zenon driver manual

IEC870_10332

v.8.10

COPA·DATA

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2 IEC870_10332

Driver for the IEC 60870-5-103 protocol (serial or TCP/IP).

Communication between the control system and the PLC is based on IEC 60870-5-103. At protocol level, the control system (primary station in accordance with IEC 60870-5-2) acts as the Master and the PLC ("= the protection equipment") as the slave.

The driver sends the ASDUs (Application Service Data Units) in a so-called control direction, the PLC in monitor direction.

In the serial case, the process control system works as the master in unbalanced communication mode. The communication channel can be shared between a 60870 Master and several 60870 Slaves. For TCP/IP, the control system acts as the Master on protocol level and as a Client on TCP level.

The communication is spontaneous, Additionally, the driver cyclically sends out General Interrogations according to the **GenInt** setting in the driver configuration.

3 IEC870_10332 - data sheet

General:	
Driver file name	IEC870_10332.exe
Driver name	IEC60870 103
PLC types	IEC60870-5-103 compatible PLCs
PLC manufacturer	IEC

Driver supports:	
Protocol	IEC 60870-5-103
Addressing: Address-based	Address based
Addressing: Name-based	--
Spontaneous communication	X
Polling communication	--
Online browsing	--
Offline browsing	--
Real-time capable	--
Blockwrite	--
Modem capable	--
RDA numerical	--
RDA String	--
Hysteresis	--

Driver supports:	
extended API	--
Supports status bit **WR-SUC**	X
alternative IP address	--

Requirements:	
Hardware PC	Standard network card or serial interface RS-232 or RS-485.
Software PC	--
Hardware PLC	--
Software PLC	--
Requires v-dll	X

Platforms:	
Operating systems	Windows 10; Windows 7; Windows 8; Windows 8.1; Windows Server 2008 R2; Windows Server 2012; Windows Server 2012 R2; Windows Server 2016

4 Driver history

Date	Driver version	Change
07.07.08	400	Created driver documentation
11/14/2008	1200	- Driver object type MONITORING TRANSIENT - INVALID bit is available - Measurands as REAL - Time stamp taken over from external device - Entries to LOG - Subdirectories (per Net address) for the disturbance data files

Date	Driver version	Change
3/23/2009	1400	- Driver object type CONNECTION STATE - Driver object type TIME SYNC - PN Bit for commands is available - SB Bit is available (for variables that have not answered in GI) - the Cause of Transmission (COT) is available

DRIVER VERSIONING

The versioning of the drivers was changed with zenon 7.10. There is a cross-version build number as of this version. This is the number in the 4th position of the file version,
For example: **7.10.0.4228** means: The driver is for version **7.10** service pack **0**, and has the build number **4228**.

Expansions or error rectifications will be incorporated into a build in the future and are then available from the next consecutive build number.

> 📄 **Example**
>
> A driver extension was implemented in build **4228**. The driver that you are using is build number **8322**. Because the build number of your driver is higher than the build number of the extension, the extension is included. The version number of the driver (the first three digits of the file version) do not have any significance in relation to this. The drivers are version-agnostic

5 Requirements

This chapter contains information on the requirements that are necessary for use of this driver.

6 Configuration

In this chapter you will learn how to use the driver in a project and which settings you can change.

> ### 💡 Information
>
> Find out more about further settings for zenon variables in the chapter Variables (main.chm::/15247.htm) of the online manual.

6.1 Creating a driver

In the **Create driver** dialog, you create a list of the new drivers that you want to create.
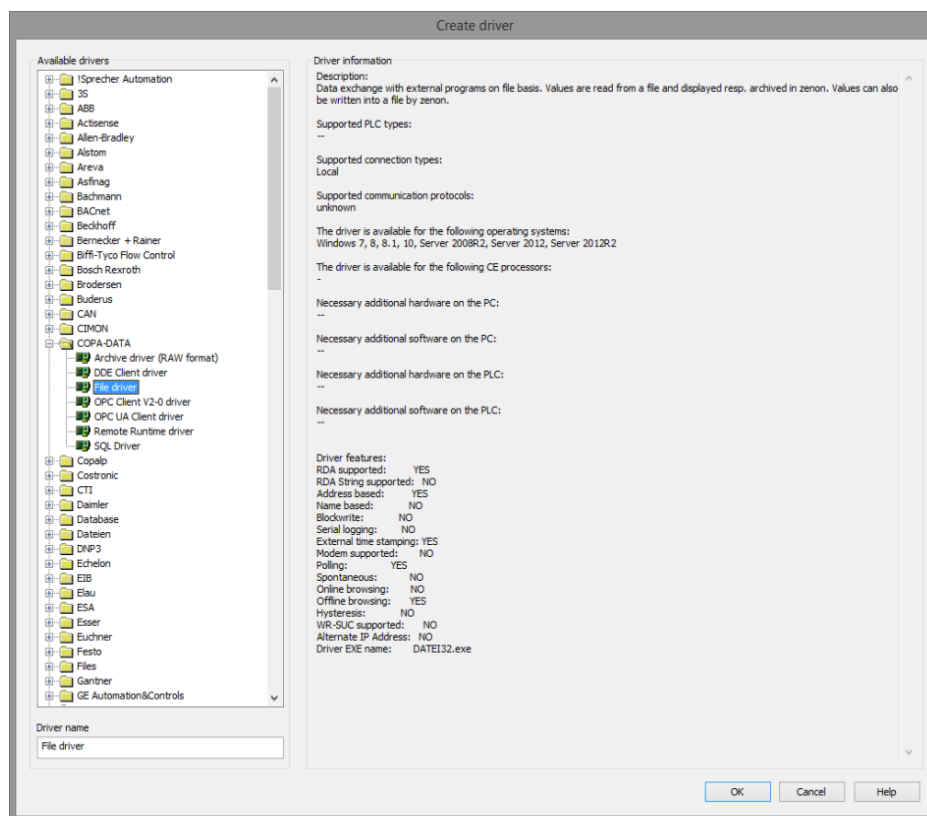
Parameter	Description
Available drivers	List of all available drivers. The display is in a tree structure: *[+]* expands the folder structure and shows the drivers contained therein. [-] reduces the folder structure Default: *no selection*
Driver name	Unique **Identification** of the driver. Default: *Empty*

Parameter	Description
	The input field is pre-filled with the pre-defined **Identification** after selecting a driver from the list of available drivers.
Driver information	Further information on the selected driver. Default: *Empty* The information on the selected driver is shown in this area after selecting a driver.

CLOSE DIALOG

Option	Description
OK	Accepts all settings and opens the driver configuration dialog of the selected driver.
Cancel	Discards all changes and closes the dialog.
Help	Opens online help.

☀ Information

The content of this dialog is saved in the file called Treiber_[Language].xml. You can find this file in the following folder:
C:\ProgramData\COPA-DATA\zenon[version number].

CREATE NEW DRIVER

In order to create a new driver:

1. Right-click on **Driver** in the Project Manager and select **New driver** in the context menu.
   Optional: Select the **New driver** button from the toolbar of the detail view of the **Variables**.
   The **Create driver** dialog is opened.

2. The dialog offers a list of all available drivers.

3. Select the desired driver and name it in the **Driver name** input field.
This input field corresponds to the **Identification** property. The name of the selected driver is automatically inserted into this input field by default.
The following is applicable for the **Driver name**:

▸ The **Driver name** must be unique.
If a driver is used more than once in a project, a new name has to be given each time.
This is evaluated by clicking on the **OK** button. If the driver is already present in the project, this is shown with a warning dialog.

▸ The **Driver name** is part of the file name.
Therefore it may only contain characters which are supported by the operating system.
Invalid characters are replaced by an underscore (_).

▸ **Attention:** This name cannot be changed later on.

4. Confirm the dialog by clicking on the **OK** button.
The configuration dialog for the selected driver is opened.

Note: The language of driver names cannot be switched. They are always shown in the language in which they have been created, regardless of the language of the Editor. This also applies to driver object types.

DRIVER NAME DIALOG ALREADY EXISTS

If there is already a driver in the project, this is shown in a dialog. The warning dialog is closed by clicking on the **OK** button. The driver can be named correctly.

ZENON PROJECT

The following drivers are created automatically for newly-created projects:

▸ **Intern**

▸ **MathDr32**

▸ **SysDrv**

> 💡 **Information**
>
> Only the required drivers need to be present in a zenon project. Drivers can be added at a later time if required.

6.2 Settings in the driver dialog

You can change the following settings of the driver:

6.2.1 General

The configuration dialog is opened when a driver is created. In order to be able to open the dialog later for editing, double click on the driver in the list or click on the **Configuration** property.

Option	Description
Mode	Allows to switch between hardware mode and simulation mode ▶ *Hardware*: A connection to the control is established. ▶ Simulation - static: No communication between to the control is established, the values are simulated by the driver. In this modus the values remain constant or the variables keep the values which were set by zenon Logic. Each variable has its own memory area. E.g. two variables of the type marker with offset 79 can have different values in the Runtime and do not influence each other. Exception: The simulator driver. ▶ *Simulation - counting*: No communication between to the control is established, the values are simulated by the driver. In this modus the driver increments the values

Option	Description
	within a value range automatically.
	▸ *Simulation - programmed*: No communication is established to the PLC. The values are calculated by a freely programmable simulation project. The simulation project is created with the help of the zenon Logic Workbench and runs in a zenon Logic Runtime which is integrated in the driver. For details see chapter Driver simulation (main.chm::/25206.htm).
Keep update list in the memory	Variables which were requested once are still requested from the control even if they are currently not needed. This has the advantage that e.g. multiple screen switches after the screen was opened for the first time are executed faster because the variables need not be requested again. The disadvantage is a higher load for the communication to the control.
Output can be written	▸ *Active*: Outputs can be written. ▸ *Inactive*: Writing of outputs is prevented. **Note**: Not available for every driver.
Variable image remanent	This option saves and restores the current value, time stamp and the states of a data point. Fundamental requirement: The variable must have a valid value and time stamp. The variable image is saved in hardware mode if one of these statuses is active: ▸ User status *M1* (*0*) to *M8* (*7*) ▸ *REVISION(9)* ▸ *AUS(20)* ▸ *ERSATZWERT(27)* The variable image is always saved if: ▸ the variable is of the object type **Driver variable** ▸ the driver runs in simulation mode. (not

Option	Description
	programmed simulation)
	The following states are not restored at the start of the Runtime:
	▸ *SELECT(8)*
	▸ *WR-ACK(40)*
	▸ *WR-SUC(41)*
	The mode **Simulation - programmed** at the driver start is not a criterion in order to restore the remanent variable image.
Stop on Standby Server	Setting for redundancy at drivers which allow only one communication connection. For this the driver is stopped at the Standby Server and only started at the upgrade.
	Attention: If this option is active, the gapless archiving is no longer guaranteed.
	▸ *Active*: Sets the driver at the not-process-leading Server automatically in a stop-like state. In contrast to stopping via driver command, the variable does not receive status **switched off** (**statusverarbeitung.chm::/24150.htm**) but an empty value. This prevents that at the upgrade to the Server irrelevant values are created in the AML, CEL and Historian.
	Default: *inactive*
	Note: Not available if the CE terminal serves as a data server. You can find further information in the zenon Operator manual in the CE terminal as a data server chapter.
Global Update time	Setting for the global update times in milliseconds:
	▸ *Active*: The set **Global update time** is used for all variables in the project. The priority set at the variables is not used.
	▸ *Inactive*: The set priorities are used for the individual variables.

Option	Description
	Exceptions: Spontaneous drivers ignore this option. They generally use the shortest possible update time. For details, see the **Spontaneous driver update time** section.
Priority	The polling times for the individual priority classes are set here. All variables with the according priority are polled in the set time.
	The variables are allocated separately in the settings of the variable properties. The communication of the individual variables can be graded according to importance or required topicality using the priority classes. Thus the communication load is distributed better.
	Attention: Priority classes are not supported by each driver, e.g. spontaneously communicating zenon drivers.

CLOSE DIALOG

Option	Description
OK	**Applies all changes in all tabs and closes the dialog.**
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

UPDATE TIME FOR SPONTANEOUS DRIVERS

With spontaneous drivers, for **Set value**, **advising** of variables and **Requests**, a read cycle is triggered immediately - regardless of the set update time. This ensures that the value is immediately available for visualization after writing. The update time is generally 100 ms.

Spontaneous drivers are **ArchDrv**, **BiffiDCM**, **BrTcp32**, **DNP3**, **Esser32**, **FipDrv32**, **FpcDrv32**, **IEC850**, **IEC870**, **IEC870_103**, **Otis**, **RTK9000**, **S7DCOS**, **SAIA_Slave**, **STRATON32** and **Trend32**.

6.2.2 Com
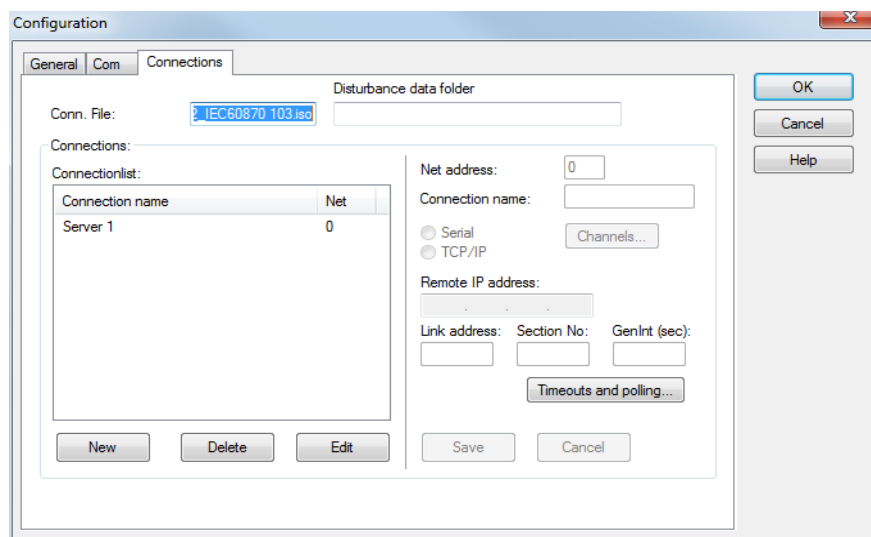
In the serial case, select the appropriate communication settings.
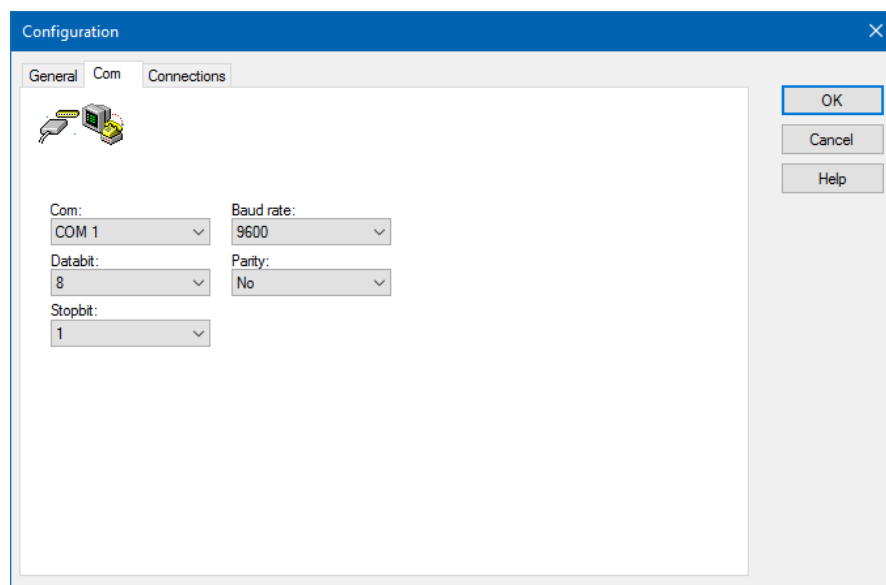
Parameter	Description
Com	COM port 1-16
Baud rate	Adjust after setting on PLC
Data bits	8
Stop bit	1
Parity	Adjust after setting on PLC

6.2.3 Connections

Options	Description
Connection file	Name of the file for configuration data. This file is required for the definition of the driver connection.
Error data folder	Name of the folder on the Runtime computer on which you want to store files with transferred error data.

CONNECTIONS

Area for configuration of as many controllers as you wish at different hardware addresses.

Options	Description
Connection list	Shows all configured connections. For each connection, the connection name is shown with the attendant net address. The connection parameters for the selected connection names are shown in the area next to the list.

Options	Description
New	Clicking on the button creates a new entry in the list and allows you to enter the connection parameters.
Delete	Deletes the selected connection from the list.
Edit	Allows configuration of the options for the selected connection.
Net address	Corresponds to the **Net address** in the variable definition. Value: *0 - 255*
Connection name	Freely definable name of the connection, e.g. the label of the PLC
Serial	▸ *Active*: A serial connection is made.
TCP/IP	▸ *Active*: Connection is made via TCP/IP. **Note:** The driver establishes the connection, in line with the **IEC60870 standard**, using port *2404*.
Channels	Click on the button to open the dialog for configuring channels (on page 20) for the Comtrade format.
Remote IP address	IP address of PLC. **Note:** The driver establishes the connection, in line with the **IEC60870 standard**, using port *2404*.
Link address	Link address of the PLC (of the IEC60870-103 slave). Every device is identified by the Net address on the Runtime side and by the Link address on the IEC60870-103 protocol side. **Note:** The **link address** *255* is used as a broadcast channel. If the **link address** of a connection is set to *255*, the **channels** and the **Section** can no longer be edited.
Section Nr.	Section of the PLC (the IEC60870-103 Slave). An IEC60870-103 device can contain multiple sectors.
GenInt (sec)	The General Interrogation Interval in seconds. The driver sends out GIs cyclically, according to this setting. Recommendation: Set the value to greater than 15 minutes (900 s).
Timeout und Polling...	Clicking on the button opens the dialog to configure the timeout settings (on page 21). The dialog is opened for editing in **New** or **Edit** mode, otherwise it is only

Options	Description
	displayed.
Save	Saves the connection settings for the selected entry.
Cancel	Discards all changes and closes the options without saving them.

Note: Driver messages can be read with the Diagnosis Viewer (main.chm::/12464.htm).

CREATE NEW CONNECTION

1. Click on the **New** button.

2. Enter the connection details.

3. Click on **Save**.

EDIT CONNECTION
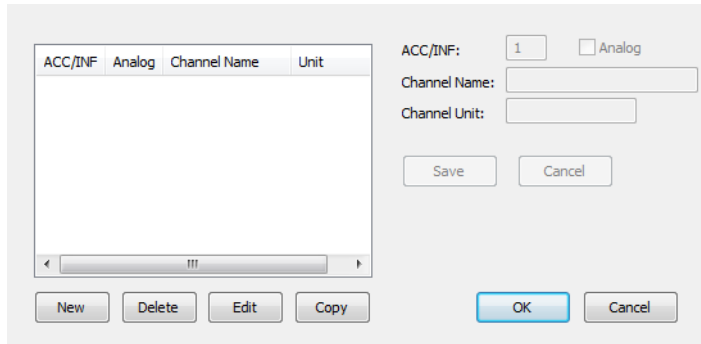
1. Select the connection in the connection list.

2. Click on the **Edit** button.

3. Change the connection parameters.

4. Finish with **Save**.

DELETE CONNECTION

1. Select the connection in the connection list.

2. Click on the button **Delete**.

3. The connection will be removed from the list

6.2.3.1 Configuring the channels

The IEC870_10332 driver writes Disturbance Data as Comtrade files in accordance with the standard of 1999. In order for zenon to process this information, additional information on the Disturbance channels is necessary. You can define the channels in the following dialog.

Note: This dialog is only available in English.

Parameters	Description
List field (left -hand side)	List of all already defined channels.
New	Activates the configuration for a new channel.
Delete	Deletes selected channel from the list.
Edit	Opens the configuration for the selected channel.
Copy	Copies entries of another hardware address.
Configuration (right-hand side)	
ACC/INF	Enter the channel number for identifying the associated Comtrade channel. ACC: analog INF: digital
Analog	Activate this check box to specify the channel as analog. Otherwise, it will be digital.
Channel Name	Enter the name of the channel here. The name must not contain a comma.
Unit	Only available if property **Analog** is active. Enter a unit for the channel here.
Save	Saves the settings for the channel.

Parameters	Description
Cancel	Discards unsaved changes and cancels processing of the channel.

After finishing, click the button **OK** to close the dialog and confirm the modifications you made. Click on **Cancel** to close the dialog and discard all changes you made.

DATA STORAGE

▶ The driver saves the disturbance data in a **comtrade .cfg** file and a **comtrade .dat** file.

▶ The name of the channel for analog and digital channels is appointed to **ch_id**. The unit for analog channels is appointed to **uu**.

▶ The channel information are stored for each hardware address in the driver connection file (xxx matches the respective hardware address):

[FETCH_HWxxx]

CH_COUNT = (Number of channels)

▶ For each channel there is a section (ccc is the consecutive number of the channels 0-(CH_COUNT-1)):

[HWxxxCHANNELccc]

CH_ANALOG = (1 analog, 0 digital)

CH_NO = (ACC/information number)

CH_NAME = (Name of the channel)

CH_UNIT = (Unit of the channel)

▶ If the driver receives a channel that wa not defined in the list, the fields in **Comtrade.cfg** remain empty.

6.2.3.2 Timeout and polling
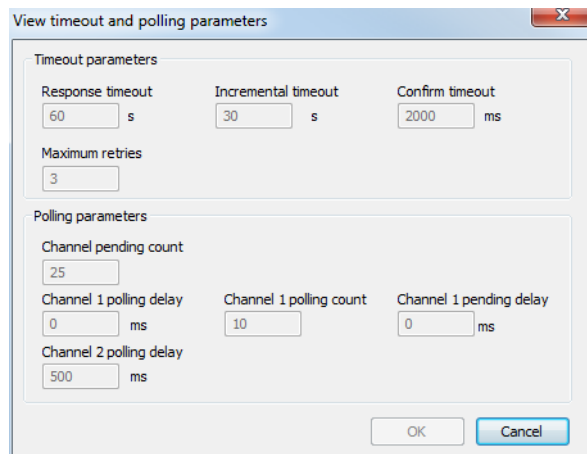
The timeout settings are defined in this dialog. Some timeouts are configured in seconds, others in milliseconds.

> ⚠ **Attention**
>
> **Response timeout** can be changed individually at any time.
>
> All other settings for timeout and polling should be left at the predefined values. Changes to these settings are only to be made by expert users and can lead to communication being configured incorrectly and thus unwanted behavior.

Note: This dialog is only available in English.

Parameter	Description
Timeout parameters	
Response timeout	General response timeout in seconds. Default: *60 s*
Incremental timeout	Maximum time in seconds that a device waits for a response from another device in the event of a command. Default: 3*0 s*
Confirm timeout	Maximum time spent waiting for a confirmation. Default: *2000 ms*
Maximum retries	Maximal number of connection attempts for serial communication. Default: *3*
Polling Parameters	Polling settings
Channel pending count	Maximum number of consecutive queries to a device. Has no effect if only one channel was configured.

Parameter	Description
	Default: *25*
Channel 1 polling delay	Polling delay for channel *1* in milliseconds.
	Default: *0 ms*
Channel 1 polling count	Number of polling attempts for channel 1.
	Default: *10*
Channel 1 pending delay	Delay for channel 1 in milliseconds.
	Default: *0 ms*
Channel 2 polling delay	Polling delay for channel *2* in milliseconds.
	Default: *500 ms*

CLOSE DIALOG

Option	Description
OK	**Applies settings and closes the dialog.**
Cancel	Discards all changes and closes the dialog.

7 Creating variables

This is how you can create variables in the zenon Editor:

7.1   Creating variables in the Editor

Variables can be created:

> ▶   as simple variables

> ▶   in arrays (main.chm::/15262.htm)

> ▶   as structure variables (main.chm::/15278.htm)

VARIABLE DIALOG

To create a new variable, regardless of which type:

1. Select the **New variable** command in the **Variables** node in the context menu
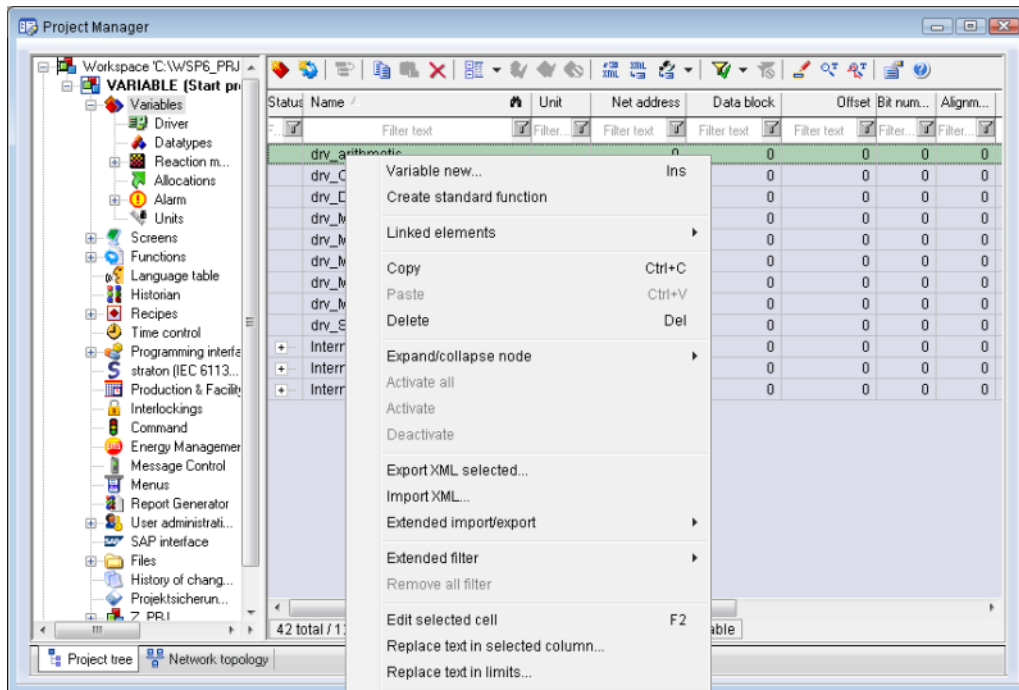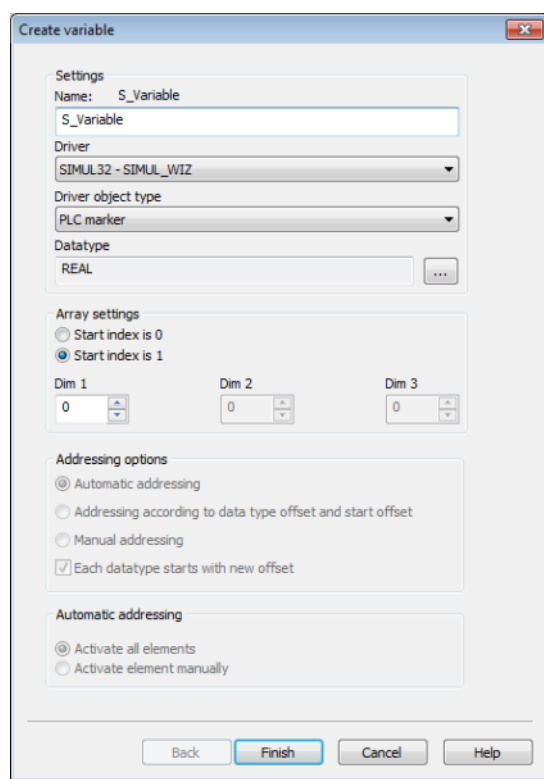
The dialog for configuring variables is opened

2. Configure the variable

3. The settings that are possible depends on the type of variables

CREATE VARIABLE DIALOG

Property	Description
Name	Distinct name of the variable. If a variable with the same name already exists in the project, no additional variable can be created with this name.

Maximum length: 128 characters

Attention: the characters **#** and **@** are not permitted in variable names. If non-permitted characters are used, creation of variables cannot be completed and the **Finish** button remains inactive.
Note: For some drivers, the addressing is possible over the property **Symbolic address**, as well. |
| **Drivers** | Select the desired driver from the drop-down list.

Note: If no driver has been opened in the project, the driver for internal variables (**Intern.exe** (**Main.chm::/Intern.chm::/Intern.htm**)) is automatically loaded. |
| **Driver Object Type** (**cti.chm::/28685.htm**) | Select the appropriate driver object type from the drop-down list. |
| **Data Type** | Select the desired data type. Click on the ... button to open the |

Property	Description
	selection dialog.
Array settings	Expanded settings for array variables. You can find details in the Arrays chapter.
Addressing options	Expanded settings for arrays and structure variables. You can find details in the respective section.
Automatic addressing	Expanded settings for arrays and structure variables. You can find details in the respective section.

SYMBOLIC ADDRESS

The **Symbolic address** property can be used for addressing as an alternative to the **Name** or **Identification** of the variables. Selection is made in the driver dialog; configuration is carried out in the variable property. When importing variables of supported drivers, the property is entered automatically.

Maximum length: *1024* characters.

The following drivers support the **Symbolic address**:

- ▶ **3S_V3**
- ▶ **AzureDrv**
- ▶ **BACnetNG**
- ▶ **IEC850**
- ▶ **KabaDPServer**
- ▶ **OPCUA32**
- ▶ **Phoenix32**
- ▶ **POZYTON**
- ▶ **RemoteRT**
- ▶ **S7TIA**
- ▶ **SEL**
- ▶ **SnmpNg32**
- ▶ **PA_Drv**

INHERITANCE FROM DATA TYPE

Measuring range, **Signal range** and **Set value** are always:

- ▶ derived from the datatype
- ▶ Automatically adapted if the data type is changed

Note for signal range: If a change is made to a data type that does not support the set **signal range**, the **signal range** is amended automatically. For example, for a change from **INT** to **SINT**, the **signal range** is changed to *127*. The amendment is also carried out if the **signal range** was not inherited from the data type. In this case, the **measuring range** must be adapted manually.

7.2   Addressing

Group/Property	Description
General	Property group for general settings.
Name	Freely definable name. **Attention:** For every zenon project the name must be unambiguous.
Identification	Freely definable identification. E.g. for Resources label, comments, ...
Addressing	
Net address	Network address of variables. This address refers to the bus address in the connection configuration of the driver. This defines the PLC, on which the variable resides.
Data block	For variables of object type *Extended data block*, enter the datablock number here. Adjustable from *0* to *4294967295*. You can take the exact maximum area for data blocks from the manual of the PLC.
Offset	Offset of variables. Equal to the memory address of the variable in the PLC. Adjustable from *0* to *4294967295*.
Alignment	not used for this driver
Bit number	Number of the bit within the configured offset. Possible entries: *0* to *65535*.
String length	Only available for String variables. Maximum number of characters that the variable can take.
Driver connection/Data Type	Data type of the variable. Is selected during the creation of the variable; the type can be changed here. **Attention:** If you change the data type later, all other properties of the variable must be checked and adjusted, if necessary.

Group/Property	Description
Driver connection/**Driver Object Type**	Object type of the variables. Depending on the driver used, is selected when the variable is created and can be changed here.
Driver connection/**Priority**	not used for this driver The driver does not support cyclically-poling communication in priority classes.

The driver's communication is address-based.

The variables are allocated via:

▶   the Net address - entered in Driver configuration (on page 17) for connection,

▶   the Function Type and the Information Number - corresponds to **FUN** and **INF** from the standard

▶   and for Measurands   also to the index - this corresponds to the sequence of MEA in ASDU <3> or <9.>

The variable of the time synchronization command (driver object type TIME SYNC) has the Function Type 0 and the Information Number 0; the same applies to the variable with the connection state (driver object type CONNECTION STATE).

> 📑   **Example**
>
> Measurand P of Measurands II (ASDU <9> in monitor direction)
>
> Data type: *REAL*
>
> Driver object type: MONITORING
>
> Function Type: 128
>
> Information Number: 148
>
> Index: 6

7.3   Driver objects and datatypes

Driver objects are areas available in the PLC, such as markers, data blocks etc. Here you can find out which driver objects are provided by the driver and which IEC data types can be assigned to the respective driver objects.

7.3.1 Driver objects

The following object types are available in this driver:

DRIVER OBJECT TYPES AND SUPPORTED IEC DATA TYPES FOR PROCESS VARIABLES IN ZENON

Driver Object Type	Channel type	Read	Write	Supported data types	Comment
COMMAND	8	--	X	*BOOL, INT, UINT, SINT, USINT*	For 'General command' - ASDU<20> in control direction In the standard corresponds to DCO (Double command); recommendation: SINT, USINT If sending fails, the variable will get a PN bit.
TIME SYNC	67	--	X	*BOOL*	For time synchronization command - ASDU<6> in control direction A set value 1 sent to this variable (Function Type 0 and Information Number 0) will be sent to the PLC as a time synchronization. If sending fails, the variable will get a PN bit.
MONITORING	9	X	--	*BOOL, REAL, INT, UINT, SINT, USINT*	In the standard corresponds to DCO (Double-point information); recommendation: SINT,

Driver Object Type	Channel type	Read	Write	Supported data types	Comment
					USINT or MVAL (F13); recommendation: REAL or SCL (R32.23); recommendation: REAL
MONITORING **TRANSIENT**	65	X	--	*BOOL, INT, UINT, SINT, USINT*	For indicators not contained in GI. In the standard corresponds to DCO (Double-point information); recommendation: SINT, USINT *) The received value is immediately set to 0 by the driver.
CONNECTION STATE	66	X	--	*BOOL*	the connection state (Function Type 0 and Information Number 0) If the value of this variable is 1, this means that a connection is active (at least on the data link level).
DISTURBANCE DATA	64	X	X	*STRING*	To be able to fetch Disturbance Data files, you have to configure two variables with the same Function Type. The variable with Information Number 0

Driver Object Type	Channel type	Read	Write	Supported data types	Comment
					is the command and status variable, Information Number 1 is the directory variable. The index of these variables is ignored.
Communication details	35	X	X	*BOOL, SINT, USINT, INT, UINT, DINT, UDINT, REAL, STRING*	Variables for the static analysis of the communication; is transferred between driver and Runtime (not to the PLC). **Note**: The addressing and the behavior is the same for most zenon drivers. You can find detailed information on this in the Communication details (Driver variables) (on page 40) chapter.
Generic Data	69	X	X	*STRING*	
Generic Data Trigger	68	X	X	*INT, UINT*	

Key:

X: supported

--: not supported

CHANNEL TYPE

The term **Kanaltyp** is the internal numerical name of the driver object type. It is also used for the extended DBF import/export of the variables.

"KANALTYP" IS USED FOR ADVANCED CSV IMPORT/EXPORT OF VARIABLES IN THE "HWOBJECTTYPE" COLUMN.GENERIC DATA TRIGGERED AND GENERIC DATA

For each generic data variable, there must be a corresponding generic data trigger variable.

The addresses of the variables are mapped as follows:

▸ **Function Type:** *kod* (normally 1)

▸ **Information Number:** *0* is not used

▸ **Index:** *gin*

The value of the trigger variable that is written decides the action to be carried out:

▸ *244*: Get Generic Data - the variable with *gin/kod* is requested

▸ *245*: Generic Data GI - a general interrogation for *Generic Data* is sent

▸ *248*: Write GenericData - the variable is written with *gin/kod*

▸ *250*: Write and Execute – the variable is written with *gin/kod* and an **execute** is instigated

The data of the generic data variables is output as a hex dump in a string.

7.3.2 Mapping of the data types

All variables in zenon are derived from IEC data types. The following table compares the IEC datatypes with the datatypes of the PLC.

PLC	zenon	Data type
BOOL	BOOL	8
USINT	USINT	9
SINT	SINT	10
UINT	UINT	2
INT	INT	1
-	UDINT	4
-	DINT	3
-	ULINT	27
-	LINT	26
REAL	REAL	5

PLC	zenon	Data type
-	LREAL	6
STRING	STRING	12
-	WSTRING	21
-	DATE	18
-	TIME	17
-	DATE_AND_TIME	20
-	TOD (Time of Day)	19

DATA TYPE

The term **data type** is the internal numerical identification of the data type. It is also used for the extended DBF import/export of the variables.

7.4   Creating variables by importing

Variables can also be imported by importing them. The XML and DBF import is available for every driver.

💡 **Information**

You can find details on the import and export of variables in the Import-Export (main.chm::/13028.htm) manual in the Variables (main.chm::/13045.htm) section.

7.4.1 XML import

During XML import of variables or data types, these are first assigned to a driver and then analyzed. Before import, the user decides whether and how the respective element (variable or data type) is to be imported:

▶ *Import*:
The element is imported as a new element.

▶ *Overwrite*:
The element is imported and overwrites a pre-existing element.

▸ *Do not import*:
The element is not imported.

Note: The actions and their durations are shown in a progress bar during import. The import of variables is described in the following documentation. Data types are imported along the same lines.

REQUIREMENTS

The following conditions are applicable during import:

▸ **Backward compatibility**

At the XML import/export there is no backward compatibility. Data from older zenon versions can be taken over. The handover of data from newer to older versions is not supported.

▸ **Consistency**

The XML file to be imported has to be consistent. There is no plausibility check on importing the file. If there are errors in the import file, this can lead to undesirable effects in the project.

Particular attention must be paid to this, primarily if not all properties exist in the XML file and these are then filled with default values. E.g.: A binary variable has a limit value of *300*.

▸ **Structure data types**

Structure data types must have the same number of structure elements.
Example: A structure data type in the project has 3 structure elements. A data type with the same name in the XML file has 4 structure elements. Then none of the variables based on this data type in the file are imported into the project.

👍 **Hint**

You can find further information on XML import in the **Import - Export** manual, in the **XML import** (**main.chm::/13046.htm**) chapter.

7.4.2 DBF Import/Export

Data can be exported to and imported from dBase.

💡 **Information**

Import and Export via CSV or dBase supported; no driver specific variable settings, such as formulas. Use export/import via XML for this.

IMPORT DBF FILE

To start the import:

1. right-click on the variable list

2. in the drop-down list of **Extended export/import...** select the **Import dBase** command

3. follow the import assistant

The format of the file is described in the chapter File structure.

> ### ⚡ Information
>
> Note:
>
> ‣ Driver object type and data type must be amended to the target driver in the DBF file in order for variables to be imported.
>
> ‣ dBase does not support structures or arrays (complex variables) at import.

EXPORT DBF FILE

To start the export:

1. right-click on the variable list

2. in the drop-down list of **Extended export/import...** select the **Export dBase...** command

3. follow the export assistant

> ### ⚠ Attention
>
> DBF files:
>
> ‣ must correspond to the 8.3 DOS format for filenames (8 alphanumeric characters for name, 3 character suffix, no spaces)
>
> ‣ must not have dots (.) in the path name.
> e.g. the path *C:\users\John.Smith\test.dbf* is invalid.
> Valid: *C:\users\JohnSmith\test.dbf*
>
> ‣ must be stored close to the root directory in order to fulfill the limit for file name length including path: maximum 255 characters

The format of the file is described in the chapter File structure.

> ### ⚡ Information
>
> dBase does not support structures or arrays (complex variables) at export.

FILE STRUCTURE OF THE DBASE EXPORT FILE

The dBaseIV file must have the following structure and contents for variable import and export:

> ⚠️ **Attention**
>
> dBase does not support structures or arrays (complex variables) at export.
>
> DBF files must:
>
> ▸ conform with their name to the 8.3 DOS format (8 alphanumeric characters for name, 3 characters for extension, no space)
>
> ▸ Be stored close to the root directory   (Root)

STRUCTURE

Identification	Type	Field size	Comment
KANALNAME	Char	128	Variable name. The length can be limited using the **MAX_LAENGE** entry in the **project.ini** file.
KANAL_R	C	128	The original name of a variable that is to be replaced by the new name entered under "VARIABLENNAME" (variable name) (field/column must be entered manually). The length can be limited using the **MAX_LAENGE** entry in the **project.ini** file.
KANAL_D	Log	1	The variable is deleted with the *1* entry (field/column has to be created by hand).
TAGNR	C	128	Identification. The length can be limited using the **MAX_LAENGE** entry in the **project.ini** file.
EINHEIT	C	11	Technical unit
DATENART	C	3	Data type (e.g. bit, byte, word, ...) corresponds to the data type.
KANALTYP	C	3	Memory area in the PLC (e.g. marker area, data area, ...) corresponds to the driver object type.

Identification	Type	Field size	Comment
HWKANAL	Num	3	Net address
BAUSTEIN	N	3	Datablock address (only for variables from the data area of the PLC)
ADRESSE	N	5	Offset
BITADR	N	2	For bit variables: bit address For byte variables: 0=lower, 8=higher byte For string variables: Length of string (max. 63 characters)
ARRAYSIZE	N	16	Number of variables in the array for index variables ATTENTION: Only the first variable is fully available. All others are only available for VBA or the Recipegroup Manager
LES_SCHR	L	1	Write-Read-Authorization 0: Not allowed to set value. 1: Allowed to set value.
MIT_ZEIT	R	1	time stamp in zenon (only if supported by the driver)
OBJEKT	N	2	Driver-specific ID number of the primitive object comprises TREIBER-OBJEKTTYP and DATENTYP
SIGMIN	Float	16	Non-linearized signal - minimum (signal resolution)
SIGMAX	F	16	Non-linearized signal - maximum (signal resolution)
ANZMIN	F	16	Technical value - minimum (measuring range)
ANZMAX	F	16	Technical value - maximum (measuring range)
ANZKOMMA	N	1	Number of decimal places for the display of the values (measuring range)
UPDATERATE	F	19	Update rate for mathematics variables (in sec, one decimal possible) not used for all other variables
MEMTIEFE	N	7	Only for compatibility reasons
HDRATE	F	19	HD update rate for historical values (in sec, one decimal possible)

Identification	Type	Field size	Comment
HDTIEFE	N	7	HD entry depth for historical values (number)
NACHSORT	R	1	HD data as postsorted values
DRRATE	F	19	Updating to the output (for zenon DDE server, in [s], one decimal possible)
HYST_PLUS	F	16	Positive hysteresis, from measuring range
HYST_MINUS	F	16	Negative hysteresis, from measuring range
PRIOR	N	16	Priority of the variable
REAMATRIZE	C	32	Allocated reaction matrix
ERSATZWERT	F	16	Substitute value, from measuring range
SOLLMIN	F	16	Minimum for set value actions, from measuring range
SOLLMAX	F	16	Maximum for set value actions, from measuring range
VOMSTANDBY	R	1	Get value from standby server; the value of the variable is not requested from the server but from the Standby Server in redundant networks
RESOURCE	C	128	Resources label. Free string for export and display in lists. The length can be limited using the MAX_LAENGE entry in **project.ini**.
ADJWVBA	R	1	Non-linear value adaption: *0*: Non-linear value adaption is used *1*: Non-linear value adaption is not used
ADJZENON	C	128	Linked VBA macro for reading the variable value for non-linear value adjustment.
ADJWVBA	C	128	ed VBA macro for writing the variable value for non-linear value adjustment.
ZWREMA	N	16	Linked counter REMA.
MAXGRAD	N	16	Gradient overflow for counter REMA.

> ⚠ **Attention**
>
> When importing, the driver object type and data type must be amended to the target driver in the DBF file in order for variables to be imported.

LIMIT VALUE DEFINITION

Limit definition for limit values *1* to *4*, or status *1* to *4*:

Identification	Type	Field size	Comment
AKTIV1	R	1	Limit value active (per limit value available)
GRENZWERT1	F	20	technical value or ID number of a linked variable for a dynamic limit value (see VARIABLEx) (if VARIABLEx is *1* and here it is *-1*, the existing variable linkage is not overwritten)
SCHWWERT1	F	16	Threshold value for limit value
HYSTERESE1	F	14	Is not used
BLINKEN1	R	1	Set blink attribute
BTB1	R	1	Logging in CEL
ALARM1	R	1	Alarm
DRUCKEN1	R	1	Printer output (for CEL or Alarm)
QUITTIER1	R	1	Must be acknowledged
LOESCHE1	R	1	Must be deleted
VARIABLE1	R	1	Dyn. limit value linking the limit is defined by an absolute value (see field GRENZWERTx).
FUNC1	R	1	Functions linking
ASK_FUNC1	R	1	Execution via Alarm Message List
FUNC_NR1	N	10	ID number of the linked function (if "-1" is entered here, the existing function is not overwritten during import)
A_GRUPPE1	N	10	Alarm/Event Group
A_KLASSE1	N	10	Alarm/Event Class

Identification	Type	Field size	Comment
MIN_MAX1	C	3	Minimum, Maximum
FARBE1	N	10	Color as Windows coding
GRENZTXT1	C	66	Limit value text
A_DELAY1	N	10	Time delay
INVISIBLE1	R	1	Invisible

Expressions in the column "Comment" refer to the expressions used in the dialog boxes for the definition of variables. For more information, see chapter Variable definition.

7.5   Communication details (Driver variables)

The driver kit implements a number of driver variables. This variables are part of the driver object type *Communication details*. These are divided into:

▸   Information

▸   Configuration

▸   Statistics and

▸   Error message

The definitions of the variables implemented in the driver kit are available in the import file **DRVVAR.DBF** and can be imported from there.
Path to file: *%ProgramData%\COPA-DATA\zenon<Versionsnummer>\PredefinedVariables*

Note: Variable names must be unique in zenon. If driver variables of the driver object type *Communication details* are to be imported from **DRVVAR.DBF** again, the variables that were imported beforehand must be renamed.

⁕   Information

Not every driver supports all driver variables of the driver object type *Communication details*.

For example:

▸   Variables for modem information are only supported by modem-compatible drivers.

▸   Driver variables for the polling cycle are only available for pure polling drivers.

▸   Connection-related information such as **ErrorMSG** is only supported for drivers that only edit one connection at a a time.

INFORMATION

Name from import	Type	Offset	Description
MainVersion	*UINT*	0	Main version number of the driver.
SubVersion	*UINT*	1	Sub version number of the driver.
BuildVersion	*UINT*	29	Build version number of the driver.
RTMajor	*UINT*	49	zenon main version number
RTMinor	*UINT*	50	zenon sub version number
RTSp	*UINT*	51	zenon Service Pack number
RTBuild	*UINT*	52	zenon build number
LineStateIdle	*BOOL*	24.0	TRUE, if the modem connection is idle
LineStateOffering	*BOOL*	24.1	TRUE, if a call is received
LineStateAccepted	*BOOL*	24.2	The call is accepted
LineStateDialtone	*BOOL*	24.3	Dialtone recognized
LineStateDialing	*BOOL*	24.4	Dialing active
LineStateRingBack	*BOOL*	24.5	While establishing the connection
LineStateBusy	*BOOL*	24.6	Target station is busy
LineStateSpecialInfo	*BOOL*	24.7	Special status information received
LineStateConnected	*BOOL*	24.8	Connection established
LineStateProceeding	*BOOL*	24.9	Dialing completed
LineStateOnHold	*BOOL*	24.10	Connection in hold
LineStateConferenced	*BOOL*	24.11	Connection in conference mode.
LineStateOnHoldPendConf	*BOOL*	24.12	Connection in hold for conference
LineStateOnHoldPendTransfer	*BOOL*	24.13	Connection in hold for transfer
LineStateDisconnected	*BOOL*	24.14	Connection terminated.
LineStateUnknow	*BOOL*	24.15	Connection status unknown
ModemStatus	*UDINT*	24	Current modem status

Name from import	Type	Offset	Description
TreiberStop	*BOOL*	28	Driver stopped For *driver stop*, the variable has the value *TRUE* and an **OFF** bit. After the driver has started, the variable has the value *FALSE* and no **OFF** bit.
SimulRTState	*UDINT*	60	Informs the status of Runtime for driver simulation.
ConnectionStates	*STRING*	61	Internal connection status of the driver to the PLC. Connection statuses: *0:* Connection OK *1:* Connection failure *2:* Connection simulated Formating: *<Netzadresse>:<Verbindungszustand>;...;...;* A connection is only known after a variable has first signed in. In order for a connection to be contained in a string, a variable of this connection must be signed in once. The status of a connection is only updated if a variable of the connection is signed in. Otherwise there is no communication with the corresponding controller.

CONFIGURATION

Name from import	Type	Offset	Description
ReconnectInRead	*BOOL*	27	If TRUE, the modem is automatically reconnected for reading
ApplyCom	*BOOL*	36	Apply changes in the settings of the serial interface. Writing to this variable immediately results in the method SrvDrvVarApplyCom being called (which currently has no further function).

Name from import	Type	Offset	Description
ApplyModem	*BOOL*	37	Apply changes in the settings of the modem. Writing this variable immediately calls the method SrvDrvVarApplyModem. This closes the current connection and opens a new one according to the settings **PhoneNumberSet** and **ModemHwAdrSet**.
PhoneNumberSet	*STRING*	38	Telephone number, that should be used
ModemHwAdrSet	*DINT*	39	Hardware address for the telephone number
GlobalUpdate	*UDINT*	3	Update time in milliseconds (ms).
BGlobalUpdaten	*BOOL*	4	TRUE, if update time is global
TreiberSimul	*BOOL*	5	TRUE, if driver in sin simulation mode
TreiberProzab	*BOOL*	6	TRUE, if the variables update list should be kept in the memory
ModemActive	*BOOL*	7	TRUE, if the modem is active for the driver
Device	*STRING*	8	Name of the serial interface or name of the modem
ComPort	*UINT*	9	Number of the serial interface.
Baudrate	*UDINT*	10	Baud rate of the serial interface.
Parity	*SINT*	11	Parity of the serial interface
ByteSize	*USINT*	14	Number of bits per character of the serial interface Value = *0* if the driver cannot establish any serial connection.
StopBit	*USINT*	13	Number of stop bits of the serial interface.
Autoconnect	*BOOL*	16	TRUE, if the modem connection should be established automatically for reading/writing
PhoneNumber	*STRING*	17	Current telephone number
ModemHwAdr	*DINT*	21	Hardware address of current telephone number

Name from import	Type	Offset	Description
RxIdleTime	*UINT*	18	Modem is disconnected, if no data transfer occurs for this time in seconds (s)
WriteTimeout	*UDINT*	19	Maximum write duration for a modem connection in milliseconds (ms).
RingCountSet	*UDINT*	20	Number of ringing tones before a call is accepted
ReCallIdleTime	*UINT*	53	Waiting time between calls in seconds (s).
ConnectTimeout	*UINT*	54	Time in seconds (s) to establish a connection.

STATISTICS

Name from import	Type	Offset	Description
MaxWriteTime	*UDINT*	31	The longest time in milliseconds (ms) that is required for writing.
MinWriteTime	*UDINT*	32	The shortest time in milliseconds (ms) that is required for writing.
MaxBlkReadTime	*UDINT*	40	Longest time in milliseconds (ms) that is required to read a data block.
MinBlkReadTime	*UDINT*	41	Shortest time in milliseconds (ms) that is required to read a data block.
WriteErrorCount	*UDINT*	33	Number of writing errors
ReadSucceedCount	*UDINT*	35	Number of successful reading attempts
MaxCycleTime	*UDINT*	22	Longest time in milliseconds (ms) required to read all requested data.
MinCycleTime	*UDINT*	23	Shortest time in milliseconds (ms) required to read all requested data.
WriteCount	*UDINT*	26	Number of writing attempts
ReadErrorCount	*UDINT*	34	Number of reading errors
MaxUpdateTimeNormal	*UDINT*	56	Time since the last update of the priority group **Normal** in milliseconds (ms).

Name from import	Type	Offset	Description
MaxUpdateTimeHigher	*UDINT*	57	Time since the last update of the priority group **Higher** in milliseconds (ms).
MaxUpdateTimeHigh	*UDINT*	58	Time since the last update of the priority group **High** in milliseconds (ms).
MaxUpdateTimeHighest	*UDINT*	59	Time since the last update of the priority group **Highest** in milliseconds (ms).
PokeFinish	*BOOL*	55	Goes to *1* for a query, if all current pokes were executed

ERROR MESSAGE

Name from import	Type	Offset	Description
ErrorTimeDW	*UDINT*	2	Time (in seconds since 1.1.1970), when the last error occurred.
ErrorTimeS	*STRING*	2	Time (in seconds since 1.1.1970), when the last error occurred.
RdErrPrimObj	*UDINT*	42	Number of the PrimObject, when the last reading error occurred.
RdErrStationsName	*STRING*	43	Name of the station, when the last reading error occurred.
RdErrBlockCount	*UINT*	44	Number of blocks to read when the last reading error occurred.
RdErrHwAdresse	*DINT*	45	Hardware address when the last reading error occurred.
RdErrDatablockNo	*UDINT*	46	Block number when the last reading error occurred.
RdErrMarkerNo	*UDINT*	47	Marker number when the last reading error occurred.
RdErrSize	*UDINT*	48	Block size when the last reading error occurred.
DrvError	*USINT*	25	Error message as number
DrvErrorMsg	*STRING*	30	Error message as text
ErrorFile	*STRING*	15	Name of error log file

8 Driver-specific functions

The driver supports the following functions:

CONNECTION STATUS

The current connection status can be requested via a BOOL variable of the **CONNECTION STATE** driver object type. The Function Type and Information Number of this variable must be 0. If the value of this variable is 1, this means that a connection is active (at least on the data link level).

GENERAL INTERROGATION (GENERAL INTERROGATION - GI)

The driver sends GI (ASDU <7> in control direction) cyclically, depending on the connection setting **GenInt** in the Driver configuration (on page 17). A GI will also be performed immediately after a connection is reestablished (if it was interrupted).

The driver also accepts received values of variables that are marked as not existent in the GI in the standard, in case the PLC sends such values.

A general query can also be sent as a broadcast. To do this, the link address (on page 17) *255* is used as a broadcast channel. For this, the following applies:

▸ General interrogation on a connection is only sent if the interval for this is not *0* (**GenInt** (on page 17) setting). Exception: Initial GI; this is always sent.

▸ General interrogation on a connection with link address *255* is sent as broadcast GI, if the interval is not *0* (**GenInt** (on page 17) setting).

TIME SYNCHRONIZATION

The driver sends time synchronization command (ASDU <6> in control direction) automatically upon every driver start, i.e. when starting zenon Runtime and after stopping/starting the driver (with zenon functions - driver commands: stop driver and start driver).

A clock synchronization can be re-executed at a later time. In order to do so, a variable of the driver object type TIME SYNC must be written to. The Function Type and Information Number of this variable must be 0. If the variable gets the value 1, the current time of the PC will be sent to the PLC. If the time synchronization could not be executed correctly, this variable will get the PN Bit.

Time synchronization can also be sent as a broadcast. To do this, the link address (on page 17) *255* is used as a broadcast channel. For this, the following applies:

▸ A *TIME SYNC* variable must be created for time synchronization.

▶ The variable must have the same network address as that used for the broadcast link address *255*.

▶ If this variable is set, a broadcast time synchronization is sent.

COMMANDS (GENERAL COMMAND)

To send General command to the PLC (ASDU <20> in control direction), you have to configure a variable of the driver object type COMMAND (on page 27) with the corresponding Function Type and Information Number. A set value sent to this variable (DCO: 1-off, 2-on) will be sent to the PLC as a General Command. If a command could not be sent successfully, the PN Bit of the variable will be set to 1.

CAUSE OF TRANSMISSION

The COT in the status of a variable is available and can be evaluated via a Rema, for example.

The response variable gets the COT from the PLC, and the driver forwards it to the control system. In the standard, COT 1 means 'spontaneous', COT 9 means 'general interrogation'.

The COT of the command will be set for the control system by the driver itself. In the direction of the PLC, the COT will be sent in accordance with standard 60870-103, but for the control system, the driver uses the COT in accordance with the standard 61870-101/104 (e.g. COT value 7 COT_actcon), in order to ensure the compatibility with the command processing. This way, the set value input with watchdog timer via cause of transmission is supported.

INVALID STATUS

The driver will set the Invalid Bit after the timeout has passed, if there is an error in the communication (TCP/IP) with the driver.

INVALID will also be set for Measurands values in whose structure (MEA) the Quality descriptor has the value ER (MVAL invalid) activated.

OV BIT STATUS

OV Bit will also be set for Measurands values, in whose structure (MEA) the Quality descriptor has the value OV (Overflow) activated.

VARIABLES THAT ARE NOT CONTAINED IN GI

Some PLCs not for all indicators (data points) send a reset of the value (from ON to OFF). Even if not all indicators are in GI by default (e.g. status indicator 'LED reset').

For such variables, we recommend the driver object type MONITORING TRANSIENT (on page 27). The received value is immediately set to 0 by the driver and can be evaluated by creating an alarm or function for limit value violation for limit value 1 (value OFF counter) or for limit value 2 (value OFF and ON counter).

If a variable of the driver object type MONITORING does not answer to a general interrogation (GI) (e.g. Time-trigged measurand - ASDU<4>), it will get the value 0 and the driver will also set the SB Bit (Substituted).

VARIABLES TIMESTAMP

Monitoring variables:

- ▶ Time-tagged message (ASDU<1>)

- ▶ Time-tagged message with relative time (ASDU<2>)

- ▶ Time-tagged measurands with relative time (ASDU<4>)

come from IEC 60870-5-103 PLCs signed with CP32Time2a time stamp. The driver uses this time for the time stamp of the variable and sets the T_EXTERN (Real-time external). All control system modules now use this time stamp, e.g. Historian, alarm list...

The counters   RET and FAN from ASDUs <2> u.<4> will not be considered by the driver.

DISTURBANCE DATA REQUEST

The Disturbance Data files are stored in the specified directory (in the driver configuration) in subfolders according to their Net address (i.e. for Net address 1, there will be a subdirectory '1', in which the files will be stored).

To fetch Disturbance Data files for a Function Type or to view the available data, you have to configure two String variables of the driver object type DISTURBANCE DATA (on page 27) and the according Function Type.
The variable with Information Number 0 is the command and status variable, the one with Information Number 1 is the directory variable. The index of these variables is ignored.

If you set the value of the variable for Information Number 0 to 'DIR', the directory information will be updated and shown in the variable with Information Number 1. After executing the operation, the variable with Information Number 0 will get the value '*DIR OK*' or '*DIR ERROR*'.

By sending '*GET [FaultNo]* to the variable with Information Number 0, the corresponding Disturbance Data file is retrieved and stored in the configured directory as Comtrade files called '[FktType]-[FaultNo].cfg' and '[FktType]-[FaultNo].dat' (for example: '128-3.cfg, 128-3.dat'). After executing the operation, the variable with Information Number 0 will get the value '*GET OK*' or '*GET ERROR*'.

SPECIFIC LOG ENTRIES

▸ '*Callback Status: Variable: , Status: I870CHNL_RESP_STATUS_TIMEOUT*'

The driver could not establish a connection with the PLC, the connection was interrupted or the PLC did not response within time.

▸ '*LOG:ConvertTime: Invalid TimeStamp*'

The timestamp received from the PLC does not match the CP32Time2a format.

9 Driver command function

The zenon **Driver commands** function is to influence drivers using zenon.
You can do the following with a driver command:

▸ Start

▸ Stop

▸ Shift a certain driver mode

▸ Instigate certain actions

Note: This chapter describes standard functions that are valid for most zenon drivers.
Not all functions described here are available for every driver. For example, a driver that does not, according to the data sheet, support a modem connection also does not have any modem functions.

> ⚠ **Attention**
>
> The zenon **Driver commands** function is not identical to driver commands that can be executed in the Runtime with Energy drivers!

CONFIGURATION OF THE FUNCTION

Configuration is carried out using the **Driver commands** function.
To configure the function:

1. Create a new function in the zenon Editor.

The dialog for selecting a function is opened
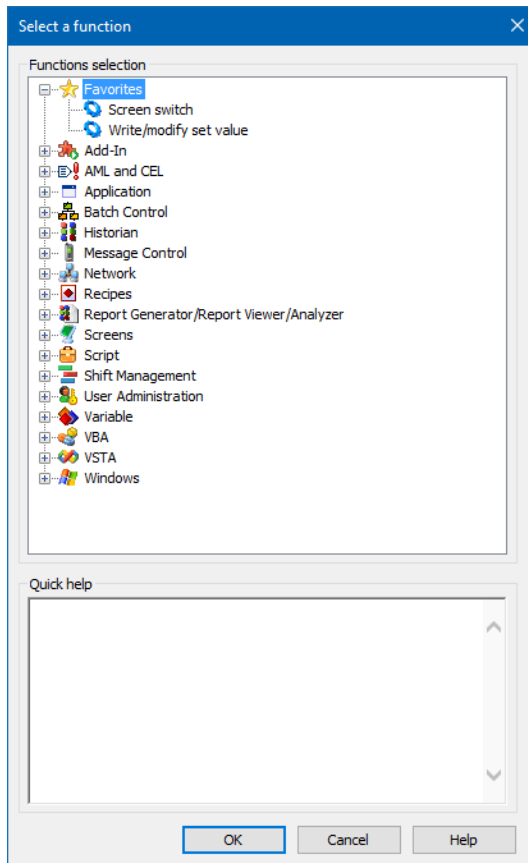
2. Navigate to the node **Variable.**

3. Select the **Driver commands** entry.

    The dialog for configuration is opened
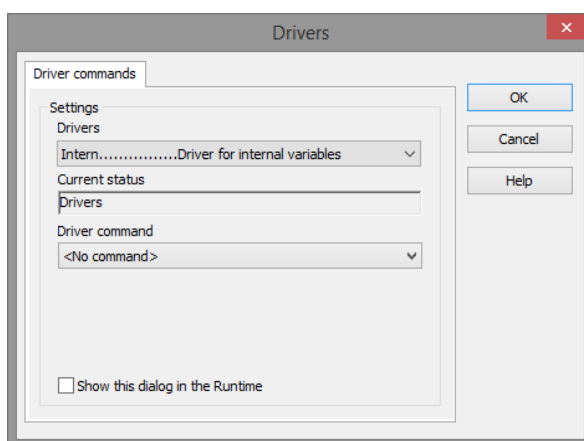
4. Select the desired driver and the required command.

5. Close the dialog by clicking on **OK** and ensure that the function is executed in the Runtime. Heed the notices in the **Driver command function in the network** section.

DRIVER COMMAND DIALOG

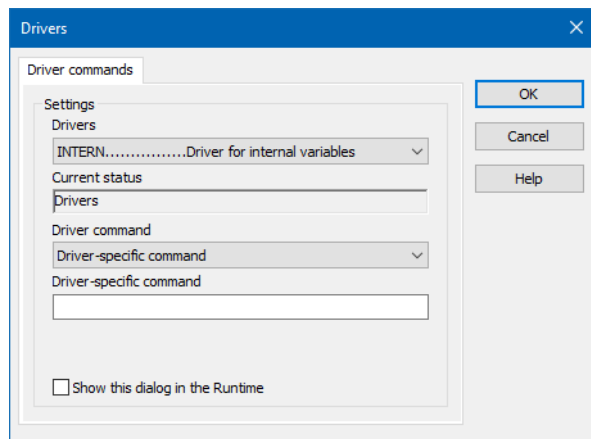| Option	Description
Driver	Selection of the driver from the drop-down list. It contains all drivers loaded in the project.
Current condition	Fixed entry that is set by the system. Has no function in the current version.
Driver command	Selection of the desired driver command from a drop-down list. For details on the configurable driver commands, see the **available driver commands** section.
Driver-specific command	Entry of a command specific to the selected driver. **Note:** Only available if, for the **driver command** option, the *driver-specific command* has been selected.
Show this dialog in the Runtime	Configuration of whether the configuration can be changed in the Runtime: ‣ *Active*: This dialog is opened in the Runtime before executing the function. The configuration can thus still be changed in the Runtime before execution. ‣ *Inactive*: The Editor configuration is applied in the Runtime when executing the function. Default: *inactive*

CLOSE DIALOG

Options	Description
OK	**Applies settings and closes the dialog.**
Cancel	Discards all changes and closes the dialog.
Help	Opens online help.

AVAILABLE DRIVER COMMANDS

These driver commands are available - depending on the selected driver:

Driver command	Description
<No command>	No command is sent. A command that already exists can thus be removed from a configured function.
Start driver (online mode)	Driver is reinitialized and started. **Note:** If the driver has already been started, it must be stopped. Only then can the driver be re-initialized and started.
Stop driver (offline mode)	Driver is stopped. No new data is accepted. **Note:** If the driver is in offline mode, all variables that were created for this driver receive the status *switched off* (*OFF*; Bit *20*).
Driver in simulation mode	Driver is set into simulation mode. The values of all variables of the driver are simulated by the driver. No values from the connected hardware (e.g. PLC, bus system, ...) are displayed.
Driver in hardware mode	Driver is set into hardware mode. For the variables of the driver the values from the connected hardware (e.g. PLC, bus system, ...) are displayed.
Driver-specific command	Entry of a driver-specific command. Opens input field in order to enter a command.
Activate driver write set value	Write set value to a driver is possible.
Deactivate driver write set value	Write set value to a driver is prohibited.
Establish connection with modem	Establish connection (for modem drivers)

Driver command	Description
	Opens the input fields for the hardware address and for the telephone number.
Disconnect from modem	Terminate connection (for modem drivers)
Driver in counting simulation mode	Driver is set into counting simulation mode. All values are initialized with *0* and incremented in the set update time by *1* each time up to the maximum value and then start at *0* again.
Driver in static simulation mode	No communication to the controller is established. All values are initialized with *0*.
Driver in programmed simulation mode	The values are calculated by a freely-programmable simulation project. The simulation project is created with the help of the zenon Logic Workbench and runs in the zenon Logic Runtime.

DRIVER COMMAND FUNCTION IN THE NETWORK

If the computer on which the **Driver commands** function is executed is part of the zenon network, further actions are also carried out:

‣ A special network command is sent from the computer to the project server.
It then executes the desired action on its driver.

‣ In addition, the Server sends the same driver command to the project standby.
The standby also carries out the action on its driver.

This makes sure that Server and Standby are synchronized. This only works if the Server and the Standby both have a working and independent connection to the hardware.

10 Interoperability List

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 information object 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 in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific 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 be marked 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. PHYSICAL LAYER

ELECTRICAL INTERFACE

[X] EIA RS-485

[X] Number of loads 32

OPTICAL INTERFACE

[X] Glass Fiber

[X] Plastic Fiber

[X] F-SMA type connector

[X] BFOC/2,5 type connector

TRANSMISSION SPEED

[X] 9600 bit/s

[X] 12900 bit/s

2. LINK LAYER

There are no choices for the Link Layer.

3. APPLICATION LAYER

TRANSMISSION MODE FOR APPLICATION DATA

Mode 1

COMMON ADDRESS OF ASDU

[X] One COMMON ADDRESS of ASDU (identical to station address)

[   ] More than one COMMON ADDRESS of ASDU

SELECTION OF STANDARD INFORMATION NUMBERS IN MONITOR DIRECTION

System functions in monitor direction		
	Inf	**Semantics**
[X]	<0>	End of general interrogation
[X]	<0>	Time synchronization
[X]	<2>	Reset FCB
[X]	<3>	Reset CU
[X]	<4>	Start/restart
[X]	<5>	Power on

Status indications in monitor direction		
	Inf	**Semantics**
[X]	<16>	Auto-recloser active
[X]	<17>	Teleprotection active
[X]	<18>	Protection active
[X]	<19>	LED reset
[X]	<20>	Monitor direction blocked

Status indications in monitor direction		
[X]	<21>	Test mode
[X]	<22>	Local parameter setting
[X]	<23>	Characteristic 1
[X]	<24>	Characteristic 2
[X]	<25>	Characteristic 3
[X]	<26>	Characteristic 4
[X]	<27>	Auxiliary input 1
[X]	<28>	Auxiliary input 2
[X]	<29>	Auxiliary input 3
[X]	<30>	Auxiliary input 4

Supervision indications in monitor direction		
	Inf	**Semantics**
[X]	<32>	Measurand supervision I
[X]	<33>	Measurand supervision V
[X]	<35>	Phase sequence supervision
[X]	<36>	Trip circuit supervision
[X]	<37>	I>> back-up operation
[X]	<38>	VT fuse failure
[X]	<39>	Teleprotection disturbed
[X]	<46>	Group warning
[X]	<47>	Group alarm

Earth fault indications in monitor direction		
	Inf	**Semantics**
[X]	<48>	Earth fault L_1

Earth fault indications in monitor direction

[X]	<49>	Earth fault L $_2$
[X]	<50>	Earth fault L $_3$
[X]	<51>	Earth fault forward, i.e. line
[X]	<52>	Earth fault reverse, i.e. busbar

Fault indications in monitor direction

	Inf	Semantics
[X]	<64>	Start /pick-up L $_1$
[X]	<65>	Start /pick-up L $_2$
[X]	<66>	Start /pick-up L $_3$
[X]	<67>	Start /pick-up N
[X]	<68>	General trip
[X]	<69>	Trip L $_1$
[X]	<70>	Trip L $_2$
[X]	<71>	Trip L $_3$
[X]	<72>	Trip I>> (back-up operation)
[X]	<73>	Fault location X in ohms
[X]	<74>	Fault forward/line
[X]	<75>	Fault reverse/busbar
[X]	<76>	Teleprotection signal transmitted
[X]	<77>	Teleprotection signal received
[X]	<78>	Zone 1
[X]	<79>	Zone 2
[X]	<80>	Zone 3
[X]	<81>	Zone 4
[X]	<82>	Zone 5

Fault indications in monitor direction		
[X]	<83>	Zone 6
[X]	<84>	General start/pick-up
[X]	<85>	Breaker failure
[X]	<86>	Trip measuring system L_1
[X]	<87>	Trip measuring system L_2
[X]	<88>	Trip measuring system L_3
[X]	<89>	Trip measuring system E
[X]	<90>	Trip I>
[X]	<91>	Trip I>>
[X]	<92>	Trip IN>
[X]	<93>	Trip IN>>

Auto-reclosure indications in monitor direction		
	Inf	**Semantics**
[X]	<128>	CB 'on' by AR
[X]	<129>	CB 'on' by long-time AR
[X]	<130>	AR blocked

Measurands in monitor direction		
	Inf	**Semantics**
[X]	<144>	Measurand I
[X]	<145>	Measurands I, V
[X]	<146>	Measurands I, V, P, Q
[X]	<147>	Measurands I_N , V_{EN}
[X]	<148>	Measurands $I_{L1,2,3}$, $V_{L1,2,3}$, P, Q, f

Generic functions in monitor direction			
		Inf	**Semantics**
[	]	<240>	Read headings of all defined groups
[	]	<241>	Read values or attributes of all entries of one group
[	]	<243>	Read directory of a single entry
[	]	<244>	Read value or attribute of a single entry
[	]	<245>	End of general interrogation of generic data
[	]	<249>	Write entry with confirmation
[	]	<250>	Write entry with execution
[	]	<251>	Write entry aborted

SELECTION OF STANDARD INFORMATION NUMBERS IN CONTROL DIRECTION

System functions in control direction		
	Inf	**Semantics**
[X]	<0>	Initiation of general interrogation
[X]	<0>	Time synchronization

General commands in control direction		
	Inf	**Semantics**
[X]	<16>	Auto-recloser on/off
[X]	<17>	Teleprotection on/off
[X]	<18>	Protection on/off
[X]	<19>	LED reset
[X]	<23>	Activate characteristic 1
[X]	<24>	Activate characteristic 2
[X]	<25>	Activate characteristic 3
[X]	<26>	Activate characteristic 4

Generic functions in control direction		
	Inf	Semantics
[ ]	<240>	Read headings of all defined groups
[ ]	<241>	Read values or attributes of all entries of one group
[ ]	<243>	Read directory of a single entry
[ ]	<244>	Read value or attribute of a single entry
[ ]	<245>	General interrogation of generic data
[ ]	<248>	Write entry
[ ]	<249>	Write entry with confirmation
[ ]	<250>	Write entry with execution
[ ]	<251>	Write entry abort

BASIC APPLICATION FUNCTIONS

[X]	Test mode
[X]	Blocking of monitor direction
[X]	Disturbance data
[ ]	Generic services
[ ]	Private data

MISCELLANEOUS

Measurands are transmitted with ASDU 3 as well as with ASDU 9. As defined in 7.2.6.8, the maximum MVAL can either

be 1,2 or 2,4 times the rated value. No different rating shall be used in ASDU 3 and ASDU 9, i.e., for each measurand

there is only one choice.

Measurand	Max. MVAL	= rated value times
Current L_1	1,2	or 2.4
Current L_2	[X]	[X]
Current L_3	[X]	[X]

Measurand	Max. MVAL	= rated value times
Voltage L $_{1-E}$	[X]	[X]
Voltage L $_{2-E}$	[X]	[X]
Voltage L $_{3-E}$	[X]	[X]
Active power P	[X]	[X]
Reactive power Q	[X]	[X]
Frequency f	[X]	[X]
Voltage L $_1$ - L $_2$	[X]	[X]

11 Error analysis

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

11.1 Analysis tool

All zenon modules such as Editor, Runtime, drivers, etc. write messages to a joint 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 8.10 -> Diagviewer.**

zenon driver log all errors in the LOG files.LOG files are text files with a special structure. The default folder for the LOG files is subfolder **LOG** in the folder **ProgramData**. For example:

%ProgramData%\COPA-DATA\LOG.

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 newly-created entries in real time

  ▶   customize the logging settings

  ▶   change the folder in which the LOG files are saved

Note:

  1.   The Diagnosis Viewer displays all entries in UTC (coordinated world time) and not in local time.

2. 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.

3. If you only use **Error-Logging**, the problem description is in the column **Error text**. For other diagnosis level the description is in the column **General text**.

4. For communication problems many drivers also log error numbers which the PLC assigns to them. They are displayed in **Error text** or **Error code** 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.

5. 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.

> ⚠ **Attention**
>
> In Windows CE errors are not logged per default due to performance reasons.

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

11.2 Check list

▸ TCP/IP:
- • Is the device you are trying to communicate with connected to the power supply?
  - • Is the PC and the device connected to the network?
- • Is the TCP/IP protocol installed?
- • Is the IP address in use by another application?

▸ Serial:
- • Is the COM port in use by another application or are the settings incorrect?
- • Is the device (PLC) you are trying to communicate with connected to the power supply?
- • Is the cable between PLC and PC or IPC connected correctly?

▸ General:
- • Have you already analyzed the   Diagnosis Viewer entries? Which errors occurred?
- • Are the Driver settings (on page 17) (connection settings) correct, e.g. link address and section no.?
- • Is the Variable addressing (on page 27) correct, e.g. does the Net address match the one in the driver configuration; do the indicators/data points with the entered FUN (Function Type) and INF (Information Number) exist in the PLC?
- • Did you choose a time interval for the General Interrogation (GI) that is long enough (at least 15 minutes recommended)?