COPADATA
do it your way

zenon manual

Process Gateway

v.7.11

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1. Welcome to COPA-DATA help

GENERAL HELP

If you cannot find any information you require in this help chapter or can think of anything that you would like added, please send an email to documentation@copadata.com (mailto:documentation@copadata.com).

PROJECT SUPPORT

You can receive support for any real project you may have from our Support Team, who you can contact via email at support@copadata.com (mailto:support@copadata.com).

LICENSES AND MODULES

If you find that you need other modules or licenses, our staff will be happy to help you. Email sales@copadata.com (mailto:sales@copadata.com).

2. Process Gateway

The Process Gateway serves as a coupling to higher-level systems. Parts of the zenon process image of other applications can be made available and be updated.

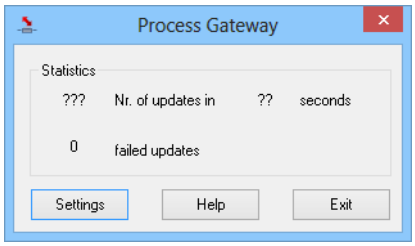
License information

Must be licensed for Editor and Runtime (single-user, Server, Standby and Client).

> **Information**
>
> *The Process Gateway user interface is only available in English.*

3. General

It is thought as an add-on to the Runtime of the control system and only works in combination with it.



Clicking on the **Settings** button opens the configuration dialog for the module selected in the INI file (on page 8).

4. Requirements

Runtime: On the computer on which the Process Gateway should run, the Runtime with the corresponding release version and a loaded project that corresponds to the configuration has to be started before it is started. If Runtime is stopped, the Process Gateway is also stopped automatically.

> **Information**
>
> *The Process Gateway uses the COM interface to access zenon data. The COM interface is used by VBA and is only available if* ***zenon6.ini*** *is present in the file under under* ***[VBA]*** *the entry EVENT=1.*

Modules: There are different modules for the Process Gateway, that take over the communication to external applications. At the moment these modules are:

File	Description	Connection to
AccessDEC.dll	Slave for DEC	Hundamp;S-DEC-System
AccessDNP3.dll	Slave for DNP3	DNP3 master
AccessICCP.dll	ICCP/TASE.2 protocol	ICCP Server
AccessIEC870S1.dll	Slave for IEC 60870-5-01/104	IEC 60870 master
AccessMODBUS.dll	Slave for Modbus	Modbus master
AccessOPCUA.dll	OPC US Server	OPC UA client
AccessSNMP.dll	SNMP agent	SNMP client
AccessSQL.dll	SQL Online-Interface	SQL databases

The module to be started is selected in the INI file (on page 8).

Attention

If the Modbus Slave driver is used, the Process Gateway only supports:

- Function Code 3: Read Multiple Registers
- Function Code 16: Write Multiple Registers

5. Installation

The add-on only consists of the **zenProcGateway.exe** file. It is preferable to copy this to the zenon installation folder. However it is possible to have any folder as the installation folder. The module to be used with the zenProcGateway has to be in the same folder as zenProcGateway.exe. Exception: SNMP (on page 137).

The configuration file zenProcGateway.ini is saved in the system folder. In this file, an entry DLL in the section [GENERAL] has to be set to the name of the module.

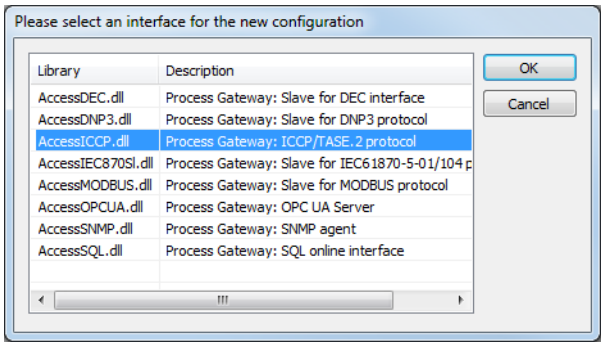
Module	Entry in `zenProcGateway.ini`
DEC	[GENERAL] DLL=AccessDEC.dll
SQL	[GENERAL] DLL=AccessDEC.dll
MODBUS	[GENERAL] DLL=AccessMODBUS.dll
DNP3	[GENERAL] DLL=AccessDNP3.dll
IEC870Sl	[GENERAL] DLL=AccessIEC870Sl.dll
SNMP:	[GENERAL] DLL=AccessSNMP.dll
OPCUA	[GENERAL] DLL=`AccessOPCUA.dll`
ICCP/TASE.2	[GENERAL] DLL=`AccessICCP.dll`

If a configuration file with a different name is to be used (e.g. for operation with multiple instances), you have to start `zenProcGateway.EXE` with the command line parameter /ini:<file> . That file must be in the system folder, too.

Example

```
zenProcGateway.EXE /ini:MyConfig.INI
```

If the gateway is started without a valid configuration file or if this file does not contain an entry about the communication module, you will be offered a selection list with all available communication modules after the start:



Select the desired module and click on OK

6. Configuration Process Gateway

6.1 Project configuration

If no special project name is defined in the configuration file (`zenProcGateway.ini`), all specifications refer to the first project loaded by the Runtime (integration project). Any project in the hierarchy of a multi project system can be accessed by setting the entry PROJECT in the section [GENERAL] of the configuration file (`zenProcGateway.ini`) to the corresponding project name.

6.2 Module configuration

The configuration of a single module depends on the type of this module. With the configuration button the configuration dialog of the module is opened.

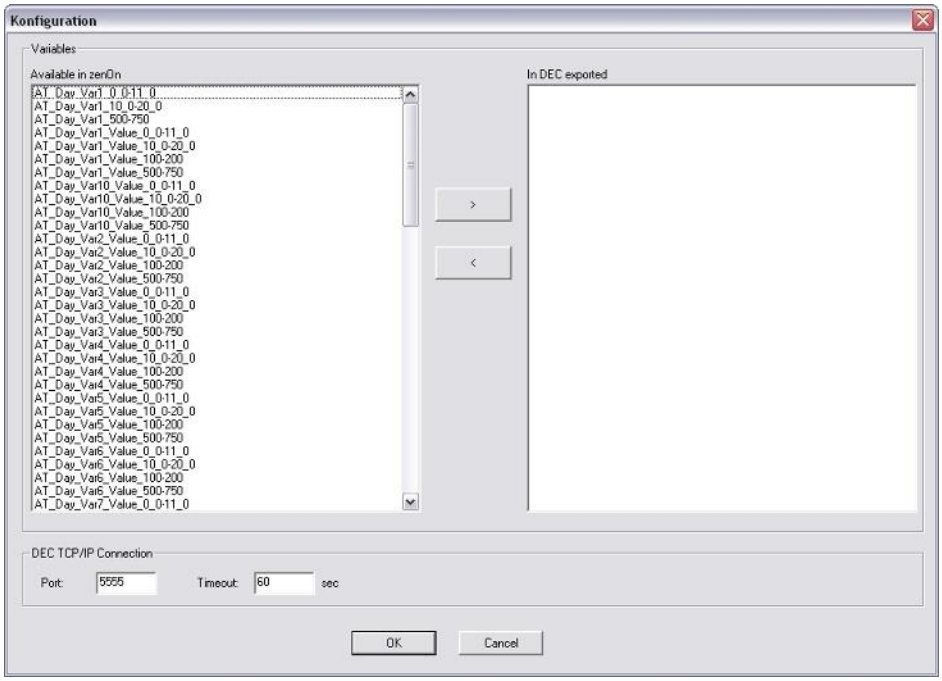
6.3 Security configuration

The Process Gateway can be executed hidden to protect it from unauthorized access. If the Process Gateway is started in the command line with the parameter /hide (or -hide), it starts invisible and cannot be configured or stopped. The Process Gateway closes automatically when zenon is closed.

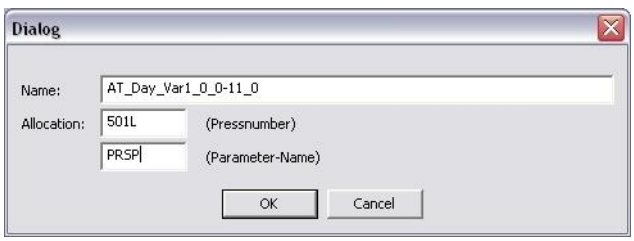
7. DEC

7.1 Module configuration

The following dialog appears after the **Settings** button is clicked:



Here the variables that should be connected can be selected. In the list on the left-hand side all variables which are available in zenon are displayed. These can be selected and moved to the DEC export list with the '>' button. With the button '<' they can be removed again. If a variable is moved to the export list, a dialog for the name assignment of the zenon variable to the DEC variable opens:



The assignment is defined with a four digit press number and the four digit parameter name. Entered characters are automatically changed to upper case. The variables selected in this way then are continuously synchronized in zenon or in the connected DEC system.

In the lower part of the configuration dialog the TCP/IP connection to the DEC system can be configured.

The port number indicates the port where the Process Gateway waits for incoming connections.

The timeout is the time without response, after that the connection is closed.

7.2 Logging

All telegrams received by the DEC system and the responds from the Process Gateway can be logged.

To do this an entry LOGFILE in the section [DEC] of the configuration file with the name of the log file has to exist. This file then is created in the same folder as `zenProcGateway.exe`.

Example for this entry:
`[DEC]`
LOGFILE=zenProcGateway.log

7.3 Configuration file: specific entries for AccessDEC

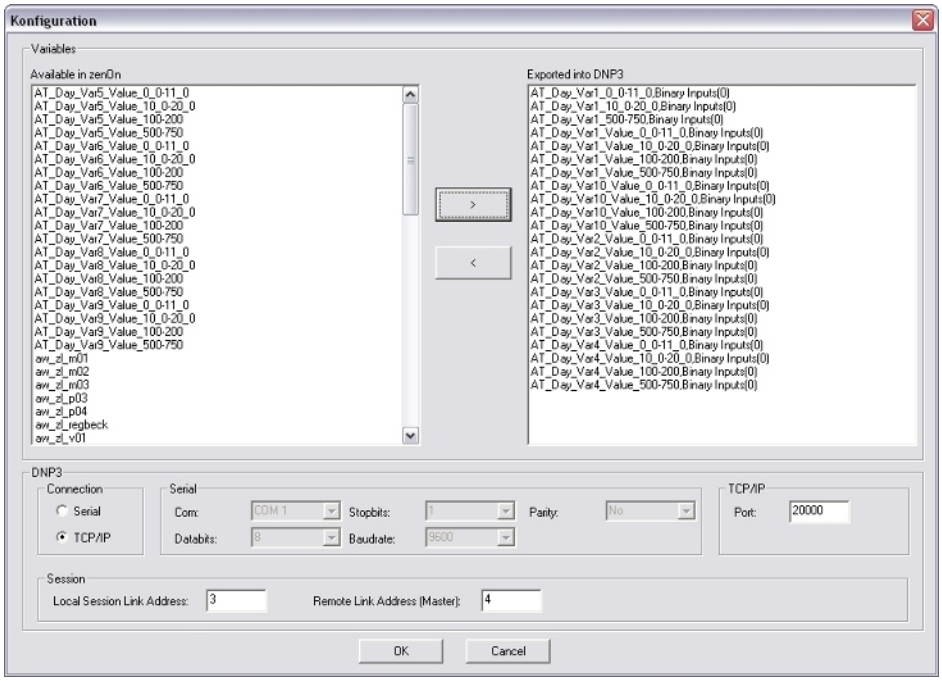
The configuration file must be in the system folder.

Parameters	Description
`[DEC]`	
`LOGFILE`	Name of the log file (if desired, e.g. zenProcGateway.log)
`PORT`	Port number, where the Process Gateway waits for connection attempts
`TCPTIMEOUT`	timeout interval, after which the connection is closed
`REFRESHRATE`	time interval in milliseconds, in which the process image of zenon is checked on changes.

8. DNP3 Slave

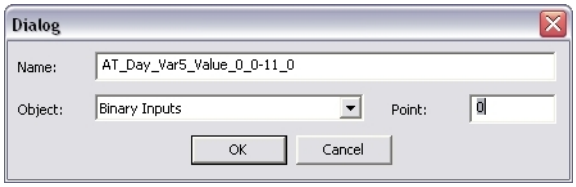
8.1 Module configuration

The following dialog appears after the **Settings** button is clicked:



Here the variables that should be connected can be selected. On the left-hand side all variables which are available in zenon are displayed. You can select them there and move them to the DNP3 export list with the button **>**. With the button **<** they can be removed again.

If a variable is moved to the export list, a dialog for the name assignment of the zenon variable to an object and point number in DNP3 opens:



The variables selected in this way then are available in the DNP3 slave and are continuously synchronized between zenon and the DNP3's object database.

In the lower part of the configuration dialog the serial or TCP/IP connection for the DNP3 slave can be configured.

The following settings are available for the configuration of the serial interface:

Parameters	Description
Com	the serial interface for the access to the DNP3 slave
Data bit	number of data bits (default: 8)
Stop bit	number of stop bits (default: 1)
Baud rate	baud rate of the serial interface (default: 9600)
Parity	parity setting even/odd/no (default: none)

For the configuration via TCP/IP only the listener-port can be defined; it should be 20000.

For the DNP3 session the local (slave's) session link address and the remote (master's) session link address must be configured. Only one active session is supported. It does not matter if serial or TCP/IP is used.

8.2 Logging

All diagnostic information of the DNP3 layer can be logged in a text file.

To enable this an entry LOGFILE in the section [DNP3] of the configuration file with the name of the log file has to exist. This file then is created in the same folder as `zenProcGateway.exe`.

Example for this entry:

```
[DNP3]
LOGFILE=zenProcGateway.log
```

8.3 Configuration file: specific entries for Access DNP3

The configuration file must be in the system folder.

Parameters	Description
[DNP3]	
SERIAL	serial communication (1) or communication via TCP/IP (0)
COMPORT	serial interface (COM1 = 0, COM2 = 1,...)
BAUD	baud rate of the serial interface
BYTESIZE	number of data bits of the serial interface
PARITY	Parity settings of the serial interface (0=no, 1=odd, 2=even)
STOPBITS	number of stop bits of the serial interface (0=1, 1=1.5, 2=2)
LINKADDRLOC	local session link address
LINKADDRREM	remote session link address
PORT	TCP/IP port

[VARIABLES]	
COUNT	number of variables to be exported
NAME_n	name of the variable with the number n (0<=<COUNT)
OBJECT_n	DNP3 object type of variable number n (0<=n<COUNT)
POINT_n	DNP3 point number of variable number n (0<=n<COUNT)

8.4 LATCH_ON and LATCH_OFF

Command Control Code from the PLC is written to USINT variables as an 8-bit value via Process Gateway. The following applies for transfer to zenon variables:

Destination variable of the command	Result
BOOL:	Set value LATCH_ON: 1 Set value LATCH_OFF: 0
USINT:	Set value corresponds to control code.
all other variables:	Command failed.

Only **direct control** is supported. **Select**, **SBO** and **Operate** are not supported.

Master, control mode direct	Process Gateway	Value zenon USINT
LATCH_ON	Binary Output Statuses	3
LATCH_OFF	Binary Output Statuses	4
Pulse On	Binary Output Statuses	1
Pulse Off	Binary Output Statuses	2
Trip	Binary Output Statuses	129
Close	Binary Output Statuses	65

For zenon binary output statuses BOOL, only LATCH_ON/LATCH_OFF is supported.

8.5 Device Profile

The template for the Device Profile is installed together with the DNP3 Process Gateway by the setup. You can find the file DNP3_ProcessGateway.xml in the following folder:

- %ProgramData%\COPA-DATA\zenon[Version]\CommunicationProfiles\Dnp3\ProcessGateway\

9. ICCP-TASE.2

The **IEC 60870-6 TASE.2 ICCP** protocol can be used with the **AccessICCP.dll** module via the zenon Process Gateway. ICCP-TASE.2 supports conformance blocks 1 and 2 as client and server. It acts in the same way as for establishing communication as a server.

PORT

Communication is effected via port 102 by default, or another port defined in the configuration file. The port is opened on startup and remains open. It allows the connection of clients. The maximum number can be defined in the configuration file.

CONFIGURATION OF INI FILE

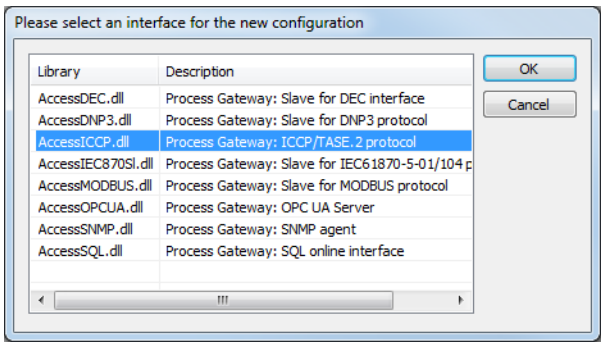
Path to the configuration file: `%CD_SYSTEM%\zenProcGateway.ini`.

Entry	Description
[ICCP]	Group
SERVER_PORT=	Number of the port. Default: 102
MAX_CONNECTIONS=	Maximum number of connections. 0: unlimited
MAJOR_VERSION_NUMBER=	Main version number.
MINOR_VERSION_NUMBER=	Minor version number.
BILATERAL_TABLE_ID=	Name of bilateral table.
LOCAL_DOMAIN_NAME=	Local domain name.
REMOTE_DOMAIN_NAME=Remote	Remote domain name.
[VARIABLES]	Group for configured variables. The following are listed: ▸ Parameters of each variable ▸ Number of variables ▸ Names of the variable
PARAM_0=1,0,0,Variable	Parameter for variable. The first is counted as 0 and the counter is increased by 1 with every further parameter. The identifier corresponds to the identifier of the variable name. **PARAM_0** corresponds to **NAME_0**.
COUNT=	Number of configured variables

`NAME_0=MyName`	Name of the variable. The first is counted as `0` and the counter is increased by `1` with every further variable. This identifier corresponds to the parameter identifier. **`PARAM_0`** corresponds to **`NAME_0`**.

9.1 Module configuration

The module must be configured when it is started for the first time.



Parameters	Description
`Library`	Shows the names of the DLL.
`Description`	Describes functionality.
`OK`	Accepts selection and starts configuration dialog.
`Cancel`	Cancels start of the Process Gateway.

FIRST START

To start the Process Gateway with the ICCP/TASE.2 module:

1. Start the Process Gates
   (no other module can be configured).
2. The dialog to select the module is opened
3. Select **`ICCP/TASE.2 protocol`**

4. click on **OK**
5. The dialog for configuring the module is opened
6. Configure the tabs
   - **General** (on page 22)
   - Server variables (on page 24)
   - Client variables (on page 27)

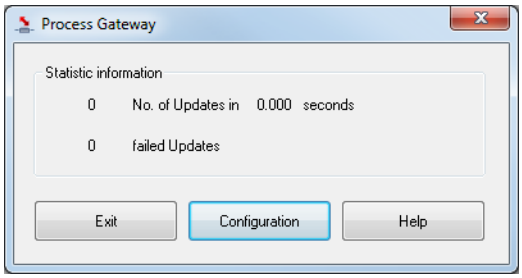
THE DIALOG TO SELECT THE MODULE IS NOT OFFERED

Starts the Process Gateway with another module that has already been configured without offering the dialog to select a module, then:

1. Close the Process Gateway
2. Navigate to the INI file
3. Add a comment for the module in the file or delete the INI file
4. Restart the Process Gateway

START WITH CONFIGURED MODULE

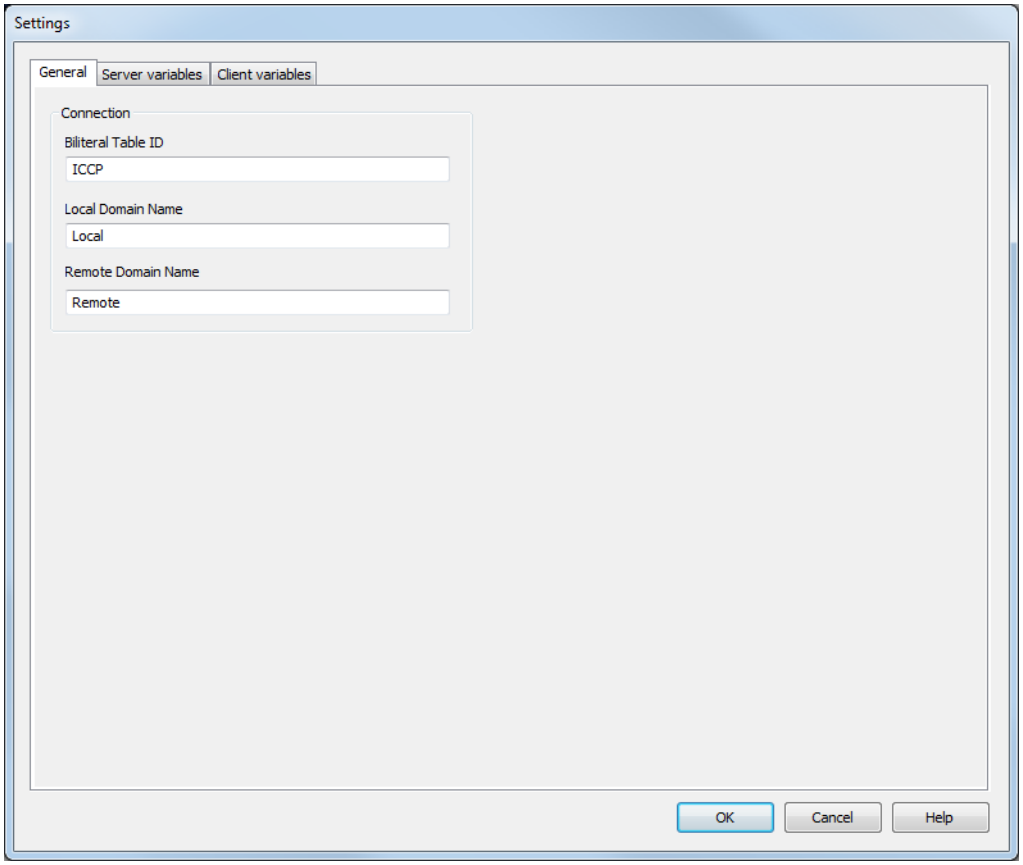
Start the Process Gateway with a module that has already been configured; a dialog with static data is opened.



Parameters	Description
Statistic information	Information on updates
Exit	Closes process gateway.
Configuration	Opens configuration dialog.
Help	Opens online help.

CONFIGURATION

Configuration is carried out using three tabs. It can be confirmed and closed by clicking on OK if all three tabs have been configured.



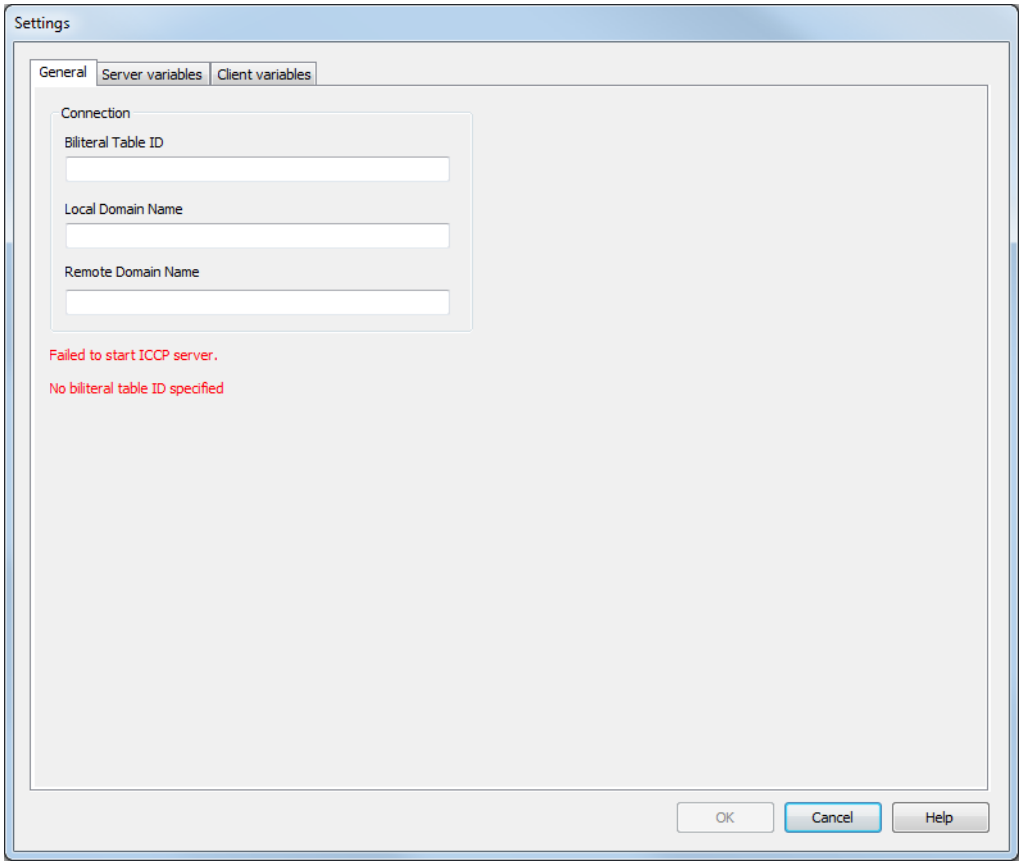
Parameters	Description
General (on page 22)	General settings.
Server variables (on page 24)	Configuration of the server variables.
Client variables (on page 27)	Configuration of the client variables.
OK	Accepts settings in all tabs and closes the dialog.
Cancel	Discards settings in all tabs and closes the dialog.
Help	Opens online help.

In both tabs for **server variables** (on page 24) and client variables (on page 27) the variables that are provided on the ICCP server or were read in via the ICCP server are selected.

If a connection to the server was made by a client, the verification of the bilateral table IDs is carried out. At the same time, a client connection to the counterpart is established and the variables to be communicated are registered as a dataset and spontaneous communication of the DSTransferSet is activated.

9.1.1 General

Configuration of the general settings.

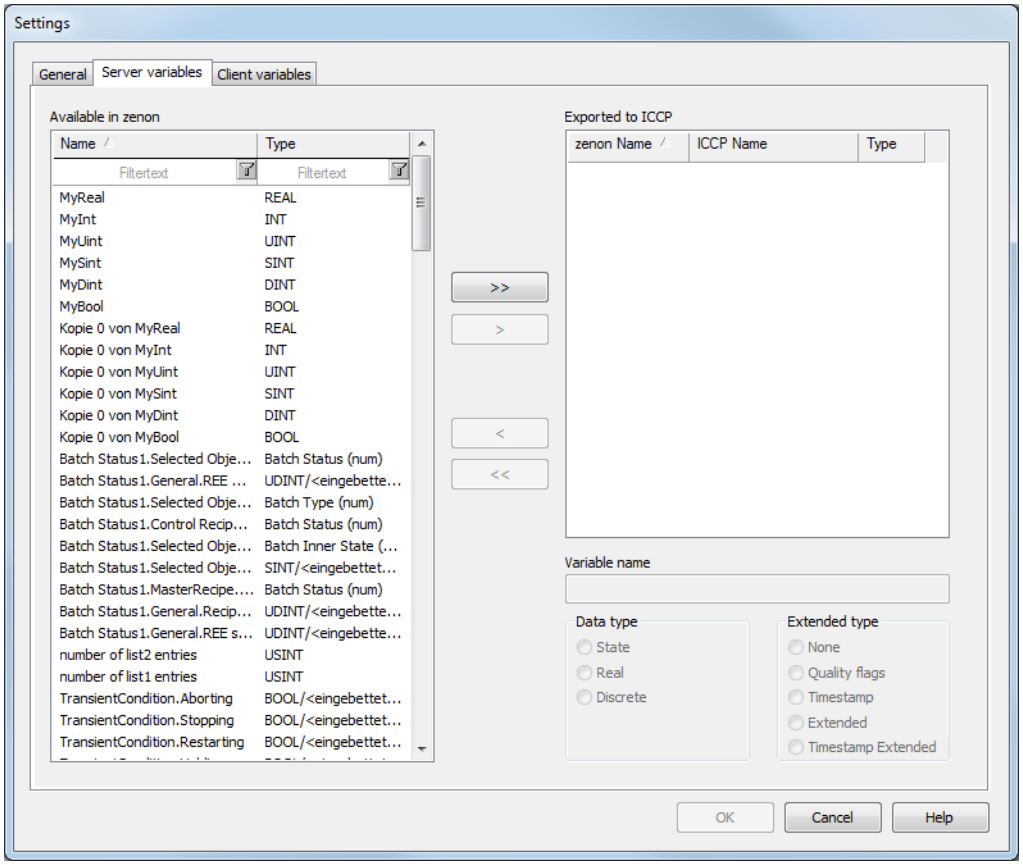


Parameters	Description
Connection	Connection settings.
Bilateral Table ID	The bilateral table ID is compared to the client by the server when the connection to the server is made and allows only authorized clients to have access to the data.
Local Domain Name	Name of the local domain that is used for all server variables.
Remote Domain Name	Name of the remote domain that is used for all client variables.
Error messages	Display of missing configuration data.
OK	Accepts the settings of all tabs, saves the configuration in the **zenProcGateway.ini** file, starts the ICCP server and waits for incoming connections.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

Note of bilateral table ID: The unique bilateral table ID must be the same on all devices that communicate with the ICCP gateway. It is queried when a connection is made by both partners. The connection is disconnected if they do not correspond. The domain names provide the names used at MMS protocol level to variables that are communicating. It must be set as the same mirror image for the partners.

9.1.2 Server variables

Selection and configuration of the variables that are provided on the ICCP client.

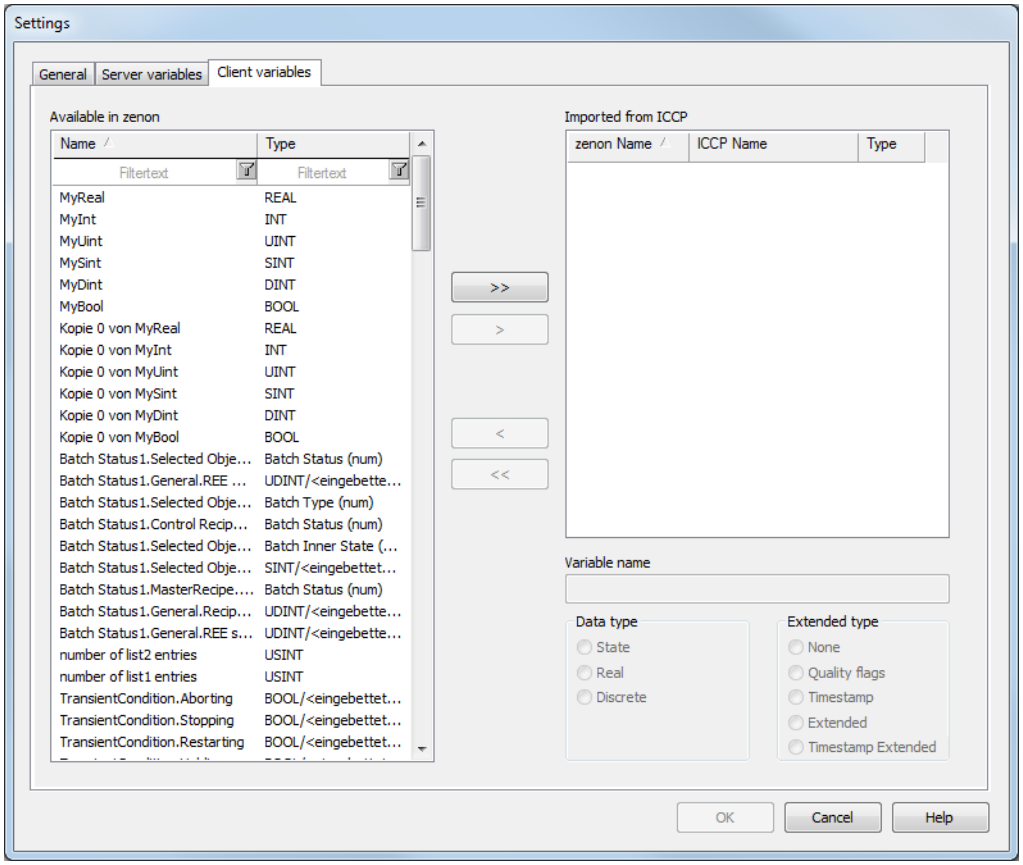


Parameters	Description
Available in zenon	List of the variables available in zenon.
Exported to ICCP	List of the variables exported to ICCP. Display: ▸ Name in zenon ▸ ICCP-Name ▸ Type ICCP name and type can be changed using the Variable name, Data type and Extended type options.
Cursor keys	Moving selected variables between the two lists. ▸ Key **>>**: Copies all variables from zenon to ICCP. ▸ Key **<<**: Removes all variables from the ICCP list. ▸ Key **>**: Copies selected variables from zenon to ICCP ▸ Key **<**: Removes selected variables from the ICCP list. Variables can also be added to the list for zenon by double clicking on the variable for the ICCP list.
Variable name	Allows renaming of the zenon variable names highlighted in the list for ICCP.
Data type	Selection of an ICCP data type for the variables selected in the list: ▸ State ▸ Real ▸ Discrete Standard display of zenon variables on ICCP: ▸ BOOL on State ▸ REAL on Real ▸ INT on Discrete Depending on the zenon variables on which they are based, data types can also not be available (grayed out).
Extended type	Selection of an ICCP variable addition for the variables selected in the list:

	▸ None: none ▸ Quality flags: Quality ▸ Timestamp: Quality + time stamp ▸ Extended: Quality + time stamp + change counter ▸ Timestamp Extended: Quality + extended timestamp Depending on the zenon variables on which they are based, data types can also not be available (grayed out).
OK	Accepts the settings of all tabs, saves the configuration in the **zenProcGateway.ini** file, starts the ICCP server and waits for incoming connections.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

9.1.3 Client variables

Selection and configuration of the variables that are provided on the ICCP client.



Parameters	Description
Available in zenon	List of the variables available in zenon.
Exported to ICCP	List of the variables exported to ICCP. Display: ▸ Name in zenon ▸ ICCP-Name ▸ Type ICCP name and type can be changed using the Variable name, Data type and Extended type options.
Cursor keys	Moving selected variables between the two lists. ▸ Key **>>**: Copies all variables from zenon to ICCP. ▸ Key **<<**: Removes all variables from the ICCP list. ▸ Key **>**: Copies selected variables from zenon to ICCP ▸ Key **<**: Removes selected variables from the ICCP list. Variables can also be added to the list for zenon by double clicking on the variable for the ICCP list.
Variable name	Allows renaming of the zenon variable names highlighted in the list for ICCP.
Data type	Selection of an ICCP data type for the variables selected in the list: ▸ State ▸ Real ▸ Discrete Standard display of zenon variables on ICCP: ▸ BOOL on State ▸ REAL on Real ▸ INT on Discrete Depending on the zenon variables on which they are based, data types can also not be available (grayed out).
Extended type	Selection of an ICCP variable addition for the variables selected in the list:

	▸ None: none ▸ Quality flags: Quality ▸ Timestamp: Quality + time stamp ▸ Extended: Quality + time stamp + change counter ▸ Timestamp Extended: Quality + extended timestamp Depending on the zenon variables on which they are based, data types can also not be available (grayed out).
OK	Accepts the settings of all tabs, saves the configuration in the **zenProcGateway.ini** file, starts the ICCP server and waits for incoming connections.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

10. IEC870 Slave

LANGUAGE

The driver and its dialogs for configuration are only available in English.

STRUCTURE

PLCs addressed with the IEC870SI driver, are divided into sectors. These sectors contain IOs (information objects) representing the actual variables. IOs refer to a variable of the process control system.

You can configure several PLCs with the IEC870SI driver. According to the used protocol, they are associated directly to a Master or polled by a Master.

IDENTIFICATION AND ADDRESSING

- 870-101: The PLC is identified by a link address.

- 870-104: The PLC is identified by the IP address of the Master.
- Sector: Addressed by COA.
- IO: Addressed by type identification and IOA.

In the following chapters, you will read how to configure the IEC870SI driver, how communication takes place and you will read about compatibility issues.

> **Information**
>
> *For variables that are configured in the IEC870 Process Gateway as command variables, each command is logged as* **`Send value`** *via the COM interface in the CEL if the* `Setting values with VBA` *property is active (*`Logging in CEL` *group).*

10.1 Module configuration

There are many settings you can change in the IEC870SI driver All lists in the configuration window can be sorted. To change the sorting sequence, simply click on the column title.

SETTINGS:

The settings for protocols 101 and 104 differ.

In the **`main window`**, you can choose the protocol you want to use and define general settings:

- (Protocol) 870-101 (on page 33)
  unlocks the settings for protocol 101 and locks all other input fields.
- (Protocol) 870-104 (on page 35)
  unlocks the settings for protocol 104 and locks all other input fields.

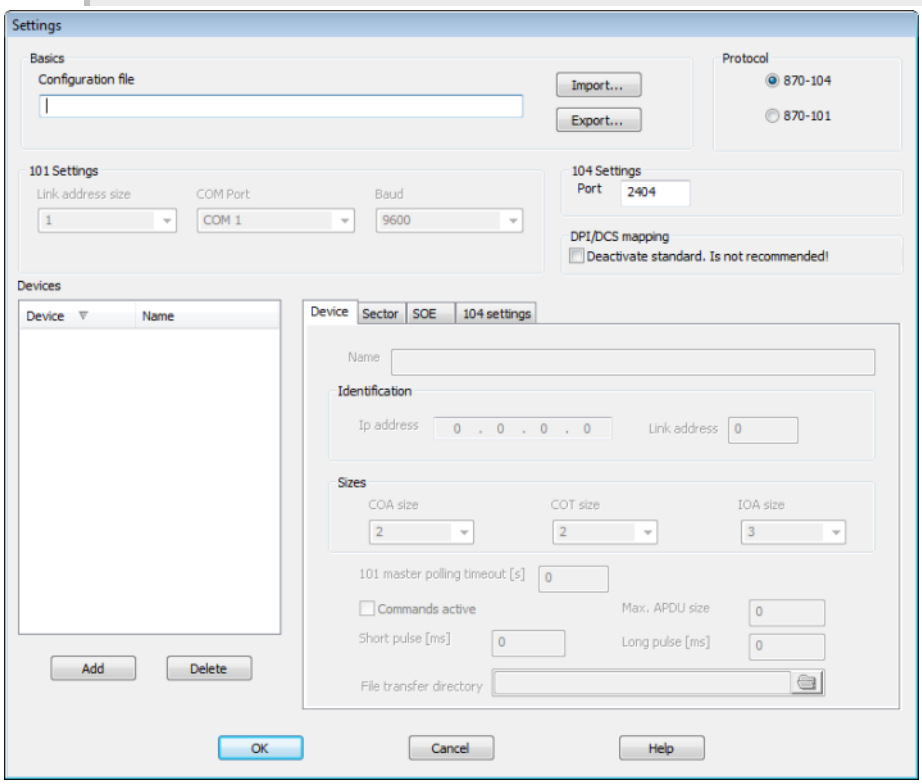
DEVICES

Devices are created and deleted in the **`Devices`** section of the main window. These devices are configured in the tabs.

The following device settings are available in Process Gateway for 870-101- and 870-104 protocols:

- **Device** (on page 45),
- **Sector** (on page 48)
- Sequence of Events SOE (on page 71) and
- **104 settings** (on page 63)

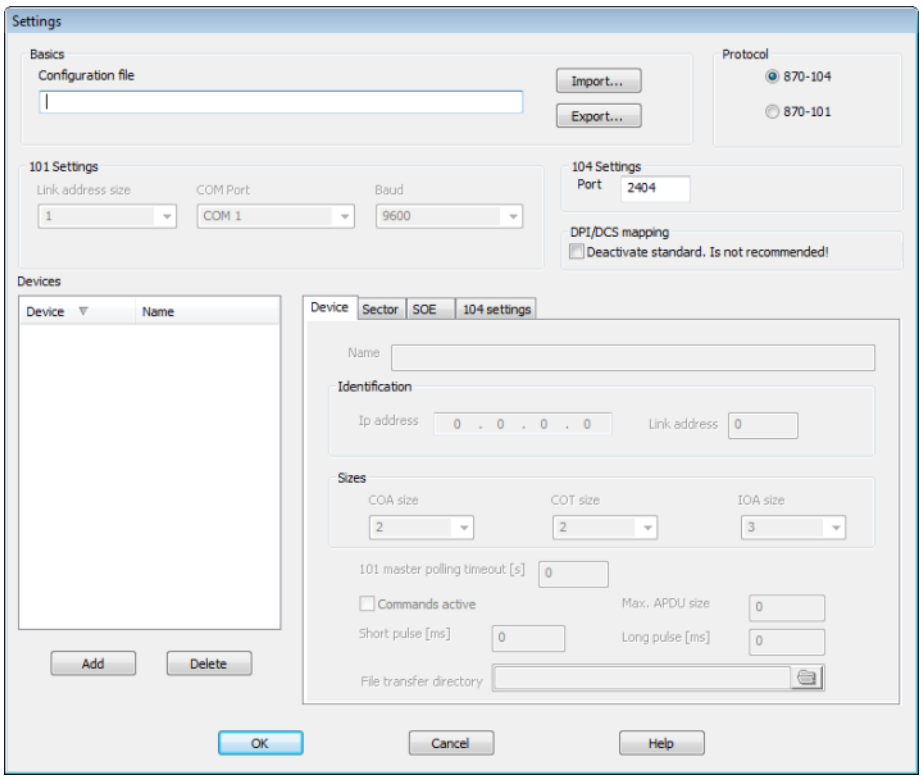
> **Information**
>
> *Only the general properties are documented in this section. You can find the protocol-dependent configurations in the section for the respective protocol or in the description of the respective device settings.*



Parameters	Description
Settings	
Configuration file	Name of the configuration file. This is where all active settings are stored and also loaded from. The name you enter must be a valid file name. Otherwise, no data can be stored. In this case, you will get an error message. Only enter the file name without path. You do not have to add the file extension XML, as it will be added automatically during saving. The current INI directory will be used as path. The file name will automatically be entered in the INI file of the process gateway as configuration. You can find the INI file in the system folder of the process control system. It is called 'SCADAProcGateway.ini' - SCADA is the placeholder for the name of the process control system.
Import...	Loads configuration data from an XML configuration file. The current settings are replaced by the ones stored in the file. The current setting for the 'configuration file' remains the same.
Export...	Stores the current settings in a file. Attention: Device that still have the default ID '????' (defined during creation) will not be exported. To export them, you must first configure the device in the configuration window "Device" (on page 45).
870-104	activates protocol 104, unlocks all input fields for 104 and locks settings for 101.
871-101	activates protocol 101, unlocks all input fields for 101 and locks settings for 104.
Deactivate standard DPI/DCS mapping and use internal mapping (not recommended).	Deactivates standard communication via DPI (Deep Packet Inspection) and DCS (Distributed Control System) and uses internal mapping for this. Default: Inactive Note: Not recommended!
Devices	List of configured devices.
Add	Adds a new device with standard settings. By default, it gets the invalid ID '????' and invalid IP/link addresses. Before you can use or export the device, you must configure it.
Delete	Deletes the selected device. This button is not active if no device has been selected.
Device	Tab for the configuration of the devices (on page 45)
Sector	Tab for the configuration of the sectors (on page 48)

SOE	Tab for the configuration of the sequence of events (on page 71)
104 settings	Tab for 870-104 protocol-specific configuration (on page 35) **Note:** Not active if 870-101 is selected as a protocol.
OK	Accepts all changed settings. They will immediately be stored in the current configuration file (as defined in 'Configuration file'). **Attention:** After clicking on 'OK', all active Master connections will be closed and restarted with the new settings. There may be communication errors during that.
Cancel	Discards all changed settings. Nothing is stored.
Help	Opens online help.

10.1.1 Settings for 870-101

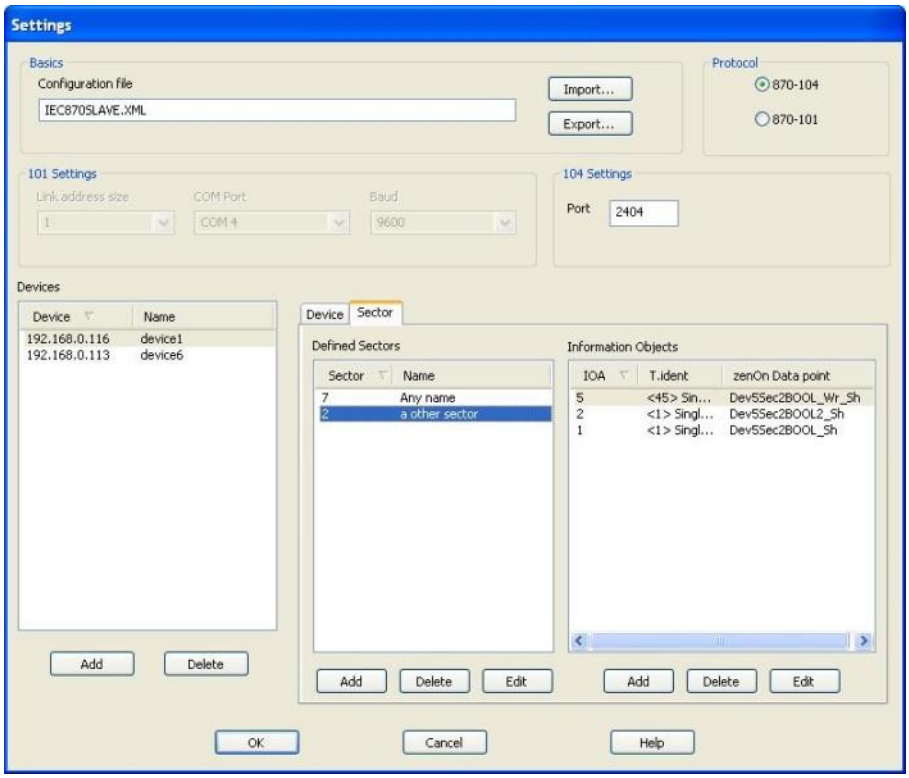


Information

Only the general properties of the 870-101 protocol are documented in this section. You can find further information in the general description of the respective device settings.

Parameters	Description
Settings	
870-104	activates protocol 104, unlocks all input fields for 104 and locks settings for 101.
871-101	activates protocol 101, unlocks all input fields for 101 and locks settings for 104.
Port	Port for the communication to the end device. Default: 2404 **Note:** Inactive if 870-101 is selected as a protocol.
Deactivate standard DPI/DCS mapping and use internal mapping (not recommended).	Deactivates standard communication and uses internal mapping for this. Default: Inactive
Devices	List of configured devices.
Add	Adds a new device with standard settings. By default, it gets the invalid ID '????' and invalid IP/link addresses. Before you can use or export the device, you must configure it.
Delete	Deletes the selected device. This button is not active if no device has been selected.
OK	Accepts all changed settings. They will immediately be stored in the current configuration file (as defined in 'Configuration file'). **Attention:** After clicking on 'OK', all active Master connections will be closed and restarted with the new settings. There may be communication errors during that.
Cancel	Discards all changed settings. Nothing is stored.
Help	Opens online help.

10.1.2 Settings for 870-104



Information

Only the general properties of the 870-104 protocol are documented in this section. You can find further information in the general description of the respective device settings.

Parameters	Description
Protocol 870-104	activates protocol 104, unlocks all input fields for 104 and locks settings for 101.
Port	TCP port to which the Masters connect. Defined by the norm as 2404. Our drivers allow you to have several instances of the Process Gateway running at the same time. That is why you can change this port: Allowed port numbers: 1200 to 65535
Devices	List of configured devices.
Add	Adds a new device with standard settings. By default, it gets the invalid ID '????' and invalid IP/link addresses. Before you can use or export the device, you must configure it.
Delete	Deletes the selected device. This button is not active if no device has been selected.
OK	Accepts all changed settings. They will immediately be stored in the current configuration file (as defined in 'Configuration file'). **Attention:** After clicking on **OK**, all active Master connections will be closed and restarted with the new settings. There may be communication errors during that.
Cancel	Discards all changed settings. Nothing is stored.
Help	Opens online help.

XML-File

The configuration of the IEC870SI is stored in an XML file. You can import and export different configurations with the buttons **'Export'** and **'Import'** in the main window.

The active configuration is stored in the INI file, for example:
[IEC 870]
SETTINGS=IEC870SLAVE.XML

You can choose any name. The path is the same as in the INI file.

STRUCTURE OF THE XML FILE

The names of most fields intuitively indicate their meaning. The settings correspond to those that are permitted in the dialog.

The values and structure of the XML file are verified when the file is read. Erroneous entries trigger an error message that is also logged.

Attention

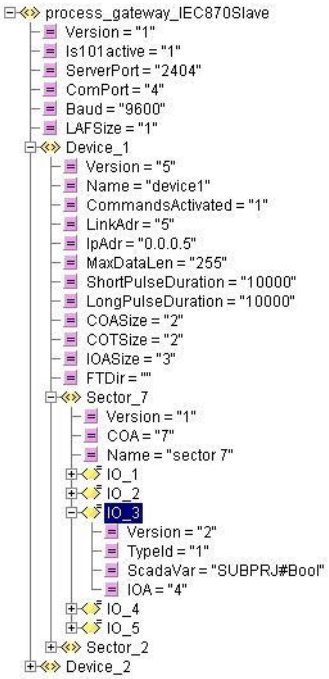
XML entries are case sensitive. Pay attention to use correct upper and lower cases.

Name	Property
process_gateway_IEC870Slave	The root node must have this name. Otherwise, the reading process will stop with an error.
VERSION	Contains the current version of attributes and nodes.
Device_x	Nodes for the device configuration. X is replaced by a consecutive number, starting with 1. This way of naming nodes is not obligatory. A device is created for every node.
LinkAdr	In protocol 101, the 'link address' is set here. It must be unique for all devices. For protocol 104, this entry has no meaning.
IpAdr	In protocol 104, the IP address of the Master is entered here. It must be unique for all devices. For protocol 101, this entry has no meaning.
Sector_x	Number of nodes per configured sector. X is replaced by the COA. This way of naming nodes is not obligatory. A sector is created for every node.
IO_x	Number of nodes per information object. X is replaced by a consecutive number, starting with 1. This way of naming nodes is not obligatory. An IO is created for every node.
ScadaVar	When the document is loaded, the existence of the specified variable in the project is verified. Variables without project reference are looked for in the default project. [ScadaProjectName#]ScadaVariableName. (Scada stands for the name of the process control system.)
TypeId	Type identification. When the document is loaded, the system will check if the type ID with the specified variable data type is possible.
COA	Common object address. Must be unique for every device per sector.
IOA	Information object address. In combination with the type ID, it must be unique per sector.
Is101active	With the value '1', the protocol 101 is activated, otherwise 104 will be active.
BSTime	Time for background scan Unit of measurement: ms. 0 deactivates the background scan.

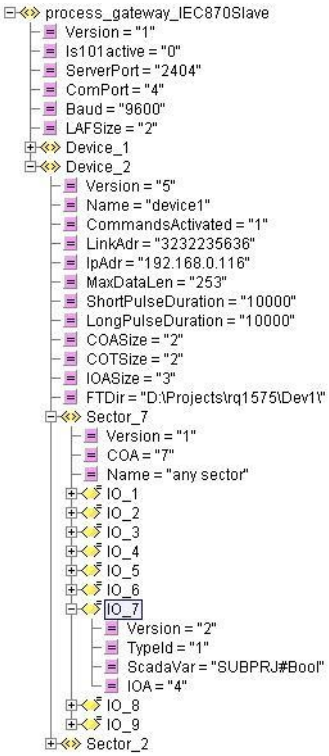
	Default: 0
CYTime	time for cyclical data transfer Unit of measurement: ms. 0 deactivates the cyclical transfer. Default: 0 Available in version 2 and above
KindOfTransfer	States the type of data transfer. 0: Spontaneous. Is also the default value. 1: backscan 2: Cyclic 3: off 4: Spontaneous transfer with buffering Default: 0 Available in version 3 and above
DeActDPIStd	DPI /DCS compliant (IEC60870 compliant) data transfer or internal control system format
Version	6: describes an XML file with the following fields for SOE support
EnableSOE	0 = inactive 1 = SOE active
MaxBufferedFilesSOE	Maximum number of buffered SOE files.
AutodeleteFilesSOE	0 = no Autodelete 1 = Autodelete if maximum file number reached
MaxEventsPerFileSOE	Maximum number of ASDUs per file
PostTrgToSOE	Post trigger timeout in [ms]
FileToSOE	File timeout in [ms]
Information Object setting for SOE support	Additional settings that must be made for SOE support at Information Object.
Version	4: describes an XML file with the following fields for SOE support

KindOfTransfer	Defines when an update triggers a transfer. 0: Spontaneous 1: Background scan 2: Periodic 3: no diffusing
TrgSOE	0 = inactive 1 = IO acts as trigger
EvDetectionSOE	determines when a change to an IO value or status can trigger a write in the SOE file. 0: SOE active 1: Saves all changes. 2: Raising edges 3: Falling edges 4: Raising and falling edges
HysteresisNegative	Value of the negative hysteresis
HysteresisPositive	Value of the positive hysteresis

Example configuration for protocol 101:



Example configuration for protocol 104:



Double Point Value Mapping

Double Point Value Mapping Is a standard function of the zenon Energy driver. It only influences zenon Runtime and has no influence on the driver communication with a device. Configuration is carried out in the driver settings in the **Basic Settings** tab.

The driver uses Double Point Value Mapping to convert values so that they are displayed in a user-friendly manner. However this only applies to HMIs.

DOUBLE POINT VALUES

The driver always communicates with one device with values for Double Points as defined in the Energy Standards with 2-bit information. That means:

Parameters	Double Point	Value	Meaning
Intermediate	00b	0	Switches are neither open nor closed, for example the end position has not yet been reached
Off	01b	1	Switch open
On	10b	2	Close switch/switch closed
Fault	11b	3	Errors

Double Points Are coded with 2-bits in the energy sector for historical reasons: The transmission of a telegram to a serial connection (RS232) with a series of values that only contain 0 was not safeguarded against transmission errors. In order to increase the certainty, it was decided in the first standards that the value for OFF is not to be sent as 0 but as 01b, which corresponds to decimal 1. These Double Point Values also precisely reflect the type of how two sensors record the physical position of a switch.

However, the values sent this way may be confusing for people:

- OFF = 1
- ON = 2

Humans are used to all other devices and systems:

- OFF = 0
- ON = 1

At the same time, single point values are also defined with OFF = 0 in the same standard.

Thus everybody who is involved must always be aware of the technical level on which they are acting and receiving and sending information. In stressful situations, this can very easily lead to serious mistakes. For example, if ON is sent instead of OFF.

In order to avoid this dangerous error, the zenon Energy driver offers its own Double Point Value Mapping.

MAPPING

With the Double Point Value Mapping, all Double Points in zenon have the following values:

- Intermediate = 2
- Off = 0
- On = 1
- Fault = 3

> **Information**
>
> This function can be deactivated in the driver settings. However some functions such as commands or ALC can no longer be used then.
>
> **Recommendation:** Do not use numerical elements and numerical values to display OFF/ON or OPEN/CLOSE. Use combined elements with graphic symbols or text elements instead.

TABLE DOUBLE POINT VALUES

The following is applicable to the Inactive setting of **Deactivate standard double point value mapping**:
The driver depicts the double point values for Runtime according to the zenon column (stVal : CODED ENUM in DPS and DPC Classes, IEC 61850-7-3).

Position	Position value decimal	position value Binary-string	Transferred Dbpos value (unmapped)	zenon (mapped)
intermediate state	0	00	0x00	2
off	1	01	0x40	0
on	2	10	0x80	1
bad state	3	11	0xC0	3

This means in Runtime (for example):

Parameters	mapped	unmapped
off	0	64
on	1	128

You can find further information in the chapter entitled: **Driver-specific functions**

10.1.3 Devices

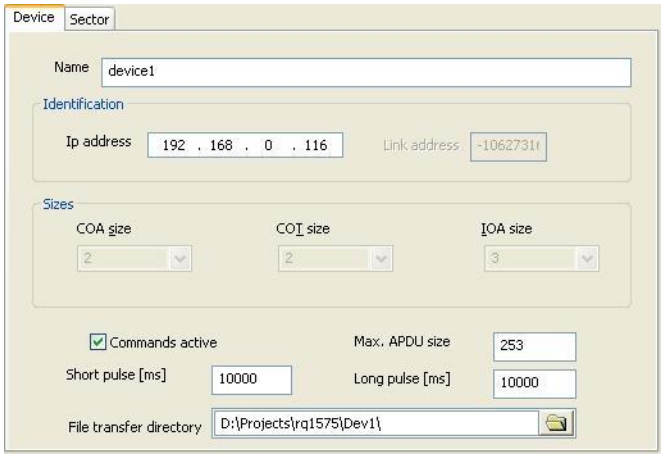
Parameters	Description
Device	ID of the device Default: ???
Name	Name of the device
Add	Adds a new device with standard settings. By default, it gets the invalid ID '????' and invalid IP/link addresses. Before you can use or export the device, you must configure it.
Delete	Deletes the selected device. This button is not active if no device has been selected.

Devices are created and deleted on the left-hand side of the dialog.

Clicking on the **Add** button adds a device, which is configured in the Device, Sector, SOE and 104settings tabs. Several devices can be created. A simple click on the respective device in the list opens the attendant configuration.

Device

In the part of the main window called '**Device**' you can define the settings of the device. Certain areas are grayed out depending on the protocol selected. A precise definition of which input fields are available for which protocol is in the list below.



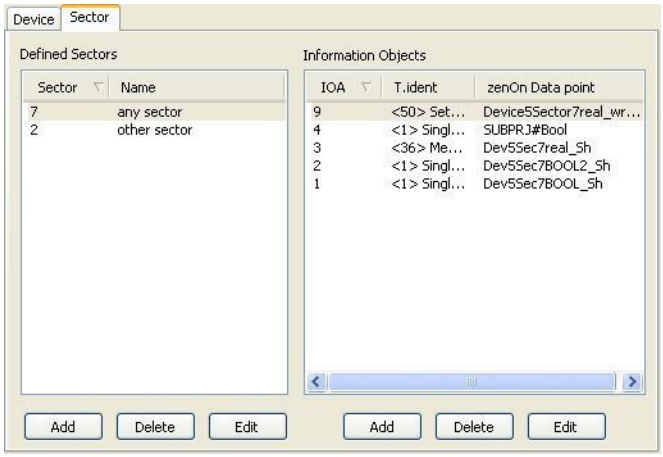
Parameters	Protocol	Description
Common Settings		
Name	101 104	Name of the device for easy identification
File transfer directory	101 104	Defines the directory for transfer of files and directories.
Short pulse	101 104	Defines the size of the pulse for the **Qualifier of Command** (on page 80) with the value 'short pulse duration' (QOC = 1) in milliseconds. Possible values: 0 to 4294967295 Default: 1000 ms **Note:** In the debug mode, there will also be a pulse for values greater than/equal to 10000, even with QOC = 0. This allows you to test the pulse generation with our IEC870 drivers.
Long pulse	101 104	Defines the size of the pulse for the **Qualifier of Command** (on page 80) with the value 'long pulse duration' (QOC = 2) in milliseconds. Possible values: 0 to 4294967295. Default: 2000 ms
Max APDU size	104	Maximum length of APDU data as defined in the standard 870-5-104 5. Possible values: between 25 and 253. Default: 253
Max. user data	101	Maximum length of user data as defined in TF1.2 870-5-2 3.2 . Possible values: between (19 + LAF size + COA size + COT size + IOA size) and (255). Default: 253
Commands active	101 104	This options allows you to activate write access. Process information in control direction are executed. If this options is deactivated, an entry in the error protocol is created. This setting can be individualized by means of a variable in zenon (IOA 2) (on page 81). Default: active

870-101 specific		
COA size	101	Defines the length of the COA (common object address). You can only change the COA size for 101. For 104, the value is automatically set to 2, in accordance with the standard. Selection of address size from drop-down list. Valid: ▸ 1 octet ▸ 2 octets Default: 2
COT size	101	Defines the length of the COT (cause of transmission). You can only change the COT size for 101. For 104, the value is fixed as 2, in accordance with the standard. Selection of address size from drop-down list. Valid: ▸ 1 octet ▸ 2 octets Default: 2
IOA size	101	Defines the length of the IOA (information object address). You can only change the IOA size for 101. For 104, the value is fixed as 3, in accordance with the standard. Selection of address size from drop-down list. Valid: ▸ 1 octet ▸ 2 octets ▸ 3 octets Default: 3
Link address	101	Link address Via the link address contained in the TF 1.2 frame, the master specifies the device that the command is intended for. With link addresses, a Master can communicate with multiple devices. The allowed range of the address depends on the setting 'links address size' in the main settings. Link address size = 1 allows a range of 0 to 254 Link address size = 2 allows a range of 0 to 65534 Default: −1 **Note:** The current value is lost if the protocol is changed.

Master polling timeout	101	Shows the time in seconds in which the master must execute a query to the slave. If there is no query within this time, the connection is ended. Default: 0 **Note:** 0 deactivates the monitoring.
870-104 specific		
IP-Address	104	IP address of the Master. This allows to identify the device that the Master communicates with. All IP addresses except 255.255.255.255 are allowed. **Note:** The current value is lost if the protocol is changed.

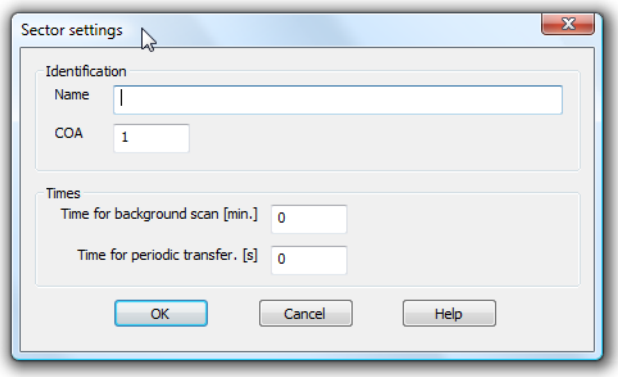
Sector

The **Sector** tab lists all sectors defined in the device. If you select a sector, its **Information Objects** (on page 52) (IOs) will be displayed.



Parameters	Description
Sectors	
New	Activates the dialog for creating a new sector (on page 49). You close this subsequent dialog and create a new sector by clicking on OK.
Edit	Activates the dialog for editing the selected sector. You can also launch the editor by double-clicking on the sector in the list. This button is inactive if no sector was selected.
Delete	Deletes the selected sector. This button is inactive if no sector was selected.
Information Objects	
New	Activates the dialog for creating new IOs (on page 52). This subsequent dialog is closed and a new IO is created by clicking on 'OK'. This button is inactive if no sector was selected.
Edit	Activates the dialog for editing the selected IO. You can also launch the editor by double-clicking on the IO in the list. This button is inactive if no IO was selected.
Delete	Deletes the selected information object. This button is inactive if no IO was selected.

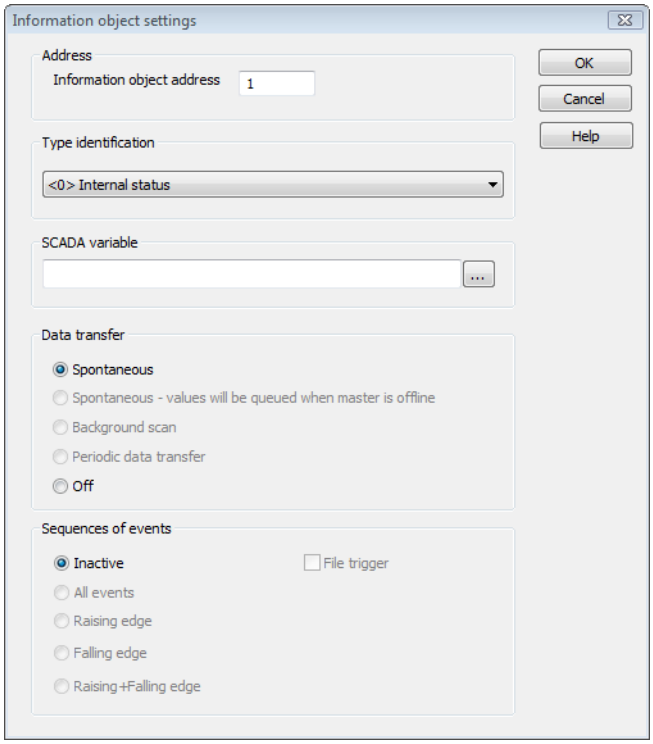
Sector Settings



Parameters	Description
Sector Settings	
Name	Any name. For easy identification of a sector.
COA	The COMMON ADDRESS OF ASDUs (IEC 60870-5-101 7.2.4) by which the sector is addressed. This number must be unique on the device side (1..254).
Time for Background scan [min]	Supports the requirements of IEC 60870 Norm Chapter 7.4.13 "Background Scan". The values are sent with COT = 2. Cycle time is stated in minutes. Values are transferred cyclically in the time grid set up for all IOs with the "Background Scan" option activated. Values are only transferred cyclically if no spontaneous value is transferred within the time set. If the value is "0", cyclical transfer of values is deactivated for this sector.
Time for periodic transfer [s]	Support of cyclical data transfer corresponding to the norm (IEC 60870-5-5 6.3). The values are sent with COT = 1. Cycle time is stated in seconds. Values are transferred cyclically for all IOs with the "Periodic data transfer" option activated. IOs are transferred cyclically and not spontaneously. If the value is "0", cyclical transfer of values is deactivated for this sector.
Select before execute	If active, a prior select is necessary for an execute.
SBE Timeout [s]	Timeout in seconds within which the select sequence must be ended and an execute must be carried out. Inactive if Select before execute is not active. Default: 30 s Input range: 1 to 65535
Transmission of integrated totals	Selection of the transfer mode (see IEC 60870-5-101 7.4.8) for the integrated totals - the IOs of type: ▸ 15 (M_IT_NA_1) ▸ 16 (M_IT_NA_1) ▸ 37 (M_IT_NA_1) No reset is supported. An FRZ with a reset triggers a warning. For modes A to D, IOs are requested immediately after connecting to the master of zenon/straton. Value changes to integrated totals IOs are administered in their

	own buffer. This can buffer the larger value of (IT IO number) * 4, or 2048 value changes.
With general interrogation	Integrated Totals are also transferred during a general interrogation (C_IC_NA_1).
Mode A: Local freeze with spontaneous transmission	Integrated totals are transferred when a value is changed.
Mode B: Local freeze with counter interrogation	Integrated totals are only transferred with a counter interrogation command (C_CI_NA_1). To do this, a maximum of five seconds is waited after the interrogation is activated until all ITs have been supplied with values. ITs without a value are transferred with an invalid qualifier. The value changes are buffered until the interrogation is completed (freeze active). All ITs thus transfer the value of the point in time, when the last IT was supplied with a value.
Mode C: freeze and transmit by counter interrogation Transmission of integrated totals commands	As with mode B.
Mode D: freeze by counter interrogation command, frozen values spontaneous	Transfer as with mode C, mode A is activated after conclusion of the interrogation.
OK	By pressing the button **OK**, you can check whether the COA is available in the device. If it is already in use you will receive an error message. If it is available, the setting is accepted and the dialog is closed.
Cancel	Discards all entries and closes the dialog.
Help	Opens online help.

Information Objects



Parameters	Description
Settings	
Information object address	Defines the address under which the IO is addressed (IEC 60870-5-101 7.2.5). In combination with the type ID (Type identifications), it must be unique for each sector. Default: 1
Type identification	Drop-down list with the supported Type identifications (IEC 60870-5-101 7.2.1). Default: <0> Internal status This setting is also called type ID. It also determines the variables of the process control system that can be associated to the IO based on their data type. **Note:** You can also find more detailed information on type ID in the chapters Assignment of data types (on page 57) and Interoperability (on page 90).
SCADA variable	Defines the variable from the process control system associated with the IO. Syntax: <Project name>#<variable name> define the project connection. Variables without project reference are looked for in the default project. While entering, the system checks if the specified variable exists in the according project and if it has a data type compatible with the type identification. The Button '. . .' opens the dialog for variable selection. Read more about this in the section 'Variable selection (on page 56)'. (Scada stands for the name of the process control system.)
Data transfer	Determines the type of data transfer for IOs Default: Spontaneous
Spontaneous	IO data transfer is spontaneous.
Background scan	IOs are transferred as a background scan in accordance with the IEC 60870 norm. A data point that does not receive a new spontaneous value within the set background scan time is automatically sent by the gateway after the time has expired. Values are only transferred if no spontaneous value has yet been transferred within the time set. The setting is inactive if the background scan is locked at the sector (Time=0) or if the type ID used does not support the background scan.

	M_SP_TA_1, M_SP_TB_1, M_DP_TA_1, M_DP_TB_1, M_ST_TA_1, M_ST_TB_1, M_ME_TA_1, M_ME_TB_1, M_ME_TC_1, M_ME_TD_1, M_ME_TE_1, M_ME_TF_1, M_BO_TB_1, M_BO_TA_1 For these type IDs, they are mapped to the corresponding TID without a time stamp when the background scan is sent. The setting is not available for any other type ID.
Periodic data transfer	Periodic data transfer in accordance with IEC 60870-5-5-6.3 norm. IOs are transferred cyclically and not spontaneously. The setting is inactive if periodic data transfer is locked for the sector (Time=0) or if the type ID used does not support periodic data transfer. The type ID =9,11,13 supports periodic transfer: M_ME_NA_1, M_ME_NB_1, M_ME_NC_1 The setting is not available for any other type ID.
Off	Changes in value are not transferred. No value is sent for the IO during a general interrogation (GI).
Spontaneous - values will be queued when master is offline	The data is buffered until it can be read by the master again. All buffered data is sent with the status COT_spont (3). The last buffered value is sent with the status COT_inrogen (20) again. Buffering can be activated for the type IDs <30..37>: M_SP_TB_1, M_DP_TB_1, M_ST_TB_1, M_BO_TB_1, M_ME_TD_1, M_ME_TE_1, M_ME_TF_1 und M_IT_TB_1 The setting is not available for any other type ID.
Sequence of Events	These settings define the IO-specific behavior for SOE. The SOE transfer (see IEC norm 60870-5-101 7.4.11.3.1) can also be activated for the type IDs <30..37>: M_SP_TB_1, M_DP_TB_1, M_ST_TB_1, M_BO_TB_1, M_ME_TD_1, M_ME_TE_1, M_ME_TF_1 und M_IT_TB_1 Default: Inactive
Inactive	Data point is not used for SOE description. Is automatically used for all type IDs that do not support SOE.
All events	Each value or status change triggers a write in the open file. The setting is blocked if the type ID if not planned for the SOE function.

Raising Edge	If the value changes from 0 to <> 0, then it triggers the write mode in the open file. The setting is blocked if the type ID if not planned for the SOE function.
Falling Edge	If the value changes from <> 0 to 0, then it triggers the write mode in the open file. The setting is blocked if the type ID if not planned for the SOE function.
Raising + Falling Edge	A change of value from 0 to <> 0 or from <> 0 to 0 triggers a write in the open file. The setting is blocked if the type ID if not planned for the SOE function.
File trigger	If a value is to be written due to the settings previously described, a new file is created and opened for the activated file, provided this has not yet been opened. The trigger event itself is also written to the SOE file. The setting is blocked if the type ID if not planned for the SOE function. Default: Inactive
Hysteresis	Value changes that are within the hysteresis are not transferred for the permitted TID if they have the Spontaneous selection. A transfer is therefore triggered: ▶ If type identification allows hysteresis. The type identifications <9> to <14> and <34> to <36> are not permitted. ▶ With spontaneous transfer ▶ With a value change that acts >= the hysteresis (according to the direction).
Negative	Negative Hysteresis, from measuring range Default: 0 **Note:** only active if type identification is not <9> to <14> or <34> to <36>. This field is also inactive if the value Data Transfer is not spontaneous. Erroneous and meaningless entries (such as text input or incorrect hysteresis values) are ignored and must be taken into account by the person configuring the project.
Positive	Positive hysteresis, from measuring range

	Default: 0 **Note:** only active if type identification is not <9> to <14> or <34> to <36>. This field is also inactive if the value Data Transfer is not spontaneous. Erroneous and meaningless entries (such as text input or incorrect hysteresis values) are ignored and must be taken into account by the person configuring the project.
OK	Your settings are verified after pressing the button "OK". If they are valid, they are accepted and the dialog is closed.
Cancel	Discards all entries and closes the dialog.
Help	Opens online help.

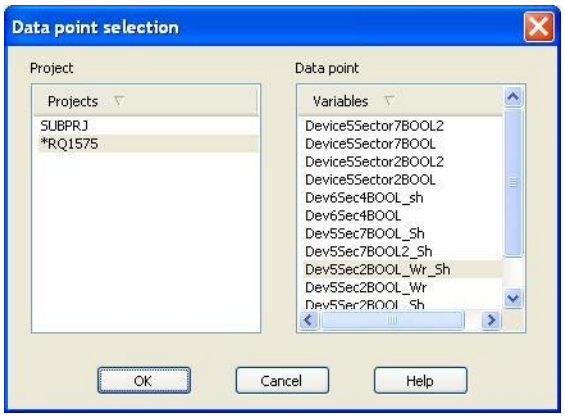
Note: The XML file of the configuration must, from zenon 7.11 onwards, contain the entry HysteresisNegative and HysteresisPositive for each IO.

Information

The communication for Spontaneous data transfer, Background scan and Periodic data transfer starts once the first general request has been received (C_IC_NA_1). For background scan and periodic data transfer, the start of the transfer cycle is calculated per IO from the time of the answer to the general query.

Data point selection

This dialog lists all available projects and their variables.



Parameters	Description
Projects	An asterisk (*) marks the default project.
Variables	The list of variables is filtered. You only see the variables that can be used with the 'type identification' selected for the IO. Selecting a project updates the list of variables.
OK	Assumes the selected variable. Alternatively, the variable can be assumed by double clicking. When loading, the currently configured project and the variable will be selected. The same variable can be used several times: for several IOs in the same sector or other sectors, for the same device or another one. If the dialog remains open and there is a reload in the Runtime, all lists will be emptied and refilled after the reload is finished.
Cancel	Discards all entries and closes the dialog.
Help	Opens online help.

Mapping of the data types

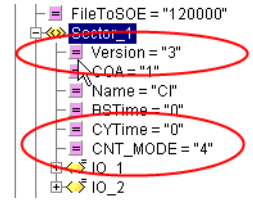
The zenon data types are compared to the data types in the Process Gateway.

Process Gateway		zenon	
IEC 60870-5-101 ASDU	**Type identification**	**Data type**	**Comment**
M_SP_NA_1	1	BOOL	
M_SP_TA_1	2	BOOL	
M_SP_TB_1	30	BOOL	
M_DP_NA_1	3	USINT	
M_DP_TA_1	4	USINT	
M_DP_TB_1	31	USINT	
M_ST_NA_1	5	USINT	Corresponds to whole VTI (IEC60870-5-101 7.2.6.5). Bit 8 is the Transient bit.
M_ST_TA_1	6	USINT	Corresponds to whole VTI (IEC60870-5-101 7.2.6.5). Bit 8 is the Transient bit.
M_ST_TB_1	32	USINT	Corresponds to whole VTI (IEC60870-5-101 7.2.6.5). Bit 8 is the Transient bit.
M_BO_NA_1	7	UDINT	
M_BO_TA_1	8	UDINT	
M_BO_TB_1	33	UDINT	
M_ME_NA_1	9	REAL	
M_ME_TA_1	10	REAL	
M_ME_TD_1	34	REAL	
M_ME_NB_1	11	INT	
M_ME_TB_1	12	INT	
M_ME_TE_1	35	INT	
M_ME_NC_1	13	REAL	
M_ME_TC_1	14	REAL	
M_ME_TF_1	36	REAL	
M_IT_NA_1	15	DINT	

M_IT_TA_1	16	DINT	
M_IT_TB_1	37	DINT	
M_EI_NA_1	70	USINT	A value change from 126 to 127 causes End of initialization to be sent to the master
C_SC_NA_1 (on page 80)	45	BOOL	mirrors the command direction during execution
C_SC_TA_1	58	BOOL	mirrors the command direction during execution
C_DC_NA_1	46	USINT	mirrors the command direction during execution
C_DC_TA_1	59	USINT	mirrors the command direction during execution
C_RC_NA_1	47	USINT	mirrors the command direction during execution
C_RC_TA_1	60	USINT	mirrors the command direction during execution
C_SE_NA_1	48	REAL	mirrors the command direction during execution
C_SE_TA_1	61	REAL	mirrors the command direction during execution
C_SE_NB_1	49	INT	mirrors the command direction during execution
C_SE_TB_1	62	INT	mirrors the command direction during execution
C_SE_NC_1	50	REAL	mirrors the command direction during execution
C_SE_TC_1	63	REAL	mirrors the command direction during execution
C_BO_NA_1	51	UDINT	mirrors the command direction during execution
C_BO_TA_1	64	UDINT	mirrors the command direction during execution
C_RD_NA_1	102	-	Is executed automatically and the execution is not reflected in zenon
C_CS_NA_1	103	BOOL	The enable variable of the time synchronization
C_RP_NA_1	105	USINT	QRP during execution
F_DR_TA_1	126	USINT	For spontaneous directory transfer

Sector

XML FIELDS



CNT_MODE	0
ToSbe	45000
SBE	1

(This tag has no subtags.)

Parameters	Description
Version	The CNT_MODE field is expected from version 3 onwards.
CNT_MODE	Configured mode of integrated totals IOs.
Sector	The new items ToSBe and ob SBE are added for the sector: ▸ ToSBe: Timeout [ms] for Select before execute: 1000 - 65535000 ▸ SBE: 0 => not required 1 => necessary for execute

CONFIGURED MODE

Parameters	Description
0	With general interrogation. (Default)
1	Mode A
2	Mode B
3	Mode C
4	Mode D

ERROR CODES

Code	Description
13	Advise for integrated totals fail.
14	Queue overrun. Integrated totals values lost.
16	Advise failed for command variable
17	List of value changes for command variables with SBE too long. Value change has been lost. 2048 value changes are buffered as a minimum, or four times the number of active Select Before Execute (SBE) - depending on which value is greater.
572	Counter interrogation. Unsupported QCC.
573	Counter interrogation. Unexpected IOA.

574	Counter interrogation. Unsupported COT.
575	Buffer for integrated totals interrogation data too small.

WARNINGS

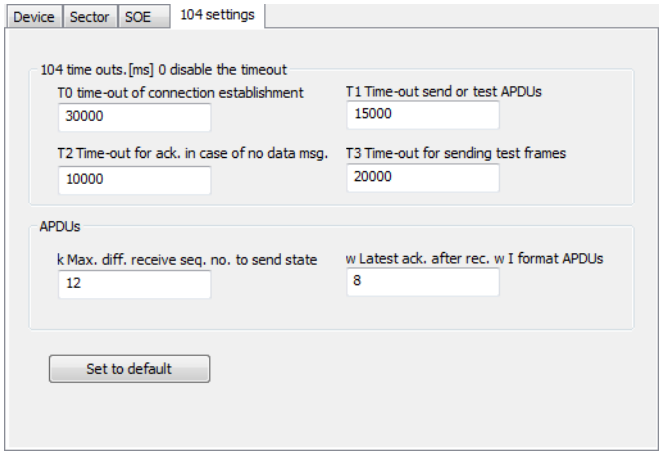
Code	Description
1011	QCC FRZ is only partly supported.
1012	Counter interrogation already active.
1014	Activation confirmation already confirmed.

ERROR MESSAGES

Message	Description
Unsupported qualifier of counter interrogation. <command>	Unknown QCC. RQT is only supported with 5.
Counter interrogation processed without reset. < command>	Warning. Reset is not supported.
Can't advise IT data point. Device:(<device>)<device> Sector:(<COA>)<Sectorname> adv:0x<Advise-ID>	Data points for integrated totals could not be requested.
IT Values lost, queue full! Device:(<device>)<device> Sector:(<COA>)<Sectorname> <Valuechange>	The buffer for the value changes of IT IOs is full. The value change is lost.

104 settings

Set the timeout times and APDUs in the 104 tab.



Note: The input fields of this tab are only available if 870-104 has been selected as a protocol.

Parameters	Description
Time-outs	Timeout settings of the connection
T0: time-out of connection establishment	Timeout for establishing connection. Value range 0 - 4294967295 Default value: 30000
T1: Time-out send or test APDUs	Time-out for frame confirmation by the master. Value range: 0 - 4294967295 Default value: 15000
T2: Time-out for ack. in case of no data msg	Time-out, within which the master should confirm if no data is exchanged. Value range: 0 - 4294967295 Default value: 10000

Parameters	Description
T3: Time-out for sending test frames	Time after which a U-frame is sent to the master if no data is to be transferred. Value range: 0 - 4294967295 Default value: 20000
APDUs	*Settings for the ISO 7816 standard: Application Protocol Data Unit (APDU).*
k: Maximum difference receive sequence nr to send state	Number of maximum I-frames not yet confirmed by the master. Value range: 0 - 4294967295 Default value: 12

Parameters	Description
`w: Latest acknowledge after receiving w I-Format APDUs`	Number of I-frames received after a confirmation is sent. Value range: `0 - 4294967295` Default value: `8`

Information

*The **`Reset to default`** button resets all input to the default values*

10.2 Communication

This chapter explains details on the communication in the Process Gateway:

- Startup (on page 67)
- General interrogation (on page 68)
- Reset (on page 68)
- Value changes (on page 69)
- Priority (on page 69)
- Read (on page 69)
- Process Initialized (on page 70)
- File transfer (on page 70)
  - Storage and naming of files for transfer (on page 70)
  - Spontaneous directory transfer (on page 71)

- Sequence of Events (SOE) (on page 71)
  - Warnings (on page 73)
  - Error messages (on page 74)
- Time synchronization (on page 77)
- DPI / DCS mapping (on page 78)
- Select before operate (on page 79)
- Qualifier of command (on page 80)
- Invalid Bit Handling (on page 80)
- Normalized Values (on page 80)
- Monitoring command (on page 81)
- Internal type T00 (on page 81)
- Pulse generation (on page 83)
- Reload (on page 83)
- Broadcasts (on page 84)
- Realtime invalid - Statusbit T_INVAL (on page 84)
- Test commands (on page 84)

10.2.1 Startup

When the process gateway is started, it loads the configured driver.

The driver then tries to read out its active configuration from the file entered in the INI file. If this is not possible, you will receive an error message and the configuration dialog will be opened for you.

If you do not quit the configuration dialog with OK, the application will quit.

> **Attention**
>
> *If the application is launched as invisible, there will be no configuration dialog. The Process Gateway will automatically quit if its configuration is invalid or missing.*

10.2.2 General query

The general request causes the driver to connect to Runtime. It is required for communication via `spontaneous data transfer`, `background scan` or `periodic data transfer`. The connection will be established in sectors.

If the connection cannot be established, there will be a negative response to the general request. If there is an active general request for the sector, it will be terminated and a warning message will be logged.

Value changes for IOs that have already sent their values to the master will be buffered as long as the general request is active.

During a project reload, it is not possible to connect to the RT. The general request will fail in this case.

10.2.3 Reset

The Master must be able to recognize a communication interrupt, so he can react with a new general request. This is why no process commands will be executed until the Master has caused a reset.

Every time there is a chance of data loss (value changes were lost), a reset will be triggered .

101
All commands will be rejected until the function code for reset (0) has been received. The code causes a reset in the link layer and the application layer.

104
When the connection is interrupted, the Master immediately reacts and restarts the initialization process. The reset will be caused if a Master connects.

Reset process command
By creating an IO of type C_RP_NA_1 with IOA 0, you can enable the control system to recognize

received commands.
The value of the variable is set to '0' and then to the value of QRP.

10.2.4 Value change

The driver receives all value changes of the requested variables..

As this may cause the list of process information not yet transferred to the master to become very large, the list of buffered value changes has a limited size.

Limit: at least: 2048 values or 4 x number of IOs per sector.

If the list exceeds this limit, the Master connection will be terminated. This way, the master is requested to obtain the next connection with a general request and obtain current value changes.

Value changes can be logged.

10.2.5 Priority

The driver supports class1 and class2 files.

The whole file transfer is treated as class 2. This makes sure that value changes will be transferred to the Master even during a file transfer.

10.2.6 Read

A maximum of 2048 read requests can be active at the same time. If this limit is reached, any further request will be rejected.

A read request is executed for every IO with the requested IOA.
There can also be several active requests for the same IO.
Read requests will be processed even if the general request is not finished yet.

10.2.7 Process initialized

You can cause the process control system to send the command M_EI_NA_1 (end of initialization) to the Master. For that,

- create an IO of type M_EI_NA_1 (T70) with IOA '0'.

The command will be sent if the current value of the variable is 126 and changes to 127. For the COI (cause of initialization), 2 (remote reset) is used.

10.2.8 File transfer

The following applies for file transfer:

- The values 1-4 are supported in the AFQ UI4
- The values 0-6 are supported in the SCQ UI4;
  0 and 1 are both 'select file'

If a new transfer is started while another one is still active, the currently active transfer will be interrupted and the new one will be started.

Storage and naming

Use the following scheme for storage and naming:

<Configured folder>\<COA>\<IOA>.<NOF>

Only 1 = 'Name of file' is supported as NOF (transparent file).
The maximum size of files for transfer is 16.711.680 Bytes.

EXAMPLE

Folder in the module configuration (on page 45): `C:\TEMP\IEC870`

File `1100.1`: For IO of sector **COA=151** and **IOA 1100**

Save location: `C:\TEMP\IEC870\151\1100.1`

Spontaneous directory transfer

Spontaneous transfer of files in the folder for file transfer can be triggered by the process control system. To do this:

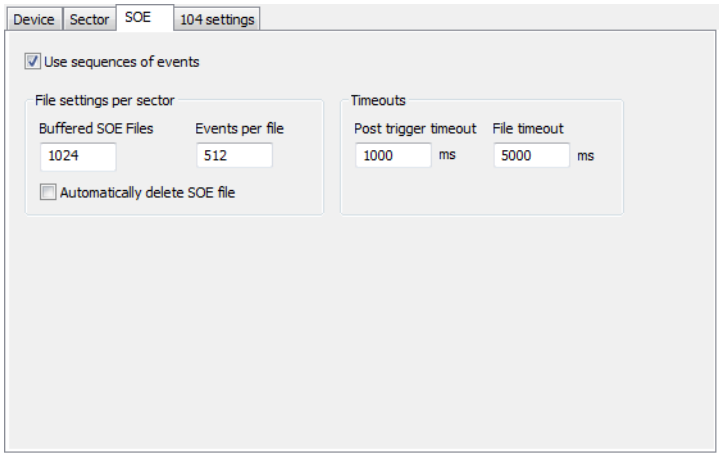
- create an IO of type F_DR_NA_1 (T126) with IOA '0'.

Value	Meaning
Change from 1 to 2	Starting transfer
3	Transfer active
4	Transfer finished
5	Transfer failure

Nested activation is prevented.

10.2.9 Sequence of Events (SOE)

SETTINGS IN THE MAIN SOE WINDOW:



Parameters	Description
`Use sequences of events`	If active, the SOE for the selected device is activated. If `inactive`, all SOE settings to the IOs are ignored. Default: `inactive`

File settings per sector	
Buffered SOE Files	If the number set for SOE files in the folder is reached for the sector, a spontaneous directory transfer (type ID "F_DT_TA_1") is triggered. If the number of files in the folder is doubled, the oldest file will start to be deleted (ring buffer function). Value range 1 to 1024. Default: 1024
Events per File	Number of value changes that are written in a file before it is closed. Value range: 1 to 4096. Default: 512
Automatically delete SOE file	If active, the reaction is that this is then automatically closed for type ID "F_AF_NA_1" (confirmation for file) for an SOE file.
Time-outs	
Post trigger timeout	If no ASDU is written to the file within this period of time, this is then closed. The time period starts over with each ASDU written. Value range: 100ms to 120000ms Default: 1000ms
File timeout	Maximum time for which the file remains open (regardless of the number of events). Value range: 100ms to 120000ms Default: 5000ms

FIRST VALUE

The exchange of data for SOE starts immediately once the Gateway has been initialized. The exchange of data for data in monitoring direction only starts when a master has connected and triggered a general interrogation (GI). The first value that is initialized does not trigger an event and is thus also not entered into the file. The same applies if Runtime is again ready to exchange data after reloading.

FILE TRANSFER

As part of the SOE function for transparent (1), event (3) is also supported as NOF.

Files are not transferred automatically if the maximum number of SOE files to be buffered is exceeded.

The IEC 60870 norm describes this with "may be activated". The Gateway does not support any file transfers activated by the salvo in the current version.

DIRECTORY TRANSFER

As part of the SOE function for transparent (1), event (3) is also supported as NOF.

Automatic directory transfer:

In accordance with the IEC 60870 norm, an automatic spontaneous directory transfer is activated for the following reasons with existing SOE files:

- 24 hours after the last automatic directory transfer.
- if the master connects
- if the maximum number of files to be buffered is exceeded

Warnings

Warning message	Meaning
Sequences of events for device <Devicename> sector <Sectorname> are activated but no trigger defined	The device has SOE activated, there is an IO in the sector with active SOE but the trigger was not activated by any IO. No file is created without a trigger. At least one IO in the sector must have a trigger activated.
SOE value change without trigger and file is closed. Value lost! Device:(<Device ID>)<Device-Name> Sector:(<COA>)<Sector name> <Value information>	A value change is not written because the SOE file is not open. Code:1010

Error messages

Error message	Meaning
Sequence of events active but no directory for the file transfer defined!	SOE files are archived in the file transfer folder. Therefore a folder for file transfer must be present.
SOE values lost, queue full! Device:(<Device ID>)<Device-Name> Sector:(<COA>)<Sector name> <Value information>	for IOs that have a SOE activated, data is exchanged to the stack via a queue. This can assume a value of 2048 or 4 * the number of SOE IO's in sector entries. If this number is exceeded, this error message is created and the value change is lost. Error code: 6
Can't create subdirectory for file transfer. Device:(<Device ID>)<Device name> Sector:(<COA>)<Sector name> system error:<System error code>	The subfolder for the sector is automatically created for SOE in the folder for file transfers. This error shows that this folder could not be created. SOE then indicates that this sector is NOT available. Error code: 10
System error code	Contains the error code returned from the operating system.
Can't advise SOE data point. Device:(<Device ID>)<Device name> Sector:(<COA>)<Sector name> adv:0x<Advise ID>	Data point request for SOE IOs failed. SOE then indicates that this sector is NOT available. Error code: 11
Write asdu to file <Filename> fail! Device:(<Device ID>)<Device name> Sector:(<COA>)<Sector name> <Value> system error: <System error code>	ASDU write to SOE file failed. Error code: 8
Illegal file name <Filename> detected! Device:(<Device ID>)<Device name> Sector:(<COA>)<Sector name>	Filenames for the file transfer have a defined format <IOA>.<NOF>. The file does not adhere to this convention. Error code: 12
Auto delete for file failed! System error: <System error code> <File transfer information>	Error code: 9
File transfer information	Contains the information that identifies the file transfer.

LOG entries

The sequence of events writes the following entries to the LOG file

Parameters	Description
deviceIp:	IP address from the device
devicename:	Name of device
COA:	Care of Address -> according to standard
SecName:	Sector description
TypeyId:	Command number
TypeIdAsTxt:	Command as text
IOA:	According to standard
AdviseID:	ID via which value changes are requested and assigned
Value:	Value transferred
TimeStamp:	Time of value change. From the driver or command
QUALDESC:	According to standard
SBEValue:	COT, select and pn mapped to unique enums: 0: Not select relevant 1: actcon+pn+select 2: actcon+select 3: deactcon+pn+select, 4: deactcon+select 5: actterm+pn+select, 6: actterm+select,
Confirmed:	1 if select already confirmed

COT:	According to standard
CotTxt:	Cot asText
Qualifier:	According to standard and command
Originator:	According to standard
QU:	Qualifier of command QU 7.2.6.26
DCS:	7.2.6.16 Double command (IEV 371-03-03)
ControlCommand:	Depending on control command

EXAMPLE FOR 45:

```
<TypeId> <TypeIdAsTxt> Device:(<deviceip>)<devicename> Sector:(<IOA>)< SecName >
ioa:<IOA> cot:(<COT>)<CotTxt> ori:<Originator> sel:<QOC S/E> qu:<QU> dcs:<DCS>
ValueChange cmd(<TypeyId>)<<TypeId>> <TypeIdAsTxt> ioa:<IOA> id:<AdviseID> value:<Wert>
time:<TimeStamp> state:< QUALDESC > sir:<SBEValue>
```

LOG entry	Module/Level	Description
SBE IED processing. Device:(<deviceIp>)<device name> Sector:(<COA>)<SecName> <ValueChange> SBE command: advise:<AdviseID> conf:<confirmed> <ControlCommand>	OSI7/Debug	Each value change that is processed for SBE creates this log message
Wrn:1014 SBE activation already confirmed! Device:(<DeviceIp>)<device name> Sector:(<COA>)<SecName> <ValueChange>	OSI7/Warnung	Renewed conformation for Select received and ignored
Error:16 Advise for SBE data point fail. SBE command: advise:<AdviseId> conf:<confirmed> <ControlCommand>	Scada/error	Variable could not be requested.
Error:17 SBE value lost, queue full! Device:(<DeviceIp>)<device name> Sector:(<COA>)<SecName> <ValueChange>	Scada/Error	Value change for SBE lost because the source is full.

10.2.10 Time synchronization

In order for time synchronization to be carried out, an information object of type 103 must be linked to a process variable for any desired device. The first IO that uses type 103 is used as an enable.

This variable must have a value of <> 0 and not have any of the following statuses:

- Blocked bit 44
- faulty bit 18
- switched off bit 20 or substitute value bit 27

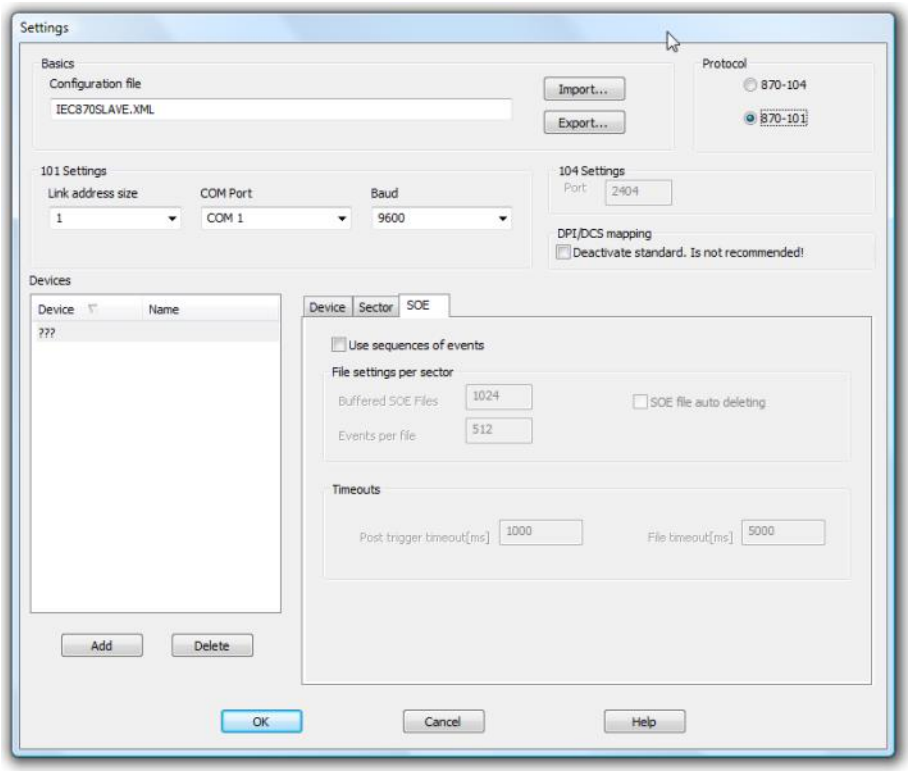
Non execution of the command due to a missing enable (or status) does not lead to the connection being broken

The missing configuration of the enable variable or the missing value of the enable variable leads to the connection being lost.

The enable variable connects to the control system if the device is reset.

10.2.11 DPI / DCS mapping

It is possible to configure whether DPI/DCS (`double-point information`/`double command state`) should be transferred in accordance with the norm or in the zenon internal display. The default is transfer (between the Process Gateway and an IEC 60870 Master) in accordance with the norm.



Setting	Functionality
Deactivate standard	Active: Mapping is deactivated. Values for DPI/DCS correspond to the values of zenon. Inactive: Values for DPI/DCS are mapped as follows, which also guarantees standard behavior for command: ▸ zenon value 0 = DPI/DCS value 1 (= OFF) ▸ zenon value 1 = DPI/DCS value 2 (= ON) ▸ zenon value 2 = DPI value 0 ▸ zenon value 3 = DPI value 3 This setting is automatically activated if an XML File with version 1 is read in.

10.2.12 Select before operate

If Sector SBE (Select before Execute) has been configured for the sector addressed, there is a wait during a Select activation until the command variable for the status Select mit ActCon Select with ActCon is reported back.

This first triggers an Activation confirmation to the CC (ControlCenter). Then a value change triggers the ending of selection without a Select. All others are rejected as long as this selection takes place.

TIMEOUT, CANCEL AND MISSING SELECT

The following rules apply for the different possibilities for responding to a Select Before Operate:

- If SBE is configured for a sector, the end time of the timeout is saved for each Select .
- In DoCyclic , the map of the active Selects is also checked to see if a Timeout has expired, then the variable is set to SE, COT_actterm and PN .
- If a Deactivate (also known as COT_deact(8)) is received by the master for a Select that is running, the Select is deleted.
- If an Execute or Deactivate is received without a Select beforehand, the response is PN .

10.2.13 Qualifier of command

An individual command received - an ASDU with Type identification **45** (**C_SC_NA_1** (on page 57)) - with Qualifier of Command (QoC) affects a zenon variable as follows:

- **QoC 0**: Undefined in accordance with IEC standard. Behaves in slave as in QoC 3 (persistent output).
- **QoC 1**: Short pulse. The zenon variable assumes the value 1 and changes, after the time defined in the Process Gateway settings (on page 45) to 0.
- **QoC 2**: Long pulse). The zenon variable assumes the value 1 and changes, after the time defined in the Process Gateway settings (on page 45) to 0.
- **QoC 3**: Persistent output. The zenon variable assumes the value 1 and retains the value 1. This must be reset to receive further individual commands.

10.2.14 INVALID bit handling

If the Process Gateway receives an INVALID bit for an information object to be sent (from the control system), the following quality bits for the information object are placed before sending:

- NT (Not Topical)
- IV (Invalid)

10.2.15 Normalized Values

OV_870 bits, which already have the variables in zenon, are sent to the master.

If values for normalized values deceed or exceed the norm area (-1 to $1-2^{-15}$), the OV_870 bit is set even if the variable does not have the status bit in zenon.

10.2.16 Monitoring command

Monitoring command single, double and regulating supports qualifiers 0 to 3.
0 is the default and is used like 1.

Command state is set as the value for the SCADA variable

10.2.17 Internal type T00 (status variable)

The internal type T00 is used for communication between the Slave and the process control system.

For the status variables, each numeric zenon variable can be assigned. This enables an internal variable to be used as the source for a type ID.

IOA 1

The variable provides the status information as to whether there is already a connection to the master. create an IO of type T00 with IOA '1'. If a connection is established, the value will change from 0 to 1.

IOA 2

A decision as to whether commands are carried out in control direction can be made for each sector by means of a zenon variable for each sector. In contrast to **device enable**, for sector-related dynamic **enable** the connection to the master is not broken if a write command comes and this is rejected. Rejected commands receive **act_con + PN** as confirmation. Rejected commands create a warning.

The zenon variable must be of UINT or DWORD type and is assigned with IOA 2 at T00 (Internal status). If the value of the variable is <> 0, the commands are approved. The variable may not have status IV (**IEC 60870 Qualifier invalid**). The commands are always approved if no IO is configured.

This setting can be set globally using the Commands active (on page 45) property.

Information

Attendant warning message:

Commands for sector deactivated, execution prohibited. <Command text>

*Warning: 1009 command in control direction was received, but rejected due to a missing **enable**.*

Data type is already integer, enhanced meaning:

Value	Status	Description
0		rejected; sets PN bit
1	Not IV	Released
2	Not IV	Silent: accept without execution or error message
3....	Not IV	Released (if value <> 0)

Comment: The global setting "Commands active" is unchanged, but only 0 or 1

IOA 3

Status variable is set to 1 if the number of SOE files in the transfer directory exceeds the maximum number of buffered files.

IOA 4

Variable provides status information on the current or most recently processed SOE file:

0 - initialization. As long as no SOE file was written.

1 - SOE file is opened

2 - file was closed

3 - too many SOE files in the directory

4 - error when writing the SOE file

5 - errors when creating the SOE file

IOA 5

Variable provides status information on the file transfer.

0 - no transfer active

1 - section is selected

2 - section is requested

3 - waiting on section confirmation

4 - waiting on confirmation of file transfer

255 - error when transferring

IOA 6

Variable provides the number of SOE files present in the transfer directory.

10.2.18 Pulse generation

The driver supports pulse generation.
After the time for the pulse has passed, the system will write the value OFF to the variable.

After ending communication, the pulse for all other active pulse variables will be stopped (i.e. a OFF written).

Communication is ended if:

- the Process Gateway application is ended
- A new configuration is activated
- Runtime reloads
- The list of buffered value changes for the sector has overflowed

If a pulse is triggered for a running pulse generation, the active pulse generation will be stopped. The variable contains the value OFF.

Note: For SCS (single command state), the value OFF is always 0, for DCS (double command state) an OFF is 1 or 0, depending on the "DPI/DCS mapping" setting.

10.2.19 Reload

If one of the projects is reloaded in the Runtime, the connection to all projects using the IOs in the sector will be closed. The device with the according sector must be reset. That means: The connection to the master is closed.

While the reload is active, you cannot establish a connection to the Runtime. This means that general requests are also not possible.

10.2.20 Broadcasts

Broadcasts are supported for the following TYPE IDs:

Type ID
ID C_IC_NA_1
C_CS_NA_1

10.2.21 Real time invalid - status bit T_INVAL

If the IEC870 driver receives a real time stamp that is marked is invalid, it sets the T_INVAL status bit. In this case, the local PC time is stamped. In the process gateway IEC870 slave, this status bit is forwarded in the direction of messaging in the time stamp.

10.2.22 Test commands

The IEC870 slave was given enhanced functionality from zenon version 7.11 so that both test commands <104> and <107> are now answered by the stack.

This response does not need to be configured and automatically runs in the background.

Information

You can find further information on command IDs the Interoperability (on page 90) chapter.

10.3 Error analysis

Should there be communication problems, this chapter will assist you in finding out the error.

10.3.1 Analysis tool

Process Gateway behaves like a zenon driver and writes messages to a common log file. To display them correctly and clearly, use the Diagnosis Viewer (main.chm::/12464.htm) program that was also installed with zenon. You can find it under *Start/All programs/zenon/Tools 7.11 -> Diagviewer.* In general, the following applies:

zenon driver log all errors in the log files. The default folder for the log files is subfolder **LOG** in directory `ProgramData`, example: `C:\ProgramData\zenon\zenon7.11\LOG` for zenon Version 7.11. Log files are text files with a special structure.

Attention: With the default settings, a driver only logs error information. With the **Diagnosis Viewer** you can enhance the diagnosis level for most of the drivers to "Debug" and "Deep Debug". With this the driver also logs all other important tasks and events.

In the Diagnosis Viewer you can also:

- follow currently created entries live
- customize the logging settings
- change the folder in which the log files are saved

Hints:

1. In Windows CE even errors are not logged per default due to performance reasons.
2. The Diagnosis Viewer displays all entries in UTC (coordinated world time) and not in local time.
3. The Diagnosis Viewer does not display all columns of a log file per default. To display more columns activate property **Add all columns with entry** in the context menu of the column header.
4. If you only use **Error logging**, the problem description is in column **Error text**. For other diagnosis level the description is in column **General text**.
5. For communication problems many drivers also log error numbers which the PLC assigns to them. They are displayed in **Error text** and/or **Error code** and/or **Driver error parameter(1**

and **2)**. Hints on the meaning of error codes can be found in the driver documentation and the protocol/PLC description.

6. At the end of your test set back the diagnosis level from **Debug** or **Deep Debug**. At **Debug** and **Deep Debug** there are a great deal of data for logging which are saved to the hard drive and which can influence your system performance. They are still logged even after you close the **Diagnosis Viewer**.

Note: Process Gateway is not available under Windows CE.

Information

You can find further information on the Diagnosis Viewer in the Diagnose Viewer (main.chm::/12464.htm) chapter.

Logging

The driver supports a comprehensive logging function for:

- Client name
- zenProcGateway_IEC870Slave
- Modules

CLIENT NAME

The way the name of the client is displayed in the diagnosis viewer depends on the configuration. That is why the name changes if you change the TCP port, the COM port or the protocol. In this case, the logging settings may also change.

If the Process Gateway is started several times with the same settings, the same client name will be used. The error messages of the different instances can be distinguished by the process ID.

Example

zenProcGateway_IEC870Slave

- 104 protocol with standard port 2404
- 101 if COM1 selected.
- If the configuration has not been loaded yet, error messages during startup will always be visible under this client.

zenProcGateway_IEC870Slave:COM4

- 101 with COM4.
  The name contains the used COM port.

zenProcGateway_IEC870Slave:Port:12345

- 104 with port 12345.
  The name contains the port for the Master connection.

MODULES

Error messages are shown for all modules:

- IEC870 Slave
- OSI2
- OSI7
- SCADA Runtime (ScadaRT)

IEC870 SLAVE

Concerns the connection to the Process Gateway and its configuration.

Information about:

- Errors during engineering

OSI2

Concerns the protocol level. This where framing with its according functions is implemented.

Information about:

- Received data as byte dump
- Sent data as byte dump
- Function codes for 101
- Errors on this level, e.g. in the framing
- APCI for 104 (870-5-104 5)

Levels

- Msg: Frame interpreting
- Debug:
  Received and sent data
  Frame analysis.
  New Master connection.
- Deep Debug: Every request about existence of characters. Produces a large number of logging entries!

OSI7

Concerns the application layer.
This is where commands are interpreted and executed.

Information about:

- Logging 'process and system information'
- Errors in the ASDUs

Levels:

- Warning: Recursive interrogation
- Msg: Process information, System information
- Debug: Confirmed I-frames
- Deep Debug: Interrogation runs. Produces a large number of logging entries!

SCADA RUNTIME (SCADART)

Messages for connection to the Runtime:

Information about:

- advised and unadvised variables
- updated variables
- Deactivating the project

Levels

- Debug:
  changed values
  project inactive

10.3.2 Error codes

The following error codes can be displayed in the diagnosis server:

Error code	Meaning
570	Value change for unknown cyclic IO
571	Transfer buffer too small to transfer a cyclic IO

10.3.3 Check list

- Is the COM port in use by another application or are the settings incorrect?
- Is the device (PLC) that you are trying to communicate with connected to the power supply?
- Is the cable between PLC and PC/IPC connected correctly?
- Have you analyzed the error file (which errors did occur)?

- For additional error analyses, please send a project backup and the LOG file of the DiagViewer to the support team responsible for you.

10.4 Interoperability

This companion standard presents sets of parameters and alternatives from which subsets must be selected to implement particular telecontrol systems. Certain parameter values, such as the choice of 'structured' or'unstructured' fields of the informationobject address of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information incommand and in monitor direction allow the specification of the complete set orsubsets, as appropriate for given applications. This clause summarizes theparameters of the previous clauses to facilitate a suitable selection for aspecific application. If a system is composed of equipment stemming from different manufacturers, it is necessary that all partners agree on the selected parameters.

The interoperability list is defined as in IEC 60870-5-101 and extended with parameters used in this standard. The text descriptions of parameters which are not applicable to this companion standard are strike-through (corresponding check box is marked black).

NOTE In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

The selected parameters should bemarked in the white boxes as follows:

[ ] Function or ASDU is not used
[X] Function or ASDU is used as standardized (default)
[R] Function or ASDU is used in reverse mode
[B] Function or ASDU is used in standard and reverse mode

The possible selection (blank, X , R , or B) is specified for each specific clause or parameter.

A black check box indicates that the option cannot be selected in this companion standard.

1. SYSTEM OR DEVICE

(system-specific parameter, indicate definition of a system or a device by marking one of the following with ' X ')

[ ] System definition
[ ] Controlling station definition (Master)
[X] Controlled station definition (Slave)

2. NETWORK CONFIGURATION: 101 ONLY

(network-specific parameter, all configurations that are used are to be marked ' X ')

[X] Point-to-point	[X] Multipoint
[X] Multiple point to point	[ ] Multipoint-star

3. PHYSICAL LAYER: 101 ONLY

(network-specific parameter, all interfaces and data rates that are used are to be marked ' X ')

TRANSMISSION SPEED (CONTROL DIRECTION)

Unbalanced interchange Circuit V.24/V.28 Standard	**Unbalanced interchange Circuit V.24/V.28 Recommended if >1 200 bit/s**	**Balanced interchange Circuit X.24/X.27**
[ ] 100 bit/s	[X] 2400 bit/s	[ ] 2400 bit/s
[ ] 200 bit/s	[X] 4800 bit/s	[ ] 4800 bit/s
[X] 300 bit/s	[X] 9600 bit/s	[ ] 9600 bit/s
[X] 600 bit/s	[X] 19200 bit/s	[ ] 19200 bit/s
[X] 1200 bit/s	[X] 38400 bit/s	[ ] 38400 bit/s
	[X] 56000 bit/s	[ ] 56000 bit/s
	[X] 57600 bit/s	[ ] 64000 bit/s
	[X] 115200 bit/s	
	[X] 128000 bit/s	
	[X] 256000 bit/s	

TRANSMISSION SPEED (MONITOR DIRECTION)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1 200 bit/s	Balanced interchange Circuit X.24/X.27
[ ] 100 bit/s	[X] 2400 bit/s	[ ] 2400 bit/s
[ ] 200 bit/s	[X] 4800 bit/s	[ ] 4800 bit/s
[X] 300 bit/s	[X] 9600 bit/s	[ ] 9600 bit/s
[X] 600 bit/s	[X] 19200 bit/s	[ ] 19200 bit/s
[X] 1200 bit/s	[X] 38400 bit/s	[ ] 38400 bit/s
	[X] 56000 bit/s	[ ] 56000 bit/s
	[X] 57600 bit/s	[ ] 64000 bit/s
	[X] 115200 bit/s	
	[X] 128000 bit/s	
	[X] 256000 bit/s	

4. LINK LAYER: 101 ONLY

(network-specific parameter, all options that are used are to be marked ' X '. Specify the maximum frame length. If a non-standard assignment of class 2 messages is implemented for unbalanced transmission, indicate the Type ID and COT of all messages assigned to class 2.)

Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.

Link transmission	Frame length [octets]	Address field of the link
[ ] Balanced transmission	[255] Maximum length L (both directions)*	[ ] not present (balanced transmission only)
[X] Unbalanced transmission		[X] One octet
		[X] Two octets
		[X] Structured
		[X] Unstructured

*may be reduced by the system

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

[ ] The standard assignment of ASDUs to class 2 messages is used as follows:

Type identification	Cause of transmission
9, 11, 13, 21	<1>

[X] A special assignment of ASDUs to class 2 messages is used as follows:

Type identification	Cause of transmission
120 - 126	All (as specified in the standard)

Note: (In response to a class 2 poll, a controlled station may respond with class 1 data when there is no class 2 data available).

5. APPLICATION LAYER

TRANSMISSION MODE FOR APPLICATION DATA

Mode 1 (Least significant octet first), as defined in 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

COMMON ADDRESS OF ASDU

(system-specific parameter, all configurations that are used are to be marked ' X ')

ASDU adress	
101 only [X] One octet	[X] Two octets

INFORMATION OBJECT ADDRESS

(system-specific parameter, all configurations that are used are to be marked ' X ')

Object adress	
101 only	[X] Structured

[X] One octet	
101 only [X] Two octets	[X] Unstructured
[X] Three octets	

CAUSE OF TRANSMISSION

(system-specific parameter, all configurations that are used are to be marked ' X ')

Cause of transmission	
101 only [X] One octet	[X] Two octets (with originator address) Originator address is set to zero if not used.

LENGTH OF APDU: 104 ONLY

(system-specific parameter, specify the maximum length of the APDU per system)
The maximum length of APDU for both directions is 253. The maximum length may be reduced by the system.

[253] Maximum length of APDU per system

SELECTION OF STANDARD ASDUS

PROCESS INFORMATION IN MONITOR DIRECTION

(station-specific parameter, mark each Type ID ' X ' if it is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

Mark	Parameter	Type
[B]	<1>: = Single-point information	M_SP_NA_1
[B]	<2>: = Single-point information with time TAG	M_SP_TA_1
[B]	<3>: = Double-point information	M_DP_NA_1
[B]	<4>: = Double-point information with time TAG	M_DP_TA_1
[B]	<5>: = Step position information	M_ST_NA_1
[B]	<6>: = Step position information with time TAG	M_ST_TA_1
[B]	<7>: = Bitstring of 32 bit	M_BO_NA_1
[B]	<8>: = Bitstring of 32 bit with time TAG	M_BO_TA_1
[B]	<9>: = Measured value, normalized value	M_ME_NA_1
[B]	<10>: = Measured value, normalized value with time TAG	M_ME_TA_1
[B]	<11>: = Measured value, scaled value	M_ME_NB_1
[B]	<12>: = Measured value, scaled value with time TAG	M_ME_TB_1
[B]	<13>: = Measured value, short floating point value	M_ME_NC_1
[B]	<14>: = Measured value, short floating point value with time TAG	M_ME_TC_1
[B]	<15>: = Integrated totals	M_IT_NA_1
[B]	<16>: = Integrated totals with time TAG	M_IT_TA_1
[ ]	<17>: = Event of protection equipment with time TAG	M_EP_TA_1
[ ]	<18>: = Packed start events of protection equipment with time TAG	M_EP_TB_1
[ ]	<19>: = Packed output circuit information of protection equipment with time TAG	M_EP_TC_1
[ ]	<20>: = Packed single-point information with status change detection	M_SP_NA_1
[ ]	<21>: = Measured value, normalized value without quality descriptor	M_ME_ND_1
[B]	<30>: = Single-point information with time TAG CP56Time2a	M_SP_TB_1
[B]	<31>: = Double-point information with time TAG CP56Time2a	M_DP_TB_1
[B]	<32>: = Step position information with time TAG CP56Time2a	M_ST_TB_1
[B]	<33>: = Bitstring of 32 bit with time TAG CP56Time2a	M_BO_TB_1

[B]	<34>: = Measured value, normalized value with time TAG CP56Time2a	M_ME_TD_1
[B]	<35>: = Measured value, scaled value with time TAG CP56Time2a	M_ME_TE_1
[B]	<36>: = Measured value, short floating point value with time TAG CP56Time2a	M_ME_TF_1
[B]	<37>: = Integrated totals with time TAG CP56Time2a	M_IT_TB_1
[ ]	<38>: = Event of protection equipment with time TAG CP56Time2a	M_EP_TD_1
[ ]	<39>: = Packed start events of protection equipment with time TAG CP56Time2a	M_EP_TE_1
[ ]	<40>:= Packed output circuit information of protection equipment with time TAG CP56Time2a	M_EP_TF_1

Either the ASDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17>, <18>, <19> or of the set <30> – <40> are used.

PROCESS INFORMATION IN CONTROL DIRECTION

(station-specific parameter, mark each Type ID ' X ' if it is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

Mark	Parameter	Type
[X]	<45>: = Single command	C_SC_NA_1
[X]	<46>: = Double command	C_DC_NA_1
[X]	<47>: = Regulating step command	C_RC_NA_1
[X]	<48>: = Set point command, normalized value	C_SE_NA_1
[X]	<49>: = Set point command, scaled value	C_SE_NB_1
[X]	<50>: = Set point command, short floating point value	C_SE_NC_1
[X]	<51>: = Bitstring of 32 bit	C_BO_NA_1
[X]	<58>: = Single command with time TAG CP56Time2a	C_SC_TA_1
[X]	<59>: = Double command with time TAG CP56Time2a	C_DC_TA_1
[X]	<60>: = Regulating step command with time TAG CP56Time2a	C_RC_TA_1
[X]	<61>: = Set point command, normalized value with time TAG CP56Time2a	C_SE_TA_1
[X]	<62>: = Set point command, scaled value with time TAG CP56Time2a	C_SE_TB_1
[X]	<63>: = Set point command, short floating point value with time TAG CP56Time2a	C_SE_TC_1
[X]	<64>:= Bitstring of 32 bit with time TAG CP56Time2a	C_BO_TA_1

Either the ASDUs of the set <45> – <51> or of the set <58> – <64> are used.

SYSTEM INFORMATION IN MONITOR DIRECTION

(station-specific parameter, mark ' X ' if used)

Mark	Parameter	Type
[X]	<70> : = End of initialization	M_EI_NA_1

SYSTEM INFORMATION IN CONTROL DIRECTION

(station-specific parameter, mark each Type ID ' X ' if it is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

Mark	Parameter	Type
[X]	<100>: = Interrogation command*	C_IC_NA_1
[X]	<101>: = Counter interrogation command	C_CI_NA_1
[X]	<102>: = Read command	C_RD_NA_1
[X]	<103>: = Clock synchronization command (option see 7.6)*	C_CS_NA_1
[X]	<104>: = Test command	C_TS_NA_1
[X]	<105>: = Reset process command	C_RP_NA_1
[ ]	<106>: = Delay acquisition command	C_CD_NA_1
[X]	<107>: = Test command with time TAG CP56Time2a	C_TS_TA_1

*also Broadcast (with Common Address of ASDU = 0xFF or 0xFFFF)

PARAMETER IN CONTROL DIRECTION

(station-specific parameter, mark each Type ID ' X ' if it is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

Mark	Parameter	Type
[ ]	<110>: = Parameter of measured value, normalized value	P_ME_NA_1
[ ]	<111>: = Parameter of measured value, scaled value	P_ME_NB_1
[ ]	<112>: = Parameter of measured value, short floating point value	P_ME_NC_1
[ ]	<113>: = Parameter activation	P_AC_NA_1

FILE TRANSFER

(station-specific parameter, mark each Type ID ' X ' if it is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

Mark	Parameter	Type
[X]	<120>: = File ready	F_FR_NA_1
[X]	<121>: = Section ready	F_SR_NA_1
[X]	<122>: = Call directory, select file, call file, call section	F_SC_NA_1
[X]	<123>: = Last section, last segment	F_LS_NA_1
[X]	<124>: = Ack file, ack section	F_AF_NA_1
[X]	<125>: = Segment	F_SG_NA_1
[X]	<126>: = Directory {blank or X, only available in monitor (standard) direction}	F_DR_TA_1

TYPE IDENTIFIER AND CAUSE OF TRANSMISSION ASSIGNMENTS

(station-specific parameters)

Shaded boxes: option not required.
Blank: functions or ASDU not used.

Mark Type Identification/Cause of transmission combinations:
'X ' if only used in the standard direction;
'R ' if only used in the reverse direction;
'B ' if used in both directions.

Type identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<1>	M_SP_NA_1		B	B		X									X					
<2>	M_SP_TA_1			B		X														
<3>	M_DP_NA_1		B	B		X									X					
<4>	M_DP_TA_1			B		X														
<5>	M_ST_NA_1		B	B		X									X					
<6>	M_ST_TA_1			B		X														
<7>	M_BO_NA_1		B	B		X									X					
<8>	M_BO_TA_1			B		X														
<9>	M_ME_NA_1	B	B	B		X									X					
<10>	M_ME_TA_1			B		X														
<11>	M_ME_NB_1	B	B	B		X									X					
<12>	M_ME_TB_1			B		X														
<13>	M_ME_NC_1	B	B	B		X									X					
<14>	M_ME_TC_1			B		X														
<15>	M_IT_NA_1			B		X									X[1]	X				
<16>	M_IT_TA_1			B		X										X				
<17>	M_EP_TA_1																			
<18>	M_EP_TB_1																			
<19>	M_EP_TC_1																			
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1																			
<30>	M_SP_TB_1			B		X														
<31>	M_DP_TB_1			B		X														

Type identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<32>	M_ST_TB_1			B		X														
<33>	M_BO_TB_1			B		X														
<34>	M_ME_TD_1			B		X														
<35>	M_ME_TE_1			B		X														
<36>	M_ME_TF_1			B		X														
<37>	M_IT_TB_1			B		X										X				
<38>	M_EP_TD_1																			
<39>	M_EP_TE_1																			
<40>	M_EP_TF_1																			
<45>	C_SC_NA_1						X	X	X[2]	X[2]	X								X	X
<46>	C_DC_NA_1						X	X	X[2]	X[2]	X								X	X
<47>	C_RC_NA_1						X	X	X[2]	X[2]	X								X	X
<48>	C_SE_NA_1						X	X	X[2]	X[2]	X								X	X
<49>	C_SE_NB_1						X	X	X[2]	X[2]	X								X	X
<50>	C_SE_NC_1						X	X	X[2]	X[2]	X								X	X
<51>	C_BO_NA_1						X	X	X[2]	X[2]	X								X	X
<58>	C_SC_TA_1						X	X	X[2]	X[2]	X								X	X
<59>	C_DC_TA_1						X	X	X[2]	X[2]	X								X	X
<60>	C_RC_TA_1						X	X	X[2]	X[2]	X								X	X
<61>	C_SE_TA_1						X	X	X[2]	X[2]	X								X	X
<62>	C_SE_TB_1						X	X	X[2]	X[2]	X								X	X
<63>	C_SE_TC_1						X	X	X[2]	X[2]	X								X	X
<64>	C_BO_TA_1						X	X	X[2]	X[2]	X								X	X

Type identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<70>	M_EI_NA_1*				X															
<100>	C_IC_NA_1						X	X	X	X	X								X	
<101>	C_CI_NA_1						X	X			X								X	
<102>	C_RD_NA_1					X												X	X	X
<103>	C_CS_NA_1						X	X										X	X	
<104>	C_TS_NA_1						X	X												
<105>	C_RP_NA_1						X	X										X	X	
<106>	C_CD_NA_1																			
<107>	C_TS_TA_1						X	X												
<110>	P_ME_NA_1																			
<111>	P_ME_NB_1																			
<112>	P_ME_NC_1																			
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1													X					X	
<121>	F_SR_NA_1													X					X	
<122>	F_SC_NA_1					X								X				X	X	
<123>	F_LS_NA_1													X					X	
<124>	F_AF_NA_1													X				X	X	
<125>	F_SG_NA_1													X					X	
<126>	F_DR_TA_1*			X		X														

* Blank or X only

[1] Optional.

[2] Slave confirms deactivations of write command (TI <45> ... <64>) but by deactivated '`Select routing`' the corresponding activation is already transferred to execution; COT_actcon and COT_actterm were already sent.

COT	Cause of Transmission	
<0>	not used	
<1>	periodic, cyclic	per/cyc
<2>	background scan	back
<3>	spontaneous	spont
<4>	initialized	init
<5>	request or requested	req
<6>	activation	act
<7>	activation confirmation	actcon
<8>	deactivation	deact
<9>	deactivation confirmation	deactcon
<10>	activation termination	actterm
<11>	return information caused by a remote command	retrem
<12>	return information caused by a local command	retloc
<13>	file transfer	file
<14...19>	reserved	
<20>	interrogated by station interrogation	inrogen
<21...36>	interrogated by interrogation of the group 1..16	inro1..16
<37>	requested by general counter request	reqcogen
<38...41>	requested by counter interrogation of the group 1 ... 4	reqco1..4
<42, 43>	reserved	
<44>	unknown type identification	
<45>	unknown cause of transmission	
<46>	unknown common address of ASDU	
<47>	unknown information object address	
<48, 63>	for special use (private range)	

6. BASIC APPLICATION FUNCTIONS

STATION INITIALIZATION

(station-specific parameter, mark 'X' if function is used)

[ ] Remote initialization

CYCLIC DATA TRANSMISSION

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

[X] Cyclic data transmission

READ PROCEDURE

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

[X] Read procedure

SPONTANEOUS TRANSMISSION

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

[B] Spontaneous transmission

DOUBLE TRANSMISSION OF INFORMATION OBJECTS WITH CAUSE OF TRANSMISSION SPONTANEOUS

(station-specific parameter, mark each information type 'X' where both a Type ID without time and corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

[ ] Single-point information M_SP_NA_1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1

[ ] Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1
[ ] Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1
[ ] Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)
[ ] Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1
[ ] Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1
[ ] Measured value, short floating point number M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

STATION INTERROGATION

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions).

[X] global		
[ ] group 1	[ ] group 7	[ ] group 13
[ ] group 2	[ ] group 8	[ ] group 14
[ ] group 3	[ ] group 9	[ ] group 15
[ ] group 4	[ ] group 10	[ ] group 16
[ ] group 5	[ ] group 11	Information object addresses assigned to each group must be shown in a separate table.
[ ] group 6	[ ] group 12	

CLOCK SYNCHRONIZATION

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions).

[X] Clock synchronization

[ ] Day of week used
[ ] RES1, GEN (time tag substituted/ not substituted) used
[B] SU-bit (summertime) used

optional, see 7.6

COMMAND TRANSMISSION

(station-specific parameter, mark ' X ' if function is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

[X] Direct command transmission
[X] Direct set point command transmission
[X] Select and execute command
[X] Select and execute set point command
[X] C_SE ACTTERM used

[X] No additional definition
[X] Short-pulse duration (duration determined by a system parameter in the outstation)
[X] Long-pulse duration (duration determined by a system parameter in the outstation)
[X] Persistent output

[setting] Supervision of maximum delay in command direction of commands and set point commands
[no limit] Maximum allowable delay of commands and set point commands

TRANSMISSION OF INTEGRATED TOTALS

(station-specific parameter, mark ' X ' if function is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

[X] Mode A: Local freeze with spontaneous transmission
[X] Mode B: Local freeze with counter interrogation
[X] Mode C: Freeze and transmit by counter-interrogation commands
[X] Mode D: Freeze by counter-interrogation command, frozen values reported spontaneously

[X] Counter read
[X] Counter freeze without reset
[ ] Counter freeze with reset
[ ] Counter reset

[X] General request counter
[ ] Request counter group 1
[ ] Request counter group 2
[ ] Request counter group 3
[ ] Request counter group 4

PARAMETER LOADING

(station-specific parameter, mark ' X ' if function is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

[ ] Threshold value
[ ] Smoothing factor
[ ] Low limit for transmission of measured values
[ ] High limit for transmission of measured values

PARAMETER ACTIVATION

(station-specific parameter, mark ' X ' if function is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

[ ] Act/deact of persistent cyclic or periodic transmission of the addressed object

TEST PROCEDURE

(station-specific parameter, mark ' X ' if function is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

[X] Test procedure

FILE TRANSFER

(station-specific parameter, mark 'X' if function is used).
File transfer in monitor direction

[X*] Transparent file
[ ] Transmission of disturbance data of protection equipment
[X] Transmission of sequences of events
[ ] Transmission of sequences of recorded analogue values

* a data can be transparently transported by the system but not generated or evaluated. Maximum file size is 16711680 bytes.

File transfer in control direction

[ ] Transparent file

BACKGROUND SCAN

(station-specific parameter, mark ' X ' if function is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

[X] Background scan

ACQUISITION OF TRANSMISSION DELAY

(station-specific parameter, mark ' X ' if function is only used in the standard direction, ' R ' if only used in the reverse direction, and ' B ' if used in both directions).

[ ] Acquisition of transmission delay

DEFINITION OF TIME OUTS: 104 ONLY

Parameter	Default value	Remarks	Selected value
t0	30 s	Time-out of connection establishment	setting
t1	15 s	Time-out of send or test APDUs	setting
t2	10 s	Time-out for acknowledges in case of no data messages; t2 < t1	setting
t3	20 s	Time-out for sending test frames in case of a long idle state; t3 > t1	setting

Recommended range for timeouts t0 - t2 : 1s to 255s, accuracy 1s

Recommended range for timeout t3 : 0s to 48hrs, accuracy 1s
Long timeouts for t3 may be needed in special cases where satellite links or dialup connections are used (e.g. to establish connection and collect values only once per day or week). For dialup connections it may be necessary to give up the connection supervision completely. This is achievable by setting the timeout t3 to zero.

MAXIMUM NUMBER OF OUTSTANDING I FORMAT APDUS K AND LATEST ACKNOWLEDGE APDUS (W): 104 ONLY

Parameter	Default value	Remarks	Selected value
k	12 APDUs	Maximum difference receive sequence number to send state variable	setting
w	8 APDUs	Latest acknowledge after receiving w I format APDUs	setting

Recommended range of values k: 1 to 32767 APDUs, accuracy 1 APDU

Recommended range of values w: 1 to 32767 APDUs, accuracy 1 APDU (Recommendation: w should not exceed two-thirds of k)

PORTNUMBER: 104 ONLY

Parameter	Default value	Remarks
Portnumber	2404	setting

REDUNDANT CONNECTIONS

[ ] Number N of redundancy group connections used

RFC 2200 SUITE

RFC 2200 is an official Internet Standard which describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

[ ] Ethernet 802.3
[ ] Serial X.21 interface
[ ] Other selection from RFC 2200:

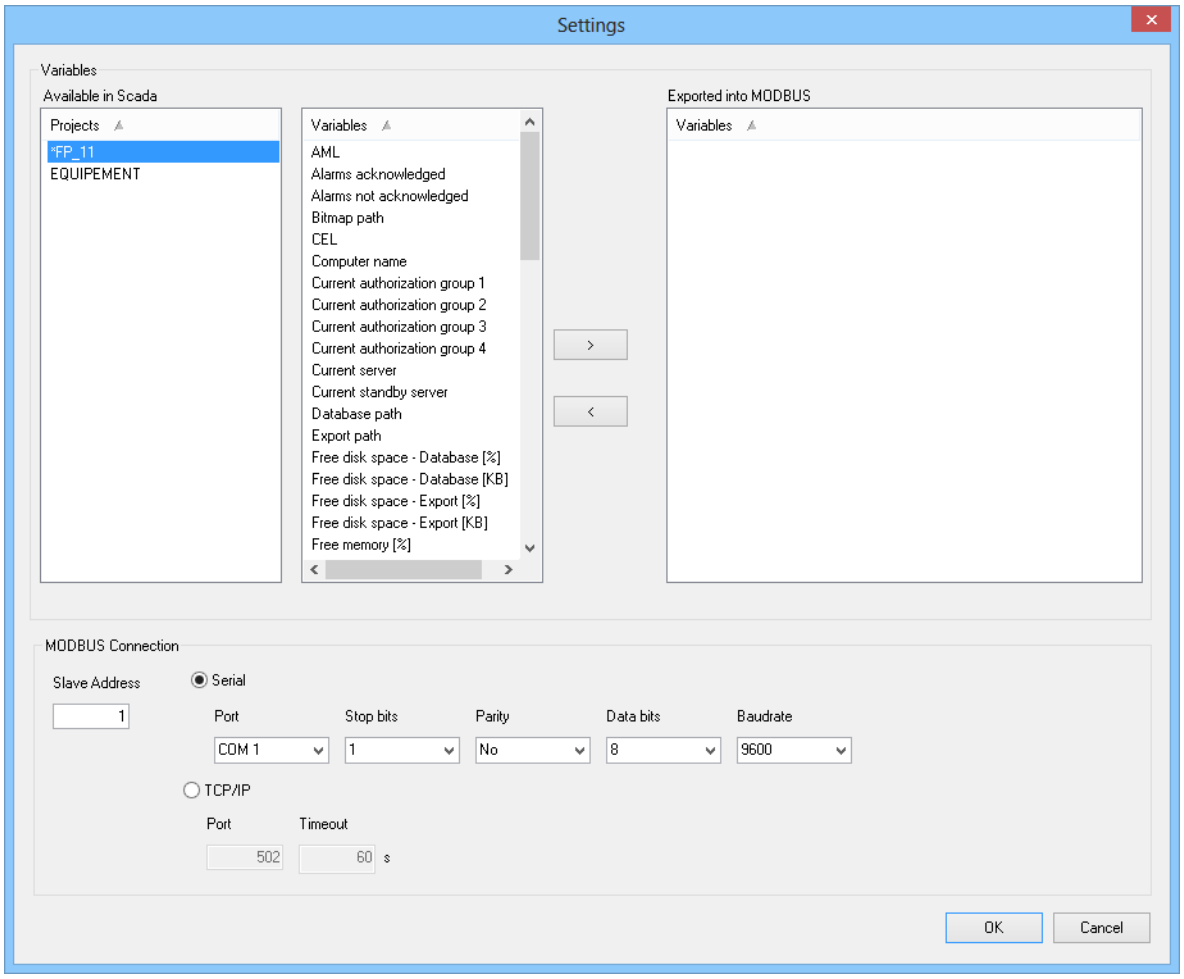
List of valid documents from RFC 2200
1. .....
2. .....
3. .....
4. .....
5. .....

6. .....
7. etc.

11. MODBUS slave

11.1 Module configuration

Click on the Settings button in the start dialog to open the dialog for selecting a variable. The variables selected in this way are continuously synchronized in zenon or in the MODBUS system.



Parameters	Description
Variables	Selection of variables that are exported to MODBUS and synchronized with zenon.
Available in SCADA	Displays all variables available in zenon With multi-project administration, variables from active projects can be selected. ▸ **Projects**: shows all available projects; the standard project is marker with a ***** ▸ **Variables**: offers all variables from the selected project to be transferred
Exported into MODBUS	Lists all variables exported to MODBUS. Variables that do not come from the standard project receive the project name as a prefix, separated by a **#** before the variable name.
Cursor keys	Allocation of the variables to MODBUS: ▸ Clicking on the **>** button adds variables from the **Available in SCADA** list to the **Exported into MODBUS** list. A dialog to allocate the address is opened (see **Allocation dialog** section). ▸ Clicking on the **<** button removes variables from the **Exported into MODBUS** list and inserts them back into the **Available in SCADA** list.
MODBUS Connection	MODBUS connection settings.
Slave Address	Modbus hardware address. Default: 1
Serial	Active: Serial connection is used. ▸ Port: Serial interface that is used for access to the MODBUS system. ▸ Stop bits: number of stop bits. Default: 1 ▸ Parity: Parity setting: No (default) Odd Even ▸ Data bit: number of data bits.

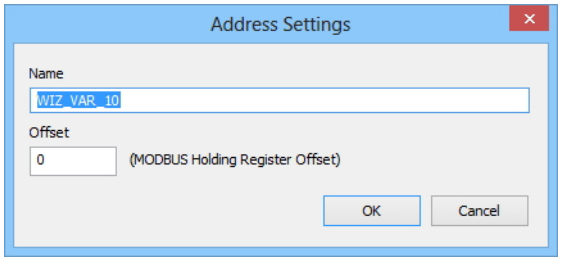
	Default: 8 ▸ Baud rate: baud rate of the serial interface. Default: 9600
TCP/IP	Active: TCP/IP connection is used. ▸ Port: Port address for the connection. ▸ Timeout: Waiting period.
OK	Applies settings and closes the dialog.
Cancel	Discards all changes and closes the dialog.

Note:

- Change of name of project and/or variables in the Editor:
  If a project name or a variable name is changed in the Editor, this change must subsequently be carried out in the configuration file (on page 114), so that the name in the INI file and in the prefix of the **Exported into MODBUS** are amended accordingly.
- Change to standard project:
  If the standard project is changed in multi-project administration, the variables must be amended.
  Variables of the standard project must not have a prefix. All other variables need a **Projectname#** prefix.

ALLOCATION DIALOG

If a variable is moved to the export list, a dialog for the name assignment of the zenon variable to an offset in MODBUS opens:



Parameters	Description
Name	Name of the variable.
Offset	Offset: MODBUS holding register offset.
OK	Applies settings and closes the dialog.
Cancel	Discards all changes and closes the dialog.

11.2 Hardware address of teh MODBUS system

The MODBUS system of the Process Gateway has a MODBUS hardware address that can be defined. This is set in the configuration dialog (on page 111) with the Slave Adress property. The address 1 is given as standard.

11.3 Configuration file: specific entries for AccessMODBUS

The configuration file zenProcGateway.ini contains specific entries for MODBUS. The file must be in the system folder.

Parameters	Description
[MODBUS]	
COMPORT	serial interface (COM1 = 0, COM2 = 1,...). Can be set using the configuration dialog (on page 111).
BAUD	Baud rate of the serial interface. Can be set using the configuration dialog (on page 111).
BYTESIZE	number of data bits of the serial interface
PARITY	Parity settings of the serial interface: 0=No 1=Odd 2=Even Can be set using the configuration dialog (on page 111).
STOPBITS	Number of stop bits of the serial interface 0=1 1=1.5 2=2 Can be set using the configuration dialog (on page 111).
TIMEOUT	timeout interval for serial communication in milliseconds
HWADDRESS	Hardware address of the MODBUS system. Default: 1 Can be set using the configuration dialog (on page 111).
REFRESHRATE	Update time in milliseconds
SERIELL	Serial or TCP/IP communication: 1 = serial 0 = TCP/IP Can be set using the configuration dialog (on page 111).
PORT	TCP/IP port

TCPTIMEOUT	TCP/IP timeout interval in seconds

Parameters	Description
[MODBUS VARIABLES]	Variables that are to be replaced in AccessMODBUS. **Note:** This entry replaces the original **[VARIABLES]** entry from zenon 7.11 onwards. This prevents unnecessary replacement using shared memory for variables from the standard project.
COUNT	number of variables to be exported
OFFSET_n	Modbus address that is allocated to the corresponding number (n).
NAME_n	Name of the variable that is allocated to the corresponding number (n).

12. OPC UA Server

The OPC server makes the variables of the project available for standard OPC client tools.

Information

The OPC UA server can be used for all zenon versions from 5.50.

The predecessor to the OPC UA servers is the OPC server. This is not part of the Process Gateway.

The OPC UA driver and all dialogs are only available in English.

MULTI-PROJECT CAPABILITY

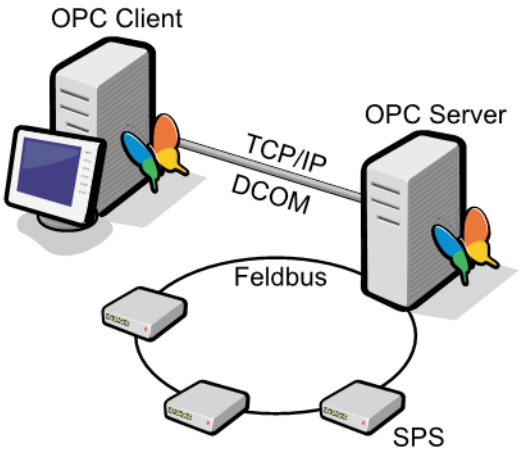
The OPC UA server is multi-project compatible from zenon 7.11 onwards. Variable from the Runtime project and all its subprojects can be selected. In doing so, the object name from the variable name and the project name are combined. Configurations for OPC UA clients that were created before zenon 7.11 are thus not compatible. These must be amended when using zenon 7.11 or higher.

12.1 Compare OPC Server and OPC UA Server

The OPC UA server system has superseded the OPC server. Use of an OPC UA server is recommended for most applications.

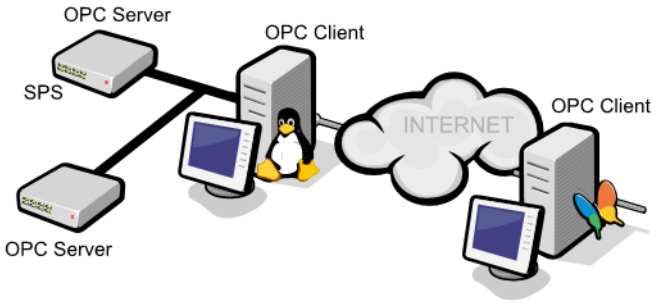
OPC SERVER

- OPC Task Force since 1995
- Uniform interface for automation systems
- Based on Microsoft's COM/DCOM technology
- OPC foundation since 1996
- several specifications for different applications



OPC UA SERVER

- First vision 2003
- Released in 2006, not yet all parts



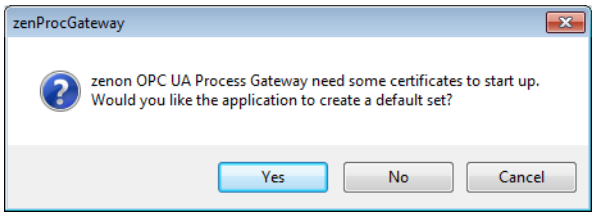
COMPARISON OF OPC SERVER TO OPC UA SERVER

Parameters	OPC Server	OPC UA Server
Data model	Limited	for all applications
Implementation	Manufacturer-dependent	Manufacturer-independent
Interoperability	No	Yes
Configuration	laborious	simple
Network use	Not recommended (security); Windows CE cannot be used	Yes
Network technology	DCOM (error-prone, unstable)	OPC UA TCP binary protocol
Performance	low	high
Platforms	Windows only	independent
Redundancy	No	Yes
Resource requirements	high	lower
Service-orientated architecture	No	Yes
Security	outdated	In accordance with current standards
Connection security	No	provided
Windows CE	No	Yes

12.2 Module configuration

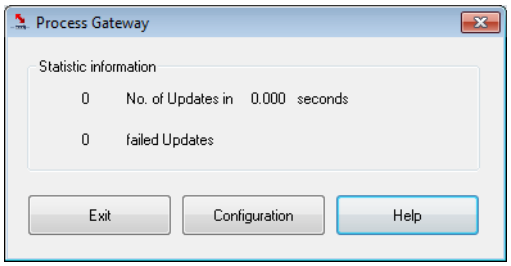
START

To start the process gateway with the OPC UA module, this must be entered into the `zenProcGateway.ini (on page 8).` The configuration of the certificate is queried when the process gateway is first started with the OPC UA module.



If no independent certificates are to be used, the certificates can be automatically created by clicking on **Yes**.

After the process gateway has been started, statistical information on the number of updates in the time period displayed and the number of unsuccessful updates is displayed. The configuration can also be started in this dialog.



Parameters	Description
Exit	Closes process gateway.
Configuration	Opens configuration dialog.
Help	Opens help.

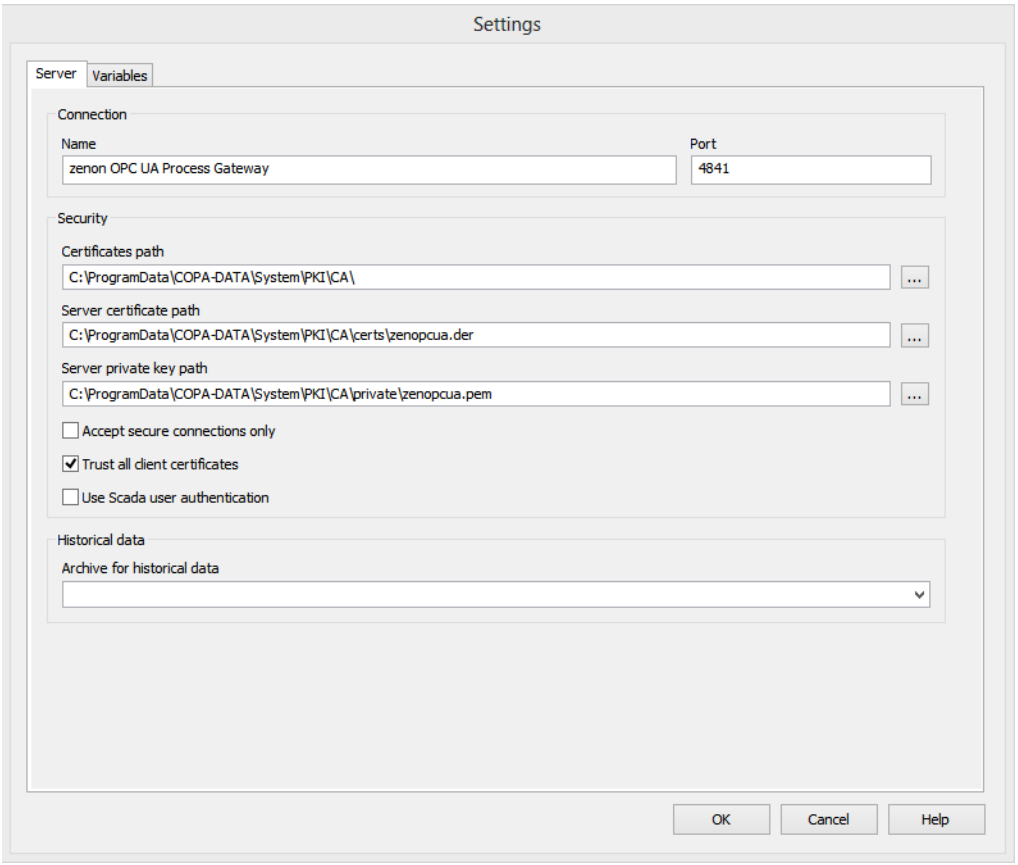
To configure the server and variables:

1. Click on Configuration
2. In the dialog that opens, you configure:
   - Server (on page 120)

- Variables (on page 123)

12.2.1 Server

Clicking on **Configuration** in the process gateway statistics dialog opens the configuration dialog:



Parameters	Description
Name	Name of the server as it is shown on the client.
Port	TCP port via which the client establishes the connection. Default: 4840
Certificate revocation list path	File with all invalid keys. ▸ Format: DER ▸ Suffix: **.crl**
Certificate trust list path	Path that contains all trustworthy keys. ▸ Format: DER ▸ Suffix: **.der**
Server certificate path	File with the public key of the server. Used by the client for encrypting messages. ▸ Format: DER ▸ Suffix: **.der**
Server private key path	File with the private key of the server. Is used by the server to decrypt the messages from the client. ▸ Format: PEM ▸ No password.
Accept secure connections only	Active: Only secure connections are accepted for establishing a connection, with the signature or with signature and encryption: ▸ Basic128Rsa15: RSA15 as key wrap algorithm and 128-bit basic as algorithm for the message encryption ▸ Basic256: 256-bit basic as algorithm for message encryption Default: inactive
Trust all client certificates	Active: All client certificates are accepted and the connection is made. Inactive: All clients that want to connect with the server must send a valid certificate. This certificate is also checked to see if it is in

	the list of known client certificates (`certificate trust list path`).
`Use zenon authentication`	`Active`: Clients can only log on to the server with a valid user ID and password. **Note:** The user administration must be active. `Inactive`: Anonymous login is possible.
`Archive for historical data`	Archive for historical data. Select from drop-down list. Archive must already have been created.
OK	Applies all changes in all tabs and closes the dialog. **Attention:** All active connections are ended and the server is restarted with the new settings. Connection errors may occur in the process.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

CERTIFICATES

*All certificates must correspond to the format **X509**.*

CERTIFICATE STORE

*The OPC UA server in the process gateway uses an **OpenSSL Directory certificate store**. The OPCUA server cannot currently be configured and the **Windows Certificate Store** (local user or local machine) cannot be used.*

SERVER CERTIFICATE

The server certificate created on initial startup is a self-signed certificate. The certificate contains a public key. A suitable 1024-large private RSA key is also generated.

*As a uniform resource identifier (URI) in the `SubjectAltName` field, it contains the **full qualified domain name** (FQN) of the computer and the default port number `4841` from the OPC UA server and a DNS entry with the computer name. The URI of the OPCUA servers is compiled dynamically and changes if, for example, the port number is changed. The server certificate is not changed in this case. A client that carries out a strict check of the server certificate can, under certain circumstances, reject the server certificate.*

It is also possible to use your own certificate with a suitable private key. The certificate must comply with the guidelines for ***application instance certificates*** *in accordance with the OPC UA standard. The* `SubjectAltName` *field must contain the URI of the server.*

CERTIFICATE TRUST LIST/CERTIFICATE TRUST CHAIN

All certificates with the suffix ***.der*** *are checked by the OPC UA server and classed as a trustworthy certificate. As an alternative to the self-designated* ***application instance certificate*** *of an OPC UA clients, the public root certificate of the certificate authority that was used to sign an* ***application instance certificate*** *of an OPC UA client can also be stored. The* ***application instance certificate*** *of the client does not need to be present on the server in this case.*

CERTIFICATE REVOCATION LIST

If an OPC UA client uses an **application instance certificate** that is signed by a certificate authority, the certificate revocation list is also checked by the server in addition to the certificate. The OPC UA server checks all files with the suffix **.crl** in the **Crl** subfolder. **Attention:** The .crl file must be stored in `PEM format`.

The connection is denied if:

- For an OPC UA client with an **application instance certificate** that is signed by a CA, there is no certificate revocation list (BadCertificateInvalid)
- The client certificate is included in the revocation list (BadCertificateRevoked)
- The CRL is no longer current (BadCertificateTimeInvalid)

12.2.2 Variables

VARIABLES

Variables for the OPC UA Process Gateway can be selected automatically or individually.

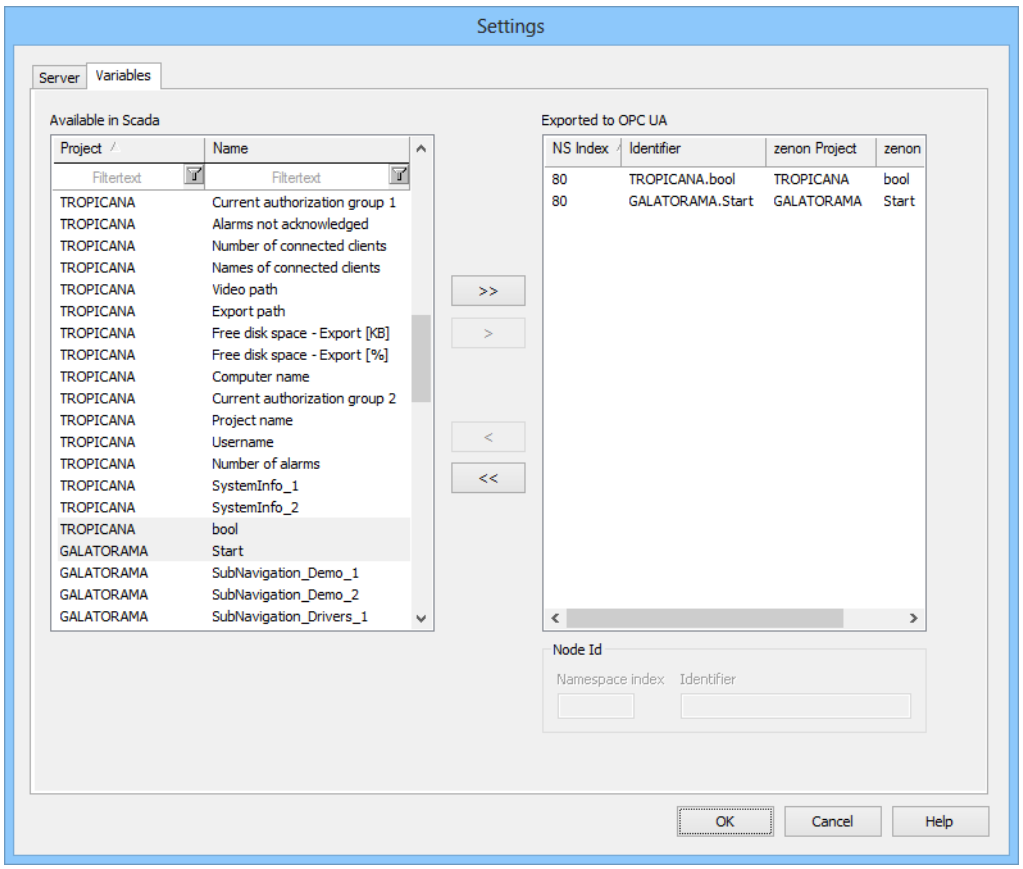
There are variables from the current project and its subprojects available. The name on the server consists of the variable names and the project names.

> **Attention**
>
> *Variables that do not have the `Setting values active` property set in the Editor cannot be written to by an OPC UA client.*

DEFINING VARIABLES

If no variables are defined in the OPC UA server configuration, then all variables from the zenon project are added to the OPC UA address space. All variables (including system variables) are visible for the clients. In doing so, each variable is given its own node with an automatically-issued numerical `identifier` and `namespace index 80`.

with manual configuration (at least one configured variable), the values defined by the user are used. The `namespace index 80` and a `string identifier` with the variable names are also entered as standard.



Parameters	Description
Available in SCADA	List of existing variables.
Filter	The existing variables can be displayed as filtered according to: ▸ Project ▸ Name The placeholders (***** or **?**) are permitted for the filter text.
Exported to OPC UA	List of exported variables. The variables can be sorted according to: ▸ NS index ▸ Identifier ▸ Project ▸ zenon name
Node ID	
Namespace index	Defines the namespace index in the **node ID** for the selected OPC UA variable. The value: ▸ must not be empty ▸ must be numerical ▸ must be greater than 0
Identifier	Defines the identifier in the **node ID** for the selected OPC UA variable. ▸ A numerical identifier is automatically created with numerical input. ▸ If a GUID is entered, a GUID identified is created, otherwise the identifier is treated as a string. GUID-Form: xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx) The field must not be empty.

To export variables to OPC UA:

1. Select the desired variables in **Available in zenon** (multiple selection is possible)
2. Click on the arrow direction **Exported to OPC UA**

To export all variables, click on the double arrow

The zenon variable name is used as **browser name** and **display name**.

Information

For zenon variables with a slash (/) in the names, the / is replaced by a dot (.). The parts of the name separated by a slash are saved in their own subfolders.

*Example: The zenon variable "**Static/Scalar/Int32**" is divided into:*

- An OPC UA variable "**Int32**"
- I a folder called "**Scalar**",
- which is a subfolder of the "**Static**" folder

This works with all data types, multi-dimensional arrays, umlauts in names and slashes at the end.

12.3 Start

When started, the process gateway loads the configured driver.

The driver tries to read the active configuration from the given INI file. If this is not possible, an error message will be given and the configuration dialog (on page 119) will be opened for you. If the configuration is not confirmed with OK, the process gateway is closed.

Attention

If the application is started as `invisible`, there is also no configuration dialog displayed. If the configuration is invalid or not present, the process gateway is automatically closed.

12.4 Connection

The OPC UA process gateway only supports the OPC UA TCP binary protocol and does not contain a discovery server. The client must also connect directly to the server. The connection address corresponds to the scheme: **opc.tcp://hostname.of.server:port**

The connection can be secured (on page 127).

12.5 Security

The module uses the security procedures that correspond to OPC UA (signing and encrypting messages) as defined in the standard. Certificates can be checked or all accepted, depending on the setting (on page 119).

SECURE CONNECTIONS

If the Accept secure connections only (on page 120) option is activated, then the server only accepts connections that use either sign or sign & encrypt as a **security mode**. Furthermore, Basic128Rsa15 or Basic256 must be used by the client as a Security Policy. If this option is deactivated, any desired combination of security mode and security policy is accepted.

USER ADMINISTRATION

If user administration is activated in the zenon project and at least one user is created, the option use zenon user authentication (on page 120) is available. If it is activated, only clients that send a valid user/password combination have access to the data on the OPC UA server. If it is inactive, no check is carried out and both anonymous and all user/password combinations are accepted.

12.6 Alarms and states

The OPC UA Process Gateway supports the zenon information model for alarms and states. It is activated as soon as a variable has at least a limit value.

From the time of activation, a linked client can be informed about limit values of a variable being exceeded. It is also in a position to confirm the alarm, as in zenon Runtime.

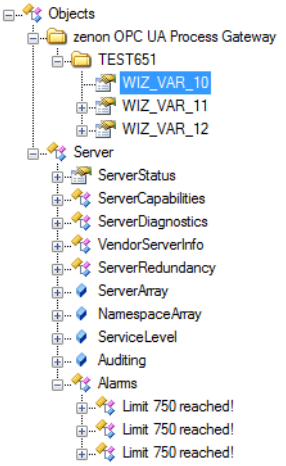
The OPC weighting, as defined in the standard, is shown on the index of the alarm/event classes linked to the limit value. The index of an alarm/event class is automatically incremented by the zenon Editor with each new alarm/event class and can be checked in the properties. Up to 20 classes with the following allocation are supported:

OPC UA range	zenon alarm/event class	OPC weighting
HIGH	20	1000
	19	950
	18	900
	17	850
MEDIUM HIGH	16	800
	15	750
	14	700
	13	650
MEDIUM	12	600
	11	550
	10	500
	9	450
MEDIUM LOW	8	400
	7	350
	6	300
	5	250
LOW	4	200
	3	150
	2	100
	1	50

If a variable with no alarm class is linked, the lowest possible classification `1` (`LOW`) is used.

ILLUSTRATION ZENON ALARM AS OBJECT

zenon variables and related alarms are illustrated in the OPC UA server as objects.



The screenshot displays the inclusion of the zenon project (**`TEST651`**) and the zenon variables (**`WIZ_VAR_10`**, **`WIZ_VAR_11`**, **`WIZ_VAR_12`**) as objects in the upper area. This includes the alarms when the limits set up have been reached (**`Limit 750 reached!`** etc).

LOGGING

The driver supports a comprehensive logging function via the diagnosis viewer.

12.7 Service sets

Service set	Is supported
Discovery service set	
FindServers	Yes
GetEndpoints	Yes
RegisterServer	No
SecureChannel Service Set	
OpenSecureChannel	No
CloseSecureChannel	No
Session service set	
CreateSession	Yes
ActivateSession	Yes
CloseSession	Yes
Cancel	No
NodeManagement Service Set	
AddNodes	No
AddReferences	No
DeleteNodes	No
DeleteReferences	No
View service set	
Browse	Yes
BrowseNext	No
TranslateBrowsePathsToNodeIds	Yes
RegisterNodes	No
UnregisterNodes	No
Query service set	

QueryFirst	No
QueryNext	No
Attribute service set	
Read	Yes
HistoryRead	No
Write	Yes
HistoryUpdate	No
Method service set	
Call	Yes
MonitoredItem service set	
CreateMonitoredItems	Yes
ModifyMonitoredItems	Yes
SetMonitoringMode	Yes
SetTriggering	No
DeleteMonitoredItems	Yes
Subscription service set	
CreateSubscription	Yes
ModifySubscription	Yes
SetPublishingMode	Yes
Publish	Yes
Republish	Yes
TransferSubscriptions	No
DeleteSubscriptions	Yes

12.8 Error messages

Error messages in logs:

Error message	Debug Level	Description
Failed to validate client certificate	Error	The client certificate could not be validated. It is either invalid (the date of validity may have been overwritten) or it was not found in the list of known client certificates. Additional information including an error number describes the error in more detail.
Wrong user/password supplied while trying to activate session (User: %s)	Error	User authentication failed. The name for the user to be authenticated is displayed.
Login of user '%s' succeeded.	Deep Debug:	User authentication successful.
Variable '%s' could not be added to OPC UA address space, because node '%s' with the same node identifier already exists	Error	A variable defined by the user could not be created, because another variable with the same identifier already exists.
Failed to initialize server architecture: An internal error occurred as a result of a programming or configuration error. (0x80020000)	Error	A certificate file, private key file or certificate revocation list file is not in the correct format.

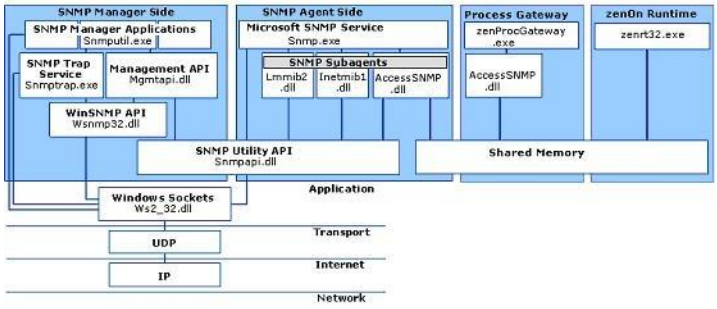
13. SNMP agent

13.1 SNMP architecture

The Windows SNMP agent supports SNMP version 2 (SNMPv2c). It also supports the SNMP functions (GET, GETNEXT, GETBULK, SET, TRAP).

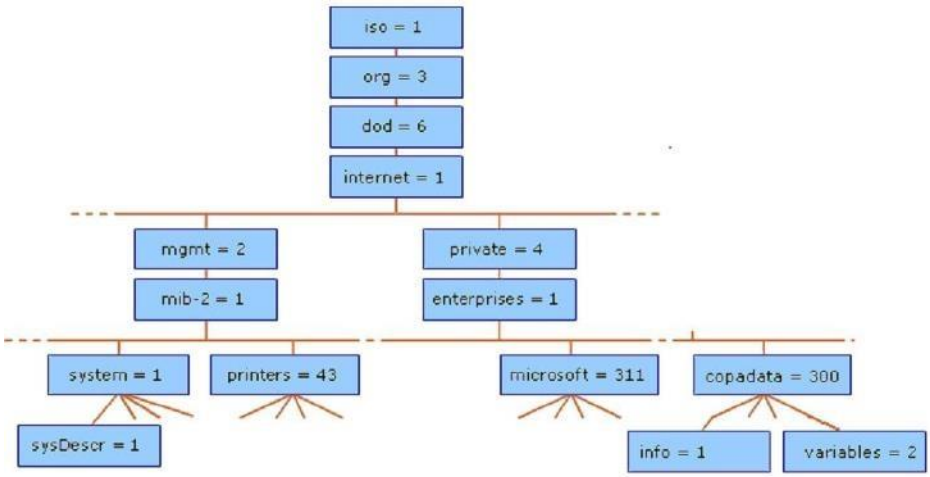
More details about Microsoft's implementation of the SNMP can be found on the Microsoft TechNet Website: “How SNMP Works”
http://technet2.microsoft.com/windowsserver/en/library/bf555774-2d63-4e96-b432-c4b7bcac6b531033.mspx
(http://technet2.microsoft.com/windowsserver/en/library/bf555774-2d63-4e96-b432-c4b7bcac6b531033.mspx)

WINDOWS OPERATING SYSTEM COMPONENTS WITH A CONNECTION TO THE PROCESS GATEWAY AND THE RUNTIME:



13.2 Management Information Base (MIB)

The Management Information Base (MIB) is a tree structure, in which the SNMP agent provides variables (OID - Object Identifiers). See below: the MIB structure, with additional variables provided via the Process Gateway.



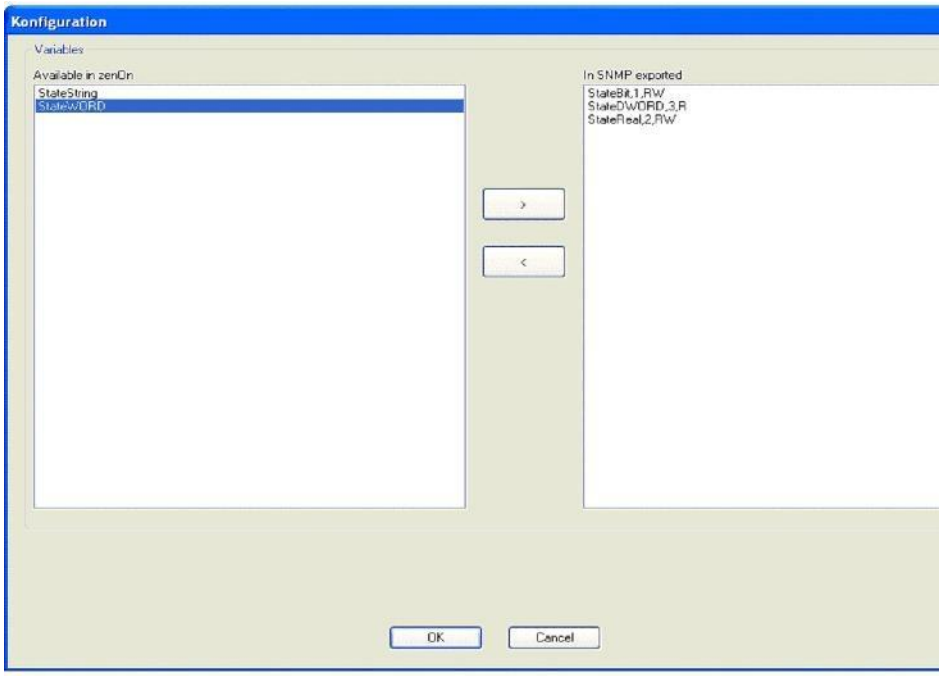
13.3 MIB structure

Info block structure is always present				
OID	**Description**	**Data type**	**Access**	**Change is sent as Trap**
1.3.6.1.4.1.300.1.1.0	copadata.info.statusinfo, Runtime is (Online, Offline)	string	read	Yes
1.3.6.1.4.1.300.1.2.0	copadata.info.statusval, Runtime is 1=Online 0=Offline	integer	read	Yes
1.3.6.1.4.1.300.1.3.0	copadata.info.watchdog	integer	read	No
1.3.6.1.4.1.300.1.4.0	copadata.info.project, name of project which the Process Gateway reads variables from	string	read	No

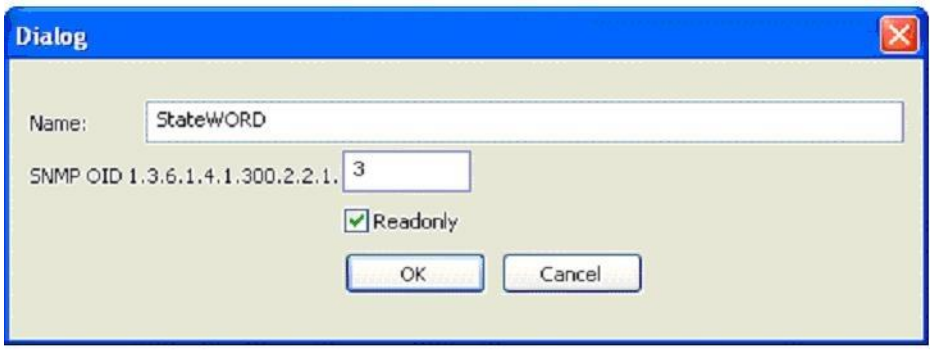
Variable structure (table) is dynamically adjusted, according to the configuration of the Process Gateway				
OID	**Description**	**Data type**	**Access**	**Change is sent as Trap**
1.3.6.1.4.1.300.2.1.0	copadata.variables.ifNumber, number of configured variables=OID	integer	read	Yes
1.3.6.1.4.1.300.2.2.1.X	copadata.variables.ifTables.ifIndex, configured OID index from the Process Gateway configuration	integer	read	No
1.3.6.1.4.1.300.2.2.2.X	copadata.variables.ifTables.ifName, variable name	string	read	No
1.3.6.1.4.1.300.2.2.3.X	copadata.variables.ifTables.ifValue, variable value as Integer. All numerical data types are formatted to an SNMP Integer data type. ATTENTION: the decimal places of REAL and DOUBLE are lost.	integer	according to configuration in Process Gateway	No
1.3.6.1.4.1.300.2.2.4.X	copadata.variables.ifTables.ifValueAsString, variable value as String. All numerical data types are formatted to an SNMP String data type.	string	according to configuration in Process Gateway	Yes
1.3.6.1.4.1.300.2.2.5.X	copadata.variables.ifTables.ifStatus, variable status value	integer	read	Yes
1.3.6.1.4.1.300.2.2.6.X	copadata.variables.ifTables.ifTimestamp, variable time stamp	integer	read	Yes

13.4 Module configuration

The following dialog appears after the **Settings** button is clicked:



Here the variables that should be connected can be selected. On the left-hand side all variables which are available in zenon are displayed. You can select them there and move them to the SNMP export list with the button > You can remove them from the export list with the button "<". If you move a variable to the export list, a dialog for the name assignment of the zenon variable to an OID address in the SNMP structure appears:



The variables selected in this way are then available on the SNMP server and are continuously synchronized between zenon and the SNMP OID structure. For every OID address you can define whether it can be write-accessed via SNMP SET. The exact structure of every OID address is described in the chapter "MIB structure.

13.5 Configuration file: specific entries for Access SNMP

The configuration file must be in the system folder.

Parameters	Description
[SNMP]	
REFRESHRATE	Update time in milliseconds

Parameters	Description
[VARIABLES]	
COUNT	number of variables to be exported
NAME_n	name of the variable with the number n (0<=<COUNT)
PARAM_n	Parameter SNMP OID table offset and the information R=read only / RW=read and write with the number n (0<=n<COUNT)

EXPORT OF VARIABLES

For the successful export the project name in `zenProcgateway.ini` in folder %CD_SYSTEM% must be entered correctly. Enter it here:

[DEFAULT]
PROJECT=

Attention: If the entry is wrong or missing the gateway is closed without any error messages. Thus the variable is not available.

13.6 Configuration of the Windows SNMP agent

To make sure that the Windows SNMP Agent (**`SNMP.exe`**) provides the zenon MIB partial structure, the Process Gateway file **`AccessSNMP.dll`** in the registry must be configured accordingly:

1. Installation of the Windows SNMP service via the control panel:

- up to Windows Vista via module: *Software -> Add Windows components*
- from Windows Vista via module: *Programs and functions - >Activate or deactivate Windows functions.*

Note: With Windows 8, the computer must be restarted once the SNMP service has been added.

2. Installation of Process Gateway with the file `AccessSNMP.dll` in the folder
   `%Program Files (x86)%\COPA-DATA\zenon 7.11`

3. Add the following keys and character strings using the registry editor. The paths and content are sometimes different for 32-bit systems and 64-bit systems:

32-Bit:

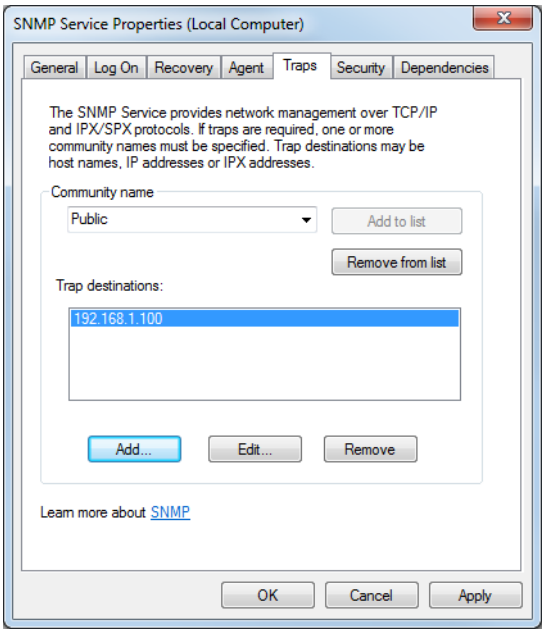
- **[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\SNMP\Parameters\ExtensionAgents]**
  Name=ProcessGateway
  Value=SOFTWARE\COPA-DATA\SNMP\CurrentVersion
- **[HKEY_LOCAL_MACHINE\SOFTWARE\COPA-DATA\SNMP\CurrentVersion]**
  Name=Pathname
  Wert=C:\Program Files\COPA-DATA\zenon 7.11\AccessSNMP.dll

64-Bit:

- **[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\SNMP\Parameters\ExtensionAgents]**
  Name=ProcessGateway
  Value=SOFTWARE\COPA-DATA\SNMP\CurrentVersion
- **[HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\COPA-DATA\SNMP\CurrentVersion]**
  Name=Pathname
  Value=C:\Program Files (x86)\COPA-DATA\zenon 7.11\AccessSNMP.dll

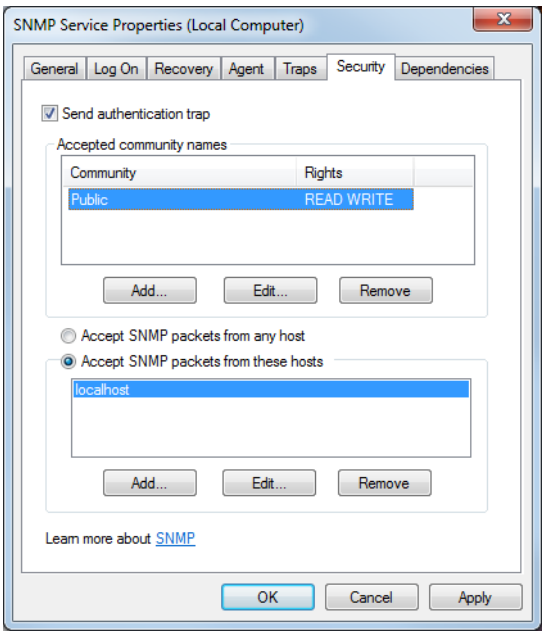
4. Start the SNMP service.
   This loads the process gateway file `AccessSNMP.dll` via the registry configuration.
   Further configuration settings for the Windows SNMP service: Control panel -> Administration-> Services-> SNMP service-> Properties

a) **`Traps:`** tab Defines the IP address in the network to which traps are sent:



- `Communityname`: Must be identical on manager and agent
- `Trap destinations`: Addresses of the destinations as host names, IP addresses or IPX addresses

a) **`Security:`** tab Defines the rights with which an SNMP client can access the SNMP agent:



- `Rights`: Must be set to "`READ WRITE`"

- `Community`: Must be identical on manager and agent

14. SQL

14.1 Module configuration

The configuration of the database connection consists of two parts.

1. OLE-DB connection: This OLE-DB connection can be defined in the configuration dialog using the selection button for the connect string. Then the standard dialog for data connection properties is opened.
2. Additionally the name of the table can be defined, if the standard name ONLINE_VALUES should not be used.
   This can be set with the `TABLE` entry in the **`[DATABASE]`** section of the configuration file (`zenProcGateway.ini`). The settings are taken over by the add-on when starting it.

> **Attention**
>
> *If table names are defined manually in the configuration file (zenProcGateway.ini), these table names must also be amended or created in the database by hand.*

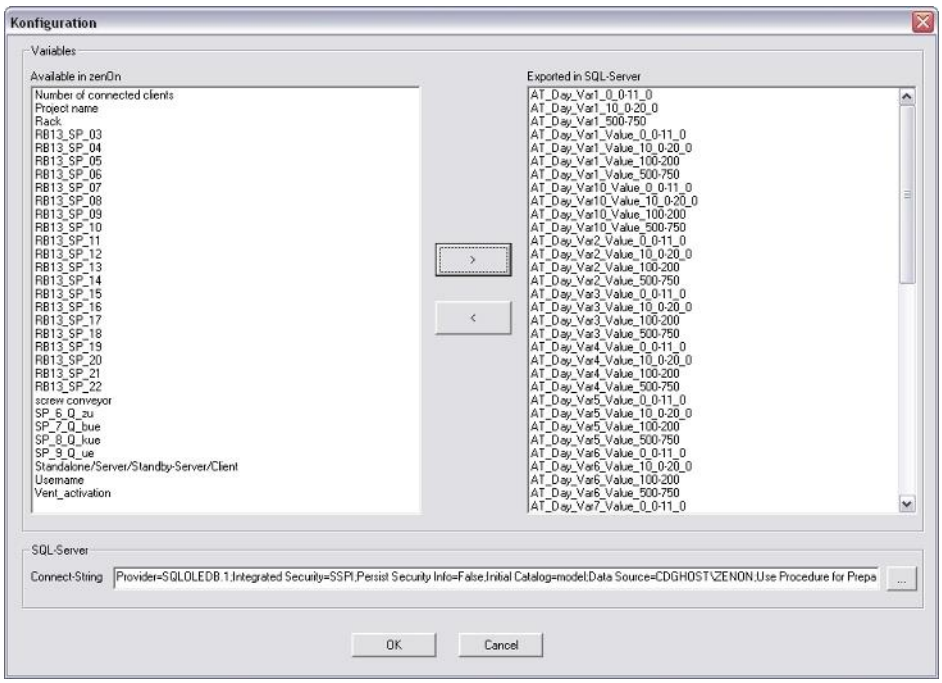
ORACLE DATABASES

Use of the Process Gateway and `AccessSQL.dll` in conjunction with Oracle databases can cause errors: It it possible, with some ODBC drivers, that no online values are written to the database. The advanced ODBC logging then issues the error message "**`1843`**".

The problem can be solved by changing the ODBC driver. For example, the ODBC driver 9.02.00.05 for Oracle 9.2 works.

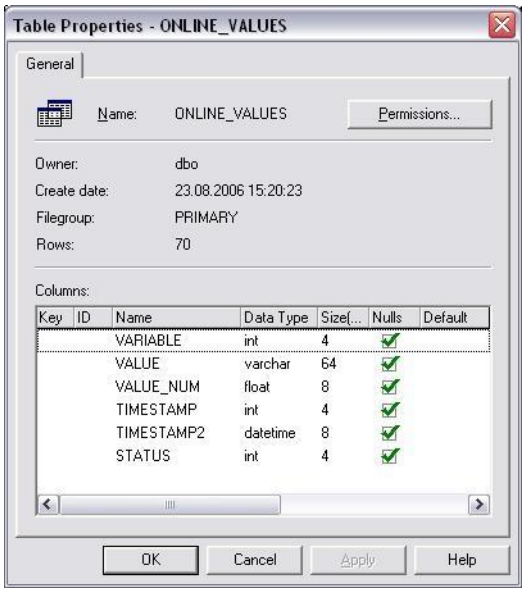
14.2 Variable selection

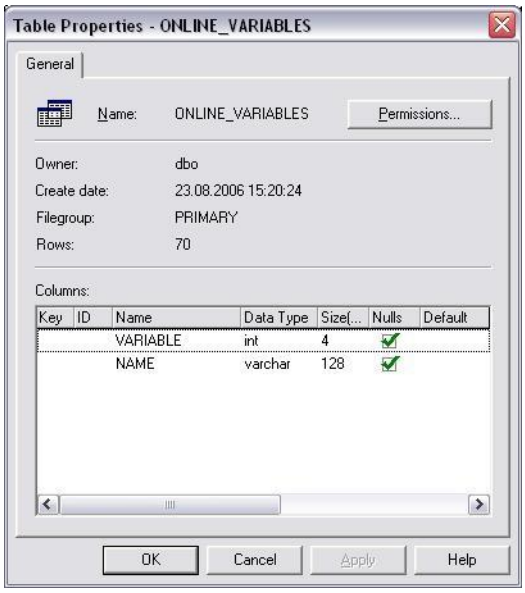
In the configuration dialog the zenon variables that should be written to the SQL process image can be defined. In order to do this the variables available in the zenon project - listed in the left part - have to be added to the image - listed in the right part.



14.3 Creating tables

After closing the configuration dialog with ok, the table structure of the SQL database is automatically generated. For the case, that it is created by hand:





14.4 Operation in a redundant system

In redundant operation two alternatives are available. In the first way the SQL database runs locally on both servers and the Process Gateway also runs on both servers. As only online values are handled no further alignment between the databases is necessary. The big disadvantage of this version is the high network load that is a result from the additional reading of online values on the Standby Server.

In the second version the Process Gateway only runs on the Runtime server and writes data to a local or a remote SQL database. In this alternative no additional network load between the Runtime Server and the Standby Server occurs and in the case of the remote SQL database the Server is not strained by external requests to that database.

14.5 Configuration file: specific entries for AccessSQL

The configuration file must be in the system folder.

Parameters	Description
[DATABASE]	
INITSTRING	OLE-DB connect-string to the SQL database
TABLE_ONL	name of the table that receives the process image
TABLE_VAR	name of the table that receives the variable IDs
REFRESHRATE	maximum refresh rate in milliseconds

Parameters	Description
[VARIABLES]	
COUNT	number of variables to be exported
NAME_n	name of variable number n (0

14.6 Table format

14.6.1 Table for process image

VARIABLE	int[4]	ID of the zenon variable
VALUE	varchar[64]	current value as string
VALUE_NUM	float	current value as float
TIMESTAMP	int[4]	time stamp of the current value (as UNIX time)
TIMESTAMP2	datetime	time stamp of the current value (as datetime)
STATUS	int[4]	status word of the current value

14.6.2 Table for variable IDs

VARIABLE	int[4]	ID of the zenon variable
NAME	varchar[128]	name of the control system variable