COPA-DATA
do it your way

zenon driver manual

MtoM32

v.7.50

Contents

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).

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2. MtoM32

The **MtoM32** driver is a passive driver with an open protocol for zenon.

All write and read access is controlled by the connected communication partner/host (PLC or PC). The externally-controlled monitor display of the control system only changes after a data transfer from the partner to zenon. The data transfer from zenon to the master is carried out by a read command. The partner must send this read command.

System memory is available as a data buffer in zenon for communication.

Connection is not possible on PC systems with the "RS 485" setting.

3. MTOM32 - Data sheet

General:	
Driver file name	MTOM32.exe
Driver name	Memory to Memory driver
PLC types	Any which implements the protocoll
PLC manufacturer	Pilz;

Driver supports:	
Protocol	Pilz MtoM;
Addressing: Address-based	X
Addressing: Name-based	--
Spontaneous communication	--
Polling communication	X
Online browsing	--
Offline browsing	--
Real-time capable	--
Blockwrite	--
Modem capable	--
Serial logging	--
RDA numerical	--
RDA String	--

Requirements:	
Hardware PC	--
Software PC	--
Hardware PLC	--
Software PLC	--
Requires v-dll	X

Platforms:	
Operating systems	Windows CE 6.0, Embedded Compact 7; Windows 7, 8, 8.1, 10, Server 2008R2, Server 2012, Server 2012R2;
CE platforms	x86; ARM;

4. Driver history

Date	Build number	Change
20.09.2014	14584	Created new driver documentation.

5. Configuration

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

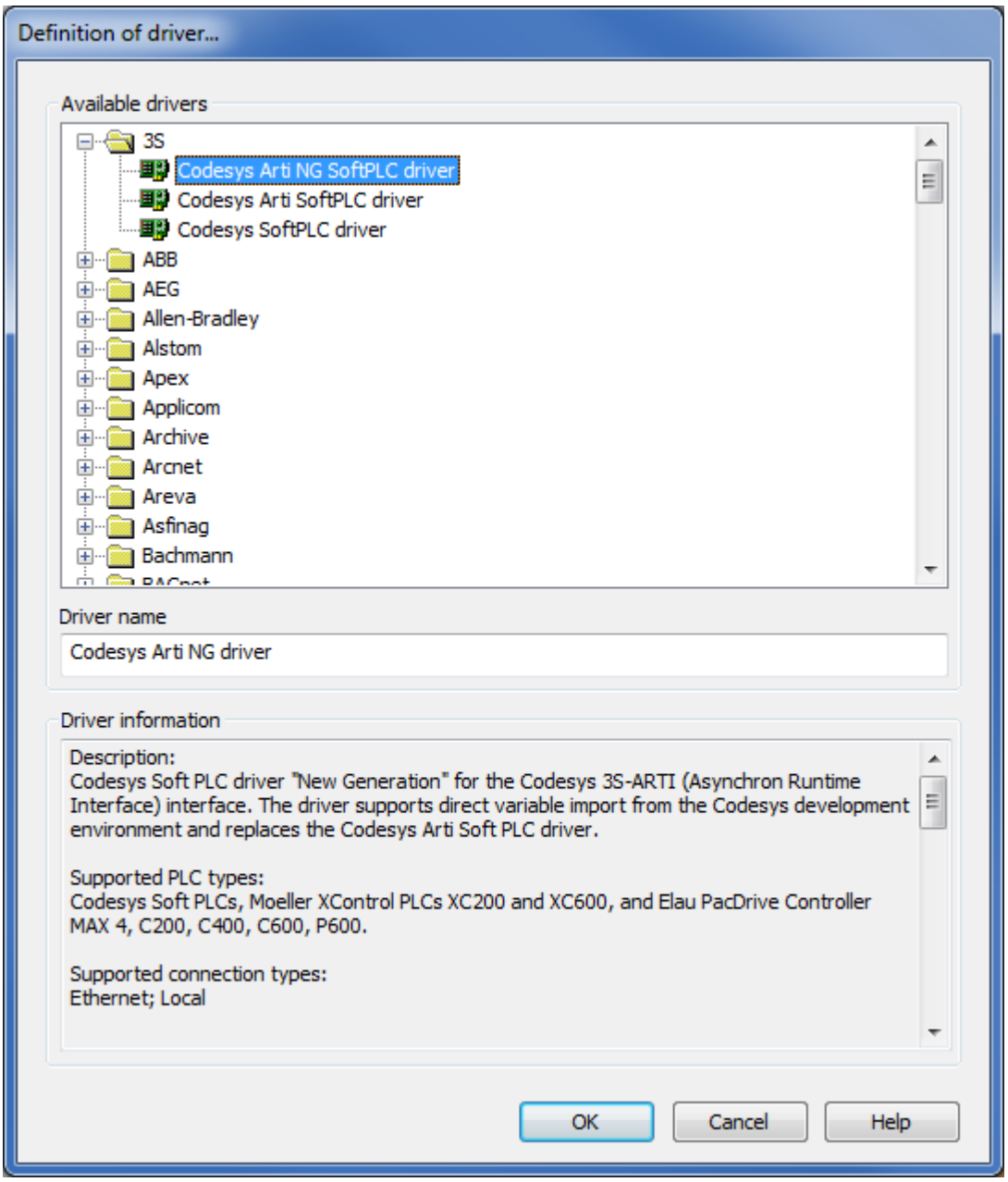
Information

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

5.1 Creating a driver

In order to create a new driver:

1. Right-click on **Driver** in the Project Manage and select **Driver new** in the context menu.
2. In the following dialog the control system offers a list of all available drivers.



3. Select the desired driver and give it a name:
   - The driver name has to be unique, i.e. if one and the same driver is to be used several times in one project, a new name has to be given each time.

- 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 with **OK**. In the following dialog the single configurations of the drivers are defined.

Only the respective required drivers need to be loaded for a project. Later loading of an additional driver is possible without problems.

Information

For new projects and for existing projects which are converted to version 6.21 or higher, the following drivers are created automatically:

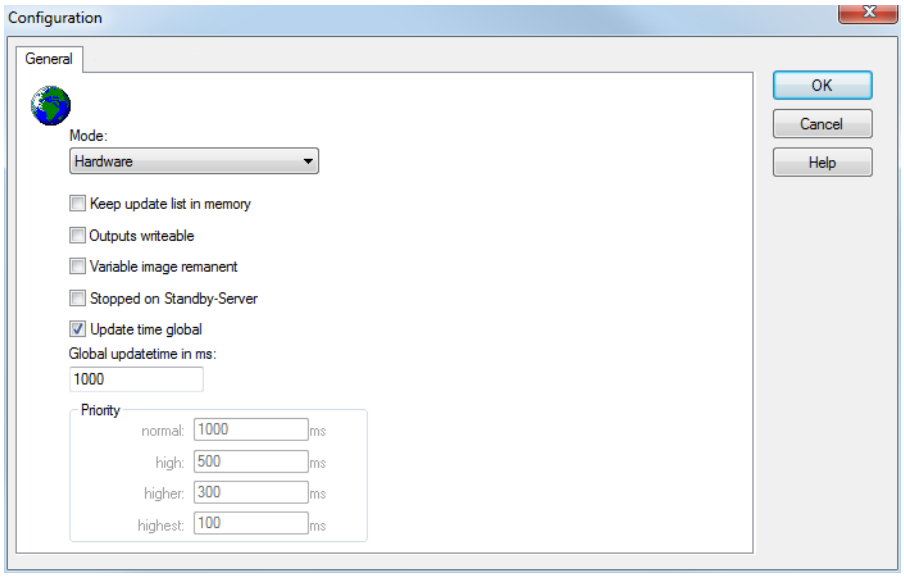
- Internal
- MathDr32
- SysDrv.

5.2 Settings in the driver dialog

You can change the following settings of the driver:

5.2.1 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.



Parameters	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 within a value range automatically. ▸ Simulation - programmed N 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 mode hardware if: ▸ one of the states S_MERKER_1(0) up to S_MERKER8(7), REVISION(9), AUS(20) or ERSATZWERT(27) is active The variable image is always saved if: ▸ the variable is of the object type **Driver variable** ▸ the driver runs in simulation mode. (not 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 on 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. 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	`Active`: The set **Global update time** in `ms` 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.
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 allocation to the variables takes place separately in the settings of the variable properties. The communication of the individual variables are graduated in respect of importance or necessary topicality using the priorities.

	Thus the communication load is distributed better. Attention: Priority classes are not supported by each driver For example, drivers that communicate spontaneously do not support it.

CLOSE DIALOG

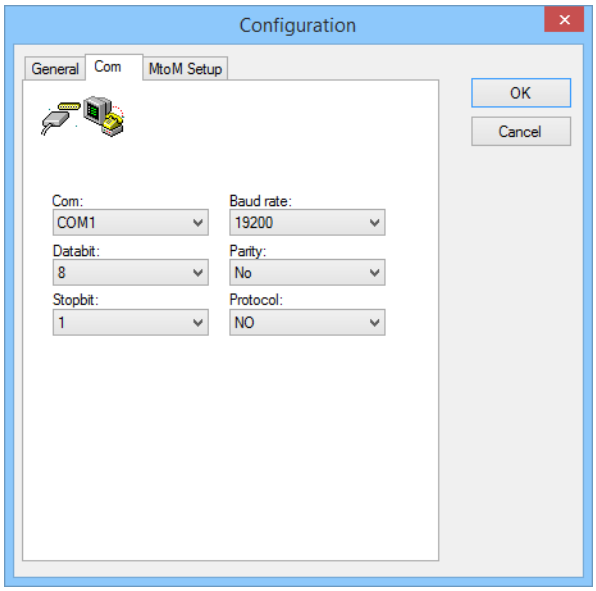
Parameters	Description
OK	Applies all changes in all tabs and closes the dialog.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

UPDATE TIME FOR CYCLICAL DRIVERS

The following applies for cyclical drivers:

For **Set value**, **Advising** of variables and **Requests**, a read cycle is immediately triggered for all drivers - regardless of the set update time. This ensures that the value is immediately available for visualization after writing. Update times can therefore be shorter than pre-set for cyclical drivers.

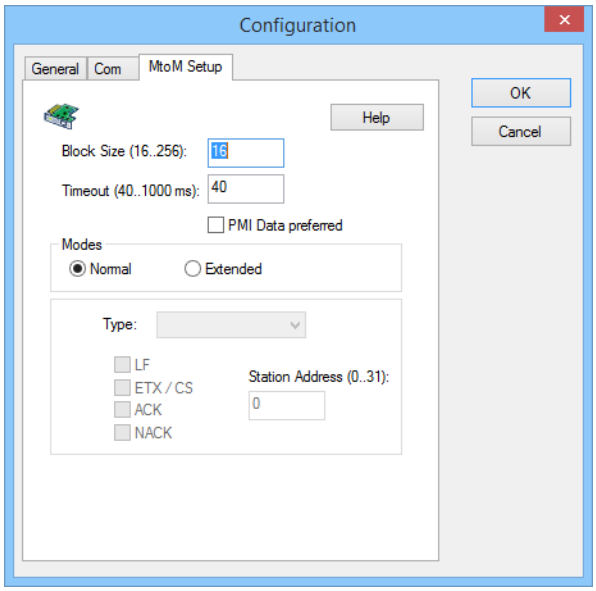
5.2.2 Com



Parameters	Description
Com:	Selection of the serial interface (physical communication port) on the computer via which the communication is carried out: COM 1 to COM 9 Default: COM1
Data bit:	Variable for selecting the number of data bits: ▶ 5 ▶ 6 ▶ 7 ▶ 8 Default: 8
Stop bit:	Drop-down list to select the number of stop bits. Allows the recipient to synchronize to each transferred character. ▶ 1 ▶ 1.5 ▶ 2 Default: 1
Baud rate:	Drop-down list to select the Baud rate for interface communication. Selection options: 4800, 9600, 19200, 38400, 56000, 57600, 115200 Default: 19200
Parity:	Selection of the parity protocol from a drop-down list: ▶ No No parity - no control bit ▶ Odd Parity bit is set if the number of data bits is even. ▶ Even Parity bit is set if the number of data bits is not even. Default: No
Protocol:	Selection of the interface standard for the interface from a drop-down list:

	▶ NO ▶ RS485 (for increased stability) Default: NO

5.2.3 MtoM settings



Parameters	Description
Block size (16..256)	Internal block size between Runtime and MtoM32 driver. Value range: 16 to 256 (words) Default: 16
Timeout (40...1000 ms)	Character delay time. Timeout time in milliseconds If there are pauses that are longer than the setting within a telegram, the corresponding telegram is discarded. Value range: 40 to 1000 Default: 40
PMI data preferred	Multicast communication has priority if activated. Default: not active
Modes	Drop-down list for the selection of the communication mode. This setting influences the further configuration possibilities for the communication type and the station address. ▸ Normal ▸ Extended Default: Normal Please also note the notes on system memory (on page 32)
Type	Drop-down list for the selection of the xx type: ▸ 1: 1 ASCII ▸ 1:1 Binary ▸ 1:N ASCII ▸ 1:N Binary Only active if mode is Extended Please also note the notes on system memory (on page 32)
Additional telegrams	The following functions can be selected in Extended mode: ▸ **LF** Line Feed Note: only active if type is ASCII ▸ **ETX / CS** End of Text/Checksum ▸ **ACK** Acknowledge telegram (ACK)

	▸ **NACK** Not-Acknowledge telegram (NAK) The selected functions are appended to the response or send telegram
Station address (0...31):	With the `1:n modes`, several stations (slave) can be connected to the host (master). The entry of a station address is absolutely necessary in this case. Value range: `0 to 31 (00`$_{Dec}$ `to 1F`$_{Hex}$`)` Default: `0` Only active if type is `1:N`. Note: If 255$_{Dec}$ (FF^{Hex}) is given as the station address, the telegram is received by all control systems. If 255$_{Dec}$ (FF$_{Hex}$) is given as the station number, the telegram is received from all PMI.

Attention

A response telegram never follows a telegram with the address 255$_{Dec}$ (FF$_{Hex}$) - not even ACK or NAK.

Communication modes

The **MtoM32** driver provides a total of five different communication modes:

- Normal mode (ASCII codes)
- Extended mode
  - 1:1 ASCII mode
  - 1:1 Binary mode
  - 1:n ASCII mode
  - 1:n Binary mode

The `normal mode` and the `Extended mode 1:1 ASCII` or `1:1 Binary` are suitable for point-to-point connections. In doing so, a master (PLC, microcontroller, PC) and a control system/PC are present. The master sends read and write telegrams to the control system/PC.

`Extended mode 1:n ASCII` or `1:n Binary` allow the connection of several control systems (slaves) to a master. The master then communicates alternately with the connected devices. The sequence of when communication takes place with which slave is determined by the user program in the master.

There is also the possibility of a transmission telegram to all slaves (group call), however only with a write command. Therefore data that needs all slaves can be transferred very quickly. With a group call, the connected slaves do not respond. There is also no return information about whether the telegram has been understood or not.

DIFFERENCE BETWEEN ASCII CODE AND BINARY CODE

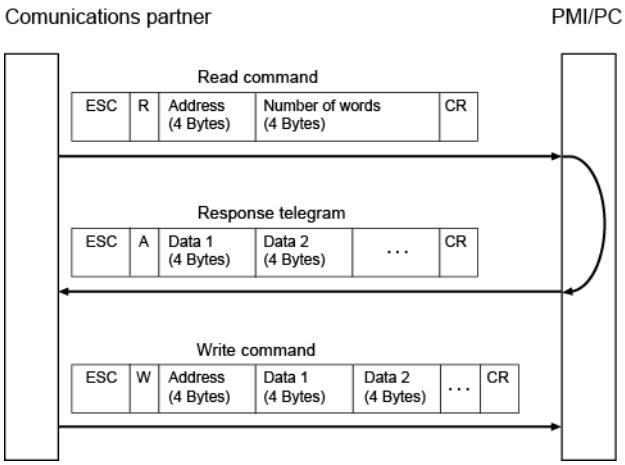
With the modes `1:n ASCII`, `1:1 ASCII` and 1:n ASCII, all characters are converted to ASCII characters. The control characters are organized in hex (binary) code. As a result, the data in the telegram is clearly differentiated from the control character.

The binary modes (`1:1 Binary` and `1:n Binary`) transfer the control characters and the data in binary (hex) code. A type of data compression occurs as a result.

Information

In binary mode, control characters that look like end identifications ETX, CR, LF) can also be present. The master thus has no unique end character for a telegram

Normal mode



Character	Identification	Meaning	Hex
R	Read	Reading of data from the PMI/PC	52
A	Answer	Response to read telegram	41
W	Write	Writing of data in PMI/PC	57
CR	Carrige Return	Command end character	0D
ESC	Escape	Command start character	1b

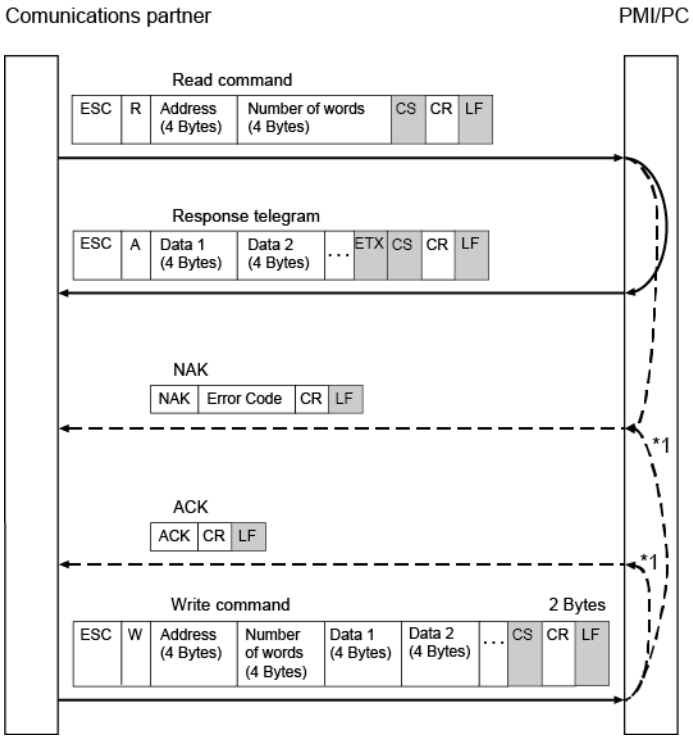
WRITE COMMAND

With a write command, data is transferred from the PLC to the slave (PMI/PC). The start code, the write command and the return are entered in hexadecimal. The address and the data are entered in ASCII code.

Extended mode

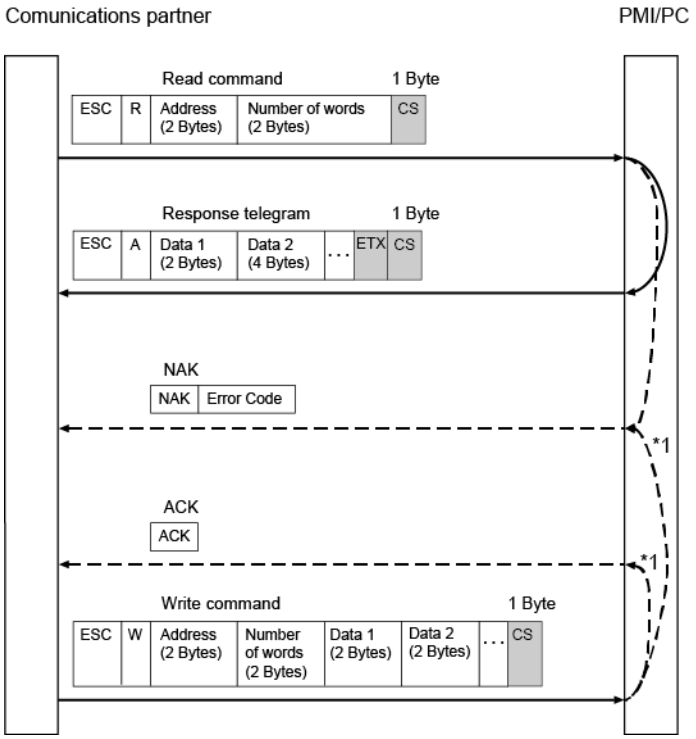
Optional control characters are underlined in gray in the following illustrations. Optional telegrams are marked with dotted arrow lines

1:1 ASCII mode



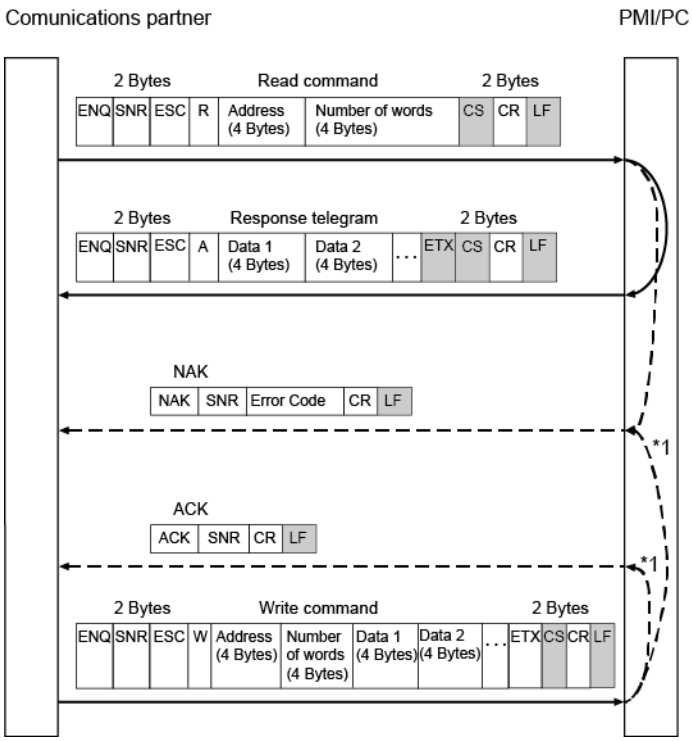
Character	Identification	Meaning	Hex
R	Read	Reading of data from the PMI/PC	52
A	Answer	Response to read telegram	41
W	Write	Writing of data in PMI/PC	57
ACK	Acknowledge	Receive data without errors	06
NAK	Negativ Acknowledge	Errors on receipt of data	15
CR	Carrige Return	End character command	0D
LF	Line Feed	End character command	0A
ETX	End of Text	End character telegram	03
ESC	Escape	Start character telegram	1B
CS	Checksum	Checksum	-

1:1 Binary mode



Character	Identification	Meaning	Hex
R	Read	Reading of data from the PMI/PC	52
A	Answer	Response to read telegram	41
W	Write	Writing of data in PMI/PC	57
ACK	Acknowledge	Receive data without errors	06
NAK	Negativ Acknowledge	Errors on receipt of data	15
ETX	End of Text	End character telegram	03
ESC	Escape	Command start character	1B
CS	Checksum	Checksum	-

1:n ASCII mode



Character	Identification	Meaning	Hex
R	Read	Reading of data from the PMI/PC	52
A	Answer	Response to read telegram	41
W	Write	Writing of data in PMI/PC	57
ACK	Acknowledge	Receive data without errors	06
NAK	Negativ Acknowledge	Errors on receipt of data	15
CR	Carrige Return	End character command	0D
LF	Line Feed	End character command	0A
ETX	End of Text	End character telegram	03
ENQ	Enquiry	Start character telegram	05
ESC	Escape	Command start character	1B
SNR	Slave Number	Slave number	-
CS	Checksum	Checksum	-

With the 1:n modes, several stations (slave) can be connected to the host (master). For this reason, the station number must also be entered in the telegrams.

Note: If 255_{Dec} (FF_{Hex}) is given as a station number, the telegram is received by all control systems.

Information

A response telegram never follows a telegram with the address 255_{Dec} (FF_{Hex}) - not even ACK or NAK.

READ COMMAND IN 1:N ASCII MODE (WITH ETX/CS WITH CR + LF, WITHOUT ACK, WITHOUT NAK)

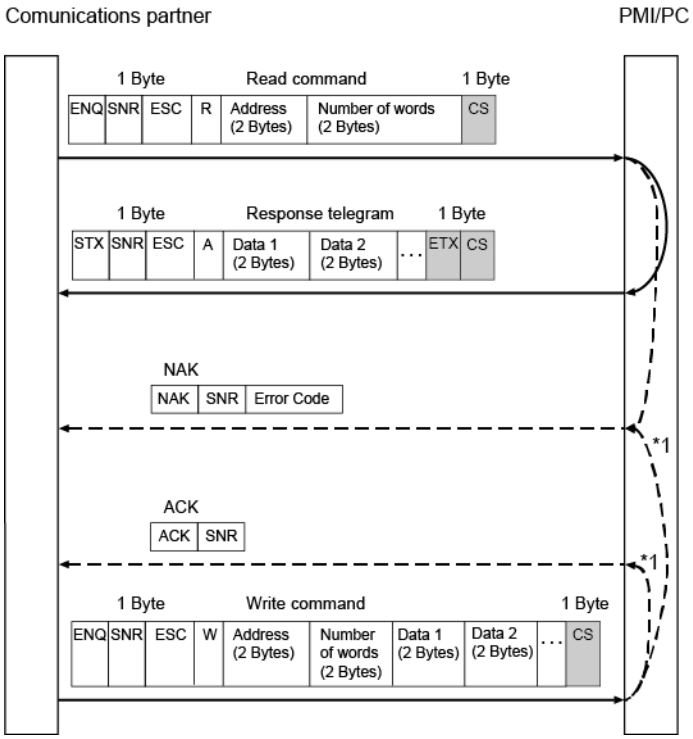
The control system with the participant address 02 should send the content of the flag words 101, 102, 103, 104 and 105 to the partner.

ENQ	SNR 2 bytes	ESC	R	Address (4 bytes)	Number of words (4 bytes)	CS 2 bytes	CR	LF
05	30 32	1B	52	30 30 36 35	30 30 30 35	45 32	0D	0A

Content of	Value (dec)		Value (hex)
MW 101:	12345	3039_{Hex}	33 30 33 39
MW 102:	6789	$1A85_{Hex}$	31 41 38 35
MW103:	2	0002_{Hex}	30 30 30 32
MW 104:	24671	$605F_{Hex}$	36 30 35 46
MW 105	13572	3504_{Hex}	33 35 30 34

ENQ	SNR 2 bytes	ESC	A	MW 101	MW 102	MW 103	MW 104	MW 105	ETX	CS 2 bytes	CR	LF
05	30 32	1B	41	33 30 33 39	31 41 38 35	30 30 30 32	36 30 35 46	33 35 30 34	03	45 32	0D	0A

1:n Binary mode



Character	Identification	Meaning	Hex
R	Read	Reading of data from the PMI/PC	52 H
A	Answer	Response to read telegram	41 H
W	Write	Writing of data in PMI/PC	57
ACK	Acknowledge	Receive data without errors	06 H
NAK	Negative Acknowledge	Errors on receipt of data	15 H
ETX	End of Text	End character telegram	03 H
STX	Start of Text	Start character telegram	02 H
ENQ	Enquiry	Start character telegram	05 H
ESC	Escape	Command start character	1B H
SNR	Slave Number	Slave number	-
CS	Checksum	Checksum	-

READ COMMAND IN 1:N BINARY MODE (WITH ETX/CS WITH CR + LF, WITHOUT ACK, WITHOUT NAK)

The PMI/the PC with the participant address 02 should send the content of the words 101, 102, 103, 104 and 105 to the partners.
The partner sends the following read commands:

ENQ	SNR 1 byte	ESC	R	Address (4 bytes)	Number of words (4 bytes)	CS 1 byte
05	02	1B	52	30 30 36 35	30 30 30 35	38

RESPONSE TELEGRAM IN 1:N BINARY MODE

The control system responds with the response telegram

Content of	Value (dec)	Value (hex)
MW 101:	12345	33 30 33 39
MW 102:	6789	31 41 38 35
MW103:	2	30 30 30 32
MW 104:	24671	36 30 35 46
MW 105	13572	33 35 30 34

STX	SNR 1 byte	ESC	A	MW 101	MW 102	MW 103	MW 104	MW 105	ETX	CS 1 byte
05	02	1B	41	33 30 33 39	33 41 38 35	30 30 30 32	33 36 35 46	33 35 30 34	03	63

Calculation of the checksum

The checksum is for checking the telegram to see that it has been sent correctly. The data transferred can be incorrect as a result of interference. This can sometimes be detected with the checksum.

In principle, the checksum displays the sum of all transferred data.

Information

Because one byte is envisaged for the checksum, this can assume the value 255_{Dec} (FF_{Hex}) as a maximum. If the calculated sum does not exceed this value, only the last two figures of the sum are transferred in hexadecimal as a checksum.
Tip: Note the following example 2 in relation to this.

With the ASCII modes, these two figures must also be converted into ASCII characters. The Start characters `STX` and STX are not included in the checksum calculation. All characters after the checksum are also not included in the calculation.

Example for the calculation of the checksum:

EXAMPLE 1 - MODE 1:N ASCII

For mode 1:n ASCII (with ETX/CS, with CR+LF)

Writing of the value 00C8Hex (200D) to address 0064Hex

(100Dec) to slave 01

ENQ	SNR	ESC	W	MW 100	MW 200	CS	CR	LF
	2 bytes					2 bytes		
05	30 31	1B	57	30 30 36 34	30 30 43 38	37 38	0D	0A

Range for the calculation of the checksum

CS

= 30+31+1B+57+30+30+36+34+30+30+43+38

= 278Hex --> 78Hex --> ASCII: 37 38

EXAMPLE 2 - MODE 1:N BINARY

For mode 1:n binary (with ETX/CS, without CR+LF)

Response from the PMI/PC to read telegram, response of the values 1234Hex

(4660Dec) and 4321Hex (17185 dec) from slave 12Hex (18Dec)

STX	SNR	ESC	A	Value 4660	Value 17185	ETX	CS
	2 bytes						1 byte
02	12	1B	41	12 34	43 21	03	1 B

Range for the calculation of the checksum

CS

= 12+1B+41+12+34+43+43+21+03 = 11BHex

= 11BHex --> only last byte: 1 BHex

6. Creating variables

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

6.1 Creating variables in the Editor

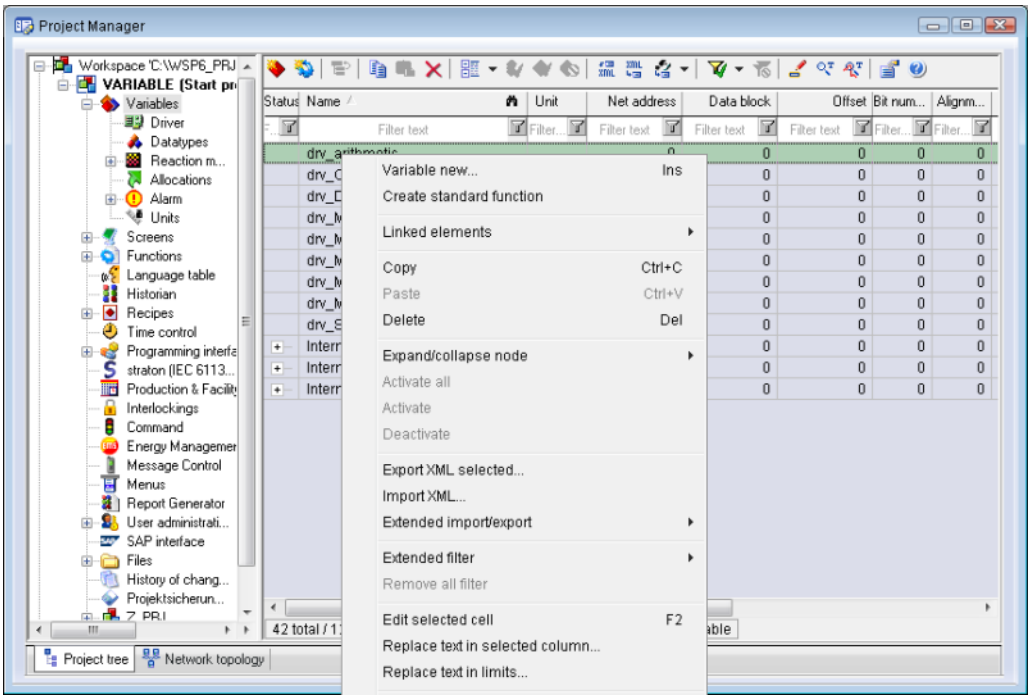
Variables can be created:

- as simple variables
- in arrays (main.chm::/15262.htm)
- as structure variables (main.chm::/15278.htm)

VARIABLE DIALOG

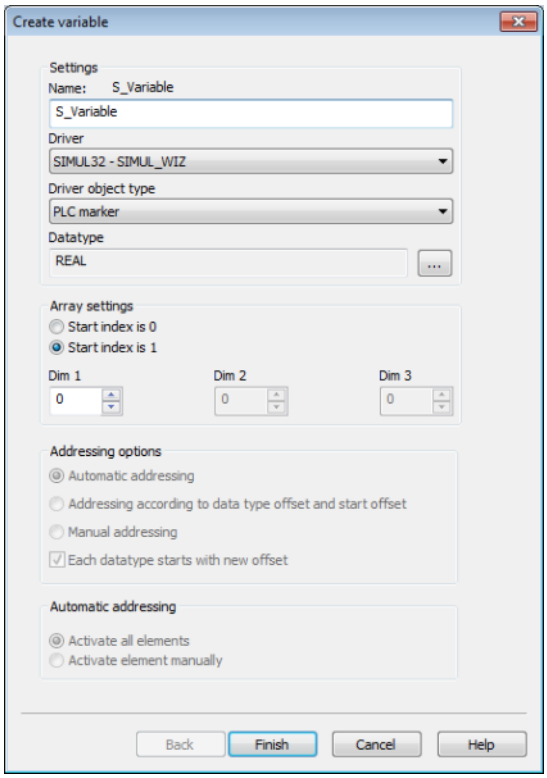
To create a new variable, regardless of which type:

1. Select the **New variable** command in the **Variables** node in the context menu



2. The dialog for configuring variables is opened
3. configure the variable

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



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 character 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 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 element activation	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.

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

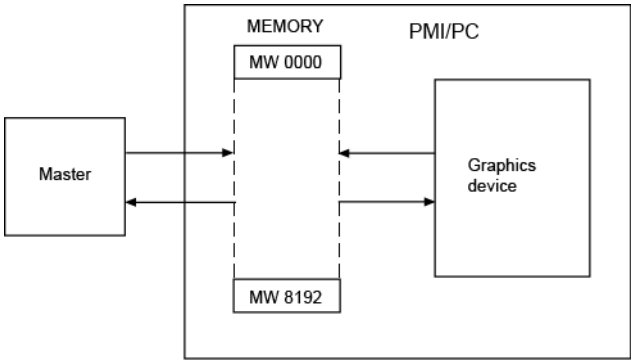
Note for signal range: If a change is made to a data type that does not support the set **signal range**, the **signal range** is amended automatically. For example, for a change from **INT** to **SINT**, the **signal range** is changed to 127. The amendment is also carried out if the **signal range**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

6.2 Addressing

Group/Property	Description
General	
Name	Freely definable name. Attention: For every zenon project the name must be unambiguous.
Identification	Freely assignable identification, e.g. for resources label, comment ...
Addressing	
Net address	not used for this driver
Data block	not used for this driver
Offset	Offset of the variable; the memory address of the variable in the PLC. Possible entries: `0` to `8191`. MtoM32 specific information: ▶ The system memory is word-orientated ▶ Each word has a low byte and a high byte. ▶ Each word has the bits 0 to 15 Attention: ▶ The `flag word 13` is reserved for further developments! ▶ Please also note the notes on system memory (on page 32)
Alignment	not used for this driver
Bit number	Number of the bit within the configured offset. Possible entries: `0` ... `15`
String length	Only available for String variables: Maximum number of characters that the variable can take. Attention: The highest offset for string flags is `8159`
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/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.

6.2.1 Notes on the system memory of the PMI/PC

The system memory serves as an interface for data transfer between the control system and its partner. Writing or reading to this memory is carried out by both sides (partner/visualization). The control system changes the display depending on the data in the system memory. The memory has a size of 8192 words. Addresses that go beyond this must not be used.



DESCRIPTION OF THE MEMORY ACCESS

zenon reads the data from the system memory independently. The partner determines when it needs data and requests this with a command. Upon receiving this command, zenon writes the requested data to the system memory.

- Read command:
  The partner sends a read request to the control system.
- Response telegram:
  zenon/the PC responds to the read command and sends the required data to the PLC.
- Write telegram:
  The PLC sends data to zenon/the PC in the system memory.

6.3 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.

6.3.1 Driver objects

The following object types are available in this driver:

Driver object type	Channel type	Read	Write	Supported data types	Description
PLC marker	80	X	X	BOOL, SINT, USINT, INT, UINT, DINT, UDINT, REAL, STRING	Addressing is word-orientated. UDINT is two words long and starts with each second storage word each time: 0 2 4 6 8 ...

6.3.2 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
Bit marker	BOOL	8
Byte marker	USINT	9
Byte marker	SINT	10
Word marker	UINT	2
Word marker	INT	1
DoubleWord marker	UDINT	4
DoubleWord marker	DINT	3
--	ULINT	27
--	LINT	26
Float marker	REAL	5
--	LREAL	6
String marker	STRING	12
--	WSTRING	21
--	DATE	18
--	TIME	17
--	DATE_AND_TIME	20
--	TOD (Time of Day)	19

Data type: The property **Data type** is the internal numerical name of the data type. It is also used for the extended DBF import/export of the variables.

6.4 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.

6.4.1 XML import

For the import/export of variables the following is true:

- The import/export must not be started from the global project.
- The start takes place via:
  - Context menu of variables or data typ in the project tree
  - or context menu of a variable or a data type
  - or symbol in the symbol bar variables

Attention

When importing/overwriting an existing data type, all variables based on the existing data type are changed.

Example:

There is a data type XYZ derived from the type `INT` with variables based on this data type. The XML file to be imported also contains a data type with the name XYZ but derived from type `STRING`. If this data type is imported, the existing data type is overwritten and the type of all variables based on it is adjusted. I.e. the variables are now no longer `INT` variables, but `STRING` variables.

6.4.2 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 **project.ini**.
KANAL_R	C	128	The original name of a variable that is to be replaced by the new name entered under "VARIABLENNAME" (field/column must be entered manually). The length can be limited using the MAX_LAENGE entry in **project.ini**.
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 **project.ini**.
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.
HWKANAL	Num	3	Bus 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	L	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)
HDTIEFE	N	7	HD entry depth for historical values (number)
NACHSORT	L	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	L	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	L	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	L	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	L	1	Set blink attribute
BTB1	L	1	Logging in CEL
ALARM1	L	1	Alarm
DRUCKEN1	L	1	Printer output (for CEL or Alarm)
QUITTIER1	L	1	Must be acknowledged
LOESCHE1	L	1	Must be deleted
VARIABLE1	L	1	Dyn. limit value linking the limit is defined by an absolute value (see field GRENZWERTx).
FUNC1	L	1	Functions linking
ASK_FUNC1	L	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
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	L	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.

6.5 Driver variables

The driver kit implements a number of driver variables. 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** (on the installation medium in the \Predefined\Variables folder) and can be imported from there.

Note: Variable names must be unique in zenon. If driver variables are to be imported from **drvvar.dbf** again, the variables that were imported beforehand must be renamed.

Information

Not every driver supports all driver variants.

For example:

- Variables for modem information are only supported by modem-compatible drivers
- Driver variables for the polling cycle only for pure polling drivers
- Connection-related information such as ErrorMSG only 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
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.

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).
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
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).
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

7. Driver-specific functions

The driver supports the following functions:

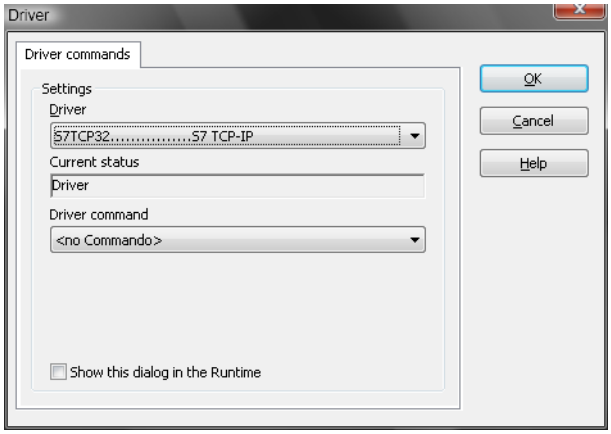
8. Driver commands

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.

Driver commands are used to influence drivers using zenon; start and stop for example.
The engineering is implemented with the help of function **Driver commands**. To do this:

- create a new function
- select Variables -> Driver commands

- The dialog for configuration is opened



Parameter	Description
Drivers	Drop-down list with all drivers which are loaded in the project.
Current status	Fixed entry which has no function in the current version.
Driver command	Drop-down list for the selection of the command.
▸ Start driver (online mode)	Driver is reinitialized 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	Enter driver-specific commands. Opens input field in order to enter a command.
▸ Driver - activate set setpoint value	Write set value to a driver is allowed.
▸ Driver - deactivate set setpoint value	Write set value to a driver is prohibited.
▸ Establish connecton with modem	Establish connection (for modem drivers) Opens the input fields for the hardware address and for the telephone number.
▸ Disconnect from modem	Terminate connection (for modem drivers)
Show this dialog in the Runtime	The dialog is shown in Runtime so that changes can be made.

DRIVER COMMANDS IN THE NETWORK

If the computer, on which the **driver command** function is executed, is part of the zenon network, additional actions are carried out. A special network command is sent from the computer to the project server, which 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.

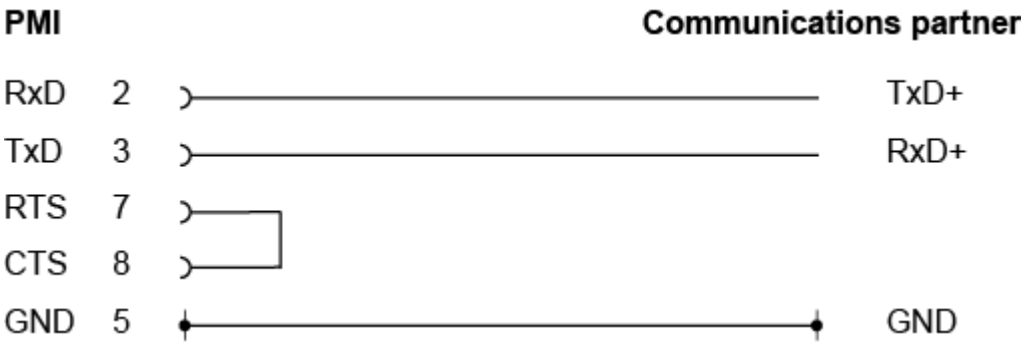
9. Connection cable

Overview of the pin assignment for the following connection cables:

- Connection cable 1 (RS 232C) (on page 50)
- Connection cable 2 (RS 422) (on page 51)
- Connection cable 3 (RS 485) (on page 52)

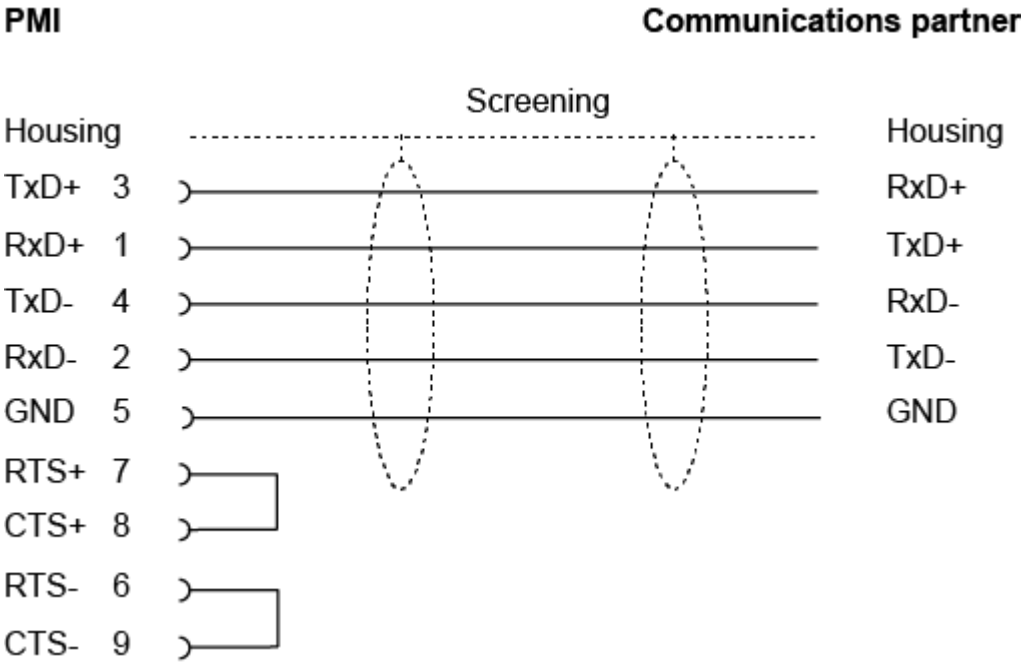
9.1 Connection cable 1 (RS 232C)

Pin assignment of connection cable 1 (RS 232C)



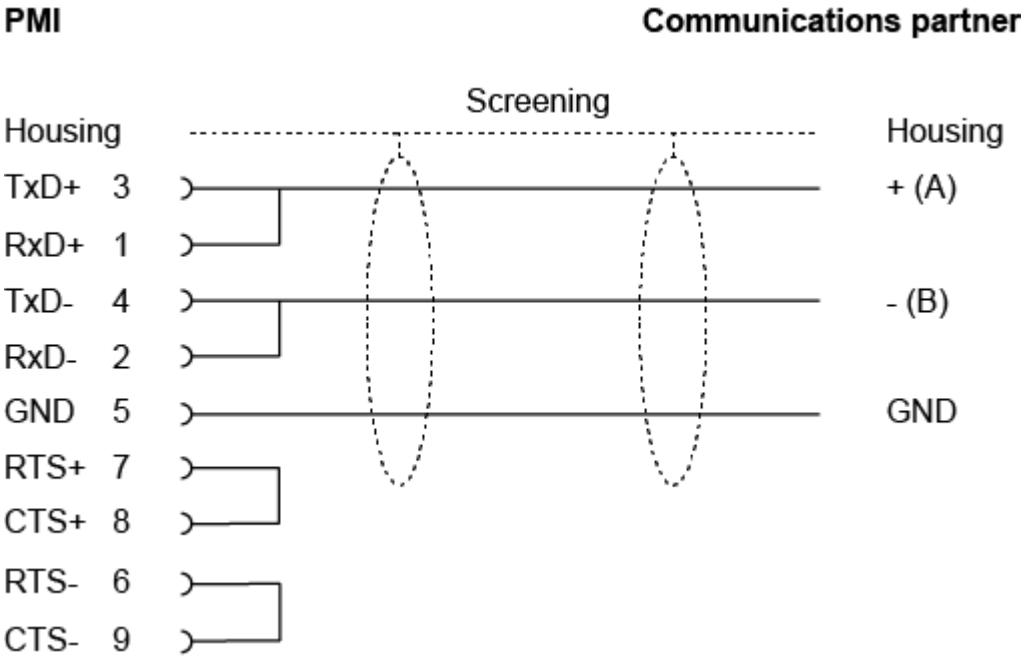
9.2 Connection cable 2 (RS 422)

Pin assignment of connection cable 2 (RS 422)



9.3 Connection cable 3 (RS 485)

Pin assignment of connection cable 2 (RS 485)



10. Error analysis

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

10.1 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 7.50 -> Diagviewer.

zenon driver log all errors in the LOG files. The default folder for the LOG files is subfolder **LOG** in directory `ProgramData`, example:

`%ProgramData%\COPA-DATA\LOG`. 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 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.

10.2 Check list

Questions and hints for fault isolation:

GENERAL TROUBLESHOOTING

- Is the PLC connected to the power supply?
- Analysis with the **Diagnosis Viewer** (on page 52):
  -> Which messages are displayed?
- Are you using the correct cable which is recommended by the manufacturer for the connection between the PLC and the PC?

- Did you select the right COM port?
- Do the communication parameters match (Baud rate, parity, start/stop bits,...)?
- Is the COM port blocked by another application?
- Did you use the right object type for the variable?

  Example: Driver variables are purely statistics variables. They do not communicate with the PLC. (See chapter Driver variable (on page 40).)
- Does the offset addressing of the variable match the one in the PLC?

VALUES ARE NOT DISPLAYED, NUMERIC VALUES REMAIN EMPTY

Driver is not working. Check the:

- Installation of zenon
- the driver installation
- The installation of all components
  -> Pay attention to error messages during the start of the Runtime.

VARIABLES ARE DISPLAYED WITH A BLUE DOT

The communication in the network is faulty:

- With a network project:
  Is the network project also running on the server?
- With a stand-alone project or a network project which is also running on the server:
  Deactivate the property **Only read from Standby Server** in node **Driver connection/Addressing**.

VALUES ARE DISPLAYED INCORRECTLY

Check the information for the calculation in node **Value calculation** of the variable properties.

DRIVER FAILS OCCASIONALLY

Analysis with the **Diagnosis Viewer** (on page 52):
-> Which messages are displayed?