

RELION® 611 SERIES

# Motor Protection and Control

## REM611

### Modbus Point List Manual







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# Section 1      Introduction

## 1.1      This manual

The point list manual describes the outlook and properties of the data points specific to the protection relay. The manual should be used in conjunction with the corresponding communication protocol manual.

## 1.2      Intended audience

This manual addresses the communication system engineer or system integrator responsible for pre-engineering and engineering for communication setup in a substation from a protection relay perspective.

The system engineer or system integrator must have a basic knowledge of communication in protection and control systems and thorough knowledge of the specific communication protocol.

## 1.3 Product documentation

### 1.3.1 Product documentation set

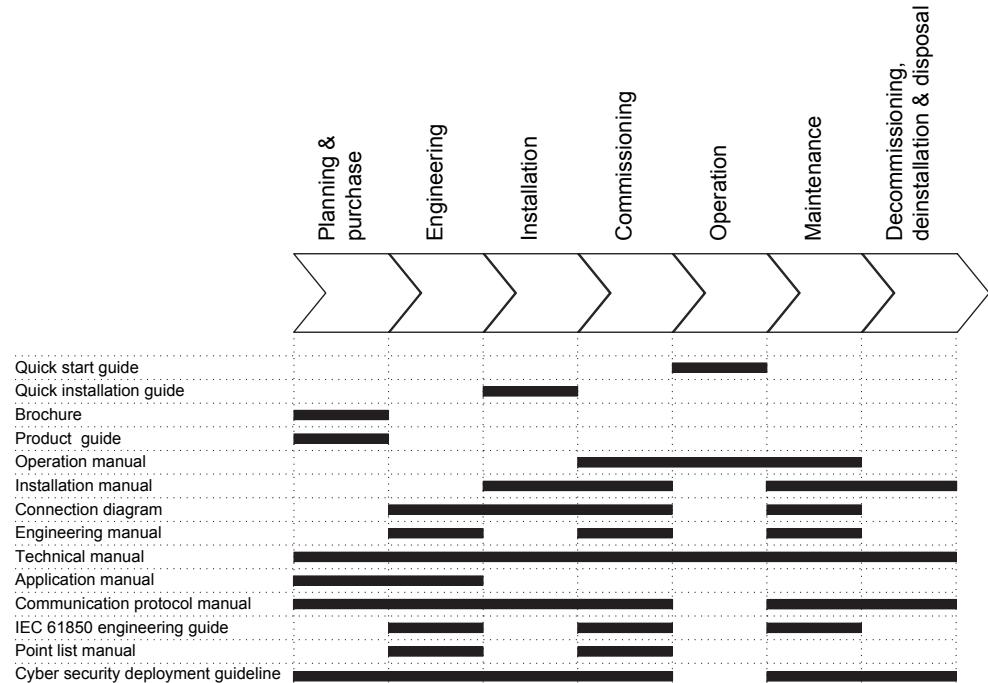


Figure 1: The intended use of manuals in different lifecycles



Product series- and product-specific manuals can be downloaded from the ABB Web site <http://www.abb.com/relion>.

### 1.3.2 Document revision history

Document revision/date	Product version	History
A/2011-11-18	1.0	First release
B/2016-02-22	2.0	Content updated to correspond to the product version
C/2019-04-10	2.0	Content updated



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

### 1.3.3

### Related documentation

Name of the document	Document ID
Modbus Communication Protocol Manual	1MRS757461

## 1.4

## Symbols and conventions

### 1.4.1

### Symbols



The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.



The information icon alerts the reader of important facts and conditions.



The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

Although warning hazards are related to personal injury, it is necessary to understand that under certain operational conditions, operation of damaged equipment may result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

### 1.4.2

### Document conventions

A particular convention may not be used in this manual.

- Abbreviations and acronyms are spelled out in the glossary. The glossary also contains definitions of important terms.
- Push button navigation in the LHMI menu structure is presented by using the push button icons.  
To navigate between the options, use and .
- Menu paths are presented in bold.  
Select **Main menu/Settings**.
- LHMI messages are shown in Courier font.  
To save the changes in nonvolatile memory, select **Yes** and press .
- Parameter names are shown in italics.  
The function can be enabled and disabled with the *Operation* setting.
- Parameter values are indicated with quotation marks.

- The corresponding parameter values are "On" and "Off".
- Input/output messages and monitored data names are shown in Courier font. When the function starts, the START output is set to TRUE.
  - This document assumes that the parameter setting visibility is "Advanced".

### 1.4.3

### Functions, codes and symbols

*Table 1: Functions included in the relay*

Function	IEC 61850	IEC 60617	IEC-ANSI
<b>Protection</b>			
Three-phase non-directional overcurrent protection, low stage, instance 1	PHLPTOC1	3I> (1)	51P-1 (1)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 1	PHIPTOC1	3I>> (1)	50P/51P (1)
Non-directional earth-fault protection, low stage, instance 1	EFLPTOC1	Io> (1)	51N-1 (1)
Non-directional earth-fault protection, high stage, instance 1	EFHPTOC1	Io>> (1)	51N-2 (1)
Negative-sequence overcurrent protection for machines, instance 1	MNSPTOC1	I2>M (1)	46M (1)
Negative-sequence overcurrent protection for machines, instance 2	MNSPTOC2	I2>M (2)	46M (2)
Loss of load supervision	LOFLPTUC1	3I<	37
Motor load jam protection	JAMPTOC1	Ist>	51LR
Motor start-up supervision	STTPMSU1	Is2t n<	49,66,48,51LR
Phase reversal protection	PREVPTOC1	I2>>	46R
Thermal overload protection for motors	MPTTR1	3Ith>M	49M
Circuit breaker failure protection	CCBRBRF1	3I>/Io>BF	51BF/51NBF
Master trip, instance 1	TRPPTRC1	Master Trip (1)	94/86 (1)
<b>Other</b>			
Input switch group <sup>1)</sup>	ISWGAPC	ISWGAPC	ISWGAPC
Output switch group <sup>2)</sup>	OSWGAPC	OSWGAPC	OSWGAPC
Selector <sup>3)</sup>	SELGAPC	SELGAPC	SELGAPC
Minimum pulse timer (2 pcs) <sup>4)</sup>	TPGAPC	TP	TP
Minimum pulse timer (2 pcs, second resolution), instance 1	TPSGAPC	TPS (1)	TPS (1)
Move (8 pcs), instance 1	MVGAPC	MV (1)	MV (1)
<b>Control</b>			
Circuit-breaker control	CBXCBR1	I <-> O CB	I <-> O CB
Emergency start-up	ESMGAPC1	ESTART	ESTART
<b>Condition monitoring and supervision</b>			
Table continues on next page			

<b>Function</b>	<b>IEC 61850</b>	<b>IEC 60617</b>	<b>IEC-ANSI</b>
Trip circuit supervision, instance 1	TCSSCBR1	TCS (1)	TCM (1)
Trip circuit supervision, instance 2	TCSSCBR2	TCS (2)	TCM (2)
Runtime counter for machines and devices	MDSOPT1	OPTS	OPTM
<b>Logging</b>			
Disturbance recorder	RDRE1	DR (1)	DFR(1)
Fault recorder	FLTRFRC1	-	FR
<b>Measurement</b>			
Three-phase current measurement, instance 1	CMMXU1	3I	3I
Sequence current measurement	CSMSQI1	I1, I2, I0	I1, I2, I0
Residual current measurement, instance 1	RESCMMXU1	Io	In

- 1) 10 instances
- 2) 20 instances
- 3) 6 instances
- 4) 10 instances



## Section 2 Modbus data mappings

### 2.1 Overview

This document describes the Modbus data points and structures available in the IED. The point list describes a superset of all data available through the standard configuration/s including the optional functionalities.

The majority of the Modbus data points are valid for all standard configurations. Some data points are standard configuration or optional application dependent and thus not available in each IED. The unavailable, that means unused, data points always return value 0 when they are read. The configuration dependent and optional data do not overlap.

### 2.2 Supported functions in REM611

*Table 2: Supported functions*

Function	IEC 61850	A ME/C101
<b>Protection</b>		
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	1
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	1
Non-directional earth-fault protection, low stage	EFLPTOC	1 <sup>1)</sup>
Non-directional earth-fault protection, high stage	EFHPTOC	1 <sup>1)</sup>
Negative-sequence overcurrent protection for machines	MNSPTOC	2
Loss of load supervision	LOFLPTUC	1
Motor load jam protection	JAMPTOC	1
Motor start-up supervision	STTPMSU	1
Phase reversal protection	PREVPTOC	1
Thermal overload protection for motors	MPTTR	1
Circuit breaker failure protection	CCBRBRF	1
Master trip	TRPPTRC	1
<b>Control</b>		
Circuit-breaker control	CBXCBR	1
Emergency start-up	ESMGAPC	1
<b>Condition monitoring and supervision</b>		
Trip circuit supervision	TCSSCBR	2
Table continues on next page		

Function	IEC 61850	A ME/C101
Runtime counter for machines and devices	MDSOPT	1
<b>Logging</b>		
Disturbance recorder	RDRE	1
Fault recorder	FLTRFRC	1
<b>Measurement</b>		
Three-phase current measurement	CMMXU	1
Sequence current measurement	CSMSQI	1
Residual current measurement	RESCMMXU	1
<b>Other</b>		
Input switch group	ISWGAPC	10
Output switch group	OSWGAPC	20
Selector	SELGAPC	6
Minimum pulse timer (2 pcs)	TPGAPC	10
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1
Move (8 pcs)	MVGAPC	1
1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standardized configuration. ( ) = optional		

1) Io selectable by parameter and default value is "Io measured"

## 2.3 Indications

*Table 3: Explanations of the indications table columns*

Column name	Description
BitA	Default 0X and 1X bit address for the data.
RegA	Default 3X and 4X register.bit (00-15) address for the data.
IEC 61850 name	Original IED data object identification. Described in the IEC 61850 format as Logical Device.Logical Node and thereafter .Data Object.Data Attribute. Logical Node is the same as the application function block name.
SA name	The signal may have a defined label that is visible, for example, in the Application Configuration tool in PCM600.
Description	Short description of the signal. See the technical manual for more information.
Value	Meaning of the value states.

### 2.3.1 Premapped indications

#### 2.3.1.1 Common data 1

*Table 4: Common data 1*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		CTRL.LLN0			
2720	170.00	.Loc.stVal	-	Remote/Local state	0/1=Rem/Loc
2721	170.01	.LocKeyHMI.stVal.Statio n	-	Station state	1=Station
		DR.RDRE1			
2722	170.02	.RcdMade.stVal	-	DR recording made	1=Made
2723	170.03	.mcd			

#### 2.3.1.2 CTRL.CBCILO1 Circuit breaker enable signals (1)

*Table 5: CTRL.CBCILO1 Circuit breaker enable signals (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		CTRL.CBCILO1			
2824	176.08	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
2825	176.09	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled

#### 2.3.1.3 CTRL.CBCSWI1 Circuit breaker (1) mom. position

*Table 6: CTRL.CBCSWI1 Circuit breaker (1) mom. position*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		CTRL.CBCSWI1	POSITION		
2804	175.04	.Pos.stVal	-	Close bit	1=Close
2805	175.05	.Pos.stVal	-	Open bit	1=Open
2806	175.06	.Pos.stVal	-	Fault bit	1=Pos(00/11)

#### 2.3.1.4 CTRL.CBCSWI1 Circuit breaker (1) mom+mcd position

*Table 7: CTRL.CBCSWI1 Circuit breaker (1) mom+mcd position*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		CTRL.CBCSWI1	POSITION		
2816	176.00	.Pos.stVal		Close bit	1=Close
2817	176.01	.mcd			
2818	176.02	.Pos.stVal		Open bit	1=Open
2819	176.03	.mcd			

Table continues on next page

## Section 2

### Modbus data mappings

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BitA	RegA	IEC 61850 name	SA name	Description	Values
2820	176.04	< reserved >			
2821	176.05	< reserved >			
2822	176.06	.Pos.stSelD	SELECTED	CB selected for control	1=Selected
2823	176.07	.mcd			
2834	177.02	.SynItlByps.stVal	ITL_BYPASS	Interlock bypass	1=Bypass
2835	177.03	.mcd			

#### 2.3.1.5 CTRL.CBXCBR1 Circuit-breaker control (1)

Table 8: *CTRL.CBXCBR1 Circuit-breaker control (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		CTRL.CBXCBR1			
2836	177.04	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked
2837	177.05	.mcd			
2838	177.06	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
2839	177.07	.mcd			

#### 2.3.1.6 LD0.CCBRBRF1 Circuit breaker failure protection (1)

Table 9: *LD0.CCBRBRF1 Circuit breaker failure protection (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.CCBRBRF1			
2828	176.12	.Str.general	CB_FAULT_AL	Timer running	1=Running
2829	176.13	.mcd			
2830	176.14	.OpEx.general	TRBU	Fail, external trip	1=Ext.trip
2831	176.15	.mcd			
2832	177.00	.OpIn.general	TRRET	Internal re-trip	1=Re-trip
2833	177.01	.mcd			

#### 2.3.1.7 LD0.CMMXU1 Three-phase current measurement (1)

Table 10: *LD0.CMMXU1 Three-phase current measurement (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.CMMXU1			
2752	172.00	.HiAlm.stVal	HIGH_ALARM	High alarm	1=Alarm
2753	172.01	.mcd			
2754	172.02	.HiWrn.stVal	HIGH_WARN	High warning	1=Warning
2755	172.03	.mcd			
2756	172.04	.LoWrn.stVal	LOW_WARN	Low warning	1=Warning

Table continues on next page

BitA	RegA	IEC 61850 name	SA name	Description	Values
2757	172.05	.mcd			
2758	172.06	.LoAlm.stVal	LOW_ALARM	Low alarm	1=Alarm
2759	172.07	.mcd			

### 2.3.1.8 LD0.EFHPTOC1 Non-directional earth-fault protection, high stage (1)

Table 11: LD0.EFHPTOC1 Non-directional earth-fault protection, high stage (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.EFHPTOC1			
3012	188.04	.Str.general	START	Stage start	1=Start
3013	188.05	.mcd			
3014	188.06	.Op.general	OPERATE	Stage operate	1=Operate
3015	188.07	.mcd			

### 2.3.1.9 LD0.EFLPTOC1 Non-directional earth-fault protection low stage (1)

Table 12: LD0.EFLPTOC1 Non-directional earth-fault protection low stage (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.EFLPTOC1			
3008	188.00	.Str.general	START	Stage start	1=Start
3009	188.01	.mcd			
3010	188.02	.Op.general	OPERATE	Stage operate	1=Operate
3011	188.03	.mcd			

### 2.3.1.10 LD0.ESMGAPC1 Emergency start-up (1)

Table 13: LD0.ESMGAPC1 Emergency start-up (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.ESMGAPC1			
2934	183.06	.Str.general	ST_EMERG_ENA	Emergency start	1=Start
2935	183.07	.mcd			

### 2.3.1.11 LD0.JAMPTOC1 Motor load jam protection (1)

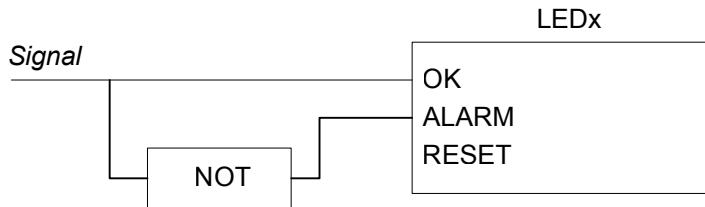
Table 14: LD0.JAMPTOC1 Motor load jam protection (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.JAMPTOC1			
2918	182.06	.Op.general	OPERATE	Stage operate	1=Operate
2919	182.07	.mcd			

### 2.3.1.12

### LD0.LEDGGIO1 Indication LED states Color1/Color2

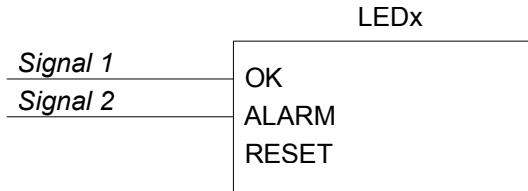
These LED indication points interpret the case when a signal is wired to both the OK and ALARM inputs, but inverted to the other. This means that the LED toggles between red and green colors. The default color for ALARM is red and green for OK. Colors can, however, be reconfigured with a setting parameter.



*Figure 2: Signal wired to both OK and ALARM inputs – inverted to the other*



If the OK and ALARM inputs are wired to separate indication signals, the LED will have three legal states and cannot be expressed with one bit only. In this case, it is possible to combine this LED bit interpretation with the corresponding value from the other LED state interpretation.



*Figure 3: Separate signals wired to OK and ALARM inputs*

*Table 15: LD0.LEDGGIO1 Indication LED states Color1/Color2*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.LEDGGIO1			
3520	220.00	.LEDSt1.stVal	-	LED 1 state	0/1=Color1/2
3521	220.01	.LEDSt2.stVal	-	LED 2 state	0/1=Color1/2
3522	220.02	.LEDSt3.stVal	-	LED 3 state	0/1=Color1/2
3523	220.03	.LEDSt4.stVal	-	LED 4 state	0/1=Color1/2
3524	220.04	.LEDSt5.stVal	-	LED 5 state	0/1=Color1/2
3525	220.05	.LEDSt6.stVal	-	LED 6 state	0/1=Color1/2
3526	220.06	.LEDSt7.stVal	-	LED 7 state	0/1=Color1/2
3527	220.07	.LEDSt8.stVal	-	LED 8 state	0/1=Color1/2
3528	220.08	.LEDSt9.stVal <sup>1)</sup>	-	LED 9 state	0/1=Color1/2

Table continues on next page

BitA	RegA	IEC 61850 name	SA name	Description	Values
3529	220.09	.LEDSt10.stVal <sup>1)</sup>	-	LED 10 state	0/1=Color1/2
3530	220.10	.LEDSt11.stVal <sup>1)</sup>	-	LED 11 state	0/1=Color1/2
3531	220.11	<reserved>			0

1) Check Communication Management tool in PCM600 or LHMI or WHMI to confirm the availability for a particular device configuration.

### 2.3.1.13

### LD0.LEDGGIO1 Indication LED states OFF/ColorX

These LED indication points interpret the case when an indication signal is wired to either the OK or ALARM input of the LED function block. The default color for ALARM is red and green for OK. Colors can, however, be reconfigured with a setting parameter.

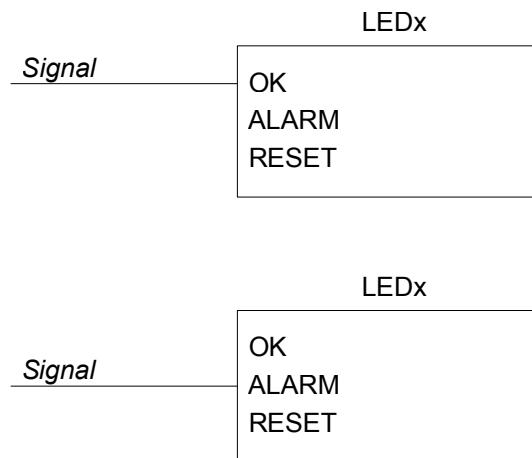


Figure 4: Signal wired to either OK or Alarm input

Table 16: LD0.LEDGGIO1 Indication LED states OFF/ColorX

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.LEDGGIO1			
2768	173.00	.LEDSt1.stVal	-	LED 1 state	0/1=Off/Color
2769	173.01	.LEDSt2.stVal	-	LED 2 state	0/1=Off/Color
2770	173.02	.LEDSt3.stVal	-	LED 3 state	0/1=Off/Color
2771	173.03	.LEDSt4.stVal	-	LED 4 state	0/1=Off/Color
2772	173.04	.LEDSt5.stVal	-	LED 5 state	0/1=Off/Color
2773	173.05	.LEDSt6.stVal	-	LED 6 state	0/1=Off/Color
2774	173.06	.LEDSt7.stVal	-	LED 7 state	0/1=Off/Color
2775	173.07	.LEDSt8.stVal	-	LED 8 state	0/1=Off/Color
2776	173.08	.LEDSt9.stVal <sup>1)</sup>	-	LED 9 state	0/1=Off/Color

Table continues on next page

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BitA	RegA	IEC 61850 name	SA name	Description	Values
2777	173.09	.LEDSt10.stVal <sup>1)</sup>	-	LED 10 state	0/1=Off/Color
2778	173.10	.LEDSt11.stVal <sup>1)</sup>	-	LED 11 state	0/1=Off/Color
2779	173.11	<reserved>			0

1) Check Communication Management tool in PCM600 or LHMI or WHMI to confirm the availability for a particular device configuration.

#### 2.3.1.14

#### LD0.LEDPTRC1 Global conditioning (1)

Table 17: LD0.LEDPTRC1 Global conditioning (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.LEDPTRC1			
2736	171.00	.Str.general	-	Global start	1=Start
2737	171.01	.mcd			
2738	171.02	.Op.general	-	Global operate	1=Operate
2739	171.03	.mcd			

#### 2.3.1.15

#### LD0.LEDPTRC1 Global conditioning - phase information (1)

Table 18: LD0.LEDPTRC1 Global conditioning - phase information (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.LEDPTRC1			
2864	179.00	.Str.phsA		Start phsA	1=Start
2865	179.01	.mcd			
2866	179.02	.Str.phsB		Start phsB	1=Start
2867	179.03	.mcd			
2868	179.04	.Str.phsC		Start phsC	1=Start
2869	179.05	.mcd			
2870	179.06	.Op.phsA		Operate phsA	1=Operate
2871	179.07	.mcd			
2872	179.08	.Op.phsB		Operate phsB	1=Operate
2873	179.09	.mcd			
2874	179.10	.Op.phsC		Operate phsC	1=Operate
2875	179.11	.mcd			

**2.3.1.16****LD0.LOFLPTUC1 Loss of load supervision (1)****Table 19:** LD0.LOFLPTUC1 Loss of load supervision (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.LOFLPTUC1			
2912	182.00	.Str.general	START	Stage start	1=Start
2913	182.01	.mcd			
2914	182.02	.Op.general	OPERATE	Stage operate	1=Operate
2915	182.03	.mcd			

**2.3.1.17****LD0.MDSOPT1 Runtime counter for machines and devices (1)****Table 20:** LD0.MDSOPT1 Runtime counter for machines and devices (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.MDSOPT1			
2876	179.12	.OpTmWrn.stVal		Accum.op.time Warn.	1=Warning
2877	179.13	.mcd			
2878	179.14	.OpTmAlm.stVal		Accum.op.time Alarm	1=Alarm
2879	179.15	.mcd			

**2.3.1.18****LD0.MNSPTOC1 Negative-sequence overcurrent protection for machines (1)****Table 21:** LD0.MNSPTOC1 Negative-sequence overcurrent protection for machines (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.MNSPTOC1			
2904	181.08	.Str.general	START	Stage start	1=Start
2905	181.09	.mcd			
2906	181.10	.Op.general	OPERATE	Stage operate	1=Operate
2907	181.11	.mcd			

**2.3.1.19****LD0.MNSPTOC2 Negative-sequence overcurrent protection for machines (2)****Table 22:** LD0.MNSPTOC2 Negative-sequence overcurrent protection for machines (2)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.MNSPTOC2			
2908	181.12	.Str.general	START	Stage start	1=Start
2909	181.13	.mcd			
2910	181.14	.Op.general	OPERATE	Stage operate	1=Operate
2911	181.15	.mcd			

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#### 2.3.1.20

#### LD0.MPTTR1 Thermal overload protection for motors (1)

*Table 23: LD0.MPTTR1 Thermal overload protection for motors (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.MPTTR1			
2916	182.04	BlkThm.stVal	BLK_RESTART	Thermal block	1=Restart
2917	182.05	.mcd			
2930	183.02	.AlmThm.general	ALARM	Thermal alarm	1=Alarm
2931	183.03	.mcd			
2932	183.04	.Op.general	OPERATE	Thermal operate	1=Operate
2933	183.05	.mcd			

#### 2.3.1.21

#### LD0.MVGAPC1 Move (8 pcs) (1)

*Table 24: LD0.MVGAPC1 Move (8 pcs) (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC1			
3536	221.00	.SPCSO1.stVal		Output 1	0/1=Off/On
3537	221.01	.mcd			
		<Mom only>		Alternative 2	0/1=Off/On
		<Latched>		Alternative 3	0/1=Off/On
3538	221.02	.SPCSO2.stVal		Output 2	0/1=Off/On
3539	221.03	.mcd			
		<Mom only>		Alternative 2	0/1=Off/On
		<Latched>		Alternative 3	0/1=Off/On
3540	221.04	.SPCSO3.stVal		Output 3	0/1=Off/On
3541	221.05	.mcd			
		<Mom only>		Alternative 2	0/1=Off/On
		<Latched>		Alternative 3	0/1=Off/On
3542	221.06	.SPCSO4.stVal		Output 4	0/1=Off/On
3543	221.07	.mcd			
		<Mom only>		Alternative 2	0/1=Off/On
		<Latched>		Alternative 3	0/1=Off/On
3544	221.08	.SPCSO5.stVal		Output 5	0/1=Off/On
3545	221.09	.mcd			
		<Mom only>		Alternative 2	0/1=Off/On
		<Latched>		Alternative 3	0/1=Off/On
3546	221.10	.SPCSO6.stVal		Output 6	0/1=Off/On
3547	221.11	.mcd			
		<Mom only>		Alternative 2	0/1=Off/On

Table continues on next page

BitA	RegA	IEC 61850 name	SA name	Description	Values
		<Latched>		Alternative 3	0/1=Off/On
3548	221.12	.SPCSO7.stVal		Output 7	0/1=Off/On
3549	221.13	.mcd			
		<Mom only>		Alternative 2	0/1=Off/On
		<Latched>		Alternative 3	0/1=Off/On
3550	221.14	.SPCSO8.stVal		Output 8	0/1=Off/On
3551	221.15	.mcd			
		<Mom only>		Alternative 2	0/1=Off/On
		<Latched>		Alternative 3	0/1=Off/On

### 2.3.1.22 LD0.PHIPTOC1 Three-phase non-directional overcurrent protection, instantaneous stage (1)

Table 25: LD0.PHIPTOC1 Three-phase non-directional overcurrent protection, instantaneous stage (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.PHIPTOC1			
2890	180.10	.Str.general	START	General start	1=Start
2891	180.11	.mcd			
2892	180.12	.Str.phsA		phsA start	1=Start
2893	180.13	.mcd			
2894	180.14	.Str.phsB		phsB start	1=Start
2895	180.15	.mcd			
2896	181.00	.Str.phsC		phsC start	1=Start
2897	181.01	.mcd			
2898	181.02	.Op.general	OPERATE	General operate	1=Operate
2899	181.03	.mcd			

### 2.3.1.23 LD0.PHLPTOC1 Three-phase non-directional overcurrent protection, low stage (1)

Table 26: LD0.PHLPTOC1 Three-phase non-directional overcurrent protection, low stage (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.PHLPTOC1			
2880	180.00	.Str.general	START	General start	1=Start
2881	180.01	.mcd			
2882	180.02	.Str.phsA		Phs A start	1=Start
2883	180.03	.mcd			
2884	180.04	.Str.phsB		Phs B start	1=Start
2885	180.05	.mcd			

Table continues on next page

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BitA	RegA	IEC 61850 name	SA name	Description	Values
2886	180.06	.Str.phsC		Phs C start	1=Start
2887	180.07	.mcd			
2888	180.08	.Op.general	OPERATE	General operate	1=Operate
2889	180.09	.mcd			

#### 2.3.1.24 LD0.PREVPTOC1 Phase reversal protection (1)

Table 27: LD0.PREVPTOC1 Phase reversal protection (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.PREVPTOC1			
2926	182.14	.Str.general	START	Stage start	1=Start
2927	182.15	.mcd			
2928	183.00	.Op.general	OPERATE	Stage operate	1=Operate
2929	183.01	.mcd			

#### 2.3.1.25 LD0.RESCMMXU1 Residual current measurement (1)

Table 28: LD0.RESCMMXU1 Residual current measurement (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.RESCMMXU1			
2760	172.08	.HiAlm.stVal	HIGH_ALARM	High alarm	1=Alarm
2761	172.09	.mcd			
2762	172.10	.HiWrn.stVal	HIGH_WARN	High warning	1=Warning
2763	172.11	.mcd			

#### 2.3.1.26 LD0.STTPMSU1 Motor start-up supervision (1)

Table 29: LD0.STTPMSU1 Motor start-up supervision (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.STTPMSS1			
2920	182.08	.Str.general	MOT_START	Startup in progress	1=In progress
2921	182.09	.mcd			
2922	182.10	.Op.general	OPR_IIT	Thermal stress operate	1=Operate
2923	182.11	.mcd			
		LD0.STTPMRI1			
2924	182.12	.Op.general	OPR_STALL	Stalling operate	1=Operate
2925	182.13	.mcd			
		.StrInh.stVal		Restart lockout	1=Lockout
		.mcd			

**2.3.1.27****LD0.TCSSCBR1 Trip circuit supervision (1)****Table 30:** LD0.TCSSCBR1 Trip circuit supervision (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.TCSSCBR1			
2780	173.12	.CircAlm.stVal	ALARM	Supervision alarm	1=Alarm
2781	173.13	.mcd			

**2.3.1.28****LD0.TCSSCBR2 Trip circuit supervision (2)****Table 31:** LD0.TCSSCBR2 Trip circuit supervision (2)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.TCSSCBR2			
2782	173.14	.CircAlm.stVal	ALARM	Supervision alarm	1=Alarm
2783	173.15	.mcd			

**2.3.1.29****LD0.TRPPTRC1 Master trip (1)****Table 32:** LD0.TRPPTRC1 Master trip (1)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.TRPPTRC1			
2740	171.04	.Op.general	-	Op. input signal	1=Operate
2741	171.05	.mcd			
2742	171.06	.Tr.general	-	Trip output signal	1=Trip
2743	171.07	.mcd			

**2.3.1.30****LD0.TRPPTRC2 Master trip (2)****Table 33:** LD0.TRPPTRC2 Master trip (2)

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.TRPPTRC2			
2744	171.08	.Op.general	-	Op. input signal	1=Operate
2745	171.09	.mcd			
2746	171.10	.Tr.general	-	Trip output signal	1=Trip
2747	171.11	.mcd			

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### Modbus data mappings

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#### 2.3.1.31

#### LD0.XGGIO100 Physical I/O states (PSM card X100)

*Table 34: LD0.XGGIO100 Physical I/O states (PSM card X100)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.XGGIO100			
3248	203.00	.SPCSO1.stVal		X100-Output 1 State	0/1=Off/On
3249	203.01	.mcd			
		.mom-only		Mom only alternative	
3250	203.02	.SPCSO2.stVal		X100-Output 2 State	0/1=Off/On
3251	203.03	.mcd			
		.mom-only		Mom only alternative	
3252	203.04	.SPCSO3.stVal		X100-Output 3 State	0/1=Off/On
3253	203.05	.mcd			
3254	203.06	.SPCSO4.stVal		X100-Output 4 State	0/1=Off/On
3255	203.07	.mcd			
3256	203.08	.SPCSO5.stVal		X100-Output 5 State	0/1=Off/On
3257	203.09	.mcd			
		.mom-only		Mom only alternative	
3258	203.10	.SPCSO6.stVal		X100-Output 6 State	0/1=Off/On
3259	203.11	.mcd			
		.mom-only		Mom only alternative	

#### 2.3.1.32

#### LD0.XGGIO120 Physical I/O states (AIM card X120)

*Table 35: LD0.XGGIO120 Physical I/O states (AIM card X120)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.XGGIO120			
3200	200.00	.Ind1.stVal		X120-Input 1 State	0/1=Off/On
3201	200.01	.mcd			
		.mom-only		Mom only alternative	
3202	200.02	.Ind2.stVal		X120-Input 2 State	0/1=Off/On
3203	200.03	.mcd			
		.mom-only		Mom only alternative	
3204	200.04	.Ind3.stVal		X120-Input 3 State	0/1=Off/On
3205	200.05	.mcd			
		.mom-only		Mom only alternative	
3206	200.06	.Ind4.stVal		X120-Input 4 State	0/1=Off/On
3207	200.07	.mcd			
		.mom-only		Mom only alternative	

## 2.3.2

### Unmapped indications

Unmapped indications are indication data that have no initial Modbus mapping locations, but can be added to the user-definable Modbus area using the Communication Management tool in PCM600. If Modbus events are enabled for these indication signals, the event identification is the user-definable area address.

#### 2.3.2.1

##### All premapped three-phase protection function stages, start and operate/phase-dependent objects added

*Table 36: All premapped three-phase protection function stages, start and operate/phase-dependent objects added*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.xxxxxxx (various)			
		.Op.phsA		Operate Phase A	1 = Operate
		.mcd			
		.Str.phsA		Start Phase A	1 = Start
		.mcd			
		.Op.phsB		Operate Phase B	1 = Operate
		.mcd			
		.Str.phsB		Start Phase B	1 = Start
		.mcd			
		.Op.phsC		Operate Phase C	1 = Operate
		.mcd			
		.Str.phsC		Start Phase C	1 = Start
		.mcd			

#### 2.3.2.2

### Common data 2

*Table 37: Common data 2*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.LDEV1			
		.DevFail.stVal		Internal fault	1=Fault
		.mcd			
		.StLstOv.stVal		Internal ind. overflow	1=Overflow
		.mcd			
		.MeasLstOv.stVal		Internal meas. overflow	1=Overflow
		.mcd			
		.ChgFlg.stVal		Configuration changed	1=Changed
		.mcd			
		.FacSet.stVal		Factory settings in use	1=In use
		.mcd			

Table continues on next page

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### Modbus data mappings

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BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.GNRLLTMS1			
		.TmChSt1.stVal		Time synch. status	0/1=Down/Up
		.mcd			
		.TmSyn.stVal		IEC 61850-9-2 sync	0...2
		.mcd			
		.TmSrcSt.stVal		Time sync source	0...99
		.mcd			
		LD0.SCHLCCH1			
		.ChLiv.stVal	CH1LIV	Ethernet channel 1 live	1=Live
		.mcd			
		LD0.SCHLCCH2			
		.ChLiv.stVal	CH2LIV	Ethernet channel 2 live	1=Live
		.mcd			
		LD0.SCHLCCH3			
		.ChLiv.stVal	CH3LIV	Ethernet channel 3 live	1=Live
		.mcd			
		LD0.GSELPRT1			
		.Alm.stVal		GOOSE alarm	1=Alarm
		.mcd			

#### 2.3.2.3 DR.RDRE1 Disturbance recorder signals

Table 38: DR.RDRE1 Disturbance recorder signals

BitA	RegA	IEC 61850 name	SA name	Description	Values
		DR.RDRE1			
		.RcdStr.stVal		Recording started	1=Started
		.mcd			
		.RcdDltInd.stVal		Recording deleted	1=Deleted
		.mcd			
		.OvWrRcdInd.stVal		Overwrite of record	1=Overwrite
		.mcd			
		.PerTrgInd.stVal		Periodic triggering	1=Triggered
		.mcd			
		.ManTrgInd.stVal		Manual triggering	1=Triggered
		.mcd			

### 2.3.2.4

### LD0.IL1TCTR1 Three-phase CT supervision (1)

*Table 39: LD0.IL1TCTR1 Three-phase CT supervision (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.IL1TCTR1			
		.Alm.stVal	ALARM	Alarm	1=Alarm
		.mcd			
		.Wrn.stVal	WARNING	Warning	1=Warning
		.mcd			

### 2.3.2.5

### LD0.RCHLCCH1 Ethernet supervision (1)

*Table 40: LD0.RCHLCCH1 Ethernet supervision (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.RCHLCCH1			
		.ChLiv.stVal	CHLIV	Ethernet channel live	1=Live
		.mcd			
		.RedChLiv.stVal	REDCHLIV	Red. Ethernet channel live	1=Live
		.mcd			

### 2.3.2.6

### LD0.RESTCTR1 Io CT supervision (1)

*Table 41: LD0.RESTCTR1 Io CT supervision (1)*

BitA	RegA	IEC 61850 name	SA name	Description	Values
		LD0.RESTCTR1			
		.Alm.stVal	ALARM	Alarm	1=Alarm
		.mcd			
		.Wrn.stVal	WARNING	Warning	1=Warning
		.mcd			

## 2.4

## Registers

*Table 42: Explanations of columns in register tables*

Column name	Description
RegA	Default 3X and 4X register address for the data.
Type	Type of the register. The alternatives are u16, u32 (unsigned 16 and 32 bits integer) or i16, i32 (signed 16 and 32 bit integer).
Scale	Scale factor as default. Also, an adjustable offset value exists that is set to 0 by default.
Table continues on next page	

Column name	Description
IEC 61850 name	Original IED data object identification. Described in the IEC 61850 format as Logical Device.Logical Node and thereafter .Data Object.Data Attribute. Logical Node is the same as the application function block name.
SA name	The signal may have a defined label that is visible, for example, in the Application Configuration tool in PCM600.
Description	Short description of the signal. See the technical manual for more information. Also, if a register is writable, it is stated here.
Values	The value range of the original IEC 61850 value, that is, before scaling.

## 2.4.1 Premapped registers

### 2.4.1.1 Active parameter setting group read and write

Table 43: *Active parameter setting group - read and write*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.LLN0			
2301	u16	1	ActSetGr.Oper.ctlVal		Active setting group	1...6

### 2.4.1.2 Control structure 1

Table 44: *Control structure 1*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
8001					Execute register	1
8002					Password reg 1	acc to setting
8003					Password reg 2	acc to setting
8004					Control register	< single bit >
8005					Confirm register	< single bit >

### 2.4.1.3 Control structure 2

Table 45: *Control structure 2*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
8006					Execute register	1
8007					Password reg 1	acc to setting
8008					Password reg 2	acc to setting
8009					Control register	< single bit >
8010					Confirm register	< single bit >

### 2.4.1.4 Control structure 3

*Table 46: Control structure 3*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
8011					Execute register	1
8012					Password reg 1	acc to setting
8013					Password reg 2	acc to setting
8014					Control register	< single bit >
8015					Confirm register	< single bit >

### 2.4.1.5 Control structure 4

*Table 47: Control structure 4*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
8016					Execute register	1
8017					Password reg 1	acc to setting
8018					Password reg 2	acc to setting
8019					Control register	< single bit >
8020					Confirm register	< single bit >

### 2.4.1.6 Control structure 5

*Table 48: Control structure 5*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
8021					Execute register	1
8022					Password reg 1	acc to setting
8023					Password reg 2	acc to setting
8024					Control register	< single bit >
8025					Confirm register	< single bit >

### 2.4.1.7 Control structure 6

*Table 49: Control structure 6*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
8026					Execute register	1
8027					Password reg 1	acc to setting
8028					Password reg 2	acc to setting
8029					Control register	< single bit >
8030					Confirm register	< single bit >

### 2.4.1.8 Control structure 7

*Table 50:* Control structure 7

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
8031					Execute register	1
8032					Password reg 1	acc to setting
8033					Password reg 2	acc to setting
8034					Control register	< single bit >
8035					Confirm register	< single bit >

### 2.4.1.9 Control structure 8

*Table 51:* Control structure 8

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
8036					Execute register	1
8037					Password reg 1	acc to setting
8038					Password reg 2	acc to setting
8039					Control register	< single bit >
8040					Confirm register	< single bit >

### 2.4.1.10 Device ID string

*Table 52:* Device ID string

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
9000	u16				ASCII coded string	1)
...						
9120	u16					

1) See the technical manual.

### 2.4.1.11 Event record structure

*Table 53:* Event record structure

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
					Selection write:	
9250	u16	1			- Num of multiple records	1...10
9251	i16	1			- Read selection	-499...5
					Record 1 data to read:	
9252	u16	1			- Record sequence num	1...500
9253	u16	1			- Unread records left	0...499

Table continues on next page

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
					Timestamp of record	
9254	u16	1			- Year, Month	Year/Month
9255	u16	1			- Day, Hour	Day/Hour
9256	u16	1			- Minute, Second	Min/Sec
9257	u16	1			- Millisecond	Millisecond
9258	u16	1			Event identification	1)
9259	u16	1			Data object ID1	1)
9260	u16	1			Data object ID2	1)
9261	u16	1			Event data value 1	1)
9262	u16	1			Event data value 2	1)
					Record 2 data to read:	If selected
9263	u16	1			- Record sequence num	1...500
9264	u16	1			- Unread records left	0...499
					Timestamp of record	
9265	u16	1			- Year, Month	Year/Month
9266	u16	1			- Day, Hour	Day/Hour
9267	u16	1			- Minute, Second	Min/Sec
9268	u16	1			- Millisecond	Millisecond
9269	u16	1			Event identification	1)
9270	u16	1			Data object ID1	1)
9271	u16	1			Data object ID2	1)
9272	u16	1			Event data value 1	1)
9273	u16	1			Event data value 2	1)
					Record 3 data to read:	If selected
9274	u16	1			- Record sequence num	1...500
9275	u16	1			- Unread records left	0...499
					Timestamp of record	
9276	u16	1			- Year, Month	Year/Month
9277	u16	1			- Day, Hour	Day/Hour
9278	u16	1			- Minute, Second	Min/Sec
9279	u16	1			- Millisecond	Millisecond
9280	u16	1			Event identification	1)
9281	u16	1			Data object ID1	1)
9282	u16	1			Data object ID2	1)
9283	u16	1			Event data value 1	1)
9284	u16	1			Event data value 2	1)

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RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
					Record 4 data to read:	If selected
9285	u16	1			- Record sequence num	1...500
9286	u16	1			- Unread records left	0...499
					Timestamp of record	
9287	u16	1			- Year, Month	Year/Month
9288	u16	1			- Day, Hour	Day/Hour
9289	u16	1			- Minute, Second	Min/Sec
9290	u16	1			- Millisecond	Millisecond
9291	u16	1			Event identification	1)
9292	u16	1			Data object ID1	1)
9293	u16	1			Data object ID2	1)
9294	u16	1			Event data value 1	1)
9295	u16	1			Event data value 2	1)
					Record 5 data to read:	If selected
9296	u16	1			- Record sequence num	1...500
9297	u16	1			- Unread records left	0...499
					Timestamp of record	
9298	u16	1			- Year, Month	Year/Month
9299	u16	1			- Day, Hour	Day/Hour
9300	u16	1			- Minute, Second	Min/Sec
9301	u16	1			- Millisecond	Millisecond
9302	u16	1			Event identification	1)
9303	u16	1			Data object ID1	1)
9304	u16	1			Data object ID2	1)
9305	u16	1			Event data value 1	1)
9306	u16	1			Event data value 2	1)
					Record 6 data to read:	If selected
9307	u16	1			- Record sequence num	1...500
9308	u16	1			- Unread records left	0...499
					Timestamp of record	
9309	u16	1			- Year, Month	Year/Month
9310	u16	1			- Day, Hour	Day/Hour
9311	u16	1			- Minute, Second	Min/Sec
9312	u16	1			- Millisecond	Millisecond
9313	u16	1			Event identification	1)
9314	u16	1			Data object ID1	1)

Table continues on next page

<b>RegA</b>	<b>Type</b>	<b>Scale</b>	<b>IEC 61850 name</b>	<b>SA name</b>	<b>Description</b>	<b>Values</b>
9315	u16	1			Data object ID2	1)
9316	u16	1			Event data value 1	1)
9317	u16	1			Event data value 2	1)
					Record 7 data to read:	If selected
9318	u16	1			- Record sequence num	1...500
9319	u16	1			- Unread records left	0...499
					Timestamp of record	
9320	u16	1			- Year, Month	Year/Month
9321	u16	1			- Day, Hour	Day/Hour
9322	u16	1			- Minute, Second	Min/Sec
9323	u16	1			- Millisecond	Millisecond
9324	u16	1			Event identification	1)
9325	u16	1			Data object ID1	1)
9326	u16	1			Data object ID2	1)
9327	u16	1			Event data value 1	1)
9328	u16	1			Event data value 2	1)
					Record 8 data to read:	If selected
9329	u16	1			- Record sequence num	1...500
9330	u16	1			- Unread records left	0...499
					Timestamp of record	
9331	u16	1			- Year, Month	Year/Month
9332	u16	1			- Day, Hour	Day/Hour
9333	u16	1			- Minute, Second	Min/Sec
9334	u16	1			- Millisecond	Millisecond
9335	u16	1			Event identification	1)
9336	u16	1			Data object ID1	1)
9337	u16	1			Data object ID2	1)
9338	u16	1			Event data value 1	1)
9339	u16	1			Event data value 2	1)
					Record 9 data to read:	If selected
9340	u16	1			- Record sequence num	1...500
9341	u16	1			- Unread records left	0...499
					Timestamp of record	
9342	u16	1			- Year, Month	Year/Month

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RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
9343	u16	1			- Day, Hour	Day/Hour
9344	u16	1			- Minute, Second	Min/Sec
9345	u16	1			- Millisecond	Millisecond
9346	u16	1			Event identification	1)
9347	u16	1			Data object ID1	1)
9348	u16	1			Data object ID2	1)
9349	u16	1			Event data value 1	1)
9350	u16	1			Event data value 2	1)
					Record 10 data to read:	If selected
9351	u16	1			- Record sequence num	1...500
9352	u16	1			- Unread records left	0...499
					Timestamp of record	
9353	u16	1			- Year, Month	Year/Month
9354	u16	1			- Day, Hour	Day/Hour
9355	u16	1			- Minute, Second	Min/Sec
9356	u16	1			- Millisecond	Millisecond
9357	u16	1			Event identification	1)
9358	u16	1			Data object ID1	1)
9359	u16	1			Data object ID2	1)
9360	u16	1			Event data value 1	1)
9361	u16	1			Event data value 2	1)

1) See the technical manual.

#### 2.4.1.12 Fault record structure header

Table 54: Fault record structure header

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
					Selection write	
9401	i16	1			Read selection	-99...5
					Record data header	
9402	u16	1			Record sequence num	1...100
9403	u16	1			Unread records left	0...99
					Timestamp of record	
9404	u16	1			Year, month	Year/Month
9405	u16	1			Day, hour	Day/Hour

Table continues on next page

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
9406	u16	1			Minute, second	Min/Sec
9407	u16	1			Millisecond	Millisecond
9408	u16	1			Timestamp quality	

#### 2.4.1.13

#### Fault record data

The table shows all potential data available in the fault record application. Which data is actually recorded depends on the functions available and enabled in the IED configuration.

Table 55: Fault record data

RegA	Type	Scale	IEC 61850 name <sup>1)</sup>	SA name	Description	Values
			LD0.FLTRFRC1		Fault record data	
9409	u32	1	.OpCnt.stVal		Fault record number (high)	0..999999
9410					(Low word)	
9411	i16	1	.ProFcn.stVal		Protection function	-32768...32767
9412	u16	100	.Hz.mag.f		Frequency	30...80.00 [Hz]
9413	u16	100	.StrDur.mag.f		Start duration	0...100.00 [%]
9414	u32	1000	.StrOpTm.mag.f		Operate time [ms] (high)	0...999999.999
9415					(Low word)	
9416	u32	100	.FltPtR.mag.f		Fault resistance	0.00...1000000.00 ohms
9417					(Low word)	
9418	u32	100	.FltDiskm.mag.f		Fault distance	0.00...9999.99 pu
9419					(Low word)	
9420	u16	1	.ActSetGr.stVal		Active setting group	1...6
9421	u16	1	.ShotPntr.stVal		AR shot pointer value	0...7
					Captured values during fault	
9422	u16	1000	.Max50DifAA.mag.f		Max. diff. current phs A	0.000...80.000 [pu]
9423	u16	1000	.Max50DifAB.mag.f		Max. diff. current phs B	0.000...80.000 [pu]
9424	u16	1000	.Max50DifAC.mag.f		Max. diff. current phs C	0.000...80.000 [pu]
9425	u16	1000	.Max50RstAA.mag.f		Max. bias current phs A	0.000...50.000 [pu]
9426	u16	1000	.Max50RstAB.mag.f		Max. bias current phs B	0.000...50.000 [pu]
9427	u16	1000	.Max50RstAC.mag.f		Max. bias current phs C	0.000...50.000 [pu]

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RegA	Type	Scale	IEC 61850 name <sup>1)</sup>	SA name	Description	Values
9428	u16	1000	.DifAPhsA.mag.f		Diff. current phs A	0.000...80.00 0 [pu]
9429	u16	1000	.DifAPhsB.mag.f		Diff. current phs B	0.000...80.00 0 [pu]
9430	u16	1000	.DifAPhsC.mag.f		Diff. current phs C	0.000...80.00 0 [pu]
9431	u16	1000	.RstAPhsA.mag.f		Bias current phs A	0.000... 50.000 [pu]
9432	u16	1000	.RstAPhsB.mag.f		Bias current phs B	0.000... 50.000 [pu]
9433	u16	1000	.RstAPhsC.mag.f		Bias current phs C	0.000... 50.000 [pu]
9434	u16	1000	.DifARes.mag.f		Diff. current lo	0.000...80.00 0 [pu]
9435	u16	1000	.RstARes.mag.f		Bias current lo	0.000... 50.000 [pu]
9436	u16	1000	.Max50APhsA1.mag.f		Max. current phs A(1)	0.000... 50.000 [ $\times I_n$ ]
9437	u16	1000	.Max50APhsB1.mag.f		Max. current phs B(1)	0.000... 50.000 [ $\times I_n$ ]
9438	u16	1000	.Max50APhsC1.mag.f		Max. current phs C(1)	0.000... 50.000 [ $\times I_n$ ]
9439	u16	1000	.Max50ARes1.mag.f		Max. current lo(1)	0.000... 50.000 [ $\times I_n$ ]
9440	u16	1000	.APhsA1.mag.f		Current phs A(1)	0.000... 50.000 [ $\times I_n$ ]
9441	u16	1000	.APhsB1.mag.f		Current phs B(1)	0.000... 50.000 [ $\times I_n$ ]
9442	u16	1000	.APhsC1.mag.f		Current phs C(1)	0.000... 50.000 [ $\times I_n$ ]
9443	u16	1000	.ARes1.mag.f		Current lo(1)	0.000... 50.000 [ $\times I_n$ ]
9444	u16	1000	.AResClc1.mag.f		Current lo-Calc(1)	0.000... 50.000 [ $\times I_n$ ]
9445	u16	1000	.APsSeq1.mag.f		Current Ps-Seq(1)	0.000... 50.000 [ $\times I_n$ ]
9446	u16	1000	.ANgSeq1.mag.f		Current Ng-Seq(1)	0.000... 50.000 [ $\times I_n$ ]
9447	u16	1000	.PhVPhsA1.mag.f		Voltage phs A(1)	0.000...4.000 [ $\times U_n$ ]
9448	u16	1000	.PhVPhsB1.mag.f		Voltage phs B(1)	0.000...4.000 [ $\times U_n$ ]
9449	u16	1000	.PhVPhsC1.mag.f		Voltage phs C(1)	0.000...4.000 [ $\times U_n$ ]
9450	u16	1000	.PPVPhsAB1.mag.f		Voltage phs AB(1)	0.000...4.000 [ $\times U_n$ ]
9451	u16	1000	.PPVPhsBC1.mag.f		Voltage phs BC(1)	0.000...4.000 [ $\times U_n$ ]

Table continues on next page

RegA	Type	Scale	IEC 61850 name <sup>1)</sup>	SA name	Description	Values
9452	u16	1000	.PPVPhsCA1.mag.f		Voltage phs CA(1)	0.000...4.000 [×Un]
9453	u16	1000	.VRes1.mag.f		Voltage Uo(1)	0.000...4.000 [×Un]
9454	u16	1000	.VZro1.mag.f		Voltage Zro-Seq(1)	0.000...4.000 [×Un]
9455	u16	1000	.VPsSeq1.mag.f		Voltage Ps-Seq(1)	0.000...4.000 [×Un]
9456	u16	1000	.VNgSeq1.mag.f		Voltage Ng-Seq(1)	0.000...4.000 [×Un]
9457	u16	100	.MaxTmpRI.mag.f		PTTR thermal level	0.00...99.99
9458	u16	100	.AMaxNgPs.mag.f		PDNSPTOC1 ratio I2/I1	0.00...999.99 [%]
9459	i16	100	.HzRteChg.mag.f		Frequency gradient	-10.00...10.00 [Hz/s]
9460	i16	100	.CondNeut.mag.f		Conductance Yo	-1000.00...100.00 [mS]
9461	i16	100	.SusNeut.mag.f		Susceptance Yo	-1000.00...100.00 [mS]
9462	i32	100	.PPLoopRis.mag.f		Fault loop resistance	-1000.00...100.00 [ohm]
9463	i32			(Low word)		
9464	i32	100	.PPLoopReact.mag.f		Fault loop reactance	-1000.00...100.00 [ohm]
9465	i32			(Low word)		
9466	u16	1000	.CBClrTm.mag.f		Breaker clear time	0.000...3.000 [s]
9467	u16	1000	.Max50APhsA2.mag.f		Max. current phsA(2)	0.000...50.000 [×In]
9468	u16	1000	.Max50APhsB2.mag.f		Max. current phsB(2)	0.000...50.000 [×In]
9469	u16	1000	.Max50APhsC2.mag.f		Max. current phsC(2)	0.000...50.000 [×In]
9470	u16	1000	.Max50Ares2.mag.f		Max. current Io(2)	0.000...50.000 [×In]
9471	u16	1000	.APhsA2.mag.f		Current phs A(2)	0.000...50.000 [×In]
9472	u16	1000	.APhsB2.mag.f		Current phs B(2)	0.000...50.000 [×In]
9473	u16	1000	.APhsC2.mag.f		Current phs C(2)	0.000...50.000 [×In]
9474	u16	1000	.ARes2.mag.f		Current Io(2)	0.000...50.000 [×In]
9475	u16	1000	.AResClc2.mag.f		Current Io-Calc(2)	0.000...50.000 [×In]
9476	u16	1000	.APsSeq2.mag.f		Current Ps-Seq(2)	0.000...50.000 [×In]

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RegA	Type	Scale	IEC 61850 name <sup>1)</sup>	SA name	Description	Values
9477	u16	1000	.ANgSeq2.mag.f		Current Ng-Seq(2)	0.000...50.000 [ $\times 1n$ ]
9478	u16	1000	.PhVPhsA2.mag.f		Voltage phs A(2)	0.000...4.000 [ $\times 1n$ ]
9479	u16	1000	.PhVPhsB2.mag.f		Voltage phs B(2)	0.000...4.000 [ $\times 1n$ ]
9480	u16	1000	.PhVPhsC2.mag.f		Voltage phs C(2)	0.000...4.000 [ $\times 1n$ ]
9481	u16	1000	.PPVPhsAB2.mag.f		Voltage phs AB(2)	0.000...4.000 [ $\times 1n$ ]
9482	u16	1000	.PPVPhsBC2.mag.f		Voltage phs BC(2)	0.000...4.000 [ $\times 1n$ ]
9483	u16	1000	.PPVPhsCA2.mag.f		Voltage phs CA(2)	0.000...4.000 [ $\times 1n$ ]
9484	u16	1000	.VRes2.mag.f		Voltage Uo(2)	0.000...4.000 [ $\times 1n$ ]
9485	u16	1000	.VZro2.mag.f		Voltage Zro-Seq(2)	0.000...4.000 [ $\times 1n$ ]
9486	u16	1000	.VPsSeq2.mag.f		Voltage Ps-Seq(2)	0.000...4.000 [ $\times 1n$ ]
9487	u16	1000	.VNgSeq2.mag.f		Voltage Ng-Seq(2)	0.000...4.000 [ $\times 1n$ ]
9488	i16	100	.DifANAngVN1.mag.f		Angle Uo-lo(1)	-180.00...180.00 [deg]
9489	i16	100	.DifAAAngVBC1.mag.f		Angle UBC-IA(1)	-180.00...180.00 [deg]
9490	i16	100	.DifABAAngVCA1.mag.f		Angle UCA-IB(1)	-180.00...180.00 [deg]
9491	i16	100	.DifACAngVAB1.mag.f		Angle UAB-IC(1)	-180.00...180.00 [deg]
9492	i16	100	.DifANAngVN2.mag.f		Angle Uo-lo(2)	-180.00...180.00 [deg]
9493	i16	100	.DifAAAngVBC2.mag.f		Angle UBC-IA(2)	-180.00...180.00 [deg]
9494	i16	100	.DifABAAngVCA2.mag.f		Angle UCA-IB(2)	-180.00...180.00 [deg]
9495	i16	100	.DifACAngVAB2.mag.f		Angle UAB-IC(2)	-180.00...180.00 [deg]
9496	u16	1000	.Max50APhsA3.mag.f		Maximum phase A current (c)	0...50.000 [ $\times 1n$ ]
9497	u16	1000	.Max50APhsB3.mag.f		Maximum phase B current (c)	0...50.000 [ $\times 1n$ ]
9498	u16	1000	.Max50APhsC3.mag.f		Maximum phase C current (c)	0...50.000 [ $\times 1n$ ]
9499	u16	1000	.Max50ARes3.mag.f		Maximum residual current (c)	0...50.000 [ $\times 1n$ ]
9500	u16	1000	.APhsA3.mag.f		Phase A current (c)	0...50.000 [ $\times 1n$ ]

Table continues on next page

RegA	Type	Scale	IEC 61850 name <sup>1)</sup>	SA name	Description	Values
9501	u16	1000	.APhsB3.mag.f		Phase B current (c)	0...50.000 [×In]
9502	u16	1000	.APhsC3.mag.f		Phase C current (c)	0...50.000 [×In]
9503	u16	1000	.ARes3.mag.f		Residual current (c)	0...50.000 [×In]
9504	u16	1000	.AResClc3.mag.f		Calculated residual current (c)	0...50.000 [×In]
9505	u16	1000	.APsSeq3.mag.f		Positive sequence current (c)	0...50.000 [×In]
9506	u16	1000	.ANgSeq3.mag.f		Negative sequence current (c)	0...50.000 [×In]

1) Check Communication Management tool in PCM600 or LHMI or WHMI to confirm the availability for a particular device configuration.

#### 2.4.1.14 IED real-time clock (in local time mode), read and write (synchronize)

*Table 56: IED real-time clock (in local time mode), read and write (synchronize)*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
9201					Control register	0...2 <sup>1)</sup>
9202					Year	2000...2099
9203					Month	1...12
9204					Day	1...31
9205					Hour	0...23
9206					Minute	0...59
9207					Second	0...59
9208					Millisecond	0...999

1) See the technical manual.

#### 2.4.1.15 IED real-time clock (in UTC time mode), read and write (synchronize)

*Table 57: IED real-time clock (in UTC time mode), read and write (synchronize)*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
9211					Control register	0...2 <sup>1)</sup>
9212					Year	2000...2099
9213					Month	1...12
9214					Day	1...31
9215					Hour	0...23
9216					Minute	0...59
9217					Second	0...59
9218					Millisecond	0...999

1) See the technical manual.

#### 2.4.1.16

#### Indication bits mirrored in registers

The pre-mapped indication bit data has been mapped from indication bit address 2720 onwards. The bit data is mirrored in registers starting from register address 170 onwards.

**Table 58:** *Indication bits mirrored in registers*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
170.00	Bit				Indication bit 2720 (0x1700)	
170.01	Bit				Indication bit 2721 (0x1701)	
:	:				:	
170.14	Bit				Indication bit 2734 (0x170E)	
170.15	Bit				Indication bit 2735 (0x170F)	
171.00	Bit				Indication bit 2736 (0x1710)	
:	:				:	

#### 2.4.1.17

#### SSR1 System status register (1) device health

**Table 59:** *SSR1 System status register (1) device health*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
128.00	Bit				Device global error	1=Error
128.01	Bit				Device global warning	1=Warning
128.02	Bit				< reserved >	0
128.03	Bit				< reserved >	0
128.04	Bit				< reserved >	0
128.05	Bit				< reserved >	0
128.06	Bit				< reserved >	0
128.07	Bit				< reserved >	0
128.08	Bit				< reserved >	0
128.09	Bit				< reserved >	0
128.10	Bit				< reserved >	0
128.11	Bit				< reserved >	0
128.12	Bit				< reserved >	0
128.13	Bit				< reserved >	0
128.14	Bit				< reserved >	0
128.15	Bit				< reserved >	0

### 2.4.1.18

### SSR2 System status register (2) protection relay's mode and state

*Table 60: SSR2 System status register (2) protection relay's mode and state*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
129.00	Bit				Device test mode	1=Test mode
129.01	Bit				< reserved >	0
129.02	Bit				Remote/Local state	0/1=Rem/Loc
					Active setting group	SG=1...6
129.03	Bit				- bit 0	
129.04	Bit				- bit 1	
129.05	Bit				- bit 2	
129.06	Bit				Protection relay's timesynch failure	1=Failure
129.07	Bit				< reserved >	0
129.08	Bit				Last reset cause a	1=Cold start
129.09	Bit				Last reset cause b	1=Watchdog
129.10	Bit				Last reset cause c	1=Warm start
129.11	Bit				< reserved >	0
129.12	Bit				< reserved >	0
129.13	Bit				< reserved >	0
129.14	Bit				< reserved >	0
129.15	Bit				< reserved >	0

### 2.4.1.19

### SSR3 System status register (3) data available 1 (client-dependent)

*Table 61: SSR3 System status register (3) data available 1 (client-dependent)*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
130.00	Bit				Unread event records available	1=Available
130.01	Bit				Unread fault records available	1=Available
130.02	Bit				< reserved >	0
130.03	Bit				< reserved >	0
130.04	Bit				Any momentary bit updated	1=Updated
130.05	Bit				Any mcd bit set	1=Set
130.06	Bit				Device restart bit	1=IED restart
130.07	Bit				< reserved >	0
130.08	Bit				Event record selected	1=Selected
130.09	Bit				Fault record selected	1=Selected
130.10	Bit				< reserved >	0
130.11	Bit				< reserved >	0
130.12	Bit				< reserved >	0

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RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
130.13	Bit				< reserved >	0
130.14	Bit				< reserved >	0
130.15	Bit				< reserved >	0

#### 2.4.1.20 SSR4 System status register (4) data available 2 (client-dependent, user-definable)

Table 62: *SSR4 System status register (4) data available 2 (client-dependent, user-definable)*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
131.00	Bit				Data category 1 has changed	1=Changed
131.01	Bit				Data category 2 has changed	1=Changed
131.02	Bit				Data category 3 has changed	1=Changed
131.03	Bit				Data category 4 has changed	1=Changed
131.04	Bit				Data category 5 has changed	1=Changed
131.05	Bit				Data category 6 has changed	1=Changed
131.06	Bit				Data category 7 has changed	1=Changed
131.07	Bit				Data category 8 has changed	1=Changed
131.08	Bit				Data category 9 has changed	1=Changed
131.09	Bit				Data category 10 has changed	1=Changed
131.10	Bit				Data category 11 has changed	1=Changed
131.11	Bit				Data category 12 has changed	1=Changed
131.12	Bit				Data category 13 has changed	1=Changed
131.13	Bit				Data category 14 has changed	1=Changed
131.14	Bit				Data category 15 has changed	1=Changed
131.15	Bit				Data category 16 has changed	1=Changed

#### 2.4.1.21 SSR5 System status register (5) device alive register

Table 63: *SSR5 System status register (5) device alive register*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
132	u16	1			Device alive counter	0...65535

## 2.4.1.22

## SSR6 System status register (6) control command status (client-dependent)

Table 64: SSR6 System status register (6) control command status (client-dependent)

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
					Last cmd result code	1)
133.00	Bit				- bit 0	
133.01	Bit				- bit 1	
133.02	Bit				- bit 2	
133.03	Bit				- bit 3	
133.04	Bit				- bit 4	
133.05	Bit				- bit 5	
133.06	Bit				- bit 6	
133.07	Bit				- bit 7	
					Response Type	1)
133.08	Bit				- bit 0	
133.09	Bit				- bit 1	
					Command state	1)
133.10	Bit				- bit 0	
133.11	Bit				- bit 1	
					Cmd sequence number	0...15
133.12	Bit				- bit 0	
133.13	Bit				- bit 1	
133.14	Bit				- bit 2	
133.15	Bit				- bit 3	

1) See the technical manual.

## 2.4.1.23

## System register values

Table 65: System register values

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.LDEV1			
2050	u16	1	.DevWrn.stVal	Warning	Last warning code	1)
2051	u16	1	.DevFail.stVal	Internal Fault	Last internal fault code	1)
	bit		.DevFail.stVal		Indicate IRF only	1=IRF
			DR.RDRE1			
2052	u16	1	.FltNum.stVal		Num. of DR recordings	0...N
2053	u16	1	.MemUsed.stVal		DR memory used	0...100[%]
	bit		.RcdStr.stVal		Recording started	1=Started
			.mcd			

Table continues on next page

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RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
	bit		.RcdDltInd.stVal		Recording deleted	1=Deleted
			.mcd			
	bit		.OvWrRcdInd.stVal		Overwrite of records	1=Overwrite
			.mcd			
	bit		.PerTrgInd.stVal		Periodic triggering	1=Triggered
			.mcd			
	bit		.ManTrgInd.stVal		Manual triggering	1=Triggered
			.mcd			
			LD0.LPHD1			
2054	u16	1	.NumPwrUp.stVal		Num. of cold starts	0...65535
2055	u16	1	.WrmStr.stVal		Num. of warm starts	0...65535
2056	u16	1	.WacTrg.stVal		Num. of watchdog resets	0...65535
	u16	1	.PhyHealth.stVal		Device self-diagnosis info	-2...3 <sup>1)</sup>
			LD0.LDEV1			
2057	u16	1	.ChgAckCnt.stVal		Num. of conf. changes	0...65535
			LD0.LLN0			
	u16	1	.ParChgCnt.stVal		Num. of setting changes	0...65535
			LD0.GNRLLTMS1			
	u16		.TmSyn.stVal		IEC 61850-9-2 sync	0...2 <sup>1)</sup>
	u16		.TmSrcSt.stVal		Time sync source	0...99 <sup>1)</sup>
			LD0.LLN0			
	u16	1	.ParChgCnt.stVal		Parameter change counter	0...65535

1) See the technical manual.

#### 2.4.1.24 Time and reason for latest IED reset

Table 66: *Time and reason for latest IED reset*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
9221	u16	1			Year	2000...2099
9222	u16	1			Month	1...12
9223	u16	1			Day	1...31
9224	u16	1			Hour	0...23
9225	u16	1			Minute	0...59
9226	u16	1			Second	0...59
9227	u16	1			Millisecond	0...999
9228	u16	1			Reset reason	
9228.0	Bit				- bit 0	1=Cold start
9228.1	Bit				- bit 1	1=Watchdog
9228.2	Bit				- bit 2	1=Warm start

**2.4.1.25****User-definable bits [Alt.2], visible on 0x,1x,3x and 4x****Table 67:** *User-definable bits [Alt.2], visible on 0x,1x,3x and 4x*

BitA	Type	Scale	IEC 61850 name	SA name	Description	Values
(0)	Bit				< not mappable - not visible >	
1	Bit				Usr reg 1.Bit 01	
2	Bit				Usr reg 1.Bit 02	
3	Bit				Usr reg 1.Bit 03	
:	:				:	
:	:				:	
15	Bit				Usr reg 1.Bit 15	
16	Bit				Usr reg 2.Bit 00	
17	Bit				Usr reg 2.Bit 01	
:	:				:	
:	:				:	
2046	Bit				Usr reg 127.Bit 14	
2047	Bit				Usr reg 127.Bit 15	

**2.4.1.26****User-definable registers [Alt.1], visible on 3x and 4x****Table 68:** *User-definable registers [Alt.1], visible on 3x and 4x*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
(0)	Reg				< not mappable - not visible >	
1	Reg				User register 1	
2	Reg				User register 2	
3	:				:	
:	:				:	
:	:				:	
127	Reg				User register 127	

**2.4.1.27****CTRL.CBCSWI1 Circuit breaker operation counter (1)****Table 69:** *CTRL.CBCSWI1 Circuit breaker operation counter (1)*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			CTRL.CBCSWI1			
2027	u16	1	.OpCntRs.stVal	Operation counter	Operation counter	0...65535

**2.4.1.28**

**LD0.CMMXU1 Phase current demand values (1)**

**Table 70:** *LD0.CMMXU1 Phase current demand values (1)*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.CAVMMXU1		Demand value	
2001	u16	1000	.A.phsA.cVal.mag.f	I_DMD_A	Phs A amplitude	0.00...50.0 [xIn]
2002	u16	1000	.A.phsB.cVal.mag.f	I_DMD_B	Phs B amplitude	0.00...50.0 [xIn]
2003	u16	1000	.A.phsC.cVal.mag.f	I_DMD_C	Phs C amplitude	0.00...50.0 [xIn]
2004					Year - month	
2005					Day - hour	
2006					Minute - second	
2007					Milliseconds	
2008					Time quality	
			LD0.CMAMMXU1		Max demand values	
2009	u16	1000	.A.phsA.cVal.mag.f	Max demand IL1	Phs A amplitude	0.00...50.0 [xIn]
2010					Year - month	
2011					Day - hour	
2012					Minute - second	
2013					Milliseconds	
2014					Time quality	
2015	u16	1000	.A.phsB.cVal.mag.f	Max demand IL2	Phs B amplitude	0.00...50.0 [xIn]
2016					Year - month	
2017					Day - hour	
2018					Minute - second	
2019					Milliseconds	
2020					Time quality	
2021	u16	1000	.A.phsC.cVal.mag.f	Max demand IL2	Phs C amplitude	0.00...50.0 [xIn]
2022					Year - month	
2023					Day - hour	
2024					Minute - second	
2025					Milliseconds	
2026					Time quality	
			LD0.CMIMMXU1		Min demand values	

Table continues on next page

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
	u16	1000	.A.phsA.cVal.mag.f	Max demand IL1	Phs A amplitude	0.00...50.0 [xIn]
	u16	1000	.A.phsB.cVal.mag.f	Max demand IL2	Phs B amplitude	0.00...50.0 [xIn]
	u16	1000	.A.phsC.cVal.mag.f	Max demand IL3	Phs C amplitude	0.00...50.0 [xIn]

#### 2.4.1.29 LD0.CMMXU1 Three-phase current measurement (1)

Table 71: LD0.CMMXU1 Three-phase current measurement (1)

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.CMMXU1		Phase current (1)	
138	u16	1000	.A.phsA.instCVal.mag.f	I_INST_A	Phs A amplitude	0.00...40.0 [xIn]
139	u16	1000	.A.phsB.instCVal.mag.f	I_INST_B	Phs B amplitude	0.00...40.0 [xIn]
140	u16	1000	.A.phsC.instCVal.mag.f	I_INST_C	Phs C amplitude	0.00...40.0 [xIn]

#### 2.4.1.30 LD0.CSMSQI1 Sequence current measurement (1)

Table 72: LD0.CSMSQI1 Sequence current measurement (1)

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.CSMSQI1		Sequence of currents	
143	u16	1000	.SeqA.c1.instCVal.mag.f	I1_INST	Positive amplitude	0.00...40.0 [xIn]
144	u16	1000	.SeqA.c2.instCVal.mag.f	I2_INST	Negative amplitude	0.00...40.0 [xIn]
145	u16	1000	.SeqA.c3.instCVal.mag.f	I3_INST	Zero amplitude	0.00...40.0 [xIn]

#### 2.4.1.31 LD0.MDSOPT1 Runtime counter for machines and devices (1)

Since the register size is 16 bits, the value saturates at 65535 hours (approximately 7.5 years). Alternatively, a 32-bit user-definable register can be made of this data to cover the whole 300 000 hours (34 years) range. The value can also, for example, be rescaled to show “total operation days” instead by changing the scale factor from 1 to 1/24 = 0.0417.

Table 73: LD0.MDSOPT1 Runtime counter for machines and devices (1)

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.MDSOPT1			
2048	u16	1	.OpTmh.stVal	OPR_TIME	Total operation hours	0..299999

#### 2.4.1.32

#### LD0.MPTTR1 Thermal overload protection for motors (1)

Table 74: LD0.MPTTR1 Thermal overload protection for motors (1)

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.MPTTR1			
147	u16	1	.TmpRl.mag.f	Therm-lev	Thermal level	0.00...9.99
148	i16	1	.TmpUsed.mag.f	TEMP_AMB	Ambient temperature	-99...999 [C]
149	u16	10	.ThmLevSt	THERMLEV_ST	Start therm.level	0.00...9.99
150	u16	10	.ThmLevEnd	THERMLEV_END	End therm.level	0.00...9.99
151	u16	1	.BlkThmRsTm.stVal	T_ENARESTART	Est. time to reset block restart	0...99999 [s]

#### 2.4.1.33

#### LD0.RESCMMXU1 Residual current demand value (1)

Table 75: LD0.RESCMMXU1 Residual current demand value (1)

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.RCAVMMXU1		Demand value	
1989	u16	1000	.A.res.cVal.mag.f	I_DMD_RES	Residual amplitude	0.00...50.0 [ $\times 10^{-6}$ ]
1990					Year - month	
1991					Day - hour	
1992					Minute - second	
1993					Milliseconds	
1994					Time quality	
			LD0.RCMAMMXU1		Max. demand value	
1995	u16	1000	.A.res.cVal.mag.f	Max demand Io	Residual amplitude	0.00...50.0 [ $\times 10^{-6}$ ]
1996					Year - month	
1997					Day - hour	
1998					Minute - second	
1999					Milliseconds	
2000					Time quality	
			LD0.RCMIMMXU1		Min. demand value	
	u16	1000	.A.res.cVal.mag.f	Min demand Io	Residual amplitude	0.00...50.0 [ $\times 10^{-6}$ ]

#### 2.4.1.34

#### LD0.RESCMMXU1 Residual current measurement (1)

Table 76: LD0.RESCMMXU1 Residual current measurement (1)

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			LD0.RESCMMXU1		Residual current (1)	
141	u16	1000	.A.res.instCVal.mag.f	I0_INST	- amplitude	0.00...40.0 [ $\times 10^{-6}$ ]

## 2.4.2

### Unmapped registers

Unmapped registers are register data that have no initial Modbus mapping locations, but can be added to the user-definable Modbus area using the Communication Management tool in PCM600. The initial register type settings of these objects have little meaning, since it is always possible to redefine the settings completely for the user-definable register.

#### 2.4.2.1

#### CTRL.LLN0 Local, Remote, Station, Off and Combinations

*Table 77: CTRL.LLN0 Local, Remote, Station, Off and Combinations*

RegA	Type	Scale	IEC 61850 name	SA name	Description	Values
			CTRL.LLN0			
	u16	1	.LocKeyHMI.stVal		0=Off; 1=Loc; 2=Rem; 3=Stat; 4=L+R; 5=L+S; 6=L+S+R; 7=S +R	0...7

## 2.5

### Controls

*Table 78: Explanations of the controls table columns*

Column name	Description
0xA	Coil (0X) address for control value.
CS	Control structure and bit within the structure for control value.
IEC 61850 name	Original IED data object identification. Described in the IEC 61850 format as Logical Device.Logical Node and thereafter .Data Object.Data Attribute. Logical Node is the same as the application function block name.
SA name	The signal may have a defined label that is visible, for example, in the Application Configuration tool in PCM600.
Description	Short description of the signal. See the technical manual for more information.
Value	Meaning of the written value.

#### 2.5.1

#### Reset, acknowledge and trigger points

*Table 79: Reset, acknowledge and trigger points*

0xA	CS	IEC 61850 name	SA name	Description	Values
		LD0.LLN0			
2060	2.00	.IndLEDRs.Oper.ctlVal		Reset indications and LEDs	1=Reset
2061	2.01	.ProgLEDRs.Oper.ctlVal		Reset Alarm LEDs	1=Reset
		DR.RDRE1			
2067	2.07	.RcdTrg.Oper.ctlVal		Trig DR recording	1=Trig
2068	2.08	.MemClr.Oper.ctlVal		Clear DR memory	1=Clear
		LD0.CMMXU1			
Table continues on next page					

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0xA	CS	IEC 61850 name	SA name	Description	Values
2069	2.09	.RcdRs.Oper.ctlVal		Reset Max current1 demands	1=Reset
		LD0.RESCMMXU1			
2073	2.13	.RcdRs.Oper.ctlVal		Reset Io (1) max demands	1=Reset

### 2.5.2 CTRL.CBCSWI1 Circuit breaker control (1)

Table 80: *CTRL.CBCSWI1 Circuit breaker control (1)*

0xA	CS	IEC 61850 name	SA name	Description	Values
		CTRL.CBCSWI1			
2048	1.00	.Pos.Oper.ctlVal		Select open	1=Select
2049	1.01	.Pos.Oper.ctlVal		Select close	1=Select
2050	1.02	.Pos.Oper.ctlVal		Cancel selection	1=Cancel
2051	1.03	.Pos.Oper.ctlVal		Execute selection	1=Execute
2052	1.04	.Pos.Oper.ctlVal		Direct open	1=Open
2053	1.05	.Pos.Oper.ctlVal		Direct close	1=Close

### 2.5.3 LD0.LDEV1 Protection relay's warm reset (1)

Table 81: *LD0.LDEV1 Protection relay's warm reset (1)*

0xA	CS	IEC 61850 name	SA name	Description	Values
		LD0.LDEV1			
2080	3.00	.WrmStrCmd.Oper.ctlVal		Warm reboot of protection relay	1=Reboot

### 2.5.4 Unmapped control points

Table 82: *Unmapped control points*

IEC 61850 name	Description	Value
LD0.LLN0		
.MeasStatRs.Oper.ctlVal	Reset all min. and max. demands	1=Reset
LD0.FLTRFRC1		
.RcdRs.Oper.ctlVal	Reset fault record data	1=Reset

## Section 3      Glossary

<b>EMC</b>	Electromagnetic compatibility
<b>IEC</b>	International Electrotechnical Commission
<b>IEC 61850</b>	International standard for substation communication and modeling
<b>IED</b>	Intelligent electronic device
<b>LED</b>	Light-emitting diode
<b>LHMI</b>	Local human-machine interface
<b>PCM600</b>	Protection and Control IED Manager
<b>WHMI</b>	Web human-machine interface





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**ABB Distribution Solutions**

**Distribution Automation**

P.O. Box 699

FI-65101 VAASA, Finland

Phone +358 10 22 11

[www.abb.com/mediumvoltage](http://www.abb.com/mediumvoltage)

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