

# SIEMENS

## SICAM AK 3

### PIXIT for IEC 61850 Ed. 2 Server

Protocol Implementation extra Information  
for Testing (PIXIT) the  
IEC 61850 Ed.2 Server Interface in  
Siemens SICAM AK 3

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**Disclaimer of Liability**

Although we have carefully checked the contents of this publication for conformity with the hardware and software described, we cannot guarantee complete conformity since errors cannot be excluded. The information provided in this manual is checked at regular intervals and any corrections that might become necessary are included in the next releases. Any suggestions for improvement are welcome.

Subject to change without prior notice.

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# Preface

**This document is applicable to the following product(s):**

- SICAM AK 3

## **Purpose of this manual**

This manual describes the Protocol Implementation extra Information for Testing (PIXIT) for the IEC 61850 Ed. 2 Server interface in:

- Siemens SICAM AK 3 using firmware "ETA5 Rev. 03.04"

Note:

PIXIT "Protocol Implementation extra Information for Testing" contains additional information on how the IEC 61850 is implemented and used.

## **Target Group**

The document you are reading right now is addressed to users, who are in charge of the following engineering tasks:

- Customers
- Sales engineering and technical clarification
- Conceptual activities, as for example design and configuration
- Technical system maintenance

## **Notes**

This document is based on:

- UCA International Users Group  
Testing Sub Committee  
Template version 1.2  
Date: June 3, 2014

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# 1 Introduction

This document specifies the protocol implementation extra information for testing (PIXIT) of the IEC 61850 interface in **Siemens SICAM AK 3** with firmware "**ETA5 Rev. 03.04**".

Together with the PICS and the MICS the PIXIT forms the basis for a conformance test according to IEC 61850-10. The PIXIT entries contain information which is not available in the PICS, MICS, TICS documents or SCL file.

Each table specifies the PIXIT for applicable ACSI service model as structured in IEC 61850-10. The "Ed" column indicates if the entry is applicable for IEC 61850 Edition 1 and/or Edition 2.

## 1.1 SICAM AK 3 “Device Under Test” (DUT)

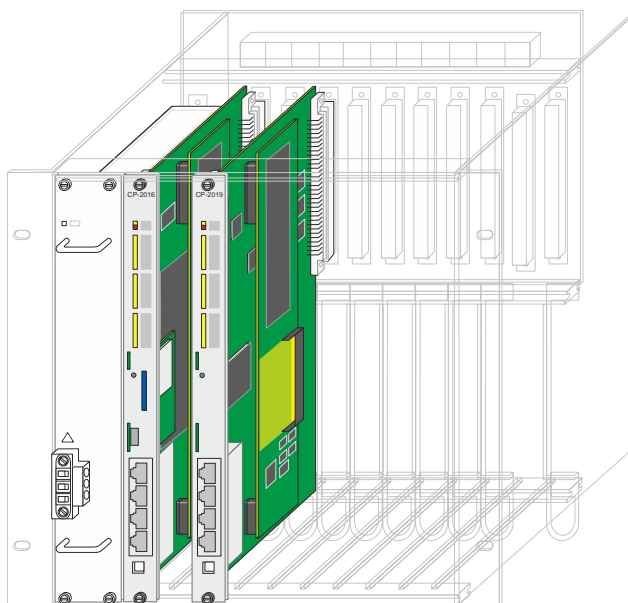
| Board                 | MLFB               | Description                          |
|-----------------------|--------------------|--------------------------------------|
| PS-2632               | 6MF11130CG320AA0BB | Power Supply 110-220VDC, 230VAC AK 3 |
| CP-2016               | 6MF10130CA160AA0BB | Central Processor AK 3               |
| CP-2019               | 6MF10132CA100AA0BB | Communication/Processing AK 3        |
| SM-2558 <sup>1)</sup> | 6MF10130CF580AA0BB | Ethernet-Interf. 1x100TX,(+1SI)      |

<sup>1)</sup> SM-2558 Ethernet interface with **ETA5 Rev. 03.04 firmware** will be plugged on CP-2019 board.



### Notes:

- the red marked interface connector is assigned to IEC61850 Ed. 2 Server with ETA5 firmware.
- the red marked interface connector is also used for WEB Browser interface for IEC61850 Ed. 2 Server.
- the blue marked interface connector is used for SICAM AK3 engineering software TOOLBOX II.



Note: SM-2558 is used as a SUB-board on CP-2019 (system internally)

## Firmware Revisions

|              | System element | HW#  | FW#  | Rev   | TBill-Update  | SetRev | P | SSE# | Task | Supportof system elements |
|--------------|----------------|------|------|-------|---------------|--------|---|------|------|---------------------------|
| M            | CP-2016/CPCX26 | 2016 | 2016 | 02    | 02 [02]       |        |   |      |      | Supported                 |
| M-Bus0/PBA-0 | PE-641X/USIO66 | 6410 | 6410 | 05.03 | 05.03 [05.03] |        |   | 0    |      | Supported                 |
| C2           | CP-2019/PCCX26 | 2019 | 2019 | 02    | 02 [02]       |        |   |      |      | Supported                 |
| C2-PRE/3     | SM-2558/ETA5   | 2558 | 1590 | 03.04 | 03.04 [03.04] |        |   | 131  |      | Supported                 |

Note: IEC61850 Ed.2 functionality is included in firmware ETA5 Rev. 03.04

## Power Supply / CPU-Boards / Interface Cards

|   | Designation   | Item-Number/MLFB            |
|---|---|-----------------------------|
|    | PS-2632 Power supply<br>110-220 VDC, 230 VAC AK 3                 | GC2-632<br>6MF11130CG320AA0 |
|   | CP-2016 Central module AK 3                                       | BC2-016<br>6MF10130CA160AA0 |
|  | CP-2019 Communication/Processing<br>AK 3                          | BC2-019<br>6MF10132CA100AA0 |
|  | SM-2558 Ethernet-Interf. 1x100TX,<br>+1 serial interface optional | BC2-558<br>6MF10130CF580AA0 |

## 2 PIXIT for Association model

| ID  | Ed  | Description   | Value / Clarification   |
|-----|-----|---|---|
| As1 | 1   | Maximum number of clients that can set-up an association simultaneously                   | 6   |
| As2 | 1,2 | TCP_KEEPALIVE value. The recommended range is 1..20s                                      | 17 seconds  |
| As3 | 1,2 | Lost connection detection time  | Up to 150 seconds   |
| As4 | -   | Authentication is not supported yet   |   |
| As5 | 1,2 | What association parameters are necessary for successful association                      | Transport selector N<br>Session selector N<br>Presentation selector N<br>AP Title N<br>AE Qualifier N |
| As6 | 1,2 | If association parameters are necessary for association, describe the correct values e.g. | Transport selector<br>Session selector<br>Presentation selector<br>AP Title<br>AE Qualifier           |
| As7 | 1,2 | What is the maximum and minimum MMS PDU size  | Max MMS PDU size 20000<br>Min MMS PDU size not checked  |
| As8 | 1,2 | What is the maximum start up time after a power supply interrupt                          | Up to 300 seconds   |
|     |     | <additional items>  |   |

## 3 PIXIT for Server model

| ID  | Ed  | Description   | Value / Clarification  |
|-----|-----|---|--|
| Sr1 | 1,2 | Which analogue value (MX) quality bits are supported (can be set by server) | Validity:<br>Y Good,<br>Y Invalid,<br>N Reserved,<br>Y Questionable<br>Y Overflow<br>N OutofRange<br>N BadReference<br>N Oscillatory<br>N Failure<br>N OldData<br>N Inconsistent<br>N Inaccurate<br>Source:<br>Y Process<br>N Substituted<br>Y Test<br>N OperatorBlocked |



| ID  | Ed  | Description   | Value / Clarification   |
|-----|-----|---|---|
| Sr2 | 1,2 | Which status value (ST) quality bits are supported (can be set by server)         | Validity:<br>Y Good,<br>Y Invalid,<br>N Reserved,<br>Y Questionable<br>N BadReference<br>N Oscillatory<br>N Failure<br>NOldData<br>N Inconsistent<br>N Inaccurate<br>Source:<br>Y Process<br>N Substituted<br>Y Test<br>N OperatorBlocked |
| Sr3 | -   | What is the maximum number of data object references in one GetDataValues request | DEPRECATED  |
| Sr4 | -   | What is the maximum number of data object references in one SetDataValues request | DEPRECATED  |
| Sr5 | 1   | Which Mode values are supported <sup>1</sup>                                      | On Y<br>[On-]Blocked Y<br>Test Y<br>Test/Blocked N<br>Off Y   |
|     |     | <additional items>  |   |

## 4 PIXIT for Data set model

| ID  | Ed | Description  | Value / Clarification |
|-----|----|--|-----------------------|
| Ds1 | 1  | What is the maximum number of data elements in one data set (compare ICD setting)                              | 150                   |
| Ds2 | 1  | How many persistent data sets can be created by one or more clients (this number includes predefined datasets) | 0                     |
| Ds3 | 1  | How many non-persistent data sets can be created by one or more clients  | 0                     |
|     |    | <additional items>   |                       |

<sup>1</sup> IEC 61850-6:2009 clause 9.5.6 states that if only a subrange of the enumeration value set is supported, this shall be indicated within an ICD file by an enumeration type, where the unsupported values are missing

## 5 PIXIT for Setting group control model

| ID  | Ed  | Description   | Value / Clarification   |
|-----|-----|---|---|
| Sg1 | 1   | What is the number of supported setting groups for each logical device                                    | See SGCB value  |
| Sg2 | 1,2 | What is the effect of when and how the non-volatile storage is updated<br>(compare IEC 61850-8-1 §16.2.4) | n.a.<br>The DUT does not use non-volatile storage for setting groups. |
| Sg3 | 1   | Can multiple clients edit the same setting group  | n.a.<br>The DUT does not support editing of setting groups.           |
| Sg4 | 1   | What happens if the association is lost while editing a setting group                                     | n.a.<br>The DUT does not support editing of setting groups            |
| Sg5 | 1   | Is EditSG value 0 allowed   | n.a.<br>The DUT does not support editing of setting groups            |
| Sg6 | 2   | When ResvTms is not present how long is an edit setting group locked                                      | n.a.<br>The DUT does not support editing of setting groups            |
|     |     | <additional items>  |   |

## 6 PIXIT for Reporting model

| ID  | Ed  | Description  | Value / Clarification   |
|-----|-----|--|---|
| Rp1 | 1   | The supported trigger conditions are<br>(compare PICS) | integrity Y<br>data change Y<br>quality change Y<br>data update Y<br>general interrogation Y  |
| Rp2 | 1   | The supported optional fields are                      | sequence-number Y<br>report-time-stamp Y<br>reason-for-inclusion Y<br>data-set-name Y<br>data-reference Y<br>buffer-overflow Y<br>entryID Y<br>conf-rev Y<br>segmentation Y |
| Rp3 | 1,2 | Can the server send segmented reports                  | Y   |

| ID   | Ed  | Description  | Value / Clarification  |
|------|-----|--|--|
| Rp4  | 1,2 | Mechanism on second internal data change notification of the same analogue data value within buffer period (Compare IEC 61850-7-2 §14.2.2.9) | Send report immediately  |
| Rp5  | 1   | Multi client URCB approach (compare IEC 61850-7-2:2003 §14.2.1)  | Each URCB is visible to all clients  |
| Rp6  | -   | What is the format of EntryID  | Deprecated   |
| Rp7  | 1,2 | What is the buffer size for each BRCB or how many reports can be buffered  | 20kBytes   |
| Rp8  | -   | Pre-configured RCB attributes that are dynamic, compare SCL report settings  | Deprecated   |
| Rp9  | 1   | May the reported data set contain:<br>- structured data objects<br>- data attributes   | Y<br>N   |
| Rp10 | 1,2 | What is the scan cycle for binary events<br>Is this fixed, configurable  | 1 or 10ms depending on the used digital input hardware. During the test the 10ms hardware is used. |
| Rp11 | 1   | Does the device support to pre-assign a RCB to a specific client in the SCL  | N  |
| Rp12 | 2   | After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart                    | Restored from original configuration   |
|      |     | <additional items>   |  |

## 7 PIXIT for Control model

| ID  | Ed  | Description  | Value / Clarification   |
|-----|-----|--|---|
| Ct1 | -   | What control models are supported (compare PICS)   | Deprecated  |
| Ct2 | 1,2 | Is the control model fixed, configurable and/or dynamic  | Configurable  |
| Ct3 | -   | Is TimeActivatedOperate supported (compare PICS or SCL)  | Deprecated  |
| Ct4 | -   | Is "operate-many" supported (compare sboClass)   | Deprecated  |
| Ct5 | 1   | Will the DUT activate the control output when the test attribute is set in the SelectWithValue and/or Operate request (when N test procedure CtI2 is applicable) | Y   |
| Ct6 | -   | What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request   | Deprecated  |
| Ct7 | -   | Is pulse configuration supported (compare pulseConfig)   | Deprecated  |
| Ct8 | 1   | What is the behaviour of the DUT when the check conditions are set<br><br>Is this behaviour fixed, configurable, online changeable                               | N synchrocheck<br>N interlock-check<br>The Check attribute is not used for interlocking and synchrocheck functionality<br>Fixed |

| ID   | Ed  | Description   | Value / Clarification   |
|------|-----|---|---|
| Ct9  | 1,2 | Which additional cause diagnosis are supported  | N Unknown<br>N Not-supported<br>N Blocked-by-switching-hierarchy<br>Y Select-failed<br>Y Invalid-position<br>N Position-reached<br><br>N Step-limit<br>Y Blocked-by-Mode<br>Y Blocked-by-process<br>N Blocked-by-interlocking<br>N Blocked-by-synchrocheck<br>Y Command-already-in-execution<br>N Blocked-by-health<br>Y 1-of-n-control<br>N Abortion-by-cancel<br>Y Time-limit-over<br>N Abortion-by-trip<br>Y Object-not-selected<br>Edition 1 specific values:<br>N Parameter-change-in-execution<br>Edition 2 specific values:<br>Y Object-already-selected<br>N No-access-authority<br>N Ended-with-overshoot<br>N Abortion-due-to-deviation<br>N Abortion-by-communication-loss<br>N Blocked-by-command<br>N None<br>Y Inconsistent-parameters<br>Y Locked-by-other-client<br>N Parameter-change-in-execution |
| Ct10 | 1,2 | How to force a "test-not-ok" respond with SelectWithValue request   | orCat >= 9  |
| Ct11 | 1,2 | How to force a "test-not-ok" respond with Select request  | orCat >= 9  |
| Ct12 | 1,2 | How to force a "test-not-ok" respond with Operate request   | orCat >= 9  |
| Ct13 | 1,2 | Which origin categories are supported / accepted  | Y bay-control<br>Y station-control<br>Y remote-control<br>Y automatic-bay<br>Y automatic-station<br>Y automatic-remote<br>Y maintenance<br>Y process  |
| Ct14 | 1,2 | What happens if the orCat value is not supported or invalid   | DUT sends a negative response with AddCause "not supported"   |
| Ct15 | 1,2 | Does the IED accept a SelectWithValue / Operate with the same control value as the current status value<br><br>Is this behaviour configurable | DOns: Y<br>SBOs: n.a.<br>DOes: Y<br>SBOes: Y<br>Configurable N  |

| ID   | Ed  | Description   | Value / Clarification                        |
|------|-----|---|--|
| Ct16 | 1,2 | Does the IED accept a select/operate on the same control object from 2 different clients at the same time                   | DOns: N<br>SBOs: n.a.<br>DOes: N<br>SBOes: N |
| Ct17 | 1   | Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (Tissue #334) | SBOs: n.a.<br>SBOes: N                       |
| Ct18 | 1,2 | Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step                               | SelectWithValue and Operate                  |
| Ct19 | -   | Can a control operation be blocked by Mod=Off or [On-]Blocked (Compare PIXIT-Sr5)   | Deprecated                                   |
| Ct20 | 1,2 | Does the IED support local / remote operation   | N  |
| Ct21 | 1,2 | Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security | SBOs: n.a.<br>DOns: N                        |
| Ct22 | 2   | How to force a "parameter-change-in-execution"  | SBOs: n.a.<br>SBOes: N                       |
|      |     | <additional items>  |  |

## 8 PIXIT for Time synchronisation model

| ID  | Ed  | Description   | Value / Clarification   |
|-----|-----|---|---|
| Tm1 | 1,2 | What time quality bits are supported (may be set by the IED)  | N LeapSecondsKnown<br>N ClockFailure<br>Y ClockNotSynchronized  |
| Tm2 | 1,2 | Describe the behaviour when the time server(s) ceases to respond<br>What is the time server lost detection time | On one time server: internal diagnosis message. Can be read with SICAM TOOLBOX II<br>On all time servers: start a timeout, after timeout all new datapoints are marked with clocknot synchronized<br>Default value is 30 minutes, although it is configured during tetsting to 5 minutes. |
| Tm3 | 1,2 | How long does it take to take over the new time from time server  | Up to 120 seconds   |
| Tm4 | 1,2 | When is the time quality bit "ClockFailure" set   |   |
| Tm5 | 1,2 | When is the time quality bit "Clock not Synchronized" set   | When connection to all time servers is lost (see PIXIT-Tm2)   |
| Tm6 | -   | Is the timestamp of a binary event adjusted to the configured scan cycle  | Deprecated  |
| Tm7 | 1   | Does the device support time zone and daylight saving   | Y   |
| Tm8 | 1,2 | Which attributes of the SNTP response packet are validated  | N Leap indicator not equal to 3<br>Y Mode is equal to SERVER<br>N OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp<br>Y RX/TX timestamp fields are checked for reasonableness<br>N SNTP version 3 and/or 4<br>N other (describe)                        |
| Tm9 | 1,2 | Do the COMTRADE files have local time or UTC time and is this configurable                                      |   |
|     |     | <additional items>  |   |

