

INSTALLATION AND CONFIGURATION MANUAL

Getting started AC500 V3 products



Table of contents

Gett	ting star	ted with example projects	3
1.1	Introduc	ction	3
1.2	Safety i	nstructions	3
1.3	Enginee	ering software Automation Builder	6
	1.3.1	Purpose	6
	1.3.2	Installation of the Automation Builder	6
	1.3.3	Licensing procedure	7
	1.3.4	Setting up of communication parameters in Windows	
1.4	Hardwa	ıre AC500 V3	11
	1.4.1	Configuration for example projects	11
	1.4.2	System assembly, construction and connection	13
1.5	Example	e project for central I/O expansion	14
	1.5.1	Purpose	14
	1.5.2	Preconditions	14
	1.5.3	Creation, setting up and saving of your AC500 V3 project	14
	1.5.4	Configuration of the I/O module	19
	1.5.5	Programming and compilation	23
	1.5.6	Setting up the communication gateway	32
	1.5.7	Installation and update of the AC500 V3 firmware	38
	1.5.8	Logging in to CPU and downloading the program	40
	1.5.9	Testing the program	41
	1.5.10	Setting up a visualization	43
	1.5.11	Creation of a visualization	47
	1.5.12	Enabling a web visualization	55
	1.5.13	Reset the CPU	60
1.6	Example	e project for remote I/O expansion with PROFINET	61
	1.6.1	Purpose	61
	1.6.2	Preconditions	61
	1.6.3	Set-up PROFINET controller	61
	1.6.4	Set-up PROFINET device	64
	1.6.5	Add remote I/O expansion to project	68
	1.6.6	Test the program	72
	1.6.7	Reset the CPU	73
1.7	Further	information on our AC500 portfolio	
Indo	Y		75

1 Getting started with example projects

1.1 Introduction

This document gives an overview of the steps for the first use of a PLC with AC500 V3 processor module and describes:

- installation of the engineering software & Chapter 1.3 "Engineering software Automation Builder" on page 6
- hardware needed for example projects & Chapter 1.4 "Hardware AC500 V3" on page 11
- commissioning a project for remote I/O expansion with PROFINET *b* Chapter 1.6 "Example project for remote I/O expansion with PROFINET" on page 61



Getting started with an AC500-eCo V3 processor module: <u>Starter kit smart guide</u>

1.2 Safety instructions

Relevant standards and regulations, accident prevention regulations and regulations on special environmental conditions must be observed (e.g., hazardous areas due to explosive substances, heavy soiling or corrosive influences).

The devices must be handled and operated within the specified technical data and system data.

The devices contain no serviceable parts and must not be opened.

Removable covers must be closed during operation unless otherwise specified.

Any liability for the consequences of incorrect use or unauthorized repairs is rejected.

Qualified personnel Both the AC500 control system and other components in the vicinity are operated with dangerous touch voltages. Touching live components can lead to serious health implications or even death.

To avoid such risks and the occurrence of property damage, persons involved in the installation, commissioning and maintenance must have relevant knowledge about:

- Automation technology
- Handling of hazardous voltages
- Application of relevant standards and regulations, accident prevention regulations and regulations on special environmental conditions (e.g., hazardous areas due to explosive substances, heavy soiling or corrosive influences).

Functional safety	The <u>AC500-S safety user manual</u> must be read and understood before using the safety configu- ration and programming tools of Automation Builder/PS501 Control Builder Plus. Only qualified personnel are permitted to work with AC500-S safety PLCs.
General infor- mation	The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variants and requirements associated with any particular installation, ABB cannot assume responsibility or liability for actual use based on the examples and diagrams.
	The PLC was developed according to the relevant standards. Any module-specific measures are described in the individual descriptions of the modules.

PLC-specific safety notices

The product family AC500 control system is designed according to the EN 61131-2 and IEC 61131-2 standards. Any data that differs from IEC 61131-2, is due to the higher requirements of Maritime Services. Other differences are described in the technical data description of the devices.

NOTICE!

Avoidance of electrostatic charging

PLC devices and equipment are sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Observe the following rules when handling the system:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

NOTICE!

Use of suitable enclosure

The devices must be mounted in a control cabinet that ensures compliance with the specified environmental conditions.

Cleaning instructions

Do not use cleaning agent for cleaning the device.

Use a damp cloth instead.

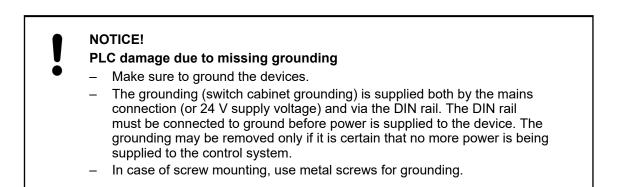
Connection plans and a user program must be created so that no dangerous situations can occur during normal operation or failure.

The application must be tested to ensure that no dangerous situations can occur during operation.

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Do not operate devices outside of the specified, technical data!

Trouble-free functioning cannot be ensured outside of the specified data.



CAUTION!

Do not obstruct the ventilation for cooling!

The ventilation slots on the upper and lower sides of the devices must not be covered.

CAUTION!

Run signal and power wiring separately!

Signal and supply lines (power cables) must be laid out so that no malfunctions due to capacitive and inductive interference can occur (EMC).



WARNING!

Warning sign on the module!

This indicates that dangerous voltages may be present or that surfaces may have dangerous temperatures.



WARNING!

Splaying of strands can cause hazards!

Avoid splayed strands when wiring terminals with stranded conductors.

Ferrules can be used to prevent splaying.



Removal/Insertion under power

Removal or insertion under power is permissible only if all conditions for hot swapping are fullfilled.

The devices are not designed for removal or insertion under power when the conditions for hot swap do not apply. Because of unforeseeable consequences, it is not allowed to plug in or unplug devices with the power being ON.

Make sure that all voltage sources (supply and process voltage) are switched off before you

- connect or disconnect any signal or terminal block
- remove, mount or replace a module.

Disconnecting any powered devices while they are energized in a hazardous location could result in an electric arc, which could create an ignition source resulting in fire or explosion.

Prior to proceeding, make sure that power is been disconnected and that the area has been thoroughly checked to ensure that flammable materials are not present.

The devices must not be opened when in operation. The same applies to the network interfaces.

Information on batteries



CAUTION!

Use only ABB approved lithium battery modules!

At the end of the battery's lifetime, always replace it only with a genuine battery module.

CAUTION! Risk of explosion!

Do not open, re-charge or disassemble lithium batteries. Attempting to charge lithium batteries will lead to overheating and can cause explosions.

Protect them from heat and fire and store them in a dry place.

Never short-circuit or operate lithium batteries with the polarities reversed. The batteries are likely to overheat and explode. Avoid unintentional short circuiting do not store batteries in metal containers and do not place them on metallic surfaces. Escaping lithium is a health hazard.

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57

Environment considerations

Recycle exhausted batteries. Dispose of batteries in an environmentally conscious manner in accordance with regulations issued by the local authorities.

1.3 Engineering software Automation Builder

1.3.1 Purpose

For configuring and programming of any AC500 CPU you need the engineering software suite Automation Builder. Automation Builder is available for download.

Section 4.5 Sectio

1.3.2 Installation of the Automation Builder

Preconditions You must have administrator rights on your PC to install Automation Builder.

In case of an update installation:

Create a project archive before upgrading Automation Builder. Project archives contain all project data, including data that is not stored with a *.project file, e.g. device description files for third party devices.

Installation

- 1. Go to <u>abb.com/automationbuilder</u> to access the homepage of Automation Builder.
- 2. In the "Downloads" section, select "Download Automation Builder".
- 3. In the *"Latest Automation Builder"* section, select *"Automation Builder x.x. Download"* (x.x = latest version). This downloads the installer on your PC.
- 4. Open the downloaded installer and follow the instructions of the installation manager.

ABB ABB Automation Builder				
Automation Builder Engineering Productivity				
Select type of installation:				
Pankan lakan 🗸				
Install Software Packages for:				
🖃 🔤 🖌 ABB Automation Builder				
🔤 🔄 Professional Tool Chain				
Professional Version Cont				
E = PLC				
■_ = PLC - AC500 V3				
— — High Availability Modbus L				
Safety PLC - Pluto				

- 5. Keep the default type of installation to *"Premium Edition"* if available.
- 6. Select software packages to be installed:

Enable the check box *"PLC - AC500 V3"* to activate installation of all options for AC500 V3.

7. Click "Download and install" and follow the instructions of the setup.

Automation Builder software must be installed successfully.

1.3.3 Licensing procedure

When you start Automation Builder software for the first time, you will be asked to choose a license option.

See also:

 \checkmark

- Details about the license model, the features of the editions and the latest license information
- Detailed description of the installation and the licensing possibilities of Automation Builder

Activate a trial license

 \square PC is connected to the internet.

- 1. Start Automation Builder.
 - \Rightarrow A licensing wizard starts and guides you through the licensing procedure.
- 2. Enter user information.

In case of future support requests, your registration details enable ABB support team to handle your questions quickly.

3. Select "OK".

1		The second		0		
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-			No. 1		-	
]間	AL U			711.1
					HKLL	
1		And Street and Street	NOTION THE		1. 1.	
C	127	0.0				
O Th	ave an activa	ition key				
			_			
• Iw	ant to activa	te a trial licens	e (valid for 30	days).		
O Iw	ant to activa	te a basic licer	nse (free of ch	arge).		
CIW	ant to contin	ue an offline ac	tivation. Impo	rt an activatio	on response file.	
					-	1
					Next >	Cancel

- 4. Enable the trial license.
- 5. Select "Next".

ABB License Manager	×
Please select your license lock mode.	
PC locked: single PC license	
O Portable: portable license, locked to a USB stick	
✓ Refresh list	
	Next > Cancel

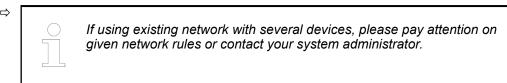
6. Enable the single PC license and select "Next".

ABB License Manager	×
Your activation request will be transfered to an ABB license service	ver now.
Online activation. Requires an internet connection.	
Offline activation. Requires another PC with internet connect	ion.

- 7. Enable online activation and select "Next".
 - ⇒ License activation procedure starts. A successfully ended licensing procedure ends with a success message.
- 8. Select "OK" to end the wizard.
 - ⇒ Automation Builder license is activated and starts.

1.3.4 Setting up of communication parameters in Windows

Setting up of To set up the communication between the PC and the PLC, e.g., for downloading the compiled program, you have to set up the communication parameters. communication parameters The IP address of your PC must be in the same class as the IP address of the CPU. The factory setting of the IP address of the CPU is 192.168.0.10. The IP address of your PC should be 192.168.0.X. Avoid X = 10 in order to prevent an IP conflict with the CPU. Subnet mask should be 255.255.255.0. Changing of the Open Windows control panel. Click "Network and Internet 1. **IP** address → Network and Sharing Center". 2. Click "Change adapter settings". ⇒



3. Right-click "Local Area Connection (Ethernet)" and select [Properties].

Local Area Connection Properties	×					
Networking Sharing						
Connect using:						
Intel(R) 82579LM Gigabit Network Connection						
Configure						
This connection uses the following items:						
 QoS Packet Scheduler File and Printer Sharing for Microsoft Networks Internet Protocol Version 6 (TCP/IPv6) Internet Protocol Version 4 (TCP/IPv4) Internet Protocol Version 4 (TCP/IPv4) Link-Layer Topology Discovery Mapper I/O Driver Link-Layer Topology Discovery Responder 						
Install Uninstall Properties						
Description Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.						
OK Cancel						

4. Double-click "Internet Protocol Version 4 (TCP/IPv4)".

eral ou can get IP settings assigned autoris capability. Otherwise, you need	
r the appropriate IP settings.	
Obtain an IP address automatic Use the following IP address:	ally
IP address:	192.168.0.9
Subnet mask:	255.255.255.0
Default gateway:	
C Obtain DNS server address aut	omatically
• Use the following DNS server and the server an	
Preferred DNS server:	
Alternate DNS server:	
Validate settings upon exit	Advanced
	OK Car

5. Enter your desired IP address and subnet mask.

1.4 Hardware AC500 V3

1.4.1 Configuration for example projects

The example projects require a small PLC configuration with I/O devices, e.g., as available in the training case <u>TA5450-CASE</u>.

Product name	Туре	First project	Second project & Chapter 1.6 "Example project for remote I/O expansion with PROFINET" on page 61
PM5630- 2ETH	AC500 V3 CPU	x	х
TB5620-2ETH	terminal base for CPU	x	х
DA501	analog/digital mixed input/output (I/O) module	x	x
TU516-H	terminal unit for I/O module	x	x

Table 1: Modules for example projects to get started with AC500 V3 PLC

Product name	Туре	First project	Second project & Chapter 1.6 "Example project for remote I/O expansion with PROFINET" on page 61
CM579-PNIO	PROFINET communi- cation module		x
CI502-PNIO	PROFINET commu- nication interface module		x
TU508-ETH	terminal unit for com- munication interface module		x
TA524	blind cap for terminal base	x	x

Connections

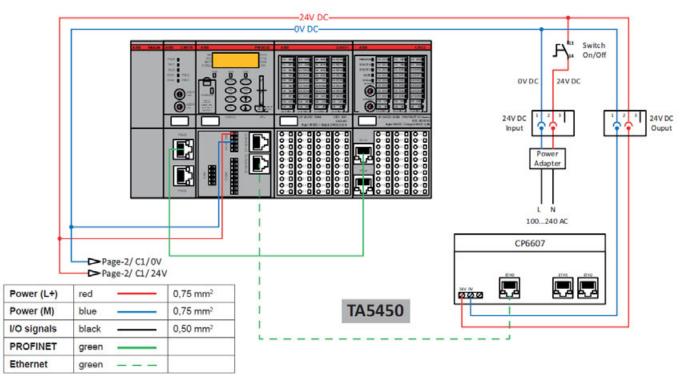


Fig. 1: Training case TA5450

In the training case, the control panel CP6607 is included. A control panel is not needed for the example projects.

For testing the example project some inputs require to be connected as follows:

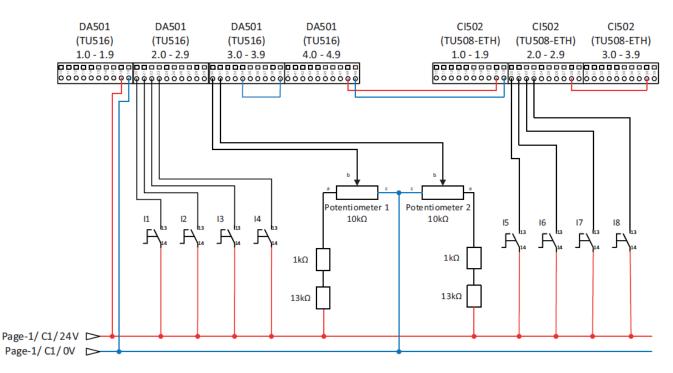


Fig. 2: Wiring of training case

For the example projects, not all input switches and none of the potentiometers included in training case are necessary.

You will need switch 11 for the example project for central I/O expansion.

You will need switch 15 for the example project for remote I/O expansion.

1.4.2 System assembly, construction and connection

NOTICE!

Avoidance of electrostatic charging

PLC devices and equipment are sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Observe the following rules when handling the system:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wrist strap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, store the equipment in appropriate static-safe packaging.

You can mount AC500 PLC either to DIN rail or to a metal plate. Here, we recommend to mount on DIN rail.

- 1. Snap the terminal base onto DIN rail.
- 2. Snap the additional terminal units for I/O modules onto DIN rail.
- 3. Make the sensor/actuator wire connections according to the dedicated electronic module you want to use. Provide external process power supply as required.
- 4. If required, make the fieldbus connections according to the dedicated master communication module you want to use.

- 5. Plug the appropriate electronic and I/O modules in the correct locations (processor module, communication modules on terminal base, and eventually also communication interface modules and I/O modules onto dedicated terminal units).
- 6. Connect a programming cable (Ethernet cable between ETH port of CPU and PC with engineering software).

1.5 Example project for central I/O expansion

1.5.1 Purpose

The following steps show how to set-up an application project and configure the hardware. A simple logic is used as example to introduce in programming and commissioning of the PLC. The workflow for creation of a visualization is explained, as well as how to set-up a web server for visualization.

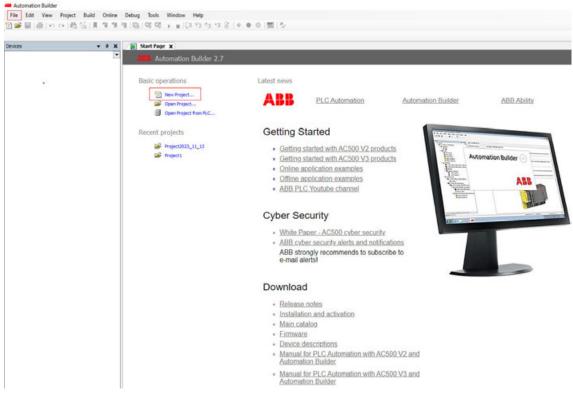
1.5.2 Preconditions

- Automation Builder is installed and licensed as, at least, basic edition.
- AC500 V3 CPU is assembled and connected to the PC V3" on page 11.

1.5.3 Creation, setting up and saving of your AC500 V3 project

1.5.3.1 Creation of a project

1. Launch Automation Builder either out of the desktop icon or out of the Windows menu.



2. Select "New Project" or go to menu "File → New Project".

管 New Project	×
Categories	Templates
Projects	AC500 project Empty project
A project containing one AC500 PLC	
Name	
Location	~
	OK Cancel

- 3. Select *"Projects"*.
- 4. Select "AC500 project".
- 5. Fill in project name.
- 6. Choose a location to save the project to.
- 7. Select [OK].
- 8. Select "PLC AC500 V3".
- 9. Select the CPU according to your hardware set-up.

Object path:			
C:\Users\Test\Documents\Pro	ject.project		
Categories	✓ Search object name		
	Name	Short Description	
<u>.</u> PLC - AC500 V3	Children Children	CRC188-ARCNET of adapter CRC188-ARCNET OF adapter CRC188-ARCNET OF adapter CRC188-ARCNET ETH-OF ETH/188-ETH-OF adapter in ED-500-1 JA-0C at 15 ED-500-1 JA-0C at 15 ED-500-1 JA-0C Breat ED-500-1 JA-0C Breat	

10. Select [Add PLC] to add the CPU to your application.

1.5.3.2 Configuration of your processor module

PLC_AC500_V3 (PM5630-2ETH - TB5620 PLC Logic Application Ibrary Manager)-2ETH)
evices	• 4 X PLC_AC500_V3 X
AC500 V3 Basic Project	Communication Settings
BII PLC Logic G Application	PLC Settings
Library Manager	Version information
E Task Configuration	Statistics
- B) PLC PRG	Files
IO_Bus	
🖻 🖬 👝 Interfaces	Log
□ COM_1 (COM 1) ■ □ CAA_SerialCom (CAA SerialCom)	PLC Shell
CAN (<empty>)</empty>	Users and Groups
ETH1 (IP Settings)	Access Rights
ETH2 (IP Settings)	Symbol Rights
Protocols (Client Protocols)	PM5630-2ETH Hardware
<pre>Extension_Bus K Slot_1 (<empty>) Slot_2 (<empty>) </empty></empty></pre>	CPU Parameters

Parameter	Туре	Value	Default Value
💬 🖗 Error LED	Enumeration of BYTE	On	On
Check battery	Enumeration of BYTE	On	On
🖉 🖗 Stop on error class	Enumeration of BYTE	Diagnosis of at least error class 2	Diagnosis of at least error class 2

- 1. Double-click "PLC_AC500_V3".
 - \Rightarrow A tab opens in the editor view.
- 2. Select "CPU Parameters".
- 3. Under parameter *"Check battery"*, choose the value *"Off"* since there is no battery present inside the CPU module.
- 4. Keep the default values for all other parameters.

1.5.3.3 Creation of folders in the device tree

To optimize the project readability, you will create different folders to group similar objects. The folder names are exemplary. Because the device tree view follows an alphabetical order, we use number prefixes to determine the order.

2024/01/05

Devices		→ ₽ X
Project		-
🖻 🗍 PLC_AC500_V3		
🗄 💮 Application	B	Conv
Colored_30		Сору
10,8at	Ē	Paste
· Carp Interfaces	*	Cut
Ordnard_RTC	\times	Delete
		Rename
	æ	Properties
		Add object
		Update objects
	O	Add Folder

- 1. Right-click "Application".
- 2. Select "Add Folder".

Add Folder	×
	Folder name: 10 POUs
	OK Cancel

3. Type in "10 POUs". This is a name example. Here, the intention is to see this folder as a last one.

The folder "10 POUs" is for program organization units (POU). POUs are objects of type program, function or function block that are used to create a user program.

1.5.3.4 Saving the project

File	Edit View	Project	Build	Online	Debug		
1	New Project	Ctrl+	٠N				
1	Open Project	Open Project					
	Close Project						
	Save Project			Ctrl	+S		
	Save Project As						
	Project Archive			•			
	Source Upload						
6	Print						
	Page Setup						
	Recent Projects						
	Exit			Alt+	F4		

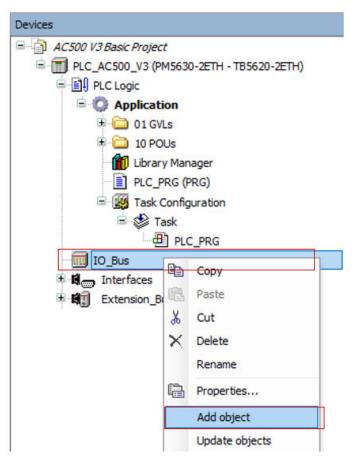
All Project.project* - Automation Builder

▷ Select menu "File → Save Project".
 Alternatively, select the save icon II in the tool bar.
 Alternatively, press [Ctrl] + [S].

1.5.4 Configuration of the I/O module

- 1.5.4.1 General
 - The types and order of modules in the Automation Builder project must match the real hardware configuration.
 - The position of the modules in the device tree can be changed by drag and drop.

1.5.4.2 Adding an I/O bus module



- 1. Right-click *"IO_Bus"* in the device tree.
- 2. Select "Add object".

Add object below : IO_Bus Object path: PLC_AC500_V3\IO_Bus Object name: DA501				
Categories	✓ Search obj	ect name		
 S500 eCo I/O modules S500 I/O modules Scripting Uncategorized 	AI523 AI531 AA521 AX522 AX522 AX522 CD522 DA500 DA500 DC522 DC532 DC532	3 16AO, U/I, 12bit+sign 1 4AI/4AO, U/I/RTD, 12bit+sign 2 8AI/8AO, U/I/RTD, 12bit+sign 3 8AI/8AO, U/I/RTD, 12bit+sign 2 2xencoder, 2xPWM 1 16DI/8DC/4AI/2AO, 24VDC 2 16DO/8DC/4AI/2AO, 24VDC 2 16DC, 24VDC 3 24DC, 24VDC 2 16DI/16DC, 24VDC	Version 3.2.0.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0 3.2.1.0	Order N A ISAP25 ISAP25 ISAPx5 ISAPx5 ISAPx5 ISAPx5 ISAPx6 ISAPx5 ISAPx5 ISAPx5 ISAPx5 ISAPx5 ISAPx4 ISAPx4 ISAPx4 ISAPx4 ISAPx4 ISAPx4
Close this dialog after each trans	action 🔲 Display	/ all versions Add object	(Close

- 3. Select "S500 I/O modules".
- 4. Select *"DA501"* module.
- 5. Select [Add object] to add the module to the I/O bus.

1.5.4.3 Variable mapping of the DA501

Devices
AC500 V3 Basic Project
PLC_AC500_V3 (PM5630-2ETH - TB5620-2ETH)
E IL PLC Logic
Application
🗷 🧰 01 GVLs
🖲 🧰 10 POUs
Library Manager
PLC_PRG (PRG)
🖹 🎆 Task Configuration
🖻 🍪 Task
PLC_PRG
IO_Bus
DA501 (DA501)

Diagnosis	Find	Filter Show all	🗸 🖶 Add FB for IO channel 🔭 Go to instance					
DA501 Parameters	Variable	Mapping	Channel Digital inputs DI0 - DI7	Address %IB0	Туре ВҮТЕ	Default Value	Unit	Description
DA501 I/O Mapping	iii - Mp		Digital inputs DI8 - DI15	%IB1	BYTE			
<u> </u>	B-10		Analog input AI0+	%IW1	INT			
DA501 IEC Objects	· · · · · ·		Analog input AI1+	%IW2	INT			
	(B)- 🎭		Analog input AI2+	%IW3	INT			
I/O mapping list	· · · · · ·		Analog input AI3+	%IW4	INT			
	* •		Analog output AO0+	%QW0	INT			
Information	- **		Analog output AO1+	%QW1	INT			
	- *		Digital inputs DC16 - DC23	%IB10	BYTE			
	÷-*•		Digital outputs DC16 - DC23	%Q86	BYTE			
	🖲 🦳 Fast counter							

1. Double-click "DA501" in the device tree.

 \Rightarrow A tab opens in the editor view.

- 2. Select "DA501 I/O Mapping"
 - ⇒ Here, you will map variable names (symbols) for the channels you will need in the program.

The suggested name convention is based on "Hungarian notation". A name prefix is describing variable type: e.g., "x" = variable of type BOOL, "w" = WORD, "i" = INT (integer) etc. This increases the code readability and is helpful for program analysis.

1.5.4.4 Handling the digital input variables

Diagnosis	Find		Filter Show all			- 🕂 Add FB for IO	channe	el → Go to i
DA501 Parameters	Variable	Mapping	Channel Digital inputs DI0 - DI7	Address %IB0	Type BYTE	Default Value	Unit	Description
DA501 I/O Mapping			Digital inputs DI8 - DI15	%IB1	BYTE			
	* xDI_08_DA501_I1	***	Digital input DI8	%IX1.0	BOOL			

- 1. Open the list of the digital inputs.
- 2. Fill in the variable names:

Channel	Туре	Variable
Digital input DI8	BOOL	xDI_08_DA501_I1

Handling the digital output variables 1.5.4.5

Diagnosis	Find		Filter Show all		- 🕂 Add FB fo	or IO channel + G	o to ins	tance
DA501 Parameters		Mapping	Channel	Address	Туре	Default Value	Unit	Description
	💷 🕀 👘		Digital inputs DI0 - DI7	%IB0	BYTE			
DA501 I/O Mapping	i⊞ * ≱		Digital inputs DI8 - DI15	%IB1	BYTE			
	۵. ا		Analog input AI0+	%IW1	INT			
DA501 IEC Objects	in - ₩		Analog input AI1+	%IW2	INT			
			Analog input AI2+	%IW3	INT			
I/O mapping list	😟 - 🦘		Analog input AI3+	%IW4	INT			
	*		Analog output AO0+	%QW0	INT			
Information	*		Analog output AO1+	%QW1	INT			
	1		Digital inputs DC16 - DC23	%IB10	BYTE			
	9- %		Digital outputs DC16 - DC23	%QB6	BYTE			
	√ xStartDriling1	×.	Digital output DC16	%QX6.0	BOOL			

- 1. Open the list of the digital outputs.
- 2. Fill in the variable names:

Channel	Туре	Variable
Digital output DC16	BOOL	xStartDrilling1

1.5.5 Programming and compilation

Task configuration 1.5.5.1

A task is a time unit in the processing of a user program (IEC application), which defines by parameters the way and the speed the CPU is executing the user program.

For this project you will use only one cycling task.



In the device tree, you see the objects "Task configuration" and "Task". Both created automatically with the project.

For this project you will use only one cycling task.

- \triangleright Double-click "Task" in the device tree.
 - \Rightarrow A tab opens in the editor view.

For this project you will use only one cyclic task. Keep the default settings for the task.

😵 Task X
Configuration
Priority (016): 15
Type
Watchdog
⊡ Enable
Time (e.g. t#200ms): t#20ms
Sensitivity: 1
💠 Add Call 🗙 Remove Call 📝 Change Call 🕸 Move Up 🔹 Move Down 🌁 Open POU
POU Comment
倒 PLC_PRG

This is how the CPU prioritizes the task, when more than one task is defined. Priority Priority 0 ... 15 = real time tasks, priority 16 = non-real time task.

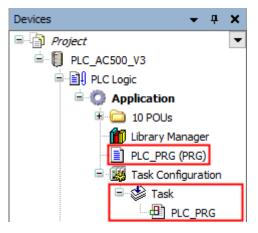
In the CPU you can run tasks dependent on the demands of the process Type Interval For cyclic tasks you can set the cyclical execution time. It is usually set in milliseconds with IEC time syntax To keep track of the time it takes to complete the task Watchdog

You can call in one or more program POUs in one single task Calls

1.5.5.2 Main program PLC_PRG

In the default task configuration, there is one call of a POU (program organization unit) i.e. "PLC_PRG" \Leftrightarrow (shown in chapter 1.5.5.1 Task configuration on page 23).

In your project the "PLC_PRG" will become a main program containing calls to other programs (POUs) which you will create one by one.



The PLC_PRG POU has been defined by default in ST (Structured Text) editor. Keep this setting because of good visibility of the instructions at a glance and good handling for trouble-shooting.

To optimize the project readability, you will work with the previously created folder "10 POUs" and add the created subroutines (POUs) to this folder. The subroutines will be created in FBD (Function Block Diagram) editor.

1.5.5.3 Boolean logic "NOT"

1.5.5.3.1 Application example "driller"

Recognizing of a driller by a photo sensor. "TRUE" input signal from sensor indicates that a driller is broken. If driller has been found correct, then start drilling.

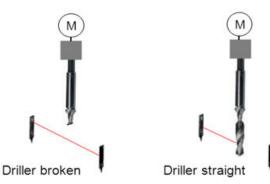


Table 2: Required behavior

Signal from photo sensor	Required signal of motor ON
FALSE	TRUE
TRUE	FALSE

Table 5. Haluware Sel-u	μ		
Element	HW channel	Symbol	Description
Switch I1	DA501 DI8	xDI_08_DA501_I1	Photo sensor
LED output DC16	DA501 DC16	xStartDrilling1	Motor on

Table 3: Hardware set-up

1.5.5.3.2 Implementation

Creation of a new program POU in the project

	▼ 9	Add object below	: 10 POUs				\times
Project PLC_AC500_V3 PLC Logic Application DOUS		Copy Paste	\	Search object name			
Toti Configuration Ordinant, JD Diffuser(_JD Diffuser(_JD Diffuser(_JD) Diffuser(_JD) Ordinant, JD)	×	Cut Delete Rename Properties		Name Name Configuration CheckConfiguration V DUT	Short Description	Version	^
	- 6	Add object Update objects Add Folder Edit Object Edit Object with		Global Variable List Image Pool ∽ Interface Metwork Variable List (Receiver) Network Variable List (Sender) T Persistent Variables POU			
		Compare Objects]	POU for implicit checks Recipe Manager Script Script Symbol Configuration Text List	_	>	*
		Close this dialog Reset filter	g after each transaction	Display all versions	object	Close	

- 1. Right-click "10 POUs".
- 2. Select "Add object".
- 3. Select "POU".
- 4. Select [Add object].

Create a new	POU (Prog	ıram Organiza	tion Unit))
Name				
_01_Assignment_NO	Т			
Туре				
Program				
O Function bloc	:k			
Extends				
Implements				
Final	Abst	tract		
Accessspecifi	er			
				\sim
Method impler	nentation la	anguage		
Function Block	Diagram (FE	BD)		\sim
Return type				
Implementation lang	juage			
Function Block Diagra				~

- 5. Enter "_01_Assignment_NOT".
- 6. Select "Program".
- 7. Select "Function Block Diagram (FBD)".
- 8. Select [Add].
 - \Rightarrow POU has been added.

Assigning the hardware DI signals to local variables

1. Double-click POU"_01_Assignement_NOT" in the device tree.

/ 🗗 _	01_Assignment_NOT 🗙	ToolBox	•	Ļ	x
1	PROGRAM _01_Assignment_NOT	😑 Gene	ral		
2	VAR	1	Network		
3	END_VAR	1 1	Box		
4		1 2	Box with EN/ENO		
		-VA	Assignment		
		-	Jump		
		-	T Return		
		**	Input		
	100 % 🕅) t	Branch		
1 1		- 5	Execute		
Ż	Start here	🗄 Boole	an Operators		

- 2. Select *"Assignment"* from the ToolBox.
- 3. Drag and drop "Assignment" into the "Start here" field in network "1".

Variables Keywords	Name Application Solution Config_Globals Solution Config_Globals Napping	Type Application VAR_GLOBAL VAR_GLOBAL	Address	
		8001. 8001.	%DV1.0 %QX8.0	
Structured view	¢	Filter:	None	
Documentation:	2	Insert with arguments	Insert with namespace	e pr
xDI_08_DA501_I1 AT % (VAR_GLOBAL)	DX1.0: BOOL;			

- 4. Select "???" on the left side of the assignment, then select "...".
- 5. Open the "Io Config_Globals_Mapping" mapping list and select "xDI_08_DA501_I1".
- 6. Select *[OK]* to add this variable to the left side of the assignment connector.

_01_NOT X			
1 PROGRAM _01_NOT			
2 VAR			
3 END_VAR			
4			
	Auto Declare		×
	Scope:	Name:	Туре:
	VAR ~	xDrillerBroken1	BOOL V >
	Object:	Initialization:	Address:
	_01_NOT [Application] V		
	Flags:	Comment:	
	CONSTANT	Comment	
	RETAIN		0
	PERSISTENT		~
1			
xDI_08_DA501_I1 xDrillerBroken1			OK Cancel
ADI_00_DROOT_II ADIIIICIDIOXCHI			

- 7. Select "???" on the right side of the assignment connector and mark the "???".
- 8. Create a new local variable by typing in "xDrillerBroken1" which will replace the "???".
- 9. Press [Enter].
 - ⇒ "Auto Declare" opens.

You see the written variable name and the data type BOOL. The scope is "VAR". It means it is a local variable within this POU.

10. Select [OK] to accept the entries.

	ToolBox
_	General
	Evecute Boolean Operators Math operators
xDI_08_DA501_I1 xDrillerBroken1	 € Other Operators Function blocks € POUs

- 11. Drag and drop *"Network"* from the ToolBox to the down-arrow of network 1.
 - \Rightarrow You added a network "2" below network 1.

Adding assignments and a Boolean NOT to the DO signals

- 1. Add an assingment from the ToolBox.
- 2. Type in or copy & paste "xDrillerBroken1" to the left side of the instruction line.
- 3. Select "???" on the right side of the instruction line, then select "...".
 - ⇒ *"Input Assistant"* opens.

xt Search Categories				
/ariables	 Name 	Туре	Address	Or
	# ID ACTUL_Displaces	Life any		Dag? seen.
	# EB ACTUL_INternal	1. Strategy		(Thereas), a
	# EB accoupts	identy'		8.12
	* El activitationelli	Library .		
	# ID AC00_Pm	idency.		Ph. 12
	* O Application	Application		
	+ E3 01.10	(deary		Producer
	🖷 🖬 to Config_Database	100,0000		
	🖶 🎒 IoConfig_Globals_Mapping	VAR_GLOBAL		
		410	14210-2	
	🔍 🖉 xStartDrilling1	BOOL	%QX0.0	OnBo
	* O inflamined	Library .		Jul Tarrative
	 B vallenithe 	Library.		Stadler II
	* O vaulterCarDiplex	100 may		reading of
	* O rudenstan	(deary		The American
	<			>
Structured view		Filter	None	
	u 💟	nsert with arguments	Insert with n	amespace prefix
cumentation	u N	isert with arguments	Insert with n	amespace pr

- 4. In the "IoConfig_Globals_ Mapping" variable list, select "xStartDrilling1".
- 5. Select [OK] to close the dialog.



xDrillerBroken1		Сору
	C.	Paste
	Ж	Cut
	\times	Delete
	•	Insert Box
	•	Insert Empty Box
	-VAR	Insert Assignmen
	->	Insert Jump
	- RET	Insert Return
	-01	Negation
	-14	Edge Detection

- 6. Right-click the center of assignment PIN.
- 7. Select "Negation" to add a negation to the assignment.

xDrillerBroken1 — XStartDrilling1

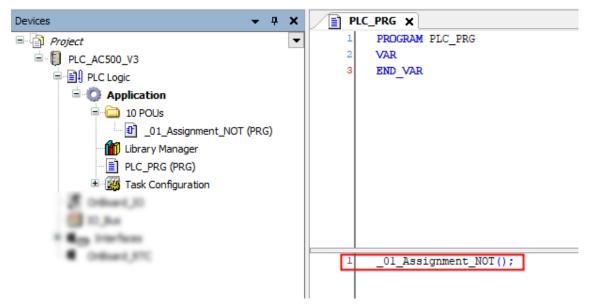
Calling the POU in the PLC_PRG

Devices 👻 🔻	×	PLC_PRG X
Project	•	1 PROGRAM PLC_PRG
🖻 📳 PLC_AC500_V3		2 VAR
ELC Logic		3 END_VAR
🖹 🧔 Application		
🖃 🗀 10 POUs		
📶 Library Manager		
PLC_PRG (PRG)		
# 📷 Task Carligutation		
E Ordinard, 3D		
😸 10. bat		
# Carp Interfaces		
Ordinand, 87C		

- 1. Double-click "PLC_PRG".
- 2. Select the first line in "PLC_PRG" and press [F2].
 - ⇒ *"Input Assistant"* opens.

nput Assistant				>
Text Search Categories				
		_		
Variables Module Calls	Name Name	Туре	Origin	
	AC500_Ethernet	Library	Ethernet, 1.2.0.5 (ABB)	
Function Blocks	AC500_Io	Library	Io, 1.2.1.1 (ABB)	
Keywords	AC500_Pm	Library	Pm, 1.2.5.2 (ABB)	
Conversion Operators	Application	Application		
conversion operators	🖹 💼 10 POUs			
	_01_Assignment_NOT			
	BPLog	Library	Breakpoint Logging F	
	Standard	Library	IoStandard, 3.5.15.0 Standard, 3.5.15.0 (
	Standard	Library	Standard, 3.5.15.0 (
Structured view				
	L.	✓ Insert with arguments	Insert with namespace	prefix
Documentation	L			prenx
PROGRAM _01_Assignm	nent_NOT			
			OK Ca	ancel
				uncer

- 3. Select "Module Calls".
- 4. Open "Application".
- 5. Open "10 POUs" and select "_01_Assignment_NOT".
- 6. Select [OK] to close the dialog.



1.5.5.3.3 Compilation of the project

Before logging-in to the CPU, you need to compile the complete code without any errors.

File Edit View Project	Build Online Debug Tools Window Help
🛅 🚅 📕 🎒 🗠 🗠 🛤	Build [PLC_AC500_V3] F11
Þ	Rebuild [PLC_AC500_V3]
Devices	Generate code [PLC_AC500_V3]
Project	Generate runtime system files [PLC_AC500_V3]
🖹 🗍 PLC_AC500_V3	Clean [PLC_AC500_V3]
🕀 🗐 PLC Logic	Clean all
·	

▷ Select menu "Build → Generate code".

⇒ The result of the compiling is shown in the *"Messages"* field at the bottom of the screen.

If you skip the compiling and select *"Login"*, the Automation Builder will automatically trigger compiling in advance to logging-in.

1.5.5.3.4 Saving the project

File	Edit View	Project	Build	Online	Debug
1	New Project			Ctrl+	٠N
1	Open Project			Ctrl+	•o
	Close Project				
	Save Project			Ctrl	+S
	Save Project As				
	Project Archive				- +
	Source Upload				
6	Print				
	Page Setup				
	Recent Projects				•
	Exit			Alt+	F4

All Project.project* - Automation Builder

▷ Select menu "File → Save Project".

Alternatively, select the save icon 🖬 in the tool bar.

Alternatively, press [Ctrl] + [S].

1.5.6 Setting up the communication gateway

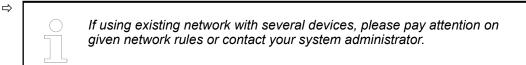
Setting up of
communication
parametersTo set up the communication between the PC and the PLC, e.g., for downloading the compiled
program, you have to set up the communication parameters.The IP address of your PC must be in the same class as the IP address of the CPU.The factory setting of the IP address of the CPU is 192.168.0.10.

The IP address of your PC should be 192.168.0.X. Avoid X = 10 in order to prevent an IP conflict with the CPU.

Subnet mask should be 255.255.255.0.

Changing of the IP address

- 1. Open Windows control panel. Click *"Network and Internet* → Network and Sharing Center".
- 2. Click "Change adapter settings".



3. Right-click "Local Area Connection (Ethernet)" and select [Properties].

Local Area Connection Properties	×
Networking Sharing	
Connect using:	
Intel(R) 82579LM Gigabit Network C	Connection
	Configure
This connection uses the following items:	
Internet Protocol Version 6 (TCP/ Internet Protocol Version 4 (TCP/ Internet Protocol Version 8	IPv4) apper I/O Driver
Install Uninstall	Properties
Description Transmission Control Protocol/Internet F wide area network protocol that provide across diverse interconnected networks	s communication
	OK Cancel

4. Double-click "Internet Protocol Version 4 (TCP/IPv4)".

	utomatically if your network supports d to ask your network administrator tically
• Use the following IP address:	
IP address:	192.168.0.9
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	
C Obtain DNS server address a Use the following DNS server Preferred DNS server: Alternate DNS server:	
Validate settings upon exit	Advanced

5. Enter your desired IP address and subnet mask.

Setting up the communication gateway

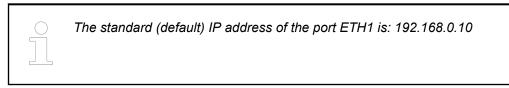
CPU and PC are connected with an Ethernet cable.

Devices	-	дх
Project		•
PLC_AC500_V3		Communication Settings
B Others 10		Source Download
😸 10,8as	82	Сору
· Con Deterfaces	æ	Paste
• 08a4,05	Ж	Cut
	\times	Delete
		Rename
	Ę.	Properties
		Add object
		Update objects
	\bigcirc	Add Folder
	ß	Edit Object
		Edit Object with
		Compare Objects
		Export •
		Runtime Licensing
		Simulation [PLC_AC500_V3]
		Reset Origin Device [PLC_AC500_V3]
		Check configuration

- 1. In the Automation Builder device tree right-click "PLC_AC500_V3".
- 2. Select "Communication Settings".

Communication 3	attings for PLC_ACHE_VT	×
IP Address	192 . 168 . 0 . 10	
Use advanced	settings	
Advand	ed Settings	
(j)	OK Ca	ancel

3. Keep the default value in the IP address of the CPU or type in the current IP address, if differs.



4. Select [OK] to implement the IP address.

Network scan If you need to scan the network for the CPU or if you have multiple CPUs on the same network.

- 1. Right-click "PLC_AC500_V3" in the device tree.
- 2. Select "Communication Settings".

Communication S	ettings for 'PLC_AC500_V3' \times							
IP Address	192 . 168 . 0 . 10							
Use advanced settings								
Advanc	ed Settings							
1	OK Cancel							

- 3. Select "…".
 - ⇒ "Pick IP Address for PLC_AC500_V3" opens.

Pick IP Address for	'PLC_AC500_V3'						- 🗆	\times
Abort scan	Extende	ed Scan						
MAC address	Device name	Port	Serial number	Device ID	IP Address	Config. IP Address	Device Ty	/pe
Scanning								
							OK.	Cancel

The automatic scan runs.

the current selected CPU.

The results will appear in this field.

4. Select the CPU in the field and select *[OK]* to implement the needed communications gateway.

If you need to check the communications settings or if you want to see more information about

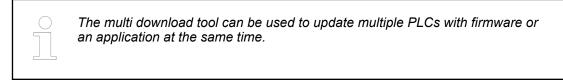
PLC_AC500_V3 × • 4 × Scan network... Gateway + Device + Communication Settings PLC Settings O Application
 O 1 - POUs
 O 2 - GVLs • . Version information -----04 - VISUs 05 - SYMs Statistics . Gateway Diagnosis Files 👔 Library Manage 192. Log Press ENTER to set active path Task Configurati IP-Address localhost 🖹 🍪 Task PLC Shell Port: 1217 + 📆 IO_Bus Users and Groups * 1 Interfaces Access Rights Symbol Rights PM5630-2ETH Hardware

1. Double-click "PLC_AC500_V3" in the device tree.

Checking the communication settings

- 2. Select "Communication Settings".
 - \Rightarrow The selected IP address is shown.
- 3. If the IP address is not visible, enter the IP address manually.
- 4. To test the connection and/or to see the CPU information press *[Enter]* or click on the black dot next to the PLC figure.

1.5.7 Installation and update of the AC500 V3 firmware



Firmware update with activated user management

The PLC user management will remain also after a firmware update or downgrade.

Due to a structural change in the PLC user management in firmware version 3.5 there are some limitations when updating the PLC firmware from a version 3.4 or lower to 3.5 or higher with activated user management.



If you update the PLC firmware from version 3.4 or lower to version 3.6 or higher this must be done in two steps. First an update to 3.5 must be done via Automation Builder. Afterwards the firmware can be updated to any later firmware version – either via Automation Builder or via memory card.

The PLC firmware can be updated via Automation Builder.

This is also necessary for commissioning V3 CPUs.

A very new CPU has no pre-installed firmware. To guarantee the authenticity of delivered AC500 firmware, V3 CPUs are delivered with a boot loader only. You need to download a valid firmware to the CPU. After download, the functionality of the CPU is given.

- An Automation Builder project with an AC500 V3 CPU is open.
- CPU is in "stop" mode or shows **uPdAtE** (update) on the display.
- After update the CPU shows either **donE** or **StoP** on the display

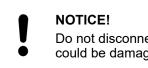
- For new modules: IP address is set. (The default IP address is 192.168.0.10)
- 1. Double-click CPU "PLC_AC500_V3".
- 2. Select "Version information".

	Debug Iools Window Help									
) 🛎 🖬 🚳 🗠 രା 🗛 🤹 🗠		000								
vices 👻 4 🗴	PLC_ACSO0_V3 X									
Project2	Communication Settings	PLC								
PLC_AC500_V3 (PM5650-2ETH - TB562 PLC Logic			Name	Firmware	State	Firmware	Required	Date Build	Info	
= O Application	PLC Settings	P.	AC500 PM56XX-2ETH	CPUFW	0	3.0.0.0	3.2.0.1044		Update required.	
Library Manager	Version information		AC500 PM56XX-2ETH	UpdateFW	0	3.1.4.82	3.2.0.180		Update required.	2
PLC_PRG (PRG)	-		AC500 PM56XX-2ETH	BootFW	0	3.1.2.46	3.1.2.46		-	
🖹 🧱 Task Configuration	Statistics		AC500 PM56XX-2ETH	DisplayFW	0	3.0.0.0	4.1.0.0		Update required.	
D PLC_PRG	Files		0.56							
10_Bus		Com	munication modules							_
B B Interfaces	Log		Interface Coupler	Device	Da	te Firmw	are Sta	Firmware	Required	In
COM_1 (COM 1)	PLC Shell									
CAN (<empty>)</empty>	Users and Groups	0 0	heck Firmware Version or	n Login' is en	abled		[Upd	ate Firmware	

- 3. Select "Update Firmware".
 - ⇒ While the update process is running, the RUN and ERR LEDs are toggling, i.e., they are flashing alternating.
- 4. Wait for the PLC to finish the update.

Firmware updates that include "UpdateFW" changes must be performed in two steps:
 First, the "UpdateFW" is updated, and once this is done click the update button again to execute the "SystemFW" update.
 Note: Firmware updates via memory card automatically cover both updates in one step.

A completed update is indicated by a message on the display. Either donE, or StoP.



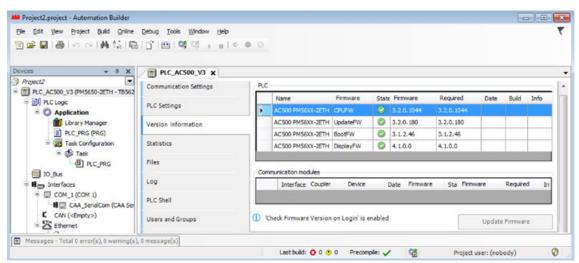
Do not disconnect the power supply during the update process! The PLC could be damaged.

StoP indicates a restart has been performed by the CPU. When donE is displayed sometimes it is necessary to re-boot the CPU manually, e.g., by powering-off. Manual re-boot might be, e.g., for some older CPU versions or if downgrading to an older firmware version according to application settings.

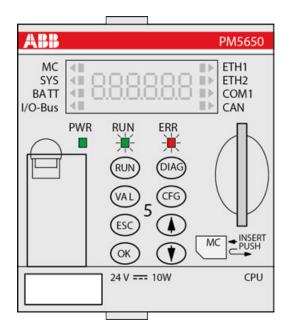


The CPU display shows StoP after re-boot. The update process is finished.

- 5. If necessary, refresh the version information by switching to another tab and back.
 - ⇒ Successful firmware update:



Behavior of LEDs during firmware update



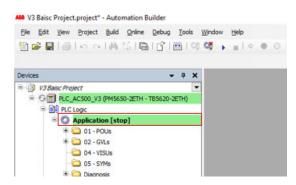
LED	LED flashes	Status
RUN and ERR	Toggling	Update pending
RUN	Flashing slow	Done successful
ERR	Flashing slow	Done failed

1.5.8 Logging in to CPU and downloading the program

Logging-in to the CPU will load the project into the AC500 V3 CPU. The first log-in will also load the hardware set-up.

Ele Edit View Project Build	Qnli	ne Debug Tools Window Help				
🖹 🚔 🔚 l 🚳 l to col 🗛 🖞	C6	Login [PLC_AC500_V3] Alt+F8	0			
	93	Logout [PLC_AC500_V3] Ctrl+F8				
Devices		Create boot application [PLC_AC500_V3]		í I		
- 🕜 V3 Baisc Project	20	Logoff current device user				
E PLC_AC500_V3 (PM5630-2		Download				
PLC Logic		Online Chapge				
Application Image: I		Source download to connected device				
1 02 - GVLs	13	Download Manager		Autom	ation Builder	×
- 🗀 04 - VISUs		Reset warm [PLC_AC500_V3]		Autom		~
05 - SYMs		Resgt cold [PLC_AC500_V3]			Application 'Application' does not exist on device 'PLC_AC500_V3'. Do you want	
🗷 🗀 Diagnosis 👔 Library Managi		Reset origin [PLC_AC500_V3]		(2)	to create it and proceed with download?	
Task Configura					to a cate it and proceed that dominada.	
🖻 🥩 Task						
DIA (PIC)	RG					
 IO_Bus IS Interfaces 						
Extension_Bus					Yes No Details	
						-

- 1. In the Automation Builder menu select "Online → Login [PLC_AC500_V3]".
 - \Rightarrow A pop-up will appear.
- 2. Select [Yes] to download the application to the AC500V3 CPU.



 \Rightarrow PLC is in "stop" mode.

Start [PLC_AC500_V3] (F5)

3. Start the PLC & Chapter 1.5.9.1 "Starting the program execution" on page 41.

Generally, if the CPU is in RUN mode, i.e. in program execution mode, a download will always cause the mode change to "stop". In stop mode the CPU is not controlling the system!

Always, after selecting the "Login" command, read carefully the dialog box text to ensure that you are aware of the CPU's behavior after the command confirmation.

By default, a download generates following actions in the CPU:

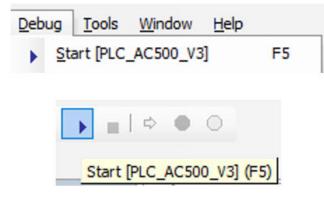
- The project is stored in the RAM memory.
- The project is stored in the flash EEPROM, if boot application was created.

1.5.9 Testing the program

1.5.9.1 Starting the program execution

- You are logged in the CPU.
- An executable project is loaded to the CPU.

The CPU is in "stop" mode.



▷ Select menu "Debug → Start [PLC_AC500_V3]".
 Alternatively, select the "start" icon in the tool bar.
 Alternatively, press [F5].

1.5.9.2 Testing the function

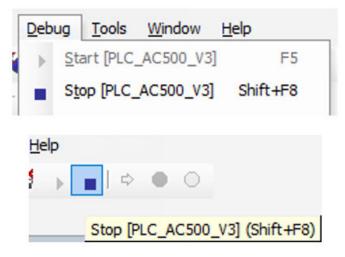
- ▷ Operate the switch I1 and observe:
 - The LEDs of the relevant DA501 inputs and outputs.
 - The online status of inputs and outputs within the POU.

evices • 0 ×	DA501 X									
 Элестрицист Элестрицист Элестрицист Элестрицист 	Diagnosis	Find		👻 💠 Add FB for ID channel *1 Go to instance						
= D PLC Logic		Variable	Mapping	Channel	Address	Type	Default Value	Current Value	Unit	Descriptio
 O Application (run) 	DASSI Parameters			Diatel inputs DID - DI7	94280	BYTE				
- C 03 GLVs	DA501 I/O Mapping	4.4		Digital inputs DIS - DI15	5429.1	BUTF	1			
* 😂 02 VISUs	Profess 6 o Labbaud	* x00_08_0A501_11		Digital input DB	%XL0	8005	TRUE			
= 😂 30 POUS	DASS1 IEC Objects	-		Digital input D09	NOVL 1	8000	0.000	_		
_01_Assignment_NOT (PRG)				Digital input DE10	%DX1.2	8001				
* 😂 Diagnosis 💣 Library Mariager	UO mapping list			Digital input DE11	%DX1.3	8001				
PLC_PRG (REG)				Digital input DE12	%2X1.4	8005				
* Task Configuration	Information			Digital input DE13	%ZX1.5	8004				
H 🙀 YaukstonManager		- *		Digital input DE14	%DX1.6	8000				
Webvisu		- *		Digital input DD15	%DX1.7	8006				
- O 10 Ba		* *		Analog input Al0+	%2W1	DVT	0 1			
O aso1 (base1)		* *		Analog input Al1+	%JW2	INT	0			
Tolling Interfaces		* *		Analog input A22+	%ZW3	DIT				
# G C com_1 (COM 1)		* *		Analog input AL3+	5004	DIT				
CHI CAA_Seria/Con (CAA Seria/Con)				Analog output A00+	NQWD	DIT				
CAN (<pre>can (<pre>can (<pre>can (<pre>can (</pre></pre></pre></pre>				Analog output A01+	%QW1	DIT				
= 08 Ethernet				Digital inputs DC16 - DC23	%3810	BYTE				
· C B ETH1 (P Settings)		8.9		Digital outputs DC16 - DC23	16086	BYTE	0			
G 🗐 NetConfig (NetConfig)		 sStartDrilling1 		Digital output DC 16	%QX6.0	BOOL	FALSE			
G III Web Server (Meb Server)				Digital output DC17	%QN6-1	8000	16450			

1.5.9.3 Stopping the program execution

- \bigtriangledown You are logged in the CPU.
- An executable project is loaded to the CPU.

The CPU is in RUN mode.



▷ Select menu "Debug → Stop [PLC_AC500_V3]"
 Alternatively, select the "stop" icon in the tool bar.
 Alternatively, press [Shift] + [F8].

1.5.10 Setting up a visualization

1.5.10.1 General

If you are not yet familiar with CODESYS visualization, we recommend you to start with the application example *<u>First steps with CODESYS visualization</u>*. The example demonstrates the main features of visualization and provides insights into possible use cases.

To use the Edge browser for CODESYS visualization of AC500 PLCs, follow the steps described in the application note <u>Usage in the Edge browser</u>.

1.5.10.2 Adding the VisualizationManager

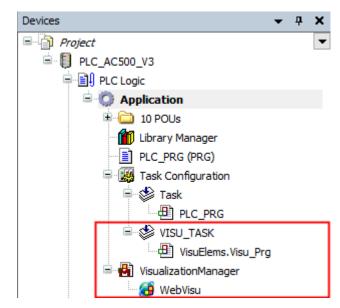
Devices		→ 井 X	А	dd object below : Application				×
		•		Object path: PLC_AC500_V3\PIc Logic\Application				
	Þ.	Copy Paste		Object name:				
R.C. MIC (MIC)	Ж	Cut		ategories 🗸 🗸	Search object name			Q
Colored_D	×	Delete Rename		Generic objects IEC61131-3	Name	Short Description	Version	Order Number
· Contractions	G.	Properties		···· Other ···· Scripting	Text List			
10 (hel)		Add object		Visualization	Visualization			
	0 0 0 0 8	Update objects Add Folder Edit Object Edit Object with Compare Objects Export Login [PLC_AC500_V3] Reset Warm [PLC_AC500_V3]	•					
		Reset Cold [PLC_AC500_V3]		Close this dialog after each transaction	Display all versions			>
				Reset filter		Add object		Close

1. Right-click "Application" in the device tree.

- 2. Select "Add object".
- 3. Select "VisualizationManager".
- 4. Select [Add object] to add the VisualizationManager to the project.
 - ⇒ Dialog "Add Visualization Manager" opens.

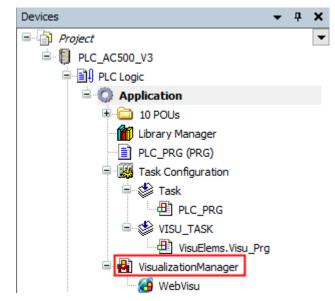
VisualizationManager	•2
Symbol libraries	Active
	bol library is a CODESYS library with ical objects. If the visualization symbol

5. Select [Add].



⇒ You added the objects "VisualizationManager" and "VISU-TASK" to the device tree.

1.5.10.3 Settin up the VisualizationManager



- 1. Double-click VisualizationManager in the device tree.
 - \Rightarrow A tab opens in the editor view.

Devices 👻 🗸 🗙	VisualizationManager 🗙
Devices • 4 × Project • PLC_AC500_V3 PLC_Logic Application 02 VISUs 02 VISUs 01_Assignment_NOT (PRG) Uibrary Manager PLC_PRG (PRG) Task PLC_PRG PLC_PRG PLC_PRG VISU_TASK VISU_TASK VISU_TASK WisuElems.Visu_Prg VisualizationManager WebVisu	VisualizationManager × Settings Obiolog Settings Use unicodestrings Use CurrentVisu variable Preview: Support client animations and overlay of r Style Settings Selected style Display all versions (for exp Preview

Visualization	Manager 🗙		
🛃 Settings 📲 Dia	ialog Settings 🔲 Default Hotkeys 🚇 Visualizations 😫 User Management 🐒 Font	Setti	ings
General Settings	ings u variable rt client animations and overlay of native elements	Ş Setti	ngs Additional Settings Activate multitouch handling Activate multitouch handling Activate semi-transparent drawing Activate standard keyboard handling Activate standard keyboard handling Call after visu initialization Program or function call, e.g. VisuInit(); Advanced Visible Memory Settings Size of Memory for Visu (initial value) 400000 Size of Paintbuffer (per Client, initial value) 50000
- Language Settings Selected language		~	File Transfer Mode Transfer visualization files to the PLC Uselocal visualization files Client Settings Maximum number of visualization clients 100

- 2. Select "Settings".
- 3. Open the drop-down menu "Selected style".
- 4. Select *"Default, x.x.x"* (exemplary).
- 5. Open the drop-down menu "Selected language".
- 6. Select "en" for English language in the visualization.
- 7. Enable "Visible" for advanced settings.
- 8. Keep the file transfer to enable the visualization on the PLC (mandatory for web server function) & *Chapter 1.5.12 "Enabling a web visualization" on page 55.*

1.5.10.4 Saving the project

All Project.project* - Automation Builder

File	Edit	View	Project	Build	Online	Debug
1	New Pro	oject			Ctrl+	N
1	Open Pr	oject			Ctrl+	0
	Close Pr	roject				
	Save Pro	oject			Ctrl	+S
	Save Pro	oject As.				
	Project	Archive				- •
	Source	Upload				
6	Print					
	Page Se	tup				
	Recent	Projects				•
	Exit				Alt+	F4

▷ Select menu *"File* → Save Project".

Alternatively, select the save icon 🖬 in the tool bar.

Alternatively, press [Ctrl] + [S].

1.5.11 Creation of a visualization

1.5.11.1 General

If you are not yet familiar with CODESYS visualization, we recommend you to start with the application example *<u>First steps with CODESYS visualization</u>*. The example demonstrates the main features of visualization and provides insights into possible use cases.

To use the Edge browser for CODESYS visualization of AC500 PLCs, follow the steps described in the application note <u>Usage in the Edge browser</u>.

1.5.11.2 Adding a folder for visualization screens

Devices		→ ∓ X
Project		-
🖻 🗐 PLC_AC500_V3		
PLC Logic		
🗉 🔘 Application		<u></u>
Colored_3D		Сору
10, ha	Ē	Paste
# 6m biterfaces	Ж	Cut
 Ordnard_RTC 	\times	Delete
		Rename
	æ	Properties
		Add object
		Update objects
	<u>ک</u>	Add Folder

- 1. Right-click "Application" in the device tree.
- 2. Select "Add Folder".

Add Folder	X
	Folder name: 02 VISUs
	OK Cancel

- 3. Type in "02 VISUs".
- 4. Select [OK] to add the folder.

1.5.11.3 Adding a screen for "_01_Assignment_NOT" POU

Devices		• џ X	Add object below : 02 VISUs		\times
Project PrC_AC500_V3 PLC_Logic Application 0 2VISUs			Object path: 02 VISUs Object name:		0
10 PDan Drawy Managar PLC, JML (MAL)	₽ ® X	Copy Paste Cut	Categories ~	Search object name	
1 Galacter/Ferage	×	Delete Rename Properties	Generic objects IEC61131-3 Other Scripting	Name Short Description Version Image Pool ∞ Interface	n ^
Constant	4:=	Add object Update objects	Usualization	Network Variable List (Receiver) Network Variable List (Sender) T Persistent Variables ⊡ POU	
	0 D	Add Folder Edit Object Edit Object with		⊕ POU for implicit checks Recipe Manager Script "≣ Symbol Configuration	
		Compare Objects		i⊞ Text List ® Trace ₩ Trend Recording Manager	
				Conversion Visualization Conversion Con	>
			Close this dialog after each transaction	Display all versions Add object Close	

- 1. Right-click "02 VISUs".
- 2. Select "Add object".
- 3. Select object "Visualization".
- 4. Select [OK].

Add Visualization	×
Creates a visualization o	bject
Name: PLC_VISU	
	Add Cancel

- 5. Type in "PLC_VISU".
- 6. Select [Add].
 - \Rightarrow A tab opens in the editor view.

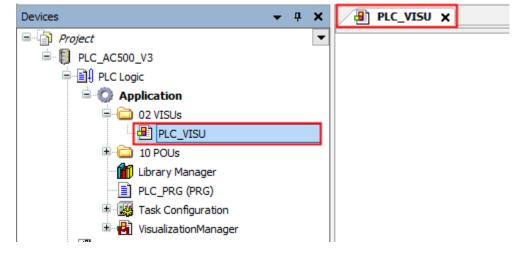


Fig. 3: PLC_VISU_tab

The name "PLC_VISU" has been chosen, because it is the default name for a home screen in a web visualization.

If you have more than one visualization object in your project, it will be useful to choose another name, e.g. "_01_Assignment_NOT_v". And to choose "PLC_VISU" as a home screen to access all available visualization screens.

The name of a visualization object can be modified afterwards.

1.5.11.4 Creation and configuration of a visualization

1.5.11.4.1 Changing the background color

- 1. Double-click "*PLC_VISU*" in the device tree.
 - \Rightarrow A tab opens in the editor view.

Devices	▼ 4	×	/ -	PLC_VISU X
Project		•		
🖻 🗓 PLC_AC500_V3				Create Global Text List
PLC Logic				Order •
🖹 💮 Application				
🖹 🗀 02 VISUs				Alignment •
PLC_VISU			1 1	Group
😐 🧰 10 POUs			100	Ungroup
📲 🎁 Library Manager			76.265	
PLC_PRG (PRG)				Frame Selection
🗄 📆 Task Configuration				Background
🗄 📑 VisualizationManager			- R.	Multiply visu element
		1		

- 2. Right-click anywhere on the "PLC_VISU" editor page.
- 3. Select "Background".

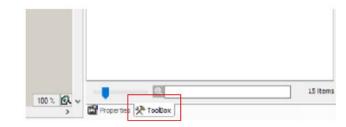
Background		— ×
Color Settings		
🔽 Use color	(255,255,255)	▼
Image Settings	Black White Lightgray Gray	
	Darkgray Yellow Orange	el
	Brown	-

Background		X
Color Settings	Lightgray	•
Image Settings		
	ОК	Cancel

- 4. Enable the check box "Use Color".
 - \Rightarrow This enables the drop-down menu.
- 5. Select a color, e.g., "Lightgray".
- 6. Select [OK] to add the color to "PLC_VISU".

1.5.11.4.2 Adding a screen title

1. Double-click on *"PLC_VISU"* in the device tree.



2. Select "ToolBox".

PLC_VISU x a	-	ToolBox		+ #
🖾 Interface Editor 🖸 Hotizeys Configuration 🗱 Bementlist		📓 i 📓 i 🗖		
1 VAR_ISE_007 BRD_VAR		Basic Comm Measurement controls	Alarm manager Lamps/Switches/Bitmaps te/time controls	
	100 % 🙉	Label Combo	box Combo box arr Tab control	
		Button Group		i

- 3. Select "Common controls".
- 4. Drag and drop *"Label"* to the page.

PLC_VISU X	
🖽 Interface Editor 🔲 Hotkeys Configuration 🔢 Ele	mentlist
1 VAR_IN_OUT 2 3 END_VAR	
	▲ ▼
	Start drilling condition

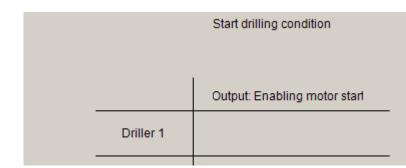
5. Type in "Start drilling condition".

1.5.11.4.3 Further lines and labels

1. Double-click on *"PLC_VISU"* in the device tree.



- 2. Select "ToolBox".
- 3. Select "Basic".
- 4. Drag and drop the line. Then drag the line to the needed length.



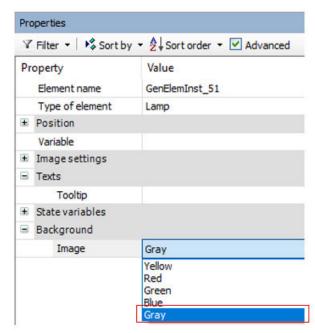
5. Follow the same procedure to create the other shapes and labels.

1.5.11.4.4 Lamp element for signal indication

1. Double-click on *"PLC_VISU"* in the device tree.

		ToolBox 👻 🤻
Start drilling condition	^	
when a mining averagion		Basic Common controls Alarm manager Measurement controls
		Lamps/Switches/Bitmaps Special controls Date/time controls
		ImagePoolDialogs Current project VisuDialogs AC500_lo
		Favorite
Output: Enabling motor start		
Driller 1		
		Image switcher Lamp Dip switch Power switch

- 2. Select "ToolBox".
- 3. Select "Lamps/Switches/Bitmaps".
- 4. Drag and drop *"Lamp"* to the screen.
- 5. Adapt the size, if required.



6. Under "Image", select "Gray".

Property	Value		
Element name	GenElemInst_2		
Type of element	Lamp		
Position			
x	395		
Y	186		
Width	70		
Height	70		
Variable			
Texts			

7. Double-click on "Variable" and select "..." to select a variable from the list.

Variables	▲ Name	Туре	Address	
Keywords	🖲 🚫 Application	Application		
	🖲 🎑 IoConfig_Globals	VAR_GLOBAL		
	IoConfig_Globals_Mapping	VAR_GLOBAL		
	<pre> *DI_08_DA501_I1</pre>	BOOL	%DX1.0	
	xStartDrilling1	BOOL	%QX6.0	
	٢			>
Structured view	٢	Filter:	None	
•		Filter:	None	,
•				,
ocumentation: StartDrilling1 AT %Q	∟_			,
ocumentation: StartDrilling1 AT %Q	∟_			,
]Structured view ocumentation: <startdrilling1 %q="" at=""> VAR_GLOBAL) DA501 :</startdrilling1>	∟_			,
cumentation: StartDrilling1 AT %Q	∟_			,
cumentation: StartDrilling1 AT %Q> VAR_GLOBAL)	∟_			,

- 8. Under "IoConfig_Globals_Mapping", select "xStartDrilling1".
- 9. Select [OK].

1.5.11.4.5 Compilation of the project

Before logging-in to the CPU, you need to compile the complete code without any errors.

File Edit View Project	Build	Online	Debug	Tools	Window	Help
🛅 🚅 🔚 🎒 🗠 🖂 🧥	💥 Bu	uild [PLC_A	AC500_V3]			F11
*	Re	ebuild (PLC	C_AC500_V	3]		
Devices	Ge	enerate co	de [PLC_A	C500_V3]		
Project	Ge	enerate rur	ntime syste	em files	. [PLC_AC50	0_V3]
□ - 🗍 PLC_AC500_V3	CI	ean [PLC_	AC500_V3]			
	CI	ean all				
· M Continuent 10						

- ▷ Select menu "Build → Generate code".
 - ⇒ The result of the compiling is shown in the *"Messages"* field at the bottom of the screen.

If you skip the compiling and select *"Login"*, the Automation Builder will automatically trigger compiling in advance to logging-in.

1.5.11.4.6 Saving the project

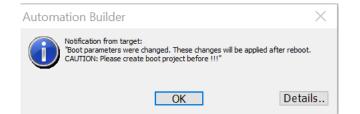
ABB Project.project* - Automation Builder

File	Edit	View	Project	Build	Online	Debug
1	New Pr	oject			Ctrl+	٠N
2	Open P	roject			Ctrl+	0
	Close P	roject				
	Save Pr	oject			Ctrl	+S
	Save Pr	oject As.				
	Project	Archive				•
	Source	Upload				
6	Print					
	Page Se	etup				
	Recent	Projects				•
	Exit				Alt+	F4

▷ Select menu "File → Save Project".
 Alternatively, select the save icon II in the tool bar.
 Alternatively, press [Ctrl] + [S].

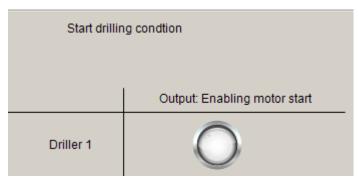
1.5.11.5 Loading the project to the CPU

- 1. Download the project to the CPU 🖏 as described in Chapter 1.5.8, on page 40.
- 2. Check the notification window at the end of the download. In case of message "Boot parameters were changed. These changes will be applied after reboot", a reboot of the CPU is required after creation of the boot project.



1.5.11.6 Testing the program

> Operate the switches and observe the visualization screen.



1.5.12 Enabling a web visualization

1.5.12.1 Adding a web server object to the device tree

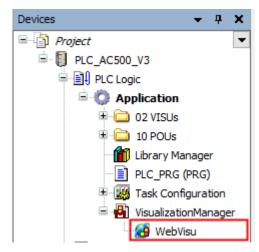
Ethernet ports can be configured for web server protocol. This description deals with ETH1 configuration for the web server

Devices	•	× A	dd object below	: ETH1				\times
Project PLC_AC500_V3			Object path: PLC_AC500_V31 Object name: ategories	Interfaces\Ethernet\ETH1	Search object name			
으 쨊 Ethernet			Ethernet protoc Scripting	cols	Name	Short Description	Version	Order Numb
₽ <mark>₩</mark>] ETH1	° ° × ₩	Copy Paste Cut Delete Rename Properties			FTP Server Modbus TCP/IP Server NetConfig OPC UA Server Script SNTP Server Web Server		3.4.0.0 3.4.0.0 3.4.0.0 3.4.0.0 3.4.0.0 3.4.0.0 3.4.0.0	
	C C	Add object Update object Scan For Dev Add Folder Edit Object Edit Object v Compare Ob Check confic	vices with	g after each transaction	< Display all versions	Add object		Close

- 1. Right-click *"ETH1"* in the device tree.
- 2. Select "Add object".
- 3. Select *"Web Server"*.

- 4. Select [Add object].
 - ⇒ You added and activated a web server on Ethernet port 1 on the AC500 V3 CPU.

1.5.12.2 Setting up the web server



1. Double-click "WebVisu" in the device tree.

🧑 WebVisu 🗙		Input Assistant				×
Start visualization		Text Search Categories				
Name of .htm file	webvisu	Visualizations(Project)	Name	Туре	Address	Origin
	🗹 Use as default page	Visualizations(Libraries)	PLC_VISU			
Update rate (ms)	200					
Default communication buffer size	50000					
Scaling Options	Show Used Visualizations					
 ○ Fixed ○ Isotropic ✓ Use scaling options for dialogs 	Anisotropic					
Client width	1280					
Client height	1024					
Presentation Options						
Antialiased drawing						
Default Text Input			<			>
Input with	Touchscreen V	Structured view				
		Documentation		Insert with arguments	Insert with nar	nespace prefix
					ОК	Cancel

- 2. Under "Start Visualization", select "...".
 - ⇒ A list opens.
- 3. Select the "PLC_VISU" screen from the list.
- 4. Keep all further settings with default values.

🙆 WebVisu 🗙	
Start visualization	PLC_VISU
Name of .htm file	webvisu
	Use as default page
Update rate (ms)	200
Default communication buffer size	50000
Scaling Options	Show Used Visualizations
Scaling Options	
○ Fixed ○ Isotropic	Anisotropic
Use scaling options for dialogs	
Client width	1280
Client height	1024
Bracastatian Ontions	
Presentation Options	
Antialiased drawing	
Default Text Input	
Input with	Touchscreen \lor

5. Select the link "Show used visualizations".

/ 🧭	WebVis	su 🛛 🛃 Visua	lizationM	anager 🗙		
📳 Se	ettings	Dialog Settings	s 🔲 Def	ault Hotkeys	📳 Visualizations	😫 Use
Nam	e			WebVisu	Number of Insta	nces
	Defau	ult behaviour				
	Visua	lizations				
	🕘 P	LC_VISU		Image: A start of the start		
Œ	Dialog	js				

⇒ The VisualizationManager editor and there the tab *"Visualizations"* opens. All screens and dialog elements created in the project are visible.

Here, you can select which screens are enabled or disabled for web visualization.

If you want to select another screen as a start visualization, you must modify the adequate parameter in the webvisu.htm file: <code><param_name="STARTVISU" value="PLC_VISU"></code>

\rightarrow This PC \rightarrow System (C:)	> Program Files (x86) > ABE	3 > AutomationBuilde	er > CODESYS	> 2.3.9.55 > \
Name	Date	Туре	Size	Tags
💿 webvisu.htm	28.04.2010 14:10	Chrome HTML Do	2 KB	

1.5.12.3 Compilation of the project

Before logging-in to the CPU, you need to compile the complete code without any errors.

File Edit View Project	Build Online Debug Tools Window Help
🛅 🚔 📕 🎒 🗠 🖂 🛤	Build [PLC_AC500_V3] F11
	Rebuild [PLC_AC500_V3]
Devices	Generate code [PLC_AC500_V3]
Project	Generate runtime system files [PLC_AC500_V3]
🖹 🗍 PLC_AC500_V3	Clean [PLC_AC500_V3]
⊞ · 🗐 🛛 PLC Logic	Clean all
· (M Crebused 10)	

- ▷ Select menu "Build → Generate code".
 - ⇒ The result of the compiling is shown in the *"Messages"* field at the bottom of the screen.

If you skip the compiling and select *"Login"*, the Automation Builder will automatically trigger compiling in advance to logging-in.

1.5.12.4 Saving the project

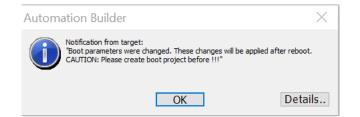
All Project.project* - Automation Builder

File	Edit	View	Project	Build	Online	Debug
1	New Pr	oject			Ctrl+	٠N
1	Open P	roject			Ctrl+	• 0
	Close P	roject				
	Save Pr	oject			Ctrl	+S
	Save Pr	oject As.				
	Project	Archive				•
	Source	Upload				
6	Print					
	Page Se	etup				
	Recent	Projects				•
	Exit				Alt+	F4

▷ Select menu "File → Save Project".
 Alternatively, select the save icon II in the tool bar.
 Alternatively, press [Ctrl] + [S].

1.5.12.5 Loading the project to the CPU

- 1. Download the project to the CPU 🖏 as described in Chapter 1.5.8, on page 40.
- 2. Check the notification window at the end of the download. In case of message "Boot parameters were changed. These changes will be applied after reboot", a reboot of the CPU is required after creation of the boot project.



1.5.12.6 Creation of a boot project

By default, after project download, the boot project is created automatically.

1.5.12.7 Reboot of the CPU

▷ Reboot the CPU by switching OFF and ON the power supply. (The parameter for web server activation is a boot pamater which is loaded during boot of the CPU)

1.5.12.8 Testing the web visualization

- You have downloaded the project and created the boot project.
- The CPU has been rebooted.
- You are logged in.
- CPU is in "stop" mode.



- Start the project execution, e.g., from the tool bar.
- 2. Launch an internet browser.
- Type in the URL field: <u>http://192.168.0.10/webvisu.htm</u>.
 192.168.0.10 is the IP address of CPU's ETH1 port. /webvisu.htm is the default htm file.
 - ⇒ Web visualization will be loaded.

The start screen "PLC_VISU" is displayed in a responsive view.



Start drillin	ig condtion
	Output: Enabling motor start
Driller 1	0

- 4. Test the function by operating switch I1.
- 5. Test the results for responsive view by changing the web browser window size.

1.5.13 Reset the CPU

Reset values In some cases, it could be required to do a CPU reset, e.g., for resetting of counter values, parameters etc.

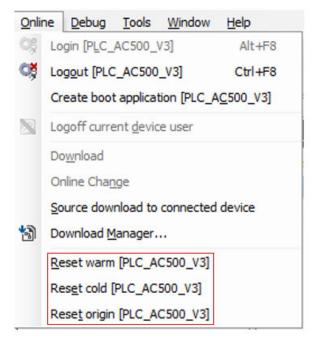


Fig. 4: Reset commands in "Online" menu

Reset warm	All variables are reset, except RETAIN PERSISTENT variables.
Reset cold	Causes initialization of all variables, except PERSISTENT variables. By recom- mended creation of remanent variables always with both properties: PERSISI- TENT and RETAIN, this command resets all variables, except PERSISTENT RETAIN variables.
Reset origin	All variables and the application project are reset.

Table 4: Behavior of variables of type VAR (local or global) and variables of type PERSISTENT RETAIN

	VAR	VAR PERSISTENT RETAIN
After online command 'Online change'	no change	no change
After online command 'Download'	initialization	no change
After online command 'Reset warm'	initialization	no change
After online command 'Reset cold'	initialization	no change
After online command 'Reset origin'	initialization	initialization
After power supply off	initialization	no change

Complete resetTo do a complete reset of the CPU thereby erasing the application from the RAM and flash
EEPROM do the following.

PLC_AC500_	Communication Settings
PLC Logic	Source download
🖻 🚞 Dia	Rename
	Properties
	Add object
📲 📶 Libr	Update objects
PLC _	Add Folder
	Edit Object
	Edit Object With
O IO_Bus	Compare Objects
Om DA5	Export
GR Interfa	Runtime Licensing
- Odg	Reset origin device [PLC_AC500_V3]
CAN (<	New Breakpoint
ම් • ි ∰ Ethe	Toggle Breakpoint
	Check configuration

- 1. Right-click the station object "*PLC_AC500_V3*" in the device tree.
- 2. Select "Reset origin device [station name]".
 - ⇒ The application is completely erased from the CPU (complete project from all memory areas).

1.6 Example project for remote I/O expansion with PROFINET

1.6.1 Purpose

This example introduces the configuration of the PLC with remote I/O. The use of I/O channels in a program and commissioning of the configuration is shown.

1.6.2 Preconditions

- Automation Builder is installed and licensed as, at least, standard edition.
- AC500 V3 CPU is assembled and connected to the PC
 Chapter 1.4 "Hardware AC500 V3" on page 11.
- Configuration and programming of this example project will be made in the existing example project for central I/O expansion *Chapter 1.5 "Example project for central I/O expansion"* on page 14.
- CI502-PNIO communication interface module is inserted in terminal unit and connected to the PLC ♦ Chapter 1.4 "Hardware AC500 V3" on page 11.

1.6.3 Set-up PROFINET controller

1.6.3.1 Add the CM579-PNIO to the device tree

- 1. In the Automation Builder device tree under "Extension_Bus", right-click "Slot_1".
- 2. Select "Add object".

- 3. Select "CM579-PNIO".
- 4. Select [Replace object] to add the CM579-PNIO.

Devices			Replace object : Slot_1				×
ACSOD V3 Basic Project Complete Compl		2ETH - TB5620-2ETH)	Object path: PLC_AC500_V3\Extension_Bus\Slot_1 Object name: CM579_PNIO				
Interfaces			Categories ~	Search object name	7/		_ 3
Extension_Bus	(m)	Copy Paste Cut Delete Rename Properties	⊡-Communication modules	Name	Short Description EtherCAT Module PROFINET IO controller module PROFINET IO device module CAN/CANopen master module	Version 3.2.1.0 3.2.0.0 3.2.0.0 3.2.1.0	Ordi 1SA 1SA 1SA 1SA
		Add object					
	6	Update objects Add Folder		K			>
	đ	Edit Object Edit Object With Compare Objects	Close this dialog after each transaction Reset filter		ns Replace object	Close	

1.6.3.2 Set-up the general behavior

Devices
AC500 V3 Basic Project
PLC_AC500_V3 (PM5630-2ETH - TB5620-2ETH)
🖻 🗐 PLC Logic
🕀 🗐 IO_Bus
🗉 🛤 🚃 Interfaces
Extension_Bus
CM579_PNIO (CM579-PNIO)
PNIO_Controller (PROFINET-IO-Controller)
Slot_2 (<empty>)</empty>

- 1. Under "Extension_Bus", double-click "CM579_PNIO" in the device tree.
 - \Rightarrow A tab opens in the editor view.
- 2. Select "CM579-PNIO Parameters".

CM579-PNIO Parameters	Parameter	Туре	Value	Default Value	Description
Status	Run on config fault	Enumeration of BYTE	No	No	Start PLC program even on configuration fault
	Bus behavior	Enumeration of DWORD	Asynchronous (IEC bus cycle)	Asynchronous (IEC bus cycle)	Type of bus behavior (asynchronous/synchronous
Information					

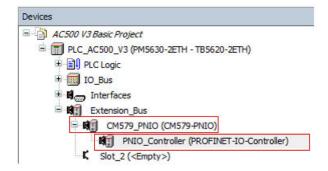
Run on configuration
faultThis parameter will prohibit the PLC from running if the CM579-PNIO
has a configuration error.Bus behaviorThis parameter sets how the data from the bus flows in/out of the
CM579-PNIO.

2	nji CM579_PNIO X			
	CM579-PNIO Parameters	PROFINET IO	:	n/a
	Status	CM579-PNIO	:	n/a
	Information	1		

- 3. Select "Status".
 - \Rightarrow This opens the bus controller status and gives a basic status overview.
- 4. Select "Information".
 - \Rightarrow This page contains general information about the CM579-PNIO.
- 5. For the example project, you can keep the default settings.

1.6.3.3 Set-up the PROFINET IO controller

To edit settings for the controller, you must not be logged-in to the PLC.



- Under "CM579_PNIO", double-click "PNIO_Controller" in the device tree.
 A tab opens in the editor view.
- 2. Select "PROFINET IO CONTROLLER"

n PNIO_Controller 🗙		
General	Station Name cm	579-pnio
PROFINET-IO-Controller I/O Mapping	IP Parameter	
I/O mapping list	IPAddress	192 . 168 . 0 . 1
Information	Subnet Mask	255 . 255 . 255 . 0
	Default Gateway	0.0.0.0
	Default Slave IP Pa	rameter
	First IP Address	192 . 168 . 0 . 2
	Last IP Address	192 . 168 . 0 . 254
	Subnet Mask	255 . 255 . 255 . 0
	Default Gateway	0.0.0.0
	10 Provider / Consu	umer Status
	Application Stop	o> Substitute Values
	Add to I/O Map	ping
	Watchdog	
	🗹 Enable	
	1000 🗘 (n	ns)

- 3. Select "General".
- 4. Here, you can set-up the way, IP addresses are distributed out to the industrial bus network. You can even set, what IP-address and DNS name (station name) the PROFINET controller has.

For the example project, keep the default settings.

1.6.4 Set-up PROFINET device

2.

3.

1.6.4.1 Hardware preparation

- 1. Switch off the power supply of your PLC.
 - Use a screw driver to set the CI502 module address to "02" by positioning of the upper rotary switch to "0" and lower switch to "2". Note, that the numbers have hexadecimal format.
 - Switch on the power supply.

1.6.4.2 Add the CI502-PNIO to the device tree

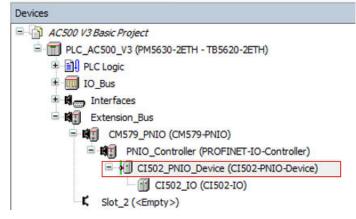
- 1. Right-click "PNIO_Controller" in the device tree.
- 2. Select "Add object".
- 3. Select "CI502-PNIO-Device".
 - 3ADR010584, 6, en_US

ADD x10H 4. Select [Add object] to add the device.

Devices			Add object below : PNIO_Controller		×
ACSOO V3 Basic Project ACSOO V3 Basic Project DEC_ACSO0_V3 (PM5630-2ETH DEC_DIG DEC_DIG	- TB5620	-2ETH)	Object path: PLC_AC500_V3!Extension_Bus\CM579_ Object name: CI502_PNIO_Device	PNIO\PNIO_Controller	
B B Extension_Bus B B CM579_PNIO (CM579	PNIO)		Categories ~	Search object name	
CM579_PNID (CM579	800 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	RC copy Paste X Qut X Delete Rename Image: Properties Add object Update objects Scan For Devices	 B- Communication interface modules Communication modules Drives Robot Controllers Scripting 		Short Description 8DI/8D0/4AI/2AO PROFINET IO device p 8DI/8D0/8DC PROFINET IO device prod. PROFINET IO device module
		Edit Object Edit Object With Compare Objects Check configuration	Close this dialog after each transaction Reset filter	Comparison Display all versions	Add object Close

1.6.4.3 Configure the CI502-PNIO device

1.6.4.3.1 Configure the CI502-PNIO PROFINET IO device



- 1. Double-click "CI502_PNIO_Device".
 - \Rightarrow A tab opens in the editor view.

2. Select "General".

General	Station Name ci502-pn-00
LicenseRequiredNotification	IP Parameter
	IP Address 192 . 168 . 0 . 2
/O mapping list	Subnet Mask 255 . 255 . 255 . 0
Information	Default Gateway 0 . 0 . 0 . 0
	Communication
	Send clock (ms) 1 \checkmark Watchdog (ms) 3 🔹
	Reduction ratio 1 VLAN ID 0
	Phase 1 ~
	RT Class 1
	User-Defined Parameters
	Set all default values
	Parameters Value Datatype Allowed values Description

Station name	Default station name
IP Parameter	IP-addressing parameters of the node. If modifications are required for "IP
	Parameter", they must be done also for CM579-PNIO and all other devices in
	this PROFINET line.
Communication	Communication time set-up
VLAN	Virtual local area network ID
RT Class	PROFINET IO RT (real time) type settings

3.

⇔



The last two values of the node's *"Station Name"* in Automation Builder correspond to the position of module's rotary switches (**hexadecimal** values): e.g., "ci502-pn-0a" or "ci502-pn-10".

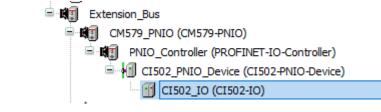
Set station name to e.g. "ci502-pn-0b" according to hardware settings.

Use small letters for the station name and not large ones.

- 4. Leave the default settings for "IP Parameter".
- 5. Adjust the communication time settings to get a Watchdog (ms) 24:
 - "Send clock (ms)": 4
 - "Reduction ratio": 2
 - *"Phase"*: 1
- 6. Leave the default settings for "VLAN ID".
- 7. Leave the default settings for "RT Class".

If the node has the same device address (the last two digits of the device name) as set by means of the rotary switches on the module, all the node parameters will be loaded automatically upon initialization scan of the CI50x module. This allows, e.g., the module exchange without an engineering tool.

1.6.4.3.2 Create CI502-PNIO I/O mapping to symbols



1. Double-click "CI502_IO".

GI502_I0 X					
General	Find	Filter Show all			
PNIO Module I/O Mapping	Variable	Mapping	Channel	Address	Туре
PNIO Hodale 1/O Happing			8-bit digital input	%IB24	USIN
I/O mapping list	*		8-bit digital input	%IB25	USIN
	₩ xDI_08_CI502_I5	***	Channel 8	%IX25.0	BOOL
Information	*>		Channel 9	%IX25.1	BOOL
	*		Channel 10	%IX25.2	BOOL
	*•		Channel 11	%IX25.3	BOOL
			Channel 12	%IX25.4	BOO
	* >		Channel 13	%IX25.5	BOOL
	*		Channel 14	%IX25.6	BOOL
	- · · · · · · · · · · · · · · · · · · ·		Channel 15	%IX25.7	BOO
	*		Fast Counter: Actual value 1	%ID7	UDIN
	*		Fast Counter: Actual value 2	%ID8	UDIN
	* •		Fast Counter: State byte 1	%IB36	USIN
	* >		Fast Counter: State byte 2	%IB37	USIN
			8-bit digital output	%QB28	USIN
	*		8-bit digital output	%QB29	USIN
	×DO_08_CI502	*	Channel 8	%QX29.0	BOOL
	* @		Channel 9	%QX29.1	BOOL
	*		Channel 10	%QX29.2	BOOL

- 2. Select "PNIO Module I/O Mapping".
- 3. Fill in the variable names:

Element	Hardware channel	Symbol
Switch I5	CI502 DI8	xDI_08_CI502_I5
LED output DO8	CI502 DO 8	xDO_08_CI502

1.6.5 Add remote I/O expansion to project

1.6.5.1 Add a program POU to the project

Devices	Add object below : 01 - POUs Object path: 01 - POUs Object name: POU		×
PLC_AC500_V3 (PM5650-2211 - 165620-2211 PLC_AC500_V3 (PM5650-2211 - 165020-2211 PLC_AC500_V3 (PM56500-2211 - 165020-2211 PLC_AC500_V3 (PM56500-2211 - 165020-2211 PLC_AC500_V3 (PM5600-2211 - 165020-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5600-2211 PLC_AC500_V3 (PM5	Categories	Search object name	0
Application	Generic objects IEC61131-3 Other Scripting Visualization	Name Short Description Vertical Marm configuration Image Pool Image Pool Image Pool Image Pool Image Pool Network Variable List (Sender) Image Pool Poul for implicit checks Recipe Manager Script Script Stript Text List	iersion ^
Extension_Bus Edit Object With	Close this dialog after each transact		V.
Compare Objects	Reset filter	Add object Cl	lose

- 1. Right-click "01 POUs" in the device tree.
- 2. Select "Add object".
- 3. Select "POU".
- 4. Select [Add object].

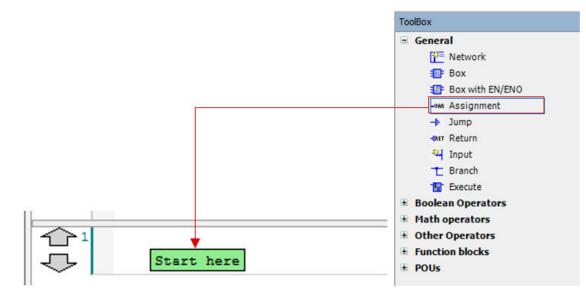
Add object below : 0	1 - POUs			×
Object path: 01 - POUs Object name:	Add POU × Create a new POU (Program Organization Unit)			
Categories	Name: POU			0
Generic objects - IEC61131-3 - Other - Scripting - Visualization	Type Program Function Block Extends: Implements: Final Abstract Access specifier: Method implementation language: Function Block Diagram (FBD) Function Return type:	ription	Version	< <
Close this dialog a	Implementation language:	1		
Reset filter	Function Block Diagram (FBD)		Close	

- 5. Fill in "_30_PNIO_test".
- 6. Select "Program".
- 7. Select "Function Block Diagram".

8. Select *[Add]* to add the POU.

1.6.5.2 Create a POU logic

1. Double-click "30_PNIO_test" in the device tree.



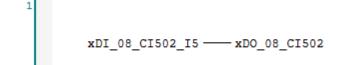
- 2. In the ToolBox, select "Assignment".
- 3. Drag and drop "Assignment" into the "Start here" field in network "1".

1	Input Assistant Text search Categories				2
	Variables Keywords	Name Application Solution S	Type Application VAR_GLOBAL VAR_GLOBAL BOOL	Address	Ŷ
		<			~
	Structured view		Filter:	None	~
< Messages - Total 0 error(s), 0 warnin All messages	Documentation:		Insert with arguments	Insert with namesp	ace prefix
Description	xDI_08_CI502_I5 AT %DX (VAR_GLOBAL) CI502_I0 :	25.0: BOOL;			
	. L			ОК	Cancel

- 4. Select "???" on the left side of the assignment, then select "...".
- 5. In "loConfig_Globals_Mapping" list, select "xDI_08_CI502_I5".
- 6. Select *[OK]* to add this variable to the left side of the assignment connector.

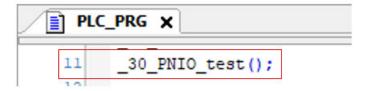
1	Input Assistant				×
xDI_08_CI502_I5 222	Text search Categories				
	Variables Keywords	Name Application Joconfig_Globals Joconfig_Globals_Mapping ✓ xDO_08_CT502	Туре Аррікавоп ИАР. (2.084) ИАР. (2.084) ВООЦ	Address %QX29.0	
	Structured view	٢	Filter:	None	>
Messages - Total 0 error(s), 0 warning(s), 0 message(s)	Documentation:		Insert with arguments	Insert with names	pace prefix
All messages	xDO_08_CI502 AT %Q: (VAR_GLOBAL) CI502_I0 :	x29.0: BOOL;			< >
				ок	Cancel

- 7. Select "???" on the right side of the assignment, then select "...".
- 8. In "IoConfig_Globals_Mapping" list, select "xDO_08_Cl502".
- 9. Select [OK].



1.6.5.3 Call the POU in PLC_PRG

- 1. Double-click "PLC_PRG".
- 2. Select the next free line in "PLC_PRG" and press [F2].
 - ⇒ *"Input Assistent"* opens.
- 3. Select "Module Calls".
- 4. Open "Application".
- 5. Open "10 POUs" and select "_30_PNIO test".
- 6. Select *[OK]* to close the dialog.



1.6.5.4 Compilation of the project

Before logging-in to the CPU, you need to compile the complete code without any errors.

File Edit View Project	Build Online Debug Tools Window Help
🛅 🚅 🔚 🕌 🗠 🖂 👫	Build [PLC_AC500_V3] F11
•	Rebuild [PLC_AC500_V3]
Devices	Generate code [PLC_AC500_V3]
Project	Generate runtime system files [PLC_AC500_V3]
PLC_AC500_V3	Clean [PLC_AC500_V3]
⊕ 🗐 PLC Logic	Clean all

- ▷ Select menu "Build → Generate code".
 - ⇒ The result of the compiling is shown in the *"Messages"* field at the bottom of the screen.

If you skip the compiling and select *"Login"*, the Automation Builder will automatically trigger compiling in advance to logging-in.

1.6.5.5 Saving the project

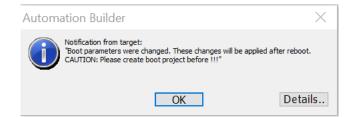
All Project.project* - Automation Builder

File	Edit	View	Project	Build	Online	Debug
	New Pr	oject			Ctrl+	٠N
1	Open P	roject			Ctrl+	0
	Close P	roject				
	Save Pr	oject			Ctrl	+S
	Save Pr	oject As.				
	Project	Archive				+
	Source	Upload				
6	Print					
	Page Se	etup				
	Recent	Projects				•
	Exit				Alt+	F4

▷ Select menu "File → Save Project".
 Alternatively, select the save icon II in the tool bar.
 Alternatively, press [Ctrl] + [S].

1.6.5.6 Loading the project to the CPU

- 1. Download the project to the CPU 🖏 as described in Chapter 1.5.8, on page 40.
- 2. Check the notification window at the end of the download. In case of message "Boot parameters were changed. These changes will be applied after reboot", a reboot of the CPU is required after creation of the boot project.



1.6.6 Test the program

1.6.6.1 Starting the program execution

- \bigtriangledown You are logged in the CPU.
- An executable project is loaded to the CPU.
- The CPU is in "stop" mode.

<u>Start [PLC_AC500_V3]</u> F5 ■ □ □	<u>D</u> ebug	<u>T</u> ools <u>W</u> indow <u>H</u> elp	
	▶ <u>S</u> t	art [PLC_AC500_V3]	F

▷ Select menu "Debug → Start [PLC_AC500_V3]".
 Alternatively, select the "start" icon in the tool bar.
 Alternatively, press [F5].

1.6.6.2 Test the function

- \triangleright Operate the switch I5 and observe:
 - The LEDs of the relevant CI502 inputs and outputs.
 - The online status of inputs and outputs within the POU.

evon - 0 x	CI562_10 X						
 Э. Ванс рицест 2020-09-14 Ф. П. Асскоз, уз ризвазо-аети - тазваго-аети) 	Diagnosis	Find	Filter Show all		• 🔶 Add FB f	er 10 channel*'' Go to in	fance -
* 14 PLC Logic		Variable	Mapping Channel	Address	Type Default	Value Current Value	Unit Descriptio
Application [run]	General	* *	8-bit datal rout	5/824	USINT		
8 🔆 🌐 10_Bus	PNID Module I/O Mapping		8-bit digital input		USINT	1	
	Philo Produce 20 Prapping	* x01_08_C1502_15	Channel 8		500	TRUE	
 Oligination 	PNID Module JEC Objects		Channel 9		500.	Lance -	
O COM_1 (COM 1)			Channel 10		100.		
CALSerialCom (CAA SerialCom)	1/0 mapping list		Channel 11		8004		
CAN (<empty>)</empty>			Channel 12		800		
= G Ethernet	Information		Channel 13		800.		
🗏 😏 🕄 ETH1 (IP Settings)			Ownei 14		800.		
· · · · · · · · · · · · · · · · · · ·			Channel 15		8001		
		-	Fast Counter: Ac	tual value 1 %207	LOWT		
			Fast Counter: Ac		LONT		
			Fast Counter: St		USINT		
			Fast Counter: St		USINT		
			8-bit digital output		USINT		
		4.	8-bit datal outp.		USINT	1.000	
		* x00_08_C1502	Orannel 8		8001	TRUE	
- G KG CIS02_P460_Device (CIS02-P460-Device)			thankely		BULL.	CTITE- 3	
🖸 🔄 (C1502_30 (C1502-40)			Channel 10		500.		
Sot_2 (<empty>)</empty>				ingratia i			

1.6.7 Reset the CPU

Reset values In some cases, it could be required to do a CPU reset, e.g., for resetting of counter values, parameters etc.

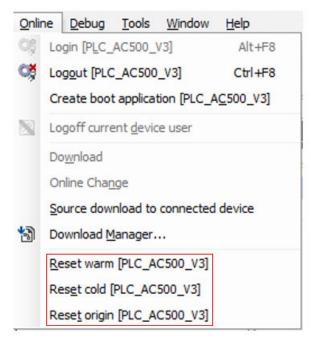


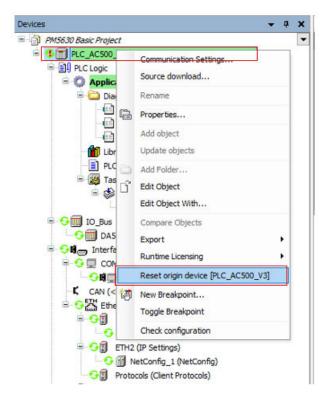
Fig. 5: Reset commands in "Online" menu

Reset warm	All variables are reset, except RETAIN PERSISTENT variables.
Reset cold	Causes initialization of all variables, except PERSISTENT variables. By recom- mended creation of remanent variables always with both properties: PERSISI- TENT and RETAIN, this command resets all variables, except PERSISTENT RETAIN variables.
Reset origin	All variables and the application project are reset.

Table 5: Behavior of variables of type VAR (local or global) and variables of type PERSISTENT RETAIN

	VAR	VAR PERSISTENT RETAIN
After online command 'Online change'	no change	no change
After online command 'Download'	initialization	no change
After online command 'Reset warm'	initialization	no change
After online command 'Reset cold'	initialization	no change
After online command 'Reset origin'	initialization	initialization
After power supply off	initialization	no change

Complete resetTo do a complete reset of the CPU thereby erasing the application from the RAM and flash
EEPROM do the following.



- 1. Right-click the station object *"PLC_AC500_V3"* in the device tree.
- 2. Select "Reset origin device [station name]".
 - ⇒ The application is completely erased from the CPU (complete project from all memory areas).

1.7 Further information on our AC500 portfolio

- PLC homepage: <u>abb.com/plc</u>
- PLC catalog as PDF: <u>PLC catalog as PDF</u>, and also as flipbook.
- Application examples
- <u>Manual for Automation Builder and all AC500 products</u>

2 Index

A

Automation Builder

getting started	6
installation	6
licensing	6
	installation

С

communication gateway 32
communication parameters
in Windows
Compiling a project

Ε

Edge browser
example project with Automation Builder and AC500 AC500 V3 products 14, 61
L
log-in to a CPU
Ρ
PLC_PRG 24
S

safety notice 3 security notice 3

Т

V
training case
testing a program 41, 72
TA5450-CASE 11

warning notices	 3



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