

## Protection and Control Relay

# 615 GRID AUTOMATION SERIES

## Protocol Implementation Conformance Statement for the IEC 61850 interface in 615 GA series



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# 1 About this document

## 1.1 Read it first!

Before attempting any operation with IED from 615 GA series, read carefully the IED documentation first.

This document is addressed to anyone who needs to interact with 615 GA series and its IEC 61850 features in more detail.

## 1.2 Document information

### Revision History

| Revision | Date          | Note               |
|----------|---------------|--------------------|
| A        | 01 July 2013  | 615 GA series v1.0 |
| B        | 06 March 2015 | 615 GA series v1.1 |
| C        | 16 July 2018  | 615 GA series v2.0 |

### Applicability

This manual is applicable to all 615 GA series Protection and Control Relay versions mentioned in document Revision History above.

# 2 Safety Information

There are safety warnings and notes in the following text. They are in a different format to distinguish them from normal text.

### Safety warning

The safety warnings should always be observed. Non-observance can result in death, personal injury or substantial damages to property. Guarantee claims might not be accepted when safety warnings are not respected. They look like below:



**Do not make any changes to the 615 GA series configuration unless you are familiar with the 615 GA series and its configuration tool. This might result in disoperation and loss of warranty.**

### Note

A note contains additional information worth noting in the specific context, and looks like below:



The selection of this control mode requires caution, because operations are allowed both from the HMI and remotely.

## 3 Abbreviations, Definitions and Conventions

### 3.1 Abbreviations

|       |   |
|-------|---|
| HMI   | Human Machine Interface                   |
| LCD   | Liquid Crystal Display                    |
| SLD   | Single Line Diagram                       |
| LED   | Light Emitting Diode                      |
| GPS   | Global Positioning System                 |
| SCADA | Supervision, Control and Data Acquisition |
| CT    | Current Transformer                       |
| VT    | Voltage Transformer                       |
| SI    | Sensor Input                              |
| Y     | Yes                                       |
| N     | No  |

### 3.2 Definitions

|                    |   |
|--------------------|---|
| Operational State: | the unit is active and it is protecting and controlling the switchgear.               |
| Stand-alone:       | the unit is not connected to a Scada system.  |
| M/m:               | mandatory support. The item shall be implemented.                                     |
| C/c:               | conditional support. The item shall be implemented if the stated condition exists.    |
| O/o:               | optional support. The implementation may decide to implement the item.                |
| x:                 | excluded: The implementation shall not implement this item.                           |
| i:                 | out-of-scope: The implementation of the item is not within the scope of this product. |
| F/S:               | Functional Standard. Should be applied.   |
| Base:              | Shall be applied in any application claiming conformance to this standard.            |

## 4 Reference Documents

| Ref | Document id                           | Rev | Document title   |
|-----|---------------------------------------|-----|--|
| [1] | 61850-8-1<br>First edition<br>2004-05 |     | Communication networks and systems in substations<br>Part 8-1: Specific communication service mapping<br>(SCSM) – Map-pings to MMS (ISO/IEC 9506 Part 1 and<br>Part 2) and to ISO/IEC 8802-3 |
| [2] | 61850-10<br>First edition<br>2005-05  |     | Communication networks and systems in substations –<br>Part 10: Conformance testing  |
| [3] | 61850-7-2 First<br>edition<br>2003-05 |     | Communication networks and systems in substations –<br>Part 7-2: Basic communication structure for substation<br>and feeder equipment – Abstract communication service<br>interface (ACSI)   |
| [4] | 61850-6<br>First edition<br>2004-03   |     | Communication networks and systems in substations -<br>Part 6: Configuration description language for communi-<br>cation in electrical substations related to IEDs                           |
| [5] | 61850-7-3<br>First edition<br>2003-05 |     | Communication networks and systems in substations –<br>Part 7-3: Basic communication structure for substation<br>and feeder equipment – Common data classes                                  |
| [6] | 61850-7-4 First<br>Edition<br>2003-05 |     | Communication networks and systems in substations –<br>Part 7-4:   |

## 5 Introduction

This document defines the compliance to IEC 61850 in terms of service, modeling and engineering interfaces. Also, exceptions and local adaptations are described.

The conformance statements and documents are referred as PICS (Protocol Implementation Conformance Statement), MICS (Model Implementation Conformance Statement) and local adaptations to be published are described in PIXIT (Protocol Implementation eXtra Information for Testing). ACSI conformance statement describes the abstract services interfaces, which are normally mapped to certain SCSM and therefore indirectly stated in PICS.

The purpose of the information in this document is to give a user, to a system integrator a detailed explanation of IEC 61850 capabilities of a product.

### 5.1 Scope of this statement

The scope of this document is one product/software module. This is identified as follows:

Product family / name:

Product designation: 615 GA series

Product version: See Document Revision History

Role(s) in two-party association (TP, c/s): Server

Role(s) in multicast association (MC, GOOSE, GSSE): GOOSE

Notes, exceptions: MMS conformance statement is not filled

## 6 ACSI conformance statement

### 6.1 General

These tables are according to 7-2. [3]

### 6.2 ACSI basic conformance statement

Table 6-1– Basic conformance statement

|  |   | Client/<br>Subscriber | Server/<br>Publisher | Value/Comments |
|--|---|-----------------------|----------------------|----------------|
| <b>Client-Server roles</b>                       |   |                       |                      |                |
| B11  | <b>Server</b> side (of TWO-PARTY-APPLICATION-ASSOCIATION) | ¾                     | Y                    |                |
| B12  | <b>Client</b> side of (TWO-PARTY-APPLICATION-ASSOCIATION) | N                     | ¾                    |                |
| <b>SCSMs supported</b>                           |   |                       |                      |                |
| B21  | <b>SCSM:</b> IEC 61850-8-1 used                           |                       | Y                    |                |
| B22  | <b>SCSM:</b> IEC 61850-9-1 used                           |                       | N                    |                |
| B23  | <b>SCSM:</b> IEC 61850-9-2 used                           |                       | N                    |                |
| B24  | <b>SCSM:</b> other  |                       |                      |                |
| <b>Generic substation event model (GSE)</b>      |   |                       |                      |                |
| B31  | <b>Publisher</b> side                                     | ¾                     | Y                    |                |
| B32  | <b>Subscriber</b> side                                    | Y                     | ¾                    |                |
| <b>Transmission of sampled value model (SVC)</b> |   |                       |                      |                |
| B41  | <b>Publisher</b> side                                     | ¾                     | N                    |                |
| B42  | <b>Subscriber</b> side                                    | N                     | ¾                    |                |

### 6.3 ACSI models conformance statement

Table 6-2– ACSI models conformance statement

|                                      |                                  | Client/<br>Subscriber | Server/<br>Publisher | Value/Comments |
|--------------------------------------|----------------------------------|-----------------------|----------------------|----------------|
| If <b>Server</b> side (B1) supported |                                  |                       |                      |                |
| M1                                   | <b>Logical device</b>            | N                     | Y                    |                |
| M2                                   | <b>Logical node</b>              | N                     | Y                    |                |
| M3                                   | <b>Data</b>                      | N                     | Y                    |                |
| M4                                   | <b>Data set</b>                  | N                     | Y                    |                |
| M5                                   | <b>Substitution</b>              | N                     | N                    |                |
| M6                                   | <b>Setting group control</b>     | N                     | Y                    |                |
|                                      | <b>Reporting</b>                 |                       |                      |                |
| M7                                   | <b>Buffered report control</b>   | N                     | Y                    |                |
| M7-1                                 | Sequence-number                  |                       |                      |                |
| M7-2                                 | report-time-stamp                |                       |                      |                |
| M7-3                                 | reason-for-inclusion             |                       |                      |                |
| M7-4                                 | data-set-name                    |                       |                      |                |
| M7-5                                 | data-reference                   |                       |                      |                |
| M7-6                                 | buffer-overflow                  |                       |                      |                |
| M7-7                                 | EntryID                          |                       |                      |                |
| M7-8                                 | BufTim                           |                       |                      |                |
| M7-9                                 | IntgPd                           |                       |                      |                |
| M7-10                                | GI                               |                       |                      |                |
| M8                                   | <b>Unbuffered report control</b> | N                     | Y                    |                |
| M8-1                                 | sequence-number                  |                       |                      |                |
| M8-2                                 | report-time-stamp                |                       |                      |                |
| M8-3                                 | reason-for-inclusion             |                       |                      |                |
| M8-4                                 | data-set-name                    |                       |                      |                |
| M8-5                                 | data-reference                   |                       |                      |                |
| M8-6                                 | BufTim                           |                       |                      |                |
| M8-7                                 | IntgPd                           |                       |                      |                |
| M8-8                                 | GI                               |                       |                      |                |
|                                      | <b>Logging</b>                   | N                     | N                    |                |
| M9                                   | <b>Log control</b>               | N                     | N                    |                |
| M9-1                                 | IntgPd                           |                       |                      |                |
| M10                                  | <b>Log</b>                       | N                     | N                    |                |
| M11                                  | <b>Control</b>                   | N                     | Y                    |                |
| If <b>GSE</b> (B31/32) is supported  |                                  |                       |                      |                |
| M12                                  | <b>GOOSE</b>                     | N                     | Y                    |                |
| M13                                  | <b>GSSE</b>                      | N                     | N                    |                |
| If <b>SVC</b> (41/42) is supported   |                                  |                       |                      |                |
| M14                                  | Multicast SVC                    | N                     | N                    |                |
| M15                                  | Unicast SVC                      | N                     | N                    |                |



|     |               | Client/<br>Subscriber | Server/<br>Publisher | Value/Comments                                  |
|-----|---------------|-----------------------|----------------------|---|
| M16 | Time          | N                     | Y                    | Time source with required accuracy is available |
| M17 | File Transfer | N                     | Y                    |   |

## 6.4 ACSI service conformance statement

The ACSI service conformance statement shall be as defined in Table 2-3 (depending on the statements in Table 2-2).

**Table 6-3 – ACSI service Conformance statement**

|                                | Services                  | AA:<br>TP/MC | Client<br>(C) | Server<br>(S) | Comments |
|--------------------------------|---------------------------|--------------|---------------|---------------|----------|
| <b>Server</b>                  |                           |              |               |               |          |
| S1                             | GetServerDirectory        | TP           |               | Y             |          |
| <b>Application association</b> |                           |              |               |               |          |
| S2                             | Associate                 |              | N             | Y             |          |
| S3                             | Abort                     |              | N             | Y             |          |
| S4                             | Release                   |              | N             | Y             |          |
| <b>Logical device</b>          |                           |              |               |               |          |
| S5                             | GetLogicalDeviceDirectory | TP           | N             | Y             |          |
| <b>Logical node</b>            |                           |              |               |               |          |
| S6                             | GetLogicalNodeDirectory   | TP           | N             | Y             |          |
| S7                             | GetAllDataValues          | TP           | N             | Y             |          |
| <b>Data</b>                    |                           |              |               |               |          |
| S8                             | GetDataValues             | TP           | N             | Y             |          |
| S9                             | SetDataValues             | TP           | N             | Y             |          |
| S10                            | GetDataDirectory          | TP           | N             | Y             |          |
| S11                            | GetDataDefinition         | TP           | N             | Y             |          |
| <b>Data set</b>                |                           |              |               |               |          |
| S12                            | GetDataSetValues          | TP           | N             | Y             |          |
| S13                            | SetDataSetValues          | TP           | N             | N             |          |
| S14                            | CreateDataSet             | TP           | N             | N             |          |
| S15                            | DeleteDataSet             | TP           | N             | N             |          |
| S16                            | GetDataSetDirectory       | TP           | N             | Y             |          |
| <b>Substitution</b>            |                           |              |               |               |          |
| S17                            | SetDataValues             | TP           | N             | N             |          |
| <b>Setting group control</b>   |                           |              |               |               |          |
| S18                            | SelectActiveSG            | TP           | N             | Y             |          |

|     | Services            | AA:<br>TP/MC | Client<br>(C) | Server<br>(S) | Comments |
|-----|---------------------|--------------|---------------|---------------|----------|
| S19 | SelectEditSG        | TP           | N             | Y             |          |
| S20 | SetSGValues         | TP           | N             | Y             |          |
| S21 | ConfirmEditSGValues | TP           | N             | Y             |          |
| S22 | GetSGValues         | TP           | N             | Y             |          |
| S23 | GetSGCBValues       | TP           | N             | Y             |          |

| Reporting                              |                    |    |   |   |  |
|--|--------------------|----|---|---|--|
| Buffered report control block (BRCB)   |                    |    |   |   |  |
| S24                                    | Report             | TP | N | Y |  |
| S24-1                                  | data-change (dchg) |    | N | Y |  |
| S24-2                                  | qchg-change (qchg) |    | N | Y |  |
| S24-3                                  | data-update (dupd) |    | N | Y |  |
| S25                                    | GetBRCBValues      | TP | N | Y |  |
| S26                                    | SetBRCBValues      | TP | N | Y |  |
| Unbuffered report control block (URCB) |                    |    |   |   |  |
| S27                                    | Report             | TP | N | Y |  |
| S27-1                                  | data-change (dchg) |    | N | Y |  |
| S27-2                                  | qchg-change (qchg) |    | N | Y |  |
| S27-3                                  | data-update (dupd) |    | N | Y |  |
| S28                                    | GetURCBValues      | TP | N | Y |  |
| S29                                    | SetURCBValues      | TP | N | Y |  |

| Logging           |                    |    |   |   |  |
|-------------------|--------------------|----|---|---|--|
| Log control block |                    |    |   |   |  |
| S30               | GetLCBValues       | TP | N | N |  |
| S31               | SetLCBValues       | TP | N | N |  |
| Log               |                    |    |   |   |  |
| S32               | QueryLogByTime     | TP | N | N |  |
| S33               | QueryLogByEntry    | TP | N | N |  |
| S34               | GetLogStatusValues | TP | N | N |  |

| Generic substation event model (GSE) |                       |    |   |   |  |
|--------------------------------------|-----------------------|----|---|---|--|
| GOOSE-CONTROL-BLOCK                  |                       |    |   |   |  |
| S35                                  | SendGOOSEMessage      | MC | N | Y |  |
| S36                                  | GetReference          | TP | N | N |  |
| S37                                  | GetGOOSEElementNumber | TP | N | N |  |
| S38                                  | GetGoCBValues         | TP | N | Y |  |
| S39                                  | SetGoCBValues         | TP | N | Y |  |
| GSSE-CONTROL-BLOCK                   |                       |    |   |   |  |
| S40                                  | SendGSSEMessage       | MC | N | N |  |
| S41                                  | GetReference          | TP | N | N |  |
| S42                                  | GetGSSEElementNumber  | TP | N | N |  |
| S43                                  | GetGsCBValues         | TP | N | N |  |
| S44                                  | SetGsCBValues         | TP | N | N |  |

| Transmission of sampled value model (SVC) |                |    |   |   |  |
|---|----------------|----|---|---|--|
| Multicast SVC                             |                |    |   |   |  |
| S45                                       | SendMSVMessage | MC | N | N |  |

|             | Services       | AA:<br>TP/MC | Client<br>(C) | Server<br>(S) | Comments |
|-------------|----------------|--------------|---------------|---------------|----------|
| S46         | GetMSVCBValues | TP           | N             | N             |          |
| S47         | SetMSVCBValues | TP           | N             | N             |          |
| Unicast SVC |                |              |               |               |          |
| S48         | SendUSVMessage | TP           | N             | N             |          |
| S49         | GetUSVCBValues | TP           | N             | N             |          |
| S50         | SetUSVCBValues | TP           | N             | N             |          |

| Control |                       |    |   |   |  |
|---------|-----------------------|----|---|---|--|
| S51     | Select                |    | N | N |  |
| S52     | SelectWithValue       | TP | N | Y |  |
| S53     | Cancel                | TP | N | Y |  |
| S54     | Operate               | TP | N | Y |  |
| S55     | Command-Termination   | TP | N | Y |  |
| S56     | TimeActivated-Operate | TP | N | N |  |

| File transfer |                        |    |   |   |  |
|---------------|------------------------|----|---|---|--|
| S57           | GetFile                | TP | N | Y |  |
| S58           | SetFile                | TP | N | Y |  |
| S59           | DeleteFile             | TP | N | Y |  |
| S60           | GetFileAttributeValues | TP | N | Y |  |

| Time |                                   |   |  |                    |   |
|------|-----------------------------------|---|--|--------------------|---|
| T1   | Time resolution of internal clock |   |  | $2^{-10}$<br>(1ms) | nearest negative power of 2 in seconds  |
| T2   | Time accuracy of internal clock   |   |  | T1                 | T0 (10ms)    T1 (1ms)    T2 (100µs)<br>T3 (25µs)    T4 (4µs)    T5 (1µs)                |
| T3   | supported TimeStamp resolution    | - |  | $2^{-10}$<br>(1ms) | nearest negative power of 2 in seconds according to IEC61850-7-2, paragraph 5.5.3.7.3.3 |

## 7 SCL conformance statement

Defines several degrees of conformance for which implementations may declare support of the substation configuration language. [1]

**Table 7-1 – SCL conformance degrees**

|       | SCL Conformance                                     | Client-CR |     |             | Server-CR |     |   |
|-------|---|-----------|-----|-------------|-----------|-----|---|
|       |   | Base      | F/S | Value/Range | Base      | F/S | Value/Range                                 |
| SCL.1 | SCL File for Implementation Available (offline)     |           |     |             | m         | m   | <i>Supported, SCL file export from tool</i> |
| SCL.2 | SCL File available from implementation online       | O         | o   |             | o         | o   | <i>Not Supported,</i>                       |
| SCL.3 | SCL implementation reconfiguration supported online | O         | o   |             | o         | o   | <i>Not Supported</i>                        |

## 8 PICS – Protocol conformance statement

### 8.1 Profile conformance

Table 8-1 and Table 8-2 define the basic conformance statement.

**Table 8-1 – PICS for A-Profile support**

|    |                                | Client |  | Server |  | Value/Comment        |
|----|--------------------------------|--------|--|--------|--|----------------------|
|    |                                | F/S    |  | F/S    |  |                      |
| A1 | Client/Server A-Profile        | c1     |  | c1     |  | <i>Supported</i>     |
| A2 | GOOSE/GSE Management A-Profile | c2     |  | c2     |  | <i>Not supported</i> |
| A3 | GSSE A-Profile                 | c3     |  | c3     |  | <i>Not supported</i> |
| A4 | TimeSync A-Profile             | c4     |  | c4     |  | <i>Supported</i>     |

c1 – shall be 'm' if support for any service specified for Client/S are declared within the ACSI basic conformance statement.  
c2 – shall be 'm' if support for any service specified for GOOSE/GSE Management are declared within the ACSI basic conformance statement.  
c3 – shall be 'm' if support for any service specified for GSSE A-Profile are declared within the ACSI basic conformance statement  
c4 – support for at least one other A-Profile shall be declared (e.g. in A1-A3) in order to claim conformance to IEC 61850-8-1.

**Table 8-2 – PICS for T-Profile support**

|   |                     | Client |  | Server |  | Value/Comment        |
|---|---------------------|--------|--|--------|--|----------------------|
|   |                     | F/S    |  | F/S    |  |                      |
| T1  | TCP/IP T-Profile    | c1     |  | c1     |  | <i>Supported</i>     |
| T2  | OSI T-Profile       | c2     |  | c2     |  | <i>Not supported</i> |
| T3  | GOOSE/GSE T-Profile | c3     |  | c3     |  | <i>Supported</i>     |
| T4  | GSSE T-Profile      | c4     |  | c4     |  | <i>Not supported</i> |
| T5  | TimeSync T-Profile  | o      |  | o      |  | <i>Supported</i>     |
| c1 – shall be 'm' if support for A1 is declared. Otherwise, shall be "i"<br>c2 – shall be "o" if support for A1 is declared. Otherwise, shall be "i".<br>c3 – shall be 'm' if support for A2 is declared. Otherwise, shall be "i".<br>c4 – shall be 'm' if support for A3 is declared. Otherwise, shall be "i". |                     |        |  |        |  |                      |

## 8.2 MMS Conformance

MMS conformance guaranteed by MMS stack vendor, ie. Sisco Inc..

All needed services supporting the ACSI services stated to be supported in paragraph 2. are supported by the MMS stack used.

## 9 PIXIT

In this chapter, the essentials for device communication configuration and integration are described. PIXIT is given as a separate document.

## 10 Appendix A: Index of Tables

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