

# **24V production line**

Commissioning (hardware)



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# 3 Commissioning (hardware)

# 3.1 Introduction

To be able to transfer the hardware configuration to the control system, it must be switched on, which first requires the system to be commissioned step by step.

Commissioning is the first intended use of a machine or system. It may only take place when the machine meets the requirements of the relevant EC directives and has been verified by the EU Declaration of Conformity and CE marking. Commissioning is an important step in the construction of industrial plants and ensures that the plant functions properly and can be operated safely. This process requires careful planning and execution.

The general steps for hardware commissioning are described below. Depending on the structure of the real system, this procedure may need to be adapted.

Before the actual commissioning begins, various preparatory work must be carried out to ensure that all the requirements for a successful start are met.

- Document review
  - Checking the circuit diagrams, wiring diagrams, parts lists and functional descriptions.
  - Ensure that all necessary permits and safety documents are available.
- Visual inspection
  - Physical inspection of the system for damage, loose connections and correct installation.
  - o Check the mechanical installation and all electrical connections.
- Checking the safety equipment
  - Ensure that all safety devices are installed and functional.
  - o Testing emergency stop switches and other safety-relevant devices.
- Check continuity and insulation resistance
  - Measurement of the low resistance of all protective conductor connections.
  - Carry out insulation measurements to ensure that there are no unwanted earth connections or short circuits.

Once the visual inspection and electrical test have been successfully completed, the system can be switched on step by step. The circuits should be switched on one after the other in a controlled manner and the corresponding voltages and rotating fields should be checked, starting with the power supply to the control unit and then the main power supply.

Once the PLC has started up, the hardware configuration can be transferred. Then check whether the configured modules and firmware versions correspond to those of the real hardware components.

To complete the commissioning of the hardware, an I/O check must be carried out to check that the sensors and actuators are wired correctly and that the signals are correctly located in the process image of the inputs and outputs.





# 3.2 Commissioning protocol

In order to be able to carry out structured commissioning, it is essential to create a commissioning log beforehand, which can be processed and in which the results are documented accordingly.

A simplified protocol was created for this system. In addition to the hardware commissioning, this also includes the part for the software that will be required at a later date.

Description	ОК	Not OK
Visual inspection		
Device manuals for the (PLC) components used available		
The electrical equipment complies with the technical documentation		
Operating equipment is without visible damage that could impair		
safety.		
Selection and adjustment of protection and monitoring devices		
Labeling of all equipment		
Professional conductor connection		
Wiring between model and PLC completed		
PLC hardware		
PLC voltage switched on		
Voltage model switched on		
Device configuration (created in the TIA Portal)		
Project data loaded in PLC		
Wiring of the sensors checked (I/O check)		
Wiring of the actuators checked (I/O check)		
PLC software		
Software translated		
Software loaded in PLC		
Transport route		
Switching on the control unit (STOP -> RUN) initializes the step chain		
Empty pallet inserted (B3 interrupted, B2 not interrupted)		
Slider (Q3) moves to home position (S3 actuated)		
Divider is closed (Q6)		
Step chain dwells in step 4 to		
- Workpiece placed on belt (BI interrupted)		
- and converter not in station (Si not actualed)		
workpiece is placed on it		
Workpiece reaches end of belt, counter is incremented		
Repeat the process until there are 3 workpieces at the end of the belt		
Divider (Q6) is opened		
If an empty pallet is available (B3 interrupted, B2 not interrupted), the		
Silder (Q3) is activated.		
Viorkpiece counter is reset		
Silder stops when it has returned to its nome position (55 actuated)		
Switching on the control unit (STOP -> RUN) initializes the step chain		
Converter moves to nome position (SI and S2 not actuated)		
Turptable in position (54 actuated)		



- Workpiece is ready on rotary table (wstReady in workpiece management)		
Transfer unit moves in the direction of the turntable (O1) until S2 is		
actuated		
Vacuum is switched on (O8)		
wstReady in workpiece management is reset		
Converter moves in the direction of the belt (O1) when		
- Band free (B) not interrupted)		
- Tape stopped (05 not activated)		
Pressing SI stops the movement		
Vacuum is switched off		
Once the vacuum has dissipated (I second) the cycle starts again from		
the beginning		
Magazine		
Switching on the control unit (STOP, $>$ DUN) initializes the stop shain		
To switch to the payt stop you must		
Magazina must be filled for at least 1 second		
Turntable in position (S/ actuated)		
- Workpiece position on rotary table must be free (nestOccupied		
in workpiece management)		
Slider (07) is moved forward for 2 seconds		
pestOccupied in workpiece management is set		
If nostOccupied in workpiece management is set		
Drilling processing station		
Switching on the control unit (STOP -> RUN) initializes the step chain		
To switch to the next step, you must		
- I urntable in position (S4 actuated)		
- drillBody plank must be set in workpiece management		
Edit (Q9) is activated for a defined time (3 seconds)		
drillingRough part is reset		
drillFinished part is set		
If drillFinished part is set in workpiece management, the cycle starts		
vveiding processing station	· · · · · · · · · · · · · · · · · · ·	
Switching on the control unit (STOP -> RUN) initializes the step chain		
To switch to the next step, you must		
- Turntable in position (S4 actuated)		
- WeldingRaw part must be set in workpiece management		
Edit (QIU) is activated for a defined time (5 seconds)		
WeldingRough part is reset		
WeidingFinished part is set		
If weid-inished part is set in workpiece management, the cycle starts		
again from the beginning		
lurntable		
Motor (Q4) must not be activated if		
- Slider (Q7) is extended		
- Transfer unit is in position Turntable (S2)		
and		
- Drillbody or Weidbody or TransferPart Is set in the Workpiece		
Meter (Q() is activated where		
Table is not in position (C4) not actuated		
- Table is not in position (54 not actualed)		
nart is set in workniece management		
- The above interlocks are fulfilled		





# **3.3** Exercise: Performing a visual inspection

### Target:

I can prepare my system for commissioning and carry out the visual inspection.

### Task:

Prepare the system for commissioning.



If the model has not yet been wired to the automation system used, carry this out. "Table 1 Terminal strip X1 assignment diagram" from the "Model description" chapter and the device manuals for the hardware used may be helpful for this.

Carry out a visual inspection and document the result in a log.





# **3.4 Connect programming device and PLC**

In order to establish the connection to the PLC (target system), the programming device (PG) and the target system must be connected via an interface. The PG and PLC exchange data and information via this communication link, which must be defined.



Picture 1 Physical networking

Common programming interfaces are, for example: PROFIBUS or PROFINET or Ethernet.

In order for communication to be established, the following requirements must be met:

- Both devices have an Ethernet connection.
- both devices are physically connected to the same network.
- Both devices are correctly parameterized (IP address set).



The IP address of the programming device can be adjusted in the Windows Control Panel under "Control Panel→ Network and Internet→ Network connections".



Picture 2 Setting the Windows network adapter

The corresponding network adapter must be selected here. In the context menu under "Properties  $\rightarrow$  Internet Protocol Version 4 (TCP/IPv4)", a free IP address and subnet mask can be assigned manually, which is located in the address space of the PLC.

### Reachable participants

Once the physical networking and the parameterization of the programming device's online interface have been completed, it must be checked whether a connection to the target system can be established.

Depending on the programming environment and target system used, various onboard tools are available for this purpose.

For example, Beckhoff offers the option of searching for accessible target systems in TwinCAT under "SYSTEM→ Select target system→ Search (Ethernet)" using Broadcast Search.



The procedure in the TIA portal, in combination with an S7 1200 CPU, is shown in detail below.

The connection to the CPU can be checked under "Online $\rightarrow$  Reachable users...".

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Picture 3 Accessible devices in the TIA Portal

The "Reachable users" function offers a simple way of determining which users can be reached via the set PG/PC interface. These are displayed in the "Accessible users of the selected interface" table after the "Start search" button has been pressed.

If a device found is selected, a flashing light can be activated on the selected device by ticking the "Flash LED" box. This allows you to check beyond doubt whether the selected device corresponds to the expected device.



## 3.5 Load project data

Once your project planning has been successfully translated, the project data that you have generated offline must be loaded into the connected device. When loading for the first time, the project data is loaded completely. Only changes are loaded during subsequent loading processes.

### 3.5.1 TIA

The procedure in the TIA Portal is described below.

To load the project data into the device, proceed as follows:

- Select the desired device in the project navigation
- Select "Load to device" in the context menu of the right mouse button
- Select what you want to load:
  - o Hardware and software (changes only)
  - o Hardware configuration
  - o Software (changes only)
  - o Software (load completely); all values are reset to their initial values



Picture 4 Charging in device

If the connection information of the project planning does not match an accessible device, the "Extended loading" dialog box appears.



	Device	Device type	Slot	Interface type	Address	Subnet	
	-KF1	CPU 1214C AC/D	1 X1	PN/IE	172.16.0.1		
		Type of the PG/PC inte	rface:	PN/IE			
		PG/PC inte	rface:	Realtek PCIe G	bE Family Controlle	er 💌	۲
		Connection to interface/su	bnet:	Direct at slot '1 )	K1*	v	۲
		1st gat	eway:			Ψ.	۲
	Select target de Device	Device type	Interf	ace type Add	iress	Target device	ses e
	Select target de Device -KF1	Device type CPU 1214C AC/D	Interfa	ace type Add	Iress 2.16.0.1	Target device	e e
	Select target de Device -KF1 -	Device type CPU 1214C AC/D —	Interfa PN/IE PN/IE	ace type Add 172 Acc	dress 2.16.0.1 Jess address	Target device 	e
Flash LED	Select target de Device -KF1 	Device type CPU 1214C AC/D —	Interfi PN/IE PN/IE	ace type Add 172 Acc	dress 2.16.0.1 tess address	Target device	e
Flash LED	Select target de Device 	Device type CPU 1214C AC/D —	Interfa PN/IE PN/IE	ace type Add 173 Acc	iress 2.16.0.1 less address	Target device	e
Flash LED	Select target de <u>-KF1</u> 	CPU 1214C AC/D	Interfi PN/IE PN/IE	ace type Add 17: Acc	dress 2.16.0.1 tess address	Target device -KF1 -	earc
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#### Configured access

The parameters defined in the configuration are displayed in the configured access nodes area.

#### Selected interface

The interface via which the PLC is connected to the programming device (PG) can be selected here.

#### Devices found

The devices accessible via the set interface are displayed in a table after pressing the "Start search" button.

#### Load" button

These buttons are used to execute the selected loading action.



The TIA Portal searches for the configured PLC in the target subnet. If you have not yet assigned an IP address to the PG in the same subnet via the Windows Control Panel, you can now do this using the dialog shown in the following image.

Go online	(0130:000011)	×
	Assign IP address To execute this function the PG/PC requires an additional IP address in the same subnet as the device. Do you want to add the IP address?	
	Yes No	]

Picture 6 Advanced loading - Assign IP address

By clicking on "Yes", the PG is temporarily assigned a suitable IP address from the subnet of the device.

The "Load preview" dialog now appears.

atus	1	Target	Message	Action		
ŧ.	2	▼ -KF1	Ready for loading.	Load '-KF1'		
	4	<ul> <li>Protection</li> </ul>	Protection from unauthorized access			
	4		Devices connected to an enterprise network or directly to the internet must be appropriately protected against unauthorized access, e.g. by use of firewalls and network segmentation. For more information about industrial security, please visit http://www.siemens.com/industrialsecurity			
	💙 🕨 Stop n	Stop modules	dules The modules are stopped for downloading to device.	Stop all		
	<ul> <li>Devîce configur</li> </ul>		Delete and replace system data in target	Download to device		
	0	<ul> <li>Software</li> </ul>	Download software to device	Consistent download		
			п			

Picture 7 Loading preview

The actions that are performed during loading are listed here. Warnings and errors may also be detected here.

After pressing the "Load" button, the loading process is executed.

Once the process has been completed, the result is displayed in a corresponding dialog box.



atus	1	Target	Message	Action
ή.	0	▼ -KF1	Downloading to device completed without error.	Load '-KF1'
	•	Start modules	Start modules after downloading to device.	Start module
T				

Picture 8 Results of the charging process

In the "Results of the loading process" dialog box, you can view any stopped Start assemblies again. Finally, press the "Done" button place".

The charging process is now complete.



# 3.6 System diagnostics

In the SIMATIC environment, the diagnosis of devices and modules is referred to as system diagnostics. The components automatically report an operating fault and provide additional diagnostic information.



Picture 9 System diagnostics

The automation system monitors the following states in the running system:

- Device failure/recovery
- Pull/Push event
- Assembly errors
- Peripheral access error
- Channel error
- Parameterization error
- Failure of the external auxiliary voltage

System diagnostics is integrated as standard in the firmware of the PLC S7-1200. Faults are detected immediately and reported to the HMI device, the web server, the LED displays on the affected module and the TIA portal.



### 3.6.1 Diagnostic functions and events

System diagnostics is the detection, evaluation and reporting of errors that occur within an automation system.

### Acquisition of diagnostic data

The recording of diagnostic data by the system diagnostics does not need to be programmed, it is available as standard and runs automatically. The PLC detects system errors, hardware errors and errors in the user program, for which diagnostic events are entered in the system status list and the diagnostic buffer in the order in which they occur.



The content of the diagnostic buffer is retained when the PLC is reset or deenergized. Errors in the system can still be evaluated by the diagnostic buffer even after a longer period of time in order to trace and assign the occurrence of individual diagnostic events.

### 3.6.2 Diagnostics in the device view

In the device view, you receive the status display for the individual modules via diagnostic icons. These can be found in various places in the TIA Portal.



Picture 10 Diagnostics icon Device view



### Fault categorization

The following symbols are used to categorize faults quickly and easily.

lcon	Meaning
	Operating status "RUN"
	Operating status "STOP"
	Start-up" operating state
$\checkmark$	No interference
2	Maintenance requirements
	Maintenance request
2	Error

#### Table 1 System diagnostics symbols

Double-click on the diagnostics symbol to start the online and diagnostics view (if available). The status of the module is displayed here under "Diagnostics- $\rightarrow$  Diagnostic status". If the module is not working properly, the error that was diagnosed is listed here. In most cases, corrective measures are also indicated.



ocal modules 🕨 -KF2	
liagnostics General	Diagnostic status
Diagnostic status	Status
Channel diagnostics Functions	Module exists. Input/output data not available. Additional information for the module: Differences were found between the loaded configuration and the offline project. Online article number: 6ES7 521-1BH00-0AB0 Offline article number: 6ES7 521-1BL00-0AB0 The installed (online) firmware version is not identical with the configured (offline) firmware version. Firmware version: V2.1 Configured firmware version: V2.2
	Standard diagnostics Message Hardware component not available due to type mismatch
	Help on selected diagnostics row A hardware component was inserted but its type does not match the configured module type. Resolution: Check the inserted hardware component or correct the configuration, if necessary.

Picture 11 Diagnostic status component



# **3.7 Exercise: Commissioning the hardware project planning**

### Target:

I can put the PLC hardware into operation independently.

### Task:

Connect the PLC to the programming device and transfer the PLC hardware by loading the configuration data into the device.





### Procedure:

1. Check whether a connection to the target system can be established using "Reachable subscribers":



2. Select your PLC in the project navigation and choose in the context menu of the right mouse button:

"Load in device"  $\rightarrow$  "Hardware and software (changes only)".

Project Edit View Insert Onlin	ne Options Tools	Window	Help	RT 💋	Go onlii	ne 🖉 Go off	line 🔥? 💽 🚺	×	
Project tree	🔲 ┥ hardware 🕽	-KF1 [C	PU 121	4C AC/I	OC/Rly]				
Devices									
ŧ	🛄 📑 🔐 -KF1 [C	PU 1214C]		-			🛛 🔍 ±		
a hardware									
Add new device									
Devices & networks						15ª			
Change d	M :					×			
Device Change d		_							
V Online Open	11		103	102	101		1	2	3
Program Open in n	ew editor		105	102	101		1	-	
Fitomo Open bloc	KIFLC data type F	Rack_0				SIGMONS	2012/02/02		
PLC tag	Ctrl+.	×							
PLC day Copy	Ctrl+	C							
Watch a	Ctrl+	V					CFU struct ACROCRIN		
Delete	De	el							
Rename	F	2					_		
Billio Program 🚝 Go to topo	ologyview								
E PI Calar Go to net	vork view			-					
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Lingrouped     Download	to device	Har	dware a	nd softw	are (only	(changes)	2		
Backup fro	m online device	Har	dware c	onfigurat	tion	,			
Cross-devic 💋 Go online	Ctrl+	K Sof	tware (o	nlychan	ges)				
Common d 🖉 Go offline	Ctrl+!	M Sof	tware (a	II)					
Document	liagnostics Ctrl+I	D					1		
Receive al	arms								



Commissioning (hardware) - Exercise: Commissioning the hardware project planning

3. Follow the "Load preview" window:



4. After the successful loading process, start the PLC.

atus	1	Target	Message	Action	
ή	0	▼ -KF1	Downloading to device completed without error.	Load '-KF1'	
	0	Start modules	Start modules after downloading to device.	1 Start module	
_					

5. If the PLC is now in RUN mode and is fault-free, the exercise is complete.

		4 h		1 [CPU									
Devices							🛃 Тор	ology view	Netw	ork viev	v 🗈	Devid	e view
۲. The second s		ð d	-KF1 [CPU 12	14C]		•		🖽 🛄 🍳 ±					
▼ 🗇 hardware		2											^
Add new device		-											
Devices & networks													
<ul> <li>-KF1 [CPU 1214C AC/DC/Rly]</li> </ul>													
Device configuration				•									≡
Q Online & diagnostics				-	-				1	-		_	
🕨 🛃 Program blocks				103	102	101		1	2	3	4	5	
Technology objects			Rack_0					II 🗸			2		
External source files										_	_		
PLC tags							SICATCAS	254 b. 27 44					
PLC data types													
Watch and force tables							20						
Online backups													
Device proxy data													
Program info							10						
PLC alarm text lists							-						
Local modules	$\checkmark$		1				L						í 📰 🖉



# 3.8 I/O check

An I/O check (input/output check) is an essential step during commissioning. It is used to ensure that all inputs and outputs are correctly wired to the PLC and are functioning properly. This check is crucial in order to identify possible sources of error at an early stage and to ensure that the system works as planned.

The I/O check is so important because an incorrect assignment or a defective sensor/actuator in a PLC system can have serious consequences, such as system downtimes, unexpected movements of machines or even accidents. The I/O check ensures that each input variable (e.g. button, sensor) reacts correctly to the PLC and that each output variable (e.g. motor, valve) shows the desired behavior.



Due to possible faulty wiring, unwanted system reactions may occur during the I/O check. A careful and considered approach must be taken to ensure that any remaining wiring or hardware faults do not pose a risk to people, the environment or system components at any time.



Ideally, an I/O check is carried out when no control program is being processed. In this way, the manually activated outputs are not overwritten and manually activated sensors do not result in a program response.

Depending on the target system, the following tools are available:

- Monitoring table (Siemens) / Monitoring list (Beckhoff)
- PLC variable table (Siemens) / Global variable list (Beckhoff)



### 3.8.1 PLC variable table

You can use the PLC variable table to put the peripheral inputs into operation. take.

PLO	PLC tags → Default tag table [26] _ = ■ = ×											
						🕣 Tags	User constants	System constants				
-	P .	→				-		3				
	Defau	It tag table	e									
	1	lame	Data type	Address	Monitor value	Comme	nt					
1		S1	Bool	%10.0	TRUE	Limit sw	itch picker in position co	nveyor belt (1- in position)				
2	-00	52	Bool	%10.1	FALSE	Limit sw	itch picker in position ro	tary table (1- in position)				
З	-00	\$3	Bool	%10.2	TRUE	Limit sw	itch pusher in home pos	ition (1 - in home position)				
4	-	B1	Bool	%10.3	TRUE	Light ba	rrier belt (0 - workpiece p	laced on belt)				
5	-00	B2	Bool	%10.4	TRUE	Light ba	Light barrier pallet top (1 - pallet empty)					
6	-01	\$4	Bool	%10.5	FALSE	Position	switch rotary table (1 - ro	otary table is in position)				
7	-	B3	Bool	%10.6	FALSE	Pallet lig	ht barrier below (0 - pall	et present)				
8	-01	B4	Bool	%10,7	FALSE	Light ba	rrier magazine (0 - workp	piece present)				
9	-00	Q1	Bool	%Q8.0	FALSE	Move pi	cker towards rotary table					
10	-	Q2	Bool	%Q8.1	FALSE	Drive pi	cker towards conveyor be	elt				
11	-00	Q3	Bool	%Q8.2	FALSE	Motor p	usher					
12	-00	Q4	Bool	%Q8.3	FALSE	Motor ro	tary table					
13	-	Q5	Bool	%Q8.4	FALSE	Motor co	onveyor belt					
14	-01	Q6	Bool	%Q8.5	FALSE	Close valve separator						
15	-00	Q7	Bool	%Q8.6	FALSE	Valve pusher magazine extend						
16	-	Q8	Bool	%Q8.7	FALSE	Valve vacuum suction cup on						
17	-	Q9	Bool	%Q9.0	FALSE	Motor D	nill					
18	-53	010	Bool	%09.1	FALSE	Lamp welding						

Picture 12 PLC variable table

### Check inputs

Inputs can be monitored in the variable table, making the function suitable for testing input modules and encoder circuits. This allows you to check the status of inputs that are read in from the process image (PAE).

Click on the "Monitor all" icon to monitor. The Observation values column appears, in which you can observe the values.

### Check outputs

Outputs cannot be controlled or changed in the PLC variable table. They can only be monitored here. The watch table must be used to change the status of an output.



### 3.8.2 Observation table

In monitoring tables, you have the option of monitoring and also controlling variables from different PLC variable tables in one place.

There must be an online connection to the PLC to monitor variables. Once you have created an observation table, you can save it, duplicate it, print it out and use it again and again to observe and control variables.

You will find the observation tables in the "Observation and force tables" folder in the project navigation of your PLC. Several watch tables can be created. The names can be freely chosen.



Picture 13 Observation table - project navigation



The following image shows an open observation table. Some variables have already been entered.

Fe	rtigun	gslinie 24V	<ul> <li>-KF1 [CP</li> </ul>	U 1214C DC/D	C/Rly] 🕨 Wat	ch and force ta	bles 🕨 IO	-Check	_ # = ×
	-12	25 El 0 El	13 13 130	00 00					
3	54	II [12] [10]	11 70 74	1					
	i	Name	Address	Display format	Monitor value	Modify value	9	Comment	Tag comment
1	// Inpu	its							
2		"S1"	%10.0	Bool	FALSE				Limit switch picker in position conveyor belt (1- in position)
3		*S2*	%IO.1	Bool	FALSE				Limit switch picker in position rotary table (1- in position)
4		*\$3*	%10.2	Bool	FALSE				Limit switch pusher in home position (1 - in home position)
5		"81"	%10.3	Bool	FALSE				Light barrier belt (0 - workpiece placed on belt)
6		"B2"	%10.4	Bool	FALSE				Light barrier pallet top (1 - pallet empty)
7		*\$4*	%10.5	Bool	FALSE				Position switch rotary table (1 - rotary table is in position)
8		*83*	%10.6	Bool	FALSE				Pallet light barrier below (0 - pallet present)
9		"B4"	%10.7	Bool	FALSE				Light barrier magazine (0 - workpiece present)
10	// Out	puts							
11		"Q1"	%Q8.0	Bool	FALSE	TRUE	A 1	V.	Move picker towards rotary table
12		"Q2"	%Q8.1	Bool	FALSE				Drive picker towards conveyor belt
13		"Q3"	%Q8.2	Bool	FALSE	TRUE			Motor pusher
14		"Q4"	%Q8.3	Bool	FALSE				Motor rotary table
15		"Q5"	%Q8.4	Bool	FALSE				Motor conveyor belt
16		"Q6"	%Q8.5	Bool	FALSE				Close valve separator
17		*Q7*	%Q8.6	Bool	FALSE				Valve pusher magazine extend
18		"Q8"	%Q8.7	Bool	FALSE				Valve vacuum suction cup on
19		*Q9*	%Q9.0	Bool	FALSE				Motor Drill
20		"Q10"	%Q9.1	Bool	FALSE				Lamp welding

Picture 14 View of observation table

The structure is very similar to the PLC variable table. However, the names of the variables cannot be changed.

### Add observation table

To create an observation table, proceed as follows:

- 1. In the project navigation, open the structure below the PLC for which you want to create a watch table.
- 2. Open the "Observation and force tables" folder.
- 3. Double-click on the "Add new observation table" command.
- 4. A new observation table is added.

### Different test cases

You can create several watch tables via "Add new watch table" and name them according to a specific test case. These observation tables are always part of the project.



### Check inputs

Inputs can be monitored in the monitoring table. This makes the function suitable for checking the input modules and the encoder circuits. This allows you to check the status of inputs that are read in from the process image.

### Control outputs

At the same time, individual outputs can be switched using the "Control" test function. The function of the connected actuators can thus be checked.

You need the following operating elements for monitoring or controlling:

lcon	Meaning
	Showing and hiding the control columns
	Switching the monitoring function on and off
1	One-time control of the selected PLC variable "Control flash"

Table 2 Symbols Observation table

### Procedure Observe

- 1. Enter the name of the variable in the "Name" column.
- 2. Start the monitoring function (glasses with green triangle).

Fer	tigur	gslinie 24V	<ul> <li>-KF1 [CP</li> </ul>	U 1214C DC/D	C/Rly] ♦ Wat	ch and force ta	bles 🕨	O-Ch	eck		_ = = = ×
\$	1	11 <sup>20</sup> 115	9. 2. 2								
	i	Name	Address	Display format	Monitor value	Modify value	9	(	Comment	Tag comment	
1	// Inp	uts									
2		"\$1"	%10.0	Bool	FALSE	TRUE				Limit switch picker in p	osition conveyor belt (1- in position)
3		*52*	%10.1	Bool	FALSE	TRUE		4		Limit switch picker in p	osition rotary table (1-in position)
4		*53*	%10.2	Bool	FALSE					Limit switch pusher in	home position (1 - in home position)
5		"B1"	%10.3	Bool	-				2	tharrier helt (0 - w	orkpiece placed on belt)
6		*82*	%10.4	Modi	fy				(	Select modified	- pallet empty)
7		*\$4*	%10.5	value	-					variable	le (1 - rotary table is in position)
8		"B3"	%10.6	vatur						Variable	(0 - pallet present)
9		"B4"	%10.7	Bool					1	cight barrier magazine	(0 - workpiece present)
10	// Out	puts						_			
11		"Q1"	%Q8.0	Bool	FALSE	TRUE				Move picker towards ro	tary table
12		"Q2"	%Q8.1	Bool	FALSE					Drive picker towards co	onveyor belt
13		"Q3"	%Q8.2	Bool	FALSE	TRUE				Motor pusher	
14		"Q4"	%Q8.3	Bool	FALSE					Motor rotary table	
15		"Q5"	%Q8.4	Bool	FALSE					Motor conveyor belt	
16		"Q6"	%Q8.5	Bool	FALSE					Close valve separator	
17		*Q7*	%Q8.6	Bool	FALSE					Valve pusher magazine	e extend



### Procedure Taxes

- 1. Enter the name of the variable in the "Name" column.
- 2. Start the monitoring function (glasses with green triangle).
- 3. Activate the control columns.
- 4. Enter the desired value in the "Tax value" column.
- 5. For a binary signal, this will be 0 or "FALSE" or 1 or "TRUE".
- 6. Activate the "control flash".



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### 3.8.3 Exercise: Performing an I/O check

### Target:

I can check connected peripheral modules.

### Task:

Check the correct wiring of the inputs and outputs of your PLC using an observation table.



- When controlling the converter, make sure that it does not move to its end positions, otherwise it will block. If the motor stalls, this can lead to an overload.
- A variable selected in the observation table can be immediately set to "TRUE" using the shortcut "Ctrl + F2" and to "FALSE" using "Ctrl + F3". This can be a helpful tool to avoid overrunning the end position.



### Procedure:

1. Use the "Add new watch table" button to add a new watch table and assign a meaningful name (e.g. "IO check"):



2. Enter the variables from your PLC variable table:

	11 <sup>20</sup>	9. 9. 2	00h 00h					
i	Name	Address	Display format	Monitor value	Modify value	9	Comment	Tag comment
// In	puts							
2	*\$1*	%10.0	Bool					Limit switch picker in position conveyor belt (1-in position
3	*52*	%10.1	Bool					Limit switch picker in position rotary table (1-in position)
t l	*\$3*	%10.2	Bool					Limit switch pusher in home position (1 - in home position
5	"B1"	%10.3	Bool					Light barrier belt (0 - workpiece placed on belt)
5	"B2"	%10.4	Bool					Light barrier pallet top (1 - pallet empty)
7	*S4*	%10.5	Bool					Position switch rotary table (1 - rotary table is in position)
3	"B3"	%10.6	Bool					Pallet light barrier below (0 - pallet present)
9	*B4*	%10.7	Bool					Light barrier magazine (0 - workpiece present)
0 110	utputs							
11	"Q1"	%Q8.0	Bool					Move picker towards rotary table
12	"Q2"	%Q8.1	Bool					Drive picker towards conveyor belt
13	"Q3"	%Q8.2	Bool					Motor pusher
14	"Q4"	%Q8.3	Bool					Motor rotary table
15	*Q5*	%Q8.4	Bool					Motor conveyor belt
16	*Q6*	%Q8.5	Bool					Close valve separator
17	"Q7"	%Q8.6	Bool					Valve pusher magazine extend
18	"Q8"	%Q8.7	Bool					Valve vacuum suction cup on
9	"Q9"	%Q9.0	Bool					Motor Drill
20	"010"	%09.1	Bool					Lamp welding

3. Start the observation with the "glasses" Annually operate all sensors and check that they are correctly wired and functioning:

00

Fei	rtigun	gslinie 24V	-KF1 [CP	U 1214C DC/D	OC/RIy] 🕨 Wate	ch and force tal	bles 🕨 IO-0
Ť	≝* .	12 Lø Lo	9. 2. 2	<sup>005</sup>			
	i	Name	Address	Display forma	Monitor value	Modify value	9
1	// Inpu	ts					
2		"S1"	%10.0	Bool	FALSE		
3		*S2*	%10.1	Bool	FALSE		
4		*\$3*	%10.2	Bool	FALSE	2	
5		"B1"	%10.3	Bool	FALSE		
6		"B2"	%10.4	Bool	FALSE		
7		*S4*	%10.5	Bool	FALSE		
8		"B3"	%10.6	Bool	FALSE		
9		"B4"	%10.7	Bool	FALSE		
10	// Outp	outs					
11		"Q1"	%Q8.0	Bool	FALSE		
12		"Q2"	%Q8.1	Bool	FALSE		



4. Enter "TRUE" or "1" in the "Control value" column for the first output variable. Make sure that the variable also has a tick in the "Flash" column:

Ferti	igung	slinie 24V )	-KF1 [CPI	J 1214C DC/D	C/Rly] 🕨 Wate	ch and force tat	oles 🕨 IO-(
÷	<u>⊇</u> ¢ <i>µ</i> .	2 <b>1/ 1</b> o :	9. 2. 2	00 00			
i	1	Name	Address	Display format	Monitor value	Modify value	9
1 /	/ Inputs	5					
2		"S1"	%10.0	Bool	FALSE		
3		*S2*	%IO.1	Bool	FALSE		
4		"\$3"	%10.2	Bool	FALSE		
5		"B1"	%10.3	Bool	FALSE		
5		"B2"	%10.4	Bool	FALSE		
7		*54*	%10.5	Bool	FALSE		
3		"B3"	%10.6	Bool	FALSE		
9		*B4*	%10.7	Bool	FALSE		
0 1	Outpu	uts					
11		"Q1"	%Q8.0	Bool	FALSE	TRUE	M (1
12		"Q2"	%Q8.1	Bool	FALSE		
13		"Q3"	%Q8.2	Bool	FALSE		2
14		"Q4"	%Q8.3	Bool	FALSE		
15		"Q5"	%Q8.4	Bool	FALSE		
16		"Q6"	%Q8.5	Bool	FALSE		
17		"Q7"	%Q8.6	Bool	FALSE		
8		"Q8"	%Q8.7	Bool	FALSE		
19		*Q9*	%Q9.0	Bool	FALSE		
20		*Q10*	%Q9.1	Bool	FALSE		

- 5. Press the button with the lightning bolt and the "1"
- 6. If the correct component is activated, enter "FALSE" or "0" for the output in the "Control value" column and press the flash again :

Fer	tigung	slinie 24	V ▶ -KF1 [CPI	J 1214C DC/D	C/Rly] ▶ Wat	ch and force tal	bles 🕨 IO-Ch
¥	<u>ا الج</u>	<u>2</u> 17 1	o 🖉 1 3 🖓	00h 00h 1			
	i	Name	Address	Display format	Monitor value	Modify value	9
10	// Outp	outs					
11		"Q1"	%Q8.0	Bool	TRUE	FALSE	M 🔺
12		"Q2"	B %Q8.1	Bool	FALSE		
13		"Q3"	%Q8.2	Bool	FALSE		2

7. Carry out procedure 4 - 6 for all outputs.

