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2399	External AI49	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2400	External AI50	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2401	External AI51	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2402	External AI52	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2403	External AI53	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2404	External AI54	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2405	External AI55	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2406	External AI56	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2407	External AI57	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2408	External AI58	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2409	External AI59	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2410	External AI60	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2411	External AI61	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■
2412	External AI62	1	0	3	Value ²⁴	External AI scaling	■	■	■	■	■

24. 1 °C = 1 / 1 F = 1 / 1 K = 1 / 1 V/A = 1 / 1 mA = 1 / 1 Ohm = 1 / 1 A = 1 / 1 V = 1 / 1 kW = 1 / 1 kVA = 1 / 1 kvar = 1 / 1 - = 1

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
2413	External AI63	1	0	3	Value ²⁵	External AI scaling	■	■	■	■	■
2414	External AI64	1	0	3	Value ²⁵	External AI scaling	■	■	■	■	■
2415	External DI1	1	0	3	1 = 1		■	■	■	■	■
2416	External DI2	1	0	3	1 = 1		■	■	■	■	■
2417	External DI3	1	0	3	1 = 1		■	■	■	■	■
2418	External DI4	1	0	3	1 = 1		■	■	■	■	■
2419	External DI5	1	0	3	1 = 1		■	■	■	■	■
2420	External DI6	1	0	3	1 = 1		■	■	■	■	■
2421	External DI7	1	0	3	1 = 1		■	■	■	■	■
2422	External DI8	1	0	3	1 = 1		■	■	■	■	■
2423	External DI9	1	0	3	1 = 1		■	■	■	■	■
2424	External DI10	1	0	3	1 = 1		■	■	■	■	■
2425	External DI11	1	0	3	1 = 1		■	■	■	■	■
2426	External DI12	1	0	3	1 = 1		■	■	■	■	■
2427	External DI13	1	0	3	1 = 1		■	■	■	■	■
2428	External DI14	1	0	3	1 = 1		■	■	■	■	■
2429	External DI15	1	0	3	1 = 1		■	■	■	■	■
2430	External DI16	1	0	3	1 = 1		■	■	■	■	■
2431	External DI17	1	0	3	1 = 1		■	■	■	■	■
2432	External DI18	1	0	3	1 = 1		■	■	■	■	■
2501	Release latches	1	1	3, 6	Release=1		■	■	■	■	■
2502	Synchronize minutes	1	1	3, 6	1 = 1		■	■	■	■	■
2504...-2507	Set Real Time Clock (RTC)	0	1	6	1 = 1		■	■	■	■	■
2508	Open select object 1	1	1	3, 6	1 = 1		■	■	■	■	■
2509	Close select object 1	1	1	3, 6	1 = 1		■	■	■	■	■
2510	Execute operation Object1	0	1	6	1 = 1		■	■	■	■	■
2511	Max ctrl pulse length of Object1	1	1	3, 6	1.00 s = 100	Max control pulse length scaling	■	■	■	■	■
2512	Open select object 2	1	1	3, 6	1 = 1		■	■	■	■	■
2513	Close select object 2	1	1	3, 6	1 = 1		■	■	■	■	■
2514	Execute operation Object2	0	1	6	1 = 1		■	■	■	■	■
2515	Max ctrl pulse length of Object2	1	1	3, 6	1.00 s = 100	Max control pulse length scaling	■	■	■	■	■
2516	Cancel selected operation	0	1	6	1 = 1		■	■	■	■	■
2517	Open select object 3	1	1	3, 6	1 = 1		■	■	■	■	■

25. 1 °C = 1 / 1 F = 1 / 1 K = 1 / 1 V/A = 1 / 1 mA = 1 / 1 Ohm = 1 / 1 A = 1 / 1 V = 1 / 1 kW = 1 / 1 kVA = 1 / 1 kvar = 1 / 1 - = 1

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
2518	Close select object 3	1	1	3, 6	1 = 1		■	■	■	■	■
2519	Execute operation Object3	0	1	6	1 = 1		■	■	■	■	■
2520	Max ctrl pulse length of Object3	1	1	3, 6	1.00 s = 100	Max control pulse length scaling	■	■	■	■	■
2521	Open select object 4	1	1	3, 6	1 = 1		■	■	■	■	■
2522	Close select object 4	1	1	3, 6	1 = 1		■	■	■	■	■
2523	Execute operation Object4	0	1	6	1 = 1		■	■	■	■	■
2524	Max ctrl pulse length of Object4	1	1	3, 6	1.00 s = 100	Max control pulse length scaling	■	■	■	■	■
2525	Open select object 5	1	1	3, 6	1 = 1		■	■	■	■	■
2526	Close select object 5	1	1	3, 6	1 = 1		■	■	■	■	■
2527	Execute operation Object5	0	1	6	1 = 1		■	■	■	■	■
2528	Max ctrl pulse length of Object5	1	1	3, 6	1.00 s = 100	Max control pulse length scaling	■	■	■	■	■
2529	Open select object 6	1	1	3, 6	1 = 1		■	■	■	■	■
2530	Close select object 6	1	1	3, 6	1 = 1		■	■	■	■	■
2531	Execute operation Object6	0	1	6	1 = 1		■	■	■	■	■
2532	Max ctrl pulse length of Object6	1	1	3, 6	1.00 s = 100	Max control pulse length scaling	■	■	■	■	■
2534	Set. group common change	1	1	3, 6	1=0;2=1;3=2;4=3		■	■	■	■	■
2536	Clear min/max/demand	1	1	3, 6	Clear=1		■	■	■	■	■

Measurement

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
3001	Positive sequence I1	1	0	3	1 A = 1		■	■		■	■
3002	Negative sequence I2	1	0	3	1 A = 1		■	■		■	■
3003	Current ratio I2/I1	1	0	3	1.0 % = 10		■	■		■	■
3004	Current phase sequence	1	0	3	??=0;OK=1; Reverse=2		■	■		■	■
3005	Phase current THD	1	0	3	1.0 % = 10		■	■		■	■
3006	Phase current IL1 THD	1	0	3	1.0 % = 10		■	■		■	■
3007	Phase current IL2 THD	1	0	3	1.0 % = 10		■	■		■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
3008	Phase current IL3 THD	1	0	3	1.0 % = 10		■	■		■	■
3009	Phase current IL	1	0	3	1 A = 1		■	■		■	■
3010	Min. of IL1 IL2 IL3	1	0	3	1 A = 1		■	■		■	■
3011	Max. of IL1 IL2 IL3	1	0	3	1 A = 1		■	■		■	■
3012	Phase current ILRMS	1	0	3	1 A = 1		■	■		■	■
3015	Phase current IL1RMS	1	0	3	1 A = 1		■	■		■	■
3016	Phase current IL2RMS	1	0	3	1 A = 1		■	■		■	■
3017	Phase current IL3RMS	1	0	3	1 A = 1		■	■		■	■
3019	Ambient temperature	1	0	3, 6	1 °C = 1 / 1 °F = 1		■	■		■	
3020	Phase current IL1da demand	1	0	3	1 A = 1		■	■		■	■
3021	Phase current IL2da demand	1	0	3	1 A = 1		■	■		■	■
3022	Phase current IL3da demand	1	0	3	1 A = 1		■	■		■	■
3031	Positive sequence U1	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3032	Negative sequence U2	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3033	Voltage U2/U1	1	0	3	1.0 % = 10		■		■	■	■
3034	Voltage phase sequence	1	0	3	??=0;OK=1; Reverse=2		■		■	■	■
3035	Voltage THD	1	0	3	1.0 % = 10		■		■	■	■
3036	Phase-Earth VL1 THD	1	0	3	1.0 % = 10		■		■	■	■
3037	Phase-Earth VL2 THD	1	0	3	1.0 % = 10		■		■	■	■
3038	Phase-Earth VL3 THD	1	0	3	1.0 % = 10		■		■	■	■
3039	Average Phase-Phase voltage	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3040	Min of Phase-Phase voltages	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3041	Max of Phase-Phase voltages	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3042	Average Phase-Earth voltage	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3043	Min. of Phase-Earth voltages	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3044	Max. of Phase-Earth voltages	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3045	RMS average voltage	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3048	Phase-Phase voltage U12RMS / Phase-Earth voltage VL1RMS	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3049	Phase-Phase voltage U23RMS /	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
	Phase-Earth voltage VL2RMS										
3050	Phase-Earth voltage VL3RMS / Phase-Phase voltage U12yRMS	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3058	Cosφ	1	0	3	1.00 = 100	PF and cos scaling	■			■	■
3059	Tangent φ	1	0	3	1.000 = 1000	Tanφ scaling	■			■	■
3060	Power angle	1	0	3	1 ° = 1		■			■	■
3061	RMS active power	1	0	3	1000 kW = 1000	Power scaling	■			■	■
3062	RMS reactive power	1	0	3	1000 kVAr = 1000	Power scaling	■			■	■
3063	RMS apparent power	1	0	3	1000 kVA = 1000	Power scaling	■			■	■
3066	Active power demand	1	0	3	1000 kW = 1000	Power scaling	■			■	■
3067	Reactive power demand	1	0	3	1000 kVAr = 1000	Power scaling	■			■	■
3068	Apparent power demand	1	0	3	1000 kVA = 1000	Power scaling	■			■	■
3069	Power factor demand	1	0	3	1.00 = 100	PF and cos scaling	■			■	■
3071	RMS active power demand	1	0	3	1000 kW = 1000	Power scaling	■			■	■
3072	RMS reactive power demand	1	0	3	1000 kVAr = 1000	Power scaling	■			■	■
3073	RMS apparent power demand	1	0	3	1000 kVA = 1000	Power scaling	■			■	■
3081	Phase L1 active power	1	0	3	1000 kW = 1000	Power scaling	■			■	■
3082	Phase L2 active power	1	0	3	1000 kW = 1000	Power scaling	■			■	■
3083	Phase L3 active power	1	0	3	1000 kW = 1000	Power scaling	■			■	■
3084	Phase L1 reactive power	1	0	3	1000 kVAr = 1000	Power scaling	■			■	■
3085	Phase L2 reactive power	1	0	3	1000 kVAr = 1000	Power scaling	■			■	■
3086	Phase L3 reactive power	1	0	3	1000 kVAr = 1000	Power scaling	■			■	■
3087	Phase L1 apparent power	1	0	3	1000 kVA = 1000	Power scaling	■			■	■
3088	Phase L2 apparent power	1	0	3	1000 kVA = 1000	Power scaling	■			■	■
3089	Phase L3 apparent power	1	0	3	1000 kVA = 1000	Power scaling	■			■	■
3090	Cosφ of phase L1	1	0	3	1.00 = 100	PF and cos scaling	■			■	■
3091	Cosφ of phase L2	1	0	3	1.00 = 100	PF and cos scaling	■			■	■
3092	Cosφ of phase L3	1	0	3	1.00 = 100	PF and cos scaling	■			■	■
3101	Frequency fy	1	0	3	50.000 Hz = 5000	Frequency scaling	■		■	■	

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
3102	Phase-to-Phase voltage U12y	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	
3103	Phase angle difference	1	0	3	1 ° = 10	-	■		■	■	
3111	Frequency fz	1	0	3	50.000 Hz = 5000	Frequency scaling	■		■	■	
3112	Phase-to-Phase voltage U12z	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	
3113	Phase angle difference	1	0	3	1 ° = 1	-					
3207	Earth fault calculated	1	0	3	1.00 A = 100	Io scaling	■	■		■	■
3208	Io CSH residual current	1	0	3	1.00 A = 100	Io scaling (CSH)	■	■		■	■
3209	Phase current IL1	1	0	3	1 A = 1		■	■		■	■
3210	Phase current IL2	1	0	3	1 A = 1		■	■		■	■
3211	Phase current IL3	1	0	3	1 A = 1		■	■		■	■
3212	Io residual current	1	0	3	1.00 A = 100	Io scaling		■		■	■
3213	Io' residual current	1	0	3	1.000 A = 1000	Io' scaling		■		■	■
3214	Phase-to-Phase voltage U12	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3215	Phase-to-Phase voltage U23	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3216	Phase-to-Phase voltage U31	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3217	Phase-to-earth voltage VL1	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3218	Phase-to-earth voltage VL2	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3219	Phase-to-earth voltage VL3	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3220	Residual voltage	1	0	3	1.0 % = 10		■		■	■	■
3221	Frequency	1	0	3	50.000 Hz = 5000	Frequency scaling	■	■	■	■	■
3222	Active power	1	0	3	1000 kW = 1000	Power scaling	■			■	■
3223	Reactive power	1	0	3	1000 kVar = 1000	Power scaling	■			■	■
3224	Apparent power	1	0	3	1000 kVA = 1000	Power scaling	■			■	■
3225	Power factor	1	0	3	1.00 = 100	PF and cos scaling	■			■	■
3226	Energy Eexp	1	0	3	1 = 1		■			■	■
3227	Eexp/10^4	1	0	3	10^4 = 1		■			■	■
3228	Eexp/10^8	1	0	3	10^8 = 1		■			■	■
3229	Energy EqExp	1	0	3	1 = 1		■			■	■
3230	EqExp/10^4	1	0	3	10^4 = 1		■			■	■
3231	EqExp/10^8	1	0	3	10^8 = 1		■			■	■
3232	Energy Eimp	1	0	3	1 = 1		■			■	■
3233	Eimp/10^4	1	0	3	10^4 = 1		■			■	■
3234	Eimp/10^8	1	0	3	10^8 = 1		■			■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
3235	Energy EqImp	1	0	3	1 = 1		■			■	■
3236	EqImp/10^4	1	0	3	10^4 = 1		■			■	■
3237	EqImp/10^8	1	0	3	10^8 = 1		■			■	■
3238	Tangent ϕ	1	0	3	1.000 = 1000	Tan ϕ scaling	■			■	■
3239	Phase current IL	1	0	3	1 A = 1		■	■		■	■
3240	Average Phase-Phase voltage	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3241	Average Phase-Earth voltage	1	0	3	1000 V = 1000	Voltage scaling	■		■	■	■
3256... 3271	Harmonics of IL1	1	0	3	1 % = 1		■	■		■	■
3276... 3291	Harmonics of IL2	1	0	3	1 % = 1		■	■		■	■
3296... 3311	Harmonics of IL3	1	0	3	1 % = 1		■	■		■	■
3316... 3331	Harmonics of U12 / Harmonics of VL1	1	0	3	1 % = 1		■		■	■	■
3336... 3351	Harmonics of U23 / Harmonics of VL2	1	0	3	1 % = 1		■		■	■	■
3356... 3371	Harmonics of VL3 / Harmonics of U12y	1	0	3	1 % = 1		■		■	■	■
3381	Temperature 1	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3382	Temperature 2	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3383	Temperature 3	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3384	Temperature 4	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3385	Temperature 5	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3386	Temperature 6	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3387	Temperature 7	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3388	Temperature 8	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3389	Temperature 9	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3390	Temperature 10	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3391	Temperature 11	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3392	Temperature 12	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3393	Temperature 13	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3394	Temperature 14	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3395	Temperature 15	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3396	Temperature 16	1	0	3	1 °C = 1 / 1 °F = 1		■	■		■	■
3410	Last fault current	1	1	3, 6	1.00 xIn = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■
3411	I> fault value	1	0	3	1.00 xIn = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■
3412	I>> fault value	1	0	3	1.00 xIn = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■
3413	I>>> fault value	1	0	3	1.00 xIn = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■
3415	Fault reactance	1	0	3	1.00 ohm = 100					■	
3416	Algorithm condition	1	0	3	OK=0;NegX=1; BigX=2;Long					■	

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
					fault=3;No DI=4; No pre-fault=5;No post-fault=6; ShrtFlt=7; PreUns=8; FltUns=9; PostUns=10; Blocked=11;Off=12						
3417	Fault value $\Omega>$	1	0	3	1.0 % $\Omega_n = 10 / 1$ rpm = 1		■	■			■
3418	Fault value $\Omega>>$	1	0	3	1.0 % $\Omega_n = 10 / 1$ rpm = 1		■	■			■
3419	Fault value $\Omega<$	1	0	3	1.0 % $\Omega_n = 10 / 1$ rpm = 1		■	■			■
3420	Fault value $\Omega<<$	1	0	3	1.0 % $\Omega_n = 10 / 1$ rpm = 1		■	■			■
3430	Last fault Io current	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling		■		■	■
3431	Io> fault value	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■
3432	Io>> fault value	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■
3433	Io>>> fault value	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■
3434	Io>>>> fault value	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling		■		■	■
3435	Io>>>>> fault value	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling		■		■	■
3436	Last fault Io ϕ > current	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling	■			■	■
3437	Io ϕ > fault value	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling	■			■	■
3438	Io ϕ >> fault value	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling	■			■	■
3439	Io ϕ >>> fault value	1	0	3	1.00 pu = 100 / 1.00 A = 100	Fault value scaling	■			■	■
3440	SOTF fault value	1	0	3	1.00 xIn = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■
3441	Uo> fault value	1	0	3	1.0 % = 10	Fault value scaling	■		■	■	■
3442	Uo>> fault value	1	0	3	1.0 % = 10	Fault value scaling	■		■	■	■
3443	Uo>>> fault value	1	0	3	1.0 % = 10	Fault value scaling	■		■	■	■
3444	Io'> fault value	1	0	3	1.000 pu = 1000 / 1.000 A = 1000	Fault value scaling		■		■	■
3445	Io'>> fault value	1	0	3	1.000 pu = 1000 / 1.000 A = 1000	Fault value scaling		■		■	■
3446	Io'>>> fault value	1	0	3	1.000 pu = 1000 / 1.000 A = 1000	Fault value scaling		■		■	■
3447	IoUo> fault value	1	0	3	1.00 %Pno = 100 / 1 kW = 1	Fault value scaling				■	■
3448	IoUo>> fault value	1	0	3	1.00 %Pno = 100 / 1 kW = 1	Fault value scaling				■	■
3449	I2> fault value	1	0	3	1.00 xIn = 100 / 1.00 A = 100	Fault value scaling	■	■		■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
3452	Cold load pickup	1	0	3	Start=1;Timeout=2		■	■		■	■
3453	Inrush detection	1	0	3	Start=1;Timeout=2		■	■		■	■
3454	df/dt> fault value	1	0	3	1.00 Hz/s = 100	Fault value scaling	■		■	■	
3455	df/dt>> fault value	1	0	3	1.00 Hz/s = 100	Fault value scaling	■		■	■	
3456	Motor speed	1	0	3	1 rpm = 1		■	■			■

Statistics and virtual Input/Output

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
3501	DI1 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3502	DI2 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3503	DI3 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3504	DI4 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3505	DI5 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3506	DI6 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3507	DI7 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3508	DI8 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3509	DI9 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3510	DI10 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3511	DI11 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3512	DI12 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3513	DI13 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3514	DI14 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3515	DI15 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3516	DI16 counter	1	1	3, 6	1 = 1		■	■	■	■	■
3517	DI17 counter	1	1	3, 6	1 = 1					■	■
3518	DI18 counter	1	1	3, 6	1 = 1					■	■
3519	DI19 counter	1	1	3, 6	1 = 1					■	■
3520	DI20 counter	1	1	3, 6	1 = 1					■	■
3521	DI21 counter	1	1	3, 6	1 = 1					■	■
3522	DI22 counter	1	1	3, 6	1 = 1					■	■
3523	DI23 counter	1	1	3, 6	1 = 1					■	■
3524	DI24 counter	1	1	3, 6	1 = 1					■	■
3525	DI25 counter	1	1	3, 6	1 = 1					■	■
3526	DI26 counter	1	1	3, 6	1 = 1					■	■
3527	DI27 counter	1	1	3, 6	1 = 1					■	■
3528	DI28 counter	1	1	3, 6	1 = 1					■	■
3529	DI29 counter	1	1	3, 6	1 = 1					■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
3530	DI30 counter	1	1	3, 6	1 = 1					■	■
3531	DI31 counter	1	1	3, 6	1 = 1					■	■
3532	DI32 counter	1	1	3, 6	1 = 1					■	■
3533	DI33 counter	1	1	3, 6	1 = 1					■	■
3534	DI34 counter	1	1	3, 6	1 = 1					■	■
3535	DI35 counter	1	1	3, 6	1 = 1					■	■
3536	DI36 counter	1	1	3, 6	1 = 1					■	■
3537	DI37 counter	1	1	3, 6	1 = 1					■	■
3538	DI38 counter	1	1	3, 6	1 = 1					■	■
3539	DI39 counter	1	1	3, 6	1 = 1					■	■
3540	DI40 counter	1	1	3, 6	1 = 1					■	■
3571	Shot1 start counter	1	1	3, 6	1 = 1		■	■		■	
3572	Shot2 start counter	1	1	3, 6	1 = 1		■	■		■	
3573	Shot3 start counter	1	1	3, 6	1 = 1		■	■		■	
3574	Shot4 start counter	1	1	3, 6	1 = 1		■	■		■	
3575	Shot5 start counter	1	1	3, 6	1 = 1		■	■		■	
3576	AR start counter	1	1	3, 6	1 = 1		■	■		■	
3577	AR fail counter	1	1	3, 6	1 = 1		■	■		■	
3578	AR shot number	1	0	3	1;2;3;4;5;END=6		■	■		■	
3579	Direct trip AR request	1	0	3	1 = 1		■	■		■	
3580	Recloser locked	1	0	3	1 = 1		■	■		■	
3581	Recloser running	1	0	3	1 = 1		■	■		■	
3582	Final trip	1	0	3	1 = 1		■	■		■	
3583	Auto-Recloser on	1	0	3	1 = 1		■	■		■	
3611	Motor starting	1	0	3	1 = 1		■	■			■
3612	Motor running	1	0	3	1 = 1		■	■			■
3613	Voltage interrupt	1	0	3	Low=0;ok=1		■		■	■	■
3614	Voltage status	1	0	3	OK=0;Low=1; High=2;Low/ High=3;(OK)=4; (Low)=5;(High) =6;(Low)/High=7		■		■	■	■
3615	Timer 1 status	1	1	3, 6	0=1;1=2		■	■	■	■	■
3616	Timer 2 status	1	1	3, 6	0=1;1=2		■	■	■	■	■
3617	Timer 3 status	1	1	3, 6	0=1;1=2		■	■	■	■	■
3618	Timer 4 status	1	1	3, 6	0=1;1=2		■	■	■	■	■
3619	CB monitoring alarm 1	1	0	3	1 = 1		■	■		■	■
3620	CB monitoring alarm 2	1	0	3	1 = 1		■	■		■	■
3621	Logic output status 1...8	1	0	3	1 = 1		■	■	■	■	■
3622	Logic output status 9...16	1	0	3	1 = 1		■	■	■	■	■
3623	Logic output status 17...20	1	0	3	1 = 1		■	■	■	■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
3626	Virtual outputs 1...10	1	0	3	1 = 1		■	■	■	■	■
3627	Virtual outputs 11...20	1	0	3	1 = 1		■	■	■	■	■
3631	Sync1 request	1	0	3	1 = 1		■		■	■	
3632	Sync1 OK	1	0	3	1 = 1		■		■	■	
3633	Bypass	1	1	3, 6	1 = 1		■		■	■	
3634	Sync1 fail	1	0	3	1 = 1		■		■	■	
3657	Virtual input 1	1	1	3, 6	0;1		■	■	■	■	■
3658	Virtual input 2	1	1	3, 6	0;1		■	■	■	■	■
3659	Virtual input 3	1	1	3, 6	0;1		■	■	■	■	■
3660	Virtual input 4	1	1	3, 6	0;1		■	■	■	■	■
3661	Virtual input 5	1	1	3, 6	0;1		■	■	■	■	■
3662	Virtual input 6	1	1	3, 6	0;1		■	■	■	■	■
3663	Virtual input 7	1	1	3, 6	0;1		■	■	■	■	■
3664	Virtual input 8	1	1	3, 6	0;1		■	■	■	■	■
3665	Virtual input 9	1	1	3, 6	0;1		■	■	■	■	■
3666	Virtual input 10	1	1	3, 6	0;1		■	■	■	■	■
3667	Virtual input 11	1	1	3, 6	0;1		■	■	■	■	■
3668	Virtual input 12	1	1	3, 6	0;1		■	■	■	■	■
3669	Virtual input 13	1	1	3, 6	0;1		■	■	■	■	■
3670	Virtual input 14	1	1	3, 6	0;1		■	■	■	■	■
3671	Virtual input 15	1	1	3, 6	0;1		■	■	■	■	■
3672	Virtual input 16	1	1	3, 6	0;1		■	■	■	■	■
3673	Virtual input 17	1	1	3, 6	0;1		■	■	■	■	■
3674	Virtual input 18	1	1	3, 6	0;1		■	■	■	■	■
3675	Virtual input 19	1	1	3, 6	0;1		■	■	■	■	■
3676	Virtual input 20	1	1	3, 6	0;1		■	■	■	■	■

Minimum value, maximum value, ARC and circuit breaker

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
4001	Minimum frequency	1	1	3, 6	50.000 Hz = 5000	Frequency scaling	■	■	■	■	■
4002	Minimum active power	1	1	3, 6	1000 kW = 1000	Power scaling	■			■	■
4003	Minimum react. power	1	1	3, 6	1000 kVAr = 1000	Power scaling	■			■	■
4004	Minimum apparent power	1	1	3, 6	1000 kVA = 1000	Power scaling	■			■	■
4005	Min power factor	1	1	3, 6	1.000 = 1000	PF and cos scaling	■			■	■
4006	Minimum of Io	1	1	3, 6	1.0 % = 10	Io scaling	■	■		■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
4007	Minimum of Io'	1	1	3, 6	1.0 % = 10	Io' scaling		■		■	■
4008	Demand Minimum active power	1	1	3, 6	1000 kW = 1000	Power scaling	■			■	■
4009	Demand minimum reactive power	1	1	3, 6	1000 kVAr = 1000	Power scaling	■			■	■
4010	Demand Minimum apparent power	1	1	3, 6	1000 kVA = 1000	Power scaling	■			■	■
4011	Demand minimum power factor	1	1	3, 6	1.000 = 1000	PF and cos scaling	■			■	■
4012	RMS Demand mini active power	1	1	3, 6	1000 kW = 1000	Power scaling	■			■	■
4013	RMS Demand min reactive power	1	1	3, 6	1000 kVAr = 1000	Power scaling	■			■	■
4014	RMS Demand mini apparent power	1	1	3, 6	1000 kVA = 1000	Power scaling	■			■	■
4015	Minimum of IL1	1	1	3, 6	1 A = 1		■	■		■	■
4016	Minimum of IL2	1	1	3, 6	1 A = 1		■	■		■	■
4017	Minimum of IL3	1	1	3, 6	1 A = 1		■	■		■	■
4018	RMS minimum of IL1	1	1	3, 6	1 A = 1		■	■		■	■
4019	RMS minimum of IL2	1	1	3, 6	1 A = 1		■	■		■	■
4020	RMS minimum of IL3	1	1	3, 6	1 A = 1		■	■		■	■
4021	Demand Minimum of IL1	1	1	3, 6	1 A = 1		■	■		■	■
4022	Demand Minimum of IL2	1	1	3, 6	1 A = 1		■	■		■	■
4023	Demand Minimum of IL3	1	1	3, 6	1 A = 1		■	■		■	■
4024	RMS Demand minimum of IL1	1	1	3, 6	1 A = 1		■	■		■	■
4025	RMS Demand minimum of IL2	1	1	3, 6	1 A = 1		■	■		■	■
4026	RMS Demand minimum of IL3	1	1	3, 6	1 A = 1		■	■		■	■
4027	Minimum of EF current	1	1	3, 6	1.0 pu = 10	Io scaling (CSH)	■	■		■	■
4028	Minimum of Uo	1	1	3, 6	1.0 % = 10	Voltage scaling	■		■	■	■
4030	Minimum of U12	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4031	Minimum of U23	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4032	Minimum of U31	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4033	Minimum U12 RMS voltage / Minimum VL1 RMS voltage	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4034	Minimum U23 RMS voltage / Minimum VL2 RMS voltage	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4035	Minimum VL3 RMS voltage / Minimum U12y RMS voltage	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
4101	Maximum frequency	1	1	3, 6	50.000 Hz = 5000	Frequency scaling	■	■	■	■	■
4102	Maximum active power	1	1	3, 6	1000 kW = 1000	Power scaling	■			■	■
4103	Maximum react. power	1	1	3, 6	1000 kVAr = 1000	Power scaling	■			■	■
4104	Maximum apparent power	1	1	3, 6	1000 kVA = 1000	Power scaling	■			■	■
4105	Max power factor	1	1	3, 6	1.000 = 1000	PF and cos scaling	■			■	■
4106	Maximum of Io	1	1	3, 6	1.0 % = 10	Io scaling	■	■		■	■
4107	Maximum of Io'	1	1	3, 6	1.0 % = 10	Io' scaling		■		■	■
4108	Demand Maximum active power	1	1	3, 6	1000 kW = 1000	Power scaling	■			■	■
4109	Demand maximum reactive power	1	1	3, 6	1000 kVAr = 1000	Power scaling	■			■	■
4110	Demand Maximum apparent power	1	1	3, 6	1000 kVA = 1000	Power scaling	■			■	■
4111	Demand maximum power factor	1	1	3, 6	1.000 = 1000	PF and cos scaling	■			■	■
4112	RMS Demand Max active power	1	1	3, 6	1000 kW = 1000	Power scaling	■			■	■
4113	RMS Demand max reactive power	1	1	3, 6	1000 kVAr = 1000	Power scaling	■			■	■
4114	RMS Demand Max apparent power	1	1	3, 6	1000 kVA = 1000	Power scaling	■			■	■
4115	Maximum of IL1	1	1	3, 6	1 A = 1		■	■		■	■
4116	Maximum of IL2	1	1	3, 6	1 A = 1		■	■		■	■
4117	Maximum of IL3	1	1	3, 6	1 A = 1		■	■		■	■
4118	RMS maximum of IL1	1	1	3, 6	1 A = 1		■	■		■	■
4119	RMS maximum of IL2	1	1	3, 6	1 A = 1		■	■		■	■
4120	RMS maximum of IL3	1	1	3, 6	1 A = 1		■	■		■	■
4121	Demand Maximum of IL1	1	1	3, 6	1 A = 1		■	■		■	■
4122	Demand Maximum of IL2	1	1	3, 6	1 A = 1		■	■		■	■
4123	Demand Maximum of IL3	1	1	3, 6	1 A = 1		■	■		■	■
4124	RMS Demand maximum of IL1	1	1	3, 6	1 A = 1		■	■		■	■
4125	RMS Demand maximum of IL2	1	1	3, 6	1 A = 1		■	■		■	■
4126	RMS Demand maximum of IL3	1	1	3, 6	1 A = 1		■	■		■	■
4127	Maximum of EF current	1	1	3, 6	1.0 pu = 10	Io scaling (CSH)	■	■		■	■
4128	Maximum of Uo	1	1	3, 6	1.0 % = 10	Voltage scaling	■		■	■	■
4130	Maximum of U12	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
4131	Maximum of U23	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4132	Maximum of U31	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4133	Maximum U12 RMS voltage / Maximum VL1 RMS voltage	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4134	Maximum U23 RMS voltage / Maximum VL2 RMS voltage /	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4135	Maximum VL3 RMS voltage / Maximum U12y RMS voltage	1	1	3, 6	1000 V = 1000	Voltage scaling	■		■	■	■
4299	Arc Io state	1	0	3	1 = 1					■	■
4300	Arc I state	1	0	3	1 = 1					■	■
4301	Clear I/O units' registers	1	1	3, 6	Clear=1						
4302	Release all latches	1	1	3, 6	Release=1					■	■
4303	Arc Stages	1	0	3	1 = 1					■	■
4304... 4309	Arc sensor status	1	0	3	OK=1;Active=2; Not conn=3;Shrt circ=4;Daylight=5; Not Inst.=6;Null=0					■	■
4351... 4355	Low limit (primary value)	1	0	3	1.0 kA = 10		■	■		■	■
4349	Minimum CB trip cmd. Time	1	1	3.6	1.0s = 1		■	■		■	■
4356... 4359	High limit (xIn)	1	0	3	1.00 xIn = 100		■	■		■	■
4360... 4361	Sum of broken current IL11	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4362... 4363	Sum of broken current IL12	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4364... 4365	Sum of broken current IL13	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4366... 4367	Sum of broken current IL14	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4368... 4369	Sum of broken current IL15	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4370... 4374	IL1 broken current counter	1	0	3	1000 = 1000	CB open count scaling	■	■		■	■
4375... 4376	Sum of broken current IL21	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4377... 4378	Sum of broken current IL22	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4379... 4380	Sum of broken current IL23	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4381... 4382	Sum of broken current IL24	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
4383... 4384	Sum of broken current IL25	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4385... 4389	IL2 broken current counter	1	0	3	1000 = 1000	CB open count scaling	■	■		■	■
4390... 4391	Sum of broken current IL31	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4392... 4393	Sum of broken current IL32	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4394... 4395	Sum of broken current IL33	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4396... 4397	Sum of broken current IL34	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4398... 4399	Sum of broken current IL35	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4400... 4404	IL3 broken current counter	1	0	3	1000 = 1000	CB open count scaling	■	■		■	■
4405... 4406	Cumul. broken current IL1	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4407... 4408	Cumul. broken current IL2	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4409... 4410	Cumul. broken current IL3	1	0	3	neighbouring two register combine to a float32 value		■	■		■	■
4411	CB Open Counter	1	0	3	1 = 1	CB open count scaling	■	■		■	■
4412	Protection Trip counter	1	0	3	1000 = 1000	CB open count scaling	■	■		■	■
4413	Rack out counter	1	0	3	1000 = 1000	CB open count scaling	■	■		■	■
4414... 4453	CB opening time	1	0	3	1 = 1		■	■		■	■
4455... 4494	CB Closing time	1	0	3	1 = 1		■	■		■	■
4496... 4535	Spring Charging times	1	0	3	1 = 1		■	■		■	■
4536... 4538	Alarm1	1	0	3	1000 = 1000	Limit for oper. left scaling	■	■		■	■
4539... 4541	Alarm2	1	0	3	1000 = 1000	Limit for oper. left scaling	■	■		■	■

Settings

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
ARC setting items:											
5001	I>int. pick-up value	1	1	3, 6	1.00 xIn = 100					■	■
5002	Io>int. pick-up value	1	1	3, 6	1.00 xIn = 100					■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
5003	Arc stage 1 enabled	1	1	3, 6	Off=0;On=1					■	■
5004	Arc stage 2 enabled	1	1	3, 6	Off=0;On=1					■	■
5005	Arc stage 3 enabled	1	1	3, 6	Off=0;On=1					■	■
5006	Arc stage 4 enabled	1	1	3, 6	Off=0;On=1					■	■
5007	Arc stage 5 enabled	1	1	3, 6	Off=0;On=1					■	■
5008	Arc stage 6 enabled	1	1	3, 6	Off=0;On=1					■	■
5009	Arc stage 7 enabled	1	1	3, 6	Off=0;On=1					■	■
5010	Arc stage 8 enabled	1	1	3, 6	Off=0;On=1					■	■
5011	Stage 1 Mode	1	1	3, 6	Light=0; Light&Current=1					■	■
5012	Stage 2 Mode	1	1	3, 6	Light=0; Light&Current=1					■	■
5013	Stage 3 Mode	1	1	3, 6	Light=0; Light&Current=1					■	■
5014	Stage 4 Mode	1	1	3, 6	Light=0; Light&Current=1					■	■
5015	Stage 5 Mode	1	1	3, 6	Light=0; Light&Current=1					■	■
5016	Stage 6 Mode	1	1	3, 6	Light=0; Light&Current=1					■	■
5017	Stage 7 Mode	1	1	3, 6	Light=0; Light&Current=1					■	■
5018	Stage 8 Mode	1	1	3, 6	Light=0; Light&Current=1					■	■
5019	Trip 1 delay [x1ms]	1	1	3, 6	1 = 1					■	■
5020	Trip 2 delay [x1ms]	1	1	3, 6	1 = 1					■	■
5021	Trip 3 delay [x1ms]	1	1	3, 6	1 = 1					■	■
5022	Trip 4 delay [x1ms]	1	1	3, 6	1 = 1					■	■
5023	Trip 5 delay [x1ms]	1	1	3, 6	1 = 1					■	■
5024	Trip 6 delay [x1ms]	1	1	3, 6	1 = 1					■	■
5025	Trip 7 delay [x1ms]	1	1	3, 6	1 = 1					■	■
5026	Trip 8 delay [x1ms]	1	1	3, 6	1 = 1					■	■
5027	Min. hold time [x1ms]	1	1	3, 6	1 = 1					■	■
5028	Min. hold time2 [x1ms]	1	1	3, 6	1 = 1					■	■
5029	Min. hold time3 [x1ms]	1	1	3, 6	1 = 1					■	■
5030	Min. hold time4 [x1ms]	1	1	3, 6	1 = 1					■	■
5031	Min. hold time5 [x1ms]	1	1	3, 6	1 = 1					■	■
5032	Min. hold time6 [x1ms]	1	1	3, 6	1 = 1					■	■
5033	Min. hold time7 [x1ms]	1	1	3, 6	1 = 1					■	■
5034	Min. hold time8 [x1ms]	1	1	3, 6	1 = 1					■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
Inrush setting											
5101	Enable for Inrush	1	1	3, 6	Off=0;On=1		■	■		■	■
5102	Max inrush current	1	1	3, 6	1.00 xIn = 100		■	■		■	■
5103	Pickup for 2nd harmonic	1	1	3, 6	1 % = 1		■	■		■	■
OverCurrent I> setting											
5151	Enable for I>	1	1	3, 6	Off=0;On=1		■	■		■	■
5152... 5155	Pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
5156... 5159	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■	■		■	■
5160... 5163	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7; STI=8;STEI=9; CO8=10;RI=11; RXIDG=12		■	■		■	■
5164... 5167	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5168... 5171	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
5172... 5175	Reset time	1	1	3, 6	1.00 s = 100		■	■		■	■
5176... 5179	Inrush status for I>	1	1	3, 6	Off=0;On=1		■	■		■	■
5180... 5183	SOL use by I>	1	1	3, 6	Off=0;On=1		■	■		■	■
5184... 5187	SOL Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5188... 5191	SOL Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
5192... 5195	CLPU status for I>	1	1	3, 6	Off=0;On=1		■	■		■	■
5196... 5199	CLPU pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
5200... 5203	CLPU operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5204... 5207	CLPU Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
5208	Include harmonics	1	1	3, 6	Off=0;On=1		■	■		■	■
5209... 5212	Reset type	1	1	3, 6	DT=0;IDMT=1		■	■		■	■
OverCurrent I>> setting											
5251	Enable for I>>	1	1	3, 6	Off=0;On=1		■	■		■	■
5252... 5255	Pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
5256... 5259	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■	■		■	■
5260... 5263	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7; STI=8;STEI=9;		■	■		■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
					CO8=10;RI=11; RXIDG=12						
5264... 5267	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5268... 5271	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
5272... 5275	Inrush status for I>>	1	1	3, 6	Off=0;On=1		■	■		■	■
5276... 5279	SOL use by I>>	1	1	3, 6	Off=0;On=1		■	■		■	■
5280... 5283	SOL Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5284... 5287	SOL Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
5288... 5291	CLPU status for I>>	1	1	3, 6	Off=0;On=1		■	■		■	■
5292... 5295	CLPU pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
5296... 5299	CLPU Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5300... 5303	CLPU Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
5304	Include harmonics	1	1	3, 6	Off=0;On=1		■	■		■	■
5305... 5308	Reset type	1	1	3, 6	DT=0;IDMT=1		■	■		■	■
5309... 5312	Reset time	1	1	3, 6	1.00 s = 100		■	■		■	■
OverCurrent I>>> setting											
5351	Enable for I>>>	1	1	3, 6	Off=0;On=1		■	■		■	■
5352... 5355	Pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
5356... 5359	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5360... 5363	Inrush status for I>>>	1	1	3, 6	Off=0;On=1		■	■		■	■
5364... 5367	SOL use by I>>>	1	1	3, 6	Off=0;On=1		■	■		■	■
5368... 5371	SOL Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5372... 5375	CLPU status for I>>>	1	1	3, 6	Off=0;On=1		■	■		■	■
5376... 5379	CLPU pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
5380... 5383	CLPU Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
SOTF setting											
5401	Enable for SOTF	1	1	3, 6	Off=0;On=1		■	■		■	■
5402	Pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
5403	Dead line detection delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5404	SOTF active Timer	1	1	3, 6	1.00 s = 100		■	■		■	■
5405	Dead line detection input	1	1	3, 6	Value ²⁶		■	■		■	■
Iφ> setting											
5411	Enable for Iφ>	1	1	3, 6	Off=0;On=1		■			■	■
5412... 5415	Pick-up value	1	1	3, 6	1.00 xIn = 100		■			■	■
5416... 5419	Direction mode	1	1	3, 6	Dir+Backup=0; Undir=1;Dir=2		■			■	■
5420... 5423	Angle offset	1	1	3, 6	1 ° = 1		■			■	■
5424... 5427	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■			■	■
5428... 5431	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7; STI=8;STEI=9; CO8=10;RI=11; RXIDG=12		■			■	■
5432... 5435	Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5436... 5439	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
5440... 5443	Reset time	1	1	3, 6	1.00 s = 100		■			■	■
5444... 5447	Inrush status for Iφ>	1	1	3, 6	Off=0;On=1		■			■	■
5448... 5451	SOL status for Iφ>	1	1	3, 6	Off=0;On=1		■			■	■
5452... 5455	SOL Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5456... 5459	SOL Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
5460... 5463	CLPU status for Iφ>	1	1	3, 6	Off=0;On=1		■			■	■
5464... 5467	CLPU pick-up value	1	1	3, 6	1.00 xIn = 100		■			■	■
5468... 5471	CLPU Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5472... 5475	CLPU Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
5476... 5479	Reset type	1	1	3, 6	DT=0;IDMT=1		■			■	■
Iφ>> setting											
5481	Enable for Iφ>>	1	1	3, 6	Off=0;On=1		■			■	■
5482... 5485	Pick-up value	1	1	3, 6	1.00 xIn = 100		■			■	■

26. DI1=1;DI2=2;...;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35; Watchdog=36;SF=37;SF=38;SF=39;SF=40;SF=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAI=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;...;VO5=59;VO6=60;DI21=65;DI22=66;...;DI39=83;DI40=84;F1=85;F2=86;...;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;SF=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;...;NI63=191;NI64=192;POC1=193;POC2=194;...;POC15=207;POC16=208;VI5=225;VI6=226;...;VI19=239;VI20=240;VO7=257;VO8=258;...;VO19=269;VO20=270; NI65=289;NI66=290;...;NI127=351;NI128=352

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
5486... 5489	Direction mode	1	1	3, 6	Dir+Backup=0; Undir=1;Dir=2		■			■	■
5490... 5493	Angle offset	1	1	3, 6	1 ° = 1		■			■	■
5494... 5497	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■			■	■
5498... 5501	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7;STI=8; STEI=9;CO8=10;RI=11; RXIDG=12		■			■	■
5502... 5505	Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5506... 5509	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
5510... 5513	Reset time	1	1	3, 6	1.00 s = 100		■			■	■
5514... 5517	Inrush status for I _φ >>	1	1	3, 6	Off=0;On=1		■			■	■
5518... 5521	SOL status for I _φ >>	1	1	3, 6	Off=0;On=1		■			■	■
5522... 5525	SOL Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5526... 5529	SOL Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
5530... 5533	CLPU status for I _φ >>	1	1	3, 6	Off=0;On=1		■			■	■
5534... 5537	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100		■			■	■
5538... 5541	CLPU Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5542... 5545	CLPU Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
5546... 5549	Reset type	1	1	3, 6	DT=0;IDMT=1		■			■	■
I _φ >>> setting											
5551	Enable for I _φ >>>	1	1	3, 6	Off=0;On=1		■			■	■
5552... 5555	Pick-up value	1	1	3, 6	1.00 xIn = 100		■			■	■
5556... 5559	Direction mode	1	1	3, 6	Dir+Backup=0; Undir=1;Dir=2		■			■	■
5560... 5563	Angle offset	1	1	3, 6	1 ° = 1		■			■	■
5564... 5567	Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5568... 5571	Inrush status for I _φ >>>	1	1	3, 6	Off=0;On=1		■			■	■
5572... 5575	SOL status for I _φ >>>	1	1	3, 6	Off=0;On=1		■			■	■
5576... 5579	SOL Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5580... 5583	CLPU status for I _φ >>>	1	1	3, 6	Off=0;On=1		■			■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
5584... 5587	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100		■			■	■
5588... 5591	CLPU Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
Iφ>>>> setting											
5601	Enable for Iφ>>>>	1	1	3, 6	Off=0;On=1		■			■	■
5602... 5605	Pick-up value	1	1	3, 6	1.00 xIn = 100		■			■	■
5606... 5609	Direction mode	1	1	3, 6	Dir+Backup=0; Undir=1;Dir=2		■			■	■
5610... 5613	Angle offset	1	1	3, 6	1 ° = 1		■			■	■
5614... 5617	Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5618... 5621	Inrush status for Iφ>>>>	1	1	3, 6	Off=0;On=1		■			■	■
5622... 5625	SOL status for Iφ>>>>	1	1	3, 6	Off=0;On=1		■			■	■
5626... 5629	SOL Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
5630... 5633	CLPU status for Iφ>>>>	1	1	3, 6	Off=0;On=1		■			■	■
5634... 5637	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100		■			■	■
5638... 5641	CLPU Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
P< setting											
5651	Enable for P<	1	1	3, 6	Off=0;On=1		■			■	■
5652... 5655	Pick-up value	1	1	3, 6	1 %Sn = 1		■			■	■
5656... 5659	Operation delay	1	1	3, 6	1.0 s = 10		■			■	■
P<< setting											
5701	Enable for P<<	1	1	3, 6	Off=0;On=1		■			■	■
5702... 5705	Pick-up value	1	1	3, 6	1 %Sn = 1		■			■	■
5706... 5709	Operation delay	1	1	3, 6	1.0 s = 10		■			■	■
I< setting											
5751	Enable for I<	1	1	3, 6	Off=0;On=1		■	■			■
5752... 5755	Pick-up value	1	1	3, 6	1.00 %In = 100		■	■			■
5756... 5759	Operation delay	1	1	3, 6	1.0 s = 10		■	■			■
I2>I1 setting											
5801	Enable for I2/I1>	1	1	3, 6	Off=0;On=1		■	■		■	■
5802... 5805	Pick-up value	1	1	3, 6	1 % = 1		■	■		■	■
5806... 5809	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
I2> setting											

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
5901	Enable for I2>	1	1	3, 6	Off=0;On=1		■	■		■	■
5902... 5905	Pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
5906... 5909	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■	■		■	■
5910... 5913	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7; STI=8;STEI=9; CO8=10;RI=11; RXIDG=12		■	■		■	■
5914... 5917	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
5918... 5921	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
5922... 5925	Reset type	1	1	3, 6	DT=0;IDMT=1		■	■		■	■
5926... 5929	Reset time	1	1	3, 6	1.00 s = 100		■	■		■	■
Ist> setting											
5951	Enable for Ist>	1	1	3, 6	Off=0;On=1		■	■			■
5952	Delay type	1	1	3, 6	DT=0;INV=1		■	■			■
5953	Motor start time	1	1	3, 6	1.0 s = 10		■	■			■
Ilr> setting											
6001	Enable for Ilr>	1	1	3, 6	Off=0;On=1		■	■			■
6002	Pick-up value	1	1	3, 6	1.0 % = 10		■	■			■
6003	Delay type	1	1	3, 6	DT=0;INV=1		■	■			■
6004	Operation delay	1	1	3, 6	1.0 s = 10		■	■			■
N> setting											
6051	Enable for N>	1	1	3, 6	Off=0;On=1		■	■			■
6052	Max motor Hot starts	1	1	3, 6	1 = 1		■	■			■
6053	Max motor cold starts	1	1	3, 6	1 = 1		■	■			■
6054	Min time between motor starts	1	1	3, 6	1.0 min = 10		■	■			■
6055	Reference period	1	1	3, 6	1.0 min = 10		■	■			■
6056	Hot Status Limit	1	1	3, 6	1.0 % = 10		■	■			■
Motor T°> setting											
6101	Enable for Motor T>	1	1	3, 6	Off=0;On=1		■	■			■
6102... 6105	Basic current setting	1	1	3, 6	1.00 xIn = 100		■	■			■
6106... 6109	Max permissive I factor	1	1	3, 6	1.00 = 100		■	■			■
6110... 6113	Heating time constant	1	1	3, 6	1.0 min = 10		■	■			■
6114... 6117	Time constant for motor starting	1	1	3, 6	1.0 min = 10		■	■			■
6118... 6121	Cooling time constant	1	1	3, 6	1.0 min = 10		■	■			■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
6130... 6133	Unbalance factor	1	1	3, 6	1.0 = 10		■	■			■
6134... 6137	Thermal alarm value	1	1	3, 6	1 % = 1		■	■			■
6138... 6141	Reserve time thermal alarm	1	1	3, 6	1.0 min = 10		■	■			■
6142... 6145	Temperature based mode	1	1	3, 6	Current=0; Ambient=1		■	■			■
6146... 6149	Nominal ambient temp	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■			■
6150... 6153	Max object temperature	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■			■
6154... 6157	Alarm temperature	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■			■
6158... 6161	Min ambient temperature	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■			■
6162... 6165	Default ambient temperature	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■			■
Feeder T°> setting											
6201	Enable for feeder T>	1	1	3, 6	Off=0;On=1		■	■		■	
6202... 6205	Basic current setting	1	1	3, 6	1.00 xIn = 100		■	■		■	
6206... 6209	Max permissive I factor	1	1	3, 6	1.00 = 100		■	■		■	
6210... 6213	Heating time constant	1	1	3, 6	1.0 min = 10		■	■		■	
6214... 6217	Thermal alarm value	1	1	3, 6	1 % = 1		■	■		■	
6218... 6221	Reserve time thermal alarm	1	1	3, 6	1.0 min = 10		■	■		■	
6222... 6225	Temperature based mode	1	1	3, 6	Current=0; Ambient=1		■	■		■	
6226... 6229	Nominal ambient temp	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■		■	
6230... 6233	Max object temperature	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■		■	
6234... 6237	Alarm temperature	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■		■	
6238... 6241	Min ambient temperature	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■		■	
6242... 6245	Default ambient temperature	1	1	3, 6	1 °C = 1 / 1 °F = 1		■	■		■	
Io> setting											
6261	Enable for Io>	1	1	3, 6	Off=0;On=1		■	■		■	■
6262... 6265	Pick-up value	1	1	3, 6	1.000 pu = 1000		■	■		■	■
6266... 6269	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■	■		■	■
6270... 6273	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7; STI=8;STEI=9; CO8=10;RI=11; RXIDG=12		■	■		■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
6274... 6277	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
6278... 6281	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
6282... 6285	Network earthing	1	1	3, 6	Res=0;Cap=1		■	■		■	■
6286... 6289	Reset time	1	1	3, 6	1.00 s = 100		■	■		■	■
6291... 6294	Inrush status for Io>	1	1	3, 6	Off=0;On=1		■	■		■	■
6295... 6298	SOL use for Io>	1	1	3, 6	Off=0;On=1		■	■		■	■
6299... 6302	SOL Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
6303... 6306	SOL Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
6307... 6310	CLPU status for Io>	1	1	3, 6	Off=0;On=1		■	■		■	■
6311... 6314	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
6315... 6318	CLPU Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
6319... 6322	CLPU Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
6323... 6326	Reset type	1	1	3, 6	DT=0;IDMT=1		■	■		■	■
6327	Enable faulty phase detection	1	1	3, 6	Off=0;On=1		■	■		■	■
6328	Phase currents change limit	1	1	3, 6	1 % = 1		■	■		■	■
Io>> setting											
6331	Enable for Io>>	1	1	3, 6	Off=0;On=1		■	■		■	■
6332... 6335	Pick-up value	1	1	3, 6	1.00 pu = 100		■	■		■	■
6336... 6339	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■	■		■	■
6340... 6343	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7; STI=8;STEI=9; CO8=10;RI=11; RXIDG=12		■	■		■	■
6344... 6347	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
6348... 6351	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
6352... 6355	Network earthing	1	1	3, 6	Res=0;Cap=1		■	■		■	■
6356... 6359	Inrush status for Io>>	1	1	3, 6	Off=0;On=1		■	■		■	■
6360... 6363	SOL use for Io>>	1	1	3, 6	Off=0;On=1		■	■		■	■
6364... 6367	SOL Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
6368... 6371	SOL Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
6372... 6375	CLPU status for lo>>	1	1	3, 6	Off=0;On=1		■	■		■	■
6376... 6379	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100		■	■		■	■
6380... 6383	CLPU Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
6384... 6387	CLPU Inv. time coefficient	1	1	3, 6	1.000 = 1000		■	■		■	■
6388... 6391	Reset type	1	1	3, 6	DT=0;IDMT=1		■	■		■	■
6392... 6395	Reset time	1	1	3, 6	1.00 s = 100		■	■		■	■
6396	Enable faulty phase detection	1	1	3, 6	Off=0;On=1		■	■		■	■
6397	Phase currents change limit	1	1	3, 6	1 % = 1		■	■		■	■
lo>>> setting											
6401	Enable for lo>>>	1	1	3, 6	Off=0;On=1		■	■		■	■
6402... 6405	Pick-up value	1	1	3, 6	1.00 pu = 100		■	■		■	■
6406... 6409	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
6410... 6413	Network earthing	1	1	3, 6	Res=0;Cap=1			■		■	■
6414... 6417	Inrush status for lo>>>	1	1	3, 6	Off=0;On=1			■		■	■
6418... 6421	SOL use for lo>>>	1	1	3, 6	Off=0;On=1			■		■	■
6422... 6425	SOL Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
6426... 6429	CLPU status for lo>>>	1	1	3, 6	Off=0;On=1			■		■	■
6430... 6433	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100			■		■	■
6434... 6437	CLPU Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
6438	Enable faulty phase detection	1	1	3, 6	Off=0;On=1			■		■	■
6439	Phase currents change limit	1	1	3, 6	1 % = 1			■		■	■
lo>>>> setting											
6451	Enable for lo>>>>	1	1	3, 6	Off=0;On=1			■		■	■
6452... 6455	Pick-up value	1	1	3, 6	1.00 pu = 100			■		■	■
6456... 6459	Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
6460... 6463	Network earthing	1	1	3, 6	Res=0;Cap=1			■		■	■
6464... 6467	Inrush status for lo>>>>	1	1	3, 6	Off=0;On=1			■		■	■
6468... 6471	SOL use for lo>>>>	1	1	3, 6	Off=0;On=1			■		■	■
6472... 6475	SOL Operation delay	1	1	3, 6	1.00 s = 100			■		■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
6476... 6479	CLPU status for lo>>>>	1	1	3, 6	Off=0;On=1			■		■	■
6480... 6483	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100			■		■	■
6484... 6487	CLPU Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
6488	Enable faulty phase detection	1	1	3, 6	Off=0;On=1			■		■	■
6489	Phase currents change limit	1	1	3, 6	1 % = 1			■		■	■
lo>>>> setting											
6501	Enable for lo>>>>	1	1	3, 6	Off=0;On=1			■		■	■
6502... 6505	Pick-up value	1	1	3, 6	1.00 pu = 100			■		■	■
6506... 6509	Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
loφ> setting											
6551	Enable for loφ>	1	1	3, 6	Off=0;On=1		■			■	■
6552... 6555	Direction mode	1	1	3, 6	ResCap=0; Sector=1;Undir=2		■			■	■
6556... 6559	Char ctrl. in ResCap mode	1	1	3, 6	Res=0;Cap=1; DI1=2;DI2=3;...; DI19=20;DI20=21;Arc1=26; Arc2=27;BI=28; VI1=30;VI2=31; VI3=32;VI4=33; DI21=66;DI22=67;...;DI31=76; DI32=77		■			■	■
6560... 6563	Pick-up value	1	1	3, 6	1.000 pu = 1000		■			■	■
6564... 6567	Uo setting for loφ> stage	1	1	3, 6	1.0 % = 10		■			■	■
6568... 6571	Angle offset	1	1	3, 6	1 ° = 1		■			■	■
6572... 6575	Pick up sector size	1	1	3, 6	1 ± ° = 1		■			■	■
6576... 6579	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■			■	■
6580... 6583	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7; STI=8;STEI=9; CO8=10;RI=11; RXIDG=12		■			■	■
6584... 6587	Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
6588... 6591	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
6592... 6595	Reset type	1	1	3, 6	DT=0;IDMT=1		■			■	■
6596... 6599	Reset time	1	1	3, 6	1.00 s = 100		■			■	■
loφ>> setting											
6601	Enable for loφ>>	1	1	3, 6	Off=0;On=1		■			■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
6602... 6605	Direction mode	1	1	3, 6	ResCap=0; Sector=1;Undir=2		■			■	■
6606... 6609	Char ctrl. in ResCap mode	1	1	3, 6	Res=0;Cap=1; DI1=2;DI2=3;...; DI19=20;DI20=21;Arc1=26; Arc2=27;BI=28; VI1=30;VI2=31; VI3=32;VI4=33; DI21=66;DI22=67;...;DI31=76; DI32=77		■			■	■
6610... 6613	Pick-up value	1	1	3, 6	1.000 pu = 1000		■			■	■
6614... 6617	Uo setting for loφ>> stage	1	1	3, 6	1.0 % = 10		■			■	■
6618... 6621	Angle offset	1	1	3, 6	1 ° = 1		■			■	■
6622... 6625	Pick up sector size	1	1	3, 6	1 ±° = 1		■			■	■
6626... 6629	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7		■			■	■
6630... 6633	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5;LTVI=6;MI=7; STI=8;STEI=9; CO8=10;RI=11; RXIDG=12		■			■	■
6634... 6637	Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
6638... 6641	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
6642... 6645	Reset type	1	1	3, 6	DT=0;IDMT=1		■			■	■
6646... 6649	Reset time	1	1	3, 6	1.00 s = 100		■			■	■
loφ>>> setting											
6651	Enable for loφ>>>	1	1	3, 6	Off=0;On=1		■			■	■
6652... 6655	Direction mode	1	1	3, 6	ResCap=0; Sector=1;Undir=2		■			■	■
6656... 6659	Char ctrl. in ResCap mode	1	1	3, 6	Res=0;Cap=1; DI1=2;DI2=3;...; DI19=20;DI20=21;Arc1=26; Arc2=27;BI=28; VI1=30;VI2=31; VI3=32;VI4=33; DI21=66;DI22=67;...;DI31=76; DI32=77		■			■	■
6660... 6663	Pick-up value	1	1	3, 6	1.000 pu = 1000		■			■	■
6664... 6667	Uo setting for loφ>>> stage	1	1	3, 6	1.0 % = 10		■			■	■
6668... 6671	Angle offset	1	1	3, 6	1 ° = 1		■			■	■
6672... 6675	Pick up sector size	1	1	3, 6	1 ±° = 1		■			■	■
6676... 6679	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3;		■			■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
					Others=4;Prg1=5;Prg2=6;Prg3=7						
6680... 6683	Delay type	1	1	3, 6	DT=0;NI=1;VI=2;EI=3;LTI=4;LTEI=5;LTVI=6;MI=7;STI=8;STEI=9;CO8=10;RI=11;RXIDG=12		■			■	■
6684... 6687	Operation delay	1	1	3, 6	1.00 s = 100		■			■	■
6688... 6691	Inv. time coefficient	1	1	3, 6	1.000 = 1000		■			■	■
6692... 6695	Reset type	1	1	3, 6	DT=0;IDMT=1		■			■	■
6696... 6699	Reset time	1	1	3, 6	1.00 s = 100		■			■	■
IoUo> setting											
6701	Enable for IoUo>	1	1	3, 6	Off=0;On=1					■	■
6702... 6705	Direction mode	1	1	3, 6	Forward=0;Reverse=1					■	■
6706... 6709	Inhibit ctrl.	1	1	3, 6	DI1=1;DI2=2;...;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;...;DI39=83;DI40=84;VI5=225;VI6=226;...;VI19=239;VI20=240					■	■
6710... 6713	Timer instant delay ctrl.	1	1	3, 6	DI1=1;DI2=2;...;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;...;DI31=75;DI32=76					■	■
6714... 6717	Pick-up value	1	1	3, 6	1.00 %Pno = 100	Pick-up value scaling				■	■
6718... 6721	Uo pick-up value	1	1	3, 6	1.0 % = 10					■	■
6722... 6725	Pick-up sector size	1	1	3, 6	1 ±° = 1					■	■
6726... 6729	Operation delay	1	1	3, 6	1.00 s = 100					■	■
6730... 6733	SOL Mode	1	1	3, 6	Off=0;On=1					■	■
6734... 6737	SOL Operation delay	1	1	3, 6	1.00 s = 100					■	■
6738... 6741	Memory Mode	1	1	3, 6	None=0;Voltage=1;Time=2;Both=3					■	■
6742... 6745	Uo pick-up value	1	1	3, 6	1.0 % = 10					■	■
6746... 6749	Memory time	1	1	3, 6	1.00 s = 100					■	■
6750	Reset time	1	1	3, 6	1.00 s = 100					■	■
IoUo>> setting											

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
6751	Enable for IoUo>>	1	1	3, 6	Off=0;On=1					■	■
6752... 6755	Direction mode	1	1	3, 6	Forward=0; Reverse=1					■	■
6756... 6759	Input for inhibit control	1	1	3, 6	DI1=1;DI2=2;...; DI19=19;DI20=20; Arc1=25; Arc2=26;BI=27; VI1=29;VI2=30; VI3=31;VI4=32; DI21=65;DI22=66;...; DI39=83; DI40=84;VI5=225; VI6=226;...; VI19=239;VI20=240					■	■
6760... 6763	Timer instant delay ctrl.	1	1	3, 6	DI1=1;DI2=2;...; DI19=19;DI20=20; Arc1=25; Arc2=26;BI=27; VI1=29;VI2=30; VI3=31;VI4=32; DI21=65;DI22=66;...; DI39=83; DI40=84;VI5=225; VI6=226;...; VI19=239;VI20=240					■	■
6764... 6767	Pick-up value	1	1	3, 6	1.00 %Pno = 100	Pick-up value scaling				■	■
6768... 6771	Uo pick-up value	1	1	3, 6	1.0 % = 10					■	■
6772... 6775	Pick up sector size	1	1	3, 6	1 ±° = 1					■	■
6776... 6779	Operation delay	1	1	3, 6	1.00 s = 100					■	■
6780... 6783	SOL Mode	1	1	3, 6	Off=0;On=1					■	■
6784... 6787	SOL Operation delay	1	1	3, 6	1.00 s = 100					■	■
6788... 6791	Memory Mode	1	1	3, 6	None=0;Voltage=1; Time=2;Both=3					■	■
6792... 6795	Uo memory value	1	1	3, 6	1.0 % = 10					■	■
6796... 6799	Memory time	1	1	3, 6	1.00 s = 100					■	■
6800	Reset time	1	1	3, 6	1.00 s = 100					■	■
U> setting											
6801	Enable for U>	1	1	3, 6	Off=0;On=1		■		■	■	■
6802... 6805	Pick-up value	1	1	3, 6	1.0 %Un = 10		■		■	■	■
6806... 6809	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
6810	Reset time	1	1	3, 6	1.00 s = 100		■		■	■	■
6811	Hysteresis	1	1	3, 6	1.0 % = 10		■		■	■	■
U>> setting											
6851	Enable for U>>	1	1	3, 6	Off=0;On=1		■		■	■	■
6852... 6855	Pick-up value	1	1	3, 6	1.0 %Un = 10		■		■	■	■
6856... 6859	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
6860	Hysteresis	1	1	3, 6	1.0 % = 10		■		■	■	■
U>>> setting											
6901	Enable for U>>>	1	1	3, 6	Off=0;On=1		■		■	■	■
6902... 6905	Pick-up value	1	1	3, 6	1.0 %Un = 10		■		■	■	■
6906... 6909	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
6910	Hysteresis	1	1	3, 6	1.0 % = 10		■		■	■	■
U< setting											
6951	Enable for U<	1	1	3, 6	Off=0;On=1		■		■	■	■
6952... 6955	Pick-up value	1	1	3, 6	1.0 %Un = 10		■		■	■	■
6956... 6959	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
6960	Reset time	1	1	3, 6	1.00 s = 100		■		■	■	■
6961	Hysteresis	1	1	3, 6	1.0 % = 10		■		■	■	■
U<< setting											
7001	Enable for U<<	1	1	3, 6	Off=0;On=1		■		■	■	■
7002... 7005	Pick-up value	1	1	3, 6	1.0 %Un = 10		■		■	■	■
7006... 7009	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
7010	Hysteresis	1	1	3, 6	1.0 % = 10		■		■	■	■
U<<< setting											
7051	Enable for U<<<	1	1	3, 6	Off=0;On=1		■		■	■	■
7052... 7055	Pick-up value	1	1	3, 6	1.0 %Un = 10		■		■	■	■
7056... 7059	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
7060	Hysteresis	1	1	3, 6	1.0 % = 10		■		■	■	■
U1< setting											
7101	Enable for U1<	1	1	3, 6	Off=0;On=1				■		■
7102... 7105	Pick-up value	1	1	3, 6	1 %Vn = 1				■		■
7106... 7109	Operation delay	1	1	3, 6	1.00 s = 100				■		■
7110	Low voltage blocking	1	1	3, 6	1.0 %Un = 10				■		■
U1<< setting											
7151	Enable for U1<<	1	1	3, 6	Off=0;On=1				■		■
7152... 7155	Pick-up value	1	1	3, 6	1 %Vn = 1				■		■
7156... 7159	Operation delay	1	1	3, 6	1.00 s = 100				■		■
7160	Low voltage blocking	1	1	3, 6	1.0 %Un = 10				■		■
Uo> setting											
7201	Enable for Uo>	1	1	3, 6	Off=0;On=1		■		■	■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
7202... 7205	Pick-up value	1	1	3, 6	1 % = 1		■		■	■	■
7206... 7209	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
7210... 7213	Reset time	1	1	3, 6	1.00 s = 100		■		■	■	■
Uo>> setting											
7251	Enable for Uo>>	1	1	3, 6	Off=0;On=1		■		■	■	■
7252... 7255	Pick-up value	1	1	3, 6	1 % = 1		■		■	■	■
7256... 7259	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
7260... 7263	Reset time	1	1	3, 6	1.00 s = 100		■		■	■	■
Uo>>> setting											
7301	Enable for Uo>>>	1	1	3, 6	Off=0;On=1		■		■	■	■
7302... 7305	Pick-up value	1	1	3, 6	1 % = 1		■		■	■	■
7306... 7309	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
7310... 7313	Reset time	1	1	3, 6	1.00 s = 100		■		■	■	■
fX setting											
7351	Enable for fX	1	1	3, 6	Off=0;On=1		■		■	■	■
7352... 7355	Pick-up value	1	1	3, 6	50.00 Hz = 5000		■		■	■	■
7356... 7359	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
7360	Low voltage blocking	1	1	3, 6	1.0 %Un = 10		■		■	■	■
fXX setting											
7401	Enable for fXX	1	1	3, 6	Off=0;On=1		■		■	■	■
7402... 7405	Pick-up value	1	1	3, 6	50.00 Hz = 5000		■		■	■	■
7406... 7409	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
7410	Low voltage blocking	1	1	3, 6	1.0 %Un = 10		■		■	■	■
f< setting											
7451	Enable for f<	1	1	3, 6	Off=0;On=1		■		■	■	■
7452... 7455	Pick-up value	1	1	3, 6	50.00 Hz = 5000		■		■	■	■
7456... 7459	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
7460	Low voltage blocking	1	1	3, 6	1.0 %Un = 10		■		■	■	■
f<< setting											
7501	Enable for f<<	1	1	3, 6	Off=0;On=1		■		■	■	■
7502... 7505	Pick-up value	1	1	3, 6	50.00 Hz = 5000		■		■	■	■
7506... 7509	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
7510	Low voltage blocking	1	1	3, 6	1.0 %Un = 10		■		■	■	■
CBFail setting											
7551	Enable for CB fail	1	1	3, 6	Off=0;On=1		■	■	■	■	■
7552	Enable CBF timer1	1	1	3, 6	Off=0;On=1		■	■	■	■	■
7553	Timer1 Operation Delay	1	1	3, 6	1.00 s = 100		■	■	■	■	■
7554	Enable CBF timer2	1	1	3, 6	Off=0;On=1		■	■	■	■	■
7555	Timer2 Operation Delay	1	1	3, 6	1.00 s = 100		■	■	■	■	■
7556	Noncurrent CBF reset mode	1	1	3, 6	I<Only=0; PoleDead=1; ProtRst=2		■	■	■	■	■
7557	Ext. CBF reset mode	1	1	3, 6	I<Only=0; PoleDead=1; ProtRst=2		■	■	■	■	■
7558	I< current set	1	1	3, 6	1.00 xIn = 100		■	■		■	■
7559	Io< current set	1	1	3, 6	1.000 pu = 1000		■	■		■	■
7560	Io'< current set	1	1	3, 6	1.000 pu = 1000			■		■	■
Ih5> setting											
7651	Enable for Ih5>	1	1	3, 6	Off=0;On=1		■	■		■	■
7652	Pick-up value	1	1	3, 6	1 % = 1		■	■		■	■
7653	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
CT setting											
7701	Enable for CT supervision	1	1	3, 6	Off=0;On=1		■	■		■	■
7702	CTS Operate mode	1	1	3, 6	3I only=0;I0&U0=1;Both=2		■	■		■	■
7703	CTS reset input	1	1	3, 6	Value ²⁷		■	■		■	■
7704	Operation delay	1	1	3, 6	1.00 s = 100		■	■		■	■
7721	Residual current >	1	1	3, 6	1.00 xIn = 100		■			■	■
7722	Residual voltage <	1	1	3, 6	1.0 %Un = 10		■			■	■
VT setting											
7751	Enable for VTS	1	1	3, 6	Off=0;On=1		■		■	■	■
7752	U2> setting	1	1	3, 6	1.0 %Vn = 10		■			■	■
7753	I2< setting	1	1	3, 6	1.00 xIn = 100		■			■	■
7754	Operation delay	1	1	3, 6	1.00 s = 100	Operate delay scaling	■			■	■
7755	Inhibit ctrl.	1	1	3, 6	Value ²⁸		■		■	■	■

27. DI1=1;DI2=2;...;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35;Watchdog=36;SF=37;SF=38;SF=39;SF=40;SF=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAI=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;...;VO5=59;VO6=60;DI21=65;DI22=66;...;DI39=83;DI40=84;F1=85;F2=86;...;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;SF=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;...;NI63=191;NI64=192;POC1=193;POC2=194;...;POC15=207;POC16=208;VI5=225;VI6=226;...;VI19=239;VI20=240;VO7=257;VO8=258;...;VO19=269;VO20=270;NI65=289;NI66=290;...;NI127=351;NI128=352
28. DI1=1;DI2=2;DI3=3;DI4=4;DI5=5;DI6=6;DI7=7;DI8=8;DI9=9;DI10=10;DI11=11;DI12=12;DI13=13;DI14=14;DI15=15;DI16=16;DI17=17;DI18=18;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
7756	DI for MCB position	1	1	3, 6	DI1=1;DI2=2;...; DI39=39;DI40=40		■		■	■	■
7757	I>(min) setting	1	1	3, 6	1.00 xln = 100		■			■	■
7758	I<(max) setting	1	1	3, 6	1.00 xln = 100		■			■	■
Io'> setting											
7761	Enable for Io'>	1	1	3, 6	Off=0;On=1			■		■	■
7762... 7765	Pick-up value	1	1	3, 6	1.000 pu = 1000			■		■	■
7766... 7769	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7			■		■	■
7770... 7773	Delay type	1	1	3, 6	DT=0;NI=1;VI=2; EI=3;LTI=4;LTEI=5; LTVI=6;MI=7; STI=8;STEI=9; CO8=10;RI=11; RXIDG=12			■		■	■
7774... 7777	Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
7778... 7781	Inv. time coefficient	1	1	3, 6	1.000 = 1000			■		■	■
7782... 7785	Network grounding	1	1	3, 6	Res=0;Cap=1			■		■	■
7786... 7789	Reset time	1	1	3, 6	1.00 s = 100			■		■	■
7791... 7794	Inrush status for Io'>	1	1	3, 6	Off=0;On=1			■		■	■
7795... 7798	SOL status for Io'>	1	1	3, 6	Off=0;On=1			■		■	■
7799... 7802	SOL Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
7803... 7806	SOL Inv. time coefficient	1	1	3, 6	1.000 = 1000			■		■	■
7807... 7810	CLPU status for Io'>	1	1	3, 6	Off=0;On=1			■		■	■
7811... 7814	CLPU Pick-up value	1	1	3, 6	1.00 xln = 100			■		■	■
7815... 7818	CLPU Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
7819... 7822	CLPU Inv. time coefficient	1	1	3, 6	1.000 = 1000			■		■	■
7823... 7826	Reset type	1	1	3, 6	DT=0;IDMT=1			■		■	■
7827	Enable faulty phase detection	1	1	3, 6	Off=0;On=1			■		■	■
7828	Phase currents change limit	1	1	3, 6	1 % = 1			■		■	■
Io'>> setting											
7831	Enable for Io'>>	1	1	3, 6	Off=0;On=1			■		■	■
7832... 7835	Pick-up value	1	1	3, 6	1.000 pu = 1000			■		■	■
7836... 7839	Delay curve family	1	1	3, 6	DT=0;IEC=1; IEEE=2;IEEE2=3; Others=4;Prg1=5; Prg2=6;Prg3=7			■		■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
7840... 7843	Delay type	1	1	3, 6	DT=0;NI=1;VI=2;EI=3;LTI=4;LTEI=5;LTVI=6;MI=7;STI=8;STEI=9;CO8=10;RI=11;RXIDG=12			■		■	■
7844... 7847	Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
7848... 7851	Inv. time coefficient	1	1	3, 6	1.000 = 1000			■		■	■
7852... 7855	Network earthing	1	1	3, 6	Res=0;Cap=1			■		■	■
7856... 7859	Inrush status for lo'>>	1	1	3, 6	Off=0;On=1			■		■	■
7860... 7863	SOL status for lo'>>	1	1	3, 6	Off=0;On=1			■		■	■
7864... 7867	SOL Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
7868... 7871	SOL Inv. time coefficient	1	1	3, 6	1.000 = 1000			■		■	■
7872... 7875	CLPU status for lo'>>	1	1	3, 6	Off=0;On=1			■		■	■
7876... 7879	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100			■		■	■
7880... 7883	CLPU Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
7884... 7887	CLPU Inv. time coefficient	1	1	3, 6	1.000 = 1000			■		■	■
7888... 7891	Reset type	1	1	3, 6	DT=0;IDMT=1			■		■	■
7892... 7895	Reset time	1	1	3, 6	1.00 s = 100			■		■	■
7896	Enable faulty phase detection	1	1	3, 6	Off=0;On=1			■		■	■
7897	Phase currents change limit	1	1	3, 6	1 % = 1			■		■	■
lo'>>> setting											
7901	Enable for lo'>>>	1	1	3, 6	Off=0;On=1			■		■	■
7902... 7905	Pick-up value	1	1	3, 6	1.000 pu = 1000			■		■	■
7906... 7909	Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
7910... 7913	Network grounding	1	1	3, 6	Res=0;Cap=1			■		■	■
7914... 7917	Inrush status for lo'>>>	1	1	3, 6	Off=0;On=1			■		■	■
7918... 7921	SOL status for lo'>>>	1	1	3, 6	Off=0;On=1			■		■	■
7922... 7925	SOL Operation delay	1	1	3, 6	1.00 s = 100			■		■	■
7926... 7929	CLPU status for lo'>>>	1	1	3, 6	Off=0;On=1			■		■	■
7930... 7933	CLPU Pick-up value	1	1	3, 6	1.00 xIn = 100			■		■	■
7934... 7937	CLPU Operation delay	1	1	3, 6	1.00 s = 100			■		■	■

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
7938	Enable faulty phase detection	1	1	3, 6	Off=0;On=1			■		■	■
7939	Phase currents change limit	1	1	3, 6	1 % = 1			■		■	■
Uc> setting											
7951	Enable for Uc>	1	1	3, 6	Off=0;On=1			■		■	
7952... 7955	Pick-up value	1	1	3, 6	1.00 xUcLN = 100			■		■	
7956... 7959	Operation delay	1	1	3, 6	1.0 s = 10			■		■	
df/dt> setting											
8001	Enable for df/dt>	1	1	3, 6	Off=0;On=1		■		■	■	
8002... 8005	Direction of change	1	1	3, 6	Negative=0; Positive=1; Either=2		■		■	■	
8006... 8009	Pick-up value	1	1	3, 6	1.0 Hz/s = 10		■		■	■	
8010... 8013	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	
8014	Low voltage blocking	1	1	3, 6	1.0 %Un = 10		■		■	■	
df/dt>> setting											
8051	Enable for df/dt>>	1	1	3, 6	Off=0;On=1		■		■	■	
8052... 8055	Direction of change	1	1	3, 6	Negative=0; Positive=1; Either=2		■		■	■	
8056... 8059	Pick-up value	1	1	3, 6	1.0 Hz/s = 10		■		■	■	
8060... 8063	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	
8064	Low voltage blocking	1	1	3, 6	1.0 %Un = 10		■		■	■	
IoInt> setting											
8101	Enable for IoInt>	1	1	3, 6	Off=0;On=1					■	
8102... 8105	Direction mode	1	1	3, 6	Forward=0; Reverse=1					■	
8106... 8109	Uo pick-up value	1	1	3, 6	1 % = 1					■	
8110... 8113	Operation delay	1	1	3, 6	1.00 s = 100					■	
8114... 8117	Min number of peaks	1	1	3, 6	1 = 1					■	
8118... 8121	Reset delay	1	1	3, 6	1.00 s = 100					■	
8122	Intermittent time	1	1	3, 6	1.00 s = 100					■	
Feeder Fault Locator setting											
8152	Pick-up value	1	1	3, 6	1.00 xIn = 100					■	
8153	Triggering digital input	1	1	3, 6	Value ²⁹					■	

29. DI1=1;DI2=2;...;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35; Watchdog=36;SF=37;SF=38;SF=39;SF=40;SF=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAI=49;LedTr=50;LedA= 51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;...;VO5=59;VO6=60;DI21=65;DI22=66;...;DI39=83;DI40=84;F1=85;F2=86;...;F6= 90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;SF=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;...;NI127=351;NI128=352

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
8154	Line reactance/unit	1	1	3, 6	1.000 ohm = 1000					■	
8155	Earth factor	1	1	3, 6	1.000 = 1000					■	
8156	Earth factor angle	1	1	3, 6	1 ° = 1					■	
8157	Event enabling	1	1	3, 6	Off=0;On=1					■	
8158	Average voltage limit	1	1	3, 6	1.0 %Un = 10					■	
8159	Io limit	1	1	3, 6	1.00 xIn = 100					■	
8160	DI timeout	1	1	3, 6	1.00 s = 100					■	
8161	Release timeout	1	1	3, 6	1.00 s = 100					■	
Synchro-check 1 setting											
8201	Enable for Synchro check 1	1	1	3, 6	Off=0;On=1		■		■	■	
8202	CB object 1	1	1	3, 6	Object 1=1; Object 2=2; Object 3=3; Object 4=4; Object 5=5; Object 6=6		■		■	■	
8203	CB object 2	1	1	3, 6	Object 1=1; Object 2=2; Object 3=3; Object 4=4; Object 5=5; Object 6=6		■		■	■	
8204	Input for selecting Object2	1	1	3, 6	Value ³⁰		■		■	■	
8205	Inhibit closing unselected CB	1	1	3, 6	Off=0;On=1		■			■	■
8206	Synchronization mode	1	1	3, 6	Off=0;Async=1; Sync=2		■			■	■
8207	Voltage check mode	1	1	3, 6	DD=1;DL=2;LD=3; DD/DL=4;DD/LD=5; DL/LD=6;DD/DL/LD=7		■			■	■
8208	CB closing time	1	1	3, 6	1.00 s = 100		■		■	■	
8209	Bypass DI	1	1	3, 6	Value ³¹		■		■	■	
8210	Bypass	1	1	3, 6	1 = 1		■		■	■	
8211	Ok pulse length	1	1	3, 6	1 ms = 1		■		■	■	
8212... 8215	Udead limit setting	1	1	3, 6	1.0 %Un = 10		■		■	■	
8216... 8219	Ulive limit setting	1	1	3, 6	1.0 %Un = 10		■		■	■	
8220... 8223	Frequency difference	1	1	3, 6	50.00 Hz = 5000		■		■	■	
8224... 8227	Voltage difference	1	1	3, 6	1.0 %Un = 10		■		■	■	

30. DI1=1;DI2=2;...;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35;Watchdog=36;SF=37;SF=38;SF=39;SF=40;SF=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAI=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;...;VO5=59;VO6=60;DI21=65;DI22=66;...;DI39=83;DI40=84;F1=85;F2=86;...;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;SF=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;...;NI127=351;NI128=352
31. DI1=1;DI2=2;...;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35;Watchdog=36;SF=37;SF=38;SF=39;SF=40;SF=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAI=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;...;VO5=59;VO6=60;DI21=65;DI22=66;...;DI39=83;DI40=84;F1=85;F2=86;...;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;SF=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;...;NI163=191;NI164=192;POC1=193;POC2=194;...;POC15=207;POC16=208;VI5=225;VI6=226;...;VI19=239;VI20=240;VO7=257;VO8=258;...;VO19=269;VO20=270;NI65=289;NI66=290;...;NI127=351;NI128=352

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
8228... 8231	Phase angle difference	1	1	3, 6	1 ° = 1		■		■	■	
8232... 8235	Request timeout	1	1	3, 6	1.0 s = 10		■		■	■	
CB Monitoring setting											
8251	Enable for CB monitoring	1	1	3, 6	Off=0;On=1		■	■		■	■
8252... 8253	Alarm level	1	1	3, 6	1.00 kA = 100		■	■		■	■
8254... 8255	Limit for operation left	1	1	3, 6	1000 = 1000	Limit for oper. left scaling	■	■		■	■
8261... 8264	High limit (primary value)	1	1	3, 6	1.0 kA = 10		■	■		■	■
Motor status setting											
8301	Motor status	1	1	3, 6	Off=0;On=1		■	■			■
8302	Nom motor start current	1	1	3, 6	1.00 xIn = 100		■	■			■
8303	Motor start detection current	1	1	3, 6	1.00 xIn = 100		■	■			■
8304	Motor start detection mode	1	1	3, 6	CB Position=0; Current=1; CB&Current=2		■	■			■
8305	Enable motor speed detection	1	1	3, 6	Off=0;On=1		■	■			■
8306	Motor speed input DI	1	1	3, 6	Slot C DI1=0;Slot D DI1=1;Slot E DI1=2		■	■			■
8307	Rated motor speed Qn	1	1	3, 6	1 rpm = 1		■	■			■
8308	Pulse per rotation	1	1	3, 6	1 = 1		■	■			■
8309	Zero speed confirm time	1	1	3, 6	1 s = 1		■	■			■
SOL setting											
8351	Enable for SOL	1	1	3, 6	off=0;On=1		■	■		■	■
8352	SOL signal number	1	1	3, 6	1=0;2=1		■	■		■	■
8353	CB Trip Clearing time	1	1	3, 6	1.00 s = 100		■	■		■	■
Admittance E/F Io/Uo> setting											
8361	Enable for Io/Uo>	1	1	3, 6	Off=0;On=1					■	■
8362	Io input	1	1	3, 6	Io=0;Io CSH=1; localc=2;Io'=3					■	■
8363... 8366	Uo pick-up value	1	1	3, 6	1.0 % = 10					■	■
8367... 8370	Correction angle	1	1	3, 6	1 ° = 1					■	■
Admittance E/F Io/Uo> YN>											
8371	Enable for YN>	1	1	3, 6	Off=0;On=1					■	■
8373... 8376	Pick-up value	1	1	3, 6	1.0 Yn% = 10	Pick-up value scaling				■	■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
8377... 8380	Input for inhibit control	1	1	3, 6	Value ³²					■	■
8381... 8384	Operation delay	1	1	3, 6	1.00 s = 100					■	■
8385... 8388	Reset time	1	1	3, 6	1.00 s = 100					■	■
8389... 8392	SOL Mode	1	1	3, 6	Off=0;On=1					■	■
8393... 8396	SOL Operation delay	1	1	3, 6	1.00 s = 100					■	■
Admittance E/F Io/Uo> GN>											
8411	Enable for GN>	1	1	3, 6	Off=0;On=1					■	■
8413... 8416	Pick-up value	1	1	3, 6	1.0 Gn% = 10	Pick-up value scaling				■	■
8417... 8420	Input for inhibit control	1	1	3, 6	Value ³²					■	■
8421... 8424	Direction mode	1	1	3, 6	Udir=0; Forward=1; Reverse=2					■	■
8425... 8428	Operation delay	1	1	3, 6	1.00 s = 100					■	■
8429... 8432	Reset time	1	1	3, 6	1.00 s = 100					■	■
8433... 8436	SOL Mode	1	1	3, 6	Off=0;On=1					■	■
8437... 8440	SOL Operation delay	1	1	3, 6	1.00 s = 100					■	■
Admittance E/F Io/Uo> BN>											
8461	Enable for BN>	1	1	3, 6	Off=0;On=1					■	■
8463... 8466	Pick-up value	1	1	3, 6	1.0 Bn% = 10	Pick-up value scaling				■	■
8467... 8470	Input for inhibit control	1	1	3, 6	Value ³²					■	■
8471... 8474	Direction mode	1	1	3, 6	Udir=0; Forward=1; Reverse=2					■	■
8475... 8478	Operation delay	1	1	3, 6	1.00 s = 100					■	■
8479... 8482	Reset time	1	1	3, 6	1.00 s = 100					■	■
8483... 8486	SOL Mode	1	1	3, 6	Off=0;On=1					■	■
8487... 8490	SOL Operation delay	1	1	3, 6	1.00 s = 100					■	■
Admittance E/F Io/Uo>> setting											
8511	Enable for Io/Uo>>	1	1	3, 6	Off=0;On=1					■	■
8512	Io input	1	1	3, 6	Io=0;Io CSH=1; localc=2;Io'=3					■	■
8513... 8516	Uo pick-up value	1	1	3, 6	1.0 % = 10					■	■

32. DI1=1;DI2=2;DI3=3;DI4=4;DI5=5;DI6=6;DI7=7;DI8=8;DI9=9;DI10=10;DI11=11;DI12=12;DI13=13;DI14=14;DI15=15;DI16=16;DI17=17;DI18=18;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
8517... 8520	Angle correction	1	1	3, 6	1 ° = 1					■	■
Admittance E/F Io/Uo>> YN>											
8521	Enable for YN>>	1	1	3, 6	Off=0;On=1					■	■
8523... 8526	Pick-up value	1	1	3, 6	1.0 Yn% = 10	Pick-up value scaling				■	■
8527... 8530	Input for inhibit control	1	1	3, 6	Value ³³					■	■
8531... 8534	Operation delay	1	1	3, 6	1.00 s = 100					■	■
8535... 8538	Reset time	1	1	3, 6	1.00 s = 100					■	■
8539... 8542	SOL Mode	1	1	3, 6	Off=0;On=1					■	■
8543... 8546	SOL Operation delay	1	1	3, 6	1.00 s = 100					■	■
Admittance E/F Io/Uo>> GN>											
8561	Enable for GN>>	1	1	3, 6	Off=0;On=1					■	■
8563... 8566	Pick-up value	1	1	3, 6	1.0 Gn% = 10	Pick-up value scaling				■	■
8567... 8570	Input for inhibit control	1	1	3, 6	Value ³³					■	■
8571... 8574	Direction mode	1	1	3, 6	Undir=0; Forward=1; Reverse=2					■	■
8575... 8578	Operation delay	1	1	3, 6	1.00 s = 100					■	■
8579... 8582	Reset time	1	1	3, 6	1.00 s = 100					■	■
8583... 8586	SOL Mode	1	1	3, 6	Off=0;On=1					■	■
8587... 8590	SOL Operation delay	1	1	3, 6	1.00 s = 100					■	■
Admittance E/F Io/Uo>> BN>											
8611	Enable for BN>>	1	1	3, 6	Off=0;On=1					■	■
8613... 8616	Pick-up value	1	1	3, 6	1.0 Bn% = 10	Pick-up value scaling				■	■
8617... 8620	Input for inhibit control	1	1	3, 6	Value ³³					■	■
8621... 8624	Direction mode	1	1	3, 6	Undir=0; Forward=1; Reverse=2					■	■
8625... 8628	Operation delay	1	1	3, 6	1.00 s = 100					■	■
8629... 8632	Reset time	1	1	3, 6	1.00 s = 100					■	■
8633... 8636	SOL Mode	1	1	3, 6	Off=0;On=1					■	■
8637... 8640	SOL Operation delay	1	1	3, 6	1.00 s = 100					■	■

33. DI1=1;DI2=2;DI3=3;DI4=4;DI5=5;DI6=6;DI7=7;DI8=8;DI9=9;DI10=10;DI11=11;DI12=12;DI13=13;DI14=14;DI15=15;DI16=16;DI17=17;DI18=18;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DI21=65;DI22=66;DI23=67;DI24=68;DI25=69;DI26=70;DI27=71;DI28=72;DI29=73;DI30=74;DI31=75;DI32=76;DI33=77;DI34=78;DI35=79;DI36=80;DI37=81;DI38=82;DI39=83;DI40=84;VI5=225;VI6=226;VI7=227;VI8=228;VI9=229;VI10=230;VI11=231;VI12=232;VI13=233;VI14=234;VI15=235;VI16=236;VI17=237;VI18=238;VI19=239;VI20=240

Add.	Name	Read	Write	FC	Scalling	Setting for Scalling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
U2> setting											
8661	Enable for U2>	1	1	3, 6	Off=0;On=1		■		■	■	■
8662... 8665	VTs Operating Mode	1	1	3, 6	NO ACTION=0; BLOCKING=1		■		■	■	■
8666... 8669	Pick-up value	1	1	3, 6	1.0 %Un = 10		■		■	■	■
8670... 8673	Delay type	1	1	3, 6	DT=0;INV=1		■		■	■	■
8674... 8677	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
8678... 8681	Reset time	1	1	3, 6	1.00 s = 100		■		■	■	■
U2>> setting											
8701	Enable for U2>>	1	1	3, 6	Off=0;On=1		■		■	■	■
8702... 8705	VTs Operating Mode	1	1	3, 6	NO ACTION=0; BLOCKING=1		■		■	■	■
8706... 8709	Pick-up value	1	1	3, 6	1.0 %Un = 10		■		■	■	■
8710... 8713	Delay type	1	1	3, 6	DT=0;INV=1		■		■	■	■
8714... 8717	Operation delay	1	1	3, 6	1.00 s = 100		■		■	■	■
8718... 8721	Reset time	1	1	3, 6	1.00 s = 100		■		■	■	■
Motor overspeed Ω >											
8751	Enable for Ω >	1	1	3, 6	Off=0;On=1		■	■			■
8752	Pick-up value	1	1	3, 6	1 % Ω_n = 1		■	■			■
8753	Operation delay	1	1	3, 6	1 s = 1		■	■			■
Motor overspeed Ω >>											
8801	Enable for Ω >>	1	1	3, 6	Off=0;On=1		■	■			■
8802	Pick-up value	1	1	3, 6	1 % Ω_n = 1		■	■			■
8803	Operation delay	1	1	3, 6	1 s = 1		■	■			■
Motor underspeed Ω <											
8851	Enable for Ω <	1	1	3, 6	Off=0;On=1		■	■			■
8852	Pick-up value	1	1	3, 6	1 % Ω_n = 1		■	■			■
8853	Operation delay	1	1	3, 6	1 s = 1		■	■			■
Motor underspeed Ω <<											
8901	Enable for Ω <<	1	1	3, 6	Off=0;On=1		■	■			■
8902	Pick-up value	1	1	3, 6	1 % Ω_n = 1		■	■			■
8903	Operation delay	1	1	3, 6	1 s = 1		■	■			■
Motor Anti-backspin (ABS)											
8951	Enable motor anti-backspin	1	1	3, 6	Off=0;On=1		■	■			■
8952	Measured Zero Speed Mode	1	1	3, 6	Off=0;On=1		■	■			■

Add.	Name	Read	Write	FC	Scaling	Setting for Scaling	P5 U20 LPCT LPVT	P5 U20	P5 V20	P5 F30	P5 M30
8953	Zero speed external mode	1	1	3, 6	Off=0;On=1		■	■			■
8954	Zero speed input DI	1	1	3, 6	Value ³⁴		■	■			■
8955	Anti-backspin Time	1	1	3, 6	1 s = 1		■	■			■
Cold load pick-up CLPU											
9001	Enable for CLPU	1	1	3, 6	Off=0;On=1		■	■		■	■
9002	Idle current	1	1	3, 6	1.00 xIn = 100		■	■		■	■
9003	Pickup current	1	1	3, 6	1.00 xIn = 100		■	■		■	■
9004	CLPU dead time	1	1	3, 6	1.00 s = 100	CLPU dead time scaling	■	■		■	■
9005	CLPU time delay	1	1	3, 6	1.00 s = 100		■	■		■	■

Specific scalings

Since the Modbus registers are 16 bits in size, they can directly represent $2^{16} = 65535$ different values, which might not be enough to describe the values of some physical quantity such as voltage or power. Thus, values transmitted over a Modbus data link are scaled to account for this.

The scaling is determined by the float value of the corresponding specific scalings. After multiplication by a scaling value, only the decimals are removed from the original measurements, and such values are easy to read and rescale to actual values on the client side after transmission.

These settings for scaling can be set by navigating to the Modbus and IEC 60870-5-101 specific scalings view in the COMMUNICATION menu in eSetup Easergy Pro or Web HMI.

A short example: The frequency is internally (in the Easergy P5 protection relays) stored as an integer value which also holds three decimal places, that is, 50.000 Hz is represented as 50000. This is a value too large to be represented with 16 bits (signed integer). However, frequency is multiplied by default scaled value 0.1, enabling it to be sent over Modbus.

Thus, the value on the receiving side (the Modbus value) will be:

$$value_{Modbus} = k \cdot value_{Internal} = 0.1 \cdot 50000 = 5000$$

34. DI1=1;DI2=2;...;DI19=19;DI20=20;Arc1=25;Arc2=26;BI=27;VI1=29;VI2=30;VI3=31;VI4=32;DO1(B)=33;DO2(B)=34;DO3(B)=35; Watchdog=36;SF=37;SF=38;SF=39;SF=40;SF=41;BO=42;DO1(C)=43;DO2(C)=44;DO3(C)=45;DO4(C)=46;LedAI=49;LedTr=50;LedA=51;LedB=52;LedC=53;LedDR=54;VO1=55;VO2=56;...;VO5=59;VO6=60;DI21=65;DI22=66;...;DI39=83;DI40=84;F1=85;F2=86;...;F6=90;F7=91;DO1(D)=97;DO2(D)=98;DO3(D)=99;SF=100;DO1(E)=101;DO2(E)=102;NI1=129;NI2=130;...;NI127=351;NI128=352

Modbus&IEC101 specific scalings

Power scaling:	☐	1.000
PF and cos scaling:	☐	1.000
Tanφ scaling:	☐	1.000
Voltage scaling:	☐	1.000
VT primary scaling:	☐	1.000
Frequency scaling:	☐	0.100
VTo secondary scaling:	☐	0.100
Io scaling:	☐	1.000
Io' scaling:	☐	1.000
CLPU dead time scaling:	☐	1.000
Limit for oper.left scaling:	☐	1.000
CB open count scaling:	☐	1.000
Operate delay scaling:	☐	1.000
Pick-up value scaling:	☐	1.000
Fault value scaling:	☐	1.000
Max control pulse length scaling:	☐	1.000

Scaling can be checked in eSetup Easergy Pro by viewing the Scaling column for each register in the Modbus slave COMMUNICATION menu.

ModBus slave: measurement

	Name	Access	Scaling	Setting for scaling	Address	ValueType
[1]	Pos. sequence I1	R -	1 A = 1	-	3001	UInt32
[2]	Negative sequence I2	R -	1 A = 1	-	3002	UInt32
[76]	Frequency	R -	50.000 Hz = 5000	Frequency scaling	3221	float32
[77]	Active power	R -	1000 kW = 1000	Power scaling	3222	Int32
[78]	Reactive power	R -	1000 kVar = 1000	Power scaling	3223	Int32
[79]	Apparent power	R -	1000 kVA = 1000	Power scaling	3224	Int32
[80]	Power factor	R -	1.00 = 100	PF and cos scaling	3225	float32

NOTE: It is highly recommended to scale values so that they are kept in the interval 0 –32000 to avoid overflow.

The Modbus scaling address can be found in the Modbus specific scalings view in the COMMUNICATION menu in eSetup Easergy Pro or Web HMI.

Modbus scaling address

	Name	Address	ValueType
[1]	Power scaling	10001...10002	float32
[2]	PF and cos scaling	10003...10004	float32
[3]	Tanφ scaling	10005...10006	float32
[4]	Voltage scaling	10007...10008	float32
[5]	VT primary scaling	10009...10010	float32
[6]	Frequency scaling	10011...10012	float32
[7]	VTo secondary scaling	10013...10014	float32
[8]	Io scaling	10015...10016	float32
[9]	Iovs scaling	10017...10018	float32
[10]	CLPU dead time scaling	10019...10020	float32
[11]	Limit for oper.left scaling	10021...10022	float32
[12]	CB Count scaling	10025...10026	float32
[13]	Operate delay scaling	10027...10028	float32
[14]	Pick-up value scaling	10029...10030	float32
[15]	Fault value scaling	10031...10032	float32
[16]	MaxCtrlPulseLength scaling	10033...10034	float32

The following table shows the different values of Voltage scaling, and the values to be filled in the frame. When the client reads a 2 register value for voltage scaling, it needs to combine these 2 values together and convert them to a float 32 value.

For example, when voltage scaling value is 0.001, the values 0x126f and 0x3A83 will be merged to 4 bytes value 0x3A83126F.

Table 45 - Voltage scaling values

Voltage scaling	IEEE 754 / Float32	Value in address 10007	Value in address 10008
1.0000	0x3F800000	0x0000	0x3F80
0.0010	0x3A83126F	0x126F	0x3A83
1000.0000	0x447A0000	0x0000	0x447A
500.0000	0x43FA0000	0x0000	0x43FA

The following table shows the specific scalings for standard Modbus.

Table 46 - Specific scalings

Add.	Name	Read	Write	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
10001...10002	Power scaling	1	0	■			■	■
10003...10004	PF and cos scaling	1	0	■			■	■
10005...10006	Tanφ scaling	1	0	■			■	■
10007...10008	Voltage scaling	1	0	■		■	■	■
10009...10010	VT primary scaling	1	0	■		■	■	■
10011...10012	Frequency scaling	1	0	■	■	■	■	■
10013...10014	VTo secondary scaling	1	0	■		■	■	■
10015...10016	Io scaling	1	0	■	■		■	■
10017...10018	Io' scaling	1	0		■		■	■
10019...10020	CLPU dead time scaling	1	0	■	■		■	■
10021...10022	Limit for oper.left scaling	1	0	■	■		■	■

Table 46 - Specific scalings (Continued)

Add.	Name	Read	Write	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
10025...10026	CB open count scaling	1	0	■	■		■	■
10027...10028	Operate delay scaling	1	0	■	■	■	■	■
10029...10030	Pick-up value scaling	1	0	■	■	■	■	■
10031...10032	Fault value scaling	1	0	■	■	■	■	■
10033...10034	Max control pulse length scaling	1	0	■	■	■	■	■
10035...10036	LPCT/VT scaling	1	0	■			■	■
10037...10038	External AI scaling	1	0	■	■	■	■	■
10039...10040	Io scaling (CSH)	1	0	■	■		■	■

Point list for PDM Modbus

PDM interface only allows the client to read float32, Int32 or UInt32 data entirely. If a client requests a part of float32, Int32 or UInt32, PDM interface returns the exception code 03. If the type of the required register is reserved or unused, PDM interface returns the invalid data corresponding to the data type.

PDM interface allows the client to read Int64 data partly.

Register Type		Invalid data
unused		0x8000
reserved	string	null
	Int16	0x8000
	UInt16/Bool	0xFFFF
	Int32	0x8000 0000
	UInt32	0xFFFF FFFF
	Int64	0x8000 0000 0000 0000
	UInt64	0xFFFF FFFF FFFF FFFF
float32		0xFFC0 0000

Table 47 - Point list for PDM Modbus

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x4-E20	20001...-20006	Firmware version	1	0	string	V01.301.102		■	■	■	■	■
un-used	20007...-20010	unused										
0x4-E2A	20011...-20040	User application name	1	1	string	If P5U20:Universal current protection If P5V20:Voltage and Frequency protection If P5F30:Directional Feeder and Transformer protection If P5M30:Motor protection If P5U20 LPCT/LPVT:Universal current protection with LPCT/LPVT		■	■	■	■	■
0x4-E48	20041	Product identifier	1	0	UInt16	If P5U20: 16700 If P5V20: 16701 If P5M30: 16702 If P5F30: 16703 If P5L30:		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
						16704 If P5T30: 16705 If P5G30: 16706 If P5U20 LPVT/ LPCT:16707						
un-used	20042...- 20044	unused										
0x4-E4C	20045...- 20060	Hardware version	1	0	string	15 digital number of module number		■	■	■	■	■
0x4-E5C	20061...- 20090	Serial number	1	0	string	Serial Number		■	■	■	■	■
0x4-E7A	20091...- 20120	Product family	1	0	string	Easergy P5		■	■	■	■	■
0x4-E98	20121...- 20150	Product capability	1	1	string	module number		■	■	■	■	■
un-used	20151... 20250	unused										
0x4-F1A	20251	Object1 state	1	0	Enum	Open=0;Close=1; Undef=2		■	■	■	■	■
0x4-F1B	20252	Object2 state	1	0	Enum	Open=0;Close=1; Undef=2		■	■	■	■	■
0x4-F1C	20253	Object3 state	1	0	Enum	Open=0;Close=1; Undef=2		■	■	■	■	■
0x4-F1D	20254	Object4 state	1	0	Enum	Open=0;Close=1; Undef=2		■	■	■	■	■
0x4-F1E	20255	Object5 state	1	0	Enum	Open=0;Close=1; Undef=2		■	■	■	■	■
0x4-F1F	20256	Object6 state	1	0	Enum	Open=0;Close=1; Undef=2		■	■	■	■	■
0x4-F20	20257	Object7 state	1	0	Enum	Open=0;Close=1; Undef=2		■	■	■	■	■
0x4-F21	20258	Object8 state	1	0	Enum	Open=0;Close=1; Undef=2		■	■	■	■	■
0x4-F22	20259	Remote/Local State	1	0	Bool	Remote=0;LOCAL=1		■	■	■	■	■
0x4-F23	20260	Global trip	1	0	Bool	Off=0;On=1		■	■	■	■	■
0x4-F24	20261	Mode of use	1	0	Enum	Normal=0;Test=1;Test Block=2		■	■	■	■	■
0x4-F25	20262	Motor starting	1	0	UInt16	0;1		■	■			■
0x4-F26	20263	Motor running	1	0	UInt16	0;1		■	■			■
0x4-F27	20264	Voltage interrupt	1	0	Bool	Low=0;ok=1		■		■	■	■
0x4-F28	20265	Voltage status	1	0	Enum	OK=0;Low=1;High=2; Low/High=3;(OK)=4; (Low)=5;(High)=6; (Low)/High=7		■		■	■	■
0x4-F29	20266	CB monitoring alarm 1	1	0	Bool	0;1		■	■		■	■
0x4-F2A	20267	CB monitoring alarm 2	1	0	Bool	0;1		■	■		■	■
un-used	20268... 20270	unused										
0x4-F2E	20271	Digital input 1	1	0	Bool	0;1		■	■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x4-F2F	20272	Digital input 2	1	0	Bool	0;1		■	■		■	■
0x4-F30	20273	Digital input 3	1	0	Bool	0;1		■	■		■	■
0x4-F31	20274	Digital input 4	1	0	Bool	0;1		■	■		■	■
0x4-F32	20275	Digital input 5	1	0	Bool	0;1		■	■		■	■
0x4-F33	20276	Digital input 6	1	0	Bool	0;1		■	■		■	■
0x4-F34	20277	Digital input 7	1	0	Bool	0;1		■	■		■	■
0x4-F35	20278	Digital input 8	1	0	Bool	0;1		■	■		■	■
0x4-F36	20279	Digital input 9	1	0	Bool	0;1		■	■		■	■
0x4-F37	20280	Digital input 10	1	0	Bool	0;1		■	■		■	■
0x4-F38	20281	Digital input 11	1	0	Bool	0;1		■	■		■	■
0x4-F39	20282	Digital input 12	1	0	Bool	0;1		■	■		■	■
0x4-F3A	20283	Digital input 13	1	0	Bool	0;1		■	■		■	■
0x4-F3B	20284	Digital input 14	1	0	Bool	0;1		■	■		■	■
0x4-F3C	20285	Digital input 15	1	0	Bool	0;1		■	■		■	■
0x4-F3D	20286	Digital input 16	1	0	Bool	0;1		■	■		■	■
0x4-F3E	20287	Digital input 17	1	0	Bool	0;1					■	■
0x4-F3F	20288	Digital input 18	1	0	Bool	0;1					■	■
0x4-F40	20289	Digital input 19	1	0	Bool	0;1					■	■
0x4-F41	20290	Digital input 20	1	0	Bool	0;1					■	■
0x4-F42	20291	Digital input 21	1	0	Bool	0;1					■	■
0x4-F43	20292	Digital input 22	1	0	Bool	0;1					■	■
0x4-F44	20293	Digital input 23	1	0	Bool	0;1					■	■
0x4-F45	20294	Digital input 24	1	0	Bool	0;1					■	■
0x4-F46	20295	Digital input 25	1	0	Bool	0;1					■	■
0x4-F47	20296	Digital input 26	1	0	Bool	0;1					■	■
0x4-F48	20297	Digital input 27	1	0	Bool	0;1					■	■
0x4-F49	20298	Digital input 28	1	0	Bool	0;1					■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x4-F4A	20299	Digital input 29	1	0	Bool	0;1					■	■
0x4-F4B	20300	Digital input 30	1	0	Bool	0;1					■	■
0x4-F4C	20301	Digital input 31	1	0	Bool	0;1					■	■
0x4-F4D	20302	Digital input 32	1	0	Bool	0;1					■	■
0x4-F4E	20303	Digital input 33	1	0	Bool	0;1					■	■
0x4-F4F	20304	Digital input 34	1	0	Bool	0;1					■	■
0x4-F50	20305	Digital input 35	1	0	Bool	0;1					■	■
0x4-F51	20306	Digital input 36	1	0	Bool	0;1					■	■
0x4-F52	20307	Digital input 37	1	0	Bool	0;1					■	■
0x4-F53	20308	Digital input 38	1	0	Bool	0;1					■	■
0x4-F54	20309	Digital input 39	1	0	Bool	0;1					■	■
0x4-F55	20310	Digital input 40	1	0	Bool	0;1					■	■
0x4-F56	20311	Arc Io state	1	0	Bool	0;1					■	■
0x4-F57	20312	Arc I state	1	0	Bool	0;1					■	■
0x4-F58	20313	Arc stage 1	1	0	Bool	0;1					■	■
0x4-F59	20314	Arc stage 2	1	0	Bool	0;1					■	■
0x4-F5A	20315	Arc stage 3	1	0	Bool	0;1					■	■
0x4-F5B	20316	Arc stage 4	1	0	Bool	0;1					■	■
0x4-F5C	20317	Arc stage 5	1	0	Bool	0;1					■	■
0x4-F5D	20318	Arc stage 6	1	0	Bool	0;1					■	■
0x4-F5E	20319	Arc stage 7	1	0	Bool	0;1					■	■
0x4-F5F	20320	Arc stage 8	1	0	Bool	0;1					■	■
0x4-F60	20321...-20326	Arc sensor status	1	0	Enum	OK=1;Active=2;Not conn=3;Shrt circ=4; Daylight=5;Not Inst.=6; Null=0					■	■
un-used	20327...20330	unused										
0x4-F6A	20331	Logic output status 1	1	0	Bool	0;1		■	■	■	■	■
0x4-F6B	20332	Logic output status 2	1	0	Bool	0;1		■	■	■	■	■
0x4-F6C	20333	Logic output status 3	1	0	Bool	0;1		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x4-F6D	20334	Logic output status 4	1	0	Bool	0;1		■	■	■	■	■
0x4-F6E	20335	Logic output status 5	1	0	Bool	0;1		■	■	■	■	■
0x4-F6F	20336	Logic output status 6	1	0	Bool	0;1		■	■	■	■	■
0x4-F70	20337	Logic output status 7	1	0	Bool	0;1		■	■	■	■	■
0x4-F71	20338	Logic output status 8	1	0	Bool	0;1		■	■	■	■	■
0x4-F72	20339	Logic output status 9	1	0	Bool	0;1		■	■	■	■	■
0x4-F73	20340	Logic output status 10	1	0	Bool	0;1		■	■	■	■	■
0x4-F74	20341	Logic output status 11	1	0	Bool	0;1		■	■	■	■	■
0x4-F75	20342	Logic output status 12	1	0	Bool	0;1		■	■	■	■	■
0x4-F76	20343	Logic output status 13	1	0	Bool	0;1		■	■	■	■	■
0x4-F77	20344	Logic output status 14	1	0	Bool	0;1		■	■	■	■	■
0x4-F78	20345	Logic output status 15	1	0	Bool	0;1		■	■	■	■	■
0x4-F79	20346	Logic output status 16	1	0	Bool	0;1		■	■	■	■	■
0x4-F7A	20347	Logic output status 17	1	0	Bool	0;1		■	■	■	■	■
0x4-F7B	20348	Logic output status 18	1	0	Bool	0;1		■	■	■	■	■
0x4-F7C	20349	Logic output status 19	1	0	Bool	0;1		■	■	■	■	■
0x4-F7D	20350	Logic output status 20	1	0	Bool	0;1		■	■	■	■	■
0x4-F7E	20351	Virtual output 1	1	0	Bool	0;1		■	■	■	■	■
0x4-F7F	20352	Virtual output 2	1	0	Bool	0;1		■	■	■	■	■
0x4-F80	20353	Virtual output 3	1	0	Bool	0;1		■	■	■	■	■
0x4-F81	20354	Virtual output 4	1	0	Bool	0;1		■	■	■	■	■
0x4-F82	20355	Virtual output 5	1	0	Bool	0;1		■	■	■	■	■
0x4-F83	20356	Virtual output 6	1	0	Bool	0;1		■	■	■	■	■
0x4-F84	20357	Virtual output 7	1	0	Bool	0;1		■	■	■	■	■
0x4-F85	20358	Virtual output 8	1	0	Bool	0;1		■	■	■	■	■
0x4-F86	20359	Virtual output 9	1	0	Bool	0;1		■	■	■	■	■
0x4-F87	20360	Virtual output 10	1	0	Bool	0;1		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x4-F88	20361	Virtual output 11	1	0	Bool	0;1		■	■	■	■	■
0x4-F89	20362	Virtual output 12	1	0	Bool	0;1		■	■	■	■	■
0x4-F8A	20363	Virtual output 13	1	0	Bool	0;1		■	■	■	■	■
0x4-F8B	20364	Virtual output 14	1	0	Bool	0;1		■	■	■	■	■
0x4-F8C	20365	Virtual output 15	1	0	Bool	0;1		■	■	■	■	■
0x4-F8D	20366	Virtual output 16	1	0	Bool	0;1		■	■	■	■	■
0x4-F8E	20367	Virtual output 17	1	0	Bool	0;1		■	■	■	■	■
0x4-F8F	20368	Virtual output 18	1	0	Bool	0;1		■	■	■	■	■
0x4-F90	20369	Virtual output 19	1	0	Bool	0;1		■	■	■	■	■
0x4-F91	20370	Virtual output 20	1	0	Bool	0;1		■	■	■	■	■
0x4-F92	20371	Virtual input 1	1	0	Bool	0;1		■	■	■	■	■
0x4-F93	20372	Virtual input 2	1	0	Bool	0;1		■	■	■	■	■
0x4-F94	20373	Virtual input 3	1	0	Bool	0;1		■	■	■	■	■
0x4-F95	20374	Virtual input 4	1	0	Bool	0;1		■	■	■	■	■
0x4-F96	20375	Virtual input 5	1	0	Bool	0;1		■	■	■	■	■
0x4-F97	20376	Virtual input 6	1	0	Bool	0;1		■	■	■	■	■
0x4-F98	20377	Virtual input 7	1	0	Bool	0;1		■	■	■	■	■
0x4-F99	20378	Virtual input 8	1	0	Bool	0;1		■	■	■	■	■
0x4-F9A	20379	Virtual input 9	1	0	Bool	0;1		■	■	■	■	■
0x4-F9B	20380	Virtual input 10	1	0	Bool	0;1		■	■	■	■	■
0x4-F9C	20381	Virtual input 11	1	0	Bool	0;1		■	■	■	■	■
0x4-F9D	20382	Virtual input 12	1	0	Bool	0;1		■	■	■	■	■
0x4-F9E	20383	Virtual input 13	1	0	Bool	0;1		■	■	■	■	■
0x4-F9F	20384	Virtual input 14	1	0	Bool	0;1		■	■	■	■	■
0x4F-A0	20385	Virtual input 15	1	0	Bool	0;1		■	■	■	■	■
0x4F-A1	20386	Virtual input 16	1	0	Bool	0;1		■	■	■	■	■
0x4F-A2	20387	Virtual input 17	1	0	Bool	0;1		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x4F-A3	20388	Virtual input 18	1	0	Bool	0;1		■	■	■	■	■
0x4F-A4	20389	Virtual input 19	1	0	Bool	0;1		■	■	■	■	■
0x4F-A5	20390	Virtual input 20	1	0	Bool	0;1		■	■	■	■	■
un-used	20391... 20400	unused										
0x4F-B0	20401	External DI1	1	0	Bool	0;1		■	■	■	■	■
0x4F-B1	20402	External DI2	1	0	Bool	0;1		■	■	■	■	■
0x4F-B2	20403	External DI3	1	0	Bool	0;1		■	■	■	■	■
0x4F-B3	20404	External DI4	1	0	Bool	0;1		■	■	■	■	■
0x4F-B4	20405	External DI5	1	0	Bool	0;1		■	■	■	■	■
0x4F-B5	20406	External DI6	1	0	Bool	0;1		■	■	■	■	■
0x4F-B6	20407	External DI7	1	0	Bool	0;1		■	■	■	■	■
0x4F-B7	20408	External DI8	1	0	Bool	0;1		■	■	■	■	■
0x4F-B8	20409	External DI9	1	0	Bool	0;1		■	■	■	■	■
0x4F-B9	20410	External DI10	1	0	Bool	0;1		■	■	■	■	■
0x4F-BA	20411	External DI11	1	0	Bool	0;1		■	■	■	■	■
0x4F-BB	20412	External DI12	1	0	Bool	0;1		■	■	■	■	■
0x4F-BC	20413	External DI13	1	0	Bool	0;1		■	■	■	■	■
0x4F-BD	20414	External DI14	1	0	Bool	0;1		■	■	■	■	■
0x4F-BE	20415	External DI15	1	0	Bool	0;1		■	■	■	■	■
0x4F-BF	20416	External DI16	1	0	Bool	0;1		■	■	■	■	■
0x4F-C0	20417	External DI17	1	0	Bool	0;1		■	■	■	■	■
0x4F-C1	20418	External DI18	1	0	Bool	0;1		■	■	■	■	■
0x4F-C2	20419	Port 1 status (Slot M)	1	0	Bool	Link off=0;Link on=1		■	■	■	■	■
0x4F-C3	20420	Port 2 status (Slot M)	1	0	Bool	Link off=0;Link on=1		■	■	■	■	■
0x4F-C4	20421	Port 1 status (Slot L)	1	0	Bool	Link off=0;Link on=1					■	■
0x4F-C5	20422	Port 2 status (Slot L)	1	0	Bool	Link off=0;Link on=1					■	■
0x4F-C6	20423	Port 1 status (Slot M&N)	1	0	Bool	Link off=0;Link on=1		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x4F-C7	20424	Port 2 status (Slot M&N)	1	0	Bool	Link off=0;Link on=1		■	■	■	■	■
un-used	20425... 20500	unused										
0x50-14	20501	Inrush detection	1	0	Enum	Start=1;Timeout=2		■	■		■	■
0x50-15	20502	I> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-16	20503	I>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-17	20504	I>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-18	20505	SOTF status	1	0	Enum	Trip=2;Blocked=3		■	■		■	■
0x50-19	20506	Iφ> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■
0x50-1A	20507	Iφ>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■
0x50-1B	20508	Iφ>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■
0x50-1C	20509	Iφ>>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■
0x50-1D	20510	P< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■
0x50-1E	20511	P<< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■
0x50-1F	20512	I< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■			■
0x50-20	20513	I2/I1> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-21	20514	I2> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-22	20515	Ist> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■			■
0x50-23	20516	Ilr> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■			■
0x50-24	20517	N> status	1	0	Enum	Enabled=0;OneLeft=1; Disabled=2;Blocked=3		■	■			■
0x50-25	20518	Overload status (Motor)	1	0	Enum	Alarm=1;Trip=2; Blocked=3		■	■			■
0x50-26	20519	Overload status (Feeder)	1	0	Enum	Alarm=1;Trip=2; Blocked=3		■	■		■	
0x50-27	20520	Io> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-28	20521	Io>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-29	20522	Io>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-2A	20523	Io>>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3			■		■	■
0x50-2B	20524	Io>>>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3			■		■	■
0x50-2C	20525	Ioφ> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x50-2D	20526	loφ>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■
0x50-2E	20527	loφ>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■			■	■
0x50-2F	20528	loUo> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	■
0x50-30	20529	loUo>> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	■
0x50-31	20530	U> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-32	20531	U>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-33	20532	U>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-34	20533	U< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-35	20534	U<< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-36	20535	U<<< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-37	20536	U1< status	1	0	Enum	Start=1;Trip=2; Blocked=3				■		■
0x50-38	20537	U1<< status	1	0	Enum	Start=1;Trip=2; Blocked=3				■		■
0x50-39	20538	Uo> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-3A	20539	Uo>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-3B	20540	Uo>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-3C	20541	fX status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-3D	20542	fXX status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-3E	20543	f< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-3F	20544	f<< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-40	20545	CBF fail 1 status	1	0	Enum	Trip=1		■	■	■	■	■
0x50-41	20546	CBF fail 2 status	1	0	Enum	Trip=1		■	■	■	■	■
un-used	20547	unused										
0x50-43	20548	lh5> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■		■	■
0x50-44	20549	CT supervisor status	1	0	Enum	Fast Alarm=1;Alarm=2; Blocked=3		■	■		■	■
0x50-45	20550	VT supervisor status	1	0	Enum	Fast Alarm=1;Alarm=2; Blocked=3		■		■	■	■
0x50-46	20551	lo'> status	1	0	Enum	Start=1;Trip=2; Blocked=3			■		■	■
0x50-47	20552	lo'>> status	1	0	Enum	Start=1;Trip=2; Blocked=3			■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x50-48	20553	Io'>>> status	1	0	Enum	Start=1;Trip=2; Blocked=3			■		■	■
0x50-49	20554	Uc> status	1	0	Enum	Start=1;Trip=2; Blocked=3			■		■	
0x50-4A	20555	df/dt> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	
0x50-4B	20556	df/dt>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	
0x50-4C	20557	IoInt> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	
un-used	20558... 20559	unused										
0x50-4F	20560	Motor status	1	0	Enum	Stopped=0;Starting=1; Running=2		■	■			■
0x50-50	20561	SOL1 Status	1	0	Enum	Trip=1		■	■		■	■
0x50-51	20562	SOL2 Status	1	0	Enum	Trip=1		■	■		■	■
un-used	20563	unused										
0x50-53	20564	YN> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	■
0x50-54	20565	GN> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	■
0x50-55	20566	BN> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	■
un-used	20567	unused										
0x50-57	20568	YN>> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	■
0x50-58	20569	GN>> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	■
0x50-59	20570	BN>> status	1	0	Enum	Start=1;Trip=2; Blocked=3					■	■
0x50-5A	20571	U2> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-5B	20572	U2>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■		■	■	■
0x50-5C	20573	Ω> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■			■
0x50-5D	20574	Ω>> status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■			■
0x50-5E	20575	Ω< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■			■
0x50-5F	20576	Ω<< status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■			■
0x50-60	20577	Anti-backspin status	1	0	Enum	Alarm=2;Blocked=3		■	■			■
0x50-61	20578	Cold load pickup	1	0	Enum	Start=1;Timeout=2		■	■		■	■
un-used	20579... 20584	unused										
0x50-68	20585	Programmable stage 1 status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x50-69	20586	Programmable stage 2 status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■	■	■	■
0x50-6A	20587	Programmable stage 3 status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■	■	■	■
0x50-6B	20588	Programmable stage 4 status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■	■	■	■
0x50-6C	20589	Programmable stage 5 status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■	■	■	■
0x50-6D	20590	Programmable stage 6 status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■	■	■	■
0x50-6E	20591	Programmable stage 7 status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■	■	■	■
0x50-6F	20592	Programmable stage 8 status	1	0	Enum	Start=1;Trip=2; Blocked=3		■	■	■	■	■
0x50-70	20593	GOOSE NI Global Error	1	0	Enum	Error=1		■	■	■	■	■
0x50-71	20594	Line 1 fault	1	0	Enum	0;1		■	■		■	■
0x50-72	20595	Line 2 fault	1	0	Enum	0;1		■	■		■	■
0x50-73	20596	Line 3 fault	1	0	Enum	0;1		■	■		■	■
0x50-74	20597	Sync1 request	1	0	Enum	0;1		■		■	■	
0x50-75	20598	Sync1 OK	1	0	Enum	0;1		■		■	■	
0x50-76	20599	Bypass	1	0	Enum	0;1		■		■	■	
0x50-77	20600	Sync1 fail	1	0	Enum	0;1		■		■	■	
un-used	20601... 20700	unused										
0x50-DC	20701	Enable for Inrush	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-DD	20702	Enable for I>	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-DE	20703	Enable for I>>	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-DF	20704	Enable for I>>>	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-E0	20705	Enable for SOTF	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-E1	20706	Enable for Iφ>	1	0	Bool	Off=0;On=1		■			■	■
0x50-E2	20707	Enable for Iφ>>	1	0	Bool	Off=0;On=1		■			■	■
0x50-E3	20708	Enable for Iφ>>>	1	0	Bool	Off=0;On=1		■			■	■
0x50-E4	20709	Enable for Iφ>>>>	1	0	Bool	Off=0;On=1		■			■	■
0x50-E5	20710	Enable for P<	1	0	Bool	Off=0;On=1		■			■	■
0x50-E6	20711	Enable for P<<	1	0	Bool	Off=0;On=1		■			■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x50-E7	20712	Enable for I<	1	0	Bool	Off=0;On=1		■	■			■
0x50-E8	20713	Enable for I2/I1>	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-E9	20714	Enable for I2>	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-EA	20715	Enable for Ist>	1	0	Bool	Off=0;On=1		■	■			■
0x50-EB	20716	Enable for Ilr>	1	0	Bool	Off=0;On=1		■	■			■
0x50-EC	20717	Enable for N>	1	0	Bool	Off=0;On=1		■	■			■
0x50-ED	20718	Enable for Motor T>	1	0	Bool	Off=0;On=1		■	■			■
0x50-EE	20719	Enable for feeder T>	1	0	Bool	Off=0;On=1		■	■		■	
0x50-EF	20720	Enable for Io>	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-F0	20721	Enable for Io>>	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-F1	20722	Enable for Io>>>	1	0	Bool	Off=0;On=1		■	■		■	■
0x50-F2	20723	Enable for Io>>>>	1	0	Bool	Off=0;On=1			■		■	■
0x50-F3	20724	Enable for Io>>>>>	1	0	Bool	Off=0;On=1			■		■	■
0x50-F4	20725	Enable for Ioφ>	1	0	Bool	Off=0;On=1		■			■	■
0x50-F5	20726	Enable for Ioφ>>	1	0	Bool	Off=0;On=1		■			■	■
0x50-F6	20727	Enable for Ioφ>>>	1	0	Bool	Off=0;On=1		■			■	■
0x50-F7	20728	Enable for IoUo>	1	0	Bool	Off=0;On=1					■	■
0x50-F8	20729	Enable for IoUo>>	1	0	Bool	Off=0;On=1					■	■
0x50-F9	20730	Enable for U>	1	0	Bool	Off=0;On=1		■		■	■	■
0x50-FA	20731	Enable for U>>	1	0	Bool	Off=0;On=1		■		■	■	■
0x50-FB	20732	Enable for U>>>	1	0	Bool	Off=0;On=1		■		■	■	■
0x50-FC	20733	Enable for U<	1	0	Bool	Off=0;On=1		■		■	■	■
0x50-FD	20734	Enable for U<<	1	0	Bool	Off=0;On=1		■		■	■	■
0x50-FE	20735	Enable for U<<<	1	0	Bool	Off=0;On=1		■		■	■	■
0x50-FF	20736	Enable for U1<	1	0	Bool	Off=0;On=1				■		■
0x51-00	20737	Enable for U1<<	1	0	Bool	Off=0;On=1				■		■
0x51-01	20738	Enable for Uo>	1	0	Bool	Off=0;On=1		■		■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x51-02	20739	Enable for Uo>>	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-03	20740	Enable for Uo>>>	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-04	20741	Enable for fX	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-05	20742	Enable for fXX	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-06	20743	Enable for f<	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-07	20744	Enable for f<<	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-08	20745	Enable for CB fail	1	0	Bool	Off=0;On=1		■	■	■	■	■
0x51-09	20746	Enable CBF timer1	1	0	Bool	Off=0;On=1		■	■	■	■	■
0x51-0A	20747	Enable CBF timer2	1	0	Bool	Off=0;On=1		■	■	■	■	■
0x51-0B	20748	Enable for lh5>	1	0	Bool	Off=0;On=1		■	■		■	■
0x51-0C	20749	Enable for CT supervision	1	0	Bool	Off=0;On=1		■	■		■	■
0x51-0D	20750	Enable for VTS	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-0E	20751	Enable for lo'>	1	0	Bool	Off=0;On=1			■		■	■
0x51-0F	20752	Enable for lo'>>	1	0	Bool	Off=0;On=1			■		■	■
0x511-0	20753	Enable for lo'>>>	1	0	Bool	Off=0;On=1			■		■	■
0x511-1	20754	Enable for Uc>	1	0	Bool	Off=0;On=1			■		■	
0x511-2	20755	Enable for df/dt>	1	0	Bool	Off=0;On=1		■		■	■	
0x511-3	20756	Enable for df/dt>>	1	0	Bool	Off=0;On=1		■		■	■	
0x511-4	20757	Enable for lolnt>	1	0	Bool	Off=0;On=1					■	
0x511-5	20758	Enable for Synchro check 1	1	0	Bool	Off=0;On=1		■		■	■	
0x511-6	20759	Enable for CB monitoring	1	0	Bool	Off=0;On=1		■	■		■	■
0x511-7	20760	Motor status	1	0	Bool	Off=0;On=1		■	■			■
0x511-8	20761	Enable for SOL	1	0	Bool	Off=0;On=1		■	■		■	■
un-used	20762	unused										
0x511-A	20763	Enable for lo/ Uo>	1	0	Bool	Off=0;On=1					■	■
0x511-B	20764	Enable for YN>	1	0	Bool	Off=0;On=1					■	■
0x511-C	20765	Enable for GN>	1	0	Bool	Off=0;On=1					■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x511-D	20766	Enable for BN>	1	0	Bool	Off=0;On=1					■	■
0x511-E	20767	Enable for Io/Uo>>	1	0	Bool	Off=0;On=1					■	■
0x511-F	20768	Enable for YN>>	1	0	Bool	Off=0;On=1					■	■
0x51-20	20769	Enable for GN>>	1	0	Bool	Off=0;On=1					■	■
0x51-21	20770	Enable for BN>>	1	0	Bool	Off=0;On=1					■	■
0x51-22	20771	Enable for U2>	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-23	20772	Enable for U2>>	1	0	Bool	Off=0;On=1		■		■	■	■
0x51-24	20773	Enable for Ω>	1	0	Bool	Off=0;On=1		■	■			■
0x51-25	20774	Enable for Ω>>	1	0	Bool	Off=0;On=1		■	■			■
0x51-26	20775	Enable for Ω<	1	0	Bool	Off=0;On=1		■	■			■
0x51-27	20776	Enable for Ω<<	1	0	Bool	Off=0;On=1		■	■			■
0x51-28	20777	Enable motor anti-backspin	1	0	Bool	Off=0;On=1		■	■			■
0x51-29	20778	Enable for CLPU	1	0	Bool	Off=0;On=1		■	■		■	■
un-used	20779... 20784	unused										
0x51-30	20785	Enable Auto-Recloser	1	0	Bool	Off=0;On=1		■			■	
un-used	20786... 20900	unused										
0x51-A4	20901	release all latch status	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x51-A5	20902	I> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-A6	20903	I>> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-A7	20904	I>>> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-A8	20905	SOTF trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-A9	20906	Iφ> trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■
0x51-AA	20907	Iφ>> trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■
0x51-AB	20908	Iφ>>> trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■
0x51-AC	20909	Iφ>>>> trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■
0x51-AD	20910	P< trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■
0x51-AE	20911	P<< trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x51-AF	20912	I< trip	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-B0	20913	I2/I1 trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-B1	20914	I2> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-B2	20915	Ist> trip	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-B3	20916	Locked rotor trip	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-B4	20917	N> motor start inhibition	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-B5	20918	Motor thermal trip	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-B6	20919	Motor thermal almVal	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-B7	20920	Motor thermal rsvAlm	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-B8	20921	Motor thermal tmpAlm	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-B9	20922	Block motor start	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-BA	20923	Motor TC1 activate	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-BB	20924	Motor TC2 activate	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-BC	20925	Feeder T> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x51-BD	20926	Feeder thermal almVal	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x51-BE	20927	Feeder thermal rsvAlm	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x51-BF	20928	Feeder thermal tmpAlm	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x51-C0	20929	Io> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-C1	20930	Io>> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-C2	20931	Io>>> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-C3	20932	Io>>>> trip	1	1	Bool	Latch status: Off=0;On=1			■		■	■
0x51-C4	20933	Io>>>>> trip	1	1	Bool	Latch status: Off=0;On=1			■		■	■
0x51-C5	20934	Ioφ> trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■
0x51-C6	20935	Ioφ>> trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■
0x51-C7	20936	Ioφ>>> trip	1	1	Bool	Latch status: Off=0;On=1		■			■	■
0x51-C8	20937	IoUo> trip	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-C9	20938	IoUo>> trip	1	1	Bool	Latch status: Off=0;On=1					■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x51-CA	20939	U> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-CB	20940	U>> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-CC	20941	U>>> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-CD	20942	U< trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-CE	20943	U<< trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-CF	20944	U<<< trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-D0	20945	U1< trip	1	1	Bool	Latch status: Off=0;On=1				■		■
0x51-D1	20946	U1<< trip	1	1	Bool	Latch status: Off=0;On=1				■		■
0x51-D2	20947	Uo> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-D3	20948	Uo>> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-D4	20949	Uo>>> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-D5	20950	fX trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-D6	20951	fXX trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-D7	20952	f< trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-D8	20953	f<< trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-D9	20954	CBF1 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x51-DA	20955	CBF2 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x51-DB	20956	lh5> trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-DC	20957	lo> trip	1	1	Bool	Latch status: Off=0;On=1			■		■	■
0x51-DD	20958	lo>> trip	1	1	Bool	Latch status: Off=0;On=1			■		■	■
0x51-DE	20959	lo>>> trip	1	1	Bool	Latch status: Off=0;On=1			■		■	■
0x51-DF	20960	Uc> trip	1	1	Bool	Latch status: Off=0;On=1			■		■	
0x51-E0	20961	df/dt> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	
0x51-E1	20962	df/dt>> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	
0x51-E2	20963	Intermittent E/F trip	1	1	Bool	Latch status: Off=0;On=1					■	
0x51-E3	20964	Synchro-check 1 request	1	1	Bool	Latch status: Off=0;On=1		■		■	■	
0x51-E4	20965	Synchro-check 1 ok	1	1	Bool	Latch status: Off=0;On=1		■		■	■	

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x51-E5	20966	Synchro-check 1 ok pulse	1	1	Bool	Latch status: Off=0;On=1		■		■	■	
0x51-E6	20967	Synchro-check 1 fail	1	1	Bool	Latch status: Off=0;On=1		■		■	■	
0x51-E7	20968	SOL1 trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-E8	20969	SOL2 trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x51-E9	20970	Io/UoYN> trip	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-EA	20971	Io/UoGN> trip	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-EB	20972	Io/UoBN> trip	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-EC	20973	Io/UoYN>> trip	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-ED	20974	Io/UoGN>> trip	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-EE	20975	Io/UoBN>> trip	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-EF	20976	U2> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-F0	20977	U2>> trip	1	1	Bool	Latch status: Off=0;On=1		■		■	■	■
0x51-F1	20978	Ω> trip	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-F2	20979	Ω>> trip	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-F3	20980	Ω< trip	1	1	Bool	Latch status: Off=0;On=1		■	■			■
0x51-F4	20981	Ω<< trip	1	1	Bool	Latch status: Off=0;On=1		■	■			■
un-used	20982... 20987	unused										
0x51-FB	20988	Arc I	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-FC	20989	Arc Io	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-FD	20990	ARC stage 1	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-FE	20991	ARC stage 2	1	1	Bool	Latch status: Off=0;On=1					■	■
0x51-FF	20992	ARC stage 3	1	1	Bool	Latch status: Off=0;On=1					■	■
0x52-00	20993	ARC stage 4	1	1	Bool	Latch status: Off=0;On=1					■	■
0x52-01	20994	ARC stage 5	1	1	Bool	Latch status: Off=0;On=1					■	■
0x52-02	20995	ARC stage 6	1	1	Bool	Latch status: Off=0;On=1					■	■
0x52-03	20996	ARC stage 7	1	1	Bool	Latch status: Off=0;On=1					■	■
0x52-04	20997	ARC stage 8	1	1	Bool	Latch status: Off=0;On=1					■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x52-05	20998	Prog. stage 1 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-06	20999	Prog. stage 2 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-07	21000	Prog. stage 3 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-08	21001	Prog. stage 4 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-09	21002	Prog. stage 5 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-0A	21003	Prog. stage 6 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-0B	21004	Prog. stage 7 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-0C	21005	Prog. stage 8 trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-0D	21006	CB Open_DI1	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-0E	21007	CB Close_DI2	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-0F	21008	AR1 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-10	21009	AR2 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-11	21010	AR3 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-12	21011	AR4 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-13	21012	Direct final trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-14	21013	Shot 1 active	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-15	21014	Shot 2 active	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-16	21015	Shot 3 active	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-17	21016	Shot 4 active	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-18	21017	Shot 5 active	1	1	Bool	Latch status: Off=0;On=1		■	■		■	
0x52-19	21018	Object 1 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-1A	21019	Object 2 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-1B	21020	Object 3 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-1C	21021	Object 4 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-1D	21022	Object 5 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-1E	21023	Object 6 final trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-1F	21024	Object failure	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x52-20	21025	Incomer fault locator	1	1	Bool	Latch status: Off=0;On=1					■	
0x52-21	21026	Overcurrent alarm	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x52-22	21027	Overcurrent trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x52-23	21028	Earth Fault alarm	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x52-24	21029	Earth Fault trip	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x52-25	21030	Line 1 fault	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x52-26	21031	Line 2 fault	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x52-27	21032	Line 3 fault	1	1	Bool	Latch status: Off=0;On=1		■	■		■	■
0x52-28	21033	GOOSE NI Global Error	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
0x52-29	21034	Global trip	1	1	Bool	Latch status: Off=0;On=1		■	■	■	■	■
un-used	21035... 21100	unused										
0x52-6C	21101	CT primary (In)	1	0	UInt16		A		■		■	■
0x52-6D	21102	CT secondary	1	0	UInt16		A		■		■	■
0x52-6E	21103...- 21104	Nominal current (In)	1	0	float32		A	■			■	■
0x52-70	21105	LPCT rated primary current (lpr)	1	0	UInt16		A	■			■	■
0x52-71	21106	Current factor	1	0	Enum	0.25=0;0.5=1;1=2;1.25=3;1.33=4;2=5;2.5=6;3.2=7;4=8;5=9;6.3=10;6.66=11;10=12;16=13;20=14;25=15;31.5=16		■			■	■
0x52-72	21107	Earth fault CT primary	1	0	UInt16		A		■		■	■
0x52-73	21108...- 21109	Earth fault CT secondary	1	0	float32		A		■		■	■
0x52-75	21110...- 21111	Io primary CSH rate	1	0	UInt32		A	■	■		■	■
0x52-77	21112...- 21113	Io secondary	1	0	float32		A	■	■		■	■
0x52-79	21114...- 21115	Earth fault input (CSH)	1	0	float32		A	■	■		■	■
0x52-7B	21116	Earth fault CT' primary	1	0	UInt16		A		■		■	■
0x52-7C	21117...- 21118	Earth fault CT' secondary	1	0	float32		A		■		■	■
0x52-7E	21119...- 21120	VT primary (Un)	1	0	float32		V			■	■	■
0x52-80	21121...- 21122	Nominal voltage (Un)	1	0	float32		V	■			■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x52-82	21123...-21124	LPVT or VT rated primary voltage	1	0	float32		V	■			■	■
0x52-84	21125	VT secondary	1	0	UInt16		V			■	■	■
0x52-85	21126	VTy secondary	1	0	UInt16		V			■	■	
0x52-86	21127...-21128	VTo primary	1	0	float32		V			■	■	■
0x52-88	21129...-21130	VTo secondary	1	0	UInt32		V			■	■	■
0x52-8A	21131...-21132	Voltage factor	1	0	float32			■			■	■
0x52-8C	21133	Phase rotation	1	0	Enum	1-2-3=0;1-3-2=1		■	■	■	■	■
0x52-8D	21134	Voltage measurement mode	1	0	Enum	2LL+Uo=0;3LN=1;1LL+Uo/LLy=2;2LL/LLy=3;LL/LLy/LLz=4;1LL=5;1LN=6;3LL=8;3LN/LNy=9;3LN/LLy=10;2LL+Uo/LNy=11;2LL+Uo+LLy=12;3LN+Uo=13;LL+Uo/y/z=14;LN+Uo/y/z=15;LL/LLy=16;3LN/2LLNy=17		■		■	■	■
0x52-8E	21135	Nominal frequency	1	0	UInt16		Hz	■	■	■	■	■
0x52-8F	21136	Power direction	1	0	Enum	Outgoing=0;Incoming=1		■			■	■
0x52-90	21137	Number of connected phase CT	1	0	Enum	11/12/13=0;11/13=1			■		■	■
0x52-91	21138...-21139	VL1 magnitude correction	1	0	float32			■			■	■
0x52-93	21140...-21141	VL2 magnitude correction	1	0	float32			■			■	■
0x52-95	21142...-21143	VL3 magnitude correction	1	0	float32			■			■	■
0x52-97	21144...-21145	VL1 angle correction	1	0	float32		°	■			■	■
0x52-99	21146...-21147	VL2 angle correction	1	0	float32		°	■			■	■
0x52-9B	21148...-21149	VL3 angle correction	1	0	float32		°	■			■	■
0x52-9D	21150...-21151	VL1y magnitude correction	1	0	float32			■			■	■
0x52-9F	21152...-21153	VL1y angle correction	1	0	float32		°	■			■	■
0x52-A1	21154...-21155	VL2y magnitude correction	1	0	float32			■			■	■
0x52-A3	21156...-21157	VL2y angle correction	1	0	float32		°	■			■	■
0x52-A5	21158	VT type	1	0	Enum	VT+Adapter=0;LPVT=1		■			■	■
0x52-A6	21159	VT secondary	1	0	UInt16	valid in LPCT/LPVT	V			■	■	■
0x52-A7	21160...-21161	VL1 adapter mag correction	1	0	float32			■			■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPCT-LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x52-A9	21162...-21163	VL2 adapter mag correction	1	0	float32			■			■	■
0x52-AB	21164...-21165	VL3 adapter mag correction	1	0	float32			■			■	■
0x52-AD	21166	VTy secondary	1	0	UInt16	valid in LPCT/LPVT	V			■	■	■
0x52-AE	21167...-21168	VL1y adapter mag correction	1	0	float32			■			■	■
0x52-B0	21169	VTo secondary	1	0	UInt16	valid in LPCT/LPVT	V			■	■	■
0x52-B1	21170...-21171	Uo adapter mag correction	1	0	float32			■			■	■
un-used	21172...-21350	unused										
0x53-66	21351...-21352	Phase-to-earth voltage VL1	1	0	float32		V	■		■	■	■
0x53-68	21353...-21354	Phase-to-earth voltage VL2	1	0	float32		V	■		■	■	■
0x53-6A	21355...-21356	Phase-to-earth voltage VL3	1	0	float32		V	■		■	■	■
0x53-6C	21357...-21358	Phase-to-Phase voltage U12	1	0	float32		V	■		■	■	■
0x53-6E	21359...-21360	Phase-to-Phase voltage U23	1	0	float32		V	■		■	■	■
0x53-70	21361...-21362	Phase-to-Phase voltage U31	1	0	float32		V	■		■	■	■
0x53-72	21363...-21364	Phase current IL1	1	0	float32		A	■	■		■	■
0x53-74	21365...-21366	Phase current IL2	1	0	float32		A	■	■		■	■
0x53-76	21367...-21368	Phase current IL3	1	0	float32		A	■	■		■	■
0x53-78	21369...-21370	Io residual current	1	0	float32		A		■		■	■
0x53-7A	21371...-21372	Io' residual current	1	0	float32		A		■		■	■
0x53-7C	21373...-21374	Io CSH residual current	1	0	float32		A	■	■		■	■
0x53-7E	21375...-21376	Power factor	1	0	float32			■			■	■
0x53-80	21377...-21378	Frequency	1	0	float32		Hz	■	■	■	■	■
0x53-82	21379...-21380	Active power	1	0	float32		kW	■			■	■
0x53-84	21381...-21382	Reactive power	1	0	float32		kvar	■			■	■
0x53-86	21383...-21384	Apparent power	1	0	float32		kVA	■			■	■
0x53-88	21385...-21386	Phase L1 active power	1	0	float32		kW	■			■	■
0x53-8A	21387...-21388	Phase L2 active power	1	0	float32		kW	■			■	■
0x53-8C	21389...-21390	Phase L3 active power	1	0	float32		kW	■			■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x53-8E	21391...-21392	Phase L1 reactive power	1	0	float32		kvar	■			■	■
0x53-90	21393...-21394	Phase L2 reactive power	1	0	float32		kvar	■			■	■
0x53-92	21395...-21396	Phase L3 reactive power	1	0	float32		kvar	■			■	■
0x53-94	21397...-21398	Phase L1 apparent power	1	0	float32		kVA	■			■	■
0x53-96	21399...-21400	Phase L2 apparent power	1	0	float32		kVA	■			■	■
0x53-98	21401...-21402	Phase L3 apparent power	1	0	float32		kVA	■			■	■
un-used	21403...-21406	unused										
0x53-9E	21407...-21408	Positive sequence I1	1	0	float32		A	■	■		■	■
0x53-A0	21409...-21410	Negative sequence I2	1	0	float32		A	■	■		■	■
0x53-A2	21411...-21412	Current ratio I2/I1	1	0	float32		%	■	■		■	■
0x53-A4	21413	Current phase sequence	1	0	Enum	??=0;OK=1;Reverse=2		■	■		■	■
0x53-A5	21414...-21415	Phase current THD	1	0	float32		%	■	■		■	■
0x53-A7	21416...-21417	Phase current IL1 THD	1	0	float32		%	■	■		■	■
0x53-A9	21418...-21419	Phase current IL2 THD	1	0	float32		%	■	■		■	■
0x53-AB	21420...-21421	Phase current IL3 THD	1	0	float32		%	■	■		■	■
0x53-AD	21422...-21423	Phase current IL	1	0	float32		A	■	■		■	■
0x53-AF	21424...-21425	Residual voltage	1	0	float32		%	■		■	■	■
0x53-B1	21426...-21427	Tangent φ	1	0	float32			■			■	■
0x53-B3	21428...-21429	Phase current ILrms	1	0	float32		A	■	■		■	■
0x53-B5	21430...-21431	Phase current IL1rms	1	0	float32		A	■	■		■	■
0x53-B7	21432...-21433	Phase current IL2rms	1	0	float32		A	■	■		■	■
0x53-B9	21434...-21435	Phase current IL3rms	1	0	float32		A	■	■		■	■
0x53-BB	21436...-21437	Ambient temperature	1	0	Int32	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	
0x53-BD	21438...-21439	Positive sequence U1	1	0	float32		V	■		■	■	■
0x53-BF	21440...-21441	Negative sequence U2	1	0	float32		V	■		■	■	■
0x53-C1	21442...-21443	Voltage U2/U1	1	0	float32		%	■		■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x53-C3	21444	Voltage phase sequence	1	0	Enum	??=0;OK=1;Reverse=2		■		■	■	■
0x53-C4	21445...-21446	Voltage THD	1	0	float32		%	■		■	■	■
0x53-C6	21447...-21448	Phase-Earth VL1 THD	1	0	float32		%	■		■	■	■
0x53-C8	21449...-21450	Phase-Earth VL2 THD	1	0	float32		%	■		■	■	■
0x53-CA	21451...-21452	Phase-Earth VL3 THD	1	0	float32		%	■		■	■	■
0x53-CC	21453...-21454	Phase-Earth voltage VL1RMS	1	0	float32		V	■		■	■	■
0x53-CE	21455...-21456	Phase-Earth voltage VL2RMS	1	0	float32		V	■		■	■	■
0x53-D0	21457...-21458	Phase-Earth voltage VL3RMS	1	0	float32		V	■		■	■	■
0x53-D2	21459...-21460	Cosφ	1	0	float32			■			■	■
un-used	21461...-21462	unused										
0x53-D6	21463	Power angle	1	0	Int16		°	■			■	■
un-used	21464	unused										
0x53-D8	21465...-21466	RMS active power	1	0	float32		kW	■			■	■
0x53-DA	21467...-21468	RMS reactive power	1	0	float32		kvar	■			■	■
0x53-DC	21469...-21470	RMS apparent power	1	0	float32		kVA	■			■	■
0x53-DE	21471...-21472	Cosφ of phase L1	1	0	float32			■			■	■
0x53-E0	21473...-21474	Cosφ of phase L2	1	0	float32			■			■	■
0x53-E2	21475...-21476	Cosφ of phase L3	1	0	float32			■			■	■
0x53-E4	21477...-21478	Frequency fy	1	0	float32		Hz	■		■	■	
0x53-E6	21479...-21480	Phase-to-Phase voltage U12y	1	0	float32		V	■		■	■	
0x53-E8	21481...-21482	Phase angle difference	1	0	float32		°	■		■	■	
0x53-EA	21483...-21484	Earth fault calculated	1	0	float32		A	■	■		■	■
0x53-EC	21485	Algorithm condition	1	0	Enum	OK=0;NegX=1;BigX=2; Long fault=3;No DI=4; No pre-fault=5;No post-fault=6;ShrtFlt=7; PreUns=8;FltUns=9; PostUns=10;Blocked=11;Off=12					■	
0x53-ED	21486...-21487	Motor speed	1	0	UInt32		rpm	■	■			■
0x53-EF	21488...-21489	Last fault current	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A.	xIn / A	■	■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
						when "Fault value scaling" configured with PU, then uint is xln.						
0x53-F1	21490...-21491	I> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is xln.	xln / A	■	■		■	■
0x53-F3	21492...-21493	I>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is xln.	xln / A	■	■		■	■
0x53-F5	21494...-21495	I>>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is xln.	xln / A	■	■		■	■
0x53-F7	21496...-21497	Fault reactance	1	0	float32		ohm				■	
0x53-F9	21498...-21499	Fault value Ω>	1	0	UInt32/float32	when "Fault value scaling" configured with Primary, then uint is rpm. when "Fault value scaling" configured with PU, then uint is %Ωn. When unit is rpm, value type is UInt32. When unit is %Ωn, value type is float32.	%Ωn / rpm	■	■			■
0x53-FB	21500...-21501	Fault value Ω>>	1	0	UInt32/float32	when "Fault value scaling" configured with Primary, then uint is rpm. when "Fault value scaling" configured with PU, then uint is %Ωn. When unit is rpm, value type is UInt32. When unit is %Ωn, value type is float32.	%Ωn / rpm	■	■			■
0x53-FD	21502...-21503	Fault value Ω<	1	0	UInt32/float32	when "Fault value scaling" configured with Primary, then uint is rpm. when "Fault value scaling" configured with PU, then uint is %Ωn. When unit is rpm, value type is UInt32. When unit is %Ωn, value type is float32.	%Ωn / rpm	■	■			■
0x53-FF	21504...-21505	Fault value Ω<<	1	0	UInt32/float32	when "Fault value scaling" configured with Primary, then uint is rpm. when "Fault value scaling" configured with PU, then uint is %Ωn. When unit is rpm, value type is UInt32. When unit is %Ωn, value type is float32.	%Ωn / rpm	■	■			■
0x54-01	21506...-21507	Last earth fault current	1	0	float32		xln	■	■		■	■
0x54-03	21508...-21509	I _o > fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A.	pu / A	■	■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
						when "Fault value scaling" configured with PU, then uint is pu.						
0x54-05	21510...-21511	lo>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A	■	■		■	■
0x54-07	21512...-21513	lo>>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A	■	■		■	■
0x54-09	21514...-21515	lo>>>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A		■		■	■
0x54-0B	21516...-21517	lo>>>>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A		■		■	■
un-used	21518...-21519	unused										
0x54-0F	21520...-21521	loφ> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A	■			■	■
0x54-11	21522...-21523	loφ>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A	■			■	■
0x54-13	21524...-21525	loφ>>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A	■			■	■
0x54-15	21526...-21527	SOTF fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is xIn.	xIn / A	■	■		■	■
0x54-17	21528...-21529	Uo>1 fault value	1	0	float32		%	■		■	■	■
0x54-19	21530...-21531	Uo>2 fault value	1	0	float32		%	■		■	■	■
0x54-1B	21532...-21533	Uo>3 fault value	1	0	float32		%	■		■	■	■
0x54-1D	21534...-21535	lo> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A		■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x54-1F	21536...-21537	Io'>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A		■		■	■
0x54-21	21538...-21539	Io'>>> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is pu.	pu / A		■		■	■
0x54-23	21540...-21541	IoUo> fault value	1	0	Int32/float32	when "Fault value scaling" configured with Primary, then uint is kW. when "Fault value scaling" configured with PU, then uint is %Pno. When unit is kW, value type is Int32. When unit is %Pno, value type is float32	%Pno / kW				■	■
0x54-25	21542...-21543	IoUo>> fault value	1	0	Int32/float32	when "Fault value scaling" configured with Primary, then uint is kW. when "Fault value scaling" configured with PU, then uint is %Pno. When unit is kW, value type is Int32. When unit is %Pno, value type is float32	%Pno / kW				■	■
0x54-27	21544...-21545	I2> fault value	1	0	float32	when "Fault value scaling" configured with Primary, then uint is A. when "Fault value scaling" configured with PU, then uint is xln.	xln / A	■	■		■	■
0x54-29	21546...-21547	df/dt> fault value	1	0	float32		Hz/s	■		■	■	
0x54-2B	21548...-21549	df/dt>> fault value	1	0	float32		Hz/s	■		■	■	
0x54-2D	21550...-21551	Phase-Phase voltage U12RMS	1	0	float32		V	■		■	■	■
0x54-2F	21552...-21553	Phase-Phase voltage U23RMS	1	0	float32		V	■		■	■	■
0x54-31	21554...-21555	Phase-Phase voltage U12yRMS	1	0	float32		V	■		■	■	■
0x54-33	21556...-21557	Phase-Earth voltage UoRMS	1	0	float32		V	■		■	■	■
0x54-35	21558...-21559	Phase-Earth voltage VL1yRMS	1	0	float32		V	■		■	■	■
un-used	21560...-21636	unused										
0x54-84	21637...-21668	Harmonics of U12	1	0	float32		%	■	■		■	■
0x54-A4	21669...-21700	Harmonics of U23	1	0	float32		%	■	■		■	■
0x54-C4	21701...-21732	Harmonics of IL1	1	0	float32		%	■	■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x54-E4	21733...-21764	Harmonics of IL2	1	0	float32		%	■	■		■	■
0x55-04	21765...-21796	Harmonics of IL3	1	0	float32		%	■	■		■	■
0x55-24	21797...-21828	Harmonics of VL1	1	0	float32		%	■		■	■	■
0x55-44	21829...-21860	Harmonics of VL2	1	0	float32		%	■		■	■	■
0x55-64	21861...-21892	Harmonics of VL3	1	0	float32		%	■		■	■	■
0x55-84	21893...-21924	Harmonics of Uo	1	0	float32		%	■		■	■	■
0x55-A4	21925...-21956	Harmonics of U12y	1	0	float32		%	■		■	■	■
0x55-C4	21957...-21988	Harmonics of VL1y	1	0	float32		%	■		■	■	■
un-used	21989...-22000	unused					%	■		■	■	■
0x55-F0	22001...-22004	Exported energy	1	0	Int64		KWh	■			■	■
0x55-F4	22005...-22008	Exp. reactive energy	1	0	Int64		KVArh	■			■	■
0x55-F8	22009...-22012	Imported energy	1	0	Int64		KWh	■			■	■
0x55-FC	22013...-22016	Imp. reactive energy	1	0	Int64		KVArh	■			■	■
un-used	22017...-22050	unused										
0x56-22	22051	Temperature 1	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-23	22052	Temperature 2	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-24	22053	Temperature 3	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-25	22054	Temperature 4	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-26	22055	Temperature 5	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-27	22056	Temperature 6	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-28	22057	Temperature 7	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-29	22058	Temperature 8	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-2A	22059	Temperature 9	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x56-2B	22060	Temperature 10	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-2C	22061	Temperature 11	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-2D	22062	Temperature 12	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-2E	22063	Temperature 13	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-2F	22064	Temperature 14	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-30	22065	Temperature 15	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
0x56-31	22066	Temperature 16	1	0	Int16	Unit of this value is match with RTD unit configured value.	°C / °F	■	■		■	■
un-used	22067... 22088	unused										
0x56-48	22089... 22090	Minimum U12 RMS voltage	1	0	float32		V	■		■	■	■
0x56-4A	22091... 22092	Minimum U23 RMS voltage	1	0	float32		V	■		■	■	■
0x56-4C	22093... 22094	Minimum U12y RMS voltage	1	0	float32		V	■		■	■	■
0x56-4E	22095... 22096	Maximum U12 RMS voltage	1	0	float32		V	■		■	■	■
0x56-50	22097... 22098	Maximum U23 RMS voltage	1	0	float32		V	■		■	■	■
0x56-52	22099... 22100	Maximum U12y RMS voltage	1	0	float32		V	■		■	■	■
0x56-54	22101...- 22102	Minimum VL1 RMS voltage	1	0	float32		V	■		■	■	■
0x56-56	22103...- 22104	Minimum VL2 RMS voltage	1	0	float32		V	■		■	■	■
0x56-58	22105...- 22106	Minimum VL3 RMS voltage	1	0	float32		V	■		■	■	■
0x56-5A	22107...- 22108	Maximum VL1 RMS voltage	1	0	float32		V	■		■	■	■
0x56-5C	22109...- 22110	Maximum VL2 RMS voltage	1	0	float32		V	■		■	■	■
0x56-5E	22111...- 22112	Maximum VL3 RMS voltage	1	0	float32		V	■		■	■	■
0x56-60	22113...- 22114	Minimum of U12	1	0	float32		V	■		■	■	■
0x56-62	22115...- 22116	Minimum of U23	1	0	float32		V	■		■	■	■
0x56-64	22117...- 22118	Minimum of U31	1	0	float32		V	■		■	■	■
0x56-66	22119...- 22120	Maximum of U12	1	0	float32		V	■		■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x56-68	22121...-22122	Maximum of U23	1	0	float32		V	■		■	■	■
0x56-6A	22123...-22124	Maximum of U31	1	0	float32		V	■		■	■	■
0x56-6C	22125...-22126	Minimum of IL1	1	0	float32		A	■	■		■	■
0x56-6E	22127...-22128	Minimum of IL2	1	0	float32		A	■	■		■	■
0x56-70	22129...-22130	Minimum of IL3	1	0	float32		A	■	■		■	■
0x56-72	22131...-22132	Maximum of IL1	1	0	float32		A	■	■		■	■
0x56-74	22133...-22134	Maximum of IL2	1	0	float32		A	■	■		■	■
0x56-76	22135...-22136	Maximum of IL3	1	0	float32		A	■	■		■	■
0x56-78	22137...-22138	Minimum of Io	1	0	float32		%	■	■		■	■
0x56-7A	22139...-22140	Minimum of Io'	1	0	float32		%	■	■		■	■
0x56-7C	22141...-22142	Minimum of EF current	1	0	float32		pu	■	■		■	■
0x56-7E	22143...-22144	Maximum of Io	1	0	float32		%	■	■		■	■
0x56-80	22145...-22146	Maximum of Io'	1	0	float32		%	■	■		■	■
0x56-82	22147...-22148	Maximum of EF current	1	0	float32		pu	■	■		■	■
0x56-84	22149...-22150	Min power factor	1	0	float32			■			■	■
0x56-86	22151...-22152	Max power factor	1	0	float32			■			■	■
0x56-88	22153...-22154	Minimum frequency	1	0	float32		Hz	■	■	■	■	■
0x56-8A	22155...-22156	Maximum frequency	1	0	float32		Hz	■	■	■	■	■
0x56-8C	22157...-22158	Minimum active power	1	0	float32		kW	■			■	■
0x56-8E	22159...-22160	Minimum react. power	1	0	float32		kvar	■			■	■
0x56-90	22161...-22162	Minimum apparent power	1	0	float32		kVA	■			■	■
0x56-92	22163...-22164	Maximum active power	1	0	float32		kW	■			■	■
0x56-94	22165...-22166	Maximum react. power	1	0	float32		kvar	■			■	■
0x56-96	22167...-22168	Maximum apparent power	1	0	float32		kVA	■			■	■
0x56-98	22169...-22170	Min. of IL1 IL2 IL3	1	0	float32		A	■	■		■	■
0x56-9A	22171...-22172	Max. of IL1 IL2 IL3	1	0	float32		A	■	■		■	■
0x56-9C	22173...-22174	Min of Phase-Phase voltages	1	0	float32		V	■		■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x56-9E	22175...-22176	Max of Phase-Phase voltages	1	0	float32		V	■		■	■	■
0x56-A0	22177...-22178	Min. of Phase-Earth voltages	1	0	float32		V	■		■	■	■
0x56-A2	22179...-22180	Max. of Phase-Earth voltages	1	0	float32		V	■		■	■	■
0x56-A4	22181...-22182	RMS minimum of IL1	1	0	float32		A	■	■		■	■
0x56-A6	22183...-22184	RMS minimum of IL2	1	0	float32		A	■	■		■	■
0x56-A8	22185...-22186	RMS minimum of IL3	1	0	float32		A	■	■		■	■
0x56-AA	22187...-22188	Minimum of Uo	1	0	float32		%	■		■	■	■
0x56-AC	22189...-22190	Maximum of Uo	1	0	float32		%	■		■	■	■
0x56-AE	22191...-22192	RMS maximum of IL1	1	0	float32		A	■	■		■	■
0x56-B0	22193...-22194	RMS maximum of IL2	1	0	float32		A	■	■		■	■
0x56-B2	22195...-22196	RMS maximum of IL3	1	0	float32		A	■	■		■	■
un-used	22197...-22200	unused										
0x56-B8	22201...-22202	Demand minimum active power	1	0	float32		kW	■			■	■
0x56-BA	22203...-22204	Demand minimum reactive power	1	0	float32		kvar	■			■	■
0x56-BC	22205...-22206	Demand minimum apparent power	1	0	float32		kVA	■			■	■
0x56-BE	22207...-22208	Demand maximum active power	1	0	float32		kW	■			■	■
0x56-C0	22209...-22210	Demand maximum reactive power	1	0	float32		kvar	■			■	■
0x56-C2	22211...-22212	Demand maximum apparent power	1	0	float32		kVA	■			■	■
0x56-C4	22213...-22214	Average Phase-Earth voltage	1	0	float32		V	■		■	■	■
0x56-C6	22215...-22216	Average Phase-Phase voltage	1	0	float32		V	■		■	■	■
0x56-C8	22217...-22218	Phase current IL1da demand	1	0	float32		A	■	■		■	■
0x56-CA	22219...-22220	Phase current IL2da demand	1	0	float32		A	■	■		■	■
0x56-CC	22221...-22222	Phase current IL3da demand	1	0	float32		A	■	■		■	■
0x56-CE	22223...-22224	Power factor demand	1	0	float32			■			■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x56-D0	22225...-22226	Active power demand	1	0	float32		kW	■			■	■
0x56-D2	22227...-22228	Reactive power demand	1	0	float32		kvar	■			■	■
0x56-D4	22229...-22230	Apparent power demand	1	0	float32		kVA	■			■	■
0x56-D6	22231...-22232	RMS average voltage	1	0	float32		V	■		■	■	■
0x56-D8	22233...-22234	RMS active power demand	1	0	float32		kW	■			■	■
0x56-DA	22235...-22236	RMS reactive power demand	1	0	float32		kvar	■			■	■
0x56-DC	22237...-22238	RMS apparent power demand	1	0	float32		kVA	■			■	■
0x56-DE	22239...-22240	Demand minimum power factor	1	0	float32			■			■	■
0x56-E0	22241...-22242	RMS Demand mini active power	1	0	float32		kW	■			■	■
0x56-E2	22243...-22244	RMS Demand min reactive power	1	0	float32		kvar	■			■	■
0x56-E4	22245...-22246	RMS Demand mini apparent power	1	0	float32		kVA	■			■	■
0x56-E6	22247...-22248	Demand Minimum of IL1	1	0	float32		A	■	■		■	■
0x56-E8	22249...-22250	Demand Minimum of IL2	1	0	float32		A	■	■		■	■
0x56-EA	22251...-22252	Demand Minimum of IL3	1	0	float32		A	■	■		■	■
0x56-EC	22253...-22254	RMS Demand minimum of IL1	1	0	float32		A	■	■		■	■
0x56-EE	22255...-22256	RMS Demand minimum of IL2	1	0	float32		A	■	■		■	■
0x56-F0	22257...-22258	RMS Demand minimum of IL3	1	0	float32		A	■	■		■	■
0x56-F2	22259...-22260	Demand maximum power factor	1	0	float32			■			■	■
0x56-F4	22261...-22262	RMS Demand max active power	1	0	float32		kW	■			■	■
0x56-F6	22263...-22264	RMS Demand max reactive power	1	0	float32		kvar	■			■	■
0x56-F8	22265...-22266	RMS Demand max apparent power	1	0	float32		kVA	■			■	■
0x56-FA	22267...-22268	Demand Maximum of IL1	1	0	float32		A	■	■		■	■
0x56-FC	22269...-22270	Demand Maximum of IL2	1	0	float32		A	■	■		■	■
0x56-FE	22271...-22272	Demand Maximum of IL3	1	0	float32		A	■	■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x57-00	22273...-22274	RMS Demand maximum of IL1	1	0	float32		A	■	■		■	■
0x57-02	22275...-22276	RMS Demand maximum of IL2	1	0	float32		A	■	■		■	■
0x57-04	22277...-22278	RMS Demand maximum of IL3	1	0	float32		A	■	■		■	■
un-used	22279...-22301	unused										
0x57-1C	22301...-22302	External AI1	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-1E	22303...-22304	External AI2	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-20	22305...-22306	External AI3	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-22	22307...-22308	External AI4	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-24	22309...-22310	External AI5	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-26	22311...-22312	External AI6	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-28	22313...-22314	External AI7	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-2A	22315...-22316	External AI8	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm /	■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
							A / V / kW / kVA / kvar					
0x57-2C	22317...-22318	External AI9	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-2E	22319...-22320	External AI10	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-30	22321...-22322	External AI11	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-32	22323...-22324	External AI12	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-34	22325...-22326	External AI13	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-36	22327...-22328	External AI14	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-38	22329...-22330	External AI15	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-3A	22331...-22332	External AI16	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x57-3C	22333...-22334	External AI17	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-3E	22335...-22336	External AI18	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-40	22337...-22338	External AI19	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-42	22339...-22340	External AI20	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-44	22341...-22342	External AI21	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-46	22343...-22344	External AI22	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-48	22345...-22346	External AI23	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-4A	22347...-22348	External AI24	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-4C	22349...-22350	External AI25	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW /	■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
							kVA / kvar					
0x57-4E	22351...-22352	External AI26	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-50	22353...-22354	External AI27	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-52	22355...-22356	External AI28	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-54	22357...-22358	External AI29	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-56	22359...-22360	External AI30	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-58	22361...-22362	External AI31	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-5A	22363...-22364	External AI32	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-5C	22365...-22366	External AI33	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-5E	22367...-22368	External AI34	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA /	■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
							Ohm / A / V / kW / kVA / kvar					
0x57-60	22369...-22370	External AI35	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-62	22371...-22372	External AI36	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-64	22373...-22374	External AI37	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-66	22375...-22376	External AI38	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-68	22377...-22378	External AI39	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-6A	22379...-22380	External AI40	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-6C	22381...-22382	External AI41	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-6E	22383...-22384	External AI42	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x57-70	22385...-22386	External AI43	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-72	22387...-22388	External AI44	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-74	22389...-22390	External AI45	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-76	22391...-22392	External AI46	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-78	22393...-22394	External AI47	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-7A	22395...-22396	External AI48	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-7C	22397...-22398	External AI49	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-7E	22399...-22400	External AI50	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-80	22401...-22402	External AI51	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW /	■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
							kVA / kvar					
0x57-82	22403...-22404	External AI52	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-84	22405...-22406	External AI53	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-86	22407...-22408	External AI54	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-88	22409...-22410	External AI55	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-8A	22411...-22412	External AI56	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-8C	22413...-22414	External AI57	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-8E	22415...-22416	External AI58	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-90	22417...-22418	External AI59	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-92	22419...-22420	External AI60	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA /	■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
							Ohm / A / V / kW / kVA / kvar					
0x57-94	22421...-22422	External AI61	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-96	22423...-22424	External AI62	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-98	22425...-22426	External AI63	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
0x57-9A	22427...-22428	External AI64	1	0	float32	set by user itself in modbus master.	°C / F / K / V/A / mA / Ohm / A / V / kW / kVA / kvar	■	■	■	■	■
un-used	22429...-22500	unused										
0x57-E4	22501	Open select object 1	1	1	UInt16	0;1		■	■	■	■	■
0x57-E5	22502	Close select object 1	1	1	UInt16	0;1		■	■	■	■	■
0x57-E6	22503	Execute operation Object1	0	1	UInt16	0;1		■	■	■	■	■
0x57-E7	22504	Open select object 2	1	1	UInt16	0;1		■	■	■	■	■
0x57-E8	22505	Close select object 2	1	1	UInt16	0;1		■	■	■	■	■
0x57-E9	22506	Execute operation Object2	0	1	UInt16	0;1		■	■	■	■	■
0x57-EA	22507	Cancel selected operation	0	1	UInt16	0;1		■	■	■	■	■
0x57-EB	22508	Open select object 3	1	1	UInt16	0;1		■	■	■	■	■
0x57-EC	22509	Close select object 3	1	1	UInt16	0;1		■	■	■	■	■
0x57-ED	22510	Execute operation Object3	0	1	UInt16	0;1		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x57-EE	22511	Open select object 4	1	1	UInt16	0;1		■	■	■	■	■
0x57-EF	22512	Close select object 4	1	1	UInt16	0;1		■	■	■	■	■
0x57-F0	22513	Execute operation Object4	0	1	UInt16	0;1		■	■	■	■	■
0x57-F1	22514	Open select object 5	1	1	UInt16	0;1		■	■	■	■	■
0x57-F2	22515	Close select object 5	1	1	UInt16	0;1		■	■	■	■	■
0x57-F3	22516	Execute operation Object5	0	1	UInt16	0;1		■	■	■	■	■
0x57-F4	22517	Open select object 6	1	1	UInt16	0;1		■	■	■	■	■
0x57-F5	22518	Close select object 6	1	1	UInt16	0;1		■	■	■	■	■
0x57-F6	22519	Execute operation Object6	0	1	UInt16	0;1		■	■	■	■	■
0x57-F7	22520...-22521	Max ctrl pulse length of Object1	1	1	float32		s	■	■	■	■	■
0x57-F9	22522...-22523	Max ctrl pulse length of Object2	1	1	float32		s	■	■	■	■	■
0x57-FB	22524...-22525	Max ctrl pulse length of Object3	1	1	float32		s	■	■	■	■	■
0x57-FD	22526...-22527	Max ctrl pulse length of Object4	1	1	float32		s	■	■	■	■	■
0x57-FF	22528...-22529	Max ctrl pulse length of Object5	1	1	float32		s	■	■	■	■	■
0x58-01	22530...-22531	Max ctrl pulse length of Object6	1	1	float32		s	■	■	■	■	■
0x58-03	22532	Timer 1 status	1	1	Enum	0=1;1=2		■	■	■	■	■
0x58-04	22533	Timer 2 status	1	1	Enum	0=1;1=2		■	■	■	■	■
0x58-05	22534	Timer 3 status	1	1	Enum	0=1;1=2		■	■	■	■	■
0x58-06	22535	Timer 4 status	1	1	Enum	0=1;1=2		■	■	■	■	■
0x58-07	22536	Sync1 request	1	0	UInt16			■		■	■	
0x58-08	22537	Sync1 OK	1	0	UInt16			■		■	■	
0x58-09	22538	Bypass	1	1	UInt16	0;1		■		■	■	
0x58-0A	22539	Sync1 fail	1	0	UInt16			■		■	■	
un-used	22540...22550	unused										
0x58-16	22551	Release latches	1	1	Bool	Release=1		■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x58-17	22552	Set. group common change	1	1	Enum	1=0;2=1;3=2;4=3		■	■	■	■	■
0x58-18	22553	Clear min/max/demand	1	1	Bool	Clear=1		■	■	■	■	■
0x58-19	22554	Release all latches	1	1	Bool	Release=1					■	■
0x58-1A	22555...-22556	Minimum Global trip cmd. time	1	1	float32		s	■	■		■	■
un-used	22557...22590	unused										
0x58-3E	22591...-22594	RTC of Partner Data Model	1	1	Date-Time			■	■	■	■	■
un-used	22595...22600	unused										
0x58-48	22601...-22602	Engine running hours	1	0	Int32		h	■	■	■	■	■
0x58-4A	22603...-22604	Engine running (in seconds)	1	0	Int32		s	■	■	■	■	■
0x58-4C	22605	Start counter	1	0	UInt16			■	■	■	■	■
un-used	22606...22700	unused										
0x58-AC	22701	DI1 counter	1	0	UInt16			■	■	■	■	■
0x58-AD	22702	DI2 counter	1	0	UInt16			■	■	■	■	■
0x58-AE	22703	DI3 counter	1	0	UInt16			■	■	■	■	■
0x58-AF	22704	DI4 counter	1	0	UInt16			■	■	■	■	■
0x58-B0	22705	DI5 counter	1	0	UInt16			■	■	■	■	■
0x58-B1	22706	DI6 counter	1	0	UInt16			■	■	■	■	■
0x58-B2	22707	DI7 counter	1	0	UInt16			■	■	■	■	■
0x58-B3	22708	DI8 counter	1	0	UInt16			■	■	■	■	■
0x58-B4	22709	DI9 counter	1	0	UInt16			■	■	■	■	■
0x58-B5	22710	DI10 counter	1	0	UInt16			■	■	■	■	■
0x58-B6	22711	DI11 counter	1	0	UInt16			■	■	■	■	■
0x58-B7	22712	DI12 counter	1	0	UInt16			■	■	■	■	■
0x58-B8	22713	DI13 counter	1	0	UInt16			■	■	■	■	■
0x58-B9	22714	DI14 counter	1	0	UInt16			■	■	■	■	■
0x58-BA	22715	DI15 counter	1	0	UInt16			■	■	■	■	■
0x58-BB	22716	DI16 counter	1	0	UInt16			■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x58-BC	22717	DI17 counter	1	0	UInt16						■	■
0x58-BD	22718	DI18 counter	1	0	UInt16						■	■
0x58-BE	22719	DI19 counter	1	0	UInt16						■	■
0x58-BF	22720	DI20 counter	1	0	UInt16						■	■
0x58-C0	22721	DI21 counter	1	0	UInt16						■	■
0x58-C1	22722	DI22 counter	1	0	UInt16						■	■
0x58-C2	22723	DI23 counter	1	0	UInt16						■	■
0x58-C3	22724	DI24 counter	1	0	UInt16						■	■
0x58-C4	22725	DI25 counter	1	0	UInt16						■	■
0x58-C5	22726	DI26 counter	1	0	UInt16						■	■
0x58-C6	22727	DI27 counter	1	0	UInt16						■	■
0x58-C7	22728	DI28 counter	1	0	UInt16						■	■
0x58-C8	22729	DI29 counter	1	0	UInt16						■	■
0x58-C9	22730	DI30 counter	1	0	UInt16						■	■
0x58-CA	22731	DI31 counter	1	0	UInt16						■	■
0x58-CB	22732	DI32 counter	1	0	UInt16						■	■
0x58-CC	22733	DI33 counter	1	0	UInt16						■	■
0x58-CD	22734	DI34 counter	1	0	UInt16						■	■
0x58-CE	22735	DI35 counter	1	0	UInt16						■	■
0x58-CF	22736	DI36 counter	1	0	UInt16						■	■
0x58-D0	22737	DI37 counter	1	0	UInt16						■	■
0x58-D1	22738	DI38 counter	1	0	UInt16						■	■
0x58-D2	22739	DI39 counter	1	0	UInt16						■	■
0x58-D3	22740	DI40 counter	1	0	UInt16						■	■
0x58-D4	22741	Shot1 start counter	1	0	UInt16			■	■		■	
0x58-D5	22742	Shot2 start counter	1	0	UInt16			■	■		■	
0x58-D6	22743	Shot3 start counter	1	0	UInt16			■	■		■	

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x58-D7	22744	Shot4 start counter	1	0	UInt16			■	■		■	
0x58-D8	22745	Shot5 start counter	1	0	UInt16			■	■		■	
0x58-D9	22746	AR start counter	1	0	UInt16			■	■		■	
0x58-DA	22747	AR fail counter	1	0	UInt16			■	■		■	
0x58-DB	22748	AR shot number	1	0	Enum	1;2;3;4;5;END=6		■	■		■	
0x58-DC	22749	Direct trip AR request	1	0	UInt16	1 = 1		■	■		■	
0x58-DD	22750	Recloser locked	1	0	UInt16	1 = 1		■	■		■	
0x58-DE	22751	Recloser running	1	0	UInt16	1 = 1		■	■		■	
0x58-DF	22752	Final trip	1	0	UInt16	1 = 1		■	■		■	
0x58-E0	22753	Auto-Recloser on	1	0	UInt16	1 = 1		■	■		■	
un-used	22754... 22900	unused										
0x59-74	22901...- 22910	Low limit (primary value)	1	0	float32		kA	■	■		■	■
0x59-7E	22911...- 22918	High limit (xIn)	1	0	float32		xIn	■	■		■	■
0x59-86	22919...- 22920	Sum of broken current IL11	1	0	float32		kA2	■	■		■	■
0x59-88	22921...- 22922	Sum of broken current IL12	1	0	float32		kA2	■	■		■	■
0x59-8A	22923...- 22924	Sum of broken current IL13	1	0	float32		kA2	■	■		■	■
0x59-8C	22925...- 22926	Sum of broken current IL14	1	0	float32		kA2	■	■		■	■
0x59-8E	22927...- 22928	Sum of broken current IL15	1	0	float32		kA2	■	■		■	■
0x59-90	22929...- 22933	IL1 broken current counter	1	0	UInt16			■	■		■	■
0x59-95	22934...- 22935	Sum of broken current IL21	1	0	float32		kA2	■	■		■	■
0x59-97	22936...- 22937	Sum of broken current IL22	1	0	float32		kA2	■	■		■	■
0x59-99	22938...- 22939	Sum of broken current IL23	1	0	float32		kA2	■	■		■	■
0x59-9B	22940...- 22941	Sum of broken current IL24	1	0	float32		kA2	■	■		■	■
0x59-9D	22942...- 22943	Sum of broken current IL25	1	0	float32		kA2	■	■		■	■
0x59-9F	22944...- 22948	IL2 broken current counter	1	0	UInt16			■	■		■	■
0x59-A4	22949...- 22950	Sum of broken current IL31	1	0	float32		kA2	■	■		■	■
0x59-A6	22951...- 22952	Sum of broken current IL32	1	0	float32		kA2	■	■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x59-A8	22953...-22954	Sum of broken current IL33	1	0	float32		kA2	■	■		■	■
0x59-AA	22955...-22956	Sum of broken current IL34	1	0	float32		kA2	■	■		■	■
0x59-AC	22957...-22958	Sum of broken current IL35	1	0	float32		kA2	■	■		■	■
0x59-AE	22959...-22963	IL3 broken current counter	1	0	UInt16			■	■		■	■
0x59-B3	22964...-22965	Cumul. broken current IL1	1	0	float32			■	■		■	■
0x59-B5	22966...-22967	Cumul. broken current IL2	1	0	float32			■	■		■	■
0x59-B7	22968...-22969	Cumul. broken current IL3	1	0	float32			■	■		■	■
0x59-B9	22970	CB open counter	1	0	UInt16			■	■		■	■
0x59-BA	22971	Protection trip counter	1	0	UInt16			■	■		■	■
0x59-BB	22972	Rack out counter	1	0	UInt16			■	■		■	■
0x59-BC	22973...-23012	CB opening time	1	0	UInt16	Modbus can remember 8 logs. Every log use 5 registers. Register structure is as below: register1: Op time register2&0xFF: year register3 & 0xFF: day register3 >> 8: month register4 & 0xFF: minutes register4 >> 8: hours register5: milliseconds		■	■		■	■
0x59-E4	23013...-23052	CB Closing time	1	0	UInt16			■	■		■	■
0x5-A0C	23053...-23092	Spring charging times	1	0	UInt16			■	■		■	■
0x5-A34	23093...-23095	Alarm 1	1	0	UInt16			■	■		■	■
0x5-A37	23096...-23098	Alarm 2	1	0	UInt16			■	■		■	■
un-used	23099...-23200	unused										
0x5A-A0	23201	Logging status	1	0	Bool	Off=0;On=1		■	■		■	■
0x5A-A1	23202	Waveform counter	1	0	UInt16			■	■		■	■
un-used	23203	unused										
0x5A-A3	23204	Record size	1	0	UInt16	120		■	■		■	■
0x5A-A4	23205	Record management method	1	0	Bool	FIFO=0		■	■		■	■
0x5A-A5	23206	File status	1	0	Bool	failed=0;ok=1		■	■		■	■
0x5A-A6	23207	Nb of disturb record files	1	0	UInt16			■	■		■	■
0x5A-A7	23208	First file number	1	0	UInt16			■	■		■	■
0x5A-A8	23209	Oldest file number	1	0	UInt16			■	■		■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x5A-A9	23210	Latest file number	1	0	UInt16			■	■		■	■
un-used	23211... 23400	unused										
0x5-B68	23401	Event Log Version	1	0	UInt16	1		■	■		■	■
0x5-B69	23402	Event Buffer Size	1	0	UInt16	100		■	■		■	■
0x5-B6A	23403	Actual number of event	1	0	UInt16			■	■		■	■
0x5-B6B	23404	Most Recent Event Entry Number	1	0	UInt16			■	■		■	■
0x5-B6C	23405	Most Recent Event Postion	1	0	UInt16			■	■		■	■
0x5-B6D	23406	Oldest Event Postion	1	0	UInt16			■	■		■	■
0x5-B6E	23407...- 24606	Events	1	0	UInt16			■	■	■	■	■
un-used	24607... 25000	unused										
0x61-A8	25001...- 25016	Label(DI1)	1	0	string			■	■	■	■	■
0x61-B8	25017...- 25032	Label(DI2)	1	0	string			■	■	■	■	■
0x61-C8	25033...- 25048	Label(DI3)	1	0	string			■	■	■	■	■
0x61-D8	25049...- 25064	Label(DI4)	1	0	string			■	■	■	■	■
0x61-E8	25065...- 25080	Label(DI5)	1	0	string			■	■	■	■	■
0x61-F8	25081...- 25096	Label(DI6)	1	0	string			■	■	■	■	■
0x62-08	25097...- 25112	Label(DI7)	1	0	string			■	■	■	■	■
0x62-18	25113...- 25128	Label(DI8)	1	0	string			■	■	■	■	■
0x62-28	25129...- 25144	Label(DI9)	1	0	string			■	■	■	■	■
0x62-38	25145...- 25160	Label(DI10)	1	0	string			■	■	■	■	■
0x62-48	25161...- 25176	Label(DI11)	1	0	string			■	■	■	■	■
0x62-58	25177...- 25192	Label(DI12)	1	0	string			■	■	■	■	■
0x62-68	25193...- 25208	Label(DI13)	1	0	string			■	■	■	■	■
0x62-78	25209...- 25224	Label(DI14)	1	0	string			■	■	■	■	■
0x62-88	25225...- 25240	Label(DI15)	1	0	string			■	■	■	■	■
0x62-98	25241...- 25256	Label(DI16)	1	0	string			■	■	■	■	■
0x62-A8	25257...- 25272	Label(DI17)	1	0	string						■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x62-B8	25273...-25288	Label(DI18)	1	0	string						■	■
0x62-C8	25289...-25304	Label(DI19)	1	0	string						■	■
0x62-D8	25305...-25320	Label(DI20)	1	0	string						■	■
0x62-E8	25321...-25336	Label(DI21)	1	0	string						■	■
0x62-F8	25337...-25352	Label(DI22)	1	0	string						■	■
0x63-08	25353...-25368	Label(DI23)	1	0	string						■	■
0x63-18	25369...-25384	Label(DI24)	1	0	string						■	■
0x63-28	25385...-25400	Label(DI25)	1	0	string						■	■
0x63-38	25401...-25416	Label(DI26)	1	0	string						■	■
0x63-48	25417...-25432	Label(DI27)	1	0	string						■	■
0x63-58	25433...-25448	Label(DI28)	1	0	string						■	■
0x63-68	25449...-25464	Label(DI29)	1	0	string						■	■
0x63-78	25465...-25480	Label(DI30)	1	0	string						■	■
0x63-88	25481...-25496	Label(DI31)	1	0	string						■	■
0x63-98	25497...-25512	Label(DI32)	1	0	string						■	■
0x63-A8	25513...-25528	Label(DI33)	1	0	string						■	■
0x63-B8	25529...-25544	Label(DI34)	1	0	string						■	■
0x63-C8	25545...-25560	Label(DI35)	1	0	string						■	■
0x63-D8	25561...-25576	Label(DI36)	1	0	string						■	■
0x63-E8	25577...-25592	Label(DI37)	1	0	string						■	■
0x63-F8	25593...-25608	Label(DI38)	1	0	string						■	■
0x64-08	25609...-25624	Label(DI39)	1	0	string						■	■
0x64-18	25625...-25640	Label(DI40)	1	0	string						■	■
0x64-28	25641...-25656	Label(DO1(B))	1	0	string			■	■	■	■	■
0x64-38	25657...-25672	Label(DO2(B))	1	0	string			■	■	■	■	■
0x64-48	25673...-25688	Label(DO3(B))	1	0	string			■	■	■	■	■
0x64-58	25689...-25704	Label(DO4(B))	1	0	string			■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x64-68	25705...-25720	Label(DO1(C))	1	0	string			■	■	■	■	■
0x64-78	25721...-25736	Label(DO2(C))	1	0	string			■	■	■	■	■
0x64-88	25737...-25752	Label(DO3(C))	1	0	string			■	■	■	■	■
0x64-98	25753...-25768	Label(DO4(C))	1	0	string			■	■	■	■	■
0x64-A8	25769...-25784	Label(DO1(D))	1	0	string						■	■
0x64-B8	25785...-25800	Label(DO2(D))	1	0	string						■	■
0x64-C8	25801...-25816	Label(DO3(D))	1	0	string						■	■
0x64-D8	25817...-25832	Label(DO4(D))	1	0	string						■	■
0x64-E8	25833...-25848	Label(DO1(E))	1	0	string						■	■
0x64-F8	25849...-25864	Label(DO2(E))	1	0	string						■	■
0x65-08	25865...-25880	Label(DO3(E))	1	0	string						■	■
0x65-18	25881...-25896	Label(DO4(E))	1	0	string						■	■
0x65-28	25897...-25912	Label(DO5(C))	1	0	string			■	■	■	■	■
0x65-38	25913...-25928	Label(DO5(D))	1	0	string						■	■
0x65-48	25929...-25944	Label(DO5(E))	1	0	string						■	■
re-served	25945...-26232	reserved										
0x66-78	26233...-26248	Label(VI1)	1	0	string			■	■	■	■	■
0x66-88	26249...-26264	Label(VI2)	1	0	string			■	■	■	■	■
0x66-98	26265...-26280	Label(VI3)	1	0	string			■	■	■	■	■
0x66-A8	26281...-26296	Label(VI4)	1	0	string			■	■	■	■	■
0x66-B8	26297...-26312	Label(VI5)	1	0	string			■	■	■	■	■
0x66-C8	26313...-26328	Label(VI6)	1	0	string			■	■	■	■	■
0x66-D8	26329...-26344	Label(VI7)	1	0	string			■	■	■	■	■
0x66-E8	26345...-26360	Label(VI8)	1	0	string			■	■	■	■	■
0x66-F8	26361...-26376	Label(VI9)	1	0	string			■	■	■	■	■
0x67-08	26377...-26392	Label(VI10)	1	0	string			■	■	■	■	■
0x67-18	26393...-26408	Label(VI11)	1	0	string			■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x67-28	26409...-26424	Label(VI12)	1	0	string			■	■	■	■	■
0x67-38	26425...-26440	Label(VI13)	1	0	string			■	■	■	■	■
0x67-48	26441...-26456	Label(VI14)	1	0	string			■	■	■	■	■
0x67-58	26457...-26472	Label(VI15)	1	0	string			■	■	■	■	■
0x67-68	26473...-26488	Label(VI16)	1	0	string			■	■	■	■	■
0x67-78	26489...-26504	Label(VI17)	1	0	string			■	■	■	■	■
0x67-88	26505...-26520	Label(VI18)	1	0	string			■	■	■	■	■
0x67-98	26521...-26536	Label(VI19)	1	0	string			■	■	■	■	■
0x67-A8	26537...-26552	Label(VI20)	1	0	string			■	■	■	■	■
0x67-B8	26553...-26568	Label(VO1)	1	0	string			■	■	■	■	■
0x67-C8	26569...-26584	Label(VO2)	1	0	string			■	■	■	■	■
0x67-D8	26585...-26600	Label(VO3)	1	0	string			■	■	■	■	■
0x67-E8	26601...-26616	Label(VO4)	1	0	string			■	■	■	■	■
0x67-F8	26617...-26632	Label(VO5)	1	0	string			■	■	■	■	■
0x68-08	26633...-26648	Label(VO6)	1	0	string			■	■	■	■	■
0x68-18	26649...-26664	Label(VO7)	1	0	string			■	■	■	■	■
0x68-28	26665...-26680	Label(VO8)	1	0	string			■	■	■	■	■
0x68-38	26681...-26696	Label(VO9)	1	0	string			■	■	■	■	■
0x68-48	26697...-26712	Label(VO10)	1	0	string			■	■	■	■	■
0x68-58	26713...-26728	Label(VO11)	1	0	string			■	■	■	■	■
0x68-68	26729...-26744	Label(VO12)	1	0	string			■	■	■	■	■
0x68-78	26745...-26760	Label(VO13)	1	0	string			■	■	■	■	■
0x68-88	26761...-26776	Label(VO14)	1	0	string			■	■	■	■	■
0x68-98	26777...-26792	Label(VO15)	1	0	string			■	■	■	■	■
0x68-A8	26793...-26808	Label(VO16)	1	0	string			■	■	■	■	■
0x68-B8	26809...-26824	Label(VO17)	1	0	string			■	■	■	■	■
0x68-C8	26825...-26840	Label(VO18)	1	0	string			■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x68-D8	26841...-26856	Label(VO19)	1	0	string			■	■	■	■	■
0x68-E8	26857...-26872	Label(VO20)	1	0	string			■	■	■	■	■
0x68-F8	26873...-26888	Label(Logic1)	1	0	string			■	■	■	■	■
0x69-08	26889...-26904	Label(Logic2)	1	0	string			■	■	■	■	■
0x69-18	26905...-26920	Label(Logic3)	1	0	string			■	■	■	■	■
0x69-28	26921...-26936	Label(Logic4)	1	0	string			■	■	■	■	■
0x69-38	26937...-26952	Label(Logic5)	1	0	string			■	■	■	■	■
0x69-48	26953...-26968	Label(Logic6)	1	0	string			■	■	■	■	■
0x69-58	26969...-26984	Label(Logic7)	1	0	string			■	■	■	■	■
0x69-68	26985...-27000	Label(Logic8)	1	0	string			■	■	■	■	■
0x69-78	27001...-27016	Label(Logic9)	1	0	string			■	■	■	■	■
0x69-88	27017...-27032	Label(Logic10)	1	0	string			■	■	■	■	■
0x69-98	27033...-27048	Label(Logic11)	1	0	string			■	■	■	■	■
0x69-A8	27049...-27064	Label(Logic12)	1	0	string			■	■	■	■	■
0x69-B8	27065...-27080	Label(Logic13)	1	0	string			■	■	■	■	■
0x69-C8	27081...-27096	Label(Logic14)	1	0	string			■	■	■	■	■
0x69-D8	27097...-27112	Label(Logic15)	1	0	string			■	■	■	■	■
0x69-E8	27113...-27128	Label(Logic16)	1	0	string			■	■	■	■	■
0x69-F8	27129...-27144	Label(Logic17)	1	0	string			■	■	■	■	■
0x6-A08	27145...-27160	Label(Logic18)	1	0	string			■	■	■	■	■
0x6-A18	27161...-27176	Label(Logic19)	1	0	string			■	■	■	■	■
0x6-A28	27177...-27192	Label(Logic20)	1	0	string			■	■	■	■	■
0x6-A38	27193...-27208	Label(logic1(t))	1	0	string			■	■	■	■	■
0x6-A48	27209...-27224	Label(logic2(t))	1	0	string			■	■	■	■	■
0x6-A58	27225...-27240	Label(logic3(t))	1	0	string			■	■	■	■	■
0x6-A68	27241...-27256	Label(logic4(t))	1	0	string			■	■	■	■	■
0x6-A78	27257...-27272	Label(logic5(t))	1	0	string			■	■	■	■	■

Table 47 - Point list for PDM Modbus (Continued)

First Register Address	Register Number	Description	Read	Write	Data type	Value	Unit	P5-U20 LPC-T LPVT	P5 U20	P5 V20	P5 F30	P5 M30
0x6-A88	27273...-27288	Label(logic6(t))	1	0	string			■	■	■	■	■
0x6-A98	27289...-27304	Label(logic7(t))	1	0	string			■	■	■	■	■
0x6A-A8	27305...-27320	Label(logic8(t))	1	0	string			■	■	■	■	■
0x6A-B8	27321...-27336	Label(logic9(t))	1	0	string			■	■	■	■	■
0x6A-C8	27337...-27352	Label(logic10(t))	1	0	string			■	■	■	■	■
0x6A-D8	27353...-27368	Label(logic11(t))	1	0	string			■	■	■	■	■
0x6A-E8	27369...-27384	Label(logic12(t))	1	0	string			■	■	■	■	■
0x6A-F8	27385...-27400	Label(logic13(t))	1	0	string			■	■	■	■	■
0x6-B08	27401...-27416	Label(logic14(t))	1	0	string			■	■	■	■	■
0x6-B18	27417...-27432	Label(logic15(t))	1	0	string			■	■	■	■	■
0x6-B28	27433...-27448	Label(logic16(t))	1	0	string			■	■	■	■	■
0x6-B38	27449...-27464	Label(logic17(t))	1	0	string			■	■	■	■	■
0x6-B48	27465...-27480	Label(logic18(t))	1	0	string			■	■	■	■	■
0x6-B58	27481...-27496	Label(logic19(t))	1	0	string			■	■	■	■	■
0x6-B68	27497...-27512	Label(logic20(t))	1	0	string			■	■	■	■	■
0x6-B78	27513...-27528	Label(Object1)	1	0	string			■	■	■	■	■
0x6-B88	27529...-27544	Label(Object2)	1	0	string			■	■	■	■	■
0x6-B98	27545...-27560	Label(Object3)	1	0	string			■	■	■	■	■
0x6B-A8	27561...-27576	Label(Object4)	1	0	string			■	■	■	■	■
0x6B-B8	27577...-27592	Label(Object5)	1	0	string			■	■	■	■	■
0x6B-C8	27593...-27608	Label(Object6)	1	0	string			■	■	■	■	■
0x6B-D8	27609...-27624	Label(Object7)	1	0	string			■	■	■	■	■
0x6B-E8	27625...-27640	Label(Object8)	1	0	string			■	■	■	■	■

Modbus master

External analog inputs and digital inputs or outputs can be added to the Easergy P5 protection relay via external Modbus I/O. This protocol is based on Modbus RTU master and RS-485 bus structure. User can configure and read external AI/DI/DO through eSetup Easergy Pro. User can also read these external AI/DI/DO through the HMI.

Function description

The Easergy P5 protection relay supports application functions include:

- Modbus master: analog inputs and alarms
- Modbus master: digital inputs
- Modbus master: digital outputs
- Modbus master: DO matrix
- Modbus master: names config

Main configuration parameters

The picture and table below explain how to configure an Easergy P5 protection relay to use the Modbus master protocol.

Figure 4 - Modbus master main configuration view

Modbus master main configuration

Table 48 - Modbus master main configuration parameters

Parameter	Value	Description
External I/O speed transm	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	The communication speed, bits per second
Parity	None, Even, Odd	The type of parity bit used

Modbus master analog inputs

Find the "Modbus master: analog inputs" and "Modbus master: analog input alarm" menus in eSetup Easergy Pro. Up to 64 points of External AI can be configured. All External AI can be read through HMI control / ExtAI.

Figure 5 - Modbus master: analog inputs menu

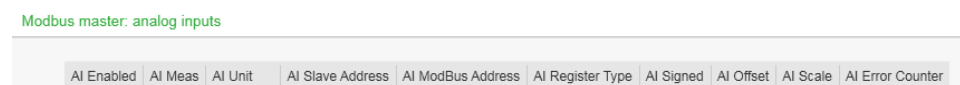
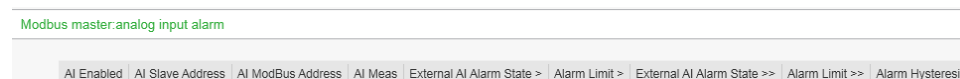


Figure 6 - Modbus master: analog inputs alarm menu



Refer to the table below for the proper values to the parameters "AI Enabled", "AI Unit", "AI slave address", "AI Modbus address", "AI register type" and "AI signed".

Table 49 - Modbus master: analog inputs configuration parameters

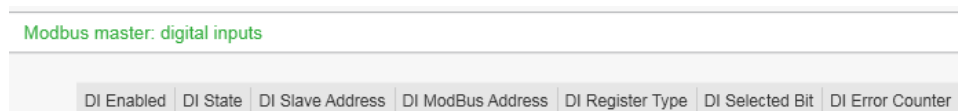
Parameter	Value	Description
AI Enabled	On, Off	Enable or disable this AI.
AI Unit	°C, F, K, V/A, mA, A, V, kW, kVA, kvar	Unit of this AI
AI slave address	1-247	Modbus slave address
AI Modbus address	1-9999	Modbus register address
AI register type	InputR, HoldingR	AI Modbus register type
AI signed	On, Off	Signed interger or Unsigned integer
AI offset	-32768 - 32767	Offset of AI Meas
AI scale	0.001-1000.000	Scale of AI Meas
Alarm 1 pick-up value	float	Threshold for this AI alarm1
Alarm 2 pick-up value	float	Threshold for this AI alarm2
Alarm hysteresis	0.0-10000.0	Hysteresis for alarms

Since holding registers are 16 bits in size, the external analog inputs menu give proper values to AI specific scaling. AI Meas is the product of the received value multiplied by the AI scale. The scaling is determined by the float value of AI scale. It is common to use scaling factors with base ten (0.100, 1.000, 10.000, 100.000...). In such cases, the original measurements only lose decimals and such values are easy to read and rescale to actual values on the client side after transmission.

Modbus master digital inputs

Find the "Modbus master: digital inputs" menu on eSetup Easergy Pro. Up to 18 points of External DI can be configured. All External DI can be read through HMI control / ExtDI.

Figure 7 - Modbus master: digital inputs menu



Refer to the table below for a more detailed explanation on the values that can be assigned to the parameters of this menu.

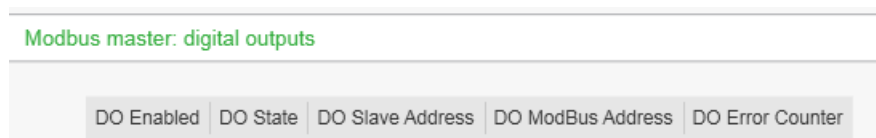
Table 50 - Modbus master: digital inputs configuration parameters

Parameter	Value	Description
DI Enabled	On, Off	Enable or disable this DI.60870-5-101
DI slave address	1-247	Modbus slave address
DI Modbus address	1-9999	Modbus register/coil address
DI register type	InputR, HoldingR, CoilS, InputS	AI Modbus register type
DI selected bit	1-16	Select DI bit for DI state

Modbus master digital outputs

Find the "Modbus master: digital outputs" menu on the eSetup Easergy Pro. Up to 16 points of External DO can be configured. All External DO can be read through HMI control / ExtDO.

Figure 8 - Modbus master: digital outputs menu

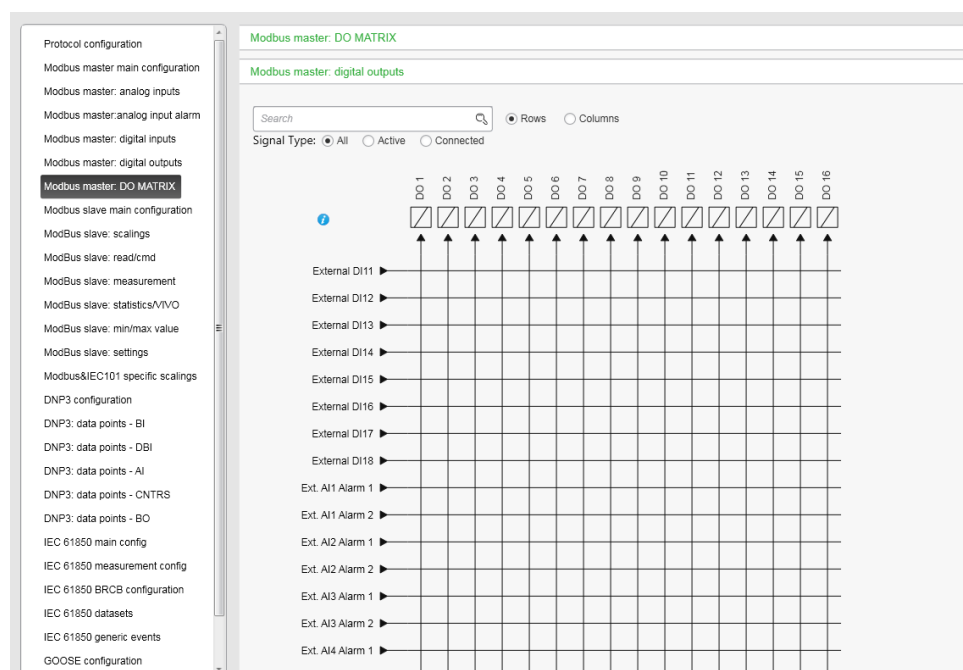


Refer to the table below for a more detailed explanation on the values that can be assigned to the parameters of this menu.

Table 51 - Modbus master: digital outputs configuration parameters

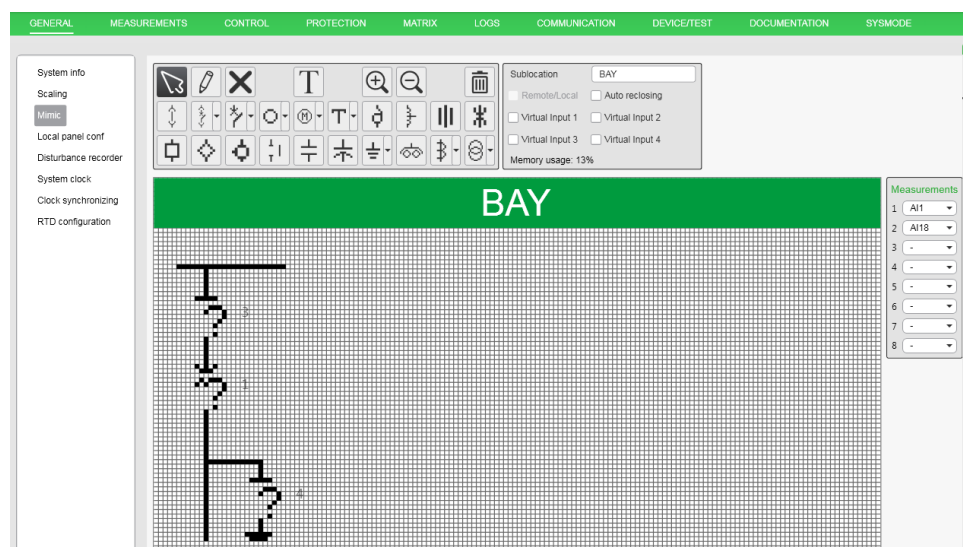
Parameter	Value	Description
DO Enabled	On, Off	Enable or disable this DO
DO slave address	1-247	Modbus slave address
DO Modbus address	1-9999	Modbus coil address

"Modbus master DO matrix is used to link protection Events (e.g. I> start, External AI alarm/trip, ...) or External DI states to DO.

Figure 9 - Modbus master DO matrix

Measurements

The external AI can be obtained by mimic through eSetup Easergy Pro or the HMI. Six or eight measurements can be shown in the main display of the Easergy P5 protection relay with small LCD screen or large one, respectively.

Figure 10 - External AI shown on the mimic screen in eSetup Easergy Pro

Modbus master names configuration

The user can configure the labels and descriptions of Modbus master AI, DI and DO through eSetup Easergy Pro. Corresponding description in Mimic, Matrix and events log will be updated too.

Figure 11 - The External AI names configuration view

External AI names config

AI Input	Label	Description
1	AI1	External AI1
2	AI2	External AI2
3	AI3	External AI3
4	AI4	External AI4
5	AI5	External AI5
6	AI6	External AI6
7	AI7	External AI7
8	AI8	External AI8
9	AI9	External AI9
10	AI10	External AI10
11	AI11	External AI11
12	AI12	External AI12
13	AI13	External AI13
14	AI14	External AI14
15	AI15	External AI15

Figure 12 - The External DI names configuration view

External DI names config

DI Input	Label	Description
1	DI1	External DI1
2	DI2	External DI2
3	DI3	External DI3
4	DI4	External DI4
5	DI5	External DI5
6	DI6	External DI6
7	DI7	External DI7
8	DI8	External DI8
9	DI9	External DI9
10	DI10	External DI10
11	DI11	External DI11
12	DI12	External DI12
13	DI13	External DI13
14	DI14	External DI14
15	DI15	External DI15
16	DI16	External DI16
17	DI17	External DI17
18	DI18	External DI18

Figure 13 - The External DO names configuration view

External DO names config

DO Input	Label	Description
1	DO1	External DO1
2	DO2	External DO2
3	DO3	External DO3
4	DO4	External DO4
5	DO5	External DO5
6	DO6	External DO6
7	DO7	External DO7
8	DO8	External DO8
9	DO9	External DO9
10	DO10	External DO10

EtherNet/IP

Presentation

The Easergy P5 protection relays support communication using EtherNet/IP protocol which is a part of Common Industrial Protocol (CIP) family. EtherNet/IP protocol is available with the optional inbuilt Ethernet port. The protocol can be used to read/write data from/to the Easergy P5 protection relays using request/response communication or via cyclic messages transporting data assigned to assemblies (data sets).

Messaging

EtherNet/IP supports two modes of messaging, unconnected and connected messaging.

- Unconnected messaging refers to peer-to-peer communication, where opening and closing of connections is allowed via unconnected messaging. This is handled by the UnConnected Message Manager (UCMM). Messages are sent over TCP/IP.
- Connected messaging, on the other hand, is dedicated to a particular purpose, such as frequent explicit message transactions or real-time I/O data transfers. Connection resources are reserved and configured using communication services available via the UCMM. Messages are sent over TCP/IP and User Datagram Protocol (UDP).

EtherNet/IP specifies a special encapsulation protocol to carry CIP messages over TCP/IP and UDP.

There are two types of connections, explicit and implicit.

- Explicit connections refer to request-response connections which are general purpose connections. Explicit connections use TCP/IP and use either unconnected messaging via UCMM (one-time request/response) or Class 3 connections (cyclic request /response).
- In implicit connections, only application data is contained within the messages. Implicit data may be polled, cyclic or Change of State (COS) messages. Implicit connections are either point-to-point (unicast) or one-to-many (multicast) connections. Implicit connections use UDP/IP.

Devices

There are two classes of devices in a CIP network, adapters and scanners.

- Adapters are targets of real-time I/O data connection. Adapters cannot send or receive real-time data unless requested to do so by a scanner device. Adapters can exchange data using explicit messages with any class of devices but cannot originate a connection.
- Scanners are originators of I/O data connection requests and originators or targets of explicit connection requests.

Objects

Objects in CIP (and thereby EtherNet/IP) are defined by:

- A description – a description of an object being specified.
- A class code (Class ID) – hexadecimal identifier assigned to each CIP object
- Attributes – data elements associated with the object.
- Common services – list of the common services defined for the object.
- Object-specific Services – the full specifications of any services unique to the object
- Connections – connections supported by the object.
- Behaviour – the relationship between attribute values and services.

The CIP also includes an Object Library, which is a set of standardised objects that covers protocol objects such as the Identity Object, Assembly Object, etc. as well as Application Objects. The Object Library covers basic automation blocks and some more complex devices, including Digital Input, Digital Output, etc.

Figure 14 - CIP object model

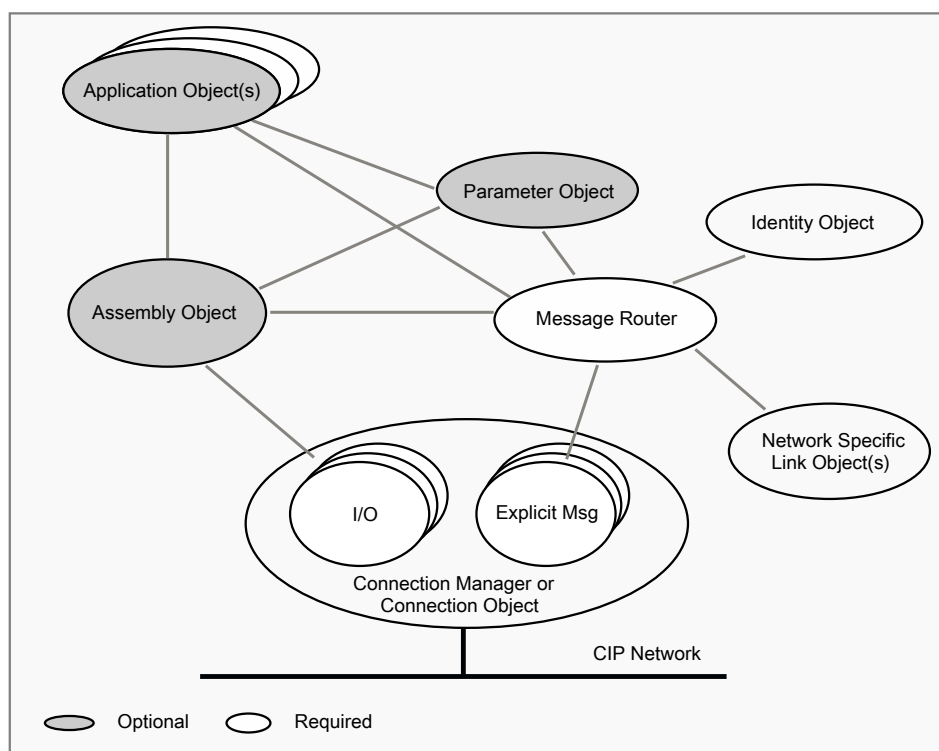


Table 52 - CIP object description

Object	Description
Connection object	The CIP Communication Object manages and provides the runtime exchange of messages.
Message router	The Message Router Object provides a messaging connection point through which a Client may address a service to any object class or instance residing in the physical device. It routes explicit messages over requested paths.
Assembly object	The Assembly Object binds attributes of multiple objects, which in allows data to or from each of these objects to be sent or received over a single connection (like a data set). Assembly objects can be used to group input data (producing instance of an Assembly Object – information transmitted to the network) or output data (consuming instance of an Assembly Object – information received from the network). I/O connections are established between Assembly Object instances of the devices – between inputs and outputs. Assembly object instances are accessible via explicit messaging.
Identity object	Provides device identification and general information about the device, such as vendor identifier, product code, name, status, etc. The Identity Object shall be present in all CIP products.

Application Objects are based on the standard objects from the Object Library if possible, if not, vendors can define their own, private (vendor specific) Application Objects. CIP specifies the Class ID ranges for that purpose.

Table 53 - CIP Class ID ranges

Range (hexadecimal)	Meaning	Quantity
0x00...0x63	Open	100
0x64...0xC7	Vendor specific	100

Table 53 - CIP Class ID ranges (Continued)

Range (hexadecimal)	Meaning	Quantity
0xC8...0xEF	Reserved by CIP for future use	40
0xF0...0x2FF	Open	528
0x300...0x4FF	Vendor specific	512
0x500...0xFFFF	Reserved by CIP for future use	64256

Device profile

The series of application objects for Easergy P5 is known as the device profile. A large number of profiles for many device types have been defined. An example of a device profile is shown in [Device profile, page 246](#).

EtherNet/IP main features

EtherNet/IP main features:

- Static data model:
 - 2 standard objects (Overload and Control Supervisor)
 - 2 private objects (one for digital data and one for analog data)
 - 4 configuration objects for configuration of protection functions
- Two configurable assemblies (one producing and one consuming) with the maximum capacity of 128 bytes. Each configuration is described in an Electronic Data Sheet (EDS) file. Each EDS file that can be fed to any client supporting EDS files and can be generated at any time, all changes to EtherNet/IP configuration or to assemblies' content require generating of the new EDS file, see [Generating an EDS File with eSetup Easergy Pro, page 253](#).
- Three types of communications are supported:
 - UCMM (one time request / response)
 - Class 3 connection (cyclic request / response)
 - Class 1 connection (cyclic IO messages containing assemblies' data)

Function description

EtherNet/IP protocol is available on Easergy P5 protection relays with an optional embedded Ethernet card. Easergy P5 protection relays with the EtherNet/IP protocol selected on the Ethernet port serves as an adapter which means that it is not able to initiate communication with other devices on the network.

Objects and messaging

The EtherNet/IP implementation on Easergy P5 protection relays supports all required standard objects with their required attributes. There is also a total of 10 application objects from which 8 are private. A list of Easergy P5 device objects and their classes is shown in the table below.

Table 54 - Device profile

Class	Object	Object Category	
0x01	Identity	Protocol	Standard
0x02	Message Router		
0x04	Assembly		
0x06	Connection Manager		

Table 54 - Device profile (Continued)

Class	Object	Object Category	
0xF5	TCP/IP Interface	Application	Private (vendor specific)
0xF6	Ethernet Link		
0x29	Control Supervisor		
0x2C	Overload		
0x64	Digital		
0x65	Analog		
0x66	StgProtCurrent		
0x67	StgProtEF		
0x68	StgProtOther		
0x69	StgGeneral		
0x70	Analog2		
0x71	Special		

The EtherNet/IP implementation in Easergy P5 protection relays supports three types of communication:

- Unconnected Explicit Requests and Responses – used mainly for establishing explicit and I/O connections, but can also be used for one time requests to attributes of data model objects.
- Explicit Messaging (Class 3) connections – these are strictly point-to-point connections used to cyclically query the adapter for some data or to cyclically write data to the adapter. Transmitted using TCP.
- I/O Messaging (Class 1) connections – can be point-to-point or multicast. Used for very frequent exchange of process data. Easergy P5 protection relays support only cyclic I/O connections. Transmitted using UDP.

Connection limits:

- For Class 3 connections – a maximum of six connections at the same time.
- For Class 1 connections – only one connection at the same time.

Supported services

Easergy P5 protection relays support following services for objects:

- GAA = Get Attribute All
- GAS = Get Attribute Single
- SAS = Set Attribute Single

GAS service is available for all attributes with the GET or GET (to access) | SET (to modify) access type and the SAS service is available for all attributes with the GET | SET or SET access type.

A list of Easergy P5 device services for objects is shown in the table below.

Table 55 - Supported services for objects

Class	Object	Object Category	
		Get	Set
0x01	Identity	GAA, GAS	–
0x02	Message router	–	–
0x04	Assembly	GAS	SAS
0x06	Connection manager	–	–
0xF5	TCP/IP interface	GAA, GAS	–

Table 55 - Supported services for objects (Continued)

Class	Object	Object Category	
		Get	Set
0xF6	Ethernet link	GAA, GAS	–
0x29	Control supervisor	GAS	SAS
0x2C	Overload	GAS	SAS
0x64	Digital	GAS	SAS
0x65	Analog	GAS	SAS
0x66	StgProtCurrent	GAS	SAS
0x67	StgProtEF	GAS	SAS
0x68	StgProtOther	GAS	SAS
0x69	StgGeneral	GAS	SAS
0x70	Analog2	GAS	SAS
0x71	Special	GAS	SAS

I/O messaging assemblies

EtherNet/IP implementation on Easergy P5 protection relays includes a total of two producing assemblies (Tx, Target → Originator) and two consuming assemblies (Rx, Target → Originator); see table below.

Table 56 - Available assemblies

Instance no.	Type	Description
2	Producing	Static Basic Output Image
50	Consuming	Static Basic Image
100	Producing	Configurable Output Image (dynamic)
150	Consuming	Configurable Input Image (dynamic)

Additionally, a zero-length configuration assembly with instance number “199” is available.

Assemblies have to be configured during the device setup. Configuring assemblies involve selecting the producing and consuming instances to be used.

If dynamic assemblies (instance numbers 100 and 150) are used it is also needed to configure the contents of both assemblies. By default both assemblies are configured with one byte of data each. By default producing assembly is configured with “Control Supervisor Object” / “Faulted attribute” and consuming assembly with “Control Supervisor Object” / “FaultRst”.

I/O connections with Easergy P5 protection relays are opened with the Requested Packet Interval (RPI) no less than 50 ms and not greater than 5 s. The default Value is 100 ms.

Electronic data sheet (EDS)

Every change to main configuration parameters or assemblies configuration requires a new EDS file to be generated (once all changes are made and the device is about to be used in the network).

Some of the configuration tools are capable of simplifying device configuration based on the EDS file. In the current implementation the EDS file can only be generated from eSetup Easergy Pro – EDS file extraction over the EtherNet/IP network is not supported in the Easergy P5 protection relay.

EDS file cannot be extracted from the Easergy P5 protection relay over the EtherNet/IP network, rather, it must be generated with eSetup Easergy Pro. This operation is explained in *Generating an EDS File with eSetup Easergy Pro*, page 253.

Events

Easergy P5 protection relay events are available under the following attributes of Digital Object (0x64)

- Attribute 118 – Event code (bits 0-5: code, bits 6-15: channel)
- Attribute 119 – Event milliseconds and seconds (bits 0-5: seconds, bits 6-15: milliseconds)
- Attribute 120 – Event min and hour (bits 0-7: hour, bits 8-15: minutes)
- Attribute 121 – Event day and month (bits 0-7: month, bits 8-15: day)
- Attribute 122 – Event year

Events are read starting from the oldest one in the Event Buffer of the Easergy P5 protection relay. Events are read sequentially, the next event is read when the previous one is acknowledged. Acknowledgement is done by setting attribute 123 of the Digital Object (0x64) – Event Ack. When all events have been read and the event buffer is thus empty, the attributes will contain zero-data (zeroes). This zero-data will automatically be replaced with the data of a new event when one is registered.

Reading of events is the same for all communication types. The Easergy P5 protection relay sends the oldest available event. The next oldest event will be read only after setting the Event Ack parameter (the one previously read is not available any more) or after the event buffer has been cleared and a new event is generated later on.

Fault codes

The table below contains a translation of Easergy P5 protection relay stages to EtherNet/IP Fault Codes.

Table 57 - EtherNet/IP fault code

EtherNet/IP fault code	Description	Protection stage	ANSI
20	Current trip	Overcurrent I> Overcurrent I>> Overcurrent I>>>	50/51
21	Thermal overload	Thermal Overload T>	49
26	Phase unbalance	Unbalance I2>	46
27	Earth/ground fault	Earth Fault Io> Earth Fault Io>> Earth Fault Io>>> Earth Fault Io>>>>	50N/51N
29	Underload	Under Current Stage I<	37
31	Stall	Motor Startup Supervision Ist>	48
51	Undervoltage	U< U<< U<<<	27
52	Overvoltage	U> U>> U>>>	59
54	Phase reversal	Unbalance I2>>	47
55	Frequency	f< f<< f>< f>><<	81U 81
73	START/HOURS Exceed	Motor Restart Inhibition N>	66

EtherNet/IP main configuration

The configuration of the EtherNet/IP settings is done in the EtherNet/IP main configuration view of the COMMUNICATION menu in eSetup Easergy Pro or Web HMI.

EtherNet/IP main configuration parameters are listed in the table below:

Table 58 - Description of the EtherNet/IP main configuration parameters

Parameter	Value	Description
General		
Multicast IP Address		Multicast IP address used for sending IO messages
Multicast TTL	1–100	Time to live of the IO messages sent to multicast address
Vendor ID	1–65535	Identification of Schneider Electric
Device Type	0–65535	Indication of general type of product
Product Code	1-65535	Identification of a particular product of an individual vendor
Major Revision	1–127	Major revision of the item the Identity Object represents
Minor Revision	1–255	Minor revision of the item the Identity Object represents
Serial Number	0-4294967295	Serial number of device
Product Name	32 chars	Human readable identification
Auto/Manual Header Detection	Manual Auto (default)	Include Run/Idle Header parameters are used to define whether Run/Idle Header is used. Run/Idle Headers are detected automatically
I/O assembly instances in use	2+50, (default) 100+150	Instance numbers of producing and consuming assemblies being used
Producing		
Producing instance number	1–1278	Instance number of producing assembly (not directly editable) ³⁵
Include Run/Idle Header (Producing)	On/Off	Include or exclude Run/Idle Header in an outgoing IO messages
Producing Instance Size	[bytes]	The size of the producing assembly (not directly editable) ³⁶
Consuming		
Consuming Instance	1–1278	Instance number of consuming assembly
Include Run/Idle Header (Consuming)	On/Off	Expect presence or absence of Run/Idle Header in an incoming IO messages
Consuming Instance Size	[bytes]	The size of the consuming assembly (not directly editable) ³⁶
Configuration		
Configuration Instance	1–1279	Instance number of configuration instance
Configuration Instance Size	[bytes]	The size of the consuming assembly (not directly editable) ³⁶

35. Automatically updated according to the value of "I/O assembly instances in use" parameter.

36. Automatically updated as the assemblies are configured.

Multicast IP

Multicast IP address is a parameter used by the device to send EtherNet/IP multicast packets, if requested to do so by the scanner. Multicast IP is a valid Class D IP address. In device there is only one possible I/O connection at a time and therefore only single Multicast IP is used.

Multicast IP parameter is ignored when scanner requested T → O (target-to-originator, i.e. adapter to scanner) communication to be point-to-point. The default value of this parameter is 239.0.0.1.

Multicast TTL

Multicast TTL value is used for the IP header Time-to-live field when sending EtherNet/IP multicast packets. This value is ignored for the unicast packets and TTL as configured for the TCP/IP stack is used instead.

The default value of this parameter is 1 (the number of network hops over which the multicast packet is propagated – datagrams limited to the local subnet).

Auto/Manual header detection

When this parameter is set to “Manual”, user needs to define manually the presence of Run/Idle header in the I/O messaging. This is done by configuring parameters “Include Run/Idle Header” for more information, see [Include Run/Idle header \(producing\)](#), page 251 and [Include Run/Idle header \(consuming\)](#), page 251.

When “Auto” is selected, Easergy P5 protection relays automatically detect whether Run/Idle header is used in the I/O messaging. The default value of this parameter is “Auto”.

I/O assembly instances in use

Selection of producing and consuming instances to be used. The values of producing and consuming assemblies are available in the EDS file (see [Generating an EDS File with eSetup Easergy Pro](#), page 253) and are used by the configuration tool as a reference path during I/O connection opening.

Every change to this parameter requires restarting the device and generation of a new EDS file.

Include Run/Idle header (producing)

An I/O connection can be established with or without the Run/Idle Header in the Target → Originator direction (adapter to scanner). Including Run/Idle Header in the producing assembly adds additional 4 bytes to the beginning of the data part of an I/O message. Run bit is always set in the outgoing messages if Easergy P5 protection relays are configured to send I/O messages with the Run/Idle Header. Information about whether the Run/Idle Header is included in the outgoing messages is available in the EDS file and can be used by the eSetup Easergy Pro to properly establish communication.

Every change to this parameter requires generation of a new EDS file.

The default value of this parameter is “Off”.

Include Run/Idle header (consuming)

An I/O connection can be established with or without the Run/Idle Header in the Target ← Originator direction (scanner to adapter). Setting this value to “On” inform the eSetup Easergy Pro that Easergy P5 protection relays expect the consuming assembly to contain additional 4 bytes of data. If the Run/Idle Header is included and the Run bit is set in the incoming I/O messages then Easergy P5 protection relays process received data, and if the Run bit is cleared then P5 device ignores received data. If the Run/Idle Header is not included in the

incoming I/O messages then the received data is always processed. Information about whether the Run/Idle Header is expected in the incoming I/O messages is available in the EDS file and can be used by the eSetup Easergy Pro to properly establish communication.

Every change to this parameter requires generation of a new EDS file. The default value of this parameter is "On".

NOTE:

Changing of both "Include Run/Idle Header" parameters while the I/O connection is running is not allowed by Easergy P5 protection relays.

Data point configuration

Available data items, that is, the contents of the Producing Assembly and the Consuming Assembly can be viewed / configured in the following eSetup Easergy Pro menus:

- EtherNet/IP I/O 2+50 (static)
- EtherNet/IP I/O 100+150 (dynamic)

Assembly 2+50 is static, meaning user cannot make changes to the contents of assembly. Assembly 100+150 is dynamic, meaning user can select data items to the assembly by clicking on a row and selecting a desired data point. An example of this is shown in figure below.

Figure 15 - Configuration of the EtherNet/IP producing assembly

EtherNet/IP I/O 100+150 (dyn.)

Producing Assembly (Tx, T => O)

	Name	Length	Scaling	Offset
[1]	Control Supervisor#010 / Faulted	1	1 = 1	000
[2]	-	-	-	001
[3]	-	-	-	002
[4]	Special#001 / 1 byte padding			003
[5]	Special#002 / 2 bytes padding			004
[6]	Control Supervisor#003 / Run1			005
[7]	Control Supervisor#010 / Faulted			006
[8]	Control Supervisor#011 / Warning			007
[9]	Control Supervisor#013 / FaultCode			008
[10]	Control Supervisor#014 / WarnCode			009
[11]	Control Supervisor#022 / CycleCount			010
[12]	Overload#005 / AvgCurrent			011
[13]	Overload#006 / %PhImbal			012
[14]	Overload#007 / %Thermal			013
[15]	Overload#008 / CurrentL1			014
	Overload#009 / CurrentL2			
	Overload#010 / CurrentL3			
	Overload#011 / GroundCurrent			
	Digital#001 / Digital inputs			
	Digital#002 / Output relays			
	Digital#003 / Alive indicator			
	Digital#004 / Events			

Table 59 - Description of assembly configuration parameters table contents

Attribute	Description
Name	Type and name of the data item
Length	Length of the data item in bytes
Scaling	The scaling used for the data item
Offset	The offset of the data item in the assembly

NOTE: Making changes to the assemblies will require a device reboot for the changes to take effect.

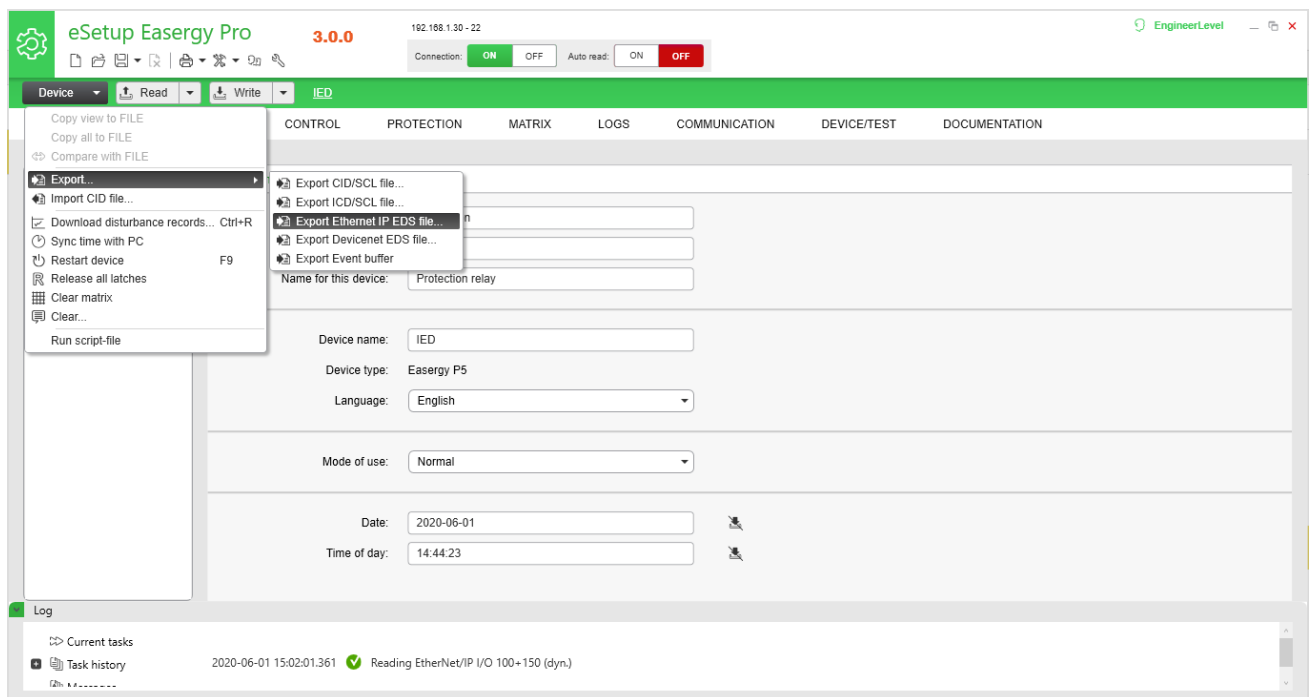
A list of the set of available data items in EtherNet/IP, see Data model of EtherNet/IP, page 253.

Generating an EDS File with eSetup Easergy Pro

Changes to main configuration parameters or the configuration of assemblies requires a new EDS file to be generated (once all changes are made and the device is about to be used in the network).

An EDS file can be generated with eSetup Easergy Pro or Web HMI in the COMMUNICATION menu. Selecting the option “Export Ethernet IP EDS file...” will generate the EDS file and bring up a file browser window asking where to save the generated file. After clicking Save the generated EDS file will be stored at the selected location.

Figure 16 - Exporting an EDS file



Data model of EtherNet/IP

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x71	Special#001/1 byte padding	1	1	1	1	■	■	■	■	■
0x71	Special#002/2 bytes padding	2	1	1	1	■	■	■	■	■
0x71	Special#003/Requested packet interval time	4	1	1	0					
0x71	Special#004/Controller Output Image 100 Size	2	1	0	0					
0x71	Special#005/Controller Input Image 150 Size	2	1	0	0					
0x71	Special#006/Controller Input Image 100 Size	2	1	0	0					
0x71	Special#007/Controller Output Image 150 Size	2	1	0	0					

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x29	Control Supervisor#003/Run1	1	1	1	1	■	■	■	■	■
0x29	Control Supervisor#010/Faulted	1	1	0	1	■	■	■	■	■
0x29	Control Supervisor#011/Warning	1	1	0	1	■	■	■	■	■
0x29	Control Supervisor#012/FaultRst	1	0	1	1	■	■	■	■	■
0x29	Control Supervisor#013/Fault code	1	1	0	1	■	■	■	■	■
0x29	Control Supervisor#014/Warning code	1	1	0	1	■	■	■	■	■
0x29	Control Supervisor#022/ CycleCount	4	1	1	1	■	■	■	■	■
0x2C	Overload#005/AvgCurrent	4	1	0	1	■	■	■	■	■
0x2C	Overload#006/%PhImbal	1	1	0	1	■	■	■	■	■
0x2C	Overload#007/%Thermal	1	1	0	1	■	■	■	■	■
0x2C	Overload#008/CurrentL1	4	1	0	1	■	■	■	■	■
0x2C	Overload#009/CurrentL2	4	1	0	1	■	■	■	■	■
0x2C	Overload#010/CurrentL3	4	1	0	1	■	■	■	■	■
0x2C	Overload#011/Earth-fault current	4	1	0	1	■	■	■	■	■
0x64	Digital#001/Digital inputs	4	1	0	1	■	■	■	■	■
0x64	Digital#002/Output relays	4	1	0	1	■	■	■	■	■
0x64	Digital#003/Alive indicator	2	1	0	1	■	■	■	■	■
0x64	Digital#004/Events	4	1	0	1	■	■	■	■	■
0x64	Digital#005/Remote/Local State	1	1	0	1	■	■	■	■	■
0x64	Digital#006/Cancel selected operation	1	0	1	1	■	■	■	■	■
0x64	Digital#007/OM_MB_ ResetLatches	1	1	1	1	■	■	■	■	■
0x64	Digital#008/Synchronize minutes	1	1	1	1	■	■	■	■	■
0x64	Digital#009/Object1 state	1	1	0	1	■	■	■	■	■
0x64	Digital#010/Object2 state	1	1	0	1	■	■	■	■	■
0x64	Digital#011/Object3 state	1	1	0	1	■	■	■	■	■
0x64	Digital#012/Object4 state	1	1	0	1	■	■	■	■	■
0x64	Digital#013/Object5 state	1	1	0	1	■	■	■	■	■
0x64	Digital#014/Object6 state	1	1	0	1	■	■	■	■	■
0x64	Digital#015/Object7 state	1	1	0	1	■	■	■	■	■
0x64	Digital#016/Object8 state	1	1	0	1	■	■	■	■	■
0x64	Digital#017/Open select Object1	1	1	1	1	■	■	■	■	■
0x64	Digital#018/Close select Object1	1	1	1	1	■	■	■	■	■
0x64	Digital#019/Execute operation Object1	1	0	1	1	■	■	■	■	■
0x64	Digital#020/Max ctrl pulse length of Object1	4	1	1	1	■	■	■	■	■
0x64	Digital#021/Open select Object2	1	1	1	1	■	■	■	■	■
0x64	Digital#022/Close select Object2	1	1	1	1	■	■	■	■	■
0x64	Digital#023/Execute operation Object2	1	0	1	1	■	■	■	■	■
0x64	Digital#024/Max ctrl pulse length of Object2	4	1	1	1	■	■	■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x64	Digital#025/Open select Object3	1	1	1	1	■	■	■	■	■
0x64	Digital#026/Close select Object3	1	1	1	1	■	■	■	■	■
0x64	Digital#027/Execute operation Object3	1	0	1	1	■	■	■	■	■
0x64	Digital#028/Max ctrl pulse length of Object3	4	1	1	1	■	■	■	■	■
0x64	Digital#029/Open select Object4	1	1	1	1	■	■	■	■	■
0x64	Digital#030/Close select Object4	1	1	1	1	■	■	■	■	■
0x64	Digital#031/Execute operation Object4	1	0	1	1	■	■	■	■	■
0x64	Digital#032/Max ctrl pulse length of Object4	4	1	1	1	■	■	■	■	■
0x64	Digital#033/Open select Object5	1	1	1	1	■	■	■	■	■
0x64	Digital#034/Close select Object5	1	1	1	1	■	■	■	■	■
0x64	Digital#035/Execute operation Object5	1	0	1	1	■	■	■	■	■
0x64	Digital#036/Max ctrl pulse length of Object5	4	1	1	1	■	■	■	■	■
0x64	Digital#037/Open select Object6	1	1	1	1	■	■	■	■	■
0x64	Digital#038/Close select Object6	1	1	1	1	■	■	■	■	■
0x64	Digital#039/Execute operation Object6	1	0	1	1	■	■	■	■	■
0x64	Digital#040/Max ctrl pulse length of Object6	4	1	1	1	■	■	■	■	■
0x64	Digital#041/DirectO1O	1	0	1	1	■	■	■	■	■
0x64	Digital#042/DirectO1C	1	0	1	1	■	■	■	■	■
0x64	Digital#043/DirectO2O	1	0	1	1	■	■	■	■	■
0x64	Digital#044/DirectO2C	1	0	1	1	■	■	■	■	■
0x64	Digital#045/DirectO3O	1	0	1	1	■	■	■	■	■
0x64	Digital#046/DirectO3C	1	0	1	1	■	■	■	■	■
0x64	Digital#047/DirectO4O	1	0	1	1	■	■	■	■	■
0x64	Digital#048/DirectO4C	1	0	1	1	■	■	■	■	■
0x64	Digital#049/DirectO5O	1	0	1	1	■	■	■	■	■
0x64	Digital#050/DirectO5C	1	0	1	1	■	■	■	■	■
0x64	Digital#051/DirectO6O	1	0	1	1	■	■	■	■	■
0x64	Digital#052/DirectO6C	1	0	1	1	■	■	■	■	■
0x64	Digital#053/Pos. sequence I1	4	1	0	1	■	■		■	■
0x64	Digital#054/Negative sequence I2	4	1	0	1	■	■		■	■
0x64	Digital#055/Current ratio I2/I1	4	1	0	1	■	■		■	■
0x64	Digital#056/Current phase sequence	1	1	0	1	■	■		■	■
0x64	Digital#057/Pos. sequence U1	4	1	0	1	■		■	■	■
0x64	Digital#058/Negative sequence U2	4	1	0	1	■		■	■	■
0x64	Digital#059/Voltage U2/U1	4	1	0	1	■		■	■	■
0x64	Digital#060/Voltage phase sequence	1	1	0	1	■		■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x64	Digital#061/Voltage interrupt	1	1	0	1	■		■	■	■
0x64	Digital#062/Voltage status	1	1	0	1	■		■	■	■
0x64	Digital#063/Clear min/max/ demand	1	1	1	1	■	■	■	■	■
0x64	Digital#064/Pos. sequence I1'	4	1	1	1					
0x64	Digital#065/Negative sequence I2'	4	1	1	1					
0x64	Digital#066/Current I' -seq./+seq.	4	1	0	1					
0x64	Digital#067/Current I' phase seq.	1	1	0	1					
0x64	Digital#068/Shot1 start counter	2	1	1	1	■	■		■	
0x64	Digital#069/Shot2 start counter	2	1	1	1	■	■		■	
0x64	Digital#070/Shot3 start counter	2	1	1	1	■	■		■	
0x64	Digital#071/Shot4 start counter	2	1	1	1	■	■		■	
0x64	Digital#072/Shot5 start counter	2	1	1	1	■	■		■	
0x64	Digital#073/AR start counter	2	1	1	1	■	■		■	
0x64	Digital#074/AR fail counter	2	1	1	1	■	■		■	
0x64	Digital#075/AR shot number	1	1	0	1	■	■		■	
0x64	Digital#076/Direct trip AR request	2	1	0	1	■	■		■	
0x64	Digital#077/Recloser locked	2	1	0	1	■	■		■	
0x64	Digital#078/Recloser running	2	1	0	1	■	■		■	
0x64	Digital#079/Final trip	2	1	0	1	■	■		■	
0x64	Digital#080/Auto-Recloser on	2	1	0	1	■	■		■	
0x64	Digital#081/Timer 1 status	1	1	1	1	■	■	■	■	■
0x64	Digital#082/Timer 2 status	1	1	1	1	■	■	■	■	■
0x64	Digital#083/Timer 3 status	1	1	1	1	■	■	■	■	■
0x64	Digital#084/Timer 4 status	1	1	1	1	■	■	■	■	■
0x64	Digital#085/Logic output states 1...8	1	1	0	1	■	■	■	■	■
0x64	Digital#086/Logic output states 9...16	1	1	0	1	■	■	■	■	■
0x64	Digital#087/Logic output states 17...20	1	1	0	1	■	■	■	■	■
0x64	Digital#088/Stage start state	1	1	0	1	■	■	■	■	■
0x64	Digital#089/Stage trip state	1	1	0	1	■	■	■	■	■
0x64	Digital#090/N> alarm	1	1	0	1	■	■			■
0x64	Digital#091/Motor start disabled	1	1	0	1	■	■			■
0x64	Digital#092/Motor starting	1	1	0	1	■	■			■
0x64	Digital#093/Motor running	1	1	0	1	■	■			■
0x64	Digital#094/CB operation alarm 1	1	1	0	1	■	■	■	■	■
0x64	Digital#095/CB operation alarm 2	1	1	0	1	■	■	■	■	■
0x64	Digital#096/Alarm L1..L3	1	1	0	1	■	■		■	■
0x64	Digital#097/Fault L1..L3	1	1	0	1	■	■		■	■
0x64	Digital#098/SetGrp common change	1	1	1	1	■	■	■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x64	Digital#099/Sync1 request	1	1	0	1	■		■	■	
0x64	Digital#100/Sync1 OK	1	1	0	1	■		■	■	
0x64	Digital#101/Bypass	1	1	1	1	■		■	■	
0x64	Digital#102/Sync1 fail	1	1	0	1	■		■	■	
0x64	Digital#103/Phase angle difference	2	1	0	1					
0x64	Digital#109/Virtual outputs	2	1	0	1	■	■	■	■	■
0x64	Digital#114/Engine running hours	4	1	1	1	■	■	■	■	■
0x64	Digital#115/Engine running (in seconds)	2	1	1	1	■	■	■	■	■
0x64	Digital#116/Start counter	2	1	1	1	■	■	■	■	■
0x64	Digital#117/Reset diagnostics	1	1	1	1	■	■	■	■	■
0x64	Digital#118/Event Code	2	1	0	1	■	■	■	■	■
0x64	Digital#119/Event Millisec And Sec	2	1	0	1	■	■	■	■	■
0x64	Digital#120/Event Min And Hour	2	1	0	1	■	■	■	■	■
0x64	Digital#121/Event Day And Month	2	1	0	1	■	■	■	■	■
0x64	Digital#122/Event Year	2	1	0	1	■	■	■	■	■
0x64	Digital#123/Event Ack	1	1	1	1	■	■	■	■	■
0x64	Digital#124/Device status	1	1	0	1	■	■	■	■	■
0x64	Digital#125/DI1 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#126/DI2 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#127/DI3 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#128/DI4 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#129/DI5 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#130/DI6 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#131/DI7 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#132/DI8 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#133/DI9 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#134/DI10 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#135/DI11 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#136/DI12 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#137/DI13 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#138/DI14 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#139/DI15 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#140/DI16 counter	2	1	1	1	■	■	■	■	■
0x64	Digital#141/DI17 counter	2	1	1	1				■	■
0x64	Digital#142/DI18 counter	2	1	1	1				■	■
0x64	Digital#143/DI19 counter	2	1	1	1				■	■
0x64	Digital#144/DI20 counter	2	1	1	1				■	■
0x64	Digital#145/DI21 counter	2	1	1	1				■	■
0x64	Digital#146/DI22 counter	2	1	1	1				■	■
0x64	Digital#147/DI23 counter	2	1	1	1				■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x64	Digital#148/DI24 counter	2	1	1	1				■	■
0x64	Digital#149/DI25 counter	2	1	1	1				■	■
0x64	Digital#150/DI26 counter	2	1	1	1				■	■
0x64	Digital#151/DI27 counter	2	1	1	1				■	■
0x64	Digital#152/DI28 counter	2	1	1	1				■	■
0x64	Digital#153/DI29 counter	2	1	1	1				■	■
0x64	Digital#154/DI30 counter	2	1	1	1				■	■
0x64	Digital#155/DI31 counter	2	1	1	1				■	■
0x64	Digital#156/DI32 counter	2	1	1	1				■	■
0x64	Digital#157/DI33 counter	2	1	1	1				■	■
0x64	Digital#158/DI34 counter	2	1	1	1				■	■
0x64	Digital#159/DI35 counter	2	1	1	1				■	■
0x64	Digital#160/DI36 counter	2	1	1	1				■	■
0x64	Digital#161/DI37 counter	2	1	1	1				■	■
0x64	Digital#162/DI38 counter	2	1	1	1				■	■
0x64	Digital#163/DI39 counter	2	1	1	1				■	■
0x64	Digital#164/DI40 counter	2	1	1	1				■	■
0x64	Digital#199/Virtual input 1	1	1	1	1	■	■	■	■	■
0x64	Digital#200/Virtual input 2	1	1	1	1	■	■	■	■	■
0x64	Digital#201/Virtual input 3	1	1	1	1	■	■	■	■	■
0x64	Digital#202/Virtual input 4	1	1	1	1	■	■	■	■	■
0x64	Digital#203/Virtual input 5	1	1	1	1	■	■	■	■	■
0x64	Digital#204/Virtual input 6	1	1	1	1	■	■	■	■	■
0x64	Digital#205/Virtual input 7	1	1	1	1	■	■	■	■	■
0x64	Digital#206/Virtual input 8	1	1	1	1	■	■	■	■	■
0x64	Digital#207/Virtual input 9	1	1	1	1	■	■	■	■	■
0x64	Digital#208/Virtual input 10	1	1	1	1	■	■	■	■	■
0x64	Digital#209/Virtual input 11	1	1	1	1	■	■	■	■	■
0x64	Digital#210/Virtual input 12	1	1	1	1	■	■	■	■	■
0x64	Digital#211/Virtual input 13	1	1	1	1	■	■	■	■	■
0x64	Digital#212/Virtual input 14	1	1	1	1	■	■	■	■	■
0x64	Digital#213/Virtual input 15	1	1	1	1	■	■	■	■	■
0x64	Digital#214/Virtual input 16	1	1	1	1	■	■	■	■	■
0x64	Digital#215/Virtual input 17	1	1	1	1	■	■	■	■	■
0x64	Digital#216/Virtual input 18	1	1	1	1	■	■	■	■	■
0x64	Digital#217/Virtual input 19	1	1	1	1	■	■	■	■	■
0x64	Digital#218/Virtual input 20	1	1	1	1	■	■	■	■	■
0x64	Digital#219/Virtual output 1	1	1	1	1	■	■	■	■	■
0x64	Digital#220/Virtual output 2	1	1	1	1	■	■	■	■	■
0x64	Digital#221/Virtual output 3	1	1	1	1	■	■	■	■	■
0x64	Digital#222/Virtual output 4	1	1	1	1	■	■	■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x64	Digital#223/Virtual output 5	1	1	1	1	■	■	■	■	■
0x64	Digital#224/Virtual output 6	1	1	1	1	■	■	■	■	■
0x64	Digital#225/Virtual output 7	1	1	1	1	■	■	■	■	■
0x64	Digital#226/Virtual output 8	1	1	1	1	■	■	■	■	■
0x64	Digital#227/Virtual output 9	1	1	1	1	■	■	■	■	■
0x64	Digital#228/Virtual output 10	1	1	1	1	■	■	■	■	■
0x64	Digital#229/Virtual output 11	1	1	1	1	■	■	■	■	■
0x64	Digital#230/Virtual output 12	1	1	1	1	■	■	■	■	■
0x64	Digital#231/Virtual output 13	1	1	1	1	■	■	■	■	■
0x64	Digital#232/Virtual output 14	1	1	1	1	■	■	■	■	■
0x64	Digital#233/Virtual output 15	1	1	1	1	■	■	■	■	■
0x64	Digital#234/Virtual output 16	1	1	1	1	■	■	■	■	■
0x64	Digital#235/Virtual output 17	1	1	1	1	■	■	■	■	■
0x64	Digital#236/Virtual output 18	1	1	1	1	■	■	■	■	■
0x64	Digital#237/Virtual output 19	1	1	1	1	■	■	■	■	■
0x64	Digital#238/Virtual output 20	1	1	1	1	■	■	■	■	■
0x65	Analog#001/Phase current IL1	4	1	0	1	■	■		■	■
0x65	Analog#002/Phase current IL2	4	1	0	1	■	■		■	■
0x65	Analog#003/Phase current IL3	4	1	0	1	■	■		■	■
0x65	Analog#004/Frequency	4	1	0	1	■	■	■	■	■
0x65	Analog#005/lo residual current	4	1	0	1		■		■	■
0x65	Analog#006/lo' residual current	4	1	0	1		■		■	■
0x65	Analog#007/Residual voltage	4	1	0	1	■		■	■	■
0x65	Analog#008/Active power	4	1	0	1	■			■	■
0x65	Analog#009/Reactive power	4	1	0	1	■			■	■
0x65	Analog#010/Apparent power	4	1	0	1	■			■	■
0x65	Analog#011/Phase-to-Phase voltage U12	4	1	0	1	■		■	■	■
0x65	Analog#012/Phase-to-Phase voltage U23	4	1	0	1	■		■	■	■
0x65	Analog#013/Phase-to-Phase voltage U31	4	1	0	1	■		■	■	■
0x65	Analog#014/Exported energy	4	1	1	1	■			■	■
0x65	Analog#015/Imported energy	4	1	1	1	■			■	■
0x65	Analog#016/Exp. reactive energy	4	1	1	1	■			■	■
0x65	Analog#017/Imp. reactive energy	4	1	1	1	■			■	■
0x65	Analog#018/Power factor	4	1	0	1	■			■	■
0x65	Analog#019/Phase-to-earth voltage VL1	4	1	0	1	■		■	■	■
0x65	Analog#020/Phase-to-earth voltage VL2	4	1	0	1	■		■	■	■
0x65	Analog#021/Phase-to-earth voltage VL3	4	1	0	1	■		■	■	■
0x65	Analog#022/Tangent φ	4	1	0	1	■			■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x65	Analog#023/Phase current IL	4	1	0	1	■	■		■	■
0x65	Analog#024/Average Phase-Phase voltage	4	1	0	1	■		■	■	■
0x65	Analog#025/Average Phase-Earth voltage	4	1	0	1	■		■	■	■
0x65	Analog#026/Phase current THD	4	1	0	1	■	■		■	■
0x65	Analog#027/Phase current IL1 THD	4	1	0	1	■	■		■	■
0x65	Analog#028/Phase current IL2 THD	4	1	0	1	■	■		■	■
0x65	Analog#029/Phase current IL3 THD	4	1	0	1	■	■		■	■
0x65	Analog#030/HARMONICS of IL1	4	1	0	1	■	■		■	■
0x65	Analog#031/HARMONICS of IL2	4	1	0	1	■	■		■	■
0x65	Analog#032/HARMONICS of IL3	4	1	0	1	■	■		■	■
0x65	Analog#033/Min. of IL1 IL2 IL3	4	1	0	1	■	■		■	■
0x65	Analog#034/Max. of IL1 IL2 IL3	4	1	0	1	■	■		■	■
0x65	Analog#035/Phase current ILRMS	4	1	0	1	■	■		■	■
0x65	Analog#036/Phase current IL1RMS	4	1	0	1	■	■		■	■
0x65	Analog#037/Phase current IL2RMS	4	1	0	1	■	■		■	■
0x65	Analog#038/Phase current IL3RMS	4	1	0	1	■	■		■	■
0x65	Analog#039/Temperature rise	4	1	0	1	■	■		■	
0x65	Analog#040/Ambient temperature	2	1	1	1	■	■		■	
0x65	Analog#041/Phase current IL1da demand	4	1	0	1	■	■		■	■
0x65	Analog#042/Phase current IL2da demand	4	1	0	1	■	■		■	■
0x65	Analog#043/Phase current IL3da demand	4	1	0	1	■	■		■	■
0x65	Analog#044/IoCalc demand	4	1	0	1	■	■		■	■
0x65	Analog#045/Io demand	4	1	0	1	■			■	■
0x65	Analog#046/Io' demand	4	1	0	1	■			■	■
0x65	Analog#047/Voltage THD	4	1	0	1	■		■	■	■
0x65	Analog#048/Phase-Earth VL1 THD	4	1	0	1	■		■	■	■
0x65	Analog#049/Phase-Earth VL2 THD	4	1	0	1	■		■	■	■
0x65	Analog#050/Phase-Earth VL3 THD	4	1	0	1	■		■	■	■
0x65	Analog#051/Harmonics of VL1	4	1	0	1	■		■	■	■
0x65	Analog#052/Harmonics of VL2	4	1	0	1	■		■	■	■
0x65	Analog#053/Harmonics of VL3	4	1	0	1	■		■	■	■
0x65	Analog#054/Min of Phase-Phase voltages	4	1	0	1	■		■	■	■
0x65	Analog#055/Max of Phase-Phase voltages	4	1	0	1	■		■	■	■
0x65	Analog#056/Min. of Phase-Earth voltages	4	1	0	1	■		■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x65	Analog#057/Max. of Phase-Earth voltages	4	1	0	1	■		■	■	■
0x65	Analog#058/RMS voltage mean	4	1	0	1	■		■	■	■
0x65	Analog#059/Phase-Earth voltage VL1RMS	4	1	0	1	■		■	■	■
0x65	Analog#060/Phase-Earth voltage VL2RMS	4	1	0	1	■		■	■	■
0x65	Analog#061/Phase-Earth voltage VL3RMS	4	1	0	1	■		■	■	■
0x65	Analog#062/Phase-Phase U12demand	4	1	0	1	■		■	■	■
0x65	Analog#063/Phase-Phase U23demand	4	1	0	1	■		■	■	■
0x65	Analog#064/Phase-Phase U31demand	4	1	0	1	■		■	■	■
0x65	Analog#065/Phase-Earth VL1demand	4	1	0	1	■		■	■	■
0x65	Analog#066/Phase-Earth VL2demand	4	1	0	1	■		■	■	■
0x65	Analog#067/Phase-Earth VL3demand	4	1	0	1	■		■	■	■
0x65	Analog#068/Cosφ	4	1	0	1	■			■	■
0x65	Analog#069/Cosφ of phase L1	4	1	0	1	■			■	■
0x65	Analog#070/Cosφ of phase L2	4	1	0	1	■			■	■
0x65	Analog#071/Cosφ of phase L3	4	1	0	1	■			■	■
0x65	Analog#072/Power angle	2	1	0	1	■			■	■
0x65	Analog#073/Phase L1 active power	4	1	0	1	■			■	■
0x65	Analog#074/Phase L2 active power	4	1	0	1	■			■	■
0x65	Analog#075/Phase L3 active power	4	1	0	1	■			■	■
0x65	Analog#076/Phase L1 reactive power	4	1	0	1	■			■	■
0x65	Analog#077/Phase L2 reactive power	4	1	0	1	■			■	■
0x65	Analog#078/Phase L3 reactive power	4	1	0	1	■			■	■
0x65	Analog#079/Phase L1 apparent power	4	1	0	1	■			■	■
0x65	Analog#080/Phase L2 apparent power	4	1	0	1	■			■	■
0x65	Analog#081/Phase L3 apparent power	4	1	0	1	■			■	■
0x65	Analog#082/RMS active power	4	1	0	1	■			■	■
0x65	Analog#083/RMS reactive power	4	1	0	1	■			■	■
0x65	Analog#084/RMS apparent power	4	1	0	1	■			■	■
0x65	Analog#085/Active power demand	4	1	0	1	■			■	■
0x65	Analog#086/Reactive power demand	4	1	0	1	■			■	■
0x65	Analog#087/Apparent power demand	4	1	0	1	■			■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x65	Analog#088/Power factor demand	4	1	0	1	■			■	■
0x65	Analog#089/RMS active power demand	4	1	0	1	■			■	■
0x65	Analog#090/RMS reactive power demand	4	1	0	1	■			■	■
0x65	Analog#091/RMS apparent power demand	4	1	0	1	■			■	■
0x65	Analog#092/Calculated Io	4	1	0	1	■	■		■	■
0x65	Analog#093/Fault current of I>	4	1	0	1	■	■		■	■
0x65	Analog#094/Fault current of I>>	4	1	0	1	■	■		■	■
0x65	Analog#095/Fault current of I>>>	4	1	0	1	■	■		■	■
0x65	Analog#096/Fault reactance	4	1	0	1				■	
0x65	Analog#097/Frequency fy	4	1	0	1					
0x65	Analog#098/Phase-to-Phase voltage U12y	4	1	0	1					
0x65	Analog#099/Frequency fz	4	1	1	1					
0x65	Analog#100/Phase-to-Phase voltage U12z	4	1	0	1					
0x65	Analog#101/Phase angle difference	2	1	0	1					
0x65	Analog#102/Minimum frequency	4	1	1	1	■	■	■	■	■
0x65	Analog#103/Minimum active power	4	1	1	1	■			■	■
0x65	Analog#104/Minimum react. power	4	1	1	1	■			■	■
0x65	Analog#105/Minimum apparent power	4	1	1	1	■			■	■
0x65	Analog#106/Min power factor	4	1	1	1	■			■	■
0x65	Analog#107/Minimum of Io	4	1	1	1	■	■		■	■
0x65	Analog#108/Minimum of Io'	4	1	1	1	■	■		■	■
0x65	Analog#109/Demand minimum active power	4	1	1	1	■			■	■
0x65	Analog#110/Demand minimum reactive power	4	1	1	1	■			■	■
0x65	Analog#111/Demand minimum apparent power	4	1	1	1	■			■	■
0x65	Analog#112/Demand minimum power factor	4	1	1	1	■			■	■
0x65	Analog#113/RMS Demand mini active power	4	1	1	1	■			■	■
0x65	Analog#114/RMS Demand min reactive power	4	1	1	1	■			■	■
0x65	Analog#115/RMS Demand mini apparent power	4	1	1	1	■			■	■
0x65	Analog#116/Minimum of IL1	4	1	1	1	■	■		■	■
0x65	Analog#117/Minimum of IL2	4	1	1	1	■	■		■	■
0x65	Analog#118/Minimum of IL3	4	1	1	1	■	■		■	■
0x65	Analog#119/RMS minimum of IL1	4	1	1	1	■	■		■	■
0x65	Analog#120/RMS minimum of IL2	4	1	1	1	■	■		■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x65	Analog#121/RMS minimum of IL3	4	1	1	1	■	■		■	■
0x65	Analog#122/Demand Minimum of IL1	4	1	1	1	■	■		■	■
0x65	Analog#123/Demand Minimum of IL2	4	1	1	1	■	■		■	■
0x65	Analog#124/Demand Minimum of IL3	4	1	1	1	■	■		■	■
0x65	Analog#125/RMS Demand minimum of IL1	4	1	1	1	■	■		■	■
0x65	Analog#126/RMS Demand minimum of IL2	4	1	1	1	■	■		■	■
0x65	Analog#127/RMS Demand minimum of IL3	4	1	1	1	■	■		■	■
0x65	Analog#128/Minimum of U12	4	1	1	1	■		■	■	■
0x65	Analog#129/Minimum of U23	4	1	1	1	■		■	■	■
0x65	Analog#130/Minimum of U31	4	1	1	1	■		■	■	■
0x65	Analog#131/Maximum frequency	4	1	1	1	■	■	■	■	■
0x65	Analog#132/Maximum active power	4	1	1	1	■			■	■
0x65	Analog#133/Maximum react. power	4	1	1	1	■			■	■
0x65	Analog#134/Maximum apparent power	4	1	1	1	■			■	■
0x65	Analog#135/Max power factor	4	1	1	1	■			■	■
0x65	Analog#136/Maximum of Io	4	1	1	1	■	■		■	■
0x65	Analog#137/Maximum of Io'	4	1	1	1	■	■		■	■
0x65	Analog#138/Demand Maximum active power	4	1	1	1	■			■	■
0x65	Analog#139/Demand maximum reactive power	4	1	1	1	■			■	■
0x65	Analog#140/Demand Maximum apparent power	4	1	1	1	■			■	■
0x65	Analog#141/Demand maximum power factor	4	1	1	1	■			■	■
0x65	Analog#142/RMS Demand max active power	4	1	1	1	■			■	■
0x65	Analog#143/RMS Demand max reactive power	4	1	1	1	■			■	■
0x65	Analog#144/RMS Demand max apparent power	4	1	1	1	■			■	■
0x65	Analog#145/Maximum of IL1	4	1	1	1	■	■		■	■
0x65	Analog#146/Maximum of IL2	4	1	1	1	■	■		■	■
0x65	Analog#147/Maximum of IL3	4	1	1	1	■	■		■	■
0x65	Analog#148/RMS maximum of IL1	4	1	1	1	■	■		■	■
0x65	Analog#149/RMS maximum of IL2	4	1	1	1	■	■		■	■
0x65	Analog#150/RMS maximum of IL3	4	1	1	1	■	■		■	■
0x65	Analog#151/Demand Maximum of IL1	4	1	1	1	■	■		■	■
0x65	Analog#152/Demand Maximum of IL2	4	1	1	1	■	■		■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x65	Analog#153/Demand Maximum of IL3	4	1	1	1	■	■		■	■
0x65	Analog#154/RMS Demand maximum of IL1	4	1	1	1	■	■		■	■
0x65	Analog#155/RMS Demand maximum of IL2	4	1	1	1	■	■		■	■
0x65	Analog#156/RMS Demand maximum of IL3	4	1	1	1	■	■		■	■
0x65	Analog#157/Maximum of U12	4	1	1	1	■		■	■	■
0x65	Analog#158/Maximum of U23	4	1	1	1	■		■	■	■
0x65	Analog#159/Maximum of U31	4	1	1	1	■		■	■	■
0x65	Analog#160/Z12 primary impedance	4	1	0	1					
0x65	Analog#161/Z23 primary impedance	4	1	0	1					
0x65	Analog#162/Z31 primary impedance	4	1	0	1					
0x65	Analog#163/Z12 secondary impedance	4	1	0	1					
0x65	Analog#164/Z23 secondary impedance	4	1	0	1					
0x65	Analog#165/Z31 secondary impedance	4	1	0	1					
0x65	Analog#166/Z12 angle	2	1	0	1					
0x65	Analog#167/Z23 angle	2	1	0	1					
0x65	Analog#168/Z31 angle	2	1	0	1					
0x65	Analog#169/Phase current IL1'	4	1	1	1					
0x65	Analog#170/Phase current IL2'	4	1	1	1					
0x65	Analog#171/Phase current IL3'	4	1	1	1					
0x65	Analog#172/IL1 difference	4	1	1	1					
0x65	Analog#173/IL2 difference	4	1	1	1					
0x65	Analog#174/IL3 difference	4	1	1	1					
0x65	Analog#175/Phase current I' THD	4	1	0	1					
0x65	Analog#176/I'L1 THD	4	1	0	1					
0x65	Analog#177/I'L2 THD	4	1	0	1					
0x65	Analog#178/I'L3 THD	4	1	0	1					
0x65	Analog#179/HARMONICS of I'L1	4	1	0	1					
0x65	Analog#180/HARMONICS of I'L2	4	1	0	1					
0x65	Analog#181/HARMONICS of I'L3	4	1	0	1					
0x65	Analog#182/Min. of I'L1 I'L2 I'L3	4	1	0	1					
0x65	Analog#183/Max. of I'L1 I'L2 I'L3	4	1	0	1					
0x65	Analog#184/Phase current I'LRMS	4	1	0	1					
0x65	Analog#185/Phase current IL1'RMS	4	1	1	1					
0x65	Analog#186/Phase current IL2'RMS	4	1	1	1					
0x65	Analog#187/Phase current IL3'RMS	4	1	1	1					

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x65	Analog#251/Io CSH residual current	4	1	0	1	■	■		■	■
0x65	Analog#252/Mode of use	2	1	0	1	■	■	■	■	■
0x66	StgProtCurrent#001/Enable for I>	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#002/Group	1	1	0	0	■	■		■	■
0x66	StgProtCurrent#003/Pick-up value	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#004/Pick-up value	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#005/Delay curve family	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#006/Delay curve family	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#007/Delay type	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#008/Delay type	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#009/Inv. time coefficient	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#010/Inv. time coefficient	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#011/Include harmonics	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#012/Constant A	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#013/Constant B	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#014/Constant C	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#015/Constant D	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#016/Constant E	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#017/Enable for I>>	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#018/Group	1	1	0	0	■	■		■	■
0x66	StgProtCurrent#019/Pick-up value	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#020/Pick-up value	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#021/Operation delay	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#022/Operation delay	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#023/Enable for I>>>	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#024/Group	1	1	0	0	■	■		■	■
0x66	StgProtCurrent#025/Pick-up value	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#026/Pick-up value	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#027/Operation delay	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#028/Operation delay	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#029/Enable for I ϕ >	1	1	1	0	■			■	■
0x66	StgProtCurrent#030/Group	1	1	0	0	■			■	■
0x66	StgProtCurrent#031/Pick-up value	4	1	1	0	■			■	■
0x66	StgProtCurrent#032/Pick-up value	4	1	1	0	■			■	■
0x66	StgProtCurrent#033/Direction mode	1	1	1	0	■			■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x66	StgProtCurrent#034/Direction mode	1	1	1	0	■			■	■
0x66	StgProtCurrent#035/Angle offset	2	1	1	0	■			■	■
0x66	StgProtCurrent#036/Angle offset	2	1	1	0	■			■	■
0x66	StgProtCurrent#037/Delay curve family	1	1	1	0	■			■	■
0x66	StgProtCurrent#038/Delay curve family	1	1	1	0	■			■	■
0x66	StgProtCurrent#039/Delay type	1	1	1	0	■			■	■
0x66	StgProtCurrent#040/Delay type	1	1	1	0	■			■	■
0x66	StgProtCurrent#041/Inv. time coefficient	4	1	1	0	■			■	■
0x66	StgProtCurrent#042/Inv. time coefficient	4	1	1	0	■			■	■
0x66	StgProtCurrent#043/Constant A	4	1	1	0	■			■	■
0x66	StgProtCurrent#044/Constant B	4	1	1	0	■			■	■
0x66	StgProtCurrent#045/Constant C	4	1	1	0	■			■	■
0x66	StgProtCurrent#046/Constant D	4	1	1	0	■			■	■
0x66	StgProtCurrent#047/Constant E	4	1	1	0	■			■	■
0x66	StgProtCurrent#048/Enable for $I_{\phi}>>$	1	1	1	0	■			■	■
0x66	StgProtCurrent#049/Group	1	1	0	0	■			■	■
0x66	StgProtCurrent#050/Pick-up value	4	1	1	0	■			■	■
0x66	StgProtCurrent#051/Pick-up value	4	1	1	0	■			■	■
0x66	StgProtCurrent#052/Direction mode	1	1	1	0	■			■	■
0x66	StgProtCurrent#053/Direction mode	1	1	1	0	■			■	■
0x66	StgProtCurrent#054/Angle offset	2	1	1	0	■			■	■
0x66	StgProtCurrent#055/Angle offset	2	1	1	0	■			■	■
0x66	StgProtCurrent#056/Delay curve family	1	1	1	0	■			■	■
0x66	StgProtCurrent#057/Delay curve family	1	1	1	0	■			■	■
0x66	StgProtCurrent#058/Delay type	1	1	1	0	■			■	■
0x66	StgProtCurrent#059/Delay type	1	1	1	0	■			■	■
0x66	StgProtCurrent#060/Inv. time coefficient	4	1	1	0	■			■	■
0x66	StgProtCurrent#061/Inv. time coefficient	4	1	1	0	■			■	■
0x66	StgProtCurrent#062/Constant A	4	1	1	0	■			■	■
0x66	StgProtCurrent#063/Constant B	4	1	1	0	■			■	■
0x66	StgProtCurrent#064/Constant C	4	1	1	0	■			■	■
0x66	StgProtCurrent#065/Constant D	4	1	1	0	■			■	■
0x66	StgProtCurrent#066/Constant E	4	1	1	0	■			■	■
0x66	StgProtCurrent#067/Enable for $I_{\phi}>>>$	1	1	1	0	■			■	■
0x66	StgProtCurrent#068/Group	1	1	0	0	■			■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x66	StgProtCurrent#069/Pick-up value	4	1	1	0	■			■	■
0x66	StgProtCurrent#070/Pick-up value	4	1	1	0	■			■	■
0x66	StgProtCurrent#071/Direction mode	1	1	1	0	■			■	■
0x66	StgProtCurrent#072/Direction mode	1	1	1	0	■			■	■
0x66	StgProtCurrent#073/Angle offset	2	1	1	0	■			■	■
0x66	StgProtCurrent#074/Angle offset	2	1	1	0	■			■	■
0x66	StgProtCurrent#075/Operation delay	4	1	1	0	■			■	■
0x66	StgProtCurrent#076/Operation delay	4	1	1	0	■			■	■
0x66	StgProtCurrent#077/Enable for I _φ >>>>	1	1	1	0	■			■	■
0x66	StgProtCurrent#078/Group	1	1	0	0	■			■	■
0x66	StgProtCurrent#079/Pick-up value	4	1	1	0	■			■	■
0x66	StgProtCurrent#080/Pick-up value	4	1	1	0	■			■	■
0x66	StgProtCurrent#081/Direction mode	1	1	1	0	■			■	■
0x66	StgProtCurrent#082/Direction mode	1	1	1	0	■			■	■
0x66	StgProtCurrent#083/Angle offset	2	1	1	0	■			■	■
0x66	StgProtCurrent#084/Angle offset	2	1	1	0	■			■	■
0x66	StgProtCurrent#085/Operation delay	4	1	1	0	■			■	■
0x66	StgProtCurrent#086/Operation delay	4	1	1	0	■			■	■
0x66	StgProtCurrent#087/Enable for I2/I1>	1	1	1	0	■	■		■	■
0x66	StgProtCurrent#088/Group	1	1	0	0	■	■		■	■
0x66	StgProtCurrent#089/Pick-up value K2	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#090/Pick-up value K2	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#093/Operation delay	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#094/Operation delay	4	1	1	0	■	■		■	■
0x66	StgProtCurrent#095/Enable for I2>>	1	1	1	0					
0x66	StgProtCurrent#096/Enable for Ist>	1	1	1	0	■	■			■
0x66	StgProtCurrent#097/Motor start detection current	4	1	1	0	■				■
0x66	StgProtCurrent#098/Nominal motor start current	4	1	1	0	■	■			■
0x66	StgProtCurrent#099/Delay type	1	1	1	0	■	■			■
0x66	StgProtCurrent#100/Motor start time	4	1	1	0	■	■			■
0x66	StgProtCurrent#101/Enable for N>	1	1	1	0	■	■			■
0x66	StgProtCurrent#102/Max motor starts/hour	4	1	1	0	■	■			■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x66	StgProtCurrent#103/Min time between motor starts	4	1	1	0	■	■			■
0x66	StgProtCurrent#104/Alarm on event	1	1	1	0	■	■			■
0x66	StgProtCurrent#105/Alarm off event	1	1	1	0	■	■			■
0x66	StgProtCurrent#106/Motor start disabled	1	1	1	0	■	■			■
0x66	StgProtCurrent#107/Motor start enabled	1	1	1	0	■	■			■
0x66	StgProtCurrent#108/Enable for I<	1	1	1	0	■	■			■
0x66	StgProtCurrent#109/Group	1	1	0	0	■	■			■
0x66	StgProtCurrent#110/Pick-up value	4	1	1	0	■	■			■
0x66	StgProtCurrent#111/Pick-up value	4	1	1	0	■	■			■
0x66	StgProtCurrent#112/Operation delay	4	1	1	0	■	■			■
0x66	StgProtCurrent#113/Operation delay	4	1	1	0	■	■			■
0x66	StgProtCurrent#117/Enable for dl>	1	1	1	0					
0x66	StgProtCurrent#118/dl> pick-up (Ibias < 0.5Ign)	4	1	1	0					
0x66	StgProtCurrent#119/Slope1	4	1	1	0					
0x66	StgProtCurrent#120/Ibias for start of slope 2	4	1	1	0					
0x66	StgProtCurrent#121/Slope2	4	1	1	0					
0x66	StgProtCurrent#122/dl> 2.harm. block enable	1	1	1	0					
0x66	StgProtCurrent#123/dl> 2.harm. block limit	4	1	1	0					
0x66	StgProtCurrent#124/Enable for dl>>	1	1	1	0					
0x66	StgProtCurrent#125/Pick-up value	4	1	1	0					
0x66	StgProtCurrent#126/Enable for I'2>	1	1	1	0					
0x66	StgProtCurrent#127/Group	1	1	1	0					
0x66	StgProtCurrent#128/Pick-up value	4	1	1	0					
0x66	StgProtCurrent#129/Pick-up value	4	1	1	0					
0x66	StgProtCurrent#130/Delay type	1	1	1	0					
0x66	StgProtCurrent#131/Delay type	1	1	1	0					
0x66	StgProtCurrent#132/Operation delay	4	1	1	0					
0x66	StgProtCurrent#133/Operation delay	4	1	1	0					
0x66	StgProtCurrent#134/Enable for I'>	1	1	1	0					
0x66	StgProtCurrent#135/Group	1	1	1	0					
0x66	StgProtCurrent#136/Pick-up value	4	1	1	0					
0x66	StgProtCurrent#137/Pick-up value	4	1	1	0					
0x66	StgProtCurrent#138/Delay curve family	1	1	1	0					

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x66	StgProtCurrent#139/Delay curve family	1	1	1	0					
0x66	StgProtCurrent#140/Delay type	1	1	1	0					
0x66	StgProtCurrent#141/Delay type	1	1	1	0					
0x66	StgProtCurrent#142/Inv. time coefficient	4	1	1	0					
0x66	StgProtCurrent#143/Inv. time coefficient	4	1	1	0					
0x66	StgProtCurrent#144/Constant A	4	1	1	0					
0x66	StgProtCurrent#145/Constant B	4	1	1	0					
0x66	StgProtCurrent#146/Constant C	4	1	1	0					
0x66	StgProtCurrent#147/Constant D	4	1	1	0					
0x66	StgProtCurrent#148/Constant E	4	1	1	0					
0x66	StgProtCurrent#149/Enable for I'>>	1	1	1	0					
0x66	StgProtCurrent#150/Group	1	1	1	0					
0x66	StgProtCurrent#151/Pick-up value	4	1	1	0					
0x66	StgProtCurrent#152/Pick-up value	4	1	1	0					
0x66	StgProtCurrent#153/Operation delay	4	1	1	0					
0x66	StgProtCurrent#154/Operation delay	4	1	1	0					
0x67	StgProtEF#001/Enable for Io>	1	1	1	0	■	■		■	■
0x67	StgProtEF#002/Group	1	1	0	0	■	■		■	■
0x67	StgProtEF#003/Pick-up value	4	1	1	0	■	■		■	■
0x67	StgProtEF#004/Pick-up value	4	1	1	0	■	■		■	■
0x67	StgProtEF#005/Delay curve family	1	1	1	0	■	■		■	■
0x67	StgProtEF#006/Delay curve family	1	1	1	0	■	■		■	■
0x67	StgProtEF#007/Delay type	1	1	1	0	■	■		■	■
0x67	StgProtEF#008/Delay type	1	1	1	0	■	■		■	■
0x67	StgProtEF#009/Operation delay	4	1	1	0	■	■		■	■
0x67	StgProtEF#010/Operation delay	4	1	1	0	■	■		■	■
0x67	StgProtEF#012/Constant A	4	1	1	0	■	■		■	■
0x67	StgProtEF#013/Constant B	4	1	1	0	■	■		■	■
0x67	StgProtEF#014/Constant C	4	1	1	0	■	■		■	■
0x67	StgProtEF#015/Constant D	4	1	1	0	■	■		■	■
0x67	StgProtEF#016/Constant E	4	1	1	0	■	■		■	■
0x67	StgProtEF#017/Enable for Io>>	1	1	1	0	■	■		■	■
0x67	StgProtEF#018/Group	1	1	0	0	■	■		■	■
0x67	StgProtEF#019/Pick-up value	4	1	1	0	■	■		■	■
0x67	StgProtEF#020/Pick-up value	4	1	1	0	■	■		■	■
0x67	StgProtEF#021/Operation delay	4	1	1	0	■	■		■	■
0x67	StgProtEF#022/Operation delay	4	1	1	0	■	■		■	■
0x67	StgProtEF#023/Enable for Ioφ>	1	1	1	0	■			■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x67	StgProtEF#024/Group	1	1	0	0	■			■	■
0x67	StgProtEF#025/Direction mode	1	1	1	0	■			■	■
0x67	StgProtEF#026/Direction mode	1	1	1	0	■			■	■
0x67	StgProtEF#027/Char ctrl. in ResCap mode	1	1	1	0	■			■	■
0x67	StgProtEF#028/Char ctrl. in ResCap mode	1	1	1	0	■			■	■
0x67	StgProtEF#029/Pick-up value	4	1	1	0	■			■	■
0x67	StgProtEF#030/Pick-up value	4	1	1	0	■			■	■
0x67	StgProtEF#031/Uo setting for loφ> stage	4	1	1	0	■			■	■
0x67	StgProtEF#032/Uo setting for loφ> stage	4	1	1	0	■			■	■
0x67	StgProtEF#033/Angle offset	2	1	1	0	■			■	■
0x67	StgProtEF#034/Angle offset	2	1	1	0	■			■	■
0x67	StgProtEF#035/Pick up sector size	2	1	1	0	■			■	■
0x67	StgProtEF#036/Pick up sector size	2	1	1	0	■			■	■
0x67	StgProtEF#037/Delay curve family	1	1	1	0	■			■	■
0x67	StgProtEF#038/Delay curve family	1	1	1	0	■			■	■
0x67	StgProtEF#039/Delay type	1	1	1	0	■			■	■
0x67	StgProtEF#040/Delay type	1	1	1	0	■			■	■
0x67	StgProtEF#041/Operation delay	4	1	1	0	■			■	■
0x67	StgProtEF#042/Operation delay	4	1	1	0	■			■	■
0x67	StgProtEF#043/Constant A	4	1	1	0	■			■	■
0x67	StgProtEF#044/Constant B	4	1	1	0	■			■	■
0x67	StgProtEF#045/Constant C	4	1	1	0	■			■	■
0x67	StgProtEF#046/Constant D	4	1	1	0	■			■	■
0x67	StgProtEF#047/Constant E	4	1	1	0	■			■	■
0x67	StgProtEF#048/Enable for loφ>>	1	1	1	0	■			■	■
0x67	StgProtEF#049/Group	1	1	0	0	■			■	■
0x67	StgProtEF#050/Direction mode	1	1	1	0	■			■	■
0x67	StgProtEF#051/Direction mode	1	1	1	0	■			■	■
0x67	StgProtEF#052/Char ctrl. in ResCap mode	1	1	1	0	■			■	■
0x67	StgProtEF#053/Char ctrl. in ResCap mode	1	1	1	0	■			■	■
0x67	StgProtEF#054/Pick-up value	4	1	1	0	■			■	■
0x67	StgProtEF#055/Pick-up value	4	1	1	0	■			■	■
0x67	StgProtEF#056/Uo setting for loφ>> stage	4	1	1	0	■			■	■
0x67	StgProtEF#057/Uo setting for loφ>> stage	4	1	1	0	■			■	■
0x67	StgProtEF#058/Angle offset	2	1	1	0	■			■	■
0x67	StgProtEF#059/Angle offset	2	1	1	0	■			■	■
0x67	StgProtEF#060/Pick up sector size	2	1	1	0	■			■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x67	StgProtEF#061/Pick up sector size	2	1	1	0	■			■	■
0x67	StgProtEF#062/Delay curve family	1	1	1	0	■			■	■
0x67	StgProtEF#063/Delay curve family	1	1	1	0	■			■	■
0x67	StgProtEF#064/Delay type	1	1	1	0	■			■	■
0x67	StgProtEF#065/Delay type	1	1	1	0	■			■	■
0x67	StgProtEF#066/Operation delay	4	1	1	0	■			■	■
0x67	StgProtEF#067/Operation delay	4	1	1	0	■			■	■
0x67	StgProtEF#068/Constant A	4	1	1	0	■			■	■
0x67	StgProtEF#069/Constant B	4	1	1	0	■			■	■
0x67	StgProtEF#070/Constant C	4	1	1	0	■			■	■
0x67	StgProtEF#071/Constant D	4	1	1	0	■			■	■
0x67	StgProtEF#072/Constant E	4	1	1	0	■			■	■
0x67	StgProtEF#073/Enable for lo>>>	1	1	1	0	■	■		■	■
0x67	StgProtEF#074/Group	1	1	0	0	■	■		■	■
0x67	StgProtEF#075/Pick-up value	4	1	1	0	■	■		■	■
0x67	StgProtEF#076/Pick-up value	4	1	1	0	■	■		■	■
0x67	StgProtEF#077/Operation delay	4	1	1	0	■	■		■	■
0x67	StgProtEF#078/Operation delay	4	1	1	0	■	■		■	■
0x67	StgProtEF#079/Compensation mode	1	1	1	0		■		■	
0x67	StgProtEF#080/Compensation current	4	1	1	0		■		■	
0x67	StgProtEF#081/Save unbalance current	1	1	1	0		■		■	
0x67	StgProtEF#082/Saving unbal' event	1	1	1	0		■		■	
0x67	StgProtEF#083/Unbal saved' event	1	1	1	0		■		■	
0x67	StgProtEF#084/Enable for lo>>>>	1	1	1	0		■		■	■
0x67	StgProtEF#085/Group	1	1	0	0		■		■	■
0x67	StgProtEF#086/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#087/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#088/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#089/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#090/Compensation mode	1	1	1	0		■		■	
0x67	StgProtEF#091/Compensation current	4	1	1	0		■		■	
0x67	StgProtEF#092/Save unbalance current	1	1	1	0		■		■	
0x67	StgProtEF#093/Max allowed faults	2	1	1	0		■		■	
0x67	StgProtEF#094/Clear location counters	1	1	1	0		■		■	
0x67	StgProtEF#095/Saving unbal' event	1	1	1	0		■		■	
0x67	StgProtEF#096/Unbal saved' event	1	1	1	0		■		■	

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x67	StgProtEF#097/Enable for IoInt>	1	1	1	0				■	
0x67	StgProtEF#098/Group	1	1	0	0				■	
0x67	StgProtEF#099/Uo pick-up	4	1	1	0				■	
0x67	StgProtEF#100/Uo pick-up	4	1	1	0				■	
0x67	StgProtEF#101/Operation delay	4	1	1	0				■	
0x67	StgProtEF#102/Operation delay	4	1	1	0				■	
0x67	StgProtEF#103/Intermittent time	4	1	1	0				■	
0x67	StgProtEF#104/Enable for Uo>	1	1	1	0	■		■	■	■
0x67	StgProtEF#105/Group	1	1	0	0	■		■	■	■
0x67	StgProtEF#106/Pick-up value	4	1	1	0	■		■	■	■
0x67	StgProtEF#107/Pick-up value	4	1	1	0	■		■	■	■
0x67	StgProtEF#108/Operation delay	4	1	1	0	■		■	■	■
0x67	StgProtEF#109/Operation delay	4	1	1	0	■		■	■	■
0x67	StgProtEF#110/Enable for Uo>>	1	1	1	0	■		■	■	■
0x67	StgProtEF#111/Group	1	1	0	0	■		■	■	■
0x67	StgProtEF#112/Pick-up value	4	1	1	0	■		■	■	■
0x67	StgProtEF#113/Pick-up value	4	1	1	0	■		■	■	■
0x67	StgProtEF#114/Operation delay	4	1	1	0	■		■	■	■
0x67	StgProtEF#115/Operation delay	4	1	1	0	■		■	■	■
0x67	StgProtEF#116/Enable for ArcIo1>	1	1	1	0					
0x67	StgProtEF#117/Pick-up value	4	1	1	0					
0x67	StgProtEF#118/Arc inputs in use	1	1	1	0					
0x67	StgProtEF#119/Enable for ArcIo2>	1	1	1	0					
0x67	StgProtEF#120/Pick-up value	4	1	1	0					
0x67	StgProtEF#121/Arc inputs in use	1	1	1	0					
0x67	StgProtEF#122/Enable for Io>>>>	1	1	1	0		■		■	■
0x67	StgProtEF#123/Group	1	1	0	0		■		■	■
0x67	StgProtEF#124/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#125/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#126/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#127/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#128/Enable for Ioφ>>>	1	1	1	0	■			■	■
0x67	StgProtEF#129/Group	1	1	0	0	■			■	■
0x67	StgProtEF#130/Direction mode	1	1	1	0	■			■	■
0x67	StgProtEF#131/Direction mode	1	1	1	0	■			■	■
0x67	StgProtEF#132/Char ctrl. in ResCap mode	1	1	1	0	■			■	■
0x67	StgProtEF#133/Char ctrl. in ResCap mode	1	1	1	0	■			■	■
0x67	StgProtEF#134/Pick-up value	4	1	1	0	■			■	■
0x67	StgProtEF#135/Pick-up value	4	1	1	0	■			■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x67	StgProtEF#136/Uo setting for loφ>>> stage	4	1	1	0	■			■	■
0x67	StgProtEF#137/Uo setting for loφ>>> stage	4	1	1	0	■			■	■
0x67	StgProtEF#138/Angle offset	2	1	1	0	■			■	■
0x67	StgProtEF#139/Angle offset	2	1	1	0	■			■	■
0x67	StgProtEF#140/Pick up sector size	2	1	1	0	■			■	■
0x67	StgProtEF#141/Pick up sector size	2	1	1	0	■			■	■
0x67	StgProtEF#142/Delay curve family	1	1	1	0	■			■	■
0x67	StgProtEF#143/Delay curve family	1	1	1	0	■			■	■
0x67	StgProtEF#144/Delay type	1	1	1	0	■			■	■
0x67	StgProtEF#145/Delay type	1	1	1	0	■			■	■
0x67	StgProtEF#146/Operation delay	4	1	1	0	■			■	■
0x67	StgProtEF#147/Operation delay	4	1	1	0	■			■	■
0x67	StgProtEF#148/Constant A	4	1	1	0	■			■	■
0x67	StgProtEF#149/Constant B	4	1	1	0	■			■	■
0x67	StgProtEF#150/Constant C	4	1	1	0	■			■	■
0x67	StgProtEF#151/Constant D	4	1	1	0	■			■	■
0x67	StgProtEF#152/Constant E	4	1	1	0	■			■	■
0x67	StgProtEF#153/Enable for Uo>>>	1	1	1	0	■		■	■	■
0x67	StgProtEF#154/Group	1	1	0	0	■		■	■	■
0x67	StgProtEF#155/Pick-up value	4	1	1	0	■		■	■	■
0x67	StgProtEF#156/Pick-up value	4	1	1	0	■		■	■	■
0x67	StgProtEF#157/Operation delay	4	1	1	0	■		■	■	■
0x67	StgProtEF#158/Operation delay	4	1	1	0	■		■	■	■
0x67	StgProtEF#159/Enable for lo'>	1	1	1	0		■		■	■
0x67	StgProtEF#160/Group	1	1	0	0		■		■	■
0x67	StgProtEF#161/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#162/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#163/Delay curve family	1	1	1	0		■		■	■
0x67	StgProtEF#164/Delay curve family	1	1	1	0		■		■	■
0x67	StgProtEF#165/Delay type	1	1	1	0		■		■	■
0x67	StgProtEF#166/Delay type	1	1	1	0		■		■	■
0x67	StgProtEF#167/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#168/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#169/lo' input	1	1	1	0		■		■	■
0x67	StgProtEF#171/Constant A	4	1	1	0		■		■	■
0x67	StgProtEF#172/Constant B	4	1	1	0		■		■	■
0x67	StgProtEF#173/Constant C	4	1	1	0		■		■	■
0x67	StgProtEF#174/Constant D	4	1	1	0		■		■	■
0x67	StgProtEF#175/Constant E	4	1	1	0		■		■	■
0x67	StgProtEF#176/Enable for lo'>>	1	1	1	0		■		■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x67	StgProtEF#177/Group	1	1	0	0		■		■	■
0x67	StgProtEF#178/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#179/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#180/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#181/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#182/lo input	1	1	1	0		■		■	■
0x67	StgProtEF#183/Enable for lo'>>>	1	1	1	0		■		■	■
0x67	StgProtEF#184/Group	1	1	0	0		■		■	■
0x67	StgProtEF#185/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#186/Pick-up value	4	1	1	0		■		■	■
0x67	StgProtEF#187/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#188/Operation delay	4	1	1	0		■		■	■
0x67	StgProtEF#189/lo input	1	1	1	0		■		■	■
0x67	StgProtEF#190/Enable for loUo>	1	1	1	0				■	■
0x67	StgProtEF#191/Group	1	1	0	0				■	■
0x67	StgProtEF#192/Pick-up value	4	1	1	0				■	■
0x67	StgProtEF#193/Pick-up value	4	1	1	0				■	■
0x67	StgProtEF#194/lo input	1	1	1	0				■	■
0x67	StgProtEF#195/Reset time	4	1	1	0				■	■
0x67	StgProtEF#196/Operation delay	4	1	1	0				■	■
0x67	StgProtEF#197/Operation delay	4	1	1	0				■	■
0x67	StgProtEF#198/Direction mode	1	1	1	0				■	■
0x67	StgProtEF#199/Direction mode	1	1	1	0				■	■
0x67	StgProtEF#200/Pick up sector size	2	1	1	0				■	■
0x67	StgProtEF#201/Pick up sector size	2	1	1	0				■	■
0x67	StgProtEF#202/Timer instant delay ctrl.	1	1	1	0				■	■
0x67	StgProtEF#203/Enable for loUo>>	1	1	1	0				■	■
0x67	StgProtEF#204/Group	1	1	0	0				■	■
0x67	StgProtEF#205/Pick-up value	4	1	1	0				■	■
0x67	StgProtEF#206/Pick-up value	4	1	1	0				■	■
0x67	StgProtEF#207/lo input	1	1	1	0				■	■
0x67	StgProtEF#208/Reset time	4	1	1	0				■	■
0x67	StgProtEF#209/Operation delay	4	1	1	0				■	■
0x67	StgProtEF#210/Operation delay	4	1	1	0				■	■
0x67	StgProtEF#211/Direction mode	1	1	1	0				■	■
0x67	StgProtEF#212/Direction mode	1	1	1	0				■	■
0x67	StgProtEF#213/Pick up sector size	2	1	1	0				■	■
0x67	StgProtEF#214/Pick up sector size	2	1	1	0				■	■
0x67	StgProtEF#215/Timer instant delay ctrl.	1	1	1	0				■	■
0x67	StgProtEF#216/Enable for l2>	1	1	1	0	■	■		■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x67	StgProtEF#217/Group	1	1	0	0	■	■		■	■
0x67	StgProtEF#218/Pick-up value	4	1	1	0	■	■		■	■
0x67	StgProtEF#219/Pick-up value	4	1	1	0	■	■		■	■
0x67	StgProtEF#220/Delay curve family	1	1	1	0	■	■		■	■
0x67	StgProtEF#221/Delay curve family	1	1	1	0	■	■		■	■
0x67	StgProtEF#222/Delay type	1	1	1	0	■	■		■	■
0x67	StgProtEF#223/Delay type	1	1	1	0	■	■		■	■
0x67	StgProtEF#224/Operation delay	4	1	1	0	■	■		■	■
0x67	StgProtEF#225/Operation delay	4	1	1	0	■	■		■	■
0x67	StgProtEF#226/Enable for Arc I'>	1	1	1	0					
0x67	StgProtEF#227/Pick-up value	4	1	1	0					
0x67	StgProtEF#228/Arc inputs in use	1	1	1	0					
0x67	StgProtEF#229/Arc I state	1	1	0	0				■	■
0x67	StgProtEF#230/Arc Io state	1	1	0	0				■	■
0x67	StgProtEF#231/Arc stage 1	1	1	0	0				■	■
0x67	StgProtEF#232/Arc stage 2	1	1	0	0				■	■
0x67	StgProtEF#233/Arc stage 3	1	1	0	0				■	■
0x67	StgProtEF#234/Arc stage 4	1	1	0	0				■	■
0x67	StgProtEF#235/Arc stage 5	1	1	0	0				■	■
0x67	StgProtEF#236/Arc stage 6	1	1	0	0				■	■
0x67	StgProtEF#237/Arc stage 7	1	1	0	0				■	■
0x67	StgProtEF#238/Arc stage 8	1	1	0	0				■	■
0x67	StgProtEF#239/Temperature 1	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#240/Temperature 2	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#241/Temperature 3	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#242/Temperature 4	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#243/Temperature 5	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#244/Temperature 6	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#245/Temperature 7	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#246/Temperature 8	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#247/Temperature 9	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#248/Temperature 10	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#249/Temperature 11	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#250/Temperature 12	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#251/Temperature 13	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#252/Temperature 14	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#253/Temperature 15	2	1	0	0	■	■	■	■	■
0x67	StgProtEF#254/Temperature 16	2	1	0	0	■	■	■	■	■
0x68	StgProtOther#001/Enable for U>	1	1	1	0	■		■	■	■
0x68	StgProtOther#002/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#003/Pick-up value	4	1	1	0	■		■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x68	StgProtOther#004/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#005/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#006/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#007/Reset time	4	1	1	0	■		■	■	■
0x68	StgProtOther#008/Hysteresis	4	1	1	0	■		■	■	■
0x68	StgProtOther#009/Enable for U>>	1	1	1	0	■		■	■	■
0x68	StgProtOther#010/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#011/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#012/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#013/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#014/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#015/Hysteresis	4	1	1	0	■		■	■	■
0x68	StgProtOther#016/Enable for U>>>	1	1	1	0	■		■	■	■
0x68	StgProtOther#017/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#018/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#019/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#020/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#021/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#022/Hysteresis	4	1	1	0	■		■	■	■
0x68	StgProtOther#023/Enable for U<	1	1	1	0	■		■	■	■
0x68	StgProtOther#024/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#025/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#026/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#027/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#028/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#029/Low voltage blocking	4	1	0	0	■		■	■	■
0x68	StgProtOther#030/Low voltage blocking	4	1	0	0	■		■	■	■
0x68	StgProtOther#031/Reset time	4	1	1	0	■		■	■	■
0x68	StgProtOther#032/Hysteresis	4	1	1	0	■		■	■	■
0x68	StgProtOther#033/Enable for U<<	1	1	1	0	■		■	■	■
0x68	StgProtOther#034/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#035/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#036/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#037/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#038/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#039/Low voltage blocking	4	1	0	0	■		■	■	■
0x68	StgProtOther#040/Low voltage blocking	4	1	0	0	■		■	■	■
0x68	StgProtOther#041/Hysteresis	4	1	1	0	■		■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x68	StgProtOther#042/Enable for U<<<	1	1	1	0	■		■	■	■
0x68	StgProtOther#043/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#044/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#045/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#046/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#047/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#048/Low voltage blocking	4	1	0	0	■		■	■	■
0x68	StgProtOther#049/Low voltage blocking	4	1	0	0	■		■	■	■
0x68	StgProtOther#050/Hysteresis	4	1	1	0	■		■	■	■
0x68	StgProtOther#051/Enable for fX	1	1	1	0	■		■	■	■
0x68	StgProtOther#052/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#053/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#054/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#055/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#056/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#057/Low voltage blocking	4	1	1	0	■		■	■	■
0x68	StgProtOther#058/Enable for fXX	1	1	1	0	■		■	■	■
0x68	StgProtOther#059/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#060/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#061/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#062/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#063/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#064/Low voltage blocking	4	1	1	0	■		■	■	■
0x68	StgProtOther#065/Enable for f<	1	1	1	0	■		■	■	■
0x68	StgProtOther#066/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#067/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#068/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#069/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#070/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#071/Low voltage blocking	4	1	1	0	■		■	■	■
0x68	StgProtOther#072/Enable for f<<	1	1	1	0	■		■	■	■
0x68	StgProtOther#073/Group	1	1	0	0	■		■	■	■
0x68	StgProtOther#074/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#075/Pick-up value	4	1	1	0	■		■	■	■
0x68	StgProtOther#076/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#077/Operation delay	4	1	1	0	■		■	■	■
0x68	StgProtOther#078/Low voltage blocking	4	1	1	0	■		■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x68	StgProtOther#079/Enable for df/dt>	1	1	1	0	■		■	■	
0x68	StgProtOther#080/Group	1	1	0	0	■		■	■	
0x68	StgProtOther#081/Pick-up value	4	1	1	0	■		■	■	
0x68	StgProtOther#082/Pick-up value	4	1	1	0	■		■	■	
0x68	StgProtOther#083/Operation delay	4	1	1	0	■		■	■	
0x68	StgProtOther#084/Operation delay	4	1	1	0	■		■	■	
0x68	StgProtOther#085/Minimum delay	4	1	1	0	■		■	■	
0x68	StgProtOther#086/Minimum delay	4	1	1	0	■		■	■	
0x68	StgProtOther#087/Enable for P<	1	1	1	0	■			■	■
0x68	StgProtOther#088/Group	1	1	0	0	■			■	■
0x68	StgProtOther#089/Pick-up value	4	1	1	0	■			■	■
0x68	StgProtOther#090/Pick-up value	4	1	1	0	■			■	■
0x68	StgProtOther#091/Operation delay	4	1	1	0	■			■	■
0x68	StgProtOther#092/Operation delay	4	1	1	0	■			■	■
0x68	StgProtOther#093/Enable for P<<	1	1	1	0	■			■	■
0x68	StgProtOther#094/Group	1	1	0	0	■			■	■
0x68	StgProtOther#095/Pick-up value	4	1	1	0	■			■	■
0x68	StgProtOther#096/Pick-up value	4	1	1	0	■			■	■
0x68	StgProtOther#097/Operation delay	4	1	1	0	■			■	■
0x68	StgProtOther#098/Operation delay	4	1	1	0	■			■	■
0x68	StgProtOther#099/Enable for feeder T>	1	1	1	0	■	■		■	
0x68	StgProtOther#100/Group	1	1	0	0	■	■		■	
0x68	StgProtOther#101/Maximum continuous current	4	1	1	0	■	■		■	
0x68	StgProtOther#102/Alarm setting	4	1	1	0	■	■		■	
0x68	StgProtOther#103/Time constant tau	2	1	1	0	■	■		■	
0x68	StgProtOther#104/Rel. cooling time constant	4	1	0	0	■	■		■	
0x68	StgProtOther#105/Max overload at +40°C	4	1	0	0	■	■		■	
0x68	StgProtOther#106/Max overload at +70°C	4	1	0	0	■	■		■	
0x68	StgProtOther#107/Ambient temperature	2	1	0	0	■	■		■	
0x68	StgProtOther#108/Ambient temp. sensor	1	1	0	0	■	■		■	
0x68	StgProtOther#109/Enable for CB fail	1	1	1	0	■	■	■	■	■
0x68	StgProtOther#110/Monitored Trip relay	1	1	1	0	■	■	■	■	■
0x68	StgProtOther#111/Timer1 Operation Delay	4	1	1	0	■	■	■	■	■
0x68	StgProtOther#112/Enable for SOTF	1	1	1	0	■	■		■	■
0x68	StgProtOther#113/Pick-up value	4	1	1	0	■	■		■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x68	StgProtOther#114/Pick-up value	4	1	1	0	■	■		■	■
0x68	StgProtOther#115/Cold load pickup	1	1	0	0	■	■		■	■
0x68	StgProtOther#116/Inrush detection	1	1	0	0	■	■		■	■
0x68	StgProtOther#117/Enable for df/dt>>	1	1	1	0	■		■	■	
0x68	StgProtOther#118/Group	1	1	0	0	■		■	■	
0x68	StgProtOther#119/Pick-up value	4	1	1	0	■		■	■	
0x68	StgProtOther#120/Pick-up value	4	1	1	0	■		■	■	
0x68	StgProtOther#121/Operation delay	4	1	1	0	■		■	■	
0x68	StgProtOther#122/Operation delay	4	1	1	0	■		■	■	
0x68	StgProtOther#123/Minimum delay	4	1	1	0	■		■	■	
0x68	StgProtOther#124/Minimum delay	4	1	1	0	■		■	■	
0x68	StgProtOther#125/Enable for Motor T>	1	1	1	0	■	■			■
0x69	StgGeneral#001/CT primary	4	1	1	0		■		■	■
0x69	StgGeneral#002/CT secondary	2	1	0	0		■		■	■
0x69	StgGeneral#003/Nominal input	2	1	0	0		■		■	■
0x69	StgGeneral#004/Earth CT primary	4	1	1	0		■	■	■	■
0x69	StgGeneral#005/Earth CT secondary	4	1	0	0		■	■	■	■
0x69	StgGeneral#006/Nominal Io1 input	4	1	0	0		■	■	■	■
0x69	StgGeneral#007/Earth CT' primary	4	1	1	0		■	■	■	■
0x69	StgGeneral#008/Earth CT' secondary	4	1	0	0		■	■	■	■
0x69	StgGeneral#009/Nominal Io' input	4	1	0	0		■	■	■	■
0x69	StgGeneral#010/VT primary	4	1	1	0			■	■	■
0x69	StgGeneral#011/VT secondary	2	1	1	0			■	■	■
0x69	StgGeneral#012/VTo secondary	4	1	1	0			■	■	■
0x69	StgGeneral#013/Motor nominal current	4	1	1	0					■
0x69	StgGeneral#021/Delay CT supervision	2	1	1	0	■	■		■	■
0x69	StgGeneral#022/VT supervisor	2	1	1	0	■		■	■	■
0x70	Analog2#001/Frequency	4	1	0	1	■	■	■	■	■
0x70	Analog2#002/Active power	4	1	0	1	■			■	■
0x70	Analog2#003/Reactive power	4	1	0	1	■			■	■
0x70	Analog2#004/Apparent power	4	1	0	1	■			■	■
0x70	Analog2#005/Phase-to-Phase voltage U12	4	1	0	1	■		■	■	■
0x70	Analog2#006/Phase-to-Phase voltage U23	4	1	0	1	■		■	■	■
0x70	Analog2#007/Phase-to-Phase voltage U31	4	1	0	1	■		■	■	■
0x70	Analog2#008/Power factor	4	1	0	1	■			■	■
0x70	Analog2#009/Phase-to-earth voltage VL1	4	1	0	1	■		■	■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x70	Analog2#010/Phase-to-earth voltage VL2	4	1	0	1	■		■	■	■
0x70	Analog2#011/Phase-to-earth voltage VL3	4	1	0	1	■		■	■	■
0x70	Analog2#012/Tangent φ	4	1	0	1	■			■	■
0x70	Analog2#013/Average Phase-Phase voltage	4	1	0	1	■		■	■	■
0x70	Analog2#014/Average Phase-Earth voltage	4	1	0	1	■		■	■	■
0x70	Analog2#015/Pos. sequence U1	4	1	0	1	■		■	■	■
0x70	Analog2#016/Negative sequence U2	4	1	0	1	■		■	■	■
0x70	Analog2#017/Min of Phase-Phase voltages	4	1	0	1	■		■	■	■
0x70	Analog2#018/Max of Phase-Phase voltages	4	1	0	1	■		■	■	■
0x70	Analog2#019/Min. of Phase-Earth voltages	4	1	0	1	■		■	■	■
0x70	Analog2#020/Max. of Phase-Earth voltages	4	1	0	1	■		■	■	■
0x70	Analog2#021/RMS voltage mean	4	1	0	1	■		■	■	■
0x70	Analog2#022/Phase-Earth voltage VL1RMS	4	1	0	1	■		■	■	■
0x70	Analog2#023/Phase-Earth voltage VL2RMS	4	1	0	1	■		■	■	■
0x70	Analog2#024/Phase-Earth voltage VL3RMS	4	1	0	1	■		■	■	■
0x70	Analog2#025/Phase-Phase U12demand	4	1	0	1	■		■	■	■
0x70	Analog2#026/Phase-Phase U23demand	4	1	0	1	■		■	■	■
0x70	Analog2#027/Phase-Phase U31demand	4	1	0	1	■		■	■	■
0x70	Analog2#028/Phase-Earth VL1demand	4	1	0	1	■		■	■	■
0x70	Analog2#029/Phase-Earth VL2demand	4	1	0	1	■		■	■	■
0x70	Analog2#030/Phase-Earth VL3demand	4	1	0	1	■		■	■	■
0x70	Analog2#031/Cos φ	4	1	0	1	■			■	■
0x70	Analog2#032/Cos φ of phase L1	4	1	0	1	■			■	■
0x70	Analog2#033/Cos φ of phase L2	4	1	0	1	■			■	■
0x70	Analog2#034/Cos φ of phase L3	4	1	0	1	■			■	■
0x70	Analog2#035/Phase L1 active power	4	1	0	1	■			■	■
0x70	Analog2#036/Phase L2 active power	4	1	0	1	■			■	■
0x70	Analog2#037/Phase L3 active power	4	1	0	1	■			■	■
0x70	Analog2#038/Phase L1 reactive power	4	1	0	1	■			■	■
0x70	Analog2#039/Phase L2 reactive power	4	1	0	1	■			■	■

Class	Name	Length	Read	Write	Cont. mode	P5U20 LPCT LPVT	P5U20	P5V20	P5F30	P5M30
0x70	Analog2#040/Phase L3 reactive power	4	1	0	1	■			■	■
0x70	Analog2#041/Phase L1 apparent power	4	1	0	1	■			■	■
0x70	Analog2#042/Phase L2 apparent power	4	1	0	1	■			■	■
0x70	Analog2#043/Phase L3 apparent power	4	1	0	1	■			■	■
0x70	Analog2#044/RMS active power	4	1	0	1	■			■	■
0x70	Analog2#045/RMS reactive power	4	1	0	1	■			■	■
0x70	Analog2#046/RMS apparent power	4	1	0	1	■			■	■
0x70	Analog2#047/Active power demand	4	1	0	1	■			■	■
0x70	Analog2#048/Reactive power demand	4	1	0	1	■			■	■
0x70	Analog2#049/Apparent power demand	4	1	0	1	■			■	■
0x70	Analog2#050/Power factor demand	4	1	0	1	■			■	■
0x70	Analog2#051/RMS active power demand	4	1	0	1	■			■	■
0x70	Analog2#052/RMS reactive power demand	4	1	0	1	■			■	■
0x70	Analog2#053/RMS apparent power demand	4	1	0	1	■			■	■
0x70	Analog2#054/Estimated time to trip	4	1	0	1	■	■		■	
0x70	Analog2#055/Phase current IL1	4	1	0	1	■	■		■	■
0x70	Analog2#056/Phase current IL2	4	1	0	1	■	■		■	■
0x70	Analog2#057/Phase current IL3	4	1	0	1	■	■		■	■
0x70	Analog2#058/Pos. sequence I1	4	1	0	1	■	■		■	■
0x70	Analog2#059/Negative sequence I2	4	1	0	1	■	■		■	■
0x70	Analog2#060/Current ratio I2/I1	4	1	0	1	■	■		■	■
0x70	Analog2#061/Voltage U2/U1	4	1	0	1	■		■	■	■
0x70	Analog2#063/Estimated time to trip	4	1	0	1	■	■			■

Redundancy protocols

There are three redundancy protocols available as options of Ethernet communication in Easergy P5 protection relays:

- PRP (Parallel Redundancy Protocol)
- HSR (High-availability Seamless Redundancy)
- RSTP (Rapid Spanning Tree Protocol)

Parallel Redundancy Protocol (PRP)

Introduction

The Parallel Redundancy Protocol used in the Easergy P5 protection relays is defined in Clause 4 of the IEC 62439-3 standard. The PRP is a “redundancy in the devices” method that provides bumpless switchover in case of network failure or reintegration. Furthermore, it provides the shortest Ethernet network reconfiguration time as network reconfiguration is seamless.

The Easergy P5 protection relay uses two independent Ethernet ports that operate in parallel on two independent networks. Each message is replicated and sent over both networks. The first network node that receives a message will process it, all later instances of the received message will be discarded. These details of replicating and discarding messages are controlled by the low-level PRP layer of the network architecture, so that the two networks are hidden from the higher level layers. Thus, PRP-based networks provide a high degree of robustness and resilience.

Easergy P5 protection relays support SNMP.

Essentially, a PRP network consists of a pair of similar Local Area Networks (LANs) which can be any topology (tree, ring or mesh). An example of a PRP network is shown in *PRP redundancy network*, page 283.

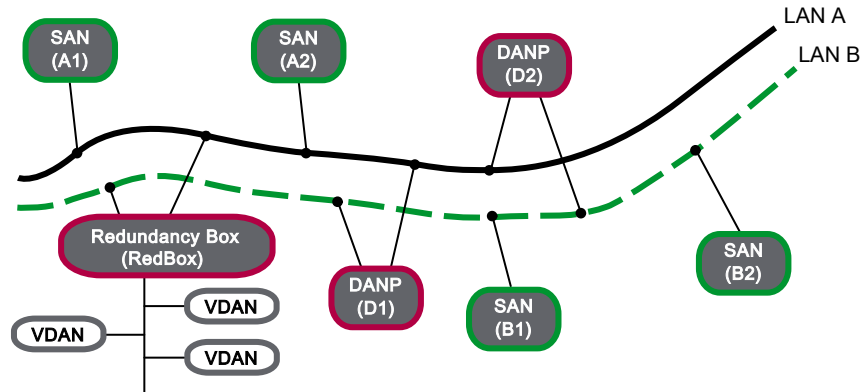
The key features of a PRP redundancy network include:

- Each of the two LANs can have one or more “Single Attached Nodes” (SANs). These are normally non-significant devices that are attached only to a single network. SANs can communicate with each other, but only if they are attached to the same LAN.
- Matched pairs of devices have an interface to each LAN, hence they are called “Dual Attached Nodes” (DANs). DANs having the PRP implemented are called “DANs with PRP implemented” (DANP).
- To make the network messages (also known as “frames”) be transferred correctly to each device in both LANs, each DANP has to be configured with the same Media Access Control (MAC) code and Internet Protocol (IP) address for both of its ports. As a result, TCP/IP traffic will automatically communicate with both of the paired devices, so it will be unaware of any layer 2 redundancy or frame duplication issues.
- A Redundancy Box is used when a single interface node has to be connected to both LANs. The RedBox can communicate with all other nodes. So far as other nodes are concerned, the RedBox behaves like a DAN, so an IED connected via a RedBox is also called a “Virtual DAN” (VDAN). The RedBox has its own unique IP address.
- The Easergy P5 protection relays have to be connected to the redundant Ethernet network as a Double Attached Node (DAN) using PRP (DAN using PRP is known as DANP).
- The redundant Ethernet interface can be made using an optical fibre connection with an LC connector type (Ethernet card dependent).
- The management of the PRP redundancy is transparent to the application data provided via the Ethernet interface.
- Disconnection of one of the LANs to the device does not cause any degradation to the application data over the Ethernet interface.
- Each supervision frame includes a sequence number as defined in the

IEC 62439-3 specification. This is incremented for each supervision message and the value starts from zero following a system restart.

- Received frames to provide supervision of the redundant network are not processed by Easergy P5 protection relays.

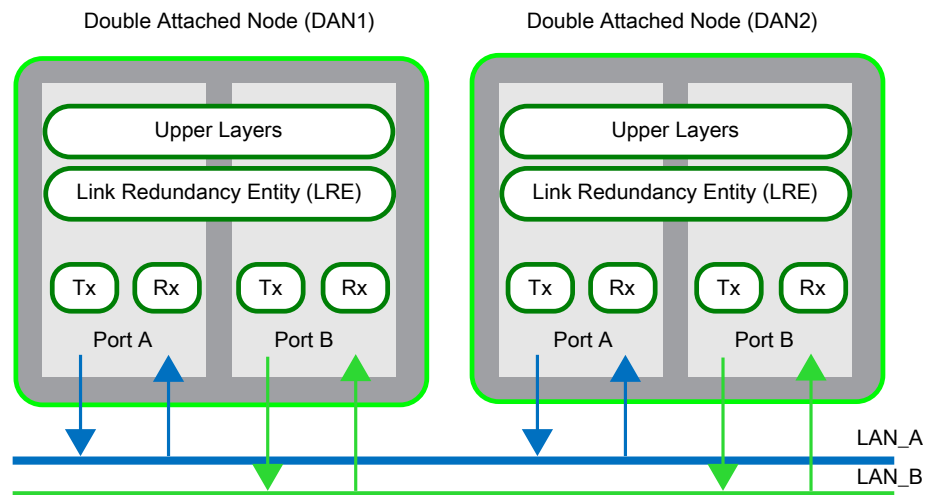
Figure 17 - PRP redundancy network



Structure of a DANP

Easergy P5 protection relays working in PRP mode work as a DANP each within the overall network topology. Each DANP has two ports that operate in parallel. They are attached to the upper layers of the communications stack through the Link Redundancy Entity (LRE).

Figure 18 - Communication between two DANPs



The LRE has two main tasks:

- Handling message frames
- Management of redundancy

When an upper layer sends a frame to the LRE, the LRE replicates the frame and sends it through both its ports at nearly the same time. The two frames move through the two LANs with slightly different delays, ideally arriving at the destination node within a small time window.

When receiving frames, the LRE forwards the first frame it received to its upper layers and then discards the duplicate.

As both DANP nodes have the same MAC and IP addresses, this makes redundancy transparent to the upper layers. This allows the Address Resolution Protocol (ARP) to work in the same way as with a SAN. Accordingly, to the upper

layers of a DANP, the LRE layer shows the same interface as the network adapter of a non-redundant adapter.

To manage redundancy, the LRE:

- Adds a 32-bit Redundancy Check Tag (RCT) to each frame it sends
- Removes the RCT from each frame it receives

Communication between SANs and DANs

A SAN can be connected to any LAN and can communicate with any other SAN on the same LAN or any DAN. However, a SAN which connected to one LAN can not communicate directly to a SAN which is connected to the other LAN.

A DAN is connected to both LANs and can communicate with any Redundancy Box (RedBox) or any other DANs or any SANs on either network. For communication purposes, a DAN “views” a SAN connected through a RedBox as a VDAN.

When a SAN generates a basic frame, it sends the frame only onto the LAN to which it is connected.

Main characteristics

- One VLAN tag supported
- 128 publishers supported per receiver
- Up to 100Mbit/s full duplex Ethernet
- Dynamic frame memory allocation (page manager)
- Configurable duplicate detection
- Wishbone interface for configuration and status registers
- CPU port interface — Ethernet or Wishbone
- Support for link-local protocols - CPU may send to specific ports only - CPU knows receive port
- Configurable frame memory and queue length
- Duplicate detection with configurable size and aging time
- MAC address filtering (8 filter masks for interlink, 6 for CPU)
- Support for interfaces with or without Ethernet preamble

According to the IEC/IEEE 8802-3, the Maximum Transmission Unit (MTU) (Ethernet maximum packet size) is:

- 1518 bytes without VLAN and without PRP
- 1522 bytes with VLAN and without PRP
- 1524 bytes without VLAN and with PRP
- 1528 bytes with VLAN and with PRP

NOTE: Check that the LAN switches setting for the MTU is at least 1528 bytes.

PRP parameters

The redundant Ethernet standard (IEC 62439-3) defines several parameters for the PRP protocol; these being fixed according to the table below:

Table 60 - PRP parameter values

Parameter	Value	Description
Supervision Frame Multicast Address	01-15-4E-00-01-00	Target MAC Address for multicast supervision frame.
Life Check Interval	2 s +/- 100 ms	Period between transmission of supervision frames.
PRP Mode	Duplicate Discard	This is normal PRP mode, Duplicate address will not be supported.
Entry Forget Time	400 ms	Duration that the received message Sequence number will be held to discard a duplicate message.
Node Reboot Interval	500 ms	Duration following reboot for which no PRP frames will be transmitted.

High-availability Seamless Redundancy (HSR)

Introduction

The High-availability Seamless Redundancy Protocol used in the Easergy P5 protection relays is defined in Clause 5 of the IEC 62439-3 standard.

The HSR is a “redundancy in the devices” method that provides seamless switchover and recovery in case of a single communication failure or reintegration. HSR Ethernet redundancy method is independent of any industrial Ethernet protocol and typically used in a ring topology.

Easergy P5 protection relays provide two redundant Ethernet ports using HSR. The redundant Ethernet interface can be made using an optical fibre connection with an LC connector type. The management of the HSR redundancy is transparent to the application data provided via the Ethernet interface.

Disconnection of one of the Nodes to the device does not cause any degradation to the application data over the Ethernet interface.

Easergy P5 protection relays support SNMP.

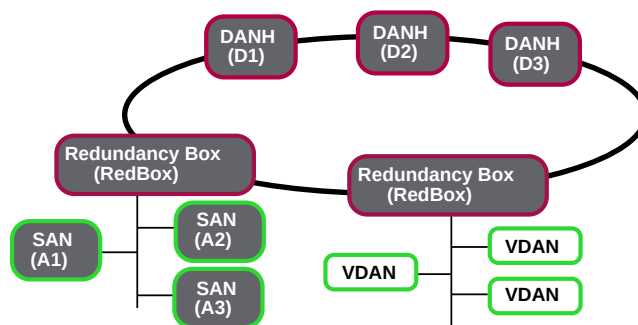
An example of a HSR network is shown in [HSR redundancy network](#), page 286.

The key features of a HSR redundancy network include:

- Nodes within the ring are restricted to be HSR-capable bridging nodes, thus avoiding the use of dedicated bridges.
- Singly Attached Nodes (SANs) such as laptops or printers cannot be attached directly to the ring, but need attachment through a RedBox.
- A simple HSR network consists of doubly attached bridging nodes, each having two ports, interconnected by full-duplex links.
- A source DANH (Double Attached Node with HSR implemented) sends a frame passed from its upper layers, prefixes it by an HSR tag to identify frame duplicates and sends the frame over each port.
- A destination DANH receives, in the fault-free state, two identical frames from each port within a certain interval, if it is a multicast frame, it instantaneously forwards it on the ring, removes the HSR tag of the first frame before passing it to its upper layers and discards any duplicate.

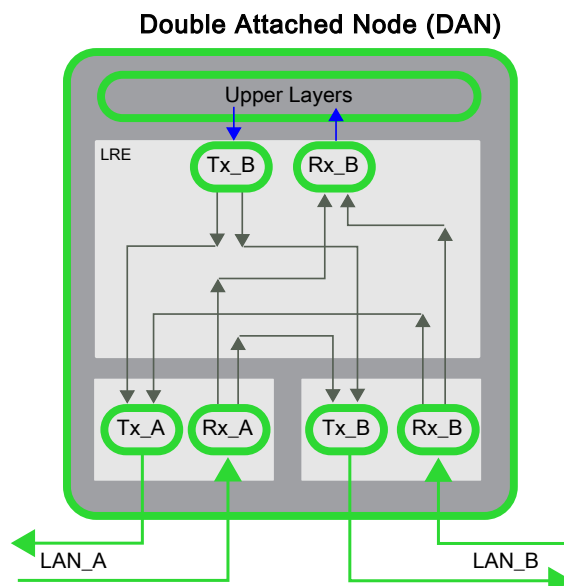
In particular, the node will not forward a frame that it injected into the ring. A destination node of a unicast frame does not forward a frame for which it is the only destination, except for testing.

- Easergy P5 protection relays have to be connected to the redundant Ethernet network as a Double Attached Node (DAN) using HSR (DANH).

Figure 19 - HSR redundancy network

Structure of a DAN

Easergy P5 protection relays working in HSR Mode work as a DAN within the overall network topology. Each DAN has two ports that operate in parallel. The two HSR ports A and B are connected by the Link Redundancy Entity (LRE), which includes a switching matrix allowing to forward frames from one port to the other. The switching matrix allows cut-through bridging. The LRE presents to the higher layers the same interface as a standard Ethernet transceiver would do.

Figure 20 - Communication between two DANs (in HSR)

DAN node is operable in HSR-tagged forwarding mode, the DAN inserts the HSR tag on behalf of its host and forwards the ring traffic, except for frames sent by the node itself. Duplicate frames and frames where the node is the unicast destination are not forwarded.

Structure of a RedBox

The RedBox has a LRE that performs the duties of the HSR protocol, in particular:

- forwards the frames received from one HSR port to the other HSR port, unless the frame receives frames addressed to its own upper protocols
- prefixes the frames sent by its own upper layers with the corresponding HSR tag before sending two copies over its HSR ports

The switching logic is incorporated into the RedBox, so interlink becomes an internal connection.

A simple RedBox is present in every node, since the LRE makes a transition to a single non-HSR host. In addition, it is usual to have more than one host in a node, since a port for maintenance often exists.

A node does not send over a port a frame that is a duplicate of a frame previously sent over that port in that same direction.

For the purpose of Duplicate Discard, a frame is identified by:

- source MAC address
- sequence number

The Duplicate Discard method forgets an entry identified by <Source MAC Address><Sequence number> after a time EntryForgetTime.

Communication between SANs, DANs and RedBoxes

Singly Attached Nodes, for instance maintenance laptops or printers cannot be inserted directly into the ring since they have only one port and cannot interpret the HSR tag in the frames. SANs communicate with ring devices through a RedBox that acts as a proxy for the SANs attached to it.

A source DANH sends a frame passed from its upper layers, and prefixes it by an HSR tag to identify frame duplicates and sends the frame over both ports. Each supervision frame includes a sequence number as defined in the IEC 62439- 3 specification. This is incremented for each supervision message and the value starts from zero following a system restart.

A destination DANH receives, in the fault-free state, two identical frames from each port within a certain interval, if it is a multicast frame, it instantaneously forwards it on the ring, removes the HSR tag of the first frame before passing it to its upper layers ("D"- frame) and discards any duplicate.

Main characteristics

- One VLAN tag supported
- Up to 128 devices supported
- Up to 100Mbit/s full duplex Ethernet
- Dynamic frame memory allocation (page manager)
- Configurable duplicate detection
- Wishbone interface for configuration and status registers
- CPU port interface - Wishbone
- Support for link-local protocols - CPU may send to specific ports only - CPU knows receive port
- Support for interfaces with or without Ethernet preamble
- Configurable frame memory and queue length
- Duplicate detection with configurable size and aging time
- MAC address filtering (8 filter masks for interlink port, 6 for CPU port)
- Support for interfaces with or without Ethernet preamble

Limitations:

- Number of devices on a same ring at 100 Mbit/s:
Each hop (devices or RedBox) not only carries its own messages but also all the other devices messages thus the bandwidth used is proportional to the number of device. The maximum number of hops is around 20 when the GOOSE messages are highly used or 40 if the number and importance of GOOSE messages is not high.
- When Precision Time Protocol, according IEEE1588/IEC 61588 standard, is used:
As the GPS receiver inaccuracy is 200 ns and as each hop (devices or RedBox) can add a 50 ns inaccuracy, the maximum number of hops is 16 if 1 µs accuracy is required (PMU application or Process Bus).

HSR parameters

The redundant Ethernet standard (IEC 62439-3) defines several parameters for the HSR protocol; these being fixed according to the table below:

Table 61 - HSR parameter values

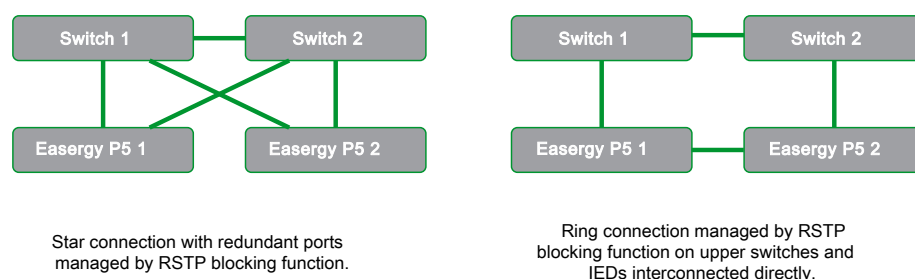
Parameter	Value	Description
Supervision Frame Multicast Address	01-15-4E-00-01-00	Target MAC Address for multicast supervision frame
Life Check Interval	2 s +/- 100 ms	Period between transmission of supervision frames
HSR Mode	Duplicate Discard	This is normal HSR mode, Duplicate address will not be supported.
Entry Forget Time	400 ms	Duration that the received message Sequence number will be held to discard a duplicate message.
Node Reboot Interval	500 ms	Duration following reboot for which no PRP frames will be transmitted.
MulticastFilterSize	8 Interlink and 6 Nios CPU	Number of multicast addresses to be filtered

Rapid Spanning Tree Protocol (RSTP)

Introduction

RSTP is a standard used to quickly reconnect a network failure by finding an alternative path, allowing loop-free network topology.

Figure 21 - A redundant Ethernet star or ring circuit



Although RSTP can recover network failures quickly, the recovery time depends on the number of devices and the topology. The recovery time also depends on the time taken by the devices to determine the root bridge and compute the port roles (discarding, learning, forwarding). The devices do this by exchanging Bridge Protocol Data Units (BPDUs) containing information about bridge devices and root path costs. See the IEEE 802.1w standard for further information.

The RSTP solution is based on open standards. It is therefore compatible with other manufacturers' IEDs that use the RSTP protocol. The typical RSTP recovery time is less than 50 ms for 10 IEDs in a network but it increases with the network size. Due to this recovery time it is not recommended to use RSTP in automation systems where a high availability of GOOSE is essential.

Easergy P5 protection relays provide two redundant Ethernet ports using RSTP. The redundant Ethernet interface can be made using RJ45 or optical fibre connections of LC connector type. The management of the RSTP is transparent to the application data provided via the Ethernet interface. One of the missed node connections to the device does not cause any degradation to the application data over the Ethernet interface.

Easergy P5 protection relays support SNMP.

RSTP parameters

Table 62 - RSTP parameter values

Parameter	Default Value	Range	Description
Enable for RSTP	Yes	Yes, No	Enable/disable the use of RSTP protocol on the Ethernet port. (RSTP on Slot L can be enabled or disabled, while RSTP on Slot M is always enabled.)
Bridge priority	32768	0...65535 (step is 4096)	Parameter used to define the RSTP root device for the network. If priorities of two or more devices are equal then the device with lowest MAC address is chosen as a root.
Hello Time	2 s	1...10 s	Setting defines how often RSTP frames (Hello BPDU) are sent.
Forward Delay	15 s	4...30 s	Time needed for the port to change its state from blocking to forwarding.
Max Age	20 s	6...40 s	The maximum age of the information transmitted by the Bridge when it is the Root Bridge.
Port1 Path Cost	200000	1...200000	Port Cost is related to transfer speed. This is determined according to RSTP specification.
Port1 Priority	128	0...255	When both Ethernet ports are set connected to the same network segment – in such a case the port with worse priority (higher value) is disabled as a backup path for that segment.
Port2 Path Cost	200000	1...200000	Port Cost is related to transfer speed. This is determined according to RSTP specification.
Port2 Priority	128	0...255	When both Ethernet ports are set connected to the same network segment – in such a case the port with worse priority (higher value) is disabled as a backup path for that segment.

The parameters for the RSTP protocol can be configured via:

- front panel
- Protocol configuration view of COMMUNICATION menu of eSetup Easergy Pro or Web HMI

Generic functions for all redundant Ethernet modules

- **Ethernet 100Base Fx/Tx**

The fibre optic ports are full duplex 100 Mbps LC connectors.

- **Forwarding**

The devices from the families Easergy P5 protection relays support store and forward mode. The switch forwards messages with known addresses to the appropriate port. The messages with unknown addresses, the broadcast messages and the multicast messages are forwarded out to all ports except the source port. Switches will not forward error packets, 802.3x pause frames or local packets.

NOTE: Forwarding is active when HSR or RSTP protocol is selected.

- **Priority Tagging**

802.1p priority tagging is enabled on all ports.

Precision Time Protocol (PTP)

Precision Time Protocol (PTP) communication uses the IEEE 802.3 protocol.

PTP communication is only available with PRP/HSR module. A Transparent Clock (TC) is supported on the HSR ring. PTP provides higher time accuracy (500 us).

Introduction to the PTP standards

A protocol is provided in this standard that enables precise Synchronisation of clocks in measurement and control systems implemented with technologies such as network communication, local computing, and distributed objects. The protocol is applicable to systems communicating via packet networks. Heterogeneous systems are enabled that include clocks of various inherent precision, resolution, and stability to synchronise. System wide synchronisation accuracy and precision in the sub-microsecond range are supported with minimal network and local clock computing resources. Simple systems are installed and operated without requiring the management attention of users because the default behaviour of the protocol allows for it.

NOTE: Specific PTP compatible external equipment (switch, time synchronisation source, etc.) are needed for Easergy P5 PTP protocols.

PTP implementation

PTP implementation is compliant with IEC 61850-9-3 and IEEE 1588v2/ IEC 61588. Peer-to-peer mode and Best Master Clock algorithm (BMCA) are supported.

Figure 22 - PTP configuration

Precision time IEEE1588

Enable time protocol:	☒	
Domain number:	0	
Precision time state:	Slave	
Precision time deviation:	0	us
Offset from master:	-18ns	
Peer propagation delay:	+0ns	
Steps removed:	1	
Parent clock Id:	EC-E5-55-FF-FE-A7-57-B6	
Parent port number:	1	
Parent clock class:	248	
Parent clock accuracy:	>10s	
Parent clock variance:	25120	
Parent priority 1:	128	
Parent priority 2:	128	

Table 63 - PTP parameter values

Parameter	Value	Description	Note
Enable time protocol	Yes, No	Enable/disable PTP protocol.	Set
Domain number	0...255	Define the permitted domain number of master clock. If the domainNumber in received PTP message header is different from the configuration parameter, the message will be rejected.	Set
Precision time state	Initial Faulty	The state of PTP.	

Table 63 - PTP parameter values (Continued)

Parameter	Value	Description	Note
	Disabled Listening Pre_master Master Passive Uncalibrated Slave		
Precision time deviation	Unit: μ s	The last time deviation for PTP in μ s.	
Offset from master	Unit: ns, μ s, ms or s	The time difference between a master and a slave computed by the slave.	
Peer propagation delay	Unit: ns, μ s, ms or s	An estimate of the current one-way propagation delay on the link.	
Steps removed	0...255	The number of communication paths traversed between the local clock and the grandmaster clock.	
Parent clock Id	xx-xx-xx-FF-FE-xx-xx-xx	The parent clock id.	
Parent port number	0...255	The number of parent port.	
Parent clock class	0...255	Parent clock attribute defining a clock's TAI traceability.	
Parent clock accuracy	0...255	Parent clock attribute defining the accuracy of a clock.	
Parent clock variance	0...65535	Parent clock attribute defining the stability of a clock.	
Parent priority 1	0...255	The parent priority 1 used in the execution of the best master clock algorithm.	
Parent priority 2	0...255	The parent priority 2 used in the execution of the best master clock algorithm.	

Simple Network Time Protocol (SNTP)

Simple Network Time Protocol is supported by the Easergy P5 protection relay. SNTP is used to synchronise the clocks of computer systems over packet-switched, variable-latency data networks. A jitter buffer is used to reduce the effects of variable latency introduced by queuing in packet switched networks, helping to ensure a continuous data stream over the network.

The Easergy P5 protection relays receive the synchronisation from the NTP server. This is done using the IP address of the NTP server. Easergy P5 supports the configuration of two NTP server IP addresses, which are defined in the cid file (see [SNTP server IP address configuration in the cid file](#)). These IP addresses can be changed from the eSetup Easergy Pro or from the local panel HMI.

Figure 23 - Configuring the NTP server

NTP server

NTP server: 192.168.1.120

NTP server (Backup): 192.168.1.191

IP address selection: IP 1

Communication SCADA

Presentation

For communication SCADA (Modbus, IEC 61850, IEC 103), Easergy P5 device can be configured to read only, which means users cannot change settings and send control command, no matter Easergy P5 in locked or unlocked state and with communication board or not. This function only works in basic cybersecurity level.

Communication SCADA configuration

The setting “Via SCADA” provides the option to forbid any setting changes and control commands from SCADA communication protocols (Modbus, IEC61850, IEC103). If the setting is disabled, Easergy P5 rejects all SCADA protocol setting changes and control commands. However, this setting has no effect on the local panel HMI, front USB communication port, eSetup Easergy Pro and Web HMI.

Parameters “Via SCADA” can be configured from the local panel HMI.

Figure 24 - Via SCADA shown on HMI

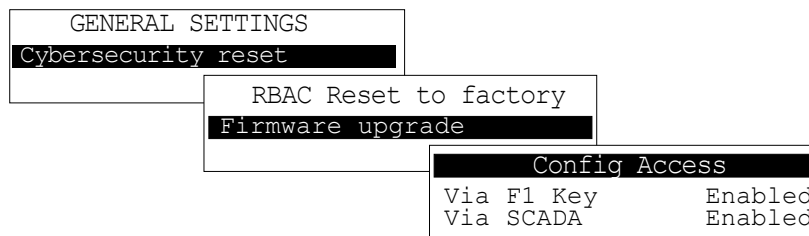


Table 64 - Via SCADA configuration parameters

Via SCADA		
	Disabled	Enabled
Access via rear comms SCADA (IEC 61850)	Read	Read/Write
Access via rear comms SCADA (Modbus)	Read	Read/Write
Access via rear comms SCADA (IEC 103)	Read	Read/Write

Client IP address filter

The “Client IP Address List” is presented in the “Protocol configuration” section of the “COMMUNICATION” menu in eSetup Easergy Pro. When there is no Ethernet Card in slot L and slot M, this list is hidden. The Client IP address filter, when enabled, defines the exclusive list of IP addresses that are accepted by the Easergy P5 relay. Connections from IP addresses, not part of this list, are rejected.

Figure 25 - The Client IP address list view in the COMMUNICATION menu

Client IP Filter List

Enable for IP filter: ☒

Index	IP address	CIDR prefix	In use
1	192.168.1.191	/24	☒
2		/24	☐
3		/24	☐
4		/24	☐
5		/24	☐
6		/24	☐
7		/24	☐
8		/24	☐

Implement New IP List

The “Client IP Address List” is also listed in the general menu of the HMI.

Scope

The client IP address filter feature is only implemented for legacy protocols through TCP/IP.

- Modbus TCP/IP
- DNP3 TCP
- EtherNet/IP

Rules

- The feature can be enabled or disabled by clicking “Enable for IP filter”.
 - Enabled:
The Easergy P5 protection relay filters the client IP address as configured in the table.
 - Disabled:
Any client can connect to the Easergy P5 protection relay.
- This feature is common for the legacy protocols supported.
- CIDR (Classless Inter-Domain Routing) notation is used to define IP addresses range, e.g. 192.168.1.191/24, which means IP address 192.168.1.0 ~ 192.168.1.255 are all available.
- More than 8 IP addresses ranges are allowed/configured. But dynamically no more than 8 connections are active.

- Only the connection from these IP addresses which are configured in the “Client IP Address List” view can be accepted by the Easergy P5 protection relay.
- Any duplicated IP address is cleared and the “In use” flag is de-selected after clicking the “Implement New IP List” button. For example, if the 2nd and 5th IP address are both “192.168.1.191”, then, when clicking the “Implement” button the 5th IP address will be changed to empty, and “in use” is not selected.
- The CIDR IP address range is only active if the 'in use flag' is selected.
- When the number of connections is less than the max. allowed number, the connection from any permitted IP address is accepted.
- When there are already max. clients connected, the first connection is closed if there is new client coming from the same available IP address, otherwise the oldest connection is closed if there is new connection from available client IP.
- The parameter modified takes effect immediately after clicking the “Implement New IP List” button, the Easergy P5 protection relay is not required to reboot. The consequence of applying the IP Filter list (clicking the “Implement New IP List” button) is defined as:
 - Firmware reads all configuration parameters
 - Check for duplicated IP addresses
 - If “Enable for IP Filter” is not selected, all existing connections will be kept, and the communication will be running as usual.
 - If “Enable for IP Filter” is selected, the connection, whose IP address is allowed (defined in the IP address list), will be kept, and the communication will be running as usual. And all other connections, whose IP addresses are forbidden (not defined in the IP address list), will be closed.

Configuration parameters

Table 65 - Client IP filter configuration parameters

Parameter	Value	Description
Enable for IP filter	No/Yes	This flag indicates whether the client IP filter feature is supported or not.
IP address	Null or available IP address	Available IP address to be filtered.
CIDR prefix	/1 /32	n-bits of CIDR prefix
In use	False/True	This flag indicates whether this CIDR notation IP address is filtered.
Implement New IP List		Command to Implement New IP List

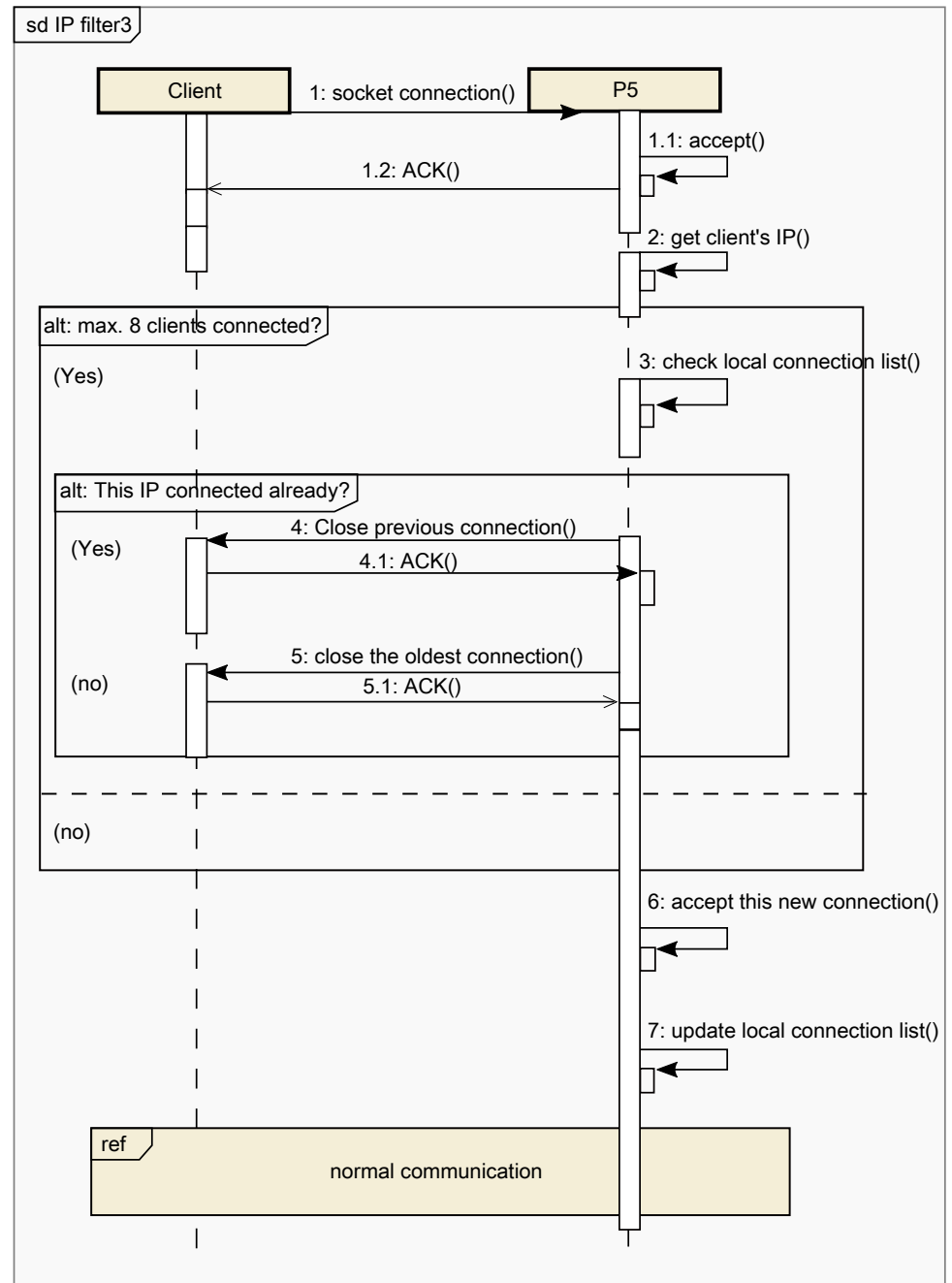
NOTE: There are 8 instances of “IP address”, “CIDR prefix” and “In use” parameters.

Process

The main sequence diagram is described as below for the condition that:

- The “Enable for IP filter” is Disable
- The “Enable for IP filter” is Enable and the client IP is configured in the filter list.

Figure 26 - Client IP filter



Secure communication with the eSetup Easergy Pro via the Ethernet interface

NOTE: The communication is done using port 22. Ensure this port is left unblocked on the network.

When Easergy P5 protection relays and eSetup Easergy Pro are connected via the Ethernet interface, they will communicate securely using SSH (Secure Shell).

The benefits of secure communication are:

- Help in the prevention of unwanted eavesdropping between eSetup Easergy Pro and the Easergy P5 protection relays.
- Help in the prevention of modification of data between eSetup Easergy Pro and the Easergy P5 protection relays.
- Ensure integrity of data.
- Help to prevent replay of data at a later date.

Revision history

Version number	Description		Release date
P5/EN M/11A	Original edition		2019-5
	Firmware version	V01	
	Release / Build	001.029	
	Configuration tool	eSetup Easergy Pro V2.0.0 or later	
		CET850 V3.1.2 or later	
P5/EN M/22A	Firmware version	V01	2019-11
	Release / Build	200.008	
	Configuration tool	eSetup Easergy Pro V2.2.0 or later	
		CET850 V3.2.0 or later	
	All protocols	Data point list updated	
	DNP3	File transfer function available	
	Modbus master	Modbus master chapter available	
	IEC 60870-5-103	Setting data configurable in IEC 60870-5-103 available	
	New feature	Client IP Address Filter chapter available	
	Conformance statement	Conformance statement for IEC 61850 Edition 1 and 2 updated	
P5/EN M/33A	Firmware version	V01	2020-07
	Release / Build	300.103	
	Configuration tool	eSetup Easergy Pro V3.0.0 or later	
		CET850 V3.3.0 or later	
	PTP	Precision Time Protocol available	
	Modbus	Modbus read exception status (FC=7) and read device identification (FC=43/14) available	
	IEC 61850	File transfer and setting group available	
	All protocols	Data point list updated	
	Conformance statement	Conformance statement for IEC 61850 Edition 1 and 2 updated	
P5/EN M/33B	Firmware version	V01	2021-02
	Release / Build	301.103	
	Configuration tool	eSetup Easergy Pro V3.1.0 or later	
		CET850 V3.4.0 or later	
	Data model of Modbus	PDM Point List updated	
	Access control through communication SCADA	Access control through communication SCADA (Modbus, IEC 61850, IEC 103) available	
	DHCP	Dynamic Host Configuration Protocol available	
P5/EN M/33C	Firmware version	V01	2021-07
	Release / Build	303.101	
	Configuration tool	eSetup Easergy Pro V3.2.1 or later	
		CET850 V3.6.1 or later	
	IEC 61850 main configuration	The information of IEC 61850 main configuration updated	

	GOOSE configuration	The publisher settings available on the local panel HMI	
	Deadband configuration	The information of deadband configuration in the cid file available	
	SNTP server IP address configuration	The information of SNTP server IP address configuration in the cid file available	
	Modbus slave	Modbus slave updated with the PDM information	

Appendix 1: Abbreviation

AP	Access Point
ARP	Address Resolution Protocol
ASDU	Application Service Data Unit
CDC	Common Data Class
CID	The Configured IED Description (file) is a file used to have communication between an IED configuration tool to an IED. It can be considered as an SCD file stripped down to what the concerned IED need to know and contains a mandatory communication section of the addressed IED.
CIP	Common Industrial Protocol
COS	Change of State
DA	Data Attribute
DAN	Double Attached Nodes
DANP	Double Attached Nodes implementing PRP
DHCP	Dynamic Host Configuration Protocol
DO	Data Object
DR	Disturbance Recorder
DS	Dateset
FPGA	Field Programmable Gate Array
FPN	Flexible Product Naming
GoCB	GOOSE Control Block
GOOSE	Generic Object Oriented Substation Event
HTTPS	Secured Hypertext Transfer Protocol (HTTPS) is an extension of the Hypertext Transfer Protocol (HTTP) to help to secure communication over a computer network.
ICD	The IED Capability Description (file) completely defines the capabilities of an IED. This file needs to be supplied by each manufacturer to make the complete system configuration. The file contains a single IED section, an optional communication section and an optional substation part which denotes the physical entities corresponding to the IED.
IED	Intelligent Electronic Device – This is a term used to describe microprocessor-based controllers of power system equipment. Common types of IEDs include protective relaying devices, load tap changer controllers, circuit breaker controllers, capacitor bank switches, recloser controllers, voltage regulators, etc.
IID	The Instantiated IED Description (file) defines the configuration of one IED for a project and is used as data exchange format from the IED configurator to the system configurator. This file contains only the data for the IED being configured: one IED section, the communication section with the IED's communication parameters, the IED's data type templates, and, optionally, a substation section with the binding of functions (LNodes) to the single line diagram.
LAN	Local Area Network
LD	Logical Device
LN	Logical Node
LRE	Link Redundancy Entity
MAC	Media Access Control
MICS	Model Implementation Conformance Statement describes how the information model is implemented.
MMS	Manufacturing Message Specification
MTU	Maximum Transmission Unit
NI	Network Input
PDM	Power Data Model
PICS	Protocol Implementation Conformance Statement describes choices made in protocol implementation.

PIXIT	Protocol Implementation Extra Information for Testing gives any additional implementation specific information not found in the previous standardised documents.
RCB	Report Control Block
RCT	Redundancy Check Tag
RedBox	Redundancy Box
SAN	Singly Attached Node
SCADA	Supervisory Control and Data Acquisition
SCD	The System (or Substation) Configuration Description is the file describing the complete power utility automation system details. It contains substation, communication, IED and Data type template sections. An SSD file and different ICD files contribute in making an SCD file.
SCT	System Configuration Tool
SCL	The System Configuration description Language is the language and representation format specified by IEC 61850 for the configuration of electrical substation devices. This includes representation of modeled data and communication services specified by IEC 61850-7-X standard documents. The complete SCL representation and its details are specified in IEC 61850-6 standard document. It includes data representation for substation device entities; its associated functions represented as logical nodes, communication systems and capabilities. The complete representation of data as SCL enhances the different devices of a substation to exchange the SCL files and to have a complete interoperability.
sFTP	Secured File Transfer Protocol (sFTP) is a network protocol that provides file access, file transfer, and file management over any reliable data stream.
SNMP	Simple Network Management Protocol (SNMP) is an "Internetstandard protocol for managing devices on IP networks.
SNTP	Simple Network Time Protocol (SNTP) is a less complex implementation of NTP, using the same protocol but without requiring the storage of state over extended periods of time.
SSD	System Specification Description
SSH	Secure Shell (SSH) is a cryptographic network protocol for operating network services securely over network communication.
TICS	Tissues Conformance Statement describes how the device behaves regarding identified technical issues.
UCMM	UnConnected Message Manager
UDP	User Datagram Protocol
VDAN	Virtual Double Attached Nodes
XML	Extensible Markup Language

Appendix 2: IEC 61850 Edition 1 conformance statement

Introduction

Document purpose

The purpose of this document is to specify the communication features of the Easergy P5 protection relays embedded IEC 61850 server implementation mapped to IEC 61850 Edition 1 standards.

The model implementation in Easergy P5 protection relays varies with the functional scope provided by the different device models.

The information provided here may be still the subject of changes due to planned further extensions in the supported IEC 61850 functionality.

Terms and abbreviations

Terms / abbreviations	Definitions
ACSI	Abstract Communication Service Interfaces
BDA	Basic Data Attribute (not structured)
DA	Data Attributes
DO	DATA in IEC 61850-7-2, data object type or instance
FCD	Functionally Constrained Data
FCDA	Functionally Constrained Data Attribute
ID	Identifier
IED	Intelligent Electronic Device
LD	Logical Device
LN	Logical Node
MSV	Multicast Sampled Value
RCB	Report Control Block
GoCB	GOOSE Control Block or GSSE Control Block
SCL	Substation Configuration description Language
SCSM	Specific Communication Service Mapping
XML	Extensible Markup Language
GSSE	Generic Substation State Event
GOOSE	Generic Object Oriented Substation Event
SCD	Substation Configuration Description
ICD	IED Configuration Description
CID	Configured IED Description
PICS	Protocol Implementation Conformance Statement
MICS	Model Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
TICS	Tissue Implementation Conformance Statement

PICS details

The PICS is based upon UCAlug PICS Template version 2.3, UCA International Users Group Testing Sub Committee, October 08, 2019.

The following ACSI conformance statements are used to provide an overview and details about following devices: P5U20, P5V20, P5F30, P5M30, with firmware version V01.

- ACSI basic conformance statement
- ACSI models conformance statement
- ACSI service conformance statement

The statements specify the communication features mapped to IEC 61850-8-1 and IEC 61850-9-2, Edition 1.

ACSI basic conformance statement

The basic conformance statement is defined in the table below.

Table 66 - Basic conformance statement

		Client / Subscriber	Server / Publisher	Value / Comments
Client–Server roles				
B11	Server side (of TWO-PARTY-APPLICATION-ASSOCIATION)		Y	
B12	Client side (of TWO-PARTY-APPLICATION-ASSOCIATION)		–	
SCSMs supported				
B21	SCSM : IEC 61850-8-1 used		Y	
B22	SCSM : IEC 61850-9-1 used		N	
B23	SCSM : IEC 61850-9-2 used		N	
B24	SCSM : other		N	
Generic substation event model (GSE)				
B31	Publisher side		Y	
B32	Subscriber side	Y		
Transmission of sampled value model (SVC)				
B41	Publisher side		N	
B42	Subscriber side	N		
– = not applicable Y = supported N or empty = not supported				

ACSI models conformance statement

The ACSI models conformance statement is defined in the table below.

Table 67 - ACSI models conformance statement

		Client / Subscriber	Server / Publisher	Value / Comments
If Server side (B11) and/or Client side (B12) is supported				
M1	Logical device		Y	
M2	Logical node		Y	Only standard LN types defined in Part 7-4.
M3	Data		Y	Only standard object types defined in Part 7-3, 7-4. Mandatory objects and attributes, selected optional objects and attributes.
M4	Data set		Y	Supported pre-defined persistent data sets, configurable via SCL. Supported dynamically created data sets (persistent and non-persistent). Data set members selection restricted to FC such as ST and MX.
M5	Substitution		N	
M6	Setting group control		Y	
Reporting				
M7	Buffered report control		Y	
M7-1	sequence-number		Y	
M7-2	report-time-stamp		Y	
M7-3	reason-for-inclusion		Y	
M7-4	data-set-name		Y	
M7-5	data-reference		Y	
M7-6	buffer-overflow		Y	
M7-7	entryID		Y	
M7-8	BufTm		Y	
M7-9	IntgPd		Y	
M7-10	GI		Y	
M7-11	conf-revision		Y	
M8	Unbuffered report control		Y	
M8-1	sequence-number		Y	
M8-2	report-time-stamp		Y	
M8-3	reason-for-inclusion		Y	
M8-4	data-set-name		Y	
M8-5	data-reference		Y	
M8-6	BufTm		Y	
M8-7	IntgPd		Y	
M8-8	GI		Y	
M8-9	conf-revision		Y	
Logging				
M9	Log control		N	

Table 67 - ACSI models conformance statement (Continued)

		Client / Subscriber	Server / Publisher	Value / Comments
M9-1	IntgPd		N	
M10	Log		N	
Other				
M11	Control		Y	
M17	File transfer		Y	
M18	Application association		Y	
M19	GOOSE Control Block		Y	
M20	Sampled Values Control Block		N	
If GSE (B31/32) is supported				
M12	GOOSE		Y	
M13	GSSE		N	
If SVC (B41/B42) is supported				
M14	Multicast SVC		N	
M15	Unicast SVC		N	
For all IEDs				
M16	Time		Y	Performance class T2 (100µs accuracy)
Y = service is supported				
N or empty = service is not supported				

ACSI service conformance statement

The ACSI service conformance statement is defined in the table below (depending on the statements in ACSI basic conformance statement, page 302).

Table 68 - ACSI service conformance statement

	Ed	ACSI Service Conformance	AA: TP/MC	Client / Sub (C)	Server / Pub (S)	Comments
Server						
S1	1,2	GetServerDirectory (LOGICAL-DEVICE)	TP		Y	
Application association						
S2	1,2	Associate			Y	
S3	1,2	Abort			Y	
S4	1,2	Release			Y	
Logical device						
S5	1,2	LogicalDeviceDirectory	TP		Y	
Logical node						
S6	1,2	LogicalNodeDirectory	TP		Y	
S7	1,2	GetAllDataValues	TP		Y	
Data						
S8	1,2	GetDataValues	TP		Y	
S9	1,2	SetDataValues	TP		Y	
S10	1,2	GetDataDirectory	TP		Y	
S11	1,2	GetDataDefinition	TP		Y	
Data set						
S12	1,2	GetDataSetValues	TP		Y	
S13	1,2	SetDataSetValues	TP		N	
S14	1,2	CreateDataSet	TP		Y	
S15	1,2	DeleteDataSet	TP		Y	
S16	1,2	GetDataSetDirectory	TP		Y	
Substitution						
S17	1	SetDataValues	TP		N	
Setting group control						
S18	1,2	SelectActiveSG	TP		Y	
S19	1,2	SelectEditSG	TP		Y	
S20	1,2	SetSGValues	TP		Y	
S21	1,2	ConfirmEditSGValues	TP		Y	
S22	1,2	GetSGValues	TP		Y	
S23	1,2	GetSGCBValues	TP		Y	
Reporting						
Buffered report control block (BRCB)						
S24	1,2	Report	TP		Y	
S24-1	1,2	data-change (dchg)			Y	
S24-2	1,2	qchg-change (qchg)			Y	
S24-3	1,2	data-update (dupd)			Y	Accepted as TrgOpt, but not functionally supported by the IED

Table 68 - ACSI service conformance statement (Continued)

	Ed	ACSI Service Conformance	AA: TP/MC	Client / Sub (C)	Server / Pub (S)	Comments
S25	1,2	GetBRCBValues	TP		Y	
S26	1,2	SetBRCBValues	TP		Y	
Unbuffered report control block (URCB)						
S27	1,2	Report	TP		Y	
S27-1	1,2	data-change (dchg)			Y	
S27-2	1,2	qchg-change (qchg)			Y	
S27-3	1,2	data-update (dupd)			Y	Accepted as TrgOpt, but not functionally supported by the IED
S28	1,2	GetURCBValues	TP		Y	
S29	1,2	SetURCBValues	TP		Y	
Logging						
Log control block						
S30	1,2	GetLCBValues	TP		N	
S31	1,2	SetLCBValues	TP		N	
Log						
S32	1,2	QueryLogByTime	TP		N	
S33	1,2	QueryLogAfter	TP		N	
S34	1,2	GetLogStatusValues	TP		N	
Generic substation event model (GSE)						
S35	1,2	SendGOOSEMessage	MC		Y	
GOOSE Control Block						
S36	1,2	GetGoReference	TP		N	
S37	1,2	GetGOOSEElement-Number	TP		N	
S38	1,2	GetGoCBValues	TP		Y	
S39	1,2	SetGoCBValues	TP		Y	
GSSE (Ed2:61850-7-2 Annex C)						
S40	1	SendGSSEMessage	MC		N	
GSSE Control Block						
S41	1	GetGsReference	TP		N	
S42	1	GetGSSEElement-Number	TP		N	
S43	1	GetGsCBValues	TP		N	
S44	1	SetGsCBValues	TP		N	
Transmission of sampled value model (SVC)						
Multicast SV						
S45	1,2	SendMSVMessage	MC		N	Use for 9-2LE or IEC 61869-9
Multicast Sampled Values Control Block						
S46	1,2	GetMSVCBValues	TP		N	
S47	1,2	SetMSVCBValues	TP		N	
Unicast SV						

Table 68 - ACSI service conformance statement (Continued)

	Ed	ACSI Service Conformance	AA: TP/MC	Client / Sub (C)	Server / Pub (S)	Comments
S48	1,2	SendUSVMessage	TP		N	
Unicast Sampled Values Control Block						
S49	1,2	GetUSVCBValues	TP		N	
S50	1,2	SetUSVCBValues	TP		N	
Control						
S51	1,2	Select			Y	
S52	1,2	SelectWithValue	TP		Y	
S53	1,2	Cancel	TP		Y	
S54	1,2	Operate	TP		Y	
S55	1,2	CommandTermination	TP		Y	
S56	1,2	TimeActivatedOperate	TP		N	
File Transfer						
S57	1,2	GetFile	TP		Y	
S58	1,2	SetFile	TP		N	
S59	1,2	DeleteFile	TP		N	
S60	1,2	GetFileAttributeValues	TP		Y	
S61	1,2	GetServerDirectory (FILE-SYSTEM)	TP		Y	
Time						
T1	1,2	Time resolution of internal clock			14	14 for IEEE1588, 10 for IRIG-B, 7 for SNTP and protocols
T2	1,2	Time accuracy of internal clock			T2	Performance class T2 for IEEE1588, T1 for IRIG-B, T0 for SNTP and protocols
T3	1,2	Supported TimeStamp resolution	-		20	Nearest value of 2 ⁻ⁿ in seconds (number 0 ... 24)

MICS details

The MICS is based upon UCAIug MICS Template version 1.2, UCA International Users Group Testing Sub Committee, August 13, 2019.

This model implementation conformance statement is applicable for P5U20, P5V20, P5F30 and P5M30, with firmware version V01.

This MICS document specifies the modeling extensions compared to IEC 61850 Edition 1.

Clause **Logical nodes list** contains the list of implemented logical nodes.

Clause **Logical node extensions** describes the new and extended logical nodes (if any).

Clause **Enum types extensions** describes the new and extended enum types (if any).

Logical nodes list

The following table contains the list of logical nodes implemented in the device:

Table 69 - Logical nodes implemented in the device

	P5U20	P5V20	P5F30	P5M30
L: System Logical Nodes				
LPHD (Physical device information)	x	x	x	x
LLN0 (Logical node zero)	x	x	x	x
LTMS (Time master supervision)	x	x	x	x
P: Logical Nodes for protection functions				
PTRC (Protection trip conditioning)	x	x	x	x
PTOC (Time overcurrent)	x		x	x
PFRC (Rate of change frequency)	x	x	x	
PIOC (Instantaneous overcurrent)	x	x	x	x
PTOF (Over frequency)	x	x	x	x
PTOV (Overvoltage)	x	x	x	x
PDOP (Directional overpower)	x		x	x
PTUC (Undercurrent)	x			x
PTTR (Thermal overload)	x		x	x
PTUF (Under frequency)	x	x	x	x
PTUV (Under voltage)	x	x	x	x
PMRI (Motor restart inhibition)	x			x
PMSS (Motor starting time supervision)	x			x
PTEF (Transient earth fault)			x	
PADM (Admittance)			x	x
POVS (Motor overspeed)	x			x
PZSU (Motor underspeed)	x			x
PHAR (Harmonic restraint)	x		x	x
R: Logical nodes for protection related functions				
RREC (Auto reclosing)	x		x	
RDRE (Disturbance recorder)	x	x	x	x

Table 69 - Logical nodes implemented in the device (Continued)

	P5U20	P5V20	P5F30	P5M30
RFLO (Fault locator)			x	
RSYN (Synchronism-check)		x	x	
G: Logical Nodes for generic references				
GGIO (Generic process I/O)	x	x	x	x
GAPC (Generic automatic process control)	x	x	x	x
M: Logical Nodes for metering and measurement				
MMTR (Metering)	x		x	x
MMXU (Measurement)	x	x	x	x
MHAI (Harmonics)	x	x	x	x
C: Logical Nodes for control				
CSWI (Switch controller)	x	x	x	x
T: Logical nodes for instrument transformers and sensors				
TCTX (Current transformer)	x		x	x
TVTX (Voltage transformer)	x	x	x	x

Logical node extensions

The following table uses:

- M: Data is mandatory in the IEC 61850-7-4.
- O: Data is optional in the IEC 61850-7-4 and is used in the device.
- C: Data is conditional in the IEC 61850-7-4 and is used in the device.
- E: Data is an extension to the IEC 61850-7-4.

New logical nodes

Newly created logical nodes are listed in this clause, with InNs attribute in the Name plate.

PADM Admittance

This LN shall be used for protection admittance E/F Io/Uo.

PADM class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5EFPADM1 P5EFPADM2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
YStr	ACD	YN start	E	
YOp	ACT	YN operate	E	

PADM class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
GStr	ACD	GN start	E	
GOp	ACT	GN operate	E	
BStr	ACD	BN start	E	
BOp	ACT	BN operate	E	
Settings				
FunEna	SPG	Whole function enable	E	
YFunEna	SPG	YN function enable	E	
GFunEna	SPG	GN function enable	E	
BFunEna	SPG	BN function enable	E	
UoStrVal	ASG	Uo pick-up value	E	
CorAng	ASG	Correction angle	E	
YStrVal	ASG	YN pick-up value	E	
YOpDITms	ASG	YN operate delay time	E	
YRsDITms	ASG	YN reset time	E	
YSolMod	SPG	YN SOL mode	E	
YSIOpDITms	ASG	YN SOL operate delay time	E	
GStrVal	ASG	GN pick-up value	E	
GDirMod	ING	GN direction mode	E	
GOpDITms	ASG	GN operate delay time	E	
GRsDITms	ASG	GN reset time	E	
GSolMod	SPG	GN SOL mode	E	
GSIOpDITms	ASG	GN SOL operate delay time	E	
BStrVal	ASG	BN pick-up value	E	
BDirMod	ING	BN direction mode	E	
BOpDITms	ASG	BN operate delay time	E	
BRsDITms	ASG	BN reset time	E	
BSolMod	SPG	BN SOL mode	E	
BSIOpDITms	ASG	BN SOL operate delay time	E	

POVS Motor overspeed

This LN shall be used for protection motor overspeed.

POVS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5MOTPOVS1 P5MOTPOVS2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				

POVS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Str	ACD	Start	E	
Op	ACT	Operate	E	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	E	
OpDITms	ASG	Operate delay time	E	

TCTX Current transformer

This LN shall be used for protection current transformer parameters.

TCTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5ITCTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Measured and metered values				
Settings				
FunEna	SPG	Function enable	E	
CTNum	ING	Number of connected phase CT	E	
OpDITmms	ING	Operate delay time	E	
PriPhs	ASG	CT primary	E	
SecPhs	ASG	CT secondary	E	

TCTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5IOTCTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				

TCTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Measured and metered values				
Settings				
PriNeut1	ASG	lo CT primary	E	
PriNeut2	ASG	lo' CT primary	E	

TCTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPITCTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Measured and metered values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
OpDITmms	ING	Operate delay time	E	
NomPri	ASG	LPCT rated primary current	E	

TVTX Voltage transformer

This LN shall be used for protection voltage transformer parameters.

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UTVTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Measured and Metered Values				

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Settings				
FunEna	SPG	Function enable	E	
ImbAMinLev	ASG	I2 min. setting	E	
ImbVMaxLev	ASG	U2 max. setting	E	
OpDITmms	ING	Operate delay time	E	
PriPhs	ASG	VT primary	E	
SecNeut	ASG	VTo secondary	E	
SecPhs	ASG	VT secondary	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPUTVTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Measured and Metered Values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
PhAMagCor	ASG	VL1 magnitude correction	E	
PhBMagCor	ASG	VL2 magnitude correction	E	
PhCMagCor	ASG	VL3 magnitude correction	E	
PhAAngCor	ASG	VL1 Angle correction	E	
PhBAngCor	ASG	VL2 Angle correction	E	
PhCAngCor	ASG	VL3 Angle correction	E	
VL1yMagCor	ASG	VL1y magnitude correction	E	
VL1yAngCor	ASG	VL1y Angle correction	E	
VL2yMagCor	ASG	VL2y magnitude correction	E	
VL2yAngCor	ASG	VL2y Angle correction	E	
VtTyp	ING	Primary VT type	E	
VtSecAdpt	ASG	VT secondary rated voltage	E	
PhAMagAdpt	ASG	VL1 Adapt magnitude correction	E	
PhBMagAdpt	ASG	VL2 Adapt magnitude correction	E	
PhCMagAdpt	ASG	VL3 Adapt magnitude correction	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
ViSecAdpt	ASG	VTy secondary rated voltage	E	
VL1yMagAdt	ASG	VL1y Adapt magnitude correction	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPUTVTX2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Measured and Metered Values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
NomPri	ASG	LPVT rated primary voltage	E	
PhAMagCor	ASG	VL1 magnitude correction	E	
PhBMagCor	ASG	VL2 magnitude correction	E	
PhCMagCor	ASG	VL3 magnitude correction	E	
PhAAngCor	ASG	VL1 Angle correction	E	
PhBAngCor	ASG	VL2 Angle correction	E	
PhCAngCor	ASG	VL3 Angle correction	E	
VL1yMagCor	ASG	VL1y magnitude correction	E	
VL1yAngCor	ASG	VL1y Angle correction	E	
VtTyp	ING	Primary VT type	E	
VtSecAdpt	ASG	VT secondary rated voltage	E	
PhAMagAdpt	ASG	VL1 Adapt magnitude correction	E	
PhBMagAdpt	ASG	VL2 Adapt magnitude correction	E	
PhCMagAdpt	ASG	VL3 Adapt magnitude correction	E	
ViSecAdpt	ASG	VTy secondary rated voltage	E	
VL1yMagAdt	ASG	VL1y Adapt magnitude correction	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPUTVTX3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Measured and Metered Values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
NomPri	ASG	LPVT rated primary voltage	E	
PhAMagCor	ASG	VL1 magnitude correction	E	
PhBMagCor	ASG	VL2 magnitude correction	E	
PhCMagCor	ASG	VL3 magnitude correction	E	
PhAAngCor	ASG	VL1 Angle correction	E	
PhBAngCor	ASG	VL2 Angle correction	E	
PhCAngCor	ASG	VL3 Angle correction	E	
VtTyp	ING	Primary VT type	E	
VtSecAdpt	ASG	VT secondary rated voltage	E	
PhAMagAdpt	ASG	VL1 Adapt magnitude correction	E	
PhBMagAdpt	ASG	VL2 Adapt magnitude correction	E	
PhCMagAdpt	ASG	VL3 Adapt magnitude correction	E	
UoSecAdpt	ASG	Uo secondary rated voltage	E	
UoMagAdt	ASG	Uo Adapt magnitude correction	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPUTVTX4		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Measured and Metered Values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
FunEna	SPG	Function enable	E	
NomPri	ASG	LPVT rated primary voltage	E	
PhAMagCor	ASG	VL1 magnitude correction	E	
PhBMagCor	ASG	VL2 magnitude correction	E	
PhCMagCor	ASG	VL3 magnitude correction	E	
PhAAngCor	ASG	VL1 Angle correction	E	
PhBAngCor	ASG	VL2 Angle correction	E	
PhCAngCor	ASG	VL3 Angle correction	E	
VtTyp	ING	Primary VT type	E	
VtSecAdpt	ASG	VT secondary rated voltage	E	
PhAMagAdpt	ASG	VL1 Adapt magnitude correction	E	
PhBMagAdpt	ASG	VL2 Adapt magnitude correction	E	
PhCMagAdpt	ASG	VL3 Adapt magnitude correction	E	

LTMS Time master supervision

This LN shall be used for time master supervision with SNTP time source.

LTMS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5SNTPLTMS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
TmSrc	VSS	Current time source	E	
TmSrcTyp	ENS	Type of the clock source	E	
Controls				
Settings				
TmSrcSet1	VSG	Setting to define the main IP address of SNTP	E	
TmSrcSet2	VSG	Setting to define the backup IP address of SNTP	E	

Standardised and extended DO of logical node type

The following table presents a summary of the standardised and extended DO of each Logical Node Type.

LN Type: SE_GAPC_PS_EasergyP5_V001

Description: Generic automatic process control

LN Class: GAPC

GAPC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5PSGAPC1...8		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	

LN Type: SE_GGIO_AR_EasergyP5FU_V001**Description:** Generic process I/O**LN Class:** GGIO

GGIO class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5ARGGIO1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Ind1	SPS	AR1 final trip	O	
Ind2	SPS	AR2 final trip	O	
Ind3	SPS	AR3 final trip	O	
Ind4	SPS	AR4 final trip	O	
Ind5	SPS	AR Direct final trip	O	
Ind6	SPS	Direct trip AR request	O	
Ind7	SPS	AR final trip	O	
Ind8	SPS	AR locked	O	
Ind9	SPS	AR request 1	O	
Ind10	SPS	AR request 2	O	
Ind11	SPS	AR request 3	O	
Ind12	SPS	AR request 4	O	
Ind13	SPS	AR request 5	O	

GGIO class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Ind14	SPS	AR running	O	
Ind15	SPS	AR shot 1	O	
Ind16	SPS	AR shot 2	O	
Ind17	SPS	AR shot 3	O	
Ind18	SPS	AR shot 4	O	
Ind19	SPS	AR shot 5	O	
Settings				
FunEna	SPG	Function enable	E	

LN Type: SE_GGIO_CBWA_EasergyP5FMU_V002

Description: Generic process I/O

LN Class: GGIO

GGIO class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CBWAGGIO1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Ind1	SPS	General indication (binary input)	O	
Ind2	SPS	General indication (binary input)	O	
Alm1Phs1	INS	Alarm 1 of Phase 1	E	
Alm1Phs2	INS	Alarm 1 of Phase 2	E	
Alm1Phs3	INS	Alarm 1 of Phase 3	E	
Alm2Phs1	INS	Alarm 2 of Phase 1	E	
Alm2Phs2	INS	Alarm 2 of Phase 2	E	
Alm2Phs3	INS	Alarm 2 of Phase 3	E	
Settings				
FunEna	SPG	Function enable	E	
CBOpenCnt	ING	CB open counter	E	
RackOutCnt	ING	Rack out counter	E	
TripCnt	ING	Protection trip counter	E	
AlmLev1	ASG	Alarm level 1	E	
AlmLev2	ASG	Alarm level 2	E	
LimOpNum1	ASG	Limit for operate left 1	E	
LimOpNum2	ASG	Limit for operate left 2	E	

LN Type: SE_MMXU_VECA_EasergyP5FMU_VSI_V001

Description: Measurement

LN Class: MMXU

MMXU class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5VECAMMXU1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Measured values				
Hz	MV	Frequency	O	
A	WYE	Phase currents (I_{L1} , I_{L2} , I_{L3})	O	
Iovs	WYE	Residual current I_o'	E	

LN Type: SE_PDOP_REVP_EasergyP5FM_V002

Description: Directional overpower

LN Class: PDOP

PDOP class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5REVPPDOP1 P5REVPPDOP2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PDOP_EF_EasergyP5FM_V002

Description: Directional overpower

LN Class: PDOP

PDOP class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5EFPDOP1 P5EFPDOP2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
DirMode	ING	Direction mode	E	
StrVal	ASG	Pick-up value	M	
UoStrVal	ASG	Uo setting	E	
SctrStrVal	ASG	Pick up sector size	E	
OpDITms	ASG	Operate delay time	E	
SolMod	SPG	SOL Mode	E	
SolOpDITms	ASG	SOL operate delay time	E	
MemMod	ING	Memory Mode	E	
MmUoStrVal	ASG	Uo setting	E	
MemTms	ASG	Memory time	E	

LN Type: SE_PFRD_DFDT_EasergyP5FV_V002

SE_PFRD_DFDT_EasergyP5U_LPT_V002

Description: Rate of change of frequency

LN Class: PFRD

PFRD class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5DFDTPFRD1 P5DFDTPFRD2 P5DFTLPFRD1 P5DFTLPFRD2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	

PFRC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Settings				
FunEna	SPG	Function enable	E	
DirChg	ING	Direction of change	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PIOC_CBFP_EasergyP5FMU_V002

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CBFPPIOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
NeutStrVal	ASG	Undercurrent threshold for earth fault current	E	
PhsStrVal	ASG	Undercurrent threshold for phase current	E	
Tm1DITms	ASG	Timer1 operate delay time	E	
Tm1Ena	SPG	Enable CBF timer1	E	
Tm2DITms	ASG	Timer2 operate delay time	E	
Tm2Ena	SPG	Enable CBF timer2	E	

LN Type: SE_PIOC_CBFP_EasergyP5V_V002

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CBFPPIOC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
Tm1DITms	ASG	Timer1 operate delay time	E	
Tm1Ena	SPG	Enable CBF timer1	E	
Tm2DITms	ASG	Timer2 operate delay time	E	
Tm2Ena	SPG	Enable CBF timer2	E	

LN Type: SE_PIOC_CBFP_EasergyP5FMU_VSI_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CBFPPIOC3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
NeutStrVal	ASG	Undercurrent threshold for earth fault current	E	
PhsStrVal	ASG	Undercurrent threshold for phase current	E	
IovsStrVal	ASG	I _{o'} < current set	E	
Tm1DITms	ASG	Timer1 operate delay time	E	
Tm1Ena	SPG	Enable CBF timer1	E	
Tm2DITms	ASG	Timer2 operate delay time	E	
Tm2Ena	SPG	Enable CBF timer2	E	

LN Type: SE_PIOC_ARCM_EasergyP5FM_ARC_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5ARCMPIOC1...8		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
MinOpTms	ING	Min. hold time [x1ms]	E	
OpDITms	ING	Trip X delay [x1ms]	E	
OpMode	ING	Arc stage X Mode	E	

LN Type: SE_PIOC_CLP_EasergyP5FMU_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CLPPIOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
Idl	ASG	Idle current	E	
StrVal	ASG	Pickup current	O	
DeadTms	ASG	CLPU dead time	E	
MaxTms	ASG	Maximum time	E	

LN Type: SE_PIOC_SOL_EasergyP5FMU_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5SOLPIOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Op	ACT	Operate	M	
Opri2	ACT	2 nd Operate	E	
Settings				
FunEna	SPG	Function enable	E	
SigNum	ING	SOL signal number	E	
CbClrTms	ASG	CB trip clearing time	E	

LN Type: SE_PIOC_SOTF_EasergyP5FMU_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5SOTFPIOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DetDITms	ASG	Dead line detection delay	E	
ActTmrTms	ASG	SOTF active Timer	E	

LN Type: SE_PMRI_MOTFST_EasergyP5MU_V003

Description: Motor restart inhibition

LN Class: PMRI

PMRI class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5FSTPMRI1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Op	ACT	Operate	O	
StrInh	SPS	Restart inhibited	O	
Settings				
MaxWrmStr	ING	Maximum warm starts, permissible number of warm starts	O	
MinStrTmm	ASG	Min time between motor starts	E	
HotSttsLmt	ASG	Hot Status Limit	E	
FunEna	SPG	Function enable	E	
MaxCldStr	ING	Max motor cold starts/hour	E	
RefPrdTmm	ASG	Reference period	E	

LN Type: SE_PMSS_STAL_EasergyP5MU_V001**Description:** Motor starting time supervision**LN Class:** PMSS

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5STALPMSS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	O	
Settings				
SetA	ASG	Current setting for motor start-up	O	
SetTms	ING	Time setting for motor start-up	O	
MotStr	ASG	Motor startup (current pickup value of motor starting)	O	

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
FunEna	SPG	Function enable	E	
TmAcrv	CURVE	Characteristics for Ist>	E	

LN Type: SE_PMSS_MSPD_EasergyP5MU_V001

Description: Motor starting time supervision

LN Class: PMSS

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5MSPDPMSS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
ZerSpdSt	SPS	Zero speed	E	
MotSpd	INS	Motor speed	E	
Settings				
FunEna	SPG	Function enable	E	
SpdIn	ING	Motor speed input DI	E	
RtdMotSpd	ASG	Rated motor speed	E	
PlsRot	ASG	Pulse per rotation	E	
ZerSpdTms	ASG	Zero speed delay	E	

LN Type: SE_PMSS_MABS_EasergyP5MU_V001

Description: Motor starting time supervision

LN Class: PMSS

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5MABSPMSS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
AbsAlm	SPS	Anti-backspin Alarm	E	
Settings				

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
FunEna	SPG	Function enable	E	
MvMod	SPG	Measured Zero Speed Mode	E	
SwMod	SPG	Zero Speed Switch Mode	E	
AbsTms	ASG	Anti-backspin Delay	E	

LN Type: SE_PMSS_51LR_EasergyP5MU_V001

Description: Motor starting time supervision

LN Class: PMSS

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LRPMSS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	O	
Settings				
SetA	ASG	Pick-up value	O	
FunEna	SPG	Function enable	E	
DITyp	ING	Delay type	E	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTEF_IO_EasergyP5F_V002

Description: Transient earth fault

LN Class: PTEF

PTEF class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5IOIOPTEF1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				

PTEF class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Str	ACD	Start	C	
Op	ACT	Operate	C	
Settings				
FunEna	SPG	Function enable	E	
DirMode	ING	Direction mode	E	
GndStr	ASG	Uo pick-up	O	
OpDITms	ASG	Operate delay time	E	
MinPeak	ING	Min number of peaks	E	
RsDITms	ASG	Reset delay	E	
Condition C: at least one of the two status information (Str, Op) shall be used.				

LN Type: SE_PTOC_STRVAL_EasergyP5FMU_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5HAR5PTOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
StrVal	ASG	Start value	O	
OpDITmms	ING	Operate delay time	O	
FunEna	SPG	Function enable	E	

LN Type: SE_PTOC_UIBC_EasergyP5FMU_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UIBCPTOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Start value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTOC_EasergyP5FMU_VSI_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5EFVSPTOC1 P5EFVSPTOC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DICrvFmly	ING	Delay curve family	E	
DITyp	ING	Delay type	E	
OpDITms	ASG	Operate delay time	E	
TmMult	ASG	Inv. time coefficient	O	
RsTyp	ING	Reset type	E	
RsDITms	ASG	Reset time	E	
InrushStat	SPG	Inrush status	E	
SolStat	SPG	SOL status	E	
SolOpDTms	ASG	SOL operate delay time	E	
SolTmMult	ASG	SOL Inv. time coefficient	E	
ClpStat	SPG	CLP status	E	
ClpStrVal	ASG	CLP pick-up value	E	

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
ClpOpDTms	ASG	CLP operate delay time	E	
ClpTmMult	ASG	CLP Inv. time coefficient	E	
NetGrd	ING	Network grounding	E	

LN Type: SE_PTOC_NORMAL_EasergyP5FMU_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5OCPTOC1 P5OCPTOC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DICrvFmly	ING	Delay curve family	E	
DIType	ING	Delay type	E	
OpDITms	ASG	Operate delay time	E	
TmMult	ASG	Inv. time coefficient	O	
RsTyp	ING	Reset type	E	
RsDITms	ASG	Reset time	E	
InrushStat	SPG	Inrush status	E	
SolStat	SPG	SOL status	E	
SolOpDTms	ASG	SOL operate delay time	E	
SolTmMult	ASG	SOL Inv. time coefficient	E	
ClpStat	SPG	CLP status	E	
ClpStrVal	ASG	CLP pick-up value	E	
ClpOpDTms	ASG	CLP operate delay time	E	
ClpTmMult	ASG	CLP Inv. time coefficient	E	

LN Type: SE_PTOC_EasergyP5FM_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5DEFPTOC1 P5DEFPTOC2 P5DEFPTOC3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
DirMode	ING	Direction mode	E	
StrVal	ASG	Pick-up value	O	
UoStrVal	ASG	Uo setting	E	
AngOffset	ASG	Angle offset	E	
SctrStrVal	ASG	Pick up sector size	E	
DIcFmly	ING	Delay curve family	E	
DITyp	ING	Delay type	E	
OpDITms	ASG	Operate delay time	E	
TmMult	ASG	Inv. time coefficient	O	
RsTyp	ING	Reset type	E	
RsDITms	ASG	Reset time	E	

LN Type: SE_PTOC_EasergyP5U_LPT_V002

Description: Time overcurrent**LN Class:** PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5DOCLPTOC1 P5DOCLPTOC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DirMode	ING	Direction mode	E	
AngOffset	ASG	Angle offset	E	
DICrvFmly	ING	Delay curve family	E	
DITyp	ING	Delay type	E	
OpDITms	ASG	Operate delay time	E	
TmMult	ASG	Inv. time coefficient	O	
RsTyp	ING	Reset type	E	
RsDITms	ASG	Reset time	E	
InrushStat	SPG	Inrush status	E	
SolStat	SPG	SOL status	E	
SolOpDTms	ASG	SOL operate delay time	E	
SolTmMult	ASG	SOL Inv. time coefficient	E	
ClpStat	SPG	CLP status	E	
ClpStrVal	ASG	CLP pick-up value	E	
ClpOpDTms	ASG	CLP operate delay time	E	
ClpTmMult	ASG	CLP Inv. time coefficient	E	

LN Type: SE_PTOC_DOC2_EasergyP5U_LPT_V001

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5DOCLPTOC3 P5DOCLPTOC4		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DirMode	ING	Direction mode	E	
AngOffset	ASG	Angle offset	E	
OpDITms	ASG	Operate delay time	E	

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
InrushStat	SPG	Inrush status	E	
SolStat	SPG	SOL status	E	
SolOpDTms	ASG	SOL operate delay time	E	
ClpStat	SPG	CLP status	E	
ClpStrVal	ASG	CLP pick-up value	E	
ClpOpDTms	ASG	CLP operate delay time	E	

LN Type: SE_PTOF_OFUF_EasergyP5FMV_V00V002/
SE_PTOF_OFUF_EasergyP5U_LPT_V002

Description: Overfrequency

LN Class: PTOF

PTOF class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5OFUFPTOF1 P5OFUFPTOF2 P5LPTPTOF1 P5LPTPTOF2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTOV_EasergyP5FMV_V002/
SE_PTOV_EasergyP5U_LPT_V001

Description: Overvoltage

LN Class: PTOV

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5OVPTOV1 P5OVPTOV2 P5OVPTOV3 P5OVLPTOV1 P5OVLPTOV2 P5OVLPTOV3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDiTms	ASG	Operate delay time	E	

LN Type: SE_PTOV_UO_EasergyP5FMV_V001/

SE_PTOV_UO_EasergyP5U_LPT_V001

Description: Overvoltage

LN Class: PTOV

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UOPTOV1 P5UOPTOV2 P5UOPTOV3 P5UOLPTOV1 P5UOLPTOV2 P5UOLPTOV3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDiTms	ASG	Operate delay time	E	
RsDiTms	ASG	Reset time	E	

LN Type: SE_PTOV_NEG_EasergyP5FMV_V001/

SE_PTOV_NEG_EasergyP5U_LPT_V001

Description: Overvoltage

LN Class: PTOV

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5NEGPTOV1 P5NEGPTOV2 P5NEGLPTOV1 P5NEGLPTOV2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	
OpMod	ING	Operate mode	E	
StrVal	ASG	Pick-up value	O	
DITyp	ING	Delay type	E	
OpDITms	ASG	Operate delay time	E	
RsDITms	ASG	Reset time	E	

LN Type: SE_PTOV_CAP_EasergyP5F_V001**Description:** Overvoltage**LN Class:** PTOV

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CAPPTOV1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
CapOfPhs	ASG	L-N capacitance of one phase	E	
RatUcLn	ASG	Rated L-N voltage UcLN	E	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTTR_THF_EasergyP5FU_V002**Description:** Thermal overload**LN Class:** PTTR

PTTR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5THFPTTR1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Op	ACT	Operate	M	
AlmThm	SPS	Thermal alarm	O	
Settings				
TmpMax	ASG	Max object temperature	O	
AlmVal	ASG	Thermal alarm value	O	
FunEna	SPS	Function enable	E	
BasicCur	ASG	Basic current setting	E	
FactorK	ASG	Factor k	E	
HeaConsTmm	ASG	Heating time constant	O	
RsvVal	ASG	Reserve time thermal alarm	E	
TmpMod	ING	Temperature based mode	E	
TmpNom	ASG	Nominal ambient temp	E	
TmpAlrm	ASG	Alarm temperature	E	
TmpAmbMin	ASG	Min ambient temperature	E	
TmpAmbDft	ASG	Default ambient temperature	E	

LN Type: SE_PTTR_THM_EasergyP5MU_V002**Description:** Thermal overload**LN Class:** PTTR

PTTR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5THMPPTTR1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				

PTTR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Op	ACT	Operate	M	
AlmThm	SPS	Thermal alarm	O	
Settings				
TmpMax	ASG	Max object temperature	O	
AlmVal	ASG	Thermal alarm value	O	
FunEna	SPS	Function enable	E	
BasicCur	ASG	Basic current setting	E	
FactorK	ASG	Factor k	E	
HeaConsTmm	ASG	Heating time constant	E	
ConsTmm	ASG	Time constant for motor starting	E	
CooConsTmm	ASG	Cooling time constant	E	
UnblFctr	ASG	Unbalance factor	E	
RsvVal	ASG	Reserve time thermal alarm	E	
TmpMod	ING	Temperature based mode	E	
TmpNom	ASG	Nominal ambient temp	E	
TmpAlrm	ASG	Alarm temperature	E	
TmpAmbMin	ASG	Min ambient temperature	E	
TmpAmbDft	ASG	Default ambient temperature	E	

LN Type: SE_PTUC_UC_EasergyP5MU_V002**Description:** Undercurrent**LN Class:** PTUC

PTUC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UCPTUC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTUF_UF_EasergyP5FMV_V002/SE_PTUF_UF_EasergyP5U_LPT_V002**Description:** Underfrequency

LN Class: PTUF

PTUF class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UFPTUF1 P5UFPTUF2 P5UFLPTUF1 P5UFLPTUF2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTUV_UV_EasergyP5FMV_V002/

SE_PTUV_UV_EasergyP5U_LPT_V002

Description: Undervoltage**LN Class:** PTUV

PTUV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UVPTUV1 P5UVPTUV2 P5UVPTUV3 P5UVLPTUV1 P5UVLPTUV2 P5UVLPTUV3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTUV_UVPS_EasergyP5MV_V002

Description: Undervoltage**LN Class:** PTUV

PTUV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UVPSPTUV1 P5UVPSPTUV2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PZSU_EasergyP5MU_V001**Description:** Motor underspeed**LN Class:** PZSU

PZSU class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5MOTPZSU1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PHAR_ID_EasergyP5FMU_V001**Description:** Harmonic restraint**LN Class:** PHAR

PHAR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5IDPHAR1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Str	ACD	Start (active when restraint is needed)	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pickup for 2nd harmonic	E	
CurBlkVal	ASG	Max inrush current	E	

LN Type: SE_LLNO_EasergyP5_V002

Description: Logical node zero

LN Class: LLNO

LLNO class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
LLNO		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	INC	Mode	M	Status-only
Beh	INS	Behaviour	M	
Health	INS	Health	M	
NamPlt	LPL	Name plate	M	
Status Information				
Loc	SPS	Local control behaviour	O	
Controls				
LEDRs	SPC	LED reset	O	
Settings				
GoEnaCB1	SPG	GOOSE Enable CB1	E	
GoEnaCB2	SPG	GOOSE Enable CB2	E	
GoEnaCB3	SPG	GOOSE Enable CB3	E	
GoEnaCB4	SPG	GOOSE Enable CB4	E	

Enum types extensions

New Enum types

Enum type ARCOpMode is one of new added types defined as below.

Value	Description	Remarks
0	Light	
1	Light and current	

Enum type DefDirMode is one of new added types defined as below.

Value	Description	Remarks
0	ResCap	
1	Sector	
2	Undir	

Enum type DocDirMode is one of new added types defined as below.

Value	Description	Remarks
0	Dir_Backup	
1	Undir	
2	Dir	

Enum type DICrvFamily is one of new added types defined as below.

Value	Description	Remarks
0	DT	
1	IEC	
2	IEEE	
3	IEEE2	
4	Others	
5	Prg1	
6	Prg2	
7	Prg3	

Enum type RsTyp is one of new added types defined as below.

Value	Description	Remarks
0	DT	
1	IDMT	

Enum type DIType is one of new added types defined as below.

Value	Description	Remarks
0	DT	
1	NI	
2	VI	
3	EI	
4	LTI	
5	LTEI	
6	LTVI	

7	MI	
8	STI	
9	STEI	
10	CO8	
11	RI	
12	RXIDG	
13	—	

Enum type NetGrd is one of new added types defined as below.

Value	Description	Remarks
0	Res	
1	Cap	

Enum type NegOPMod is one of new added type defined as below.

Value	Description	Remarks
0	No_Action	
1	Blocking	

Enum type NegDITyp is one of new added type defined as below.

Value	Description	Remarks
0	DT	
1	INV	

Enum type StrMod is one of new added type defined as below.

Value	Description	Remarks
0	Negative	
1	Positive	
2	Either	

Enum type MemoryMode is one of new added types defined as below.

Value	Description	Remarks
0	None	
1	Voltage	
2	Time	
3	Both	

Enum type EfDirModeKind is one of new added type defined as below.

Value	Description	Remarks
0	Forward	
1	Reverse	

Enum type SlotDSelect is one of new added type defined as below.

Value	Description	Remarks
0	Slot_C_DI1	
1	Slot_D_DI1	

2	Slot_E_DI1	

Enum type VTTypeKind is one of new added type defined as below.

Value	Description	Remarks
0	VT	
1	LPVT	

Enum type TempModKind is one of new added type defined as below.

Value	Description	Remarks
0	Current	
1	Ambient	

Enum type PadmDirMod is one of new added type defined as below.

Value	Description	Remarks
0	Undir	
1	Forward	
2	Reverse	

Enum type SignalNum is one of new added type defined as below.

Value	Description	Remarks
0	1	
1	2	

Enum type ClockSourceKind is one of new added type defined as below.

Value	Description	Remarks
1	Unknown	
2	SNTP	
3	PTP	
4	IRIG-B	
5	Substation internal	

Extended Enum types

Enum type SIUnitKind is extended by the following enumerations.

Value	Quantity	Unit name	Symbol
-1	Rate of change of frequency	hertz per second	Hz/s
-2	Number of characters	characters	char
-3	Baud	characters per second	Char/s
-4	Turbine inertia	kg square meter	kgm ²
-5	Sound pressure level	decibel	dB
-6	Numerical tagging method	per unit	pu
-7	Percent	percent	%
-8	Relative temperature	degree Fahrenheit	°F
-9	Electric resistance	ohm (V/A)	V/A
-10	Rotational speed	Revolutions per minute	rmp

-11	Pulse per rotation	Pulse per rotation	/R
-12	time	minute	min

Enum type AutoRecST is extended by the following enumerations.

Value	Symbol
-1	Reclaim
-2	Ready_Ext
-3	WaitOpen
-4	WaitClose
-5	Discrim
-6	Locked
-7	FinalTr
-8	CBFail
-9	Inhibit
-10	Blocked
-11	ExtOpen
-12	ExClose
-13	WaitSync

PIXIT details

Introduction

This PIXIT is based upon UCAlug PIXIT Template version 15, UCA International Users Group Testing Sub Committee, October 22, 2019.

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in P5U20, P5V20, P5F30 and P5M30, with firmware version V01.

Together with the PICS and MICS documents, the PIXIT document forms the basis for a conformance test according to IEC 61850-10. The PIXIT entries contain information which is not available in the PICS, MICS, TICS documents or SCL file.

Each chapter specifies the PIXIT for applicable ACSI service model as structured in IEC 61850-10. The "Ed" column indicates if the entry is applicable for IEC 61850 Edition 1 and/or Edition 2.

PIXIT for association model

The extra information for testing is given in the table below.

Table 70 - Protocol implementation extra information for testing

ID	Ed	Description	Value / Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	8
As2	1,2	TCP_KEEPAIVE value. The recommended range is 0...20s	Configurable: from 0 to 20s
As3	1,2	Lost connection detection time	TCP_KEEPAIVE + 2s *10 Maximum 140s (2s is retransmission interval of TCP Keep-alive message, 10 retransmissions) (0 means 120s)
As4	-	Authentication is not supported yet	
As5	1,2	What association parameters are necessary for successful association	Transport selector Calling: N Called: Y Session selector Calling: N Called: Y Presentation selector Calling: N Called: Y AP title Calling: N Called: N AE qualifier Calling: N Called: N
As6	1,2	If association parameters are necessary for association, describe the correct values. Association parameters are configurable, default values are	Transport selector 1 Session selector 1 Presentation selector 1 AP title 1,1,1,999,1 AE qualifier 12
As7	1,2	What is the maximum and minimum MMS PDU size	Max: 65535 bytes Min: In initiate request 1024 bytes

Table 70 - Protocol implementation extra information for testing (Continued)

ID	Ed	Description	Value / Clarification
As8	1,2	What is the maximum start up time after a power supply interrupt	P5 relay start-up time including the server function is at average 180s; it depends on the configuration size (number and types of logical nodes)
As9	1,2	Does this device function only as test equipment? (test equipment need not have a non-volatile configuration; but it cannot be part of the substation automation system)	N

PIXIT for server model

ID	Ed	Description	Value / Clarification
Sr1	1,2	Which analogue value (MX) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, Y Questionable N Overflow Y OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted Y Test N OperatorBlocked
Sr2	1,2	Which status value (ST) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, Y Questionable N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted Y Test N OperatorBlocked
Sr3	-	What is the maximum number of data object references in one GetDataValues request	Deprecated
Sr4	-	What is the maximum number of data object references in one SetDataValues request	Deprecated
Sr5	1	Which Mode values are supported	On Y [On-]Blocked N Test Y Test/Blocked Y Off N

PIXIT for data set model

ID	Ed	Description	Details
Ds1	1	What is the maximum number of data elements in one data set (compare ICD setting)	500
Ds2	1	How many persistent data sets can be created by one or more clients (this number includes predefined datasets)	50
Ds3	1	How many non-persistent data sets can be created by one or more clients	50

NOTE: Arrays are not supported in dataset.

PIXIT for setting group control model

ID	Ed	Description	Value / Clarification
Sg1	1	What is the number of supported setting groups for each logical device	4
Sg2	1,2	What is the effect of when and how the non-volatile storage is updated (compare IEC 61850-8-1 §16.2.4)	When: CnfEdit set to TRUE successfully. How: the setting value in edit buffer will be copied to the selected setting group, and then the new value will be updated to non-volatile storage by setting engine.
Sg3	1	Can multiple clients edit the same setting group	N
Sg4	1	What happens if the association is lost while editing a setting group	The SE values changes are lost, the EditSG value will not change.
Sg5	1	Is EditSG value 0 allowed?	Y Write a value of 0 to EditSG will cancel all the setting values in the Edit buffer.
Sg6	2	When ResvTms is not present how long is an edit setting group locked	Reserved forever except Cancel, Confirm or Disconnection.

PIXIT for reporting model

ID	Ed	Description	Details	
Rp1	1	The supported trigger conditions (compare PICS)	integrity	Y
			data change	Y
			quality change	Y
			data update	Y
			general interrogation	Y
Rp2	1	The supported optional fields are	sequence-number	Y
			report-time-stamp	Y
			reason-for-inclusion	Y
			data-set-name	Y

ID	Ed	Description	Details	
			data-reference	Y
			buffer-overflow (not applicable to URCB)	Y
			entryID (not applicable to URCB)	Y
			conf-rev	Y
			segmentation	Y
Rp3	1,2	Can the server send segmented reports? (when not supported the device shall refuse an association request with a smaller than minimum PDU size)	Y	
Rp4	1,2	Mechanism on second internal data change notification of the same analogue data value within buffer period (compare IEC 61850-7-2 §14.2.2.9)	Send report immediately	
Rp5	1	Multi client URCB approach (compare IEC 61850-7-2 §14.2.1)	Each URCB is visible to all clients	
Rp6	-	What is the format of EntryID	Deprecated	
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered	100k bytes per report control block	
Rp8	-	Pre-configured RCB attributes that are dynamic, compare SCL report settings	Deprecated	
Rp9	1	May the reported data set contain: - structured data objects? - data attributes?	Y Y	
Rp10	1,2	What is the scan cycle for binary events? Is this fixed, configurable or event-driven	5 milliseconds Fixed	
Rp11	1	Does the device support to pre-assign a RCB to a specific client in the SCL	N	
Rp12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart	From the original configuration	
Rp13	1,2	Does the server accept any client to configure / enable a BRCB with ResvTms=-1? What fields are used to do the identification?	N	
Rp14	1,2	What is default value for BRCB. ResvTms if client does not write or ResvTms not exposed in the control block (must be >= 0)	Not support ResvTms.	

PIXIT for GOOSE publish model

ID	Ed	Description	Value / Clarification
Gp1	1,2	Can the test (Ed1) / simulation (Ed2) flag in the published GOOSE be set	N
Gp2	1	What is the behaviour when the GOOSE publish configuration is incorrect	NdsCom=T DUT keeps GoEna=F
Gp3	1,2	Published FCD supported common data classes / data types are	Common data classes: SPS, DPC, CMV, MV Data types as single attributes: BOOLEAN, CODED ENUM, FLOAT32, QUALITY Arrays are not supported.
Gp4	1,2	What is the maximum value of TAL (maxTime)? Is it fixed or configurable?	Maximum TAL = 120000 ms (double of maximum configurable slowest retransmission cycle 60000 ms) Configurable by configuration tool
Gp5	1,2	What is the fastest retransmission time? Is it fixed or configurable?	4 ms Retransmission scheme: First message upon data change, followed by 4, 10, 20, 40, 80, 160, 320, 640, 1280, 2500, 5000, 10000, 20000, 40000, 60000 and finally reaching the configured slow retransmission time). TAL is set to value 2 times bigger than interval. Fixed
Gp6	-	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)	Deprecated
Gp7	1,2	What is initial GOOSE sqNum after restart of the device	1
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD) - timestamp data attributes	Y Y
Gp9	1,2	Does Server or ICT refuse GOOSE payload dataset length greater than SCSM supports?	Y

PIXIT for GOOSE subscribe model

ID	Ed	Description	Value / Clarification
Gs1	1,2	What elements of a subscribed GOOSE message are checked to decide the message is valid and the allData values are accepted? If yes, describe the conditions. Notes: - the VLAN tag may be removed by a ethernet switch and shall not be checked - the simulation flag shall always be checked (Ed2) - the ndsCom shall always be checked (Ed2)	Y destination MAC address (equal to configured) Y APPID (equal to configured) N gocbRef N timeAllowedtoLive (see Remarks) N datSet Y goID (equal to configured, checking can be set off) N t Y stNum (see Remarks) N sqNum (see Remarks) Y simulation/test (if true, values not passed to application, the application data will keep last received value when simulation/test was false, but status of the network input stays valid) Y confRev (equal to configured) Y ndsCom (if true, values not passed to application, the application data will keep last received value , and network inputs status is set to invalid as if message was never received) Y numDatSetEntries (see Remarks) N out-of-order dataset members
Gs2	1,2	When is a subscribed GOOSE marked as lost? (TAL = time allowed to live value from the last received GOOSE message)	Message does not arrive by TAL+1s Internally in the relay there is a status indication to the application about GOOSE problem (data is marked as OLD if the message does not arrive prior to TAL+1s if TAL>1s or prior to 1s if TAL<1s).
Gs3	1,2	What is the behaviour when one or more subscribed GOOSE messages isn't received or syntactically incorrect (missing GOOSE)	The subsequently received GOOSE message is accepted even if the new state number is not equal to the incremented value of the previously received state number (it is enough that it is not equal to the last received state number).
Gs4	1,2	What is the behaviour when a subscribed GOOSE message is out-of-order	Message is treated as normal (it is assumed that previous messages have been lost).
Gs5	1,2	What is the behaviour when a subscribed GOOSE message is duplicated	Duplicated message is ignored
Gs6	1	Does the device subscribe to GOOSE messages with/without the VLAN tag?	Y with the VLAN tag Y without the VLAN tag
Gs7	1	May the GOOSE data set contain: - structured data objects? - data attributes?	Y Y
Gs8	1,2	Subscribed FCD supported common data classes / data types are	Data classes: SPS, SPC, DPS, DPC, INS, INC, ENS, ENC, CMV, MV Data types as single attributes: BOOLEAN, INT8, INT16, INT32, INT8U, INT16U, INT32U, ENUM, CODED ENUM, BITSTRING, FLOAT32 Arrays are not supported

ID	Ed	Description	Value / Clarification
Gs9	1,2	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/ simulation mode	N - Test mode is not supported by the device
Gs10	1,2	Max number of dataset members	Unlimited
Gs11	1	Is Fixed-length encoded GOOSE supported	Yes

TAL = Time Allowed to Live

Remarks:

A GOOSE message will be accepted and processed by the subscriber in DUT:

- Even if it is received after expiration of the time allowed to live sent in the previous message,
- Even if the new state number is not equal to the incremented value of the previously received state number - it is enough that it is not equal to the last received state number,
- If the state number differs from the previously received state number, the sequence number is accepted with any value (if the state number is equal to the previously received state number, the message is treated as retransmission),
- Even if the received message contains a dataset of the size different than the size of the previously received dataset.

A GOOSE message will NOT be accepted by the subscriber in DUT if:

- Destination MAC address is not equal to configured one
- Protocol ID is not equal to 0x88B8
- APPID is not equal to configured one for any of the network inputs
- ConfRev is not equal to configured one for any of the network inputs
- goID is not equal to configured one for any of the network inputs
- state number is the same as in the previous message (is treated as retransmission)
- ndsCom bit is set to true in received message

Note for sGosN6h (out of order dataset)

Value from GOOSE message will be accepted even if the type is different than in previous message given that:

- Type is compatible with network input type i.e. for binary network inputs accepted types are: BOOLEAN, INTEGER and BITSTRIG, ENUM, CODED ENUM for analog network inputs accepted types are FLOAT32 and INTEGER
- In case of binary network input and types other than BOOLEAN as a value for processing bit selected in configuration will be taken from the received data in the message (by default it is bit 0)
- Value will not be accepted if data from the message is not containing configured bit (for example if bit 5 is configured and received data contains only 2 bits like stVal from DPC type)

Every network input can be associated via internal logic with one of 16 validity indications. If given network input is not received due to one of the reasons mentioned above this indication is activated. Validity flag for the network input will be activated also if next message with the value will not be received within the time indicated in **time to live** field contained in the previous message.

The value of numDatSetEntries from the header determines how many data entries from the message are processed. With numDatSetEntries = 0 no data entries are processed from the received message. If numDatSetEntries is lower than expected (source information for some network inputs is not processed or missing) those missing network inputs will be marked as invalid.

During device startup there can be more than one state transition of the GOOSE publisher dataset, since different parts of the relay application will start after GOOSE publisher.

PIXIT for GOOSE performance

ID	Ed	Description	Value / Clarification	
Gf1	1,2	Performance class	N/A	
Gf2	1,2	GOOSE ping-pong processing method	Scan cycle based	
Gf3	1,2	Application logic scan cycle (ms)	Max.	3 ms for SPS, 10 ms for DPS
			Min.	0 ms for SPS, 0 ms for DPS
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality has to be counted as separate attributes)	500	

PIXIT for control model

ID	Ed	Description	Value / Clarification
Ct1	-	What control models are supported (compare PICS)	DOns: Y SBOs: Y DOes: Y SBOes: Y
Ct2	1,2	Is the control model fixed, configurable and/or dynamic?	Configurable for CSWI class: All controllable objects Obj1 ... Obj6 under CSWI class are configured to use one and the same chosen control model. Objects Obj7 ... Obj8 under CSWI class have fixed control model status-only. Fixed for GGIO: All controllable objects under GGIO class the control model is fixed: direct-with-normal-security.
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated
Ct4	-	Is "operate-many" supported (compare sboClass)	N
Ct5	1	Will the DUT activate the control output when the test attribute is set in the SelectWithValue and/or Operate request (when N test procedure Ct2 is applicable)	N
Ct6	-	What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request	Deprecated
Ct7	-	Is pulse configuration supported (compare pulseConfig)	Deprecated
Ct8	1	What is the behaviour of the DUT when the check conditions are set Is this behaviour fixed, configurable, online changeable?	N synchrocheck N interlock-check DUT ignores the check value and the command is executed as usual Fixed
Ct9	1,2	Which additional cause diagnosis are supported	N Unknown

ID	Ed	Description	Value / Clarification
			Y Not-supported Y Blocked-by-switching-hierarchy N Select-failed Y Invalid-position Y Position-reached N Step-limit Y Blocked-by-Mode N Blocked-by-process N Blocked-by-interlocking N Blocked-by-synchrocheck Y Command-already-in-execution N Blocked-by-health N 1-of-n-control N Abortion-by-cancel Y Time-limit-over N Abortion-by-trip Y Object-not-selected Y Parameter-change-in-execution
Ct10	1,2	How to force a "test-not-ok" respond with SelectWithValue request?	Put device into local mode
Ct11	1,2	How to force a "test-not-ok" respond with Select request?	Put device into local mode
Ct12	1,2	How to force a "test-not-ok" respond with Operate request?	DOns: Operate with orCat out of range SBOs: Operate without Select DOes: Operate with orCat out of range SBOes: Operate without Select
Ct13	1,2	Which origin categories are supported/accepted?	Y bay-control Y station-control Y remote-control Y automatic-bay Y automatic-station Y automatic-remote Y maintenance Y process
Ct14	1,2	What happens if the orCat is not supported or invalid	DOns: Negative response SBOs: Negative response DOes: Negative response (with additional cause diagnosis code value Not-supported) SBOes: Negative response (with additional cause diagnosis code value Not-supported)
Ct15	1,2	Does the IED accept a SelectWithValue/Operate with the same control value as the current status value? Is this behaviour configurable?	DOns: N SBOs: N DOes: N Addcause: Position-reached SBOes: N Addcause: Position-reached

ID	Ed	Description	Value / Clarification
			Configurable: N
Ct16	1	Does the IED accept a select/operate on the same control object from 2 different clients at the same time?	DOs: Y (see Remarks) SBOs: N DOes: N SBOes: N
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (tissue 334)	SBOs: N SBOes: N
Ct18	1	Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step?	Y During SelectWithValue and during Operate
Ct19	-	Can a control operation be blocked by Mod=Off or [On-] Blocked (compare PIXIT Sr5)	Deprecated
Ct20	1,2	Does the IED support local / remote operation?	Y
Ct21	1,2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security?	SBOs: N DOs: N
Ct22	2	How to force a "parameter-change-in-execution"	SBOs: N/A SBOes: N/A
Ct23	1,2	How many SBOs/SBOes control objects can be selected at the same time?	SBOs: 1 SBOes: 1
Ct24	1,2	Does the DUT support any operate timeout > 0	N
Ct25	1,2	When CDC=DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	Y
Ct26	1,2	Name an enhanced security point (if any) with a finite operate timeout specify the timeout (in milliseconds)	Relay/Obj1CSWI1.Pos Operate timeout can be configured by setting Configuration Tool, the range is 0.02 ... 600 s. For example: DOes: 10000 ms SBOes: 10000 ms
Ct27	2	Does the IED support control objects with external signals?	DOs: Y SBOs: Y DOes: Y SBOes: Y
Ct_ex1		SBO Timeout	60 seconds

Remarks:

In DOs model: When two clients send Operate request within a very short interval (under 100 ms) then for processing the second command the object position is still unchanged due to the first command, thus both clients receive positive Operate response.

PIXIT for time synchronisation

ID	Ed	Description	Value / Clarification
Tm1	1	What time quality bits are supported (may be set by the IED) Ed.2 requires all 3 bits	Y LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
Tm2	1,2	Describe the behaviour when the time server(s) ceases to respond What is the time server lost detection time	Time is taken from internal RTC The latency depends on measured drift of the internal clock. Usually it can take 400 seconds
Tm3	1,2	How long does it take to take over the new time from time server	Depends on time difference between internal and time server. Max. 400 s is the waiting time to see Timestamp Quality transition to ClockNotSynchronized.
Tm4	1,2	When is the time quality bit "Clock failure" set?	The time quality bit "Clock failure" is set to "one" when the P5 IED restarts from power up, or when the connection to time server is lost; the bit is reset to "zero" when the clock becomes synchronised. All available time synchronisation sources will affect the "Clock failure" bit. These time sources include SNTP and where applicable, IRIG-B.
Tm5	1	When is the time quality bit "Clock not synchronised" set? Note: For Ed2 and up, CNS is set according to PIXIT Tm2	The time quality bit "Clock not synchronised" is set to "one" when the P5 IED starts from power up, or when the connection to time server is lost; the bit is reset to "zero" when the clock becomes synchronised. All available time synchronisation sources will affect the "Clock not synchronised" bit. These time sources include SNTP and where applicable, IRIG-B.
Tm6	-	Is the timestamp of a binary event adjusted to the configured scan cycle?	Deprecated
Tm7	1	Does the device support time zone and daylight saving?	Y
Tm8	1,2	Which attributes of the SNTP response packet are validated?	N Leap indicator not equal to 3 N Mode is equal to SERVER Y OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp Y RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 or 4 N other
Tm9	1,2	Do the COMTRADE files have local time or UTC time Is this configurable	Local N

PIXIT for file transfer model

ID	Ed	Description	Value / Clarification
Ft1	1	What is structure of files and directories Where are the COMTRADE files stored Are comtrade files zipped and what files are included in each zip file	Directory structure - COMTRADE - DR - TREND COMTRADE files stored in folder / COMTRADE /DR Zipped; Each COMTRADE record includes 2 files: .cfg and .dat
Ft2	1,2	Directory names are separated from the file name by	Separated by '/'
Ft3	1	The maximum file name size including path (recommended 64 chars)	255 Below are all the maximum sizes: - Full file name (including the directory path, suffix and separation characters): 255 - File name: 64 - File directory name: 32 - File name suffix: 3
Ft4	1,2	Are directory/file name case sensitive	Case sensitive
Ft5	1,2	Maximum file size for SetFile	SetFile is not supported.
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name	Y
Ft7	1	Is the wild char supported MMS fileDirectory request	Y
Ft8	1,2	Is it allowed that 2 clients get a file at the same time	N
Ft9	1,2	Which files can be deleted	None

TICS details

Introduction

The TICS is based upon UCAIug TICS Template version 2.1, UCA International Users Group Testing Sub Committee, April 23, 2019.

This Tissues implementation conformance statement is applicable for Easergy P5U20, P5V20, P5F30, P5M30, with firmware version V01.

Implemented Tissues

During the October 2006 meeting IEC TC57 working group 10 decided that:

- green Tissues with the category “IntOp” are mandatory for IEC 61850 Edition 1
- Tissues with the category “Ed.2” Tissues should not be implemented

The below tables give an overview of the applicable mandatory Tissues.

Table 71 - Tissues implementation conformance statement

Part	Tissue	Description	Implemented by server	Supported by client
8-1	116	GetNameList with empty response?	Y	na
	165	Improper Error Response for GetDataSetValues	Y	na
	183	GetNameList error handling	Y	na
	246	Control negative response (SBOs) with LastApplError	na	na *
	545	Skip file directories with no files	na	ni
7-4	252	AlmThm should have CDC SPS	Y	na
7-3	28	Definition of APC	na	na
	54	Point def xVal, not cVal	na	na
	55	Ineut = Ires ?	Y	ni
	63	mag in CDC CMV	Y	na
	65	Deadband calculation of a Vector and trigger option	na	na
	219	operTm in ACT	na	na
	270	WYE and DEL rms values	Y	ni
	1199	BCR	Y	na
7-2	30	control parameter T	Y	na *
	31	Typo	na	na *
	32	Typo in syntax	na	na*
	35	Typo Syntax Control time	na	na *
	36	Syntax parameter DSet-Ref missing	na	na
	37	Syntax GOOSE "T" type	Y	na
	39	Add DstAddr to GoCB	Y	na
	40	GOOSE Message "AppID" to "GoID"	Y	na
	41	GsCB "AppID" to "GsID"	na	na
	42	SV timestamp: "EntryTime" to "TimeStamp"	na	na
	43	Control "T" semantic	na	na
	44	AddCause - Object not sel	Y	na

Table 71 - Tissues implementation conformance statement (Continued)

Part	Tissue	Description	Implemented by server	Supported by client
	45	Missing AddCauses	na	na
	46	Synchro check cancel	na	na
	47	"." in LD Name?	Y	na
	49	BRCB TimeOfEntry (part of #453)	-	na *
	50	LNName start with number?	Y	na
	51	ARRAY [0..num] missing	Y	na *
	52	Ambiguity GOOSE SqNum	Y	na
	53	Add DstAddr to GsCB, SV	na	na
	151	Name constraint for control blocks etc.	Y	na
	166	DataRef attribute in Log	na	na *
	185	Logging - Integrity period	na	na *
	189	SV Format	na	na
	190	BRCB: EntryId and TimeOfEntry (part of #453)	-	na *
	191	BRCB: Integrity and buffering reports (part of #453)	-	na *
	278	EntryId not valid for a server (part of #453)	-	na *
	297	Sequence number	Y	na *
	298	Type of SqNum	na	na *
	305	Reporting with BufTm=0	na	na *
	322	Write Configuration attribute of BRCBs	na	na *
	329	Reporting and BufOvl	na	na *
	333	Enabling of an incomplete GoCB	na	na
	335	Clearing of Bufovfl	na	na *
	348	URCB class and report	na	na *
	349	BRCB TimeOfEntry has two definitions	na	na *
	453	Reporting & Logging model revision	Y	na *
	1281	Default for TrgPos.GI is TRUE	na	na *
6	1	Syntax	na	na
	5	tExtensionAttributeNameEnum is restricted	Y	ni
	8	SIUnit enumeration for W	Y	na
	10	Base type for bitstring usage	Y	na
	17	DAI/SDI elements syntax	Y	na
	169	Ordering of enum differs from 7-3	na	na
	245	Attribute RptId in SCL	Y	na *
	529	Replace sev - Unknown by unknown	na	na

NOTE: Tissue 49, 190, 191, 275 and 278 are part of tissue #453, all other technical tissues in the table are mandatory if applicable.

NOTE: Editorial tissues are marked as "na".

For detailed information on the individual Tissues, connect to the TISSUE database: www.tissues.iec61850.com

Appendix 3: IEC 61850 Edition 2 conformance statement

Introduction

Document purpose

The purpose of this document is to specify the communication features of the Easergy P5 protection relays embedded IEC 61850 server implementation mapped to IEC 61850 Edition 2 standards.

The model implementation in Easergy P5 protection relays varies with the functional scope provided by the different device models.

The information provided here may be still the subject of changes due to planned further extensions in the supported IEC 61850 functionality.

Terms and abbreviations

Terms / abbreviations	Definitions
ACSI	Abstract Communication Service Interfaces
BDA	Basic Data Attribute (not structured)
DA	Data Attributes
DO	DATA in IEC 61850-7-2, data object type or instance
FCD	Functionally Constrained Data
FCDA	Functionally Constrained Data Attribute
ID	Identifier
IED	Intelligent Electronic Device
LD	Logical Device
LN	Logical Node
MSV	Multicast Sampled Value
RCB	Report Control Block
GoCB	GOOSE Control Block or GSSE Control Block
SCL	System Configuration description Language
SCSM	Specific Communication Service Mapping
XML	Extensible Markup Language
GSSE	Generic Substation State Event
GOOSE	Generic Object Oriented Substation Event
SCD	Substation Configuration Description
ICD	IED Configuration Description
CID	Configured IED Description
PICS	Protocol Implementation Conformance Statement
MICS	Model Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
TICS	Tissue Implementation Conformance Statement

PICS details

The PICS is based upon UCAlug PICS Template version 2.3, UCA International Users Group Testing Sub Committee, October 08, 2019.

The following ACSI conformance statements are used to provide an overview and details about following devices: P5U20, P5V20, P5F30, P5M30, with firmware version V01.

- ACSI basic conformance statement,
- ACSI models conformance statement,
- ACSI service conformance statement

The statements specify the communication features mapped to IEC 61850-8-1 and IEC 61850-9-2, Edition 2.

ACSI basic conformance statement

The basic conformance statement is defined in the table below.

Table 72 - Basic conformance statement

		Client / Subscriber	Server / Publisher	Value / Comments
Client–Server roles				
B11	Server side (of TWO-PARTY-APPLICATION-ASSOCIATION)		Y	
B12	Client side (of TWO-PARTY-APPLICATION-ASSOCIATION)		–	
SCSMs supported				
B21	SCSM : IEC 61850-8-1 used		Y	
B22	SCSM : IEC 61850-9-1 used			Deprecated in Ed.2
B23	SCSM : IEC 61850-9-2 used		N	
B24	SCSM : other		N	
Generic substation event model (GSE)				
B31	Publisher side		Y	
B32	Subscriber side	Y		
Transmission of sampled value model (SVC)				
B41	Publisher side		N	
B42	Subscriber side	N		
– = not applicable Y = supported N or empty = not supported				

ACSI models conformance statement

The ACSI models conformance statement is defined in the table below.

Table 73 - ACSI models conformance statement

		Client / Subscriber	Server / Publisher	Value / Comments
If Server side (B11) and/or Client side (B12) supported				
M1	Logical device		Y	
M2	Logical node		Y	Only standard LN types defined in Part 7-4.
M3	Data		Y	Only standard object types defined in Part 7-3, 7-4. Mandatory objects and attributes, selected optional objects and attributes.
M4	Data set		Y	Supported pre-defined persistent data sets, configurable via SCL. Supported dynamically created data sets (persistent and non-persistent). Data set members selection restricted to FC such as ST and MX.
M5	Substitution		N	
M6	Setting group control		Y	
Reporting				
M7	Buffered report control		Y	
M7-1	sequence-number		Y	
M7-2	report-time-stamp		Y	
M7-3	reason-for-inclusion		Y	
M7-4	data-set-name		Y	
M7-5	data-reference		Y	
M7-6	buffer-overflow		Y	
M7-7	entryID		Y	
M7-8	BufTm		Y	
M7-9	IntgPd		Y	
M7-10	GI		Y	
M7-11	conf-revision		Y	
M8	Unbuffered report control		Y	
M8-1	sequence-number		Y	
M8-2	report-time-stamp		Y	
M8-3	reason-for-inclusion		Y	
M8-4	data-set-name		Y	
M8-5	data-reference		Y	
M8-6	BufTm		Y	
M8-7	IntgPd		Y	
M8-8	GI		Y	
M8-9	conf-revision		Y	

Table 73 - ACSI models conformance statement (Continued)

		Client / Subscriber	Server / Publisher	Value / Comments
Logging				
M9	Log control		N	
M9-1	IntgPd		N	
M10	Log		N	
Other				
M11	Control		Y	
M17	File transfer		Y	
M18	Application association		Y	
M19	GOOSE Control Block		Y	
M20	Sampled Values Control Block		N	
If GSE (B31/32) is supported				
M12	GOOSE		Y	
M13	GSSE		N	Deprecated in Ed.2
If SVC (B41/B42) is supported				
M14	Multicast SVC		N	
M15	Unicast SVC		N	
For all IEDs				
M16	Time		Y	Performance class T2 (100µs accuracy)
Y = service is supported				
N or empty = service is not supported				

ACSI service conformance statement

The ACSI service conformance statement is defined in the table below (depending on the statements in ACSI basic conformance statement, page 360).

Table 74 - ACSI service conformance statement

	Ed	ACSI Service Conformance	AA: TP/MC	Client / Sub (C)	Server / Pub (S)	Comments
Server						
S1	1,2	GetServerDirectory (LOGICAL-DEVICE)	TP		Y	
Application association						
S2	1,2	Associate			Y	
S3	1,2	Abort			Y	
S4	1,2	Release			Y	
Logical device						
S5	1,2	LogicalDeviceDirectory	TP		Y	
Logical node						
S6	1,2	LogicalNodeDirectory	TP		Y	
S7	1,2	GetAllDataValues	TP		Y	
Data						
S8	1,2	GetDataValues	TP		Y	
S9	1,2	SetDataValues	TP		Y	
S10	1,2	GetDataDirectory	TP		Y	
S11	1,2	GetDataDefinition	TP		Y	
Data set						
S12	1,2	GetDataSetValues	TP		Y	
S13	1,2	SetDataSetValues	TP		N	Deprecated in Ed.2
S14	1,2	CreateDataSet	TP		Y	
S15	1,2	DeleteDataSet	TP		Y	
S16	1,2	GetDataSetDirectory	TP		Y	
Substitution						
S17	1	SetDataValues	TP		N	
Setting group control						
S18	1,2	SelectActiveSG	TP		Y	
S19	1,2	SelectEditSG	TP		Y	
S20	1,2	SetEditSGValue	TP		Y	
S21	1,2	ConfirmEditSGValues	TP		Y	
S22	1,2	GetEditSGValue	TP		Y	
S23	1,2	GetSGCBValues	TP		Y	
Reporting						
Buffered report control block (BRCB)						
S24	1,2	Report	TP		Y	
S24-1	1,2	data-change (dchg)			Y	
S24-2	1,2	qchg-change (qchg)			Y	
S24-3	1,2	data-update (dupd)			Y	Accepted as TrgOpt, but not functionally

Table 74 - ACSI service conformance statement (Continued)

	Ed	ACSI Service Conformance	AA: TP/MC	Client / Sub (C)	Server / Pub (S)	Comments
						supported by the IED
S25	1,2	GetBRCBValues	TP		Y	
S26	1,2	SetBRCBValues	TP		Y	
Unbuffered report control block (URCB)						
S27	1,2	Report	TP		Y	
S27-1	1,2	data-change (dchg)			Y	
S27-2	1,2	qchg-change (qchg)			Y	
S27-3	1,2	data-update (dupd)			Y	Accepted as TrgOpt, but not functionally supported by the IED
S28	1,2	GetURCBValues	TP		Y	
S29	1,2	SetURCBValues	TP		Y	
Logging						
Log control block						
S30	1,2	GetLCBValues	TP		N	
S31	1,2	SetLCBValues	TP		N	
Log						
S32	1,2	QueryLogByTime	TP		N	
S33	1,2	QueryLogAfter	TP		N	
S34	1,2	GetLogStatusValues	TP		N	
Generic substation event model (GSE)						
S35	1,2	SendGOOSEMessage	MC		Y	
GOOSE Control Block						
S36	1,2	GetGoReference	TP		N	
S37	1,2	GetGOOSEElement-Number	TP		N	
S38	1,2	GetGoCBValues	TP		Y	
S39	1,2	SetGoCBValues	TP		Y	
GSSE (Ed2:61850-7-2 Annex C)						
S40	1	SendGSSEMessage	MC		N	Deprecated in Ed.2
GSSE Control Block						
S41	1	GetGsReference	TP		N	Deprecated in Ed.2
S42	1	GetGSSEElementNum-ber	TP		N	Deprecated in Ed.2
S43	1	GetGsCBValues	TP		N	Deprecated in Ed.2
S44	1	SetGsCBValues	TP		N	Deprecated in Ed.2
Transmission of sampled value model (SVC)						
Multicast SV						
S45	1,2	SendMSVMessage	MC		N	Use for 9-2LE or IEC 61869-9
Multicast Sampled Values Control Block						
S46	1,2	GetMSVCBValues	TP		N	

Table 74 - ACSI service conformance statement (Continued)

	Ed	ACSI Service Conformance	AA: TP/MC	Client / Sub (C)	Server / Pub (S)	Comments
S47	1,2	SetMSVCBValues	TP		N	
Unicast SV						
S48	1,2	SendUSVMessage	TP		N	
Unicast Sampled Values Control Block						
S49	1,2	GetUSVCBValues	TP		N	
S50	1,2	SetUSVCBValues	TP		N	
Control						
S51	1,2	Select			Y	
S52	1,2	SelectWithValue	TP		Y	
S53	1,2	Cancel	TP		Y	
S54	1,2	Operate	TP		Y	
S55	1,2	CommandTermination	TP		Y	
S56	1,2	TimeActivatedOperate	TP		N	
File Transfer						
S57	1,2	GetFile	TP		Y	
S58	1,2	SetFile	TP		N	
S59	1,2	DeleteFile	TP		N	
S60	1,2	GetFileAttributeValues	TP		Y	
S61	1,2	GetServerDirectory (FILE-SYSTEM)	TP		Y	
Time						
T1	1,2	Time resolution of internal clock			14	14 for IEEE1588, 10 for IRIG-B, 7 for SNTP and protocols
T2	1,2	Time accuracy of internal clock			T2	Performance class T2 for IEEE1588, T1 for IRIG-B, T0 for SNTP and protocols
T3	1,2	Supported TimeStamp resolution	-		20	Nearest value of 2 ⁻ⁿ in seconds (number 0 ... 24)

MICS details

The MICS is based upon UCAIug MICS Template version 1.2, UCA International Users Group Testing Sub Committee, August 13, 2019.

This model implementation conformance statement is applicable for P5U20, P5V20, P5F30, P5M30, with firmware version V01.

This MICS document specifies the modeling extensions compared to IEC 61850 Edition 2.

Clause **Logical nodes list** contains the list of implemented logical nodes.

Clause **Logical node extensions** describes the new and extended logical nodes (if any).

Clause **Enum types extensions** describes the new and extended enum types (if any).

Logical nodes list

The following table contains the list of logical nodes implemented in the device:

Table 75 - Logical nodes implemented in the device

	P5U20	P5V20	P5F30	P5M30
L: System Logical Nodes				
LPHD (Physical device information)	x	x	x	x
LLN0 (Logical node zero)	x	x	x	x
LTMS (Time master supervision)	x	x	x	x
P: Logical Nodes for protection functions				
PTRC (Protection trip conditioning)	x	x	x	x
PTOC (Time overcurrent)	x		x	x
PFRC (Rate of change frequency)	x	x	x	
PIOC (Instantaneous overcurrent)	x	x	x	x
PTOF (Over frequency)	x	x	x	x
PTOV (Overvoltage)	x	x	x	x
PDOP (Directional overpower)	x		x	x
PTUC (Undercurrent)	x			x
PTTR (Thermal overload)	x		x	x
PTUF (Under frequency)	x	x	x	x
PTUV (Under voltage)	x	x	x	x
PMRI (Motor restart inhibition)	x			x
PMSS (Motor starting time supervision)	x			x
PTEF (Transient earth fault)			x	
PADM (Admittance)			x	x
POVS (Motor overspeed)	x			x
PZSU (Motor underspeed)	x			x
PHAR (Harmonic restraint)	x		x	x
R: Logical nodes for protection related functions				
RREC (Auto reclosing)	x		x	
RDRE (Disturbance recorder)	x	x	x	x

Table 75 - Logical nodes implemented in the device (Continued)

	P5U20	P5V20	P5F30	P5M30
RFLO (Fault locator)			x	
RSYN (Synchronism-check)		x	x	
G: Logical Nodes for generic references				
GGIO (Generic process I/O)	x	x	x	x
GAPC (Generic automatic process control)	x	x	x	x
M: Logical Nodes for metering and measurement				
MMTR (Metering)	x		x	x
MMXU (Measurement)	x	x	x	x
MHAI (Harmonics)	x	x	x	x
C: Logical Nodes for control				
CSWI (Switch controller)	x	x	x	x
T: Logical nodes for instrument transformers and sensors				
TCTX (Current transformer)	x		x	x
TVTX (Voltage transformer)	x	x	x	x

Logical node extensions

The following table uses:

- M: Data is mandatory in the IEC 61850-7-4.
- O: Data is optional in the IEC 61850-7-4 and is used in the device.
- C: Data is conditional in the IEC 61850-7-4 and is used in the device.
- E: Data is an extension to the IEC 61850-7-4.

The condition below is available for all logical nodes in this chapter.
Condition C1: Mod, Health and NamPIt shall be inherited by LLN0 of the root LD of a hierarchy as mandatory and by all other LN as optional.

New logical nodes

Newly created logical nodes are listed in this clause, with InNs attribute in the Name plate.

PADM Admittance

This LN shall be used for protection admittance E/F Io/Uo.

PADM class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5EFPADM1 P5EFPADM2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPIt	LPL	Name plate	C1	
Status Information				

PADM class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
YStr	ACD	YN start	E	
YOp	ACT	YN operate	E	
GStr	ACD	GN start	E	
GOp	ACT	GN operate	E	
BStr	ACD	BN start	E	
BOp	ACT	BN operate	E	
Settings				
FunEna	SPG	Whole function enable	E	
YFunEna	SPG	YN function enable	E	
GFunEna	SPG	GN function enable	E	
BFunEna	SPG	BN function enable	E	
UoStrVal	ASG	Uo pick-up value	E	
CorAng	ASG	Correction angle	E	
YStrVal	ASG	YN pick-up value	E	
YOpDITms	ASG	YN operate delay time	E	
YRsDITms	ASG	YN reset time	E	
YSolMod	SPG	YN SOL mode	E	
YSIOpDITms	ASG	YN SOL operate delay time	E	
GStrVal	ASG	GN pick-up value	E	
GDirMod	ENG	GN direction mode	E	
GOpDITms	ASG	GN operate delay time	E	
GRsDITms	ASG	GN reset time	E	
GSolMod	SPG	GN SOL mode	E	
GSIOpDITms	ASG	GN SOL operate delay time	E	
BStrVal	ASG	BN pick-up value	E	
BDirMod	ENG	BN direction mode	E	
BOpDITms	ASG	BN operate delay time	E	
BRsDITms	ASG	BN reset time	E	
BSolMod	SPG	BN SOL mode	E	
BSIOpDITms	ASG	BN SOL operate delay time	E	

POVS Motor overspeed

This LN shall be used for protection motor overspeed.

POVS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5MOTPOVS1 P5MOTPOVS2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	

POVS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	E	
Op	ACT	Operate	E	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	E	
OpDITms	ASG	Operate delay time	E	

TCTX Current transformer

This LN shall be used for protection current transformer parameters.

TCTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5ITCTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Measured and metered values				
Settings				
FunEna	SPG	Function enable	E	
CTNum	ING	Number of connected phase CT	E	
OpDITmms	ING	Operate delay time	O	
PriPhs	ASG	CT primary	E	
SecPhs	ASG	CT secondary	E	

TCTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5IOTCTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	

TCTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Measured and metered values				
Settings				
PriNeut1	ASG	lo CT primary	E	
PriNeut2	ASG	lo' CT primary	E	

TCTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPITCTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Measured and metered values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
OpDITmms	ING	Operate delay time	E	
NomPri	ASG	LPCT rated primary current	E	

TVTX Voltage transformer

This LN shall be used for protection voltage transformer parameters.

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UTVTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Status Information				
Measured and Metered Values				
Settings				
FunEna	SPG	Function enable	E	
ImbAMinLev	ASG	I2 min. setting	E	
ImbVMaxLev	ASG	U2 max. setting	E	
OpDITmms	ING	Operate delay time	E	
PriPhs	ASG	VT primary	E	
SecNeut	ASG	VTo secondary	E	
SecPhs	ASG	VT secondary	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPUTVTX1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Measured and Metered Values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
PhAMagCor	ASG	VL1 magnitude correction	E	
PhBMagCor	ASG	VL2 magnitude correction	E	
PhCMagCor	ASG	VL3 magnitude correction	E	
PhAAngCor	ASG	VL1 Angle correction	E	
PhBAngCor	ASG	VL2 Angle correction	E	
PhCAngCor	ASG	VL3 Angle correction	E	
VL1yMagCor	ASG	VL1y magnitude correction	E	
VL1yAngCor	ASG	VL1y Angle correction	E	
VL2yMagCor	ASG	VL2y magnitude correction	E	
VL2yAngCor	ASG	VL2y Angle correction	E	
VtTyp	ING	Primary VT type	E	
VtSecAdpt	ASG	VT secondary rated voltage	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
PhAMagAdpt	ASG	VL1 Adapt magnitude correction	E	
PhBMagAdpt	ASG	VL2 Adapt magnitude correction	E	
PhCMagAdpt	ASG	VL3 Adapt magnitude correction	E	
VISecAdpt	ASG	VTy secondary rated voltage	E	
VL1yMagAdt	ASG	VL1y Adapt magnitude correction	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPUTVTX2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	EINS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Measured and Metered Values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
NomPri	ASG	LPVT rated primary voltage	E	
PhAMagCor	ASG	VL1 magnitude correction	E	
PhBMagCor	ASG	VL2 magnitude correction	E	
PhCMagCor	ASG	VL3 magnitude correction	E	
PhAAngCor	ASG	VL1 Angle correction	E	
PhBAngCor	ASG	VL2 Angle correction	E	
PhCAngCor	ASG	VL3 Angle correction	E	
VL1yMagCor	ASG	VL1y magnitude correction	E	
VL1yAngCor	ASG	VL1y Angle correction	E	
VtTyp	ING	Primary VT type	E	
VtSecAdpt	ASG	VT secondary rated voltage	E	
PhAMagAdpt	ASG	VL1 Adapt magnitude correction	E	
PhBMagAdpt	ASG	VL2 Adapt magnitude correction	E	
PhCMagAdpt	ASG	VL3 Adapt magnitude correction	E	
VISecAdpt	ASG	VTy secondary rated voltage	E	
VL1yMagAdt	ASG	VL1y Adapt magnitude correction	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPUTVTX3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Measured and Metered Values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
NomPri	ASG	LPVT rated primary voltage	E	
PhAMagCor	ASG	VL1 magnitude correction	E	
PhBMagCor	ASG	VL2 magnitude correction	E	
PhCMagCor	ASG	VL3 magnitude correction	E	
PhAAngCor	ASG	VL1 Angle correction	E	
PhBAngCor	ASG	VL2 Angle correction	E	
PhCAngCor	ASG	VL3 Angle correction	E	
VtTyp	ING	Primary VT type	E	
VtSecAdpt	ASG	VT secondary rated voltage	E	
PhAMagAdpt	ASG	VL1 Adapt magnitude correction	E	
PhBMagAdpt	ASG	VL2 Adapt magnitude correction	E	
PhCMagAdpt	ASG	VL3 Adapt magnitude correction	E	
UoSecAdpt	ASG	Uo secondary rated voltage	E	
UoMagAdt	ASG	Uo Adapt magnitude correction	E	

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LPUTVTX4		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	E	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				

TVTX class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Measured and Metered Values				
ExtPri	MV	Rated ext. primary current In	E	
Settings				
FunEna	SPG	Function enable	E	
NomPri	ASG	LPVT rated primary voltage	E	
PhAMagCor	ASG	VL1 magnitude correction	E	
PhBMagCor	ASG	VL2 magnitude correction	E	
PhCMagCor	ASG	VL3 magnitude correction	E	
PhAAngCor	ASG	VL1 Angle correction	E	
PhBAngCor	ASG	VL2 Angle correction	E	
PhCAngCor	ASG	VL3 Angle correction	E	
VtTyp	ING	Primary VT type	E	
VtSecAdpt	ASG	VT secondary rated voltage	E	
PhAMagAdpt	ASG	VL1 Adapt magnitude correction	E	
PhBMagAdpt	ASG	VL2 Adapt magnitude correction	E	
PhCMagAdpt	ASG	VL3 Adapt magnitude correction	E	

Standardised and extended DO of logical node type

The following table presents a summary of the standardised and extended DO of each Logical Node Type.

LN Type: SE_GAPC_PS_EasergyP5_V001

Description: Generic automatic process control

LN Class: GAPC

GAPC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5PSGAPC1...8		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	

LN Type: SE_GGIO_AR_EasergyP5FU_V001

Description: Generic process I/O

LN Class: GGIO

GGIO class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5ARGGIO1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Ind1	SPS	AR1 final trip	O	
Ind2	SPS	AR2 final trip	O	
Ind3	SPS	AR3 final trip	O	
Ind4	SPS	AR4 final trip	O	
Ind5	SPS	AR Direct final trip	O	
Ind6	SPS	Direct trip AR request	O	
Ind7	SPS	AR final trip	O	
Ind8	SPS	AR locked	O	
Ind9	SPS	AR request 1	O	
Ind10	SPS	AR request 2	O	
Ind11	SPS	AR request 3	O	
Ind12	SPS	AR request 4	O	
Ind13	SPS	AR request 5	O	
Ind14	SPS	AR running	O	
Ind15	SPS	AR shot 1	O	
Ind16	SPS	AR shot 2	O	
Ind17	SPS	AR shot 3	O	
Ind18	SPS	AR shot 4	O	
Ind19	SPS	AR shot 5	O	
Settings				
FunEna	SPG	Function enable	E	

LN Type: SE_GGIO_CBWA_EasergyP5FMU_V002**Description:** Generic process I/O**LN Class:** GGIO

GGIO class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CBWAGGIO1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				

GGIO class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Ind1	SPS	General indication (binary input)	O	
Ind2	SPS	General indication (binary input)	O	
Alm1Phs1	INS	Alarm 1 of Phase 1	E	
Alm1Phs2	INS	Alarm 1 of Phase 2	E	
Alm1Phs3	INS	Alarm 1 of Phase 3	E	
Alm2Phs1	INS	Alarm 2 of Phase 1	E	
Alm2Phs2	INS	Alarm 2 of Phase 2	E	
Alm2Phs3	INS	Alarm 2 of Phase 3	E	
Settings				
FunEna	SPG	Function enable	E	
CBOpenCnt	ING	CB open counter	E	
RackOutCnt	ING	Rack out counter	E	
TripCnt	ING	Protection trip counter	E	
AlmLev1	ASG	Alarm level 1	E	
AlmLev2	ASG	Alarm level 2	E	
LimOpNum1	ASG	Limit for operate left 1	E	
LimOpNum2	ASG	Limit for operate left 2	E	

LN Type: SE_MMXU_VECA_EasergyP5FMU_VSI_V001

Description: Measurement

LN Class: MMXU

MMXU class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5VECAMMXU1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Measured values				
Hz	MV	Frequency	O	
A	WYE	Phase currents (IL1, IL2, IL3)	O	
Iovs	WYE	Residual current I _o '	E	

LN Type: SE_PDOP_REVP_EasergyP5FM_V002

Description: Directional overpower

LN Class: PDOP

PDOP class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5REVPPDOP1 P5REVPPDOP2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PDOP_EF_EasergyP5FM_V002**Description:** Directional overpower**LN Class:** PDOP

PDOP class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5EFPDOP1 P5EFPDOP2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
DirMode	ENG	Direction mode	E	
StrVal	ASG	Pick-up value	M	
UoStrVal	ASG	Uo setting	E	
SctrStrVal	ASG	Pick up sector size	E	
OpDITms	ASG	Operate delay time	E	
SolMod	SPG	SOL Mode	E	
SolOpDITms	ASG	SOL operate delay time	E	

PDOP class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
MemMod	ENG	Memory Mode	E	
MmUoStrVal	ASG	Uo setting	E	
MemTms	ASG	Memory time	E	

LN Type: SE_PFRC_DFDT_EasergyP5FV_V002

SE_PFRC_DFDT_EasergyP5U_LPT_V002

Description: Rate of change of frequency

LN Class: PFRC

PFRC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5DFDTPFRC1 P5DFDTPFRC2 P5DFTLPFRC1 P5DFTLPFRC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
DirChg	ENG	Direction of change	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PIOC_CBFP_EasergyP5FMU_V002

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CBFPPIOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Str	ACD	Start	O	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
NeutStrVal	ASG	Undercurrent threshold for earth fault current	E	
PhsStrVal	ASG	Undercurrent threshold for phase current	E	
Tm1DITms	ASG	Timer1 operate delay time	E	
Tm1Ena	SPG	Enable CBF timer1	E	
Tm2DITms	ASG	Timer2 operate delay time	E	
Tm2Ena	SPG	Enable CBF timer2	E	

LN Type: SE_PIOC_CBFP_EasergyP5V_V002

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CBFPPIOC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
Tm1DITms	ASG	Timer1 operate delay time	E	
Tm1Ena	SPG	Enable CBF timer1	E	
Tm2DITms	ASG	Timer2 operate delay time	E	
Tm2Ena	SPG	Enable CBF timer2	E	

LN Type: SE_PIOC_CBFP_EasergyP5FMU_VSI_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CBFPPIOC3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
NeutStrVal	ASG	Undercurrent threshold for earth fault current	E	
PhsStrVal	ASG	Undercurrent threshold for phase current	E	
IovsStrVal	ASG	Io'< current set	E	
Tm1DITms	ASG	Timer1 operate delay time	E	
Tm1Ena	SPG	Enable CBF timer1	E	
Tm2DITms	ASG	Timer2 operate delay time	E	
Tm2Ena	SPG	Enable CBF timer2	E	

LN Type: SE_PIOC_ARCM_EasergyP5FM_ARC_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5ARCMPIOC1...8		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
MinOpTmms	ING	Min. hold time [x1ms]	E	

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
OpDITmms	ING	Trip X delay [x1ms]	E	
OpMode	ENG	Arc stage X Mode	E	

LN Type: SE_PIOC_CLP_EasergyP5FMU_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CLPPIOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
Idl	ASG	Idle current	E	
StrVal	ASG	Pickup current	O	
DeadTms	ASG	CLPU dead time	E	
MaxTms	ASG	Maximum time	E	

LN Type: SE_PIOC_SOL_EasergyP5FMU_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5SOLPIOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Op	ACT	Operate	M	
Oprt2	ACT	2 nd Operate	E	
Settings				

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
FunEna	SPG	Function enable	E	
SigNum	ENG	SOL signal number	E	
CbClrTms	ASG	CB trip clearing time	E	

LN Type: SE_PIOC_SOTF_EasergyP5FMU_V001

Description: Instantaneous overcurrent

LN Class: PIOC

PIOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5SOTFPIOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Enable for SOTF	E	
StrVal	ASG	Pick-up value	O	
DetDITms	ASG	Dead line detection delay	E	
ActTmrTms	ASG	SOTF active Timer	E	

LN Type: SE_PMRI_MOTFST_EasergyP5MU_V003

Description: Motor restart inhibition

LN Class: PMRI

PMRI class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5FSTPMRI1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Op	ACT	Operate	O	
StrInh	SPS	Restart inhibited	O	
Settings				

PMRI class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
MaxWrmStr	ING	Maximum warm starts, permissible number of warm starts	O	
MinStrTmm	ASG	Min time between motor starts	E	
HotSttsLmt	ASG	Hot Status Limit	E	
FunEna	SPG	Function enable	E	
MaxCldStr	ING	Max motor cold starts/hour	E	
RefPrdTmm	ASG	Reference period	E	

LN Type: SE_PMSS_STAL_EasergyP5MU_V001

Description: Motor starting time supervision

LN Class: PMSS

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5STALPMSS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	O	
Settings				
SetA	ASG	Current setting for motor start-up	O	
SetTms	ING	Time setting for motor start-up	O	
MotStr	ASG	Motor startup (current pickup value of motor starting)	O	
FunEna	SPG	Function enable	E	
TmACrv	CURVE	Characteristics for Ist>	E	

LN Type: SE_PMSS_MSPD_EasergyP5MU_V001

Description: Motor starting time supervision

LN Class: PMSS

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5MSPDPMSS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
ZerSpdSt	SPS	Zero speed	E	
MotSpd	INS	Motor speed	E	
Settings				
FunEna	SPG	Function enable	E	
SpdIn	ENG	Motor speed input DI	E	
RtdMotSpd	ASG	Rated motor speed	E	
PlsRot	ASG	Pulse per rotation	E	
ZerSpdTms	ASG	Zero speed delay	E	

LN Type: SE_PMSS_MABS_EasergyP5MU_V001

Description: Motor starting time supervision

LN Class: PMSS

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5MABSPMSS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
AbsAlm	SPS	Anti-backspin Alarm	E	
Settings				
FunEna	SPG	Function enable	E	
MvMod	SPG	Measured Zero Speed Mode	E	
SwMod	SPG	Zero Speed Switch Mode	E	
AbsTms	ASG	Anti-backspin Delay	E	

LN Type: SE_PMSS_51LR_EasergyP5MU_V001

Description: Motor starting time supervision

LN Class: PMSS

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5LRPMSS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				

PMSS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	O	
Op	ACT	Operate	O	
Settings				
SetA	ASG	Pick-up value	O	
FunEna	SPG	Function enable	E	
DITyp	ENG	Delay type	E	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTEF_IO_EasergyP5F_V002

Description: Transient earth fault

LN Class: PTEF

PTEF class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5IOIOPTEF1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	C	
Op	ACT	Operate	C	
Settings				
FunEna	SPG	Function enable	E	
DirMode	ENG	Direction mode	E	
GndStr	ASG	Uo pick-up	O	
OpDITms	ASG	Operate delay time	E	
MinPeak	ING	Min number of peaks	E	
RsDITms	ASG	Reset delay	E	
Condition C: at least one of the two status information (Str, Op) shall be used.				

LN Type: SE_PTOC_STRVAL_EasergyP5FMU_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5HAR5PTOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
StrVal	ASG	Start value	O	
OpDITms	ING	Operate delay time	O	
FunEna	SPG	Function enable	E	

LN Type: SE_PTOC_UIBC_EasergyP5FMU_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UIBCPTOC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Start value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTOC_EasergyP5FMU_VSI_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5EFVSPTOC1 P5EFVSPTOC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DICrvFmly	ENG	Delay curve family	E	
DITyp	ENG	Delay type	E	
OpDITms	ASG	Operate delay time	E	
TmMult	ASG	Inv. time coefficient	O	
RsTyp	ENG	Reset type	E	
RsDITms	ASG	Reset time	E	
InrushStat	SPG	Inrush status	E	
SolStat	SPG	SOL status	E	
SolOpDTms	ASG	SOL operate delay time	E	
SolTmMult	ASG	SOL Inv. time coefficient	E	
ClpStat	SPG	CLP status	E	
ClpStrVal	ASG	CLP pick-up value	E	
ClpOpDTms	ASG	CLP operate delay time	E	
ClpTmMult	ASG	CLP Inv. time coefficient	E	
NetGrd	ENG	Network grounding	E	

LN Type: SE_PTOC_NORMAL_EasergyP5FMU_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5OCPTOC1 P5OCPTOC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DICrvFmly	ENG	Delay curve family	E	
DITyp	ENG	Delay type	E	
OpDITms	ASG	Operate delay time	E	
TmMult	ASG	Inv. time coefficient	O	
RsTyp	ENG	Reset type	E	
RsDITms	ASG	Reset time	E	
InrushStat	SPG	Inrush status	E	
SolStat	SPG	SOL status	E	
SolOpDTms	ASG	SOL operate delay time	E	
SolTmMult	ASG	SOL Inv. time coefficient	E	
ClpStat	SPG	CLP status	E	
ClpStrVal	ASG	CLP pick-up value	E	
ClpOpDTms	ASG	CLP operate delay time	E	
ClpTmMult	ASG	CLP Inv. time coefficient	E	

LN Type: SE_PTOC_EasergyP5FM_V002

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5DEFPTOC1 P5DEFPTOC2 P5DEFPTOC3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
DirMode	ENG	Direction mode	E	

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
StrVal	ASG	Pick-up value	O	
UoStrVal	ASG	Uo setting	E	
AngOffset	ASG	Angle offset	E	
SctrStrVal	ASG	Pick up sector size	E	
DICrvFmly	ENG	Delay curve family	E	
DITyp	ENG	Delay type	E	
OpDITms	ASG	Operate delay time	E	
TmMult	ASG	Inv. time coefficient	O	
RsTyp	ENG	Reset type	E	
RsDITms	ASG	Reset time	E	

LN Type: SE_PTOC_EasergyP5U_LPT_V002

Description: Time overcurrent**LN Class:** PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5DOCLPTOC1 P5DOCLPTOC2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DirMode	ENG	Direction mode	E	
AngOffset	ASG	Angle offset	E	
DICrvFmly	ENG	Delay curve family	E	
DITyp	ENG	Delay type	E	
OpDITms	ASG	Operate delay time	E	
TmMult	ASG	Inv. time coefficient	O	
RsTyp	ENG	Reset type	E	
RsDITms	ASG	Reset time	E	
InrushStat	SPG	Inrush status	E	
SolStat	SPG	SOL status	E	
SolOpDTms	ASG	SOL operate delay time	E	

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
SolTmMult	ASG	SOL Inv. time coefficient	E	
ClpStat	SPG	CLP status	E	
ClpStrVal	ASG	CLP pick-up value	E	
ClpOpDTms	ASG	CLP operate delay time	E	
ClpTmMult	ASG	CLP Inv. time coefficient	E	

LN Type: SE_PTOC_DOC2_EasergyP5U_LPT_V001

Description: Time overcurrent

LN Class: PTOC

PTOC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5DOCLPTOC3 P5DOCLPTOC4		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
DirMode	ENG	Direction mode	E	
AngOffset	ASG	Angle offset	E	
OpDITms	ASG	Operate delay time	E	
InrushStat	SPG	Inrush status	E	
SolStat	SPG	SOL status	E	
SolOpDTms	ASG	SOL operate delay time	E	
ClpStat	SPG	CLP status	E	
ClpStrVal	ASG	CLP pick-up value	E	
ClpOpDTms	ASG	CLP operate delay time	E	

LN Type: SE_PTOF_OFUF_EasergyP5FMV_V00V002/

SE_PTOF_OFUF_EasergyP5U_LPT_V002

Description: Overfrequency

LN Class: PTOF

PTOF class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5OFUFPTOF1 P5OFUFPTOF2 P5LPTPTOF1 P5LPTPTOF2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTOV_EasergyP5FMV_V002/

SE_PTOV_EasergyP5U_LPT_V001

Description: Overvoltage

LN Class: PTOV

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5OVPTOV1 P5OVPTOV2 P5OVPTOV3 P5OVLPTOV1 P5OVLPTOV2 P5OVLPTOV3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTOV_UO_EasergyP5FMV_V001/

SE_PTOV_UO_EasergyP5U_LPT_V001

Description: Overvoltage

LN Class: PTOV

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UOPTOV1 P5UOPTOV2 P5UOPTOV3 P5UOLPTOV1 P5UOLPTOV2 P5UOLPTOV3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	
RsDITms	ASG	Reset time	E	

LN Type: SE_PTOV_NEG_EasergyP5FMV_V001/

SE_PTOV_NEG_EasergyP5U_LPT_V001

Description: Overvoltage**LN Class:** PTOV

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5NEGPTOV1 P5NEGPTOV2 P5NEGLPTOV1 P5NEGLPTOV2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	
OpMod	ENG	Operate mode	E	
StrVal	ASG	Pick-up value	O	

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
DITyp	ENG	Delay type	E	
OpDITms	ASG	Operate delay time	E	
RsDITms	ASG	Reset time	E	

LN Type: SE_PTOV_CAP_EasergyP5F_V001

Description: Overvoltage

LN Class: PTOV

PTOV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5CAPPTOV1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	O	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
CapOfPhs	ASG	L-N capacitance of one phase	E	
RatUcLn	ASG	Rated L-N voltage UcLN	E	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTTR_THF_EasergyP5FU_V002

Description: Thermal overload

LN Class: PTTR

PTTR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5THFPTTR1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				

PTTR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Op	ACT	Operate	M	
AlmThm	SPS	Thermal alarm	O	
Settings				
TmpMax	ASG	Max object temperature	O	
AlmVal	ASG	Thermal alarm value	O	
FunEna	SPS	Function enable	E	
BasicCur	ASG	Basic current setting	E	
FactorK	ASG	Factor k	E	
HeaConsTmm	ASG	Heating time constant	O	
RsvVal	ASG	Reserve time thermal alarm	E	
TmpMod	ENG	Temperature based mode	E	
TmpNom	ASG	Nominal ambient temp	E	
TmpAlrm	ASG	Alarm temperature	E	
TmpAmbMin	ASG	Min ambient temperature	E	
TmpAmbDft	ASG	Default ambient temperature	E	

LN Type: SE_PTTR_THM_EasergyP5MU_V002

Description: Thermal overload

LN Class: PTTR

PTTR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5THMPTR1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Op	ACT	Operate	M	
AlmThm	SPS	Thermal alarm	O	
Settings				
TmpMax	ASG	Max object temperature	O	
AlmVal	ASG	Thermal alarm value	O	
FunEna	SPS	Function enable	E	
BasicCur	ASG	Basic current setting	E	
FactorK	ASG	Factor k	E	
HeaConsTmm	ASG	Heating time constant	E	
ConsTmm	ASG	Time constant for motor starting	E	
CooConsTmm	ASG	Cooling time constant	E	
UnblFctr	ASG	Unbalance factor	E	

PTTR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
RsvVal	ASG	Reserve time thermal alarm	E	
TmpMod	ENG	Temperature based mode	E	
TmpNom	ASG	Nominal ambient temp	E	
TmpAlrm	ASG	Alarm temperature	E	
TmpAmbMin	ASG	Min ambient temperature	E	
TmpAmbDft	ASG	Default ambient temperature	E	

LN Type: SE_PTUC_UC_EasergyP5MU_V002

Description: Undercurrent

LN Class: PTUC

PTUC class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UCPTUC1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTUF_UF_EasergyP5FMV_V002/SE_PTUF_UF_EasergyP5U_LPT_V002

Description: Underfrequency

LN Class: PTUF

PTUF class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UFPTUF1 P5UFPTUF2 P5UFLPTUF1 P5UFLPTUF2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	

PTUF class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTUV_UV_EasergyP5FMV_V002/

SE_PTUV_UV_EasergyP5U_LPT_V002

Description: Undervoltage

LN Class: PTUV

PTUV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UVPTUV1 P5UVPTUV2 P5UVPTUV3 P5UVLPTUV1 P5UVLPTUV2 P5UVLPTUV3		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PTUV_UVPS_EasergyP5MV_V002

Description: Undervoltage

LN Class: PTUV

PTUV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5UVPSPTUV1 P5UVPSPTUV2		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only

PTUV class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PZSU_EasergyP5MU_V001**Description:** Motor underspeed**LN Class:** PZSU

PZSU class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5MOTPZSU1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start	M	
Op	ACT	Operate	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pick-up value	O	
OpDITms	ASG	Operate delay time	E	

LN Type: SE_PHAR_ID_EasergyP5FMU_V001**Description:** Harmonic restraint**LN Class:** PHAR

PHAR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5IDPHAR1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only

PHAR class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Str	ACD	Start (active when restraint is needed)	M	
Settings				
FunEna	SPG	Function enable	E	
StrVal	ASG	Pickup for 2nd harmonic	E	
CurBlkVal	ASG	Max inrush current	E	

LN Type: SE_LLNO_EasergyP5_V002

Description: Logical node zero

LN Class: LLNO

LLNO class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
LLNO		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
Loc	SPS	Local control behaviour	O	
Controls				
LEDRs	SPC	LED reset	O	
Settings				
GoEnaCB1	SPG	GOOSE Enable CB1	E	
GoEnaCB2	SPG	GOOSE Enable CB2	E	
GoEnaCB3	SPG	GOOSE Enable CB3	E	
GoEnaCB4	SPG	GOOSE Enable CB4	E	

LN Type: SE_LTMS_BASIC_EasergyP5_V001

Description: Time master supervision

LN Class: LTMS

LTMS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
P5SNTPLTMS1		The name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to IEC 61850-7-2, Clause 22.	M	
Data Objects				
Common Logical Node Information				

LTMS class				
Data object name	Common data class	Explanation	M/O/C/E	Remarks
Mod	ENC	Mode	C1	Status-only
Beh	ENS	Behaviour	M	
Health	ENS	Health	C1	
NamPlt	LPL	Name plate	C1	
Status Information				
TmSrc	VSS	Current time source	M	
TmSrcTyp	ENS	Type of the clock source	E	
Controls				
Settings				
TmSrcSet1	VSG	Setting to define the main IP address of SNTP	O	
TmSrcSet2	VSG	Setting to define the backup IP address of SNTP	O	

Enum types extensions

New Enum types

Enum type ARCOpMode is one of new added types defined as below.

Value	Description	Remarks
0	Light	
1	Light and current	

Enum type DefDirMode is one of new added types defined as below.

Value	Description	Remarks
0	ResCap	
1	Sector	
2	Undir	

Enum type DocDirMode is one of new added types defined as below.

Value	Description	Remarks
0	Dir_Backup	
1	Undir	
2	Dir	

Enum type DICrvFamily is one of new added types defined as below.

Value	Description	Remarks
0	DT	
1	IEC	
2	IEEE	
3	IEEE2	
4	Others	
5	Prg1	

6	Prg2	
7	Prg3	

Enum type RsTyp is one of new added types defined as below.

Value	Description	Remarks
0	DT	
1	IDMT	

Enum type DType is one of new added types defined as below.

Value	Description	Remarks
0	DT	
1	NI	
2	VI	
3	EI	
4	LTI	
5	LTEI	
6	LTVI	
7	MI	
8	STI	
9	STEI	
10	CO8	
11	RI	
12	RXIDG	
13	—	

Enum type NetGrd is one of new added types defined as below.

Value	Description	Remarks
0	Res	
1	Cap	

Enum type NegOPMod is one of new added type defined as below.

Value	Description	Remarks
0	No_Action	
1	Blocking	

Enum type NegDType is one of new added type defined as below.

Value	Description	Remarks
0	DT	
1	INV	

Enum type StrMod is one of new added type defined as below.

Value	Description	Remarks
0	Negative	
1	Positive	
2	Either	

Enum type MemoryMode is one of new added types defined as below.

Value	Description	Remarks
0	None	
1	Voltage	
2	Time	
3	Both	

Enum type EfDirModeKind is one of new added type defined as below.

Value	Description	Remarks
0	Forward	
1	Reverse	

Enum type SlotDISelect is one of new added type defined as below.

Value	Description	Remarks
0	Slot_C_DI1	
1	Slot_D_DI1	
2	Slot_E_DI1	

Enum type VTTypeKind is one of new added type defined as below.

Value	Description	Remarks
0	VT	
1	LPVT	

Enum type TempModKind is one of new added type defined as below.

Value	Description	Remarks
0	Current	
1	Ambient	

Enum type PadmDirMod is one of new added type defined as below.

Value	Description	Remarks
0	Undir	
1	Forward	
2	Reverse	

Enum type SignalNum is one of new added type defined as below.

Value	Description	Remarks
0	1	
1	2	

Enum type ClockSourceKind is one of new added type defined as below.

Value	Description	Remarks
1	Unknown	
2	SNTP	
3	PTP	

Value	Description	Remarks
4	IRIG-B	
5	Substation internal	

Extended Enum types

Enum type SIUnitKind is extended by the following enumerations.

Value	Quantity	Unit name	Symbol
-6	Numerical tagging method	per unit	pu
-7	Percent	percent	%
-8	Relative temperature	degree Fahrenheit	°F
-9	Electric resistance	ohm (V/A)	V/A
-10	Rotational speed	Revolutions per minute	rmp
-11	Pulse per rotation	Pulse per rotation	/R

Enum type AutoReclosingKind is extended by the following enumerations.

Value	Symbol
-1	Reclaim
-2	Ready_Ext
-3	WaitOpen
-4	WaitClose
-5	Discrim
-6	Locked
-7	FinalTr
-8	CBFail
-9	Inhibit
-10	Blocked
-11	ExtOpen
-12	ExClose
-13	WaitSync

PIXIT details

Introduction

This PIXIT is based upon UCAIug PIXIT Template version 15, UCA International Users Group Testing Sub Committee, October 22, 2019.

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in P5U20, P5V20, P5F30, P5M30, with firmware version V01.

Together with the PICS and the MICS the PIXIT document forms the basis for a conformance test according to IEC 61850-10. The PIXIT entries contain information which is not available in the PICS, MICS, TICS documents or SCL file.

Each chapter specifies the PIXIT for applicable ACSI service model as structured in IEC 61850-10. The “Ed” column indicates if the entry is applicable for IEC 61850 Edition 1 and/or Edition 2.

PIXIT for documentation

ID	Ed	Description	Value / Clarification
Do1	2	How to expose required firmware versions not present in the data model	Information included in the ICD file and in the data model (LLN0.NamePit.swRev)

PIXIT for association model

The extra information for testing is given in the table below.

Table 76 - Protocol implementation extra information for testing

ID	Ed	Description	Value / Clarification
As1	1	Maximum number of clients that can set-up an association simultaneously	8
As2	1,2	TCP_KEEPALIVE value. The recommended range is 0...20s	Configurable: from 0 to 20s
As3	1,2	Lost connection detection time	TCP_KEEPALIVE + 2s *10 Maximum 140s (2s is retransmission interval of TCP Keep-alive message, 10 retransmissions) (0 means 120s)
As4	-	Authentication is not supported yet	
As5	1,2	What association parameters are necessary for successful association	Transport selector Calling: N Called: Y Session selector Calling: N Called: Y Presentation selector Calling: N Called: Y AP title Calling: N Called: N AE qualifier Calling: N Called: N
As6	1,2	If association parameters are necessary for association, describe the correct values. Association parameters are configurable, default values are	Transport selector 1 Session selector 1 Presentation selector 1 AP title 1,1,1,999,1

Table 76 - Protocol implementation extra information for testing (Continued)

ID	Ed	Description	Value / Clarification
			AE qualifier 12
As7	1,2	What is the maximum and minimum MMS PDU size	Max: 65535 bytes Min: In initiate request 1024 bytes
As8	1,2	What is the maximum start up time after a power supply interrupt	P5 relay start-up time including the server function is at average 180s; it depends on the configuration size (number and types of logical nodes)
As9	1,2	Does this device function only as test equipment? (test equipment need not have a non-volatile configuration; but it cannot be part of the substation automation system)	N

PIXIT for server model

ID	Ed	Description	Value / Clarification
Sr1	1,2	Which analogue value (MX) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, Y Questionable N Overflow Y OutofRange N BadReference N Oscillatory N Failure N OldData N Inconsistent N Inaccurate Source: Y Process N Substituted Y Test N OperatorBlocked
Sr2	1,2	Which status value (ST) quality bits are supported (can be set by server)	Validity: Y Good, Y Invalid, N Reserved, Y Questionable N BadReference N Oscillatory N Failure Y OldData N Inconsistent N Inaccurate Source: Y Process N Substituted Y Test N OperatorBlocked
Sr3	-	What is the maximum number of data object references in one GetDataValues request	Deprecated
Sr4	-	What is the maximum number of data object references in one SetDataValues request	Deprecated
Sr5	1	Which Mode values are supported	On Y [On-]Blocked N Test Y Test/Blocked Y Off N

PIXIT for data set model

ID	Ed	Description	Details
Ds1	1	What is the maximum number of data elements in one data set (compare ICD setting)	500
Ds2	1	How many persistent data sets can be created by one or more clients (this number includes predefined data sets)	50
Ds3	1	How many non-persistent data sets can be created by one or more clients	50

NOTE: Arrays are not supported in dataset.

PIXIT for setting group control model

ID	Ed	Description	Value / Clarification
Sg1	1	What is the number of supported setting groups for each logical device	4
Sg2	1,2	What is the effect of when and how the non-volatile storage is updated (compare IEC 61850-8-1 §16.2.4)	When: CnfEdit set to TRUE successfully. How: the setting value in edit buffer will be copied to the selected setting group, and then the new value will be updated to non-volatile storage by setting engine.
Sg3	1	Can multiple clients edit the same setting group	N
Sg4	1	What happens if the association is lost while editing a setting group	The SE values changes are lost, the EditSG value will not change.
Sg5	1	Is EditSG value 0 allowed	Y Write a value of 0 to EditSG will cancel all the setting values in the Edit buffer.
Sg6	2	When ResvTms is not present how long is an edit setting group locked	Reserved forever except Cancel, Confirm or Disconnection.

PIXIT for reporting model

ID	Ed	Description	Details	
Rp1	1	The supported trigger conditions (compare PICS)	integrity	Y
			data change	Y
			quality change	Y
			data update	Y
			general interrogation	Y
Rp2	1	The supported optional fields are	sequence-number	Y
			report-time-stamp	Y
			reason-for-inclusion	Y
			data-set-name	Y
			data-reference	Y
			buffer-overflow (not applicable to URCB)	Y

ID	Ed	Description	Details	
			entryID (not applicable to URCB)	Y
			conf-rev	Y
			segmentation	Y
Rp3	1,2	Can the server send segmented reports? (when not supported the device shall refuse an association request with a smaller than minimum PDU size)	Y	
Rp4	1,2	Mechanism on second internal data change notification of the same analogue data value within buffer period (compare IEC 61850-7-2 §14.2.2.9)	Send report immediately	
Rp5	1	Multi client URCB approach (compare IEC 61850-7-2 §14.2.1)	Each URCB is visible to all clients	
Rp6	-	What is the format of EntryID	Deprecated	
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered	100k bytes per report control block	
Rp8	-	Pre-configured RCB attributes that are dynamic, compare SCL report settings	Deprecated	
Rp9	1	May the reported data set contain: - structured data objects? - data attributes?	Y Y	
Rp10	1,2	What is the scan cycle for binary events? Is this fixed, configurable or event-driven	5 milliseconds Fixed	
Rp11	1	Does the device support to pre-assign a RCB to a specific client in the SCL	N	
Rp12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart	from the original configuration	
Rp13	1,2	Does the server accept any client to configure / enable a BRCB with ResvTms=-1? What fields are used to do the identification?	N	
Rp14	2	When BRCB.ResvTms is exposed, what is default value for BRCB.ResvTms if client does not write (must be > 0) or When BRCB.ResvTms is not exposed, what is the internal reservation time (must be >= 0)	1s 1s	

PIXIT for GOOSE publish model

ID	Ed	Description	Value / Clarification
Gp1	1,2	Can the test (Ed1) / simulation (Ed2) flag in the published GOOSE be set	N
Gp2	1	What is the behaviour when the GOOSE publish configuration is incorrect	NdsCom=T DUT keeps GoEna=F
Gp3	1,2	Published FCD supported common data classes / data types are	Common data classes: SPS, DPC, CMV, MV Data types as single attributes: BOOLEAN, CODED ENUM, FLOAT32, QUALITY Arrays are not supported.
Gp4	1,2	What is the maximum value of TAL (maxTime) Is it fixed or configurable	Maximum TAL = 120000 ms (double of maximum configurable slowest retransmission cycle 60000 ms) Configurable by configuration tool
Gp5	1,2	What is the fastest retransmission time Is it fixed or configurable	4 ms Retransmission scheme: First message upon data change, followed by 4, 10, 20, 40, 80, 160, 320, 640, 1280, 2500, 5000, 10000, 20000, 40000, 60000 and finally reaching the configured slow retransmission time). TAL is set to value 2 times bigger than interval. Fixed
Gp6	-	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)	Deprecated
Gp7	1,2	What is initial GOOSE sqNum after restart of the device	1
Gp8	1	May the GOOSE data set contain: - structured data objects (FCD) - timestamp data attributes	Y Y
Gp9	1,2	Does Server or ICT check GOOSE payload data set length	Y

PIXIT for GOOSE subscribe model

ID	Ed	Description	Value / Clarification
Gs1	1,2	What elements of a subscribed GOOSE message are checked to decide the message is valid and the allData values are accepted? If yes, describe the conditions. Notes: - the VLAN tag may be removed by a ethernet switch and shall not be checked - the simulation flag shall always be checked (Ed2)	Y destination MAC address (equal to configured) Y APPID (equal to configured) N gocbRef N timeAllowedtoLive (see Remarks) N dataSet Y gold (equal to configured, checking can be set off) N t Y stNum (see Remarks) N sqNum (see Remarks) Y simulation/test (if true, values not passed to application, the application data will keep last received value when simulation/test was false, but status of the network input stays valid) Y confRev (equal to configured) Y ndsCom (if true, values not passed to application, the application data will keep last received value, and network inputs status is set to invalid as if message was never received) Y numDataSetEntries (see Remarks) N out-of-order dataset members
Gs2	1,2	When is a subscribed GOOSE marked as lost (TAL = time allowed to live value from the last received GOOSE message)	Message does not arrive by TAL+1s Internally in the relay there is a status indication to the application about GOOSE problem (data is marked as OLD if the message does not arrive prior to TAL+1s if TAL>1s or prior to 1s if TAL<1s).
Gs3	1,2	What is the behaviour when one or more subscribed GOOSE messages isn't received or syntactically incorrect (missing GOOSE)	The subsequently received GOOSE message is accepted even if the new state number is not equal to the incremented value of the previously received state number (it is enough that it is not equal to the last received state number).
Gs4	1,2	What is the behaviour when a subscribed GOOSE message is out-of-order	Message is treated as normal (it is assumed that previous messages have been lost).
Gs5	1,2	What is the behaviour when a subscribed GOOSE message is duplicated	Duplicated message is ignored
Gs6	1	Does the device subscribe to GOOSE messages with/without the VLAN tag	Y with the VLAN tag Y without the VLAN tag
Gs7	1	May the GOOSE data set contain: - structured data objects - data attributes	Y Y
Gs8	1,2	Subscribed FCD supported common data classes / data types are	Data classes: SPS, SPC, DPS, DPC, INS, INC, ENS, ENC, CMV, MV Data types as single attributes: BOOLEAN, INT8, INT16, INT32, INT8U, INT16U, INT32U, ENUM, CODED ENUM, BITSTRING, FLOAT32 Arrays are not supported
Gs9	1,2	Are subscribed GOOSE with test=T (Ed1) /	N - Simulation mode is not supported by the device

ID	Ed	Description	Value / Clarification
		simulation=T (Ed2) accepted in test/ simulation mode	
Gs10	1,2	Max number of dataset members	Unlimited
Gs11	1	Is Fixed-length encoded GOOSE supported	Y

TAL = Time Allowed to Live

Remarks:

A GOOSE message will be accepted and processed by the subscriber in DUT:

- Even if it is received after expiration of the time allowed to live sent in the previous message,
- Even if the new state number is not equal to the incremented value of the previously received state number - it is enough that it is not equal to the last received state number,
- If the state number differs from the previously received state number, the sequence number is accepted with any value (if the state number is equal to the previously received state number, the message is treated as retransmission),
- Even if the received message contains a dataset of the size different than the size of the previously received dataset.

A GOOSE message will NOT be accepted by the subscriber in DUT if:

- Destination MAC address is not equal to configured one
- Protocol ID is not equal to 0x88B8
- APPID is not equal to configured one for any of the network inputs
- ConfRev is not equal to configured one for any of the network inputs
- goID is not equal to configured one for any of the network inputs
- state number is the same as in the previous message (is treated as retransmission)
- ndsCom bit is set to true in received message

Note for sGosN6h (out of order dataset):

Value from GOOSE message will be accepted even if the type is different than in previous message given that:

- Type is compatible with network input type i.e. for binary network inputs accepted types are: BOOLEAN, INTEGER and BITSTRIG, ENUM, CODED ENUM for analog network inputs accepted types are FLOAT32 and INTEGER
- In case of binary network input and types other than BOOLEAN as a value for processing bit selected in configuration will be taken from the received data in the message (by default it is bit 0)
- Value will not be accepted if data from the message is not containing configured bit (for example if bit 5 is configured and received data contains only 2 bits like stVal from DPC type)

Every network input can be associated via internal logic with one of 16 validity indications. If given network input is not received due to one of the reasons mentioned above this indication is activated. Validity flag for the network input will be activated also if next message with the value will not be received within the time indicated in **time to live** field contained in the previous message.

The value of numDatSetEntries from the header determines how many data entries from the message are processed. With numDatSetEntries = 0 no data entries are processed from the received message. If numDatSetEntries is lower than expected (source information for some network inputs is not processed or missing) those missing network inputs will be marked as invalid.

During device startup there can be more than one state transition of the GOOSE publisher dataset, since different parts of the relay application will start after GOOSE publisher.

PIXIT for GOOSE performance

ID	Ed	Description	Value / Clarification	
Gf1	1,2	Performance class	P2	
Gf2	1,2	GOOSE ping-pong processing method	Scan cycle based	
Gf3	1,2	Application logic scan cycle (ms)	Max.	3 ms for SPS, 10 ms for DPS
			Min.	0 ms for SPS, 0 ms for DPS
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality has to be counted as separate attributes)	500	

PIXIT for control model

ID	Ed	Description	Value / Clarification
Ct1	1	What control models are supported (compare PICS)	DOs: Y SBOs: Y DOes: Y SBOes: Y
Ct2	1,2	Is the control model fixed, configurable and/or dynamic?	Configurable for CSWI class: All controllable objects Obj1 ... Obj6 under CSWI class are configured to use one and the same chosen control model. Objects Obj7 ... Obj8 under CSWI class have fixed control model status-only. Fixed for GGIO: All controllable objects under GGIO class the control model is fixed: direct-with-normal-security.
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated
Ct4	-	Is "operate-many" supported (compare sboClass)	Deprecated
Ct5	1	Will the DUT activate the control output when the test attribute is set in the SelectWithValue and/or Operate request (when N test procedure Ct12 is applicable)	N
Ct6	-	What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request	Deprecated
Ct7	-	Is pulse configuration supported (compare pulseConfig)	Deprecated
Ct8	1	What is the behaviour of the DUT when the check conditions are set Is this behaviour fixed, configurable, online changeable?	N synchrocheck N interlock-check DUT ignores the check value and the command is executed as usual Fixed

ID	Ed	Description	Value / Clarification
Ct9	1,2	Which additional cause diagnosis are supported	N Unknown Y Not-supported Y Blocked-by-switching-hierarchy N Select-failed Y Invalid-position Y Position-reached N Step-limit Y Blocked-by-Mode N Blocked-by-process N Blocked-by-interlocking N Blocked-by-synchrocheck Y Command-already-in-execution N Blocked-by-health N 1-of-n-control N Abortion-by-cancel Y Time-limit-over N Abortion-by-trip Y Object-not-selected Y Object-already-selected N No-access-authority N Ended-with-overshoot N Abortion-due-to-deviation N Abortion-by-communication-loss N Blocked-by-command N None Y Inconsistent-parameters Y Locked-by-other-client N Parameter-change-in-execution
Ct10	1,2	How to force a "test-not-ok" respond with SelectWithValue request?	Put device into local mode
Ct11	1,2	How to force a "test-not-ok" respond with Select request?	Put device into local mode
Ct12	1,2	How to force a "test-not-ok" respond with Operate request?	DOns: Operate with orCat out of range SBOs: Operate without Select DOes: Operate with orCat out of range SBOes: Operate without Select
Ct13	1,2	Which origin categories are supported/accepted?	Y bay-control Y station-control Y remote-control Y automatic-bay Y automatic-station Y automatic-remote Y maintenance

ID	Ed	Description	Value / Clarification
			Y process
Ct14	1,2	What happens if the orCat is not supported or invalid	DOns: Negative response SBOs: Negative response DOes: Negative response (with additional cause diagnosis code value Not-supported) SBOes: Negative response (with additional cause diagnosis code value Not-supported)
Ct15	1,2	Does the IED accept a SelectWithValue/ Operate with the same control value as the current status value? Is this behaviour configurable?	DOns: N SBOs: N DOes: N Addcause: Position-reached SBOes: N Addcause: Position-reached Configurable: N
Ct16	1	Does the IED accept a select/operate on the same control object from 2 different clients at the same time?	DOns: Y (see Remarks) SBOs: N DOes: N SBOes: N
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (tissue 334)	SBOs: N SBOes: N
Ct18	1	Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step?	Y During SelectWithValue and during Operate
Ct19	-	Can a control operation be blocked by Mod=Off or [On-]Blocked (compare PIXIT Sr5)	Deprecated
Ct20	1,2	Does the IED support local / remote operation?	Y
Ct21	1,2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security?	SBOs: N DOns: N
Ct22	2	How to force a "parameter-change-in-execution"	SBOs: N/A SBOes: N/A
Ct23	1,2	How many SBOs/ SBOes control objects can be selected at the same time?	SBOs: 1 SBOes: 1
Ct24	1,2	Can a controllable object be forced to keep its old state e.g. Internal Controllable Objects may not be accessible to force this, whereas a switch like Circuit Breaker outside the DUT can?	Y
Ct25	1,2	When CDC=DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	Y

ID	Ed	Description	Value / Clarification
Ct26	1,2	Name a DOes point (if any) with a finite operate timeout and specify the timeout (in milliseconds)	Relay/Obj1CSWI1.Pos Operate timeout can be configured by setting Configuration Tool, the range is 0.02 ... 600 s. For example: DOes: 10000 ms SBOes: 10000 ms
Ct27	2	Does the IED support control objects with external signals?	DOns: Y SBOs: Y DOes: Y SBOes: Y
Ct_ex1		SBO Timeout	60 seconds

NOTE: In DOns model: When two clients send Operate request within a very short interval (under 100 ms) then for processing the second command the object position is still unchanged due to the first command, thus both clients receive positive Operate response.

PIXIT for time synchronisation

ID	Ed	Description	Value / Clarification
Tm1	1	What time quality bits are supported (may be set by the IED) Ed.2 requires all 3 bits	Y LeapSecondsKnown Y ClockFailure Y ClockNotSynchronized
Tm2	1,2	Describe the behaviour when the time server(s) ceases to respond What is the time server lost detection time	Time is taken from internal RTC The latency depends on measured drift of the internal clock. Usually it can take 400 seconds
Tm3	1,2	How long does it take to take over the new time from time server	Depends on time difference between internal and time server. Max. 400 s is the waiting time to see Timestamp Quality transition to ClockNotSynchronised.
Tm4	1,2	When is the time quality bit "Clock failure" set?	The time quality bit "Clock failure" is set to "one" when the P5 IED restarts from power up, or when the connection to time server is lost; the bit is reset to "zero" when the clock becomes synchronised. All available time synchronisation sources will affect the "Clock failure" bit. These time sources include SNTP and where applicable, IRIG-B.
Tm5	1	When is the time quality bit "Clock not synchronised" set? Note: For Ed2 and up, CNS is set according to PIXIT Tm2	The time quality bit "Clock not synchronised" is set to "one" when the P5 IED starts from power up, or when the connection to time server is lost; the bit is reset to "zero" when the clock becomes synchronised. All available time synchronisation sources will affect the "Clock not synchronised" bit. These time sources include SNTP and where applicable, IRIG-B.
Tm6	-	Is the timestamp of a binary event adjusted to the configured scan cycle?	Deprecated
Tm7	1	Does the device support time zone and daylight saving?	Y

ID	Ed	Description	Value / Clarification
Tm8	1,2	Which attributes of the SNTP response packet are validated?	N Leap indicator not equal to 3 N Mode is equal to SERVER Y OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp Y RX/TX timestamp fields are checked for reasonableness Y SNTP version 3 or 4 N other
Tm9	1,2	Do the COMTRADE files have local time or UTC time Is this configurable	Local N

PIXIT for file transfer model

ID	Ed	Description	Value / Clarification
Ft1	1	What is structure of files and directories Where are the COMTRADE files stored Are comtrade files zipped and what files are included in each zip file	Directory structure - COMTRADE - DR - TREND COMTRADE files stored in folder / COMTRADE /DR Zipped; Each COMTRADE record includes 2 files: .cfg and .dat
Ft2	1,2	Directory names are separated from the file name by	Separated by '/'
Ft3	1	The maximum file name size including path (recommended 64 chars)	255 Below are all the maximum sizes: - Full file name (including the directory path, suffix and separation characters): 255 - File name: 64 - File directory name: 32 - File name suffix: 3
Ft4	1,2	Are directory/file name case sensitive	Case sensitive
Ft5	1,2	Maximum file size for SetFile	SetFile is not supported.
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name	Y
Ft7	1	Is the wild char supported MMS fileDirectory request	Y
Ft8	1,2	Is it allowed that 2 clients get a file at the same time	N
Ft9	1,2	Which files can be deleted	None

TICS details

Introduction

The TICS is based upon UCAlug TICS Template version 2.1, UCA International Users Group Testing Sub Committee, April 23, 2019.

This document is applicable for P5U20, P5V20, P5F30 and P5M30, with firmware version V01.

Mandatory Edition 2 Tissues

The below tables give an overview of the applicable mandatory Tissues.

The original TISSUE should be consulted for details of changes.

Implemented by server:

Y: means that the server has implemented the respective tissue

ni: no impact on testing

na: not applicable if the server does not support the corresponding ACSI service(s)

Supported by client:

Y: means that the client supports servers that have implemented the respective tissue

ni: no impact on testing

na: not applicable if the client does not support the corresponding ACSI service(s)

Table 77 - Tissues implementation conformance statement

Part 6 Tissue	Description	Implemented Y/na
658	Tracking related features	na
663	FCDA element cannot be a "functionally constrained logical node"	Y
668	Autotransformer modeling	na
687	SGCB ResvTms	na
719	ConfDataSet - maxAttributes definition is confusing	Y
721	Log element name	na
768	bType VisString65 is missing	na
779	Object references	na
788	SICS S56 from optional to mandatory	na
789	ConfLdName as services applies to both server and client	na
804	valKind and IED versus System configuration	na
806	Max length of log name inconsistent between IEC 61850-6 and IEC 61850-7-2	na
807	Need a way to indicate if "Owner" present in RCB	Y
823	ValKind for structured data attributes	na
824	Short addresses on structured data attributes	na
825	Floating point value	na
845	SGCB ResvTms	na
853	SBO and ProtNs	Y
855	Recursive SubFunction	na

Table 77 - Tissues implementation conformance statement (Continued)

Part 6 Tissue	Description	Implemented Y/na
856	VoltageLevel frequency and phases	na
857	Function/SubFunction for ConductingEquipment	na
886	Missing IEC 61850-8-1 P-types	na
901	tServices as AP or as IED element	Y
936	SupSubscription parameter usage is difficult	na
1147	tServices - FileHandling not consistent with IEC 61850-7-2	Y
1185	ValKind value Conf for EX FC data valKind=Conf is allowed for dataNs	na
1284	SCSM mapping may require a communication section in an ICD file	Y
1328	Limitation on the size of data type templates identifiers	Y
1395	Client LN attributes	na
1402	ExtRef during engineering	na
1415	SICS-S110 IID import mandatory for Edition2	na
1419	Support of IdName on other IEDs SICS I212 is now mandatory	Y
1444	Need to support fixed and SCT controlled datasets	na
1445	ConfReportControl and a fixed ReportSettings	na
1450	OriginalSciXxx computation rules	Y
1485	Need to supercede Tissue 1398 to clarify SCT behaviour	na

Part 7-1 Tissue	Description	Implemented Y/na
828	Data model namespace revision IEC 61850-7-4:2007[A]	Y
948	Enumeration (string) values format	na
1151	Simulated GOOSE disappears after 1st appearance when LPHD.Sim = TRUE	na
1396	The use and configuration flow of LGOS and LSVS is unclear	na
1447	Restriction on ENUMtypes in SCL	na
1457	Multiple DOI nodes with the same name	na
1468	Re-use DO from other LN	Y
1491	CmdBlk blocks itself	na
1495	GetVariableAccessAttributes error code	Y

Part 7-2 Tissue	Description	Implemented Y/na
728	BRCB: could PurgeBuf be set when RptEna = TRUE	Y
778	AddCause values – add value not-supported	na
780	What are unsupported trigger options at a control block	Y
783	TimOper Resp- ; add authorisation check	na
786	AddCause values 26 and 27 are switched	Y
820	Mandatory ACSI services (use for PICS template)	Y
858	Typo in enumeration ServiceType	na
861	Dchg of ConfRev attribute	na
1050	GTS Phycomaddr definition in SCL	Y
1071	Length of DO name	Y

Part 7-2 Tissue	Description	Implemented Y/na
1127	Missing owner attribute in BTS and UTS	Y
1202	GI not optional	Y
1232	EntryID needs clarification	Y
1242	NTS definition	N
1307	Segmented report with Buffer overflow	Y
1428	MTS and NTS should use svOptFlds	N
1630	Attributes in CDC=LTS do not match 8-1 definition	Y

Part 7-3 Tissue	Description	Implemented Y/na
697	Persistent command / PulseConfig	na
698	Wrong case is BAC.dB attribute	na
711	blkEna freeze data update while setting its quality to operatorBlocked	na
722	Units for 'h' and 'min' not in UnitKind enumeration.	Y
919	Presence Condition for sVC	na
925	Presence of i or f attribute - Problem with writing	na
926	Presence Conditions within RangeConfig	na
954	Data attributes with FC=CF should have trgOp=dchg	na
1078	CMV.t update if rangeAng changed	na
1565	db = 0 behaviour	Y
1578	DataAttribute NameSpace content	N

Part 7-4 Tissue	Description	Implemented Y/na
671	Mistake in definition of Mod & Beh	na
674	CDC of ZRRCLocSta is wrong	na
676	Same data object name used with different CDC	na
677	MotStr is used with different CDC in PMMS and SOPM LN classes	na
679	Remove CycTrMod Enum	na
680	SI unit for MHYD.Cndct	na
681	Enum PIDAlg	na
682	ANCR.ParColMod	na
683	Enum QVVR.IntrDetMth	na
685	Enum ParTraMod	na
686	New annex H - enums types in XML	na
694	Data object CmdBik	na
696	LSVS.St (Status of subscription)	na
712	Interpretation of quality operatorBlocked	na
713	DO Naming of time constants in FFIL	na
714	Enums for ShOpCap and SwOpCap	na
715	RBDR.ChNum1	na
716	TAXD text for condition	na
724	ANCR.Auto	na
725	Loc in LN A-group	na

Part 7-4 Tissue	Description	Implemented Y/na
734	LLN0.OpTmh vs. LPHD.OpTmh	na
736	PFSign	na
742	GAPC.Str, GAPC.Op and GAPC.StrVal	Y
743	CCGR.PmpCtl and CCGR.FanCtl	na
744	LN STMP, EEHealth and EEName	na
772	LPHD.PwrUp/PwrDn should be transient	na
773	Loc, LockKey and LocSta YPSH and YLTC	na
774	ITCI.LockKey	na
776	LPHD.OutOv/InOv and LCCH.OutOv/InOv	na
800	Misspelling in CSYN	na
802	CCGR and Harmonized control authority	na
808	Presence condition of ZMOT.DExt and new Dos	na
831	Setting of ConfRevNum in LGOS	na
838	Presence condition of ZMOT.DExt and new Dos	na
844	MFLK.PhPiMax, MFLK.PhPiLoFil, MFLK.PhPiRoot DEL->WYE	na
877	QVUB -settings should be optional	na
908	ARIS.StrSeq – transient	na
909	Remove ANCR.ColOpR and ColOpL	na
912	Clarification of PwrRtg/VARtg	na
920	Resettable Counter is NOT resettable	na
932	Rename AVCO.SptVol to AVCO.VolSpt	na
933	Presence of LCCH.RedFerCh and RedRxCnt	na
939	Change CDC for ANCR.FixCol	na
991	LGOS: GoCBRef (as well as LSVS.SvCBRef) should be mandatory	na
1007	PTRC as fault indicator - Update of description required	Y
1044	TapChg in AVCO	na
1077	Rename DOnames within LTIM	na
1256	New DO for LTIM to set time "manually"	na
1331	Mod, Beh and Health with q=TEST, client can't receive their states	na
1426	Add two DO for leap seconds in LTIM	na
1456	Annex A and Mod/Beh/Health	na
1568	ISAF.AImReset ->transient	na

NOTE: Tissues 675, 735, 772, 775, 776, 878 are not relevant for conformance testing.

Part 8-1 Tissue	Description	Implemented Y/na
770	GoID type mismatch 18.1.1 and 18.1.2.5.2	Y
784	Tracking of control (CTS)	na
817	Fixed-length GOOSE float encoding	Y
827	Mandatory ACSI services (Part of IEC 61850-7-2 TISSUE resolution)	Y
834	File dir name length 64	na

Part 8-1 Tissue	Description	Implemented Y/na
951	Encoding of Owner attribute	Y
1040	More associate error codes	Y
1178	Select Response+ is non-null value	Y
1324	The response- for DeleteNamedVariableList is not defined	Y
1345	Fixed-length GOOSE ASN.1 length encoding	na
1441	Optional fields in buffered reports	Y
1442	Journal variableTag for ReasonCode	na
1453	Purge buffer on write to BRCB	Y
1454	Reports can be transmitted before write (RptEna=true) is confirmed	na
1500	The response for DeleteNamedVariableList with a non-existent LN is not specified	Y
1626	PICs For Information Report is incorrect	na

For detailed information on the individual Tissues, connect to the TISSUE database: www.tissues.iec61850.com

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P5/EN M/33C