

SIEMENS

SICAM 8 Applications Communication

Manual

Preface

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OPC UA server

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NOTE

For your own safety, observe the warnings and safety instructions contained in this document, if available.

Disclaimer of Liability

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Preface

Purpose of the Manual

This manual describes the SICAM 8 Application Group **Communication**.

This is divided into:

- OPC UA Server

Target Audience

This manual is addressed to personnel and customers who are responsible for evaluation, conceptual design, configuration, and technical system maintenance. It provides hints on how to get information or files via the website <https://support.industry.siemens.com>. If you do not have access to this website, contact your project manager at Siemens.

Scope

This manual is valid for the SICAM 8 series.

Indication of Conformity



The product described conforms to the regulations of the following European Directives:

- 2014/30/EU
Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility; Official Journal of the EU L96, 29/03/2014, p. 79–106
- 2014/35/EU
Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits; Official Journal of the EU L96, 29/03/2014, p. 357–374
- 2011/65/EU
Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment; Official Journal of the EU L174, 01/07/2011, p. 88–110

The conformity of the product with the above mentioned regulations is proven through the observance of the following harmonized standards:

- IEC/EN 60870-2-1 for 2014/30/EU
- IEC/EN 61010-1 and IEC/EN 61010-2-201 for 2014/35/EU;
IEC/EN 61010-2-030 (only AI-8510, AI-8511, CM-8820, AI-8330, AI-8340)
- IEC/EN 63000 for 2011/65/EU

This declaration certifies the conformity with the specified directives, but is not an assurance of characteristics in the sense of the product liability law.

The product is intended exclusively for use in an industrial environment.

Standards

This product is UL-certified based on the Technical data:

UL 61010-1 and UL 61010-2-201; UL 61010-2-030

CAN/CSA-C22.2 No. 61010-1 and CAN/CSA-C22.2 No. 61010-2-201; CAN/CSA C22.2 No. 61010-2-030



IND. CONT. EQ.
E486146
E496940

For more information, see Product iQ on the Internet: <https://productiq.ulprospector.com/de>.

Log in (or use the option **Search abridged site without login**) and search for UL file number **E496940**, **E486146** or **E469507**, to see a list of the currently certified modules.

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Siemens AG

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Customer Support Center

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Notes on Safety

This document is not a complete index of all safety measures required for operation of the equipment (module or device). However, it comprises important information that must be followed for personal safety, as well as to avoid material damage. Information is highlighted and illustrated as follows according to the degree of danger:



DANGER

DANGER means that death or severe injury **will** result if the measures specified are not taken.

- ✧ Comply with all instructions, in order to avoid death or severe injuries.
-



WARNING

WARNING means that death or severe injury **may** result if the measures specified are not taken.

- ✧ Comply with all instructions, in order to avoid death or severe injuries.
-



CAUTION

CAUTION means that medium-severe or slight injuries **can** occur if the specified measures are not taken.

- ✧ Comply with all instructions, in order to avoid moderate or minor injuries.
-

NOTICE

NOTICE means that property damage **can** result if the measures specified are not taken.

- ✧ Comply with all instructions, in order to avoid property damage.
-



NOTE

Important information about the product, product handling or a certain section of the documentation which must be given attention.

OpenSSL

This product includes software developed by the OpenSSL Project for use in OpenSSL Toolkit (<http://www.openssl.org/>).

This product includes software written by Tim Hudson (tjh@cryptsoft.com).

This product includes cryptographic software written by Eric Young (ey@cryptsoft.com).

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1 General Information

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1.1 Platform Thought

With the SICAM 8 series, the new automation platform, you have a consistent, scalable platform for different purposes (everywhere where energy flows).

With the SICAM 8 series, you are able to functionally integrate different modules (e.g. SICAM HMI, complete controllers) and have end-to-end engineering with the SICAM Device Manager.

With SICAM 8, the new automation platform, you benefit from:

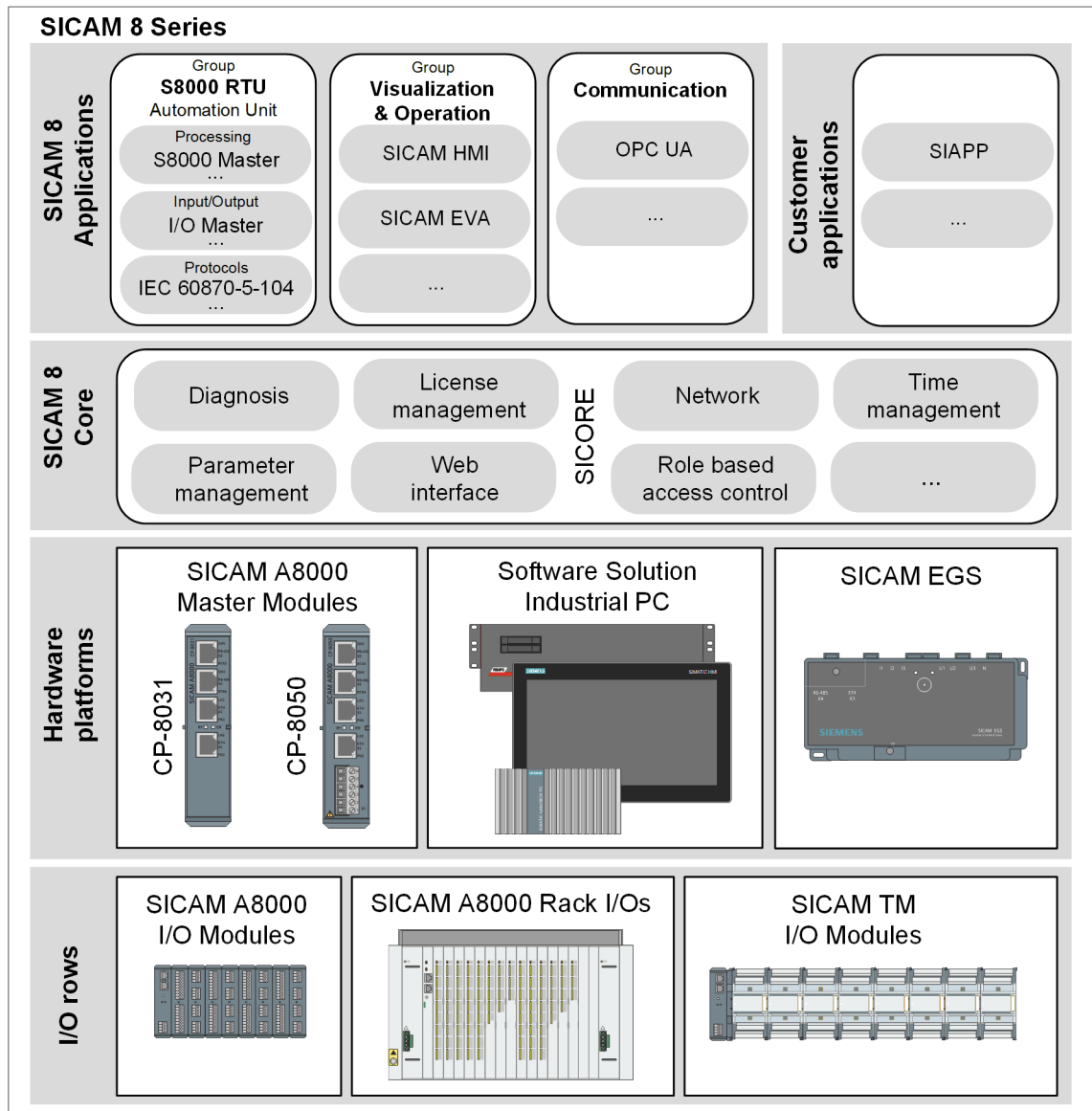
- Unified platform for hardware, software, controllers and engineering - less training required for operating personnel.
- Significant reduction of different systems in the network - Minimization of maintenance effort and costs.

Your advantages with the new platform:

- Optimum adaptability: for every application through modular AND variable hardware, identical software.
- High operational reliability: "State of the Art" Cybersecurity according to BDEW Whitepaper and NERC CIP. Certification according to process industry safety standard IEC62443.
- Faster network expansion: thanks to hardware-independent reuse of applications.
- Reduced effort for engineering training: by standardizing new hardware variants based on the SICAM 8 platform.
- Shorter repair times (MTTR - Mean Time to Repair): enables the flexible use or replacement of hardware.
- Tailor-made hardware and software: made for all areas of energy supply.

Modular system

SICAM 8 is a modular system that can be optimally adapted to the required plant requirements. The SICAM 8 platform consists of application groups and their applications, which provide functionalities for diverse business logic. The range of SICAM 8 applications is constantly being expanded.



[dw_SICAM_8_Overview, 2, en_US]

The SICAM 8 core functions are available for running the applications. These contain all the necessary functions and infrastructure services for operating, managing, configuring and updating these applications.

Several hardware versions are available to run the SICAM 8 Core with the applications.

1.2 Terms

Application (formerly Firmware)

As previously mentioned, the SICAM 8 Core platform manages a wide variety of applications. Software applications are meant here, such as the SICAM S8000 RTU applications or HMI applications. On the SICAM A8000 devices, these applications used to be referred to as firmwares. Since the term firmware rather reflects a hardware dependency, with the release of the product SICAM 8 Software Solution the term firmware was replaced by the term application and used for all device types.

Automation Unit

The term automation unit is used for all applications of the "S8000 RTU" application group. In previous products, this always meant the entire device, since only the RTU function actually ran on these devices. The SICAM 8 product line is developing more and more into a platform (SICORE) on which different applications run simultaneously. e.g. the S8000 RTU functionality as well as "visualization and operating functions" such as the SICAM HMI application.

Basic System Element / Supplementary System Elements

These terms come from products (e.g. SICAM ACP), where each application (formerly also called firmware) was assigned to a dedicated hardware element. For reasons of consistency, these terms will continue to be used. In the SICAM 8 system, each system element corresponds to its own process, which is managed by the SICORE platform.

System-technical Addressing

The addressing of automation units via regional component numbers and applications within the automation unit via basic and supplementary system element numbers is also often referred to as "system-technical addressing". This term is mainly used in the engineering tool SICAM Toolbox II.

Process-technical Parameterization

The term "Process-technical Parameterization" is used in the engineering tool SICAM Toolbox / OPM and means the data point-specific parameterization of signals. i.e. the properties of the signal can be adjusted via parameters for each data point/signal. In the engineering tool SICAM Device Manager, these parameters are parameterized in the S8000 RTU tile Signals, the term signal assignment is used for this. The term signal assignment is used in the document for reasons of consistency.

1.3 Engineering

The following engineering tools are available for the SICAM 8 Series:

- SICAM Device Manager
- SICAM WEB¹

1.3.1 SICAM Device Manager

Engineering is an important cost factor in the creation of new plants for energy generation, distribution and transmission. The maintenance of existing systems and the maintenance of the relevant databases also require high expenses. Configuration, parameterization, test and commissioning with the SICAM Device Manager solve these tasks and requirements in an intuitive manner and save time and money.

The SICAM Device Manager supports project and device management for:

- SICAM A8000 CP-8031
- SICAM A8000 CP-8050
- SICAM 8 Software Solution
- SICAM EGS

The SICAM Device Manager is available in German and English language.

There are 3 licenses to choose from:

- 6MF7800-1FB00: SICAM Device Manager Basic
- 6MF7800-1FS00: SICAM Device Manager standard (inclusive CFC)
- 6MF7800-1GS00: SICAM Device Manager Upgrade Basic to Standard

Supported operating systems:

- Microsoft Windows 7
- Microsoft Windows 10
- Microsoft Windows 2012 Server R2
- Microsoft Windows 2016 Server R2

Cyber Security

In line with the SICAM 8 series, the SICAM Device Manager also meets the cyber security requirements of tomorrow. In addition to the already known features, such as BDEW White Paper conformity, the SICAM Device Manager only supports digitally signed Application.

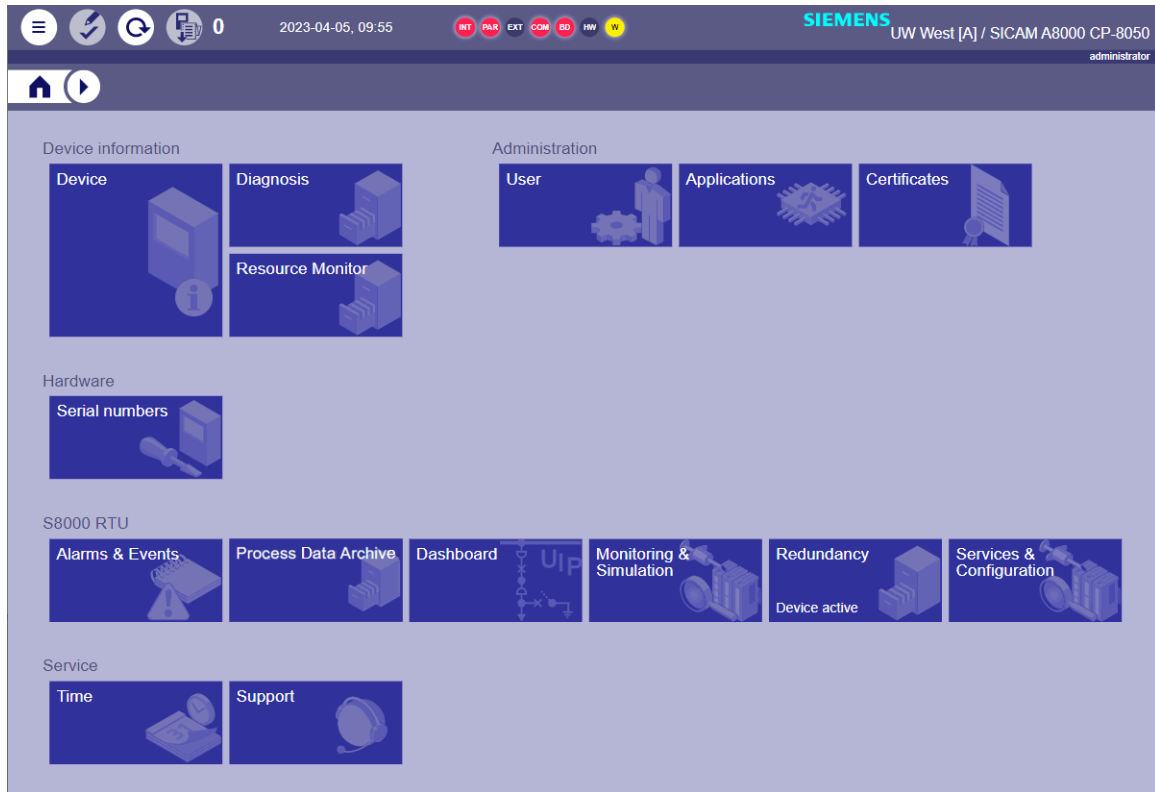
1.3.2 SICAM WEB

Particular value was placed on simplest operation. SICAM WEB has an integrated web server that is operated with a standard web browser. By means of that, no special tools or additional licenses are needed.

Supported web browser:

- Google Chrome
- Microsoft Edge
- Mozilla Firefox

¹ SICAM WEB only offers very limited functions for engineering



[sc_SICAM_WEB_dashboard, 6, en_US]

Figure 1-1 SICAM WEB Dashboard

1.3.3 Differences in the Engineering Tools

	SICAM Device Manager	SICAM WEB
License required	✓	–
Support of SICAM A8000 CP-8031	✓	✓
Support of SICAM A8000 CP-8050	✓	✓
Support of SICAM 8 Software Solution	✓	✓
Support of SICAM EGS	✓	✓
Interfacing	• direct point-to-point connection via Ethernet interface • LAN/WAN connection via Ethernet interface • NAT/PAT via Router • One Click to connect (with CP-8031/CP-8050)	• direct point-to-point connection via Ethernet interface • LAN/WAN connection via Ethernet interface
Addressing	Via SICAM Device Manager Engineering ID	Via IP address
Engineering mode	Offline, then load parameters into the target system (no conversion required)	–
Remote maintenance	–	–

	SICAM Device Manager	SICAM WEB
Equipment of modules	Graphical assembly editor	–
Equipment of applications	• “Visualization & Operation” Applications (e.g. SICAM HMI, SICAM Event & Alarms) • Communication Applications (e.g. OPC UA Server)	–
Equipment of customer applications	SIAPP Runtimes	–
Management of signals	• Signals can be assigned directly to the processing function or the I/O module • Bulk processing of signals and values possible • No conversion required	–
Application program	Based on IEC 61131-3, with restrictions from system limits (memory) • Function diagram via CFC editor • Instruction list	–
Reading back engineering data from device	✓	✓
Test functions for automation unit S8000 RTU	Online functions SICAM WEB	• Process data Monitoring • Process data Simulation • I/O test • I/O Simulation
Test functions for application program	• Online test • Offline simulation	
Sum diagnosis information	Online functions SICAM WEB	✓
Role Based Access Control	✓	✓
Read security logbook	Online functions SICAM WEB	✓

2 Common Functions

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2.1 Functional Overview and Sizing

Communication Application	A8000 CP-8031	A8000 CP-8050	Software Solution (IPC)
OPC UA server	✓	✓	✓

2.2 Common Functions

This chapter describes functions that are used in the same way by different applications for communication.

3 OPC UA server

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3.1 OPC UA Server

The OPC UA protocol (OPC Unified Architecture) is an Ethernet-based industry standard communication protocol that is widely used in automation technology and industrial applications. It enables secure and reliable communication between different devices and systems from different manufacturers.

The OPC UA server provides information for further processing to higher-level systems.

Applications for OPC UA:

Application	System	Standard and function
OPCUA00	SICAM 8 A8000 (CP-8031, CP-8050)	OPC UA Server
OPCUA00	SICAM 8 Software Solution (IPC)	OPC UA Server

Overview

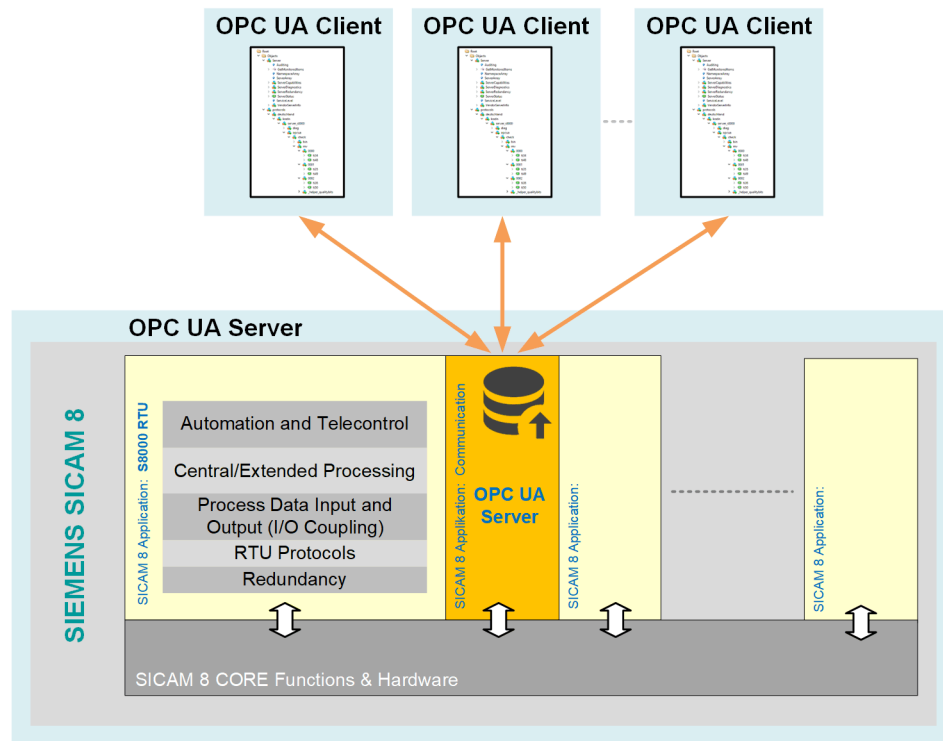
Open Platform Communications Unified Architecture (OPC UA) was developed by the OPC Foundation, founded in 1996, of which Siemens is a founding member. The OPC Foundation is a global non-profit organization with more than 850 members from all industries. It works closely with users and manufacturers to continuously develop the open, manufacturer-independent standard.

OPC UA is specified in the IEC 62541 series of standards.

OPC UA features:

- Manufacturer-independent and platform-neutral
- Internationally standardized interfaces for easy machine integration (companion specifications)
- Secure communication without additional hardware directly in the protocol
- Communication between machines (M2M) and higher-level systems
- Cyclic and event-driven transmission of information
- Information model and semantic services
- Simple and unambiguous interpretation of the data
- Simple Ethernet-based networking, using the existing Industrial Ethernet infrastructure
- Integrated security concept (encryption, signing and authentication)
- Unrestricted parallel operation with other protocols on the TCP/IP level
- High performance through fast communication

Schematic configuration



[OPC UA_Configuration_intern [GER], 1, en_US]



NOTE

- If required, several applications for OPC UA servers can be configured in one device. Several OPC UA servers in a device with the same IP address must use different port numbers for communication.

3.2 Functions

Function	OPCUA00
OPC UA	
OPC UA Server	✓
OPC UA Client	–
OPC UA Protocol Stack = open62541	v1.3.5
OPC UA Standard	v1.04
max. number of connections to OPC UA Clients	100
max. number signals "send" (recommended)	5000
max. number signals "receive" (recommended)	5000
Interoperability	
Interoperability (see 3.10 Interoperability)	✓
License	
License required to use the application	✓
License: OPC UA Server	✓
OPC UA communication models	
OPC UA Client/Server	✓
OPC UA Publish/Subscribe	–
Supported OPC UA application profiles & facets	
Micro embedded device 2017 server profile	✓
Security²	
OPC UA Security Policies - Client-Server:	
• None	✓
• Basic128Rsa15 ³	✓
• Basic256 ³	✓
• Basic256Sha256	✓
• Aes128_Sha256_RsaOaep	✓
• Aes128_Sha256_RsaPss	–
Checking the identity of OPC UA clients	–
Verification of the identity of the users	–
Signed/encrypted data exchange between OPC UA server and clients	✓
Supported OPC UA transport protocols	
HTTPS - UA Binary	–
HTTPS - UA XML	–
UA TCP - UA Binary	✓
Supported OPC UA services	
Browse	✓

² For certificate management see manual **SICAM 8 - Core Functions & Hardware**, section **Certificate Management**.

³ outdated

Function	OPCUA00
Read/Write	✓
Subscribe	✓
MethodCall	–
Discovery:	
• LDS: Local Discovery Server	✓
• LDS-ME: Local Discovery Server Multicast Extension	–
• GDS: Global Discovery Server	–
OPC UA Build-In information model	
• Base	✓
• Data Access (DA)	✓
• Historical Data Access (HA)	–
• Alarms & Conditions (AC)	–
• Aggregates	–
• Programs	–
OPC UA Namespace⁴	
Freely definable (Namespace according to the tree structure of the signal definition in the SICAM Device Manager)	✓
Network configuration	
LAN/WAN	✓
Port number OPC UA	4840
Port number OPC UA (can be set by parameter: 1 to 65535)	✓
Supported SICAM 8 signal types in transmission direction	
Command	–
Bitstring of 32 bits command	–
Bitstring of 32 bits value	✓
Blocked activation of the protection	–
Blocked trip of the protection	–
Message	✓
Measured value	✓
Parameters for measured values	–
RTU internal	–
Event of protection equipment	–
Setpoint value	–
Regulating step command	–
Step position information	–
Integrated Total	–
Supported SICAM 8 signal types in receive direction	
Command	✓
Bitstring of 32 bits command	–

⁴ [NamespaceIndex=2] For your own signals the namespace is 2. Namespace 0 is reserved for the standard objects (see <http://opcfoundation.org/UA/>).

Function	OPCUA00
Bitstring of 32 bits value	–
Blocked activation of the protection	–
Blocked trip of the protection	–
Message	–
Measured value	–
Parameters for measured values	–
RTU internal	–
Event of protection equipment	–
Setpoint value	✓
Regulating step command	–
Step position information	–
Integrated Total	–
Supported OPC UA data types	
Boolean	R/W ⁵
Float	R/W ⁵
UINT32	R ⁶
Redundancy	
	–
Web-Interface	
	–
Engineering	
SICAM Device Manager	✓
SICAM TOOLBOX II	–
SICAM WEB	–

Restrictions



NOTE

- The application for OPC UA Server in SICAM 8 supports only a subset of the possible functions of OPC UA.
When used in the project, the supported functionality must be observed!
- The application for OPC UA Server in SICAM 8 uses the open source protocol stack **open62541** (see <https://www.open62541.org/#>) - this is included in the C program of the application.

⁵ R .. Read | W .. Write.

⁶ R .. Read

3.3 Communication

For the stations to communicate with each other, suitable transmission facilities and/or network components may be needed in addition.

Own station: OPC UA Server

System	Master module	Applications	Remarks
SICAM A8000 Series	CP-8031/CPCI85 CP-8050/CPCI85 CP-8050/EPCI85	OPCUA00	
	Software Solution (IPC)	OPCUA00	

Remote station: OPC UA Client

System	Master module	Applications	Remarks
3rd Party System			

3.4 Overview

3.4.1 What is OPC UA?

The OPC UA protocol (OPC Unified Architecture) is an industry standard communication protocol that is widely used in the automation and Industry 4.0 industries. It enables secure and reliable communication between different devices and systems in industrial environments.

OPC UA It is based on a standardized, hierarchical data model that allows data to be organized and exchanged in a structured way.

One of the main strengths of OPC UA is its ability to work in different industrial environments, regardless of the hardware or software platforms used. It is vendor independent and enables interoperability between different devices and systems that support OPC UA. This makes it easier to integrate devices from different manufacturers into a common infrastructure.

OPC UA also offers advanced security features that ensure the protection of data and systems in industrial environments. It supports various encryption and authentication mechanisms to ensure data confidentiality, integrity and availability.

OPC UA Server

An OPC UA Server is a software component or device that provides data and information according to the OPC UA protocol and can be accessed by OPC UA clients. It is essentially a communication interface that allows data and information from different sources to be accessed and made available to other OPC UA clients.

How is data transferred with OPC UA?

Data transfer takes place via the OPC UA protocol, which is based on a client-server model. OPC UA defines a standardized communication interface for the exchange of data and information between OPC UA clients and OPC UA servers.

Basic steps for data transfer with OPC UA:

- **Connection setup:** The OPC UA client establishes a connection to the OPC UA server. Various security and authentication mechanisms are used to protect the connection and control access to the data.
- **Request-Response-Mechanism:** The OPC UA client sends requests to the OPC UA server to retrieve data or information or to perform actions. The OPC UA server then answers (Response) with the requested data or information. This request-response mechanism enables the bidirectional exchange of data and information between client and server.
- **OPC UA messages:** OPC UA uses a structured format for transferring data and information in the form of OPC UA messages. These messages can contain different types of data, such as variable values, states, events or method calls ⁷. OPC UA messages can be transmitted in different formats. The OPC UA Server in SICAM 8 only supports binary encoding.
- **OPC UA-Security:** OPC UA also provides advanced data transfer security mechanisms to ensure the confidentiality, integrity and authenticity of the data transferred. This includes encryption, digital signature, authentication of clients and servers, as well as the management of access rights.
- **Session Management:** OPC UA enables sessions to be managed between the client and server. A session is created when the connection is established and can have various properties such as timeout, recovery mechanisms and security settings. The session allows to manage the state of communication between client and server and efficiently exchange data and information.

Addressing of the data with OPC UA

OPC UA data addressing is a technique used to access data and information within an OPC UA system. OPC UA uses a hierarchical modeling of data in the form of address spaces, which allows data and information to be

⁷ Are currently not supported by the OPC UA Server in SICAM 8.

presented in a structured and organized manner. There are two main types of addressing in OPC UA: node ID addressing and browse addressing.

- **Node ID addressing:** In the OPC UA node ID addressing, a specific node, i.e. a unit of data or information, is accessed using a unique node ID. A node ID is a unique identifier for a node within the OPC UA address space and can appear in different forms, such as a numeric value, a GUID (Globally Unique Identifier) or a string. Node ID addressing enables direct and precise access to a specific node within the OPC UA address space.
- **Browse addressing:** OPC UA browse addressing uses a browsing mechanism to access nodes in the OPC UA address space. A so-called browse request is sent to the OPC UA server to obtain information about the nodes and their hierarchy. The server responds with a list of nodes that exist in the address space and meet certain criteria. The client can then point to the desired node in the response list and access its data and information. Browse addressing enables flexible and dynamic navigation in the OPC UA address space to access different nodes and their information.

Communication models for OPC UA

- **Client/Server**
Service-oriented approach for acyclic operations like reading/writing data or function calls ⁸.
- **Publish/Subscribe⁸**
Message-oriented approach to cyclic communication

OPC UA Services

- **OPC UA Basis Service – Browse**
The client can query information such as the data management of a server.
- **OPC UA Basic Service – Read/Write**
The Read/Write service specifies how data can be read and written from an OPC UA server.
- **OPC UA Basic Service – Subscribe**
This service is available for change notification. A client can subscribe to specific data points. The server notifies the client of changes to the corresponding data.
- **OPC UA Basic Service – MethodCall⁸**
In principle, OPC UA servers can also provide functions for clients. The MethodCallService offers the possibility to call such functions from the client.
- **OPC UA Basis Service – Discovery**
The discovery services serve as the basis for the automatic connection between server and client. Various discovery services are specified for finding an OPC UA server.
 - Local Discovery Server (LDS)
To find an OPC UA server, the client must establish a connection to the corresponding device. This is usually done with a FindServersRequest. The device then responds to this request with an application description of the OPC UA servers available on the device.
 - Local Discovery Multicast Extension (LDS-ME) ⁹
 - Global Discovery Server (GDS) ⁹

Security with OPC UA

OPC UA allows data exchange between different systems, both within the process and production level, as well as to systems at the management and company level.

OPC UA offers the following security mechanisms:

⁸ Currently not supported by the OPC UA Server in SICAM 8.

⁹ Currently not supported by the OPC UA Server in SICAM 8.

- Checking the identity of OPC UA server and clients. ⁹
- Verification of the identity of the users. ⁹
- Signed/encrypted data exchange between OPC UA server and clients.

3.5 Configure OPC UA Server Application

So that the OPC UA Server application can be used for SICAM 8, it must first be downloaded and then imported into the SICAM Device Manager and configured for the device.

Import application for OPC UA Server in the SICAM Device Manager

- Click in menu **Applications ...**



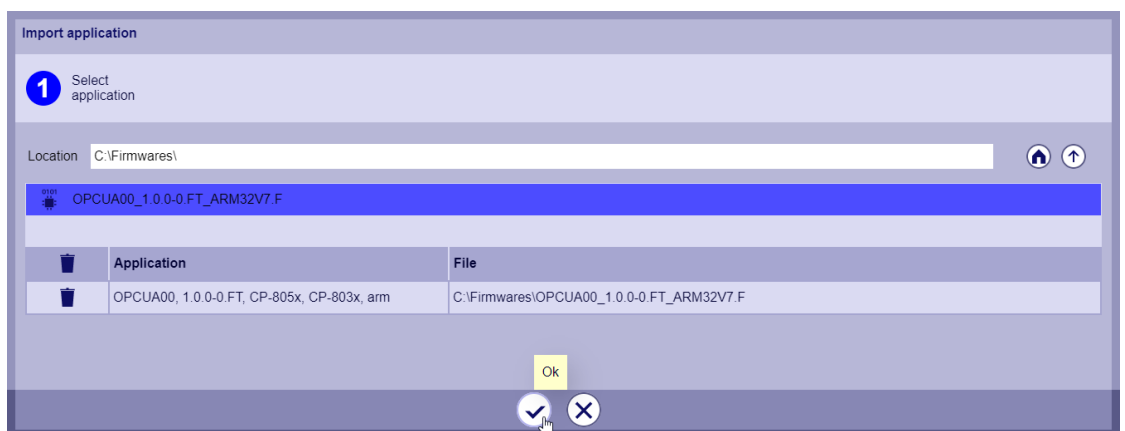
[Applikation importieren_01 [GER], 1, en_US]

- Click **Import application**



[Applikation importieren_02 [GER], 1, en_US]

- Select application and import with **OK**¹⁰



[Applikation importieren_03 [GER], 1, en_US]

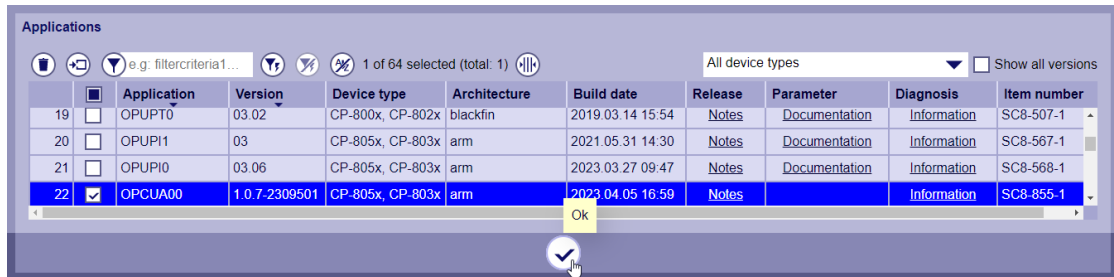
¹⁰ The current revision of the application can differ from the representation in the picture.

- Complete the import of the application with **OK**



[Applikation importieren_04 [GER], 1, en_US]

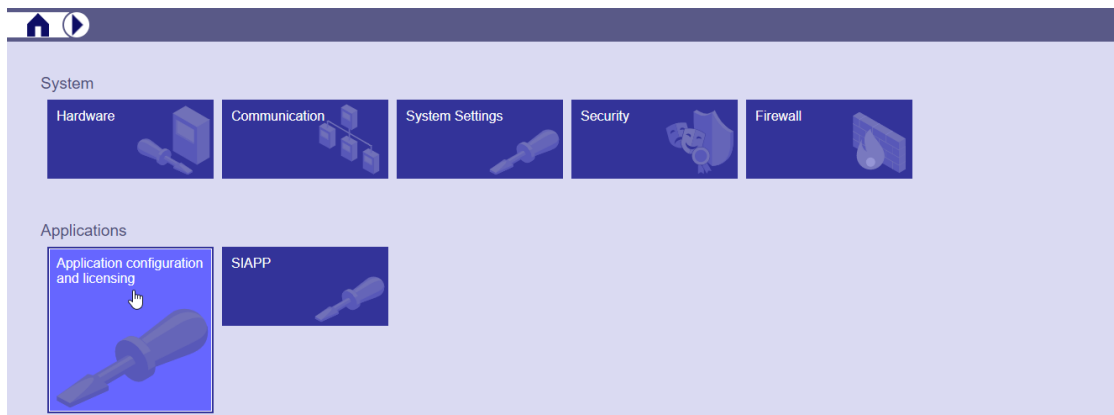
- The imported application is displayed in the overview. Close the display with **OK**.



[Applikation importieren_05 [GER], 1, en_US]

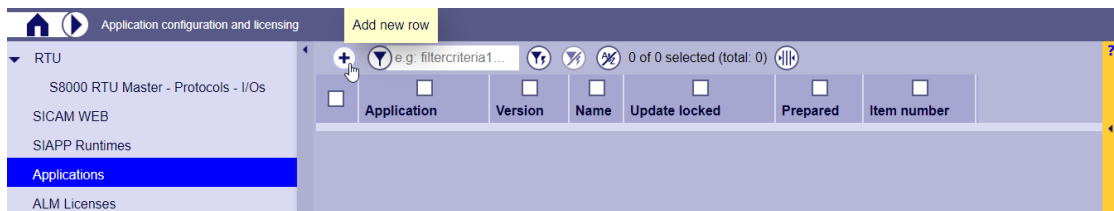
Configure application for OPC UA Server in the SICAM Device Manager

- Click **Home | Application configuration and licensing**



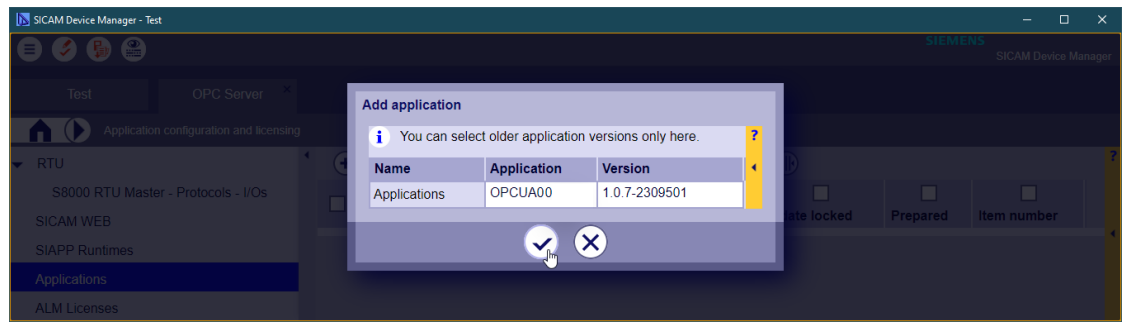
[Applikationen - Konfiguration der Applikationen und Lizenzierung [GER], 1, en_US]

- In the **Applications** section click **Add new row**



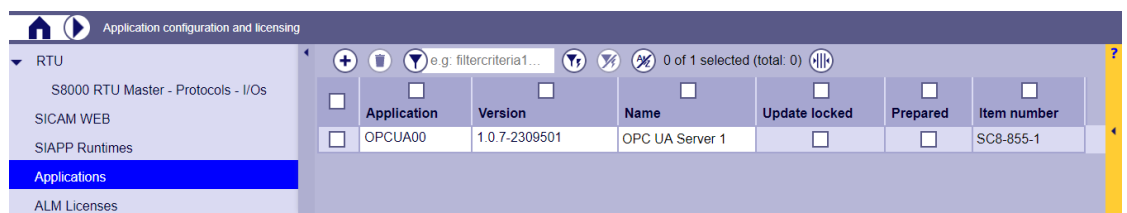
[Applikationen - neue Zeile einfügen [GER], 1, en_US]

- In the **Add new application** dialog, select the application for the OPC UA server (OPCUA00) and then confirm the selection.



[Applikationen - Applikation auswählen_1 [GER], 1, en_US]

- When the application is successfully added, the new application will appear in the **Applications** section



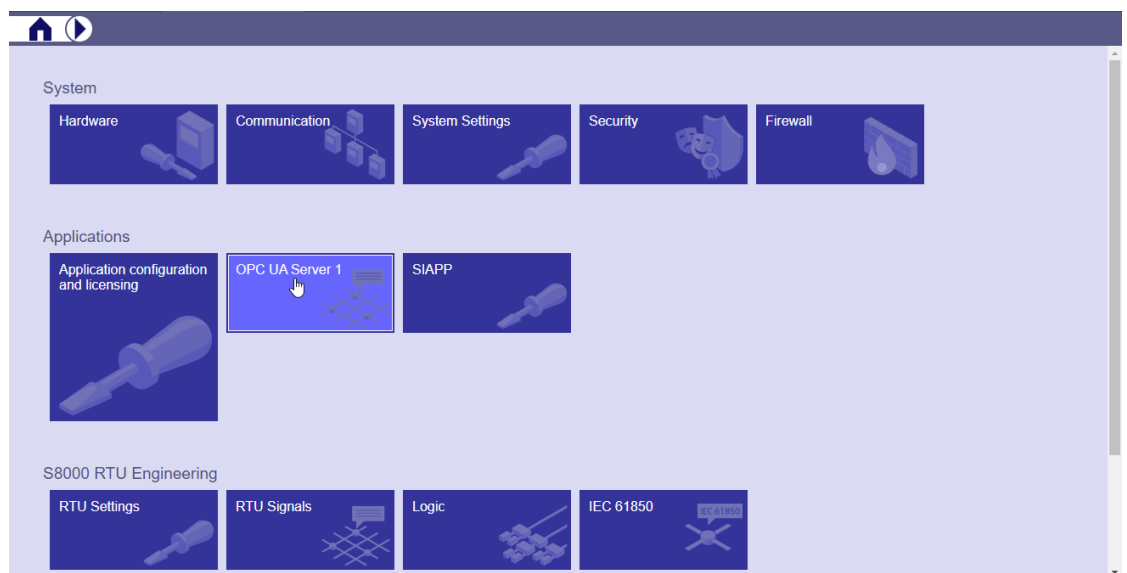
[Applikationen - Applikation auswählen_2 [GER], 1, en_US]

- In the **Applications** section, click on the **Name** of the selected application and, if necessary, change the name of the application for OPC UA Server in the device.



[Applikationen - Applikation auswählen_2b [GER], 1, en_US]

- The selected application for OPC UA Server is displayed under **Home**



[Applikationen - OPC UA Server [GER], 1, en_US]



NOTE

- If required, several applications for OPC UA servers can be configured in one device. Several OPC UA servers in a device with the same IP address must use different port numbers for communication.
-

3.6 Licenses

A license is required in SICAM 8 for each **OPC UA Server** application.

Requirements

- For permanent operation a license is required

Order information - Function Point Manager License

SICAM function point manager Licenses are generated with the *SICAM function point manager*¹¹. The ordering process is described in the **Function Points Manager** user manual, section **SICAM License Files**.

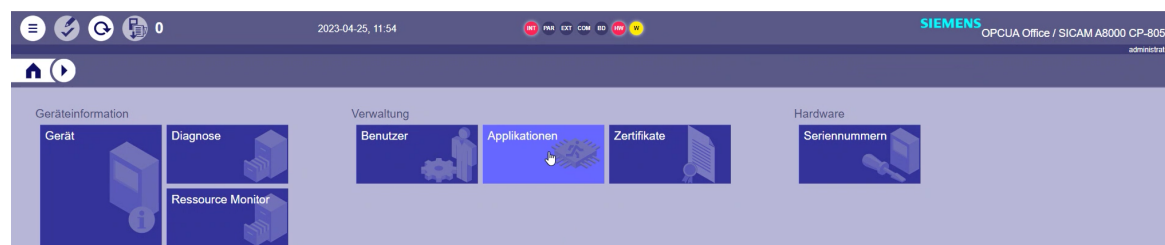
Ordering Information

Medium	Designation (License type)
OSD Download	OPC UA Server

Import the license into the device

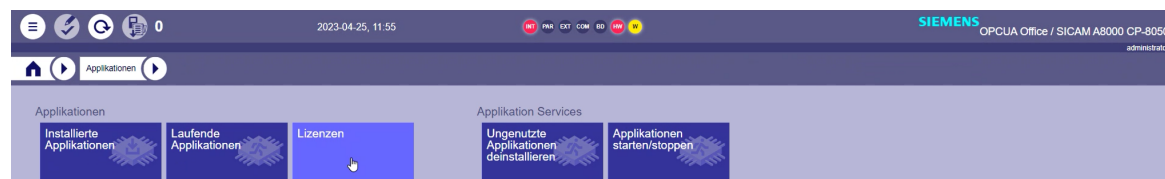
The license is loaded into the device via SICAM WEB.

- Connect the SICAM 8 device to the PC and start SICAM WEB.
- On the SICAM WEB interface of the device, click **Home | Applications**



[SICAM WEB - Applikationen [GER], 1, en_US]

- Click **Lizenzen**



[SICAM WEB - Applikationen - Lizenzen [GER], 1, en_US]

- Import the license for the device generated with the Function Points Manager

¹¹ The serial number of the device, required for generating the license file with the SICAM function point manager, is displayed with SICAM WEB under Home | Applications | Licenses

0

2023-04-25, 11:58

INT

PAR

EXT

COM

BD

HW

W

SIEMENS

OPCUA Office / SICAM A8000 CP-8050

administrator

Applikationen

Lizenzen

Gerät

Seriennummer

BF1702056618

Importierte Lizenzen

e.g. filtercriteria1...

0 of 0 selected (total: 0)

☐

Lizenztyp

Lizenzwert

Verwendet von

Lizenz Quelle

Applikations Übersicht

e.g. filtercriteria1...

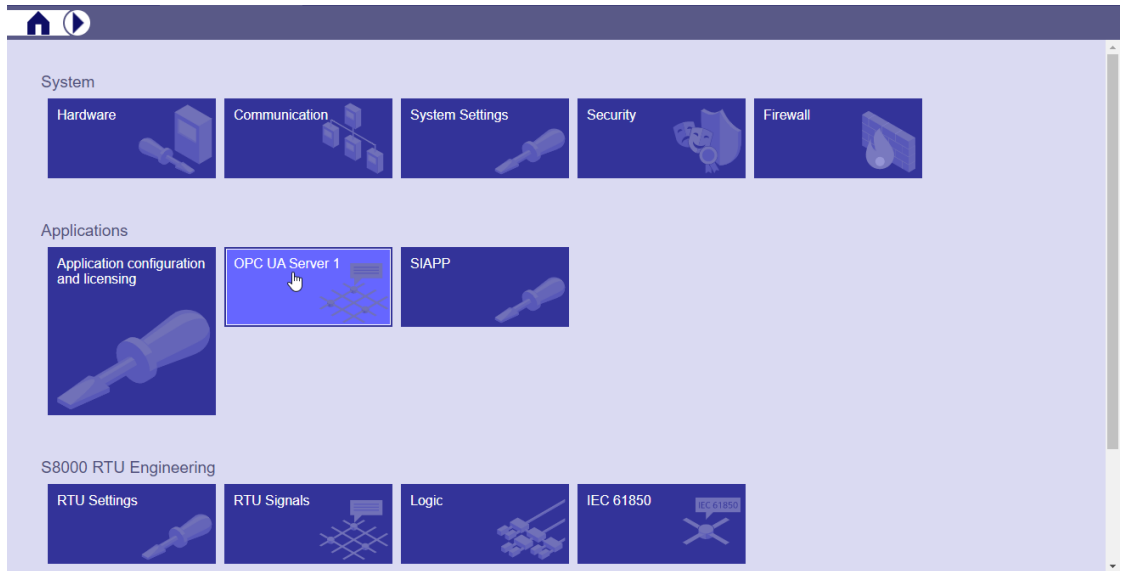
Applikationsgruppe	Instanz	Applikation	Kurzbezeichnung	Lizenztyp	Minimaler Lizenzwert	Status
S8000 RTU (Verarbeitung)	M	S8000 RTU Master	S8000 RTU Master	SIFLSA8WEB0100 / RTU Ext SICAM WEB		läuft in 20 Tagen
Kommunikation	OPC UA Server	OPC UA Server	OPC UA Server	OPC UA Server		läuft in 20 Tagen

[SICAM WEB - Applikationen - Lizenzen_2[GER], 1, en_US]

3.7 Parameters and Properties

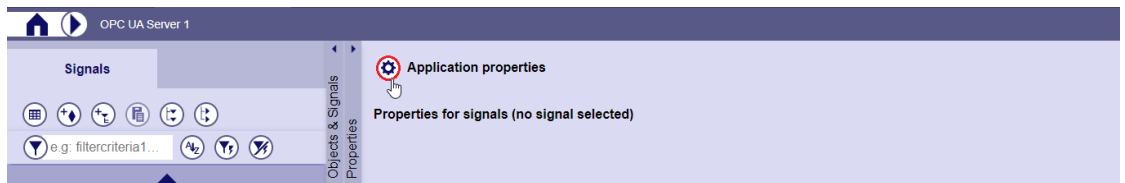
The parameters for the application OPC UA Server (signals and properties of the application) are to be parameterized with the SICAM Device Manager in the tile for OPC UA Server.

- Select OPC UA Server: Click **Home | OPC UA Server** ¹²



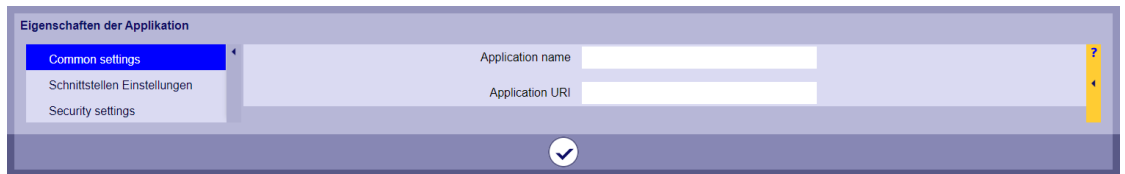
[Applikationen - OPC UA Server [GER], 1, en_US]

- Click **Application properties**



[OPC UA Server - Eigenschaften der Applikation [GER] red, 1, en_US]

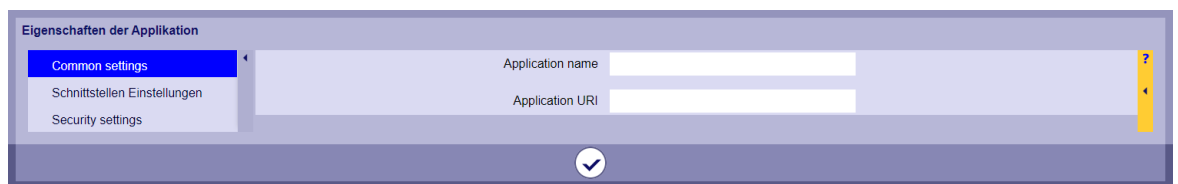
- The properties of the application (parameters) are displayed



[OPC UA Server_Eigenschaften der Applikation_2a [GER], 1, en_US]

Application parameters and properties

Common settings



[OPC UA Server_Eigenschaften der Applikation_2a [GER], 1, en_US]

¹² The name of the application can be changed when configuring the application.

Parameter name	Description	Settings
Application name	Name of the OPC UA Server application. The name is read out by the OPC UA client when connecting with Discovery and displayed as the name for the configured connection and returned as Application-Name in the "FindServersResponse" response.	Permitted range = - Max. 100 characters - all characters are permitted Default setting =
Application URI	Globally unique identifier for the application instance. For security, this URI must match the subject alternative name URI in the server certificate.	Permitted range = - Max. 100 characters - all characters are permitted Default setting =

Interface settings

[OPC UA Server_Eigenschaften der Applikation_2b [GER], 1, en_US]

Parameter name	Description	Settings
LAN interface	SICAM 8 internal LAN interface for OPC UA Server.	Permitted range = Default setting =
Port number	TCP port number for OPC UA Server.	Permitted range = 1 to 65535 0 = not used Default setting = 4840

Security settings

[OPC UA Server_Eigenschaften der Applikation_2c [GER], 1, en_US]

Parameter name	Description	Settings
Enable security profiles	Enable security in the OPC UA server. If disabled, no connection with security is allowed.	Permitted range = Disabled, Enabled Default setting = Disabled
Certificate verification accept all	If enabled, the certificate transmitted by the OPC UA client is not checked and every certificate is permitted.	Permitted range = Disabled, Enabled Standard setting = Enabled
Certificate	Certificate ¹³	Permitted range = Certificate 1 to 10 Default setting = not used
Certificate authority	Certificate authority ¹³	Permitted range = Certificate authority 1 to 10 Default setting = not used

¹³ (Certificate management see manual **SICAM 8 Series - Core Functions & Hardware**, section **Certificate management**.)

3.8 Security

In case of Connect, the OPC UA server transmits the supported security policies.

With the OPC UA client, the security for the connection is defined by the OPC UA client.

Certificate management see manual **SICAM 8 Series - Core Functions & Hardware**, section **Certificate management**.

Supported Security Policies for OPC UA Server

OPC UA security policy (Security Policy) - Client-Server	OPCUA00	signed ¹⁴	Encrypted ¹⁴ (encrypted)
None	✓	–	–
Basic128Rsa15 ¹⁵	✓	✓	–
Basic128Rsa15 ¹⁵	✓	✓	✓
Basic256 ¹⁵	✓	✓	–
Basic256 ¹⁵	✓	✓	✓
Basic256Sha256	✓	✓	–
Basic256Sha256	✓	✓	✓
Aes128_Sha256_RsaOaep	✓	✓	–
Aes128_Sha256_RsaOaep	✓	✓	✓
Aes128_Sha256_RsaPss	–	–	–

Parameter for security (Details see section **Application parameters and properties**)

- Enable security profiles
- Certificate verification accept all
- Certificate
- Certificate authority

Certificate

The certificate must include the following extensions:

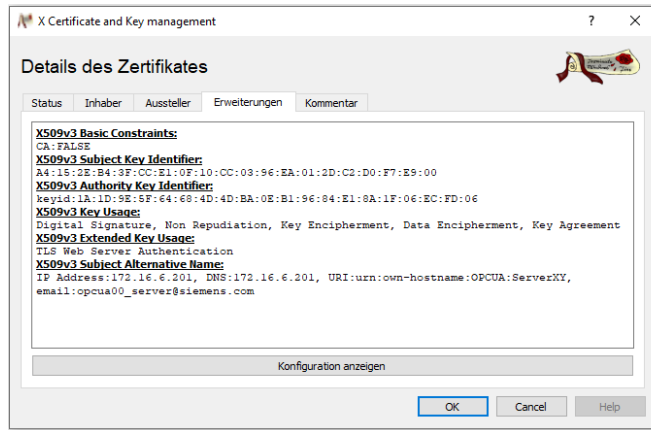
- X509v3 Basic Constraints
- X509v3 Subject Key Identifier
- X509v3 Authority Key Identifier
- X509v3 Key Usage
- X509v3 Extended Key Usage
- X509v3 Subject Alternative Name ¹⁶

Example:

¹⁴ signed or signed and encrypted

¹⁵ outdated

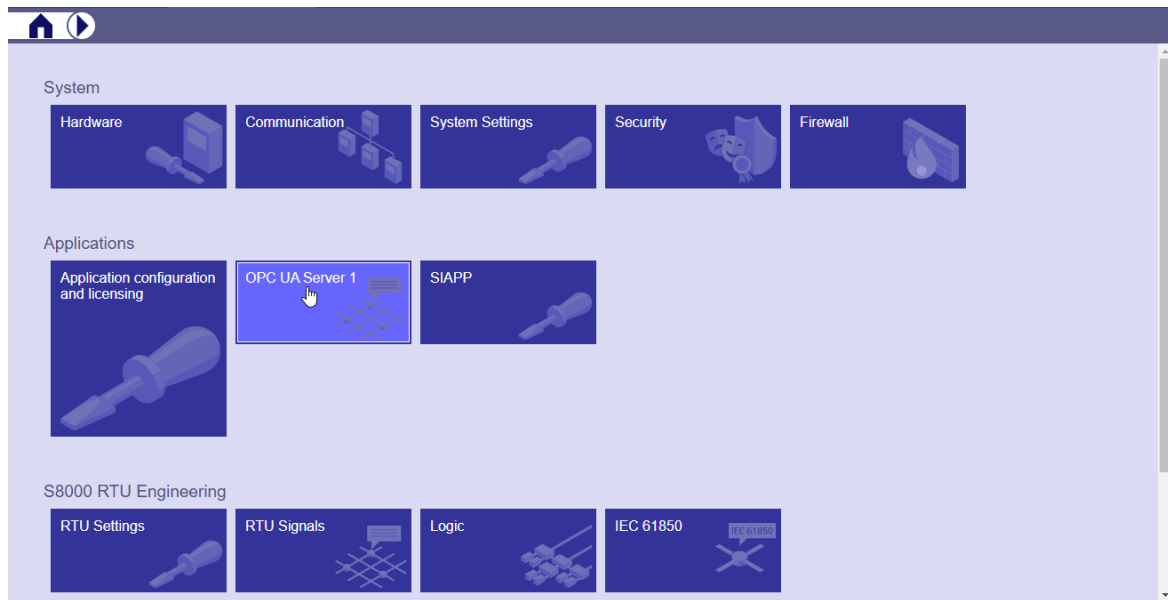
¹⁶ IP, DNS and URI are required



[Beispiel - OPC UA Zertifikat, 1, ...]

3.9 Signals

Signals are those data points that are transferred from the SICAM 8 device between the OPC UA Server and the remote station (= OPC UA Client).



[Applikationen - OPC UA Server [GER], 1, en_US]

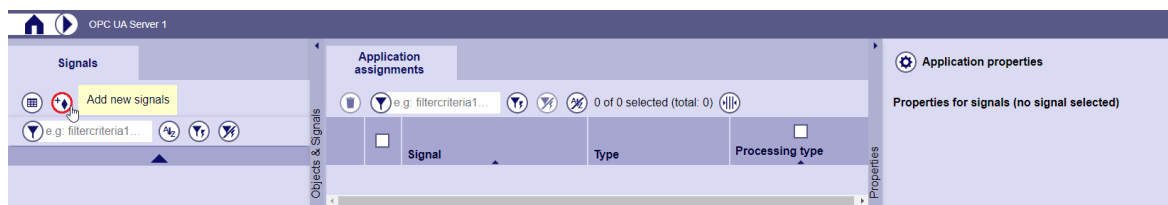
3.9.1 Overview

Add signals

The signals can be added with the SICAM Device Manager either in the OPC UA Server application or in the tile RTU signals.

The signals are assigned to the application and the properties of the signals are parameterized with the SICAM Device Manager in the OPC UA Server application (see **Assignment of the signals to the application**).

Details on the engineering of signals can be found in the SICAM Device Manager manual.



[OPCUA00_Signal_hinzufügen [GER] red, 1, en_US]

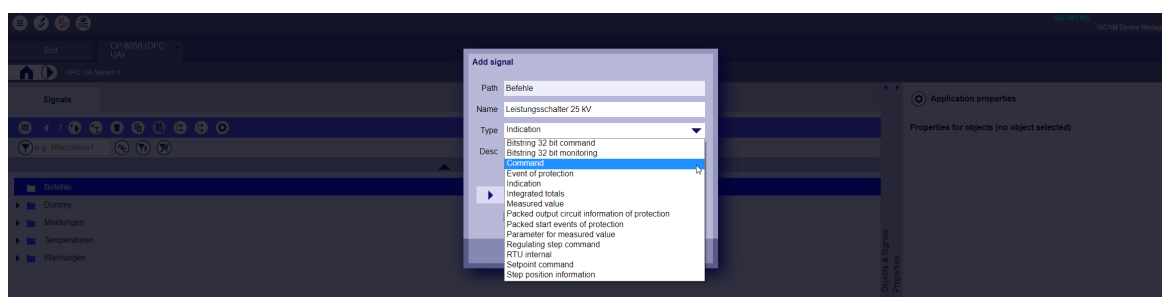
Supported Signal Types

SICAM 8 signal type	Direction	Processing type ¹⁷	OPCUA00
Command	Receive	Receive signals	✓
Bitstring of 32 bits command	—	—	—
Bitstring of 32 bits value	Transmit	Send signals	✓
Blocked activation of the protection	—	—	—

¹⁷ The processing type is assigned automatically when the signals are assigned to the OPC UA server application.

SICAM 8 signal type	Direction	Processing type ¹⁷	OPCUA00
Blocked trip of the protection	—	—	—
Message	Transmit	Send signals	✓
Measured value	Transmit	Send signals	✓
Parameters for measured values	—	—	—
RTU internal	—	—	—
Event of protection equipment	—	—	—
Setpoint value	Receive	Receive signals	✓
Regulating step command	—	—	—
Step position information	—	—	—
Integrated Total	—	—	—

The SICAM 8 signal type (**Type**) for signals is selected at **Add signal**.



[OPCUA00_Signal_hinzufügen_01 [GER], 1, en_US]

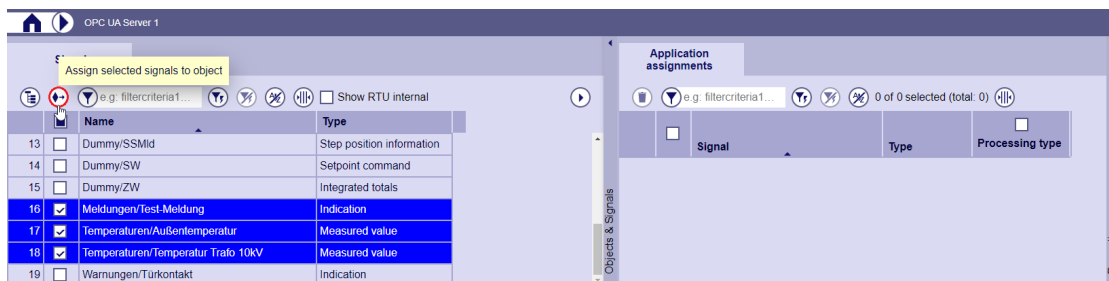
Data exchange between application and SICAM 8 Core

The signals assigned to the application **Communication** are registered by the application after startup with the SICAM 8 core function for transmission (“subscribed”) and transmitted internally to the application in the event of a change or general query.

A logging of the transmitted signals between SICAM 8 Core function and the application for OPC UA Server is currently not supported.

Allocation of the signals to the application

- Select the required signals from the signal list and assign them to the application for OPC UA server with **Assign selected signals to object**.



[OPCUA00_Signale_zuordnen_01 [GER] red, 1, en_US]

¹⁷ The processing type is assigned automatically when the signals are assigned to the OPC UA server application.

- The processing type is assigned automatically when the signals are assigned to the OPC UA server application.

No further properties need to be configured for the signals for the OPC UA server.

Signal	Type	Processing type
1 ☐ Befehle/Leistungsschalter 10 kV	Command	Receive signals
2 ☐ Temperaturen/Außentemperatur	Measured value	Send signals
3 ☐ Temperaturen/Temperatur Trafo 10kV	Measured value	Send signals
4 ☐ Warnungen/Türkontakt	Indication	Send signals

[OPCUA00_Signale zuordnen_02 [GER] red, 1, en_US]



NOTE

Unsupported signal types are not assigned.

Signal name	Signal type	Processing type
Dummy/Bef	Command	Receive signals
Dummy/BM32B	Bitstring 32 bit command	Unsupported signal type
Dummy/BM32W	Bitstring 32 bit monitoring	Send signals
Dummy/GAnS	Packed start events of protection	Unsupported signal type
Dummy/GAuS	Packed output circuit information of protection	Unsupported signal type
Dummy/MId	Indication	Send signals
Dummy/MW	Measured value	Send signals
Dummy/PfM	Parameter for measured value	Unsupported signal type
Dummy/Schutz	Event of protection	Unsupported signal type
Dummy/SSBef	Regulating step command	Unsupported signal type
Dummy/SSMId	Step position information	Unsupported signal type
Dummy/SW	Setpoint command	Receive signals
Dummy/ZW	Integrated totals	Unsupported signal type

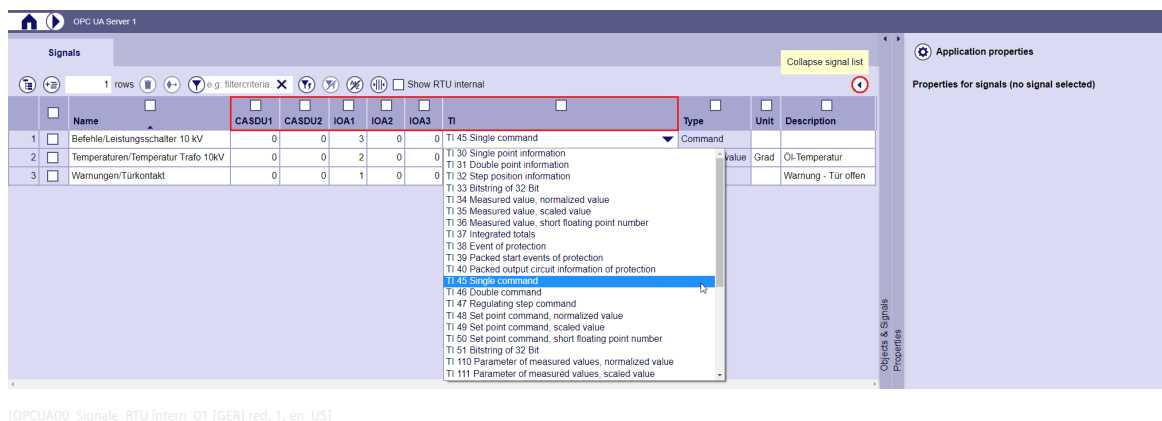
IEC 60870-5-101/104 Parameter

The IEC 60870-5-101/104 parameters are not evaluated by the application for OPC UA Server. The IEC 60870-5-101/104 parameters (CASDU, IOA, TI) are only required if the signals are processed in the application **S8000 RTU - Automation and Telecontrol** or in another application that requires these parameters.

The IEC 60870-5-101/104 parameters are only displayed with the **Open signal list** setting.

[OPCUA00_Signale_RTU intern_00b [GER] red, 1, en_US]

Parameters for IEC 60870-5-101/104 address (**CASDU**, **IOA**, **TI**) and the assignment of SICAM 8 signal type (**Type**) to IEC 60870-5-101/104 type identifier (**TI**):



OPC UA Type

The assignment of the SICAM 8 signal type (**Type**) to OPC UA **DataType Identifier** is done by the application for OPC UA Server.

SICAM 8 Signal type [Type]	IEC 60870-5-101/104 type Identification ¹⁸ [TI]	OPC UA DataType Identifier
Message	TI 30 .. Single-point information with time tag CP56Time2a	Boolean
Message	TI 31 .. Double-point information with time tag CP56Time2a	Boolean ¹⁹
Bitstring of 32 bits Value	TI 33 .. Bitstring of 32 bits with time tag CP56Time2a	UInt32
Measured value	TI 34 .. Measured value, normalized value with time tag CP56Time2a	Float
Measured value	TI 35 .. Measured value, scaled value with time tag CP56Time2a	Float
Measured value	TI 36 .. Measured value, short floating-point number with time tag CP56Time2a	Float
Command	TI 45 .. Single command	Boolean
Command	TI 46 .. Double command	Boolean
Setpoint value	TI 48 .. Setpoint command, normalized value	Float
Setpoint value	TI 49 .. Setpoint command, scaled value	Float
Setpoint value	TI 50 .. Setpoint command, short floating-point number	Float

¹⁸ The IEC 60870-5-101/104 type Identification is not evaluated from the application for OPC UA server. The 101/104 type identifier is only required if the signal is processed in the SICAM 8 application S8000 RTU automation and telecontrol function or in another application that requires the 101/104 type identifier.

¹⁹ In case of messages (TI 31 .. Double-point information with time tag CP56Time2a): Indeterminate state (DIFF) is represented in OPC UA status code with **Uncertain_LastUsableValue**. Indeterminate state (DIFF) or faulty position (FAULT) is represented in OPC UA status code with **Uncertain_EngineeringUnitsExceeded**.

OPC UA Attributes

Attribute	Value
▼ Nodell	ns=2;s=protocols.deutschland.koeln.server_8031.opcua.check.bin.0001.ti30
NamespaceIndex	2
IdentifierType	String
Identifier	protocols.deutschland.koeln.server_8031.opcua.check.bin.0001.ti30
NodeClass	Variable
BrowseName	2, "ti30"
DisplayName	""
Description	"AT", "SIEMENS"
WriteMask	0
UserWriteMask	0
RolePermissions	BadAttributeldInvalid (0x80350000)
UserRolePermissions	BadAttributeldInvalid (0x80350000)
AccessRestrictions	BadAttributeldInvalid (0x80350000)
▼ Value	
SourceTimestamp	24.05.2023 18:32:48.660
SourcePicoSeconds	0
ServerTimestamp	24.05.2023 18:32:48.662
ServerPicoSeconds	0
StatusCode	Good (0x00000000)
Value	false
▼ DataType	
NamespaceIndex	0
IdentifierType	Numeric
Identifier	1 [Boolean]
ValueRank	-1 (Scalar)
ArrayDimensions	UInt32 Array[-1]
AccessLevel	CurrentRead
UserAccessLevel	CurrentRead
AccessLevelEx	BadAttributeldInvalid (0x80350000)
MinimumSamplingInterval	0
Historizing	false

OPC UA Attributes	Value	Note
Nodell		
• NamespaceIndex	2	
• IdentifierType	String	
• Identifier		SICAM 8 signal name (complete tree structure) See NodeID identifier for signals
NodeClass	Variable	
BrowseName		SICAM 8 signal name (Last element of NodeID identifier) See NodeID identifier for signals
DisplayName		SICAM 8 signal name (Last element of NodeID identifier) See NodeID identifier for signals
Description	"AT", "SIEMENS"	Fixed value for description (cannot be changed)
Value		
• SourceTimeStamp		Signal acquisition time in format DD.MM.JJJJ hh:mm:ss.ms
• SourcePicoSeconds	0	
• ServerTimestamp		Time at which the signal was transferred to the OPC UA Server in format DD.MM.YYYY hh:mm:ss.ms
• ServerPicoSeconds	0	
• StatusCode		see quality identifier of the signals (OPC UA status)
• Value		see messages/measured values/commands/setpoint values
DataType	Boolean Float UInt32	
• NamespaceIndex	0	
• IdentifierType	Numeric	

OPC UA Attributes	Value	Note
Identifier	1 [Boolean] 7 [UInt32] 10 [Float]	
ValueRank	-1 (Scalar)	
ArrayDimensions	UInt32 Array [-1]	
AccessLevel	CurrentRead	
UserAccessLevel	CurrentRead	
AccessLevelEx		not supported
MinimumSamplingInterval	0	
Historizing	false	
WriteMask	0	
UserWriteMask	0	
RolePermissions		not supported
UserRolePermissions		not supported
AccessRestrictions		not supported

NodeId Identifier

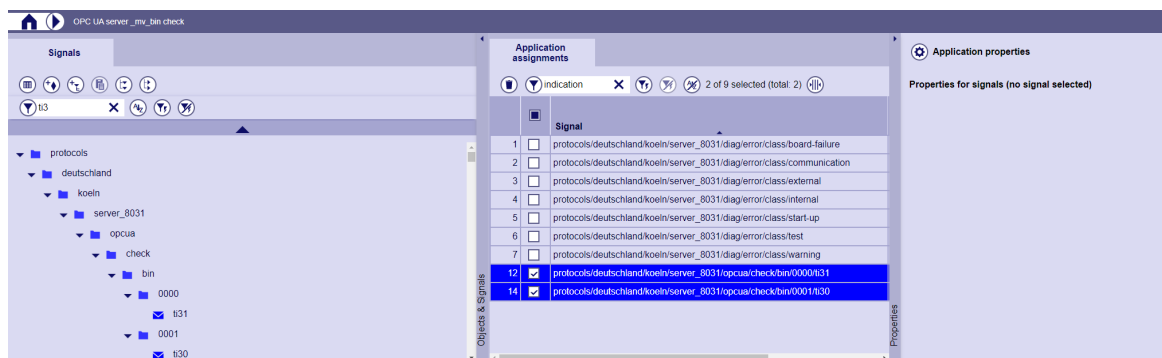
With OPC UA, the signal is addressed with the NodeId identifier. The freely definable name of the signal from the SICAM Device Manager is used as the NodeId identifier (complete tree structure).

Example:

Signal name = protocols/deutschland/koeln/server_8031/opcua/check/bin/0000/ti31

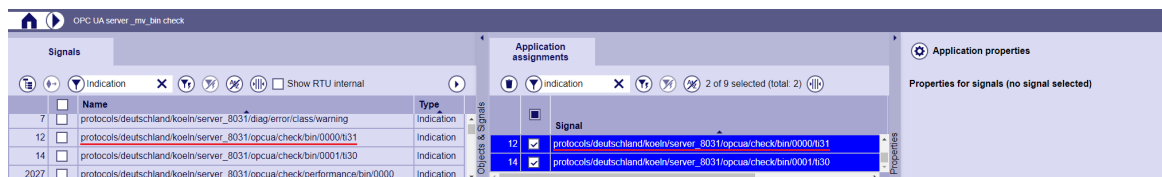
OPC UA NodeId identifier = protocols.deutschland.koeln.server_8031.opcua.check.bin.0000.ti31

Signals as a tree:



[OPCUA00_Signale_Baum [GER] red, 1, en_US]

Signals as a list:



[OPCUA00_Signale_Liste [GER] red, 1, en_US]

Signal in OPC UA: ²⁰

Attribute	Value
▼ NodeId	ns=2;s=protocols.deutschland.koeln.server_8031.opcua.check.bin.0000.ti31
NamespaceIndex	2
IdentifierType	String
Identifier	protocols.deutschland.koeln.server_8031.opcua.check.bin.0000.ti31
NodeClass	Variable
BrowseName	2, "ti31"
DisplayName	"" "ti31"
Description	"AT", "SIEMENS"
WriteMask	0
UserWriteMask	0
RolePermissions	BadAttributeInvalid (0x80350000)
UserRolePermissions	BadAttributeInvalid (0x80350000)
AccessRestrictions	BadAttributeInvalid (0x80350000)
▼ Value	
SourceTimestamp	24.05.2023 18:32:49.760
SourcePicoseconds	0
ServerTimestamp	24.05.2023 18:32:49.762
ServerPicoseconds	0
StatusCode	Good (0x00000000)
Value	true
▼ DataType	Boolean
NamespaceIndex	0
IdentifierType	Numeric
Identifier	1 [Boolean]
ValueRank	-1 (Scalar)
ArrayDimensions	UInt32 Array[-1]
AccessLevel	CurrentRead
UserAccessLevel	CurrentRead
AccessLevelEx	BadAttributeInvalid (0x80350000)
MinimumSamplingInterval	0
Historizing	false

OPC UA status code

The quality identifier of the signals is transmitted by the application in the OPC UA status code.

Supported OPC UA status codes in the transmit direction (send signals):

IEC 60870-5-101/104 Quality Bit	SICAM 8 quality	OPC UA status code
NT .. Not Topical	NT .. Not Topical	Uncertain_LastUsableValue
IV .. Invalid	IV .. Invalid	Bad_DeviceFailure
OV .. Overflow	OV .. Overflow	Uncertain_EngineeringUnitsExceeded ²¹
SB .. Substitute	SB .. Substitute	Uncertain_SubstituteValue
BL .. Blocked	BL .. Blocked	Uncertain_LastUsableValue ²¹
		Good
—	—	Furthermore, the following status codes are supported by the open62541 OPC UA server protocol stack: See https://www.open62541.org/doc/1.0/statuscodes.html

Supported OPC UA status codes in the receive direction (receive signals):

IEC 60870-5-101/104 Quality Bit	SICAM 8 quality	OPC UA status code
NT .. Not Topical	NT .. Not Topical	Uncertain_LastUsableValue
IV .. Invalid	IV .. Invalid	Bad_DeviceFailure

²⁰ [NamespaceIndex=2] For your own signals the namespace is 2. Namespace 0 is reserved for the standard objects (see <http://opcfoundation.org/UA/>)

²¹ In case of messages (TI 31 .. Double-point information with time tag CP56Time2a): Indeterminate state (DIFF) is represented in OPC UA status code with **Uncertain_LastUsableValue**. Indeterminate state (DIFF) or faulty position (FAULT) is represented in OPC UA status code with **Uncertain_EngineeringUnitsExceeded**.

IEC 60870-5-101/104 Quality Bit	SICAM 8 quality	OPC UA status code
OV .. Overflow	OV .. Overflow	Uncertain_EngineeringUnitsEx- ceeded ²¹
SB .. Substitute	SB .. Substitute	Uncertain_SubstituteValue
		Good
IV .. Invalid	IV .. Invalid	22

3.9.2 Signals in Transmit Direction

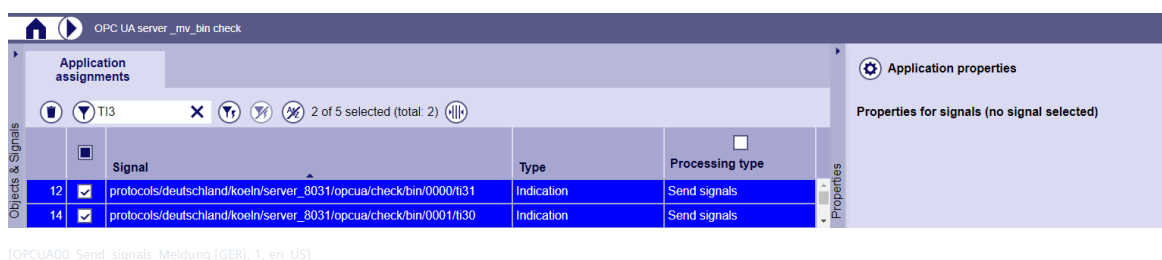
Signals in transmit direction: SICAM 8 OPC UA Server → OPC UA Client

IEC 60870-5-101/104 Type identification	SICAM 8 signal type (Type)	OPC UA Data Type Identifier
TI 30 .. Single-point information with time tag CP56Time2a	Message	Boolean
TI 31 .. Double-point information with time tag CP56Time2a	Message	Boolean
TI 33 .. Bitstring of 32 bits with time tag CP56Time2a	Bitstring of 32 bits Bit value	UInt32
TI 34 .. Measured value, normalized value with time tag CP56Time2a	Measured value	Float
TI 35 .. Measured value, scaled value with time tag CP56Time2a	Measured value	Float
TI 36 .. Measured value, floating-point number with time tag CP56Time2a	Measured value	Float

3.9.2.1 Indications

The parameterization of indications in transmit direction for OPC UA Server is done with the SICAM Device Manager in the application for OPC UA Server under **Objects & Signals - Application Assignments**.

Processing type: Send signals



Supported IEC 60870-5-101/104 type identification

IEC 60870-5-101/104 Type identification	SICAM 8 type	OPC UA data type
TI 30 .. Single-point information with time tag CP56Time2a	Indication	Boolean
TI 31 .. Double-point information with time tag CP56Time2a	Indication	Boolean

²² OPC UA status codes that are not supported are converted to IV (invalid) by the application for OPC UA Server. Status codes see <https://www.open62541.org/doc/1.0/statuscodes.html>

Objects & Signals Attribute	
Signal	SICAM 8 signal name (complete tree structure). See NodeID identifier for signals
Type	SICAM 8 type = Indication
Processing type	Send signals

Supported properties for signals

Property name	Description
Diff Text	will not be rated
Off Text	will not be rated
On Text	will not be rated
Fault Text	will not be rated
Alarm, if ...	will not be rated (not supported)
Description	will not be rated

OPC UA - Attribute for indication

Attribute	Value
NodeID	ns=2;s=protocols.deutschland.koeln.server_8031.opcua.check.bin.0001.ti30
NamespaceIndex	2
IdentifierType	String
Identifier	protocols.deutschland.koeln.server_8031.opcua.check.bin.0001.ti30
NodeClass	Variable
BrowseName	2, "ti30"
DisplayName	"" , "ti30"
Description	"AT", "SIEMENS"
WriteMask	0
UserWriteMask	0
RolePermissions	BadAttributeInvalid (0x80350000)
UserRolePermissions	BadAttributeInvalid (0x80350000)
AccessRestrictions	BadAttributeInvalid (0x80350000)
Value	
SourceTimestamp	24.05.2023 18:32:48.660
SourcePicoseconds	0
ServerTimestamp	24.05.2023 18:32:48.662
ServerPicoseconds	0
StatusCode	Good (0x00000000)
Value	false
DataType	Boolean
NamespaceIndex	0
IdentifierType	Numeric
Identifier	1 [Boolean]
ValueRank	-1 (Scalar)
ArrayDimensions	UInt32 Array[-1]
AccessLevel	CurrentRead
UserAccessLevel	CurrentRead
AccessLevelEx	BadAttributeInvalid (0x80350000)
MinimumSamplingInterval	0
Historizing	false

OPC UA Attribute ²³	Value	Note
NodeID		
• Identifier		SICAM 8 signal name (complete tree structure) See NodeID identifier for signals
Value		
• SourceTimeStamp		Signal acquisition time in format DD.MM.JJJJ hh:mm:ss.ms
• StatusCode		see quality identifier of the signals (OPC UA status)
• Value	true/false	Indication state: true = ON; false = OFF ²⁴
DataType	Boolean	

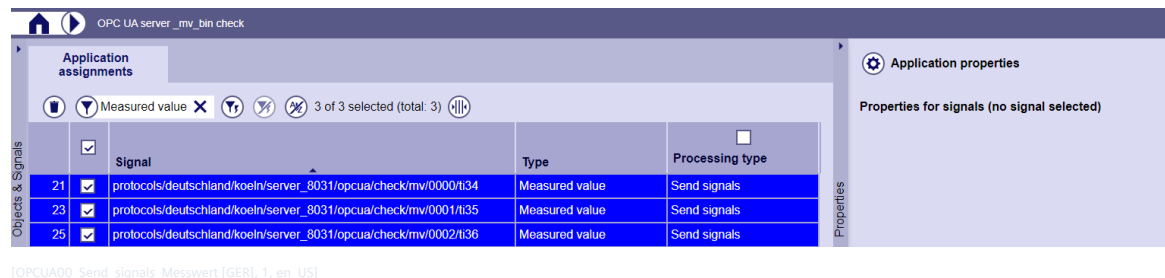
²³ Only the most important attributes are listed here. All attributes are documented under OPC UA attributes.

²⁴ In case of indications (TI 31 .. Double-point information with time tag CP56Time2a): · Indeterminate state (DIFF) is represented in OPC UA status code with **Uncertain_LastUsableValue**. · Indeterminate state (DIFF) or faulty position (FAULT) is represented in OPC UA status code with **Uncertain_EngineeringUnitsExceeded**. See quality identifier of the signals (OPC UA status Code).

3.9.2.2 Measured Values

The parameterization of measured values in transmit direction for OPC UA Server is done with the SICAM Device Manager in the application for OPC UA Server under **Objects & Signals - Application Assignments**.

Processing type: Send signals



Supported IEC 60870-5-101/104 type identification

IEC 60870-5-101/104 Type identification	SICAM 8 type	OPC UA data type
TI 34 .. Measured value, normalized value with time tag CP56Time2a	Measured value	Float
TI 35 .. Measured value, scaled value with time tag CP56Time2a	Measured value	Float
TI 36 .. Measured value, floating-point number with time tag CP56Time2a	Measured value	Float

Objects & Signals Attribute	
Signal	SICAM 8 signal name (complete tree structure). See NodeID identifier for signals
Type	SICAM 8 type = Measured value
Processing type	Send signals

Supported properties for signals

Property name	Description
Unit	will not be rated
X0%, X100%, Y0%, Y100%	will not be rated (not supported)
Accuracy	will not be rated (not supported)
Description	will not be rated

OPC UA attribute for measured value

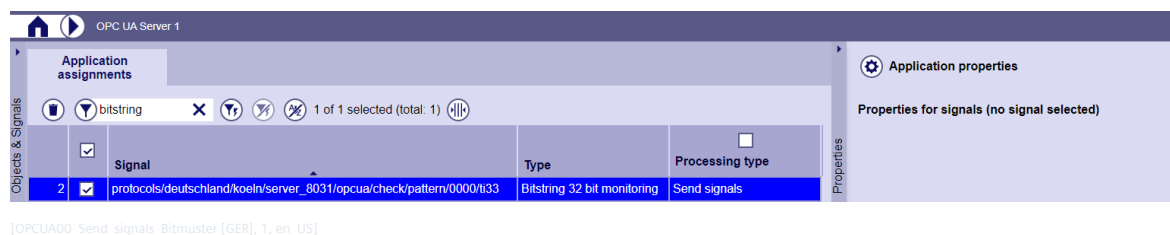
Attribute	Value
▼ NodeId	ns=2;s=protocols.deutschland.koeln.server_8031.opcua.check.mv.0002.ti36
NamespaceIndex	2
IdentifierType	String
Identifier	protocols.deutschland.koeln.server_8031.opcua.check.mv.0002.ti36
NodeClass	Variable
BrowseName	2, "ti36"
DisplayName	"", "ti36"
Description	"AT", "SIEMENS"
WriteMask	0
UserWriteMask	0
RolePermissions	BadAttributeValueInvalid (0x80350000)
UserRolePermissions	BadAttributeValueInvalid (0x80350000)
AccessRestrictions	BadAttributeValueInvalid (0x80350000)
▼ Value	
SourceTimeStamp	24.05.2023 18:33:44.060
SourcePicoseconds	0
ServerTimeStamp	24.05.2023 18:33:44.062
ServerPicoseconds	0
StatusCode	Good (0x00000000)
Value	-1.26542
▼ DataType	Float
NamespaceIndex	0
IdentifierType	Numeric
Identifier	10 [Float]
ValueRank	-1 (Scalar)
ArrayDimensions	UInt32 Array[-1]
AccessLevel	CurrentRead
UserAccessLevel	CurrentRead
AccessLevelEx	BadAttributeValueInvalid (0x80350000)
MinimumSamplingInterval	0
Historizing	false

OPC UA Attribute ²⁵	Value	Note
NodeId		
• Identifier		SICAM 8 signal name (complete tree structure) See NodeID identifier for signals
Value		
• SourceTimeStamp		Signal acquisition time in format DD.MM.JJJJ hh:mm:ss.ms
• StatusCode		see quality identifier of the signals (OPC UA status)
• Value		Measured value in format <FLOAT32> (IEEE Single Precision - 32 Bit - Floating Point Value) ²⁶
DataType	Float	

3.9.2.3 Bitstring of 32 Bits Value

The parameterization of bitstring of 32 bits value in transmit direction for OPC UA Server is done with the SICAM Device Manager in the application for OPC UA Server under **Objects & Signals - Application Assignments**.

Processing type: Send signals



²⁵ Only the most important attributes are listed here. All attributes are documented under OPC UA attributes.

²⁶ Value adjustment with the parameters X_0%, X_100%, Y_0%, Y_100% is currently not supported.

Supported IEC 60870-5-101/104 type identification

IEC 60870-5-101/104 Type identification	SICAM 8 type	OPC UA data type
TI 33 .. Bitstring of 32 bits with time tag CP56Time2a	Bitstring of 32 bits value	UInt32

Objects & Signals Attribute	
Signal	SICAM 8 signal name (complete tree structure). See NodeID identifier for signals
Type	SICAM 8 Type= Bitstring of 32 bits value
Processing type	Send signals

Supported properties for signals

Property name	Description
Description	will not be rated

OPC OPC attributes for bitstring of 32 bits value

Attribute	Value
▼ NodeId	ns=2;s=protocols.deutschland.koeln.server_8031.opcua.check.mv.0002.ti33
NamespaceIndex	2
IdentifierType	String
Identifier	protocols.deutschland.koeln.server_8031.opcua.check.mv.0002.ti33
NodeClass	Variable
BrowseName	2, "ti33"
DisplayName	""
Description	"AT", "SIEMENS"
▼ Value	
SourceTimeStamp	26.05.2023 07:52:20.185
SourcePicoSeconds	0
ServerTimeStamp	26.05.2023 07:52:20.189
ServerPicoSeconds	0
StatusCode	Good (0x00000000)
Value	405028992
▼ DataType	UInt32
NamespaceIndex	0
IdentifierType	Numeric
Identifier	7 [UInt32]
ValueRank	-1 (Scalar)
ArrayDimensions	UInt32 Array[-1]
AccessLevel	CurrentRead
UserAccessLevel	CurrentRead
AccessLevelEx	BadAttributeInvalid (0x80350000)
MinimumSamplingInterval	0
Historizing	false
WriteMask	0
UserWriteMask	0
RolePermissions	BadAttributeInvalid (0x80350000)
UserRolePermissions	BadAttributeInvalid (0x80350000)
AccessRestrictions	BadAttributeInvalid (0x80350000)

OPC UA Attribute ²⁷	Value	Note
NodeId		
• Identifier		SICAM 8 signal name (complete tree structure) See NodeID identifier for signals
Value		
• SourceTimeStamp		Signal acquisition time in format DD.MM.JJJJ hh:mm:ss.ms
• StatusCode		see quality identifier of the signals (OPC UA status)
• Value		Value in format <UInt32> (Integer value between 0 and 4 294 967 295 inclusive)
DataType	UInt32	

²⁷ Only the most important attributes are listed here. All attributes are documented under OPC UA attributes.

3.9.3 Signals in Receive Direction

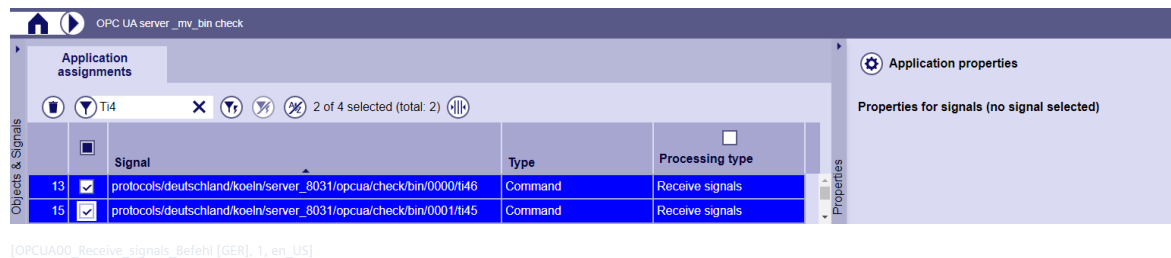
Signals in Receive Direction: SICAM 8 OPC UA Server ← OPC UA Client

IEC 60870-5-101/104 Type identification	SICAM 8 signal type (Type)	OPC UA data type
TI 45 .. Single command	Command	Boolean
TI 46 .. Double command	Command	Boolean
TI 48 .. Setpoint command, normalized value	Setpoint value	Float
TI 49 .. Setpoint command, scaled value	Setpoint value	Float
TI 50 .. Setpoint command, short floating-point number	Setpoint value	Float

3.9.3.1 Commands

The parameterization of commands in receive direction for OPC UA Server is done with the SICAM Device Manager in the application for OPC UA Server under **Objects & Signals - Application Assignments**.

Processing type: Receive signals



Supported IEC 60870-5-101/104 type identification

IEC 60870-5-101/104 Type identification	SICAM 8 type	OPC UA data type
TI 45 .. Single command	Command	Boolean
TI 46 .. Double command	Command	Boolean

Objects & Signals Attribute	
Signal	SICAM 8 signal name (complete tree structure). See NodeID identifier for signals
Type	SICAM 8 type = Command
Processing type	Receive signals

OPC UA - Attribute for command

Attribute	Value
NodeId	ns=2;s=protocols.deutschland.koeln.server_8031.opcua.check.bin.0001.ti45
NamespaceIndex	2
IdentifierType	String
Identifier	protocols.deutschland.koeln.server_8031.opcua.check.bin.0001.ti45
NodeClass	Variable
BrowseName	2, "ti45"
DisplayName	""
Description	"AT", "SIEMENS"
WriteMask	0
UserWriteMask	0
RolePermissions	BadAttributeValue (0x80350000)
UserRolePermissions	BadAttributeValue (0x80350000)
AccessRestrictions	BadAttributeValue (0x80350000)
Value	
SourceTimestamp	25.05.2023 08:42:02.288
SourcePicoSeconds	0
ServerTimestamp	25.05.2023 08:42:02.288
ServerPicoSeconds	0
StatusCode	Good (0x00000000)
Value	true
DataType	Boolean
NamespaceIndex	0
IdentifierType	Numeric
Identifier	1 [Boolean]
ValueRank	-1 (Scalar)
ArrayDimensions	UInt32 Array[-1]
AccessLevel	CurrentRead, CurrentWrite
UserAccessLevel	CurrentRead, CurrentWrite
AccessLevelEx	BadAttributeValue (0x80350000)
MinimumSamplingInterval	0
Historizing	false

OPC UA Attribute ²⁸	Value	Note
NodeId		
• Identifier		SICAM 8 signal name (complete tree structure) See NodeID identifier for signals
Value		
• SourceTimeStamp		Signal acquisition time in format DD.MM.JJJJ hh:mm:ss.ms
• StatusCode		See supported OPC UA status codes (quality identifier of the signals)
• Value	true/false	Command state: true = ON; false = OFF
DataType	Boolean	

Conversion of the commands to SICAM 8 format

SICAM 8	Description
Type	= Command
Value	Command status = ON if OPC UA attribute "Value" = True Command status = OFF if OPC UA attribute "Value" = False
Time Stamp	= OPC UA attribute "SourceTimeStamp"
Cause Of Transmission	= activation (ACT) ²⁹
Quality	See supported OPC UA status codes (quality identifier of the signals) in receive direction.
Add Info	not supported
Originator	not supported
Session-ID	

²⁸ Only the most important attributes are listed here. All attributes are documented under OPC UA attributes.

²⁹ Other causes of transmission are not supported.

Supported properties for signals

Property name	Description
Off Text	will not be rated
On Text	will not be rated
QOC	Only "no additional definition" is supported
Selection before execution	"Only execution" is supported
Timeout confirmation for selection	will not be rated (not supported)
Timeout confirmation for execution	will not be rated (not supported)
Timeout termination	will not be rated (not supported)
Description	will not be rated

3.9.3.2 Setpoint Values

The parameterization of setpoint values in receive direction for OPC UA Server is done with the SICAM Device Manager in the application for OPC UA Server under **Objects & Signals - Application Assignments**.

Processing type: Receive signals

The screenshot shows the 'Application assignments' window in the SICAM Device Manager. The window has a title bar 'OPC UA server_mv_bin check'. Below the title bar, there is a search bar with 'Setpoint' entered and a filter icon. A table lists three selected signals (3 of 3 selected). The table has columns for 'Signal', 'Type', and 'Processing type'. The signals are all 'Setpoint command' type and 'Receive signals' processing type. The right pane shows 'Application properties' with the text 'Properties for signals (no signal selected)'. The bottom status bar indicates the language is German.

Signal	Type	Processing type
22 protocols/deutschland/koeln/server_8031/opcu/check/mv/0000/i48	Setpoint command	Receive signals
24 protocols/deutschland/koeln/server_8031/opcu/check/mv/0001/i49	Setpoint command	Receive signals
26 protocols/deutschland/koeln/server_8031/opcu/check/mv/0002/i50	Setpoint command	Receive signals

[OPCU400_Receive_signals_Sollwert [GER], 1, en_US]

Supported IEC 60870-5-101/104 type identification

IEC 60870-5-101/104 Type identification	SICAM 8 type	OPC UA data type
TI 48 .. Setpoint command, normalized value	Setpoint value	Float
TI 49 .. Setpoint command, scaled value	Setpoint value	Float
TI 50 .. Setpoint command, short floating-point number	Setpoint value	Float

Objects & Signals Attribute	
Signal	SICAM 8 signal name (complete tree structure). See NodeID identifier for signals
Type	SICAM 8 type = Setpoint value
Processing type	Receive signals

OPC UA attribute for setpoint value

Attribute	Value
NodeId	ns=2;s=protocols.deutschland.koeln.server_8031.opcua.check.mv.0002.ti50
NamespaceIndex	2
IdentifierType	String
Identifier	protocols.deutschland.koeln.server_8031.opcua.check.mv.0002.ti50
NodeClass	Variable
BrowseName	2, "ti50"
DisplayName	""
Description	"AT", "SIEMENS"
WriteMask	0
UserWriteMask	0
RolePermissions	BadAttributeValue (0x80350000)
UserRolePermissions	BadAttributeValue (0x80350000)
AccessRestrictions	BadAttributeValue (0x80350000)
Value	
SourceTimestamp	25.05.2023 08:43:02.302
SourcePicoSeconds	0
ServerTimestamp	25.05.2023 08:43:02.302
ServerPicoSeconds	0
StatusCode	Good (0x00000000)
Value	0.585833
DataType	Float
NamespaceIndex	0
IdentifierType	Numeric
Identifier	10 [Float]
ValueRank	-1 (Scalar)
ArrayDimensions	UInt32 Array[-1]
AccessLevel	CurrentRead, CurrentWrite
UserAccessLevel	CurrentRead, CurrentWrite
AccessLevelEx	BadAttributeValue (0x80350000)
MinimumSamplingInterval	0
Historizing	false

OPC UA Attribute ³⁰	Value	Note
NodeId		
• Identifier		SICAM 8 signal name (complete tree structure) See NodeID identifier for signals
Value		
• SourceTimeStamp		Signal acquisition time in format DD.MM.JJJJ hh:mm:ss.ms
• StatusCode		see quality identifier of the signals (OPC UA status)
• Value		Measured value in format <FLOAT32> (IEEE Single Precision - 32 Bit - Floating Point Value)
DataType	Float	

Conversion of the setpoint values to SICAM 8 format

SICAM 8	Description
Type	= Setpoint value
Value	= OPC UA attribute „Value“ ³¹
Time Stamp	= OPC UA attribute „SourceTimeStamp“
Cause Of Transmission	= activation (ACT) ³²
Quality	See supported OPC UA status codes (quality identifier of the signals) in receive direction.
Add Info	not supported
Originator	not supported
Session-ID	

³⁰ Only the most important attributes are listed here. All attributes are documented under OPC UA attributes.

³¹ Value adjustment with the parameters X_0%, X_100%, Y_0%, Y_100% is currently not supported.

³² Other causes of transmission are not supported.

Supported properties for signals

Property name	Description
Unit	will not be rated
Selection before execution	"Only execution" is supported
Timeout confirmation for selection	will not be rated (not supported)
Timeout confirmation for execution	will not be rated (not supported)
Timeout termination	will not be rated (not supported)
X0%, X100%, Y0%, Y100%	is supported
Accuracy	will not be rated (not supported)
Description	will not be rated

3.10 Interoperability

3.10.1 SICAM 8 – OPC UA Server Features (General)

Name	Value	Description
Max. number of connected clients	100	The server supports up to 100 clients per application. The Server does not verify the IP address of client based on white list.
Used OPC UA Protocol Stack	open62541 v1.3.5	https://www.open62541.org/
Supported OPC UA Standard	v1.04	
Supported OPC UA Profiles	Micro Embedded Device 2017 Server Profile	

3.10.2 SICAM 8 – OPC UA Features

Function	OPCUA00
Function Server Information	
• Product Name	SICAM 8
• Product Version	
• OPC Compliant	✓
• Server Ready to Test	✓
• Machine Name	
• Operating System	Linux
• OS Service Pack	
• Supported Interfaces Interface Client-Server Pattern for UA	✓
• Supported Interfaces ServerProgID / URL	
Supported Security Policy³³	
• Basic256Sha256	✓
• Aes128_Sha256_RsaOaep	✓
• Aes128_Sha256_RsaPss	–
• None	✓
• Basic128Rsa15 ³⁴	✓
• Basic256 ³⁴	✓
Supported Transports	
HTTPS - UA Binary	–
HTTPS - UA XML	–
UA TCP - UA Binary	✓
Transport Security (HTTPS)	
• TLS 1.2	–
• TLS 1.2 with PFS	–

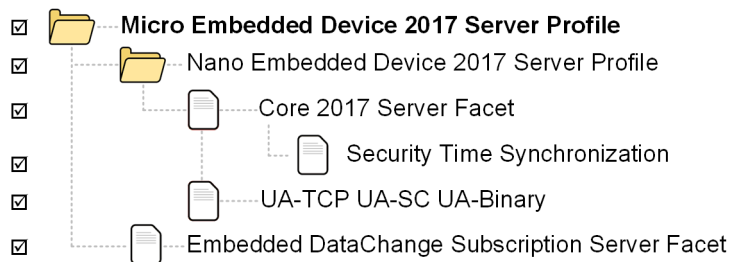
³³ For certificate management see manual **SICAM 8 - Core Functions & Hardware**, section **Certificate Management**.

³⁴ outdated

Function	OPCUA00
User Authentication	
• User Name - Password	–
• X509 Certificate	–
Supported Profiles	
Standard UA Client	–
Standard UA Server	–
Embedded UA Server	–
Micro Embedded Device Server	✓
Nano Embedded Device Server	✓
Global Discovery Server Profile [deprecated]	–
Global Discovery Server 2017	–
Global Discovery and Certification Management Server [deprecated]	–
Global Discovery and Certification Management 2017	–
Global Certification Management Client Profile	–
Global Certification Management Client 2017	–
Supported Facets	
Entry-Level-Support 2015 Client	–
Data Access	✓
Methods	–
Node Management	–
Auditing	–
DataChange Subscription	✓
Event Subscription	–
Client Redundancy	–
Complex Types	–
Enhanced DataChange Subscription	✓
Redundancy Transparent	–
Redundancy Visible	–
Embedded DataChange Subscription	✓
Supported Companion Standards	
OPC UA for Devices (DI)	–
Analyzer Devices (ADI)	–
61131-3 Information Model for OPC UA (PLOpen)	–
Client Function Blocks (PLCopen)	–
AutoID Device (e.g. RFID, Barcode Reader)	–
Field Device Integration – FDI	–
FDI Communication Server	–
Enterprise-Controlsystem Integration Model - ISA 95	–
CNC Model (VDW)	–
MDIS – Oil and Gas	–

Function	OPCUA0 0
Supported A&C Facets	
A&C Simple	–
Address Space Instances	–
Enable / Disable	–
Alarm Type Support	–
Acknowledgement Support	–
Exclusive Alarm Types	–
Non-Exclusive Alarm Types	–
Support of Previous Alarm Instances	–
Dialog Condition Types	–
A&E Wrapper Facet	–
Supported HA Facets	
Historical Read Raw Data	–
Enhanced Historical Support (5 cont. Points, serverTimestamp)	–
Supported GDS Facets	
Global Service Authorization Request Server Facet	–
Global Service KeyCredential Pull Facet	–
Global Service KeyCredential Push Facet	–
GDS AliasName Server Facet	–

3.10.3 Supported OPC UA Profiles



[Micro Embedded Device 2017 Server Profile, 1, --, --]

Name	Included Conformance Units		Description
	Is Optional	Is Supported	
Application Profile: "Micro Embedded Device 2017 Server Profile" Session Services			
Session Minimum 2 Parallel	☐	☒	Support minimum 2 parallel Sessions (total for all Clients).

Name	Included Conformance Units		Description
	Is Optional	Is Supported	
Included Profile: “Nano Embedded Device 2017 Server Profile” Base Information			
Base Info Custom Type System	☒	☐	The Server supports custom types (i.e. types that are derived from well-known ObjectTypes, VariableTypes, ReferenceTypes or DataTypes). Supporting this ConformanceUnit requires that the custom types with their full inheritance tree are exposed in the AddressSpace.
Base Info Diagnostics	☒	☐	The Server supports the collection of diagnostic information. The Server supports the collection of diagnostic information. The EnabledFlag in the ServerDiagnostics Object can be set TRUE and in that case all static and dynamic Objects and Variables for diagnostic data as defined in UA Part 5 are supported.
Included Profile: “Core 2017 Server Facet” Address Space Model			
Address Space Atomicity	☐	☒	Support setting the NonatomicRead and NonatomicWrite flags in the AccessLevelEx Attribute for Variable Nodes to indicate whether Read or Write operations can be performed in atomic manner. If the flags are set to '1', atomicity cannot be assured.
Address Space Base	☐	☒	Support the NodeClasses with their Attributes and References as defined in Part 3. This includes for instance: Object, ObjectType, Variable, VariableType, References and DataType.
Address Space Full Array Only	☐	☒	Support setting the WriteFullArrayOnly flag in the AccessLevelEx Attribute for Variable Nodes of non-scalar data types to indicate whether write operations for an array can be performed with an IndexRange.
Address Space AddIn DefaultInstanceBrowseName	☒	☐	Support the DefaultInstanceBrowseName Property for ObjectType.
Address Space AddIn Reference	☒	☐	Support the HasAddIn Reference to bind an AddIn to an Object or ObjectType.
Address Space Dictionary Entries	☒	☐	Support external dictionaries by relating OPC UA Nodes to dictionary entries using the HasDictionaryEntry ReferenceType.
Address Space Interfaces	☒	☐	Support Interfaces and associated rules.
Included Profile: “Core 2017 Server Facet” Base Information			
Base Info Core Structure	☐	☒	The Server supports the Server Object, ServerCapabilities and supports the OPC UA AddressSpace structure.
Base Info Currency	☒	☐	Support the Currency Property on Data-Variables that represent currency.

Name	Included Conformance Units		Description
	Is Optional	Is Supported	
Base Info Estimated Return Time	☒	☐	Server supports the EstimatedReturnTime Property. It indicates the time at which the Server is expected to have a Server-Status.State of RUNNING_0. Clients can use this information to govern the reconnect logic.
Base Info OptionSet	☒	☐	The Server supports the VariableType OptionSetType.
Base Info Placeholder Modelling Rules	☒	☐	The Server supports defining custom Object or Variables that include the use of OptionalPlaceholder or MandatoryPlaceholder modelling rules.
Base Info Selection List	☒	☐	The Server supports Variables of the SelectionListType VariableType.
Base Info Server Capabilities	☒	☐	The Server supports publishing of the Server limitation in the ServerCapabilities, including MaxArrayLength, MaxStringLength, MaxNodePerRead, MaxNodesPerWrite, MaxNodesPerSubscription and MaxNodesPerBrowse.
Base Info ValueAsText	☒	☐	The Server supports the Property ValueAsText for enumerated DataTypes.
Included Profile: “Core 2017 Server Facet” Base Services			
Session General Service Behaviour	☐	☒	Implement basic Service behaviour. This includes in particular: – checking the authentication token – returning the requestHandle in responses – respecting a timeoutHint
Base Services Diagnostics	☒	☐	The Server returns available diagnostic information as requested with the 'return-Diagnostics' parameter.
Included Profile: “Core 2017 Server Facet” Discovery Services			
Discovery Find Servers Self	☐	☒	Support the FindServers Service only for itself.
Discovery Get Endpoints	☐	☒	Support the GetEndpoints Service to obtain all Endpoints of the Server. This includes filtering based on Profiles.

Name	Included Conformance Units		Description
	Is Optional	Is Supported	
Included Profile: “Core 2017 Server Facet” Session Services			
Session Base	☐	☒	Support the Session Service Set (CreateSession, ActivateSession, CloseSession) except the use of ActivateSession to change the Session user. This includes correct handling of all parameters that are provided. Note that for the CreateSession and ActivateSession services, if the SecurityMode = None then: 1) The Application Certificate and Nonce are optional. 2) The signatures are null/empty. The details of this are described in Part 4.
Session Minimum 1	☐	☒	Support minimum 1 Session (total).
Session Change User	☒	☐	Support the use of ActivateSession to change the Session user.
Included Profile: “Core 2017 Server Facet” View Services			
View Basic	☐	☒	Support the View Service Set (Browse, BrowseNext).
View Minimum Continuation Point 01	☐	☒	Support minimum 1 continuation point per Session.
View RegisterNodes	☐	☒	Support the RegisterNodes and UnregisterNodes Services as a way to optimize access to repeatedly used Nodes in the Server's OPC UA AddressSpace.
View TranslateBrowsePath	☐	☒	Support TranslateBrowsePathsToNodeIds Service.
Included Profile: “Core 2017 Server Facet” Attribute Services			
Attribute Read	☐	☒	Supports the Read Service to read one or more Attributes of one or more Nodes. This includes support of the IndexRange parameter to read a single element or a range of elements when the Attribute value is an array.
Attribute Write Index	☒	☐	Supports the IndexRange to write a single element or a range of elements when the Attribute value is an array and partial updates is allowed for this array.
Attribute Write Values	☒	☐	Supports writing to values to one or more Attributes of one or more Nodes.
Included Profile: “Core 2017 Server Facet” Security General			
SecurityPolicy Support	☐	☒	Support at least one Security Policy. Support of SecurityPolicy None is recommended for testing and compatibility reasons even if the UA Server supports a more secure policy.

Name	Included Conformance Units		Description
	Is Optional	Is Supported	
Security Administration	☒	☒ ³⁵	Allow configuration of the following Security related items (when they apply). - select the allowed/used User identification policy or policies (e.g. User Name/Password or X509). - enable/disable or select the security policy "None" or other security policies. - enable/disable or select endpoints with MessageSecurityMode SIGN or SIGNANDENCRIPT. - set the permitted certification authorities. - define how to react to unknown Certificates. - allow accepting any valid Certificate
Security Role Server Authorization	☒	☐	Restrict access based on the configured Roles and permissions.
Included Profile: "User Token – User Name Password Server Facet" Security Token			
Security Invalid user token	☐	☒	Servers shall take proper measures to protect against attacks on user identity tokens. Such an attack is assumed if repeated connection attempts with invalid user identity tokens happen. See Activate-Session Service in UA Part 4.
Security User Name Password	☐	☒	The Server supports User Name/Password combination(s). The token will be encrypted if required by the security policy of the User Token Policy or by the security policy of the endpoint. An unencrypted token either requires message encryption or means outside the scope of OPC UA to secure the identity token so that it cannot be retrieved by sniffing the communication. One option would be a secure transport like a VPN.
Included Profile: "UA-TCP UA-SC UA-Binary Protocol and Encoding			
Protocol UA TCP	☐	☒	Support the UA TCP transport protocol defined in UA Part 6.
UA Binary Encoding	☐	☒	Support UA Binary Encoding. Values of these data types are encoded in compact binary formats, contiguously and without tagging. I.e. the receiver is assumed to understand the structure it is decoding.
UA Secure Conversation	☐	☒	Support UA Secure Conversation specified in UA Part 6.

³⁵ User Name/Password wird nicht unterstützt.

Name	Included Conformance Units		Description
	Is Optional	Is Supported	
Included Profile: “Embedded DataChange Subscription Server Facet” Subscription Services			
Subscription Basic	☐	☒	Support the following Subscription Services: CreateSubscription, ModifySubscription, DeleteSubscriptions, Publish, Republish and SetPublishingMode.
Subscription Minimum 1	☐	☒	Support at least 1 Subscription per Session. This number has to be supported for all of the minimum required sessions.
Subscription Publish Min 02	☐	☒	Support at least 2 Publish Service requests per Session. This number has to be supported for all of the minimum required sessions. Support of a NotificationMessage retransmission queue is not required; if not available the Republish Service returns Bad_MessageNotAvailable.
Subscription PublishRequest Queue Overflow	☐	☒	If the maximum supported number of PublishRequests has been queued and a new PublishRequest arrives, the "oldest" PublishRequest has to be discarded by returning the proper error.
Included Profile: “Embedded DataChange Subscription Server Facet” Monitored Item Services			
Monitor Basic	☐	☒	Support the following MonitoredItem Services: CreateMonitoredItems, ModifyMonitoredItems, DeleteMonitoredItems and SetMonitoringMode.
Monitor Items 2	☐	☒	Support at least 2 MonitoredItems per Subscription where the size of each MonitoredItem is at least equal to size of Double.
Monitor QueueSize_1	☐	☒	This ConformanceUnit does not require queuing when multiple value changes occur during a "publish period". I.e. the latest change will be sent in the Notification.
Monitor Value Change	☐	☒	Support creation of MonitoredItems for Attribute value changes. This includes support of the IndexRange to select a single element or a range of elements when the Attribute value is an array.