

RELION® 611 SERIES

# Voltage Protection and Control

## REU611

### 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 an 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

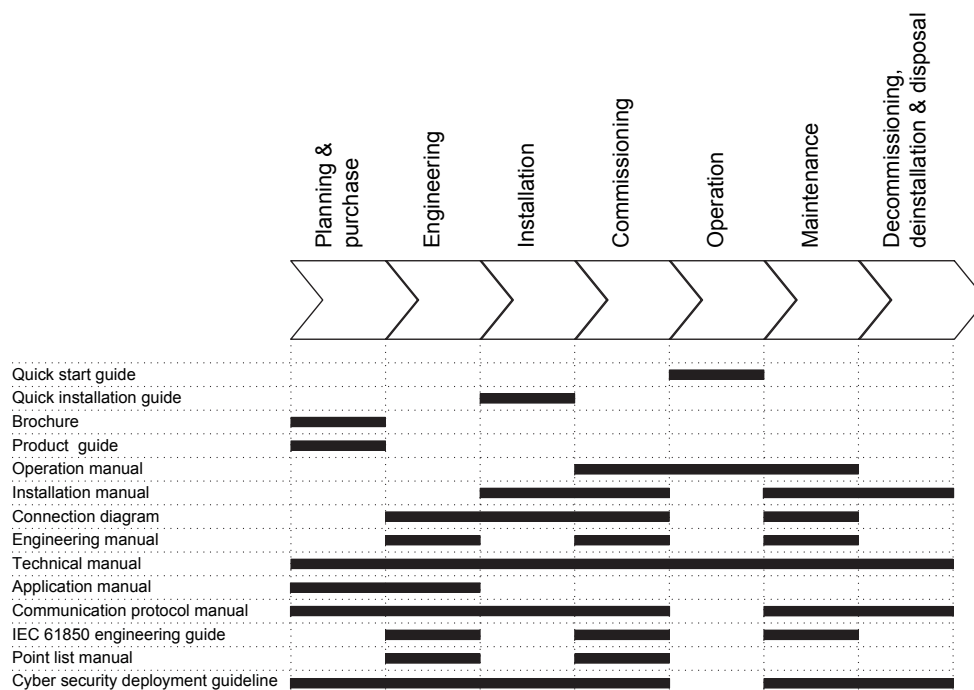


Figure 1: The intended use of manuals in different lifecycles



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/2016-02-22           | 2.0             | First release   |
| B/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>                                     |           |                      |           |
| Residual overvoltage protection, instance 1           | ROVPTOV1  | U <sub>0</sub> > (1) | 59G (1)   |
| Residual overvoltage protection, instance 2           | ROVPTOV2  | U <sub>0</sub> > (2) | 59G (2)   |
| Residual overvoltage protection, instance 3           | ROVPTOV3  | U <sub>0</sub> > (3) | 59G (3)   |
| Three-phase undervoltage protection, instance 1       | PHPTUV1   | 3U< (1)              | 27(1)     |
| Three-phase undervoltage protection, instance 2       | PHPTUV2   | 3U< (2)              | 27(2)     |
| Three-phase undervoltage protection, instance 3       | PHPTUV3   | 3U< (3)              | 27(3)     |
| Three-phase overvoltage protection, instance 1        | PHPTOV1   | 3U> (1)              | 59(1)     |
| Three-phase overvoltage protection, instance 2        | PHPTOV2   | 3U> (2)              | 59(2)     |
| Three-phase overvoltage protection, instance 3        | PHPTOV3   | 3U> (3)              | 59(3)     |
| Positive-sequence undervoltage protection, instance 1 | PSPTUV1   | U <sub>1</sub> < (1) | 47U+(1)   |
| Positive-sequence undervoltage protection, instance 2 | PSPTUV2   | U <sub>1</sub> < (2) | 47U+(2)   |
| Negative-sequence overvoltage protection, instance 1  | NSPTOV1   | U <sub>2</sub> > (1) | 47O-(1)   |
| Negative-sequence overvoltage protection, instance 2  | NSPTOV2   | U <sub>2</sub> > (2) | 47O-(2)   |
| Frequency protection, instance 1                      | FRPFRQ1   | f>/f<,df/dt (1)      | 81(1)     |
| Frequency protection, instance 2                      | FRPFRQ2   | f>/f<,df/dt (2)      | 81(2)     |
| Master trip, instance 1                               | TRPPTRC1  | Master Trip (1)      | 94/86 (1) |
| Master trip, instance 2                               | TRPPTRC2  | Master Trip (2)      | 94/86 (2) |
| <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        |
| Table continues on next page                          |           |                      |           |

| Function                                    | IEC 61850 | IEC 60617  | IEC-ANSI   |
|---------------------------------------------|-----------|------------|------------|
| Move (8 pcs), instance 1                    | MVGAPC    | MV (1)     | MV (1)     |
| <b>Control</b>                              |           |            |            |
| Circuit-breaker control                     | CBXCBR1   | I <-> O CB | I <-> O CB |
| <b>Condition monitoring and supervision</b> |           |            |            |
| Trip circuit supervision, instance 1        | TCSSCBR1  | TCS (1)    | TCM (1)    |
| Trip circuit supervision, instance 2        | TCSSCBR2  | TCS (2)    | TCM (2)    |
| <b>Logging</b>                              |           |            |            |
| Disturbance recorder                        | RDRE1     | DR (1)     | DFR(1)     |
| Fault recorder                              | FLTRFRC1  | -          | FR         |
| <b>Measurement</b>                          |           |            |            |
| Three-phase voltage measurement, instance 1 | VMMXU1    | 3U         | 3U         |
| Three-phase voltage measurement, instance 2 | VMMXU2    | 3U(B)      | 3U(B)      |
| Sequence voltage measurement, instance 1    | VSMSQI1   | U1, U2, U0 | U1, U2, U0 |
| Residual voltage measurement                | RESVMMXU1 | Uo         | Vn         |
| Frequency measurement, instance 1           | FMMXU1    | f          | f          |

- 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 REU611

**Table 2:** *Supported functions*

| Function                                    | IEC 61850 | A       |
|---------------------------------------------|-----------|---------|
|                                             |           | UE/C101 |
| <b>Protection</b>                           |           |         |
| Residual overvoltage protection             | ROVPTOV   | 3       |
| Three-phase undervoltage protection         | PHPTUV    | 3       |
| Three-phase overvoltage protection          | PHPTOV    | 3       |
| Positive-sequence undervoltage protection   | PSPTUV    | 2       |
| Negative-sequence overvoltage protection    | NSPTOV    | 2       |
| Frequency protection                        | FRPFRQ    | 2       |
| Master trip                                 | TRPPTRC   | 2       |
| <b>Control</b>                              |           |         |
| Circuit-breaker control                     | CBXCBR    | 1       |
| <b>Condition monitoring and supervision</b> |           |         |
| Trip circuit supervision                    | TCSSCBR   | 2       |
| <b>Logging</b>                              |           |         |
| Disturbance recorder                        | RDRE      | 1       |
| Fault recorder                              | FLTRFRC   | 1       |
| <b>Measurement</b>                          |           |         |
| Three-phase voltage measurement             | VMMXU     | 2       |
| Sequence voltage measurement                | VSMSQI    | 1       |
| Table continues on next page                |           |         |

| Function                                                                                                                                                                                                     | IEC 61850 | A       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------|
|                                                                                                                                                                                                              |           | UE/C101 |
| Residual voltage measurement                                                                                                                                                                                 | RESVMMXU  | 1       |
| Frequency measurement                                                                                                                                                                                        | FMMXU     | 1       |
| <b>Other</b>                                                                                                                                                                                                 |           |         |
| Input switch group                                                                                                                                                                                           | ISWGAPC   | 10      |
| Output switch group                                                                                                                                                                                          | OSWGAPC   | 20      |
| Selector                                                                                                                                                                                                     | SELGAPC   | 6       |
| Minimum pulse timer (2 pcs)                                                                                                                                                                                  | TPGAPC    | 10      |
| 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.<br>( ) = optional |           |         |

## 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.Station | -       | 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 | 175.00 | .Pos.stVal     | -        | Close bit   | 1=Close      |
| 2805 | 175.01 | .Pos.stVal     | -        | Open bit    | 1=Open       |
| 2806 | 175.02 | .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              |            |                         |            |
| 2820 | 176.04 | < reserved >      |            |                         |            |
| 2821 | 176.05 | < reserved >      |            |                         |            |
| 2822 | 176.06 | .Pos.stSeld       | SELECTED   | CB selected for control | 1=Selected |
| 2823 | 176.07 | .mcd              |            |                         |            |
| 2826 | 176.10 | .SynItlByps.stVal | ITL_BYPASS | Interlock bypass        | 1=Bypass   |
| 2827 | 176.11 | .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.FRPFRQ1 Frequency protection (1)

**Table 9:** *LD0.FRPFRQ1 Frequency protection (1)*

| BitA | RegA   | IEC 61850 name | SA name  | Description        | Values    |
|------|--------|----------------|----------|--------------------|-----------|
|      |        | LD0.FRPTRC1    |          |                    |           |
| 3040 | 190.00 | .Str.general   | START    | Stage 1 start      | 1=Start   |
| 3041 | 190.01 | .mcd           |          |                    |           |
|      |        | LD0.FRPTOF1    |          | Overfrequency      |           |
| 3042 | 190.02 | .Op.general    | OPR_OFRQ | Operate            | 1=Operate |
| 3043 | 190.03 | .mcd           |          |                    |           |
|      |        | LD0.FRPTUF1    |          | Underfrequency     |           |
| 3044 | 190.04 | .Op.general    | OPR_UFRQ | Operate            | 1=Operate |
| 3045 | 190.05 | .mcd           |          |                    |           |
|      |        | LD0.FRPFRQ1    |          | Frequency gradient |           |
| 3046 | 190.06 | .Op.general    | OPR_FRG  | Operate            | 1=Operate |
| 3047 | 190.07 | .mcd           |          |                    |           |

### 2.3.1.7 LD0.FRPFRQ2 Frequency protection (2)

**Table 10:** *LD0.FRPFRQ2 Frequency protection (2)*

| BitA | RegA   | IEC 61850 name | SA name  | Description    | Values    |
|------|--------|----------------|----------|----------------|-----------|
|      |        | LD0.FRPTRC2    |          |                |           |
| 3048 | 190.08 | .Str.general   | START    | Stage 2 start  | 1=Start   |
| 3049 | 190.09 | .mcd           |          |                |           |
|      |        | LD0.FRPTOF2    |          | Overfrequency  |           |
| 3050 | 190.10 | .Op.general    | OPR_OFRQ | Operate        | 1=Operate |
| 3051 | 190.11 | .mcd           |          |                |           |
|      |        | LD0.FRPTUF2    |          | Underfrequency |           |
| 3052 | 190.12 | .Op.general    | OPR_UFRQ | Operate        | 1=Operate |
| 3053 | 190.13 | .mcd           |          |                |           |

Table continues on next page

| BitA | RegA   | IEC 61850 name | SA name | Description        | Values    |
|------|--------|----------------|---------|--------------------|-----------|
|      |        | LD0.FRPFR2     |         | Frequency gradient |           |
| 3054 | 190.14 | .Op.general    | OPR_FRG | Operate            | 1=Operate |
| 3055 | 190.15 | .mcd           |         |                    |           |

### 2.3.1.8

### 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.

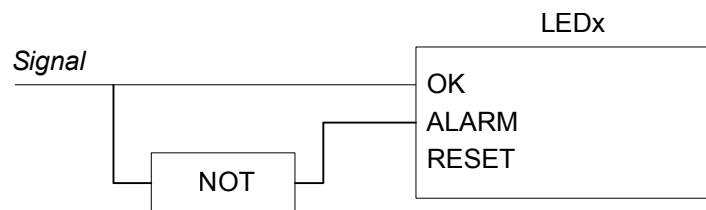


Figure 2: Signal wired to both OK and ALARM inputs – inverted to the other



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.

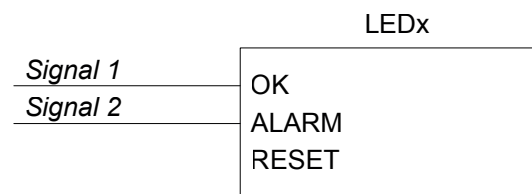


Figure 3: Separate signals wired to OK and ALARM inputs

Table 11: 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 |

Table continues on next page

| BitA | RegA   | IEC 61850 name               | SA name | Description  | Values       |
|------|--------|------------------------------|---------|--------------|--------------|
| 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 |
| 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.

### 2.3.1.9

### 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.

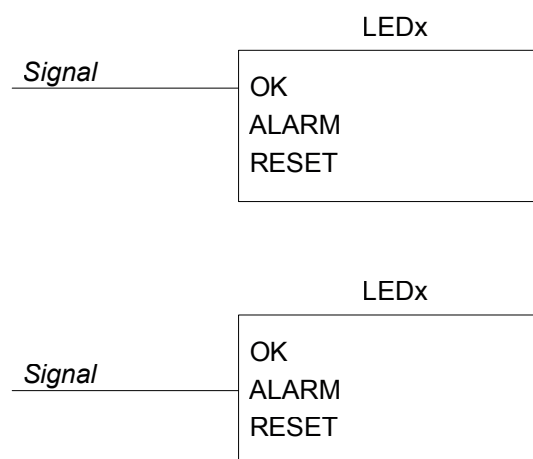


Figure 4: Signal wired to either OK or Alarm input

Table 12: 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 |

Table continues on next page

| BitA | RegA   | IEC 61850 name               | SA name | Description  | Values        |
|------|--------|------------------------------|---------|--------------|---------------|
| 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 |
| 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.

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

Table 13: 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           |         |                |           |

### 2.3.1.11 LD0.LEDPTRC1 Global conditioning, phase information (1)

Table 14: LD0.LEDPTRC1 Global conditioning, phase information (1)

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

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

**Table 15:** *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 |
|      |        | <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 |



**2.3.1.13 LD0.NSPTOV1 Negative-sequence overvoltage protection (1)****Table 16:** *LD0.NSPTOV1 Negative-sequence overvoltage protection (1)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.NSPTOV1    |         |                 |           |
| 2988 | 186.12 | .Str.general   | START   | General start   | 1=Start   |
| 2989 | 186.13 | .mcd           |         |                 |           |
| 2996 | 187.04 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2997 | 187.05 | .mcd           |         |                 |           |

**2.3.1.14 LD0.NSPTOV2 Negative-sequence overvoltage protection (2)****Table 17:** *LD0.NSPTOV2 Negative-sequence overvoltage protection (2)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.NSPTOV2    |         |                 |           |
| 2998 | 187.06 | .Str.general   | START   | General start   | 1=Start   |
| 2999 | 187.07 | .mcd           |         |                 |           |
| 3006 | 187.14 | .Op.general    | OPERATE | General operate | 1=Operate |
| 3007 | 187.15 | .mcd           |         |                 |           |

**2.3.1.15 LD0.PHPTOV1 Three-phase overvoltage protection (1)****Table 18:** *LD0.PHPTOV1 Three-phase overvoltage protection (1)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.PHPTOV1    |         |                 |           |
| 2912 | 182.00 | .Str.general   | START   | General start   | 1=Start   |
| 2913 | 182.01 | .mcd           |         |                 |           |
| 2914 | 182.02 | .Str.phsA      |         | Phs A start     | 1=Start   |
| 2915 | 182.03 | .mcd           |         |                 |           |
| 2916 | 182.04 | .Str.phsB      |         | Phs B start     | 1=Start   |
| 2917 | 182.05 | .mcd           |         |                 |           |
| 2918 | 182.06 | .Str.phsC      |         | Phs C start     | 1=Start   |
| 2919 | 182.07 | .mcd           |         |                 |           |
| 2920 | 182.08 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2921 | 182.09 | .mcd           |         |                 |           |

### 2.3.1.16 LD0.PHPTOV2 Three-phase overvoltage protection (2)

**Table 19:** *LD0.PHPTOV2 Three-phase overvoltage protection (2)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.PHPTOV2    |         |                 |           |
| 2922 | 182.10 | .Str.general   | START   | General start   | 1=Start   |
| 2923 | 182.11 | .mcd           |         |                 |           |
| 2924 | 182.12 | .Str.phsA      |         | Phs A start     | 1=Start   |
| 2925 | 182.13 | .mcd           |         |                 |           |
| 2926 | 182.14 | .Str.phsB      |         | Phs B start     | 1=Start   |
| 2927 | 182.15 | .mcd           |         |                 |           |
| 2928 | 183.00 | .Str.phsC      |         | Phs C start     | 1=Start   |
| 2929 | 183.01 | .mcd           |         |                 |           |
| 2930 | 183.02 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2931 | 183.03 | .mcd           |         |                 |           |

### 2.3.1.17 LD0.PHPTOV3 Three-phase overvoltage protection (3)

**Table 20:** *LD0.PHPTOV3 Three-phase overvoltage protection (3)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.PHPTOV3    |         |                 |           |
| 2932 | 183.04 | .Str.general   | START   | General start   | 1=Start   |
| 2933 | 183.05 | .mcd           |         |                 |           |
| 2934 | 183.06 | .Str.phsA      |         | Phs A start     | 1=Start   |
| 2935 | 183.07 | .mcd           |         |                 |           |
| 2936 | 183.08 | .Str.phsB      |         | Phs B start     | 1=Start   |
| 2937 | 183.09 | .mcd           |         |                 |           |
| 2938 | 183.10 | .Str.phsC      |         | Phs C start     | 1=Start   |
| 2939 | 183.11 | .mcd           |         |                 |           |
| 2940 | 183.12 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2941 | 183.13 | .mcd           |         |                 |           |

### 2.3.1.18 LD0.PHPTUV1 Three-phase undervoltage protection (1)

**Table 21:** *LD0.PHPTUV1 Three-phase undervoltage protection (1)*

| BitA                         | RegA   | IEC 61850 name | SA name | Description   | Values  |
|------------------------------|--------|----------------|---------|---------------|---------|
|                              |        | LD0.PHPTUV1    |         |               |         |
| 2944                         | 184.00 | .Str.general   | START   | General start | 1=Start |
| 2945                         | 184.01 | .mcd           |         |               |         |
| 2946                         | 184.02 | .Str.phsA      |         | Phs A start   | 1=Start |
| Table continues on next page |        |                |         |               |         |

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
| 2947 | 184.03 | .mcd           |         |                 |           |
| 2948 | 184.04 | .Str.phsB      |         | Phs B start     | 1=Start   |
| 2949 | 184.05 | .mcd           |         |                 |           |
| 2950 | 184.06 | .Str.phsC      |         | Phs C start     | 1=Start   |
| 2951 | 184.07 | .mcd           |         |                 |           |
| 2952 | 184.08 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2953 | 184.09 | .mcd           |         |                 |           |

### 2.3.1.19 LD0.PHPTUV2 Three-phase undervoltage protection (2)

Table 22: LD0.PHPTUV2 Three-phase undervoltage protection (2)

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.PHPTUV2    |         |                 |           |
| 2954 | 184.10 | .Str.general   | START   | General start   | 1=Start   |
| 2955 | 184.11 | .mcd           |         |                 |           |
| 2956 | 184.12 | .Str.phsA      |         | Phs A start     | 1=Start   |
| 2957 | 184.13 | .mcd           |         |                 |           |
| 2958 | 184.14 | .Str.phsB      |         | Phs B start     | 1=Start   |
| 2959 | 184.15 | .mcd           |         |                 |           |
| 2960 | 185.00 | .Str.phsC      |         | Phs C start     | 1=Start   |
| 2961 | 185.01 | .mcd           |         |                 |           |
| 2962 | 185.02 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2963 | 185.03 | .mcd           |         |                 |           |

### 2.3.1.20 LD0.PHPTUV3 Three-phase undervoltage protection (3)

Table 23: LD0.PHPTUV3 Three-phase undervoltage protection (3)

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.PHPTUV3    |         |                 |           |
| 2964 | 185.04 | .Str.general   | START   | General start   | 1=Start   |
| 2965 | 185.05 | .mcd           |         |                 |           |
| 2966 | 185.06 | .Str.phsA      |         | Phs A start     | 1=Start   |
| 2967 | 185.07 | .mcd           |         |                 |           |
| 2968 | 185.08 | .Str.phsB      |         | Phs B start     | 1=Start   |
| 2969 | 185.09 | .mcd           |         |                 |           |
| 2970 | 185.10 | .Str.phsC      |         | Phs C start     | 1=Start   |
| 2971 | 185.11 | .mcd           |         |                 |           |
| 2972 | 185.12 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2973 | 185.13 | .mcd           |         |                 |           |

### 2.3.1.21 LD0.PSPTUV1 Positive-sequence undervoltage protection (1)

**Table 24:** *LD0.PSPTUV1 Positive-sequence undervoltage protection (1)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.PSPTUV1    |         |                 |           |
| 3008 | 188.00 | .Str.general   | START   | General start   | 1=Start   |
| 3009 | 188.01 | .mcd           |         |                 |           |
| 3016 | 188.08 | .Op.general    | OPERATE | General operate | 1=Operate |
| 3017 | 188.09 | .mcd           |         |                 |           |

### 2.3.1.22 LD0.PSPTUV2 Positive-sequence undervoltage protection (2)

**Table 25:** *LD0.PSPTUV2 Positive-sequence undervoltage protection (2)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.PSPTUV2    |         |                 |           |
| 3018 | 188.10 | .Str.general   | START   | General start   | 1=Start   |
| 3019 | 188.11 | .mcd           |         |                 |           |
| 3026 | 189.02 | .Op.general    | OPERATE | General operate | 1=Operate |
| 3027 | 189.03 | .mcd           |         |                 |           |

### 2.3.1.23 LD0.RESVMMXU1 Residual voltage measurement (1)

**Table 26:** *LD0.RESVMMXU1 Residual voltage measurement (1)*

| BitA | RegA   | IEC 61850 name | SA name    | Description  | Values    |
|------|--------|----------------|------------|--------------|-----------|
|      |        | LD0.RESVMMXU1  |            |              |           |
| 2764 | 172.12 | .HiAlm.stVal   | HIGH_ALARM | High alarm   | 1=Alarm   |
| 2765 | 172.13 | .mcd           |            |              |           |
| 2766 | 172.14 | .HiWrn.stVal   | HIGH_WARN  | High warning | 1=Warning |
| 2767 | 172.15 | .mcd           |            |              |           |

### 2.3.1.24 LD0.ROVPTOV1 Residual overvoltage protection (1)

**Table 27:** *LD0.ROVPTOV1 Residual overvoltage protection (1)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.ROVPTOV1   |         |                 |           |
| 2976 | 186.00 | .Str.general   | START   | General start   | 1=Start   |
| 2977 | 186.01 | .mcd           |         |                 |           |
| 2978 | 186.02 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2979 | 186.03 | .mcd           |         |                 |           |

**2.3.1.25 LD0.ROVPTOV2 Residual overvoltage protection (2)****Table 28:** *LD0.ROVPTOV2 Residual overvoltage protection (2)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.ROVPTOV2   |         |                 |           |
| 2980 | 186.04 | .Str.general   | START   | General start   | 1=Start   |
| 2981 | 186.05 | .mcd           |         |                 |           |
| 2982 | 186.06 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2983 | 186.07 | .mcd           |         |                 |           |

**2.3.1.26 LD0.ROVPTOV3 Residual overvoltage protection (3)****Table 29:** *LD0.ROVPTOV3 Residual overvoltage protection (3)*

| BitA | RegA   | IEC 61850 name | SA name | Description     | Values    |
|------|--------|----------------|---------|-----------------|-----------|
|      |        | LD0.ROVPTOV3   |         |                 |           |
| 2984 | 186.08 | .Str.general   | START   | General start   | 1=Start   |
| 2985 | 186.09 | .mcd           |         |                 |           |
| 2986 | 186.10 | .Op.general    | OPERATE | General operate | 1=Operate |
| 2987 | 186.11 | .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           |         |                    |           |

### 2.3.1.31 LD0.VMMXU1 Three-phase voltage measurement (1)

**Table 34:** *LD0.VMMXU1 Three-phase voltage measurement (1)*

| BitA | RegA   | IEC 61850 name | SA name    | Description  | Values    |
|------|--------|----------------|------------|--------------|-----------|
|      |        | LD0.VMMXU1     |            |              |           |
| 2784 | 174.00 | .HiAlm.stVal   | HIGH_ALARM | High alarm   | 1=Alarm   |
| 2785 | 174.01 | .mcd           |            |              |           |
| 2786 | 174.02 | .HiWrn.stVal   | HIGH_WARN  | High warning | 1=Warning |
| 2787 | 174.03 | .mcd           |            |              |           |
| 2788 | 174.04 | .LoWrn.stVal   | LOW_WARN   | Low warning  | 1=Warning |
| 2789 | 174.05 | .mcd           |            |              |           |
| 2790 | 174.06 | .LoAlm.stVal   | LOW_ALARM  | Low alarm    | 1=Alarm   |
| 2791 | 174.07 | .mcd           |            |              |           |

**2.3.1.32 LD0.XAGGIO130 Physical I/O states (AIM card XA130)****Table 35:** *LD0.XAGGIO130 Physical I/O states (AIM card XA130)*

| BitA | RegA   | IEC 61850 name | SA name | Description          | Values     |
|------|--------|----------------|---------|----------------------|------------|
|      |        | LD0.XAGGIO130  |         |                      |            |
| 3280 | 205.00 | .Ind1.stVal    |         | XA130-Input 1 State  | 0/1=Off/On |
| 3281 | 205.01 | .mcd           |         |                      |            |
|      |        | .mom-only      |         | Mom only alternative |            |
| 3282 | 205.02 | .Ind2.stVal    |         | XA130-Input 2 State  | 0/1=Off/On |
| 3283 | 205.03 | .mcd           |         |                      |            |
|      |        | .mom-only      |         | Mom only alternative |            |
| 3284 | 205.04 | .Ind3.stVal    |         | XA130-Input 3 State  | 0/1=Off/On |
| 3285 | 205.05 | .mcd           |         |                      |            |
|      |        | .mom-only      |         | Mom only alternative |            |
| 3286 | 205.06 | .Ind4.stVal    |         | XA130-Input 4 State  | 0/1=Off/On |
| 3287 | 205.07 | .mcd           |         |                      |            |
|      |        | .mom-only      |         | Mom only alternative |            |

**2.3.1.33 LD0.XGGIO100 Physical I/O states (PSM card X100)****Table 36:** *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 |            |

## 2.3.2 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 37:** *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 38:** *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



| 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 39: 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.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            |          |                            |        |

### 2.3.2.5 LD0.RESTVTR1 Uo VT supervision (1)

Table 41: LD0.RESTVTR1 Uo VT supervision (1)

| BitA | RegA | IEC 61850 name | SA name | Description | Values    |
|------|------|----------------|---------|-------------|-----------|
|      |      | LD0.RESTVTR1   |         |             |           |
|      |      | .Alm.stVal     | ALARM   | Alarm       | 1=Alarm   |
|      |      | .mcd           |         |             |           |
|      |      | .Wrn.stVal     | WARNING | Warning     | 1=Warning |
|      |      | .mcd           |         |             |           |

### 2.3.2.6 LD0.UL1TVTR1 Three-phase VT supervision (1)

Table 42: LD0.UL1TVTR1 Three-phase VT supervision (1)

| BitA | RegA | IEC 61850 name | SA name | Description | Values    |
|------|------|----------------|---------|-------------|-----------|
|      |      | LD0.UL1TVTR1   |         |             |           |
|      |      | .Alm.stVal     | ALARM   | Alarm       | 1=Alarm   |
|      |      | .mcd           |         |             |           |
|      |      | .Wrn.stVal     | WARNING | Warning     | 1=Warning |
|      |      | .mcd           |         |             |           |

### 2.3.2.7 LD0.UL1TVTR2 Three-phase VT supervision (2)

Table 43: LD0.UL1TVTR2 Three-phase VT supervision (2)

| BitA | RegA | IEC 61850 name | SA name | Description | Values    |
|------|------|----------------|---------|-------------|-----------|
|      |      | LD0.UL1TVTR2   |         |             |           |
|      |      | .Alm.stVal     | ALARM   | Alarm       | 1=Alarm   |
|      |      | .mcd           |         |             |           |
|      |      | .Wrn.stVal     | WARNING | Warning     | 1=Warning |
|      |      | .mcd           |         |             |           |

**2.3.2.8 LD0.VMMXU2 Three-phase voltage measurement (2)****Table 44:** *LD0.VMMXU2 Three-phase voltage measurement (2)*

| BitA | RegA | IEC 61850 name | SA name    | Description  | Values      |
|------|------|----------------|------------|--------------|-------------|
|      |      | LD0.VMMXU2     |            |              |             |
|      |      | .HiAlm.stVal   | HIGH_ALARM | High alarm   | 1 = Alarm   |
|      |      | .mcd           |            |              |             |
|      |      | .HiWrn.stVal   | HIGH_WARN  | High warning | 1 = Warning |
|      |      | .mcd           |            |              |             |
|      |      | .LoWrn.stVal   | LOW_WARN   | Low warning  | 1 = Warning |
|      |      | .mcd           |            |              |             |
|      |      | .LoAlm.stVal   | LOW_ALARM  | Low alarm    | 1 = Alarm   |
|      |      | .mcd           |            |              |             |

**2.4 Registers****Table 45:** *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.                                                                                                                          |
| 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 46:** *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 47:** *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 48:** *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 49:** *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 50:** *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 51:** *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 52:** *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 53:** *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 54:** *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 55:** *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 56:** *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     |
|      |      |       |                |         | 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)          |

Table continues on next page

| RegA | Type | Scale | IEC 61850 name | SA name | Description            | Values      |
|------|------|-------|----------------|---------|------------------------|-------------|
| 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)          |
|      |      |       |                |         |                        |             |
|      |      |       |                |         | 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  |

Table continues on next page

## Section 2

### Modbus data mappings

1MRS758336 B

| RegA                         | Type | Scale | IEC 61850 name | SA name | Description            | Values      |
|------------------------------|------|-------|----------------|---------|------------------------|-------------|
| 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)          |
| 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 |
| Table continues on next page |      |       |                |         |                        |             |



| RegA                         | Type | Scale | IEC 61850 name | SA name | Description             | Values      |
|------------------------------|------|-------|----------------|---------|-------------------------|-------------|
| 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  |
| 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)          |
| Table continues on next page |      |       |                |         |                         |             |

| RegA | Type | Scale | IEC 61850 name | SA name | Description        | Values |
|------|------|-------|----------------|---------|--------------------|--------|
| 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 57:** *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    |
| 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 58:** *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)                 |                 |

Table continues on next page

| RegA                         | Type | Scale | IEC 61850 name <sup>1)</sup> | SA name | Description                  | Values                        |
|------------------------------|------|-------|------------------------------|---------|------------------------------|-------------------------------|
| 9416                         | u32  | 100   | .FltPtR.mag.f                |         | Fault resistance             | 0.00...<br>1000000.00<br>ohms |
| 9417                         |      |       |                              |         | (Low word)                   |                               |
| 9418                         | u32  | 100   | .FltDiskm.mag.f              |         | Fault distance               | 0.00...<br>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...80.00<br>0 [pu]       |
| 9423                         | u16  | 1000  | .Max50DifAB.mag.f            |         | Max. diff. current phs B     | 0.000...80.00<br>0 [pu]       |
| 9424                         | u16  | 1000  | .Max50DifAC.mag.f            |         | Max. diff. current phs C     | 0.000...80.00<br>0 [pu]       |
| 9425                         | u16  | 1000  | .Max50RstAA.mag.f            |         | Max. bias current phs A      | 0.000...<br>50.000 [pu]       |
| 9426                         | u16  | 1000  | .Max50RstAB.mag.f            |         | Max. bias current phs B      | 0.000...<br>50.000 [pu]       |
| 9427                         | u16  | 1000  | .Max50RstAC.mag.f            |         | Max. bias current phs C      | 0.000...<br>50.000 [pu]       |
| 9428                         | u16  | 1000  | .DifAPhsA.mag.f              |         | Diff. current phs A          | 0.000...80.00<br>0 [pu]       |
| 9429                         | u16  | 1000  | .DifAPhsB.mag.f              |         | Diff. current phs B          | 0.000...80.00<br>0 [pu]       |
| 9430                         | u16  | 1000  | .DifAPhsC.mag.f              |         | Diff. current phs C          | 0.000...80.00<br>0 [pu]       |
| 9431                         | u16  | 1000  | .RstAPhsA.mag.f              |         | Bias current phs A           | 0.000...<br>50.000 [pu]       |
| 9432                         | u16  | 1000  | .RstAPhsB.mag.f              |         | Bias current phs B           | 0.000...<br>50.000 [pu]       |
| 9433                         | u16  | 1000  | .RstAPhsC.mag.f              |         | Bias current phs C           | 0.000...<br>50.000 [pu]       |
| 9434                         | u16  | 1000  | .DifARes.mag.f               |         | Diff. current Io             | 0.000...80.00<br>0 [pu]       |
| 9435                         | u16  | 1000  | .RstARes.mag.f               |         | Bias current Io              | 0.000...<br>50.000 [pu]       |
| 9436                         | u16  | 1000  | .Max50APhsA1.mag.f           |         | Max. current phs A(1)        | 0.000...<br>50.000 [×In]      |
| 9437                         | u16  | 1000  | .Max50APhsB1.mag.f           |         | Max. current phs B(1)        | 0.000...<br>50.000 [×In]      |
| 9438                         | u16  | 1000  | .Max50APhsC1.mag.f           |         | Max. current phs C(1)        | 0.000...<br>50.000 [×In]      |
| 9439                         | u16  | 1000  | .Max50ARes1.mag.f            |         | Max. current Io(1)           | 0.000...<br>50.000 [×In]      |
| 9440                         | u16  | 1000  | .APhsA1.mag.f                |         | Current phs A(1)             | 0.000...<br>50.000 [×In]      |
| Table continues on next page |      |       |                              |         |                              |                               |

## Section 2

### Modbus data mappings

1MRS758336 B

| RegA | Type | Scale | IEC 61850 name <sup>1)</sup> | SA name | Description           | Values                       |
|------|------|-------|------------------------------|---------|-----------------------|------------------------------|
| 9441 | u16  | 1000  | .APhsB1.mag.f                |         | Current phs B(1)      | 0.000...<br>50.000 [×In]     |
| 9442 | u16  | 1000  | .APhsC1.mag.f                |         | Current phs C(1)      | 0.000...<br>50.000 [×In]     |
| 9443 | u16  | 1000  | .ARes1.mag.f                 |         | Current Io(1)         | 0.000...<br>50.000 [×In]     |
| 9444 | u16  | 1000  | .AResClc1.mag.f              |         | Current Io-Calc(1)    | 0.000...<br>50.000 [×In]     |
| 9445 | u16  | 1000  | .APsSeq1.mag.f               |         | Current Ps-Seq(1)     | 0.000...<br>50.000 [×In]     |
| 9446 | u16  | 1000  | .ANgSeq1.mag.f               |         | Current Ng-Seq(1)     | 0.000...<br>50.000 [×In]     |
| 9447 | u16  | 1000  | .PhVPhsA1.mag.f              |         | Voltage phs A(1)      | 0.000...4.000<br>[×Un]       |
| 9448 | u16  | 1000  | .PhVPhsB1.mag.f              |         | Voltage phs B(1)      | 0.000...4.000<br>[×Un]       |
| 9449 | u16  | 1000  | .PhVPhsC1.mag.f              |         | Voltage phs C(1)      | 0.000...4.000<br>[×Un]       |
| 9450 | u16  | 1000  | .PPVPhsAB1.mag.f             |         | Voltage phs AB(1)     | 0.000...4.000<br>[×Un]       |
| 9451 | u16  | 1000  | .PPVPhsBC1.mag.f             |         | Voltage phs BC(1)     | 0.000...4.000<br>[×Un]       |
| 9452 | u16  | 1000  | .PPVPhsCA1.mag.f             |         | Voltage phs CA(1)     | 0.000...4.000<br>[×Un]       |
| 9453 | u16  | 1000  | .VRes1.mag.f                 |         | Voltage Uo(1)         | 0.000...4.000<br>[×Un]       |
| 9454 | u16  | 1000  | .VZro1.mag.f                 |         | Voltage Zro-Seq(1)    | 0.000...4.000<br>[×Un]       |
| 9455 | u16  | 1000  | .VPsSeq1.mag.f               |         | Voltage Ps-Seq(1)     | 0.000...4.000<br>[×Un]       |
| 9456 | u16  | 1000  | .VNgSeq1.mag.f               |         | Voltage Ng-Seq(1)     | 0.000...4.000<br>[×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<br>[%]         |
| 9459 | i16  | 100   | .HzRteChg.mag.f              |         | Frequency gradient    | -10.00...10.0<br>0 [Hz/s]    |
| 9460 | i16  | 100   | .CondNeut.mag.f              |         | Conductance Yo        | -1000.00...10<br>00.00 [mS]  |
| 9461 | i16  | 100   | .SusNeut.mag.f               |         | Susceptance Yo        | -1000.00...10<br>00.00 [mS]  |
| 9462 | i32  | 100   | .PPLoopRis.mag.f             |         | Fault loop resistance | -1000.00...10<br>00.00 [ohm] |
| 9463 | i32  |       |                              |         | (Low word)            |                              |
| 9464 | i32  | 100   | .PPLoopReact.mag.f           |         | Fault loop reactance  | -1000.00...10<br>00.00 [ohm] |
| 9465 | i32  |       |                              |         | (Low word)            |                              |

Table continues on next page

| RegA | Type | Scale | IEC 61850 name <sup>1)</sup> | SA name | Description          | Values                     |
|------|------|-------|------------------------------|---------|----------------------|----------------------------|
| 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...<br>50.000 [×In]   |
| 9468 | u16  | 1000  | .Max50APhsB2.mag.f           |         | Max. current phsB(2) | 0.000...<br>50.000 [×In]   |
| 9469 | u16  | 1000  | .Max50APhsC2.mag.f           |         | Max. current phsC(2) | 0.000...<br>50.000 [×In]   |
| 9470 | u16  | 1000  | .Max50Ares2.mag.f            |         | Max. current Io(2)   | 0.000...<br>50.000 [×In]   |
| 9471 | u16  | 1000  | .APhsA2.mag.f                |         | Current phs A(2)     | 0.000...<br>50.000 [×In]   |
| 9472 | u16  | 1000  | .APhsB2.mag.f                |         | Current phs B(2)     | 0.000...<br>50.000 [×In]   |
| 9473 | u16  | 1000  | .APhsC2.mag.f                |         | Current phs C(2)     | 0.000...<br>50.000 [×In]   |
| 9474 | u16  | 1000  | .ARes2.mag.f                 |         | Current Io(2)        | 0.000...<br>50.000 [×In]   |
| 9475 | u16  | 1000  | .AResClc2.mag.f              |         | Current Io-Calc(2)   | 0.000...<br>50.000 [×In]   |
| 9476 | u16  | 1000  | .APsSeq2.mag.f               |         | Current Ps-Seq(2)    | 0.000...<br>50.000 [×In]   |
| 9477 | u16  | 1000  | .ANgSeq2.mag.f               |         | Current Ng-Seq(2)    | 0.000...<br>50.000 [×In]   |
| 9478 | u16  | 1000  | .PhVPhsA2.mag.f              |         | Voltage phs A(2)     | 0.000...4.000 [×Un]        |
| 9479 | u16  | 1000  | .PhVPhsB2.mag.f              |         | Voltage phs B(2)     | 0.000...4.000 [×Un]        |
| 9480 | u16  | 1000  | .PhVPhsC2.mag.f              |         | Voltage phs C(2)     | 0.000...4.000 [×Un]        |
| 9481 | u16  | 1000  | .PPVPhsAB2.mag.f             |         | Voltage phs AB(2)    | 0.000...4.000 [×Un]        |
| 9482 | u16  | 1000  | .PPVPhsBC2.mag.f             |         | Voltage phs BC(2)    | 0.000...4.000 [×Un]        |
| 9483 | u16  | 1000  | .PPVPhsCA2.mag.f             |         | Voltage phs CA(2)    | 0.000...4.000 [×Un]        |
| 9484 | u16  | 1000  | .VRes2.mag.f                 |         | Voltage Uo(2)        | 0.000...4.000 [×Un]        |
| 9485 | u16  | 1000  | .VZro2.mag.f                 |         | Voltage Zro-Seq(2)   | 0.000...4.000 [×Un]        |
| 9486 | u16  | 1000  | .VPsSeq2.mag.f               |         | Voltage Ps-Seq(2)    | 0.000...4.000 [×Un]        |
| 9487 | u16  | 1000  | .VNgSeq2.mag.f               |         | Voltage Ng-Seq(2)    | 0.000...4.000 [×Un]        |
| 9488 | i16  | 100   | .DifANAngVN1.mag.f           |         | Angle Uo-Io(1)       | -180.00...<br>180.00 [deg] |
| 9489 | i16  | 100   | .DifAAAngVBC1.mag.f          |         | Angle UBC-IA(1)      | -180.00...<br>180.00 [deg] |

Table continues on next page

| RegA | Type | Scale | IEC 61850 name <sup>1)</sup> | SA name | Description                     | Values                     |
|------|------|-------|------------------------------|---------|---------------------------------|----------------------------|
| 9490 | i16  | 100   | .DifABAngVCA1.mag.f          |         | Angle UCA-IB(1)                 | -180.00...<br>180.00 [deg] |
| 9491 | i16  | 100   | .DifACAngVAB1.mag.f          |         | Angle UAB-IC(1)                 | -180.00...<br>180.00 [deg] |
| 9492 | i16  | 100   | .DifANAngVN2.mag.f           |         | Angle Uo-Io(2)                  | -180.00...<br>180.00 [deg] |
| 9493 | i16  | 100   | .DifAAAngVBC2.mag.f          |         | Angle UBC-IA(2)                 | -180.00...<br>180.00 [deg] |
| 9494 | i16  | 100   | .DifABAngVCA2.mag.f          |         | Angle UCA-IB(2)                 | -180.00...<br>180.00 [deg] |
| 9495 | i16  | 100   | .DifACAngVAB2.mag.f          |         | Angle UAB-IC(2)                 | -180.00...<br>180.00 [deg] |
| 9496 | u16  | 1000  | .Max50APhsA3.mag.f           |         | Maximum phase A current (c)     | 0...50.000<br>[×In]        |
| 9497 | u16  | 1000  | .Max50APhsB3.mag.f           |         | Maximum phase B current (c)     | 0...50.000<br>[×In]        |
| 9498 | u16  | 1000  | .Max50APhsC3.mag.f           |         | Maximum phase C current (c)     | 0...50.000<br>[×In]        |
| 9499 | u16  | 1000  | .Max50ARes3.mag.f            |         | Maximum residual current (c)    | 0...50.000<br>[×In]        |
| 9500 | u16  | 1000  | .APhsA3.mag.f                |         | Phase A current (c)             | 0...50.000<br>[×In]        |
| 9501 | u16  | 1000  | .APhsB3.mag.f                |         | Phase B current (c)             | 0...50.000<br>[×In]        |
| 9502 | u16  | 1000  | .APhsC3.mag.f                |         | Phase C current (c)             | 0...50.000<br>[×In]        |
| 9503 | u16  | 1000  | .ARes3.mag.f                 |         | Residual current (c)            | 0...50.000<br>[×In]        |
| 9504 | u16  | 1000  | .AResClc3.mag.f              |         | Calculated residual current (c) | 0...50.000<br>[×In]        |
| 9505 | u16  | 1000  | .APsSeq3.mag.f               |         | Positive sequence current (c)   | 0...50.000<br>[×In]        |
| 9506 | u16  | 1000  | .ANgSeq3.mag.f               |         | Negative sequence current (c)   | 0...50.000<br>[×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 59:** 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              |

Table continues on next page

| RegA | Type | Scale | IEC 61850 name | SA name | Description | Values  |
|------|------|-------|----------------|---------|-------------|---------|
| 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 60:** *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 61:** *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 62:** *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 63:** *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            |

Table continues on next page



| RegA   | Type | Scale | IEC 61850 name | SA name | Description  | Values |
|--------|------|-------|----------------|---------|--------------|--------|
| 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 64:** *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             |
| 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 65:** *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 |

Table continues on next page

| RegA   | Type | Scale | IEC 61850 name | SA name | Description                  | Values    |
|--------|------|-------|----------------|---------|------------------------------|-----------|
| 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 66: 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 67: 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 68: 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              |                |                            |                      |
|      | 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.GNRLTMS1      |                |                            |                      |
|      | 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 69:** *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 70:** *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 71:** *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 72:** *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.FMMXU1 Frequency measurement (1)****Table 73:** *LD0.FMMXU1 Frequency measurement (1)*

| RegA | Type | Scale | IEC 61850 name | SA name | Description | Values            |
|------|------|-------|----------------|---------|-------------|-------------------|
|      |      |       | LD0.FMMXU1     |         |             |                   |
| 155  | u16  | 100   | .Hz.mag.f      | F_DB    | Frequency   | 35.00..75.00 [Hz] |

**2.4.1.29 LD0.RESVMMXU1 Residual voltage demand value (1)****Table 74:** *LD0.RESVMMXU1 Residual voltage demand value (1)*

| RegA | Type | Scale | IEC 61850 name      | SA name   | Description        | Values           |
|------|------|-------|---------------------|-----------|--------------------|------------------|
|      |      |       | LD0.RVAVMMXU1       |           | Demand value       |                  |
| 1977 | u16  | 1000  | .PhV.res.cVal.mag.f | U_DMD_RES | Residual amplitude | 0.00...4.0 [×Un] |
| 1978 |      |       |                     |           | Year - month       |                  |
| 1979 |      |       |                     |           | Day - hour         |                  |
| 1980 |      |       |                     |           | Minute - second    |                  |
| 1981 |      |       |                     |           | Milliseconds       |                  |
| 1982 |      |       |                     |           | Time quality       |                  |
|      |      |       | LD0.RVMAMMXU1       |           | Max. demand value  |                  |

Table continues on next page

| RegA | Type | Scale | IEC 61850 name      | SA name       | Description        | Values              |
|------|------|-------|---------------------|---------------|--------------------|---------------------|
| 1983 | u16  | 1000  | .PhV.res.cVal.mag.f | Max demand Uo | Residual amplitude | 0.00...4.0<br>[×Un] |
| 1984 |      |       |                     |               | Year - month       |                     |
| 1985 |      |       |                     |               | Day - hour         |                     |
| 1986 |      |       |                     |               | Minute - second    |                     |
| 1987 |      |       |                     |               | Milliseconds       |                     |
| 1988 |      |       |                     |               | Time quality       |                     |
|      |      |       | LD0.RVMIMMXU1       |               | Min. demand value  |                     |
|      | u16  | 1000  | .PhV.res.cVal.mag.f | Min demand Io | Residual amplitude | 0.00...4.0<br>[×Un] |

### 2.4.1.30 LD0.RESVMMXU1 Residual voltage measurement (1)

Table 75: LD0.RESVMMXU1 Residual voltage measurement (1)

| RegA | Typ | Scale | IEC 61580 name       | SA name | Description          | Values               |
|------|-----|-------|----------------------|---------|----------------------|----------------------|
|      |     |       | LD0.RESVMMXU1        |         | Residual voltage (1) |                      |
| 151  | u16 | 1000  | PhV.res.instCVal.mag | U0_INST | - amplitude          | 0.00...4.00<br>[×Un] |

### 2.4.1.31 LD0.VMMXU1 Three-phase voltage measurement (1)

Table 76: LD0.VMMXU1 Three-phase voltage measurement (1)

| RegA | Typ | Scale | IEC 61580 name        | SA name | Description              | Values               |
|------|-----|-------|-----------------------|---------|--------------------------|----------------------|
|      |     |       | LD0.VMMXU1            |         | Phase-ground voltage (1) |                      |
| 145  | u16 | 1000  | .phV.phsA.cVal.mag.f  | U_DB_A  | Phs A amplitude          | 0.00...4.00<br>[xUn] |
| 146  | u16 | 1000  | .phV.phsB.cVal.mag.f  | U_DB_B  | Phs B amplitude          | 0.00...4.00<br>[xUn] |
| 147  | u16 | 1000  | .phV.phsC.cVal.mag.f  | U_DB_C  | Phs C amplitude          | 0.00...4.00<br>[xUn] |
|      |     |       | LD0.VMMXU1            |         | Phase-phase voltage (1)  |                      |
| 148  | u16 | 1000  | .PPV.phsAB.cVal.mag.f | U_DB_AB | Phs AB amplitude         | 0.00...4.00<br>[xUn] |
| 149  | u16 | 1000  | .PPV.phsBC.cVal.mag.f | U_DB_BC | Phs BC amplitude         | 0.00...4.00<br>[xUn] |
| 150  | u16 | 1000  | .PPV.phsCA.cVal.mag.f | U_DB_CA | Phs CA amplitude         | 0.00...4.00<br>[xUn] |

**2.4.1.32 LD0.VMMXU1 Voltage demand values (1)****Table 77:** *LD0.VMMXU1 Voltage demand values (1)*

| RegA | Type | Scale | IEC 61850 name        | SA name  | Description      | Values              |
|------|------|-------|-----------------------|----------|------------------|---------------------|
|      |      |       | LD0.VAVMMXU1          |          | Demand value     |                     |
| 1954 | u16  | 1000  | .PhV.phsA.cVal.mag.f  | U_DMD_A  | Phs A amplitude  | 0.00...4.0<br>[×Un] |
| 1955 | u16  | 1000  | .PhV.phsB.cVal.mag.f  | U_DMD_B  | Phs B amplitude  | 0.00...4.0<br>[×Un] |
| 1956 | u16  | 1000  | .PhV.phsC.cVal.mag.f  | U_DMD_C  | Phs C amplitude  | 0.00...4.0<br>[×Un] |
| 1957 | u16  | 1000  | .PPV.phsAB.cVal.mag.f | U_DMD_AB | Phs AB amplitude | 0.00...4.0<br>[×Un] |
| 1958 | u16  | 1000  | .PPV.phsBC.cVal.mag.f | U_DMD_BC | Phs BC amplitude | 0.00...4.0<br>[×Un] |
| 1959 | u16  | 1000  | .PPV.phsCA.cVal.mag.f | U_DMD_CA | Phs CA amplitude | 0.00...4.0<br>[×Un] |

**2.4.1.33 LD0.VSMSQI1 Sequence voltage measurement (1)****Table 78:** *LD0.VSMSQI1 Sequence voltage measurement (1)*

| RegA | Typ | Scale | IEC 61580 name          | SA name | Description          | Values               |
|------|-----|-------|-------------------------|---------|----------------------|----------------------|
|      |     |       | LD0.VSMSQI1             |         | Sequence of voltages |                      |
| 152  | u16 | 1000  | .SeqV.c1.instCVal.mag.f | U1_INST | Positive amplitude   | 0.00...4.00<br>[×Un] |
| 153  | u16 | 1000  | .SeqV.c2.instCVal.mag.f | U2_INST | Negative amplitude   | 0.00...4.00<br>[×Un] |
| 154  | u16 | 1000  | .SeqV.c3.instCVal.mag.f | U3_INST | Zero amplitude       | 0.00...4.00<br>[×Un] |

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

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

## 2.4.2.2 LD0.VMMXU2 Three-phase voltage measurement (2)

**Table 80:** *LD0.VMMXU2 Three-phase voltage measurement (2)*

| RegA | Type | Scale | IEC 61850 name        | SA name | Description              | Values              |
|------|------|-------|-----------------------|---------|--------------------------|---------------------|
|      |      |       | LD0.VMMXU2            |         | Phase-ground voltage (2) |                     |
|      | u16  | 1000  | .phV.phsA.cVal.mag.f  | U_DB_A  | Phs A amplitude          | 0.00..4.00<br>[×Un] |
|      | u16  | 1000  | .phV.phsB.cVal.mag.f  | U_DB_B  | Phs B amplitude          | 0.00..4.00<br>[×Un] |
|      | u16  | 1000  | .phV.phsC.cVal.mag.f  | U_DB_C  | Phs C amplitude          | 0.00..4.00<br>[×Un] |
|      |      |       | LD0.VMMXU2            |         | Phase-phase voltage (2)  |                     |
|      | u16  | 1000  | .PPV.phsAB.cVal.mag.f | U_DB_AB | Phs AB amplitude         | 0.00..4.00<br>[×Un] |
|      | u16  | 1000  | .PPV.phsBC.cVal.mag.f | U_DB_BC | Phs BC amplitude         | 0.00..4.00<br>[×Un] |
|      | u16  | 1000  | .PPV.phsCA.cVal.mag.f | U_DB_CA | Phs CA amplitude         | 0.00..4.00<br>[×Un] |

## 2.5 Controls

**Table 81:** *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 82:** *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  |

Table continues on next page



| 0xA  | CS   | IEC 61850 name      | SA name | Description              | Values  |
|------|------|---------------------|---------|--------------------------|---------|
| 2068 | 2.08 | .MemClr.Oper.ctlVal |         | Clear DR memory          | 1=Clear |
|      |      | LD0.RESVMMXU1       |         |                          |         |
| 2074 | 2.14 | .RcdRs.Oper.ctlVal  |         | Reset Uo (1) max demands | 1=Reset |

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

Table 83: 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 84: 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 85: 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 |



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## 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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