



COPADATA
do it your way

zenon driver manual

S7TCP32

v.7.20





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1. Welcome to COPA-DATA help

GENERAL HELP

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

PROJECT SUPPORT

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

LICENSES AND MODULES

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

2. S7TCP32

Driver for S7 TCP/IP connection using standard network card without additional software.

The driver also supports Simatic PDiag error messages.

3. S7TCP32 - Data sheet

General:	
Driver file name	S7TCP32.exe
Driver name	S7 TCP-IP
PLC types	Siemens S7 200, 300, 400 and S71200, S7 1500 or VIPA 200V, 300V, 300S and 500S
PLC manufacturer	Inat; Siemens; Vipa; Process-Informatik;

Driver supports:	
Protocol	TCP/IP - RFC1006;
Addressing: Address-based	x
Addressing: Name-based	-
Spontaneous communication	x
Polling communication	x
Online browsing	-
Offline browsing	x
Real-time capable	-
Blockwrite	x
Modem capable	-
Serial logging	-
RDA numerical	x
RDA String	-

Requirements:	
Hardware PC	Standard network card
Software PC	No additional Siemens communication software necessary
Hardware PLC	Siemens: CP 343-1 or. CP 443-1; INAT: S7 Ethernet Adapter; Vipa: CP 443; Process-Informatik: S7-LAN Adapter (MPI on TCP/IP Gateway); Helmholtz NetLink PRO; Simatic CPU S7 31x PN/DP (Ethernet onboard)
Software PLC	-
Requires v-dll	-

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

4. Driver history

Date	Driver version	Change
07.07.08	5900	Created driver documentation

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.

5.1 PC

This driver supports a connection via the standard network card of the PC. Make sure that the PLC and the PC are in the same network range and that the subnet masks are set accordingly on both devices.

5.2 PLC

The driver uses S7 communication via the TCP/IP transport protocol.

An Ethernet interface with ISO protocol RFC 1006 is required at the PLC (for so-called open IE communication). The communication interface should support these communication services (S7 communication and TCP/IP).

Here are some examples for this:

- ▶ Siemens: S7 CP 343-1, CP 443-1, CP243-1, S7 CPU 31x PN/DP
- ▶ Vipa: CP443; Speed7 PLC
- ▶ Helmholtz NetLink PRO
- ▶ INAT: S7 Ethernet Adapter; 'ECHOLINK' Serial Ethernet converter
- ▶ Process informatics: S7-LAN Adapter (MPI to TCP/IP converter)

TIA SETTINGS FOR COMMUNICATION WITH S7 1511

The following settings are necessary for communication with an S7 1511 PLC:

TIA:

- ▶ *PLC -> General -> Protection:*
Allow access by remote partner via PUT/GET communication: active
- ▶ *PLC -> Data block -> General -> Attributes:*
Optimized block access: inactive

zenon Driver, TCP/IP connection (on page 15) tab:

- ▶ **Remote TSAP:** 02.01

The controller expects direct addresses, no **Symbolic address**.

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 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.

▶

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.



Parameters	Description
Mode	<p>Allows to switch between hardware mode and simulation mode</p> <ul style="list-style-type: none"> ▶ Hardware: <p>A connection to the control is established.</p> ▶ Simulation static <p>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.</p> ▶ Simulation - counting <p>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.</p> ▶ Simulation - programmed <p>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).</p>
Keep update list in the memory	<p>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.</p>
Output can be written	<p>Active: Outputs can be written.</p> <p>Inactive: Writing of outputs is prevented.</p> <p>Note: Not available for every driver.</p>
Variable image remanent	<p>This option saves and restores the current value, time stamp and the states of a data point.</p> <p>Fundamental requirement: The variable must have a valid value and time stamp.</p>

	<p>The variable image is saved in mode hardware if:</p> <ul style="list-style-type: none"> ▶ one of the states S_MERKER_1(0) up to S_MERKER8(7), REVISION(9), AUS(20) or ERSATZWERT(27) is active <p>The variable image is always saved if:</p> <ul style="list-style-type: none"> ▶ the variable is of the object type Driver variable ▶ the driver runs in simulation mode. (not programmed simulation) <p>The following states are not restored at the start of the Runtime:</p> <ul style="list-style-type: none"> ▶ SELECT(8) ▶ WR-ACK(40) ▶ WR-SUC(41) <p>The mode Simulation - programmed at the driver start is not a criterion in order to restore the remanent variable image.</p>
Stop on Standby Server	<p>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.</p> <p>Attention: If this option is active, the gapless archiving is no longer guaranteed.</p> <p>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.</p> <p>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.</p>
Global Update time	<p>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.</p> <p>Inactive: The set priorities are used for the individual variables.</p>
Priority	<p>The polling times for the individual priority classes are set here. All variables with the according priority are polled in the set time.</p> <p>The allocation to the variables takes place separately in the settings of the variable properties.</p> <p>The communication of the individual variables are graduated in respect of importance or necessary topicality using the priorities.</p>

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

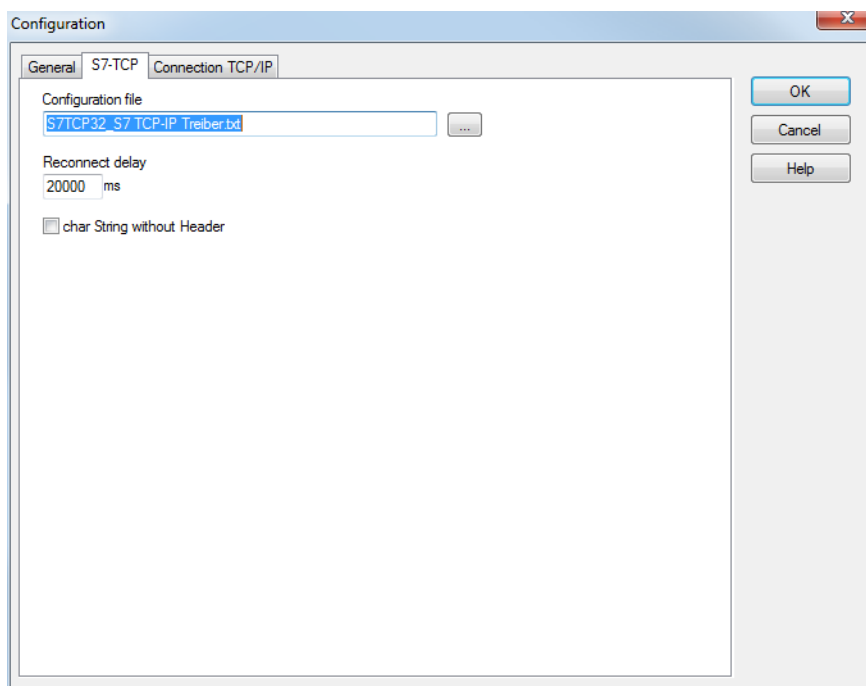
Parameters	Description
OK	Applies all changes in all tabs and closes the dialog.
Cancel	Discards all changes in all tabs and closes the dialog.
Help	Opens online help.

UPDATE TIME FOR CYCLICAL DRIVERS

The following applies for cyclical drivers:

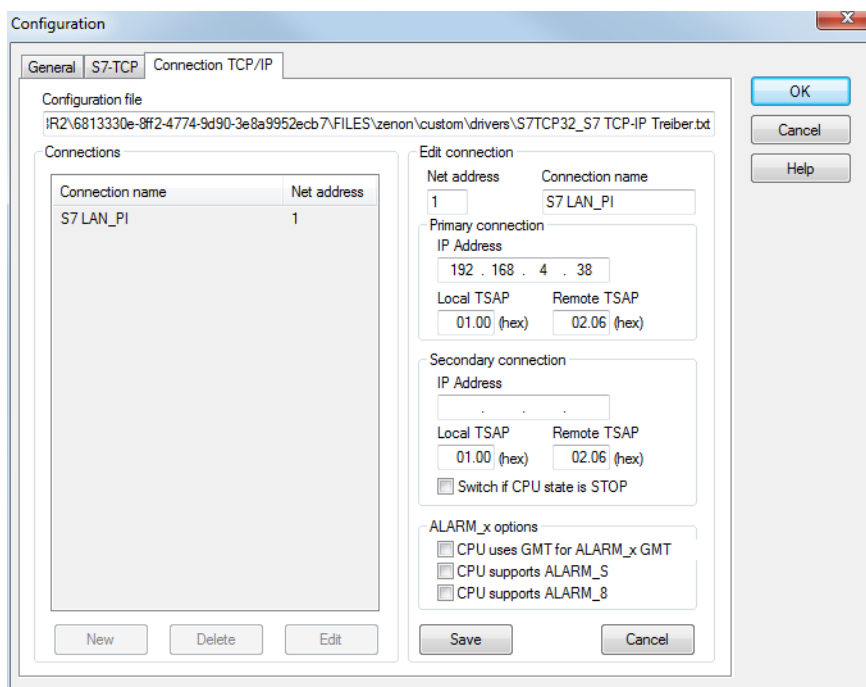
For **Set value**, **Advising** of variables and **Requests**, a read cycle is immediately triggered for all drivers - regardless of the set update time. This ensures that the value is immediately available for visualization after writing. Update times can therefore be shorter than pre-set for cyclical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

6.2.2 S7-TCP



Parameters	Description
Configuration file	The configuration file must be in the current project directory. The file name can be freely defined.
Delay after connection termination (ms)	If the connection fails, the driver will take the set amount of time between re-attempts to establish communication. Default: 20000 ms
Char string without header	<i>The type of String variables in the PLC S7 String with or without header information:</i> <ul style="list-style-type: none"> ▶ Inactive: STRING ▶ Active: ARRAY (CHAR) Default: inactive

6.2.3 Connection TCP/IP



Parameters	Description
Configuration file	Selected configuration file. For information only, is configured in the S7-TCP (on page 14) tab.
Connections	Configuration of the connections
Connection list	List with all configured connections. Displays the connection names with the corresponding Net addresses. The connection parameters are displayed when the connection name is selected.
Edit connection	Settings for the connection
Net address	Corresponds to the Net address property in variable configuration.
Connection name	Freely definable name.
Primary connection	Configuration of the primary connection.
IP address	Depends on the settings of the S7 TCP Runtime. Communication is performed via port 102.
Local TSAP	<p>TSAP for this station. It consists of two groups (bytes). Each group is built from two hexadecimal characters, and the two groups are separated by a blank or a dot.</p> <ul style="list-style-type: none"> ▶ First group: can contain a device identification ▶ Second group: is always 0 <p>Recommended setting: 01 . 00</p> <p>Example: 01.00 = PD communicates directly with the connected SIMATIC components</p>
Remote TSAP	<p>TSAP for the partner station (S7 CPU). It consists of two groups (bytes). Each group is built from two hexadecimal characters, and the two groups are separated by a blank or a dot.</p> <ul style="list-style-type: none"> ▶ First group: Contains a device identification, for which resources are reserved in the SIMATIC-S7. Possible device identifications: 01 = PD 02 = OM (Operating & Monitoring) 03 = Other ▶ Second group: Contains the addressing of the SIMATIC station, with which communication should be established. Divided into: (Bit 7...5) = Rack (subsystem) (Bit 4...0) = CPU slot Attention: Not the communication processor slot, but the CPU on which the PLC program also runs. Usually: Slot 2. <p>Sample configuration:</p> <p>OS communicates via the SIMATIC with the assembly group in rack 2, slot 3. Help rule for rack/slot group: Left character = rack * 2</p>

	<p>Right character = slot</p> <p>Special case:</p> <p>If the device connected to the net is addressed directly, the group contains 00. The remote TSAP can be read directly in the Hardware Manager. (avoids misinterpretations due to the writing on the device itself.)</p> <p>Communication with S7 200:</p> <p>In order to be able to also use the S7TCP driver for the S7 200 PLCs (via CP243), a configured connection must be created in the PLC. (this is possible using "MicroWIN" configuration software). The TSAP settings in the driver must then be selected according to this connection.</p> <p>For CPUs of the company Vipa: Speed 7 CPU 315 2AG10: RemoteTSAP: 02.02</p> <p>Communication with S7 1511: RemoteTSAP: 02.01</p> <p>Note the TIA settings (on page 8) too!</p>
Secondary connection	Alternative connection parameters if primary configuration does not work.
IP address	If you fill out this field, the driver will try to connect to this address after every failed connection attempt and then stick with this alternative address until it can no longer be reached or until Runtime is restarted (for redundant networks with two communication processors in one PLC and two network cards in the zenon computer).
Local TSAP	Alternative TSAP local. Configuration similar to the primary connection.
Remote TSAP	Alternative TSAP remote. Configuration similar to the primary connection.
Switch if CPU status is STOP	Active: As soon as the CPU has the status STOP, a switch to the alternative IP connection is made.
Alarm_x options	Settings for Alarm_S and Alarm_8
CPU uses, for ALARM_x GMT	Active: The transferred time of ALARM_S or Alarm_8 object is considered as GMT. Activate this option if the PLC sends the time stamp of the ALARM-S/8 message GMT format.
CPU supports ALARM_S	Active: CPU supports ALARM_S. For more details see chapter Driver-specific functions (on page 43).
CPU supports ALARM_8	Active: CPU supports ALARM_8. For more details see chapter Driver-specific functions (on page 43).
New	Create new connection
Delete	Delete existing connection
Edit	Edit existing connection Select the desired connection in the connection list, press button "Connect".

	Select "Edit". Make changes and close with "Save".
Save	Save new/amended entries.
Cancel	Discard amended entries.
OK	Accept changes in the dialog and close dialog. Only available if no connection is in the "edit" state.
Cancel	Discards all changes and closes the dialog.
Help	Opens online help.

CREATE NEW CONNECTION

1. click on the button **New**
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

SHOW CONNECTION DETAILS

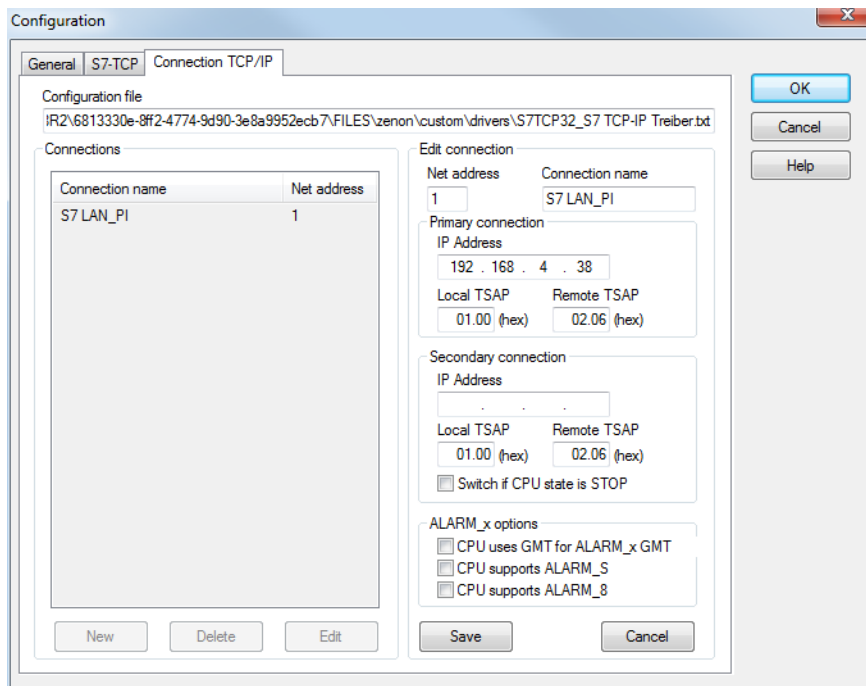
Highlight the desired connection in the connection list.

Configuration of Helmholtz NETLinkPRO adapter

To create a connection for a Helmholtz NETLinkPRO adapter:

1. Click on the **New** button in the configuration dialog in the **TCP/IP connection** tab
2. Enter the **Network address** and **Name**

3. Enter, under **Remote IP**, the IP address of the NETLinkPRO
4. Enter **01.00** for **Local TSAP**
5. Enter **01.00** for **Local TSAP**
6. Click on **save**
7. Configure further properties as required
8. click on **OK**



Parameters	Description
Conn. File	Selected configuration file
Connection list	Displays the connection names with the corresponding hardware addresses. The connection parameters are displayed by selecting the connection name.
Edit connection	Settings for the connection.
Net Address	Corresponds to the Net address in the variable definition.
Connection name	Freely definable name
Primary connection	Configuration of the primary connection.
IP address	IP address of NETLinkPRO, for example: 192 . 168 . 4 . 38.
Local TSAP	TSAP for this station: 01.00
Remote TSAP	TMPI address AG = 6 Entry: 02 . 06
Secondary connection	Alternative connection parameters if primary configuration does not work.
IP address	If you fill out this field, the driver will try to connect to this address after every failed connection attempt and then stick with this alternative address until it can no longer be reached or until Runtime is restarted (for redundant networks with two communication processors in one PLC and two network cards in the zenon computer).
Local TSAP	Alternative TSAP local.
Remote TSAP	Alternative TSAP remote.
Switch if CPU status is STOP	Active: As soon as the CPU has the status STOP, a switch to the alternative IP connection is made.
Alarm_x options	Settings for Alarm_S and Alarm_8
CPU uses, for ALARM_x GMT	Active: The transferred time of ALARM_S or Alarm_8 object is considered as GMT. Activate this option if the PLC sends the time stamp of the ALARM-S/8 message GMT format.
CPU supports ALARM_S	Active: CPU supports ALARM_S.
CPU supports ALARM_8	Active: CPU supports ALARM_8.
New	Create new connection
Delete	Delete existing connection
Edit	Edit existing connection Select the desired connection in the connection list, press button "Connect". Select "Edit". Make changes and close with "Save".
Save	Save new/amended entries.
Cancel	Discard amended entries.

OK	Accept changes in the dialog and close dialog. Only available if no connection is in the "edit" state.
Cancel	Discards all changes and closes the dialog.
Help	Opens online help.

7. Creating variables

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

7.1 Creating variables in the Editor

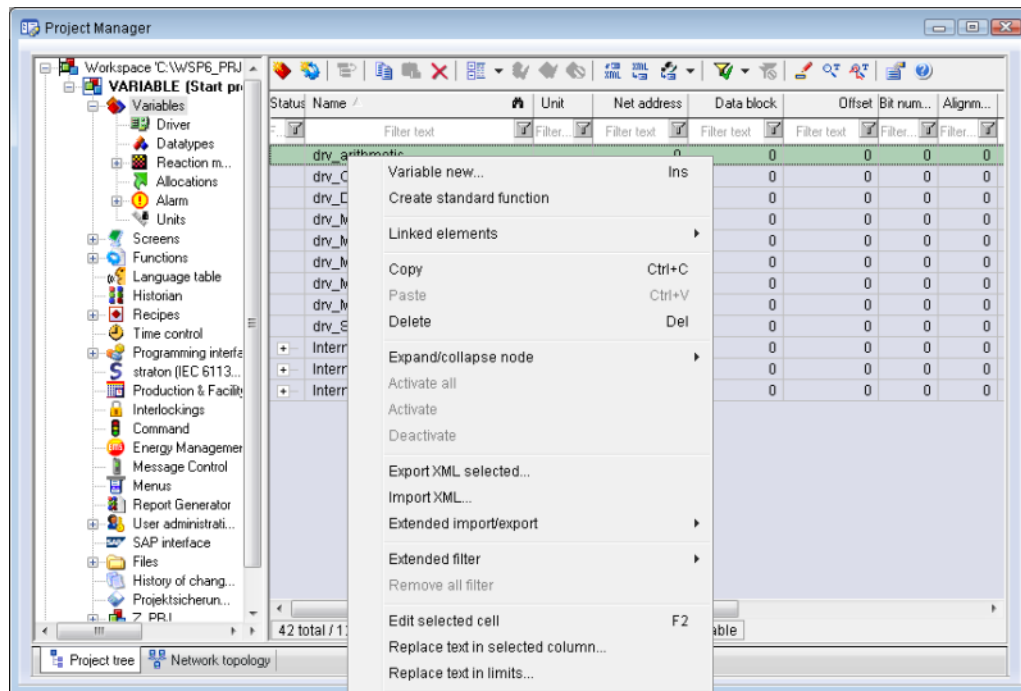
Variables can be created:

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

VARIABLE DIALOG

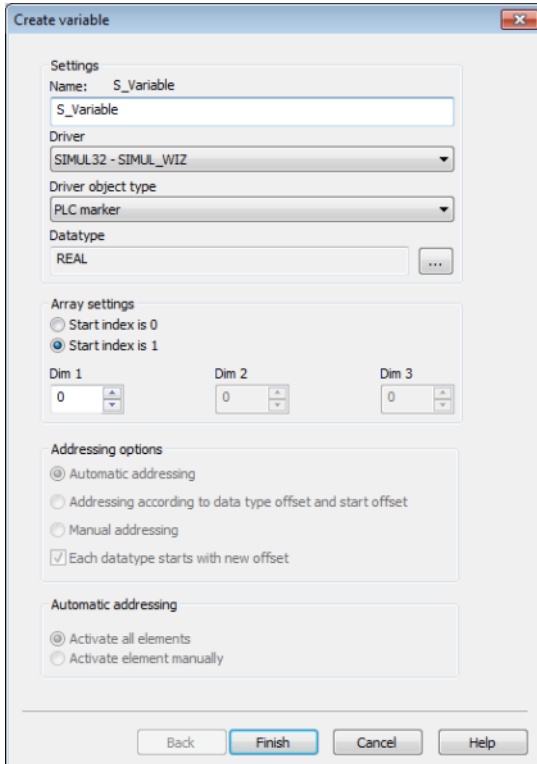
To create a new variable, regardless of which type:

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



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

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



The screenshot shows the 'Create variable' dialog box with the following settings:

- Settings**
 - Name: S_Variable
 - Driver: SIMUL32 - SIMUL_WIZ
 - Driver object type: PLC marker
 - Datatype: REAL
- Array settings**
 - ☐ Start index is 0
 - ☒ Start index is 1
 - Dim 1: 0
 - Dim 2: 0
 - Dim 3: 0
- Addressing options**
 - ☒ Automatic addressing
 - ☐ Addressing according to data type offset and start offset
 - ☐ Manual addressing
 - ☒ Each datatype starts with new offset
- Automatic addressing**
 - ☒ Activate all elements
 - ☐ Activate element manually

Buttons at the bottom: Back, Finish, Cancel, Help.

Property	Description
Name	<p>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.</p> <p>Maximum length: 128 Zeichen</p> <p>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.</p> <p>Note: For some drivers, the addressing is possible over the property Symbolic address, as well.</p>
Driver	<p>Select the desired driver from the drop-down list.</p> <p>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.</p>
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.

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

The address resolution of the driver is BYTE-based, therefore SINT. When addressing INT and UINT variables, address in steps of two, for DINT and UDINT in steps of four. You can address single bits by adding the bit number.

SETTINGS FOR THE UNIQUE ADDRESSING OF VARIABLES

Property	Description
Name	Freely definable name Achtung: the name must be unique within each control system project.
Identification	Any text can be entered here, e.g. for resource labels, comments ...
Net address	Bus address or net address of the variable. 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. Configurable [0.. 4294967295] . Please look up the exact maximum range for data blocks in the manual of the PLC.
Offset	Offset of the variable; the memory address of the variable in the PLC. Configurable [0.. 4294967295] Most S7 controllers support a maximum offset of 65535. You can look up the exact maximum range for each data block in the manual of the PLC.
Alignment	not used for this driver
Bit number	Number of the bit within the configured offset. Allowed entry [0.. 65535], Working range [0..7]
String length	Only available for String variables: Maximum number of characters that the variable can take.
Driver object type	Depending on the employed driver, an object type is selected during the creation of the variable; the type can be changed here later.
Data type	Data type of the variable, which is selected during the creation of the variable; the type can be changed here later. Attention: If you change the data type later, all other properties of the variable must be checked and adjusted, if necessary.

EXAMPLE

- For addressing double word (DINT/UDINT) variables:

The connection was configured with net address 2. Two double words in data block 33 in a row starting from offset 20.

Addressing double word 1:

Net address:	2
Data block:	33
Offset:	20
Driver object type:	Ext. Data block
Data type:	UDINT (DINT)

Addressing double word 2:

Net address:	2
Data block:	33
Offset:	24
Driver object type:	Ext. Data block
Data type:	UDINT (DINT)

- For addressing bit (BOOL) variables:

The connection was configured with bus address 2. One marker bit with offset 79, the fourth bit.

Net address:	2
Data block:	not used
Offset:	79
Bit number:	3 (bits are counted from 0)
Driver object type:	SPS marker
Data type:	BOOL

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
ALARM_S Associated value	65	R	BOOL, SINT, USINT, INT, UINT, DINT, UDINT	Variables of the type ALARM_S associated value contain the associated values received with a message, if they exist. Also here the offset contains the S7 message number. The addressing of the associated value in the associated value record is realized via the bit number. If e.g. 3 associated values of the type byte are received, the first one has bit number 0, the second bit number 8 and the third bit number 16. If it is 3 words, the bit numbers are 0, 16 and 32.
ALARM_S Message	9	R	BOOL, UDINT	With the datatype ALARM_S bit, spontaneous realtime-stamped alarm messages of the S7 can be received (e.g. from PDiag). This variable only has a value, when the S7 sends an ALARM_S telegram. No initial image or similar thing is read. The offset here is the S7 message number. A variable of type ALARM_S message doubleword always contains the last received message number. The offset is not used here and has to be 0.
Output	11	R / W	BOOL, SINT, USINT, INT, UINT	If you want outputs to be written, you have to activate this in the general section of the driver settings.
Input	10	R	BOOL, SINT, USINT, INT, UINT	
Ext. Data block	34	R / W	BOOL, SINT, USINT, INT, UINT, DINT, UDINT, REAL, STRING, WSTRING, DATE_AND_TIME	STRING: max. 210 characters DATE_AND_TIME: 8 bytes time*

S5Time data block	97	R / W	REAL	Only times in seconds will be read and written. Attention: 32 bits of data will be read, but in the S7, S5Time has only 16 bits; you should therefore make sure that there are still 16 bits left after the last S5Time object in a data block.
PLC marker	8	R / W	BOOL, SINT, USINT, INT, UINT, DINT, UDINT, REAL	
Counters	4	R / W	UDINT	
Time	5	R	REAL	
Driver variable	35	R / W	BOOL, SINT, USINT, INT, UINT, DINT, UDINT, REAL, STRING	Variables for the statistical analysis of communication. Find out more in the chapter about the Driver variables (on page 36)

*)The data type DATE_AND_TIME in detail:

For each offset the following structure is read or written:

Byte	Contents	Value	Possible value range	BCD code
0	Year	0 - 99	1990 - 1999 2000 - 2089	90h - 99h 00h - 89h
1	Month	1 - 12	1 - 12	01h - 12h
2	Day	1 - 31	1 - 31	01h - 31h
3	Hour	0 - 23	0 - 23	00h - 23h
4	Minute	0 - 59	0 - 59	00h - 59h
5	Second	0 - 59	0 - 59	00h - 59h
6	Millisecond HT	0 - 990 ms Bit 4 - 7 Hundreds, 0 - 3 Tens	0 - 999	00h - 999h
7	Milliseconds O, Data	0 - 9 Bit 4 - 7 millisec. Ones, 0 - 15 Bit 0 - 3 Data		

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.

MAPPING OF THE DATA TYPES FROM THE PLC TO ZENON DATA TYPES

Control	zenon	Data type
BOOL	BOOL	8
SINT	SINT	10
BYTE	USINT	9
INT	INT	1
WORD	UINT	2
DINT	DINT	3
DWORD	UDINT	4
DATE_AND_TIME	DATE_AND_TIME	20
REAL	REAL	5
STRING	STRING	12

The channel type or the data type is used in the driver for mapping the correct object types or data types. This information is also used for the "Extended variable import/export" via DBF files.

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.

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

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.

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 there 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

Description	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)
ADDRESS	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 Recipe Group Manager
LES_SCHR	R	1	Write-Read-Authorization

			0: Not allowed to set value. 1: Allowed to set value.
MIT_ZEIT	R	1	time stamp in zenon zenon (only if supported by the driver)
OBJEKT	N	2	Driver-specific ID number of the primitive object comprises TREIBER-OBJEKTYP 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	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 DEFINITION

Limit definition for limit values 1 to 4, and status 1 bis 4:

Description	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 (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
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)
QUITTTIER1	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
MIN_MAX1	C	3	Minimum, Maximum
FARBE1	N	10	Color as Windows coding
GRENZTXT1	C	66	Limit 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 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 defined in the driver kit are available in the import file `drvvar.dbf` (on the CD in the directory: `CD_Drive:/Predefined/Variables`) 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 ErrorMessage only for drivers that only edit one connection at 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 <code>driver stop</code> , the variable has the value <code>TRUE</code> and an OFF bit. After the driver has started, the variable has the value <code>FALSE</code> 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 <code>TRUE</code> , 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 <code>SrvDrvVarApplyCom</code> 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 <code>SrvDrvVarApplyModem</code> . 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.
Baud rate	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

8. Driver-specific functions

The driver supports the following functions:

INAT BOARD (OPTIONAL)

This card can replace an original Siemens CP-443-1/TCP.

The requests are handled via RFC 1006. The definition of the send/receive orders is done in the INAT configurator.

On the zenon side, you have to enter the same own and remote TSAPs have as on the according board. Several simultaneous and parallel connections are possible.

If several independent zenon servers communicate with one card, a separate connection for each server has to be defined on the INAT-CP.

The card can handle S5 and S7 protocols simultaneously.

The configuration on the PLC is realized by creating a configuration block in OB 100 or 101 (for restart), i.e. synchronizing the CPU with the board.

In a cyclically called block the block NET_ALL is called (like in an S5 Send-All/Receive-All), which handles the data communication with the CPU.

F&S (FISCHER & SCHMIDT)

In order to be able to use the datatypes for F&S, they must be activated explicitly. This activation is defined with the following entry in the project.ini file

[S7TCP]

FS=1

ALARM-S

With the datatype ALARM_S message bit, spontaneous realtime-stamped alarm messages of the S7 can be received (e.g. from PDiag). This variable only has a value, when the S7 sends an ALARM_S telegram. No initial image or similar thing is read. The offset here is the S7 message number.

A variable of type ALARM_S message doubleword always contains the last received message number. The offset is not used here and has to be 0.

Variables of the type 'ALARM_S associated value' contain the associated values received with a message, if they exist. Also here the offset contains the S7 message number. The addressing of the associated value in the associated value record is realized with the bit number. If e.g. 3 associated values of the type byte are received, the first one has bit number 0, the second bit number 8 and the third bit number 16. If it is 3 words, the bit numbers are 0, 16 and 32. On transmitting PDiag associated values always a doubleword is sent. In the doubleword the low byte and the high byte are permuted; this has to be cared of in the addressing of the bit number.

EXAMPLE:

- ▶ Associated value = bit: offset = message number / bit number = 24
- ▶ associated value = byte offset = message number / bit number = 24
- ▶ associated value = word offset = message number / bit number = 16
- ▶ associated value = doubleword offset = message number / bit number = 0

ALARM-8

Configuration is similar to ALARM_S.

Differences:

- ▶ The index of the message at the ALARM_8 block must also be given in the database.
- ▶ For ALARM_8, 8 bit messages are transferred for each message number. The 10 associated values are packed and processed consecutively as Dump.
Maximum size of all associated values together per message: 32 bytes
- ▶ The initial stack, which is read after the connection is established, contains in contrast to ALARM_S neither associated values nor time stamps.

LIMITATIONS

In projects with the S7 TCP driver please be aware, that S7 PLCs only have limited communication resources. This becomes noticeable with the S7 300 types, that particularly for the smaller models allow only a few (6-12) simultaneous communications.

Example:

S7 312C only allows 6 connections, where as a default 4 are reserved, so that only 2 simultaneous connections are possible.

All reserved connections with the exception of the PD communication and an OP communication can be released, so for a S7 312C a maximum of 4 free connections is available.

S7 414-2 allows 32 connections, 4 reserved as a default, and 28 additional possible.

Access to S7-200 via CP243, in S7 200 only DB 1 exists.

PROJECT.INI ENTRIES

[S7TCP]	
BLOCKWRITE=1	Activates blockwrite

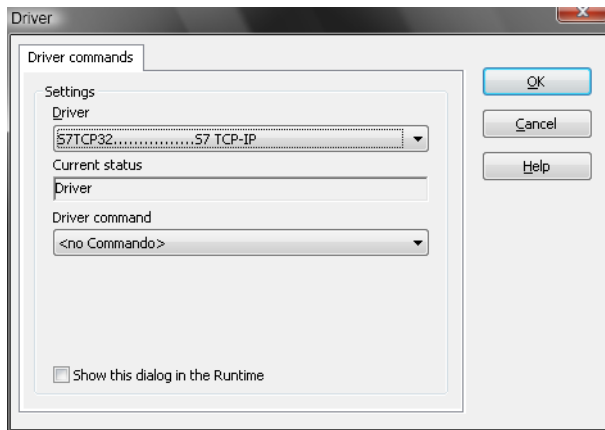
9. Driver commands

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



Parameters	Description
Drivers	Drop-down list with all drivers which are loaded in the project.
Current state	Fixed entry which has no function in the current version.
Driver commands	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 <code>switched off (OFF; Bit 20)</code> .
▶ 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.
▶ Activate driver write set value	Write set value to a driver is allowed.
▶ Deactivate driver write set value	Write set value to a driver is prohibited.
▶ Establish connection 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.

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 7.20 -> Diagviewer*.

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

`C:\ProgramData\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 currently created entries live
- ▶ customize the logging settings
- ▶ change the folder in which the log files are saved

Note:

1. In Windows CE even errors are not logged per default due to performance reasons.
2. The Diagnosis Viewer displays all entries in UTC (coordinated world time) and not in local time.
3. The Diagnosis Viewer does not display all columns of a log file per default. To display more columns activate property **Add all columns with entry** in the context menu of the column header.
4. If you only use **Error logging**, the problem description is in column **Error text**. For other diagnosis level the description is in column **General text**.
5. For communication problems many drivers also log error numbers which the PLC assigns to them. They are displayed in **Error text** and/or **Error code** and/or **Driver error parameter (1 and 2)**. Hints on the meaning of error codes can be found in the driver documentation and the protocol/PLC description.
6. At the end of your test set back the diagnosis level from **Debug** Or **Deep Debug**. At **Debug** and **Deep Debug** there are a great deal of data for logging which are saved to the hard drive and which can influence your system performance. They are still logged even after you close the **Diagnosis Viewer**.

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

10.2 Error numbers

Example of a log entry:

Error Read - HW:0 Kennung:132 DB:10 OFF:599 Count:4 Error:wrong length

Error Read

Read error

HW:0

Net address of the PLC (according to driver configuration)

Identification 132

(Internal Siemens ID)

- 129 Input
- 130 Output
- 131 Marker
- 132 Data block

DB:10

Number of the data block as defined in the variable configuration

OFF:599

Offset as defined in variable configuration

Count 4

The block size to be read, usually in bytes. The driver optimizes this size automatically. Attention: Hint: Size must also be readable from the PLC, i.e. it must exist !! (in the case of Offset 599 and Count 4, the data block must be configured until Offset 603)

Error:wrong length

Error source - if known

Remote Error Code (e.g.: 0xA) Para1 Para2

Error codes not disclosed by Siemens !

ERROR CODES IN THE API

The following is a list of possible error codes returned by the WSAGetLastError call, along with their extended explanations. Errors are listed in alphabetical order by error macro. Some error codes defined in Winsock2.h are not returned from any function-these are not included in this topic.

Error (Code)	Meaning	Description
WSAEACCES (10013)	Permission denied.	<p>An attempt was made to access a socket in a way forbidden by its access permissions. An example is using a broadcast address for sendto without broadcast permission being set using set-sockopt(SO_BROADCAST).</p> <p>Another possible reason for the WSAEACCES error is that when the bind function is called (on Windows NT 4 SP4 or later), another application, service, or kernel mode driver is bound to the same address with exclusive access. Such exclusive access is a new feature of Windows NT 4 SP4 and later, and is implemented by using the SO_EXCLUSIVEADDRUSE option.</p>
WSAEADDRINUSE (10048)	Address already in use.	<p>Typically, only one usage of each socket address (protocol/IP address/port) is permitted. This error occurs if an application attempts to bind a socket to an IP address/port that has already been used for an existing socket, or a socket that was not closed properly, or one that is still in the process of closing. For server applications that need to bind multiple sockets to the same port number, consider using set-sockopt(SO_REUSEADDR). Client applications usually need not call bind at all—connect chooses an unused port automatically. When bind is called with a wildcard address (involving ADDR_ANY), a WSAEADDRINUSE error could be delayed until the specific address is committed. This could happen with a call to another function later, including connect, listen, WSAConnect, or WSAJoinLeaf.</p>
WSAEADDRNOTAVAIL (10049)	Cannot assign requested address.	<p>The requested address is not valid in its context. This normally results from an attempt to bind to an address that is not valid for the local machine. This can also result from connect, sendto, WSAConnect, WSAJoinLeaf, or WSASendTo when the remote address or port is not valid for a remote machine (for example, address or port 0).</p>
WSAEAFNOSUPPORT (10047)	Address family not supported by protocol family.	<p>An address incompatible with the requested protocol was used. All sockets are created with an associated address family (that is, AF_INET for Internet Protocols) and a generic protocol type (that is, SOCK_STREAM). This error is returned if an incorrect protocol is explicitly requested in the socket call, or if an address of the wrong family is used for a socket, for example, in sendto.</p>
WSAEALREADY (10037)	Operation already in progress.	<p>An operation was attempted on a nonblocking socket with an operation already in progress—that is, calling connect a second time on a nonblocking socket that is already connecting, or canceling an asynchronous request (WSAAsyncGetXbyY) that has already been canceled or completed.</p>
WSAECONNABORTED (10053)	Software caused connection abort.	<p>An established connection was aborted by the software in your host machine, possibly due to a data transmission time-out or protocol error.</p>
WSAECONNREFUSED (10061)	Connection refused.	<p>No connection could be made because the target machine actively refused it. This usually results from trying to connect to a service that is inactive on the foreign host—that is, one with no server application running.</p>
WSAECONNRESET (10054)	Connection reset by peer.	<p>An existing connection was forcibly closed by the remote host. This normally results if the peer application on the remote host is suddenly stopped, the host is rebooted, or the remote host uses a hard close (see setsockopt for more information on the SO_LINGER option on the remote socket.) This error may also result if a connection was broken due to keep-alive activity detecting a failure while one or more operations are in progress. Operations that were in progress fail with WSAENETRESET. Subsequent operations fail with WSAECONNRESET.</p>
WSAEDESTADDRREQ (10039)	Destination address required.	<p>A required address was omitted from an operation on a socket. For example, this error is returned if sendto is called with the remote address of ADDR_ANY.</p>

WSAEFAULT (10014)	Bad address.	The system detected an invalid pointer address in attempting to use a pointer argument of a call. This error occurs if an application passes an invalid pointer value, or if the length of the buffer is too small. For instance, if the length of an argument, which is a SOCKADDR structure, is smaller than the sizeof(SOCKADDR).
WSAEHOSTDOWN (10064)	Host is down.	A socket operation failed because the destination host is down. A socket operation encountered a dead host. Networking activity on the local host has not been initiated. These conditions are more likely to be indicated by the error WSAETIMEDOUT.
WSAEHOSTUNREACH (10065)	No route to host.	A socket operation was attempted to an unreachable host. See WSAENETUNREACH.
WSAEINPROGRESS (10036)	Operation now in progress.	A blocking operation is currently executing. Windows Sockets only allows a single blocking operation-per- task or thread-to be outstanding, and if any other function call is made (whether or not it references that or any other socket) the function fails with the WSAEINPROGRESS error.
WSAEINTR (10004)	Interrupted function call.	A blocking operation was interrupted by a call to WSACancelBlockingCall.
WSAEINVAL (10022)	Invalid argument.	Some invalid argument was supplied (for example, specifying an invalid level to the setsockopt function). In some instances, it also refers to the current state of the socket-for instance, calling accept on a socket that is not listening.
WSAEISCONN (10056)	Socket is already connected.	A connect request was made on an already-connected socket. Some implementations also return this error if sendto is called on a connected SOCK_DGRAM socket (for SOCK_STREAM sockets, the to pa-rameter in sendto is ignored) although other implementations treat this as a legal occurrence.
WSAEMFILE (10024)	Too many open files.	Too many open sockets. Each implementation may have a maximum number of socket handles avail-able, either globally, per process, or per thread.
WSAEMSGSIZE (10040)	Message too long.	A message sent on a datagram socket was larger than the internal message buffer or some other network limit, or the buffer used to receive a datagram was smaller than the datagram itself.
WSAENETDOWN (10050)	Network is down.	A socket operation encountered a dead network. This could indicate a serious failure of the network sys-tem (that is, the protocol stack that the Windows Sockets DLL runs over), the network interface, or the local network itself.
WSAENETRESET (10052)	Network dropped connection on reset.	The connection has been broken due to keep-alive activity detecting a failure while the operation was in progress. It can also be returned by setsockopt if an attempt is made to set SO_KEEPALIVE on a con-nection that has already failed.
WSAENETUNREACH (10051)	Network is unreachable.	A socket operation was attempted to an unreachable network. This usually means the local software knows no route to reach the remote host.
WSAENOBUFS (10055)	No buffer space available.	An operation on a socket could not be performed because the system lacked sufficient buffer space or because a queue was full.
WSAENOPROTOPT (10042)	Bad protocol option.	An unknown, invalid or unsupported option or level was specified in a getsockopt or setsockopt call.
WSAENOTCONN	Socket is not connected.	A request to send or receive data was disallowed because the socket is not connected and (when send-ing on a datagram socket using sendto) no address was supplied. Any

(10057)		other type of operation might also return this error-for example, setsockopt setting SO_KEEPALIVE if the connection has been reset.
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WSAENOTSOCK (10038)	Socket operation on nonsocket.	An operation was attempted on something that is not a socket. Either the socket handle parameter did not reference a valid socket, or for select, a member of an fd_set was not valid.
WSAEOPNOTSUPP (10045)	Operation not supported.	The attempted operation is not supported for the type of object referenced. Usually this occurs when a socket descriptor to a socket that cannot support this operation is trying to accept a connection on a datagram socket.
WSAEPFNOSUPPORT (10046)	Protocol family not supported.	The protocol family has not been configured into the system or no implementation for it exists. This message has a slightly different meaning from WSAEAFNOSUPPORT. However, it is interchangeable in most cases, and all Windows Sockets functions that return one of these messages also specify WSAEAFNOSUPPORT.
WSAEPROCLIM (10067)	Too many processes.	A Windows Sockets implementation may have a limit on the number of applications that can use it simultaneously. WSASocket may fail with this error if the limit has been reached.
WSAEPROTONOSUPPORT (10043)	Protocol not supported.	The requested protocol has not been configured into the system, or no implementation for it exists. For example, a socket call requests a SOCK_DGRAM socket, but specifies a stream protocol.
WSAEPROTOTYPE (10041)	Protocol wrong type for socket.	A protocol was specified in the socket function call that does not support the semantics of the socket type requested. For example, the ARPA Internet UDP protocol cannot be specified with a socket type of SOCK_STREAM.
WSAESHUTDOWN (10058)	Cannot send after socket shutdown.	A request to send or receive data was disallowed because the socket had already been shut down in that direction with a previous shutdown call. By calling shutdown a partial close of a socket is requested, which is a signal that sending or receiving, or both have been discontinued.
WSAESOCKTNOSUPPORT (10044)	Socket type not supported.	The support for the specified socket type does not exist in this address family. For example, the optional type SOCK_RAW might be selected in a socket call, and the implementation does not support SOCK_RAW sockets at all.
WSAETIMEDOUT (10060)	Connection timed out.	A connection attempt failed because the connected party did not properly respond after a period of time, or the established connection failed because the connected host has failed to respond.
WSATYPE_NOT_FOUND (10109)	Class type not found.	The specified class was not found.
WSAEWOULDBLOCK (10035)	Resource temporarily unavailable.	This error is returned from operations on nonblocking sockets that cannot be completed immediately, for example recv when no data is queued to be read from the socket. It is a nonfatal error, and the operation should be retried later. It is normal for WSAWOULDBLOCK to be reported as the result from calling connect on a nonblocking SOCK_STREAM socket, since some time must elapse for the connection to be established.
WSAHOST_NOT_FOUND (11001)	Host not found.	No such host is known. The name is not an official host name or alias, or it cannot be found in the data-base(s) being queried. This error may also be returned for protocol and service queries, and means that the specified name could not be found in the relevant database.
WSA_INVALID_HANDLE	Specified event object	An application attempts to use an event object, but the specified handle is not valid.

E (OS dependent)	handle is invalid.	
WSA_INVALID_PARAMETER (OS dependent)	One or more parameters are invalid.	An application used a Windows Sockets function which directly maps to a Win32 function. The Win32 function is indicating a problem with one or more parameters.
WSA_INVALID_PROCTABLE (OS dependent)	Invalid procedure table from service provider.	A service provider returned a bogus procedure table to Ws2_32.dll. (Usually caused by one or more of the function pointers being null.)
WSA_INVALID_PROVIDER (OS dependent)	Invalid service provider version number.	A service provider returned a version number other than 2.0.
WSA_IO_INCOMPLETE (OS dependent)	Overlapped I/O event object not in signaled state.	The application has tried to determine the status of an overlapped operation which is not yet completed. Applications that use WSAGetOverlappedResult (with the fWait flag set to FALSE) in a polling mode to determine when an overlapped operation has completed, get this error code until the operation is complete.
WSA_IO_PENDING (OS dependent)	Overlapped operations will complete later.	The application has initiated an overlapped operation that cannot be completed immediately. A completion indication will be given later when the operation has been completed.
WSA_NOT_ENOUGH_MEMORY (OS dependent)	Insufficient memory available.	An application used a Windows Sockets function that directly maps to a Win32 function. The Win32 function is indicating a lack of required memory resources.
WSANOTINITIALISED (10093)	Successful WSAStartup not yet performed.	Either the application has not called WSAStartup or WSAStartup failed. The application may be accessing a socket that the current active task does not own (that is, trying to share a socket between tasks), or WSACleanup has been called too many times.
WSANO_DATA (11004)	Valid name, no data record of requested type.	The requested name is valid and was found in the database, but it does not have the correct associated data being resolved for. The usual example for this is a host name-to-address translation attempt (using gethostbyname or WSAsyncGetHostByName) which uses the DNS (Domain Name Server). An MX record is returned but no A record-indicating the host itself exists, but is not directly reachable.
WSANO_RECOVERY (11003)	This is a nonrecoverable error.	This indicates some sort of nonrecoverable error occurred during a database lookup. This may be because the database files (for example, BSD-compatible HOSTS, SERVICES, or PROTOCOLS files) could not be found, or a DNS request was returned by the server with a severe error.
WSAPROVIDERFAILED_INIT (OS dependent)	Unable to initialize a service provider.	Either a service provider's DLL could not be loaded (LoadLibrary failed) or the provider's WSPStartup/NSPStartup function failed.
WSASYSCALLFAILURE (OS dependent)	System call failure.	Returned when a system call that should never fail does. For example, if a call to WaitForMultipleObjects fails or one of the registry functions fails trying to manipulate the protocol/name space catalogs.

WSASYSNOTREADY (10091)	Network subsystem is unavailable.	<p>This error is returned by WSASStartup if the Windows Sockets implementation cannot function at this time because the underlying system it uses to provide network services is currently unavailable. Users should check:</p> <p>That the appropriate Windows Sockets DLL file is in the current path.</p> <p>That they are not trying to use more than one Windows Sockets implementation simultaneously. If there is more than one Winsock DLL on your system, be sure the first one in the path is appropriate for the network subsystem currently loaded.</p> <p>The Windows Sockets implementation documentation to be sure all necessary components are currently installed and configured correctly.</p>
WSATRY_AGAIN (11002)	Nonauthoritative host not found.	This is usually a temporary error during host name resolution and means that the local server did not receive a response from an authoritative server. A retry at some time later may be successful.
WSAVERNOTSUPPORTED (10092)	Winsock.dll version out of range.	The current Windows Sockets implementation does not support the Windows Sockets specification version requested by the application. Check that no old Windows Sockets DLL files are being accessed.
WSAEDISCON (10101)	Graceful shutdown in progress.	Returned by WSARcv and WSARcvFrom to indicate that the remote party has initiated a graceful shut-down sequence.
WSA_OPERATION_ABORTED (OS dependent)	Overlapped operation aborted.	An overlapped operation was canceled due to the closure of the socket, or the execution of the SIO_FLUSH command in WSALocctl.

10.3 Check list

- Is the device (PLC) that you are trying to communicate with connected to the power supply?
Is the PC or the SPS connected to the network?
 - Is the TCP/IP protocol installed?
 - Are the used datablocks correctly defined in the SPS?
 - Have you analyzed the Diagnosis Viewer entries (which errors have occurred)?
 - Are all participants in the same subnet?
 - Have you transmitted the driver configuration file to the target computer?
 - Have you analyzed the "driver communication error file" (which errors have occurred)?