

Project 3

**Process visualization of a coin plant
with SIMATIC - WinCC**

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1 Objectives of the project

Main objective:

Becoming acquainted to and use of a current visualization software close to industry

Learning objectives:

Practical operation of the visualization software

- Statement of configurations
- Statement of variables for communication with the process
- Generation of an image of the installation with available tools and symbols
- Testing mode, combined with a Programmable Logic Controller

2 Introduction

2.1 Overview of visualization software SIMATIC WinCC

WinCC (Windows Control Center) by Siemens is a programming software solving visualization tasks concerning operator-process monitoring and control in the production and process automation. It provides industry suitable function units for graphic representation, alarming, archiving and protocolling.

The operating systems MS Windows 95/98 or MS Windows NT serve as platform for WinCC.

The system design of the Control Center:

Control Center

- Explorer: within the Control Center
- Data Manager: supplies the process image with tag values and procures data from the automation systems (receive, request).

Function units

- Graphic system (*Graphics Designer*): graphic representation and process interfacing
- Action processing (*Global Scripts*): Dynamizing of the project to user specific requirements
- Alarming system (*Alarm Logging*)
- Archiving and processing of measured values (*Tag Logging*)
- Report system (*Report Designer*)



The documentation for WinCC is very extensive. Therefore it is recommended to run the interactive learning programm by selecting the menu command "Tutorial" before beginning a new project. During this program, the operation of WinCC is completely worked through by means of an example. To make setting up and editing a project easier, a pattern *Procedure for design, configuration and generation of an image of the coin plant* as well as *Procedure for the input of the object properties* were designed.

3 Hard- and Software

The execution of the visualization requires the following hard- and software components:

- a) Programmable Logic Controller S7-300 with components:
 - mounting channel as a mounting rack
 - Power supply module PS 3075A (6ES7-307-1EA00-0AA0)
 - Central processing unit CPU 315-2DP (6ES7-315-2AF03-0AB0)
 - Digital input module 16xDC 24V (6ES7-321-1BH01-0AA0)
 - Digital output module 16xDC 24V, 0.5A (6ES7-322-1BH01-0AA0)
- b) MPI interface cable for the connection CPU / PC
- c) PC with a minimum configuration: Pentium processor, Windows 95/98/NT, 32MB RAM, hard disc 3 GB, CD-ROM drive, color display
- d) Software SIMATIC WinCC

4 Procedure for design, configuration and generation of an image of the „Coin plant“


( = left mouseclick)
(R = right mouseclick)

Starting with WinCC and creating a new project

Start menu




Simatic → WinCC → Windows Control Center  (starts the program) → file , → new ,

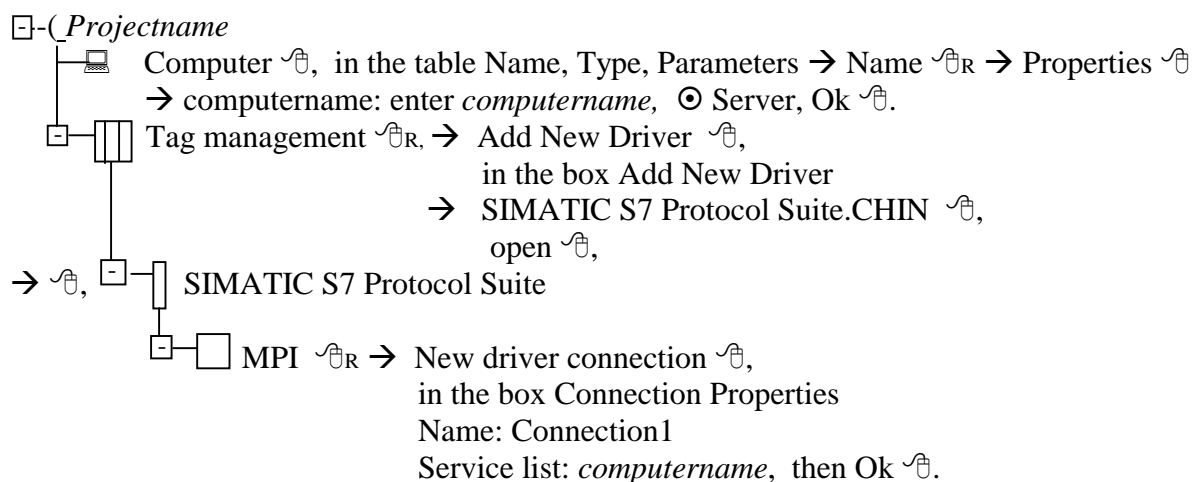
Adjusting a new project: In the box Control Center → Single-user system, then Ok .

Creating a new project : → Project name : enter a project name (*projectname*)

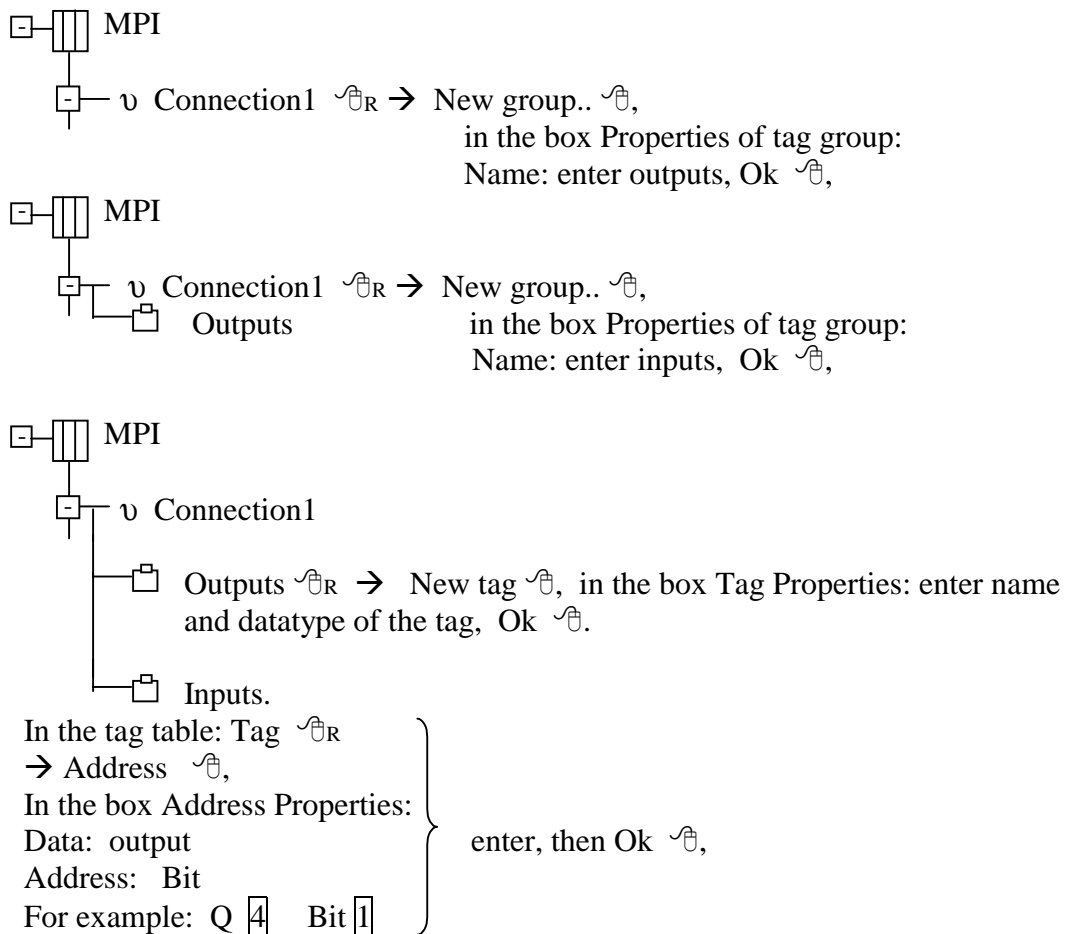
→ Project path: for example C:\SIEMENS

→ Create button .

New connection:



Creating new groups and variables:



In addition you have to define all the tags for tag groups Inputs and Outputs by upturned example.

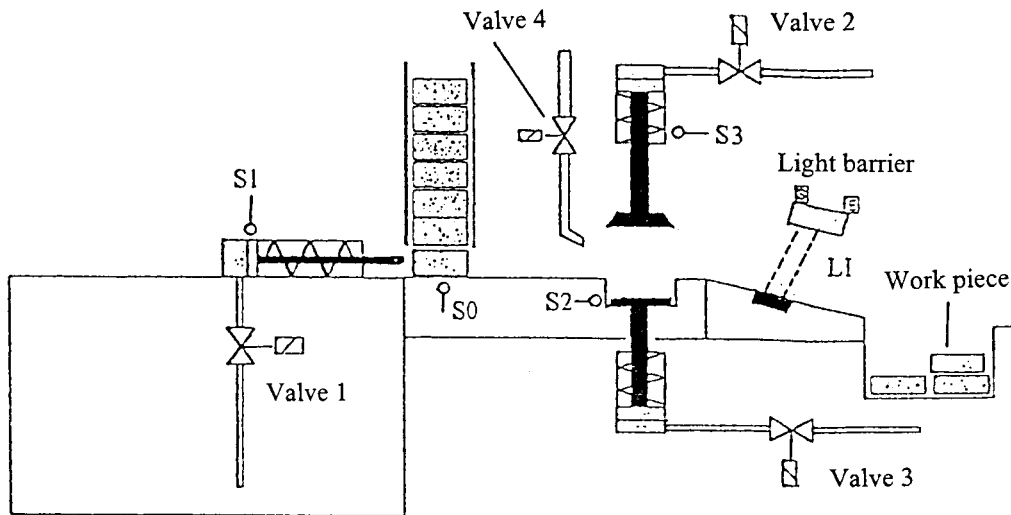
Creating the process image

- Select in *Control Center* tab *Editor Graphics Designer*, and select „new picture“
- NewPd10.Pdl in right window of *Control Center*,
- Rename picture, → in submit box type „Projectname“.
- Open the picture *Projectname.pdl* by „open picture“ or doubleclick on the filename.

By using the object palette, style palette, Dynamic Wizard, as well as the library in the toolbar, the image of the coin plant and the text fields are created. (see 6: Pattern for the graphical representation of the process). Afterwards, properties of all objects are defined. (see 8: Procedure for the input of the object properties)

5 Problem description of a coin plant

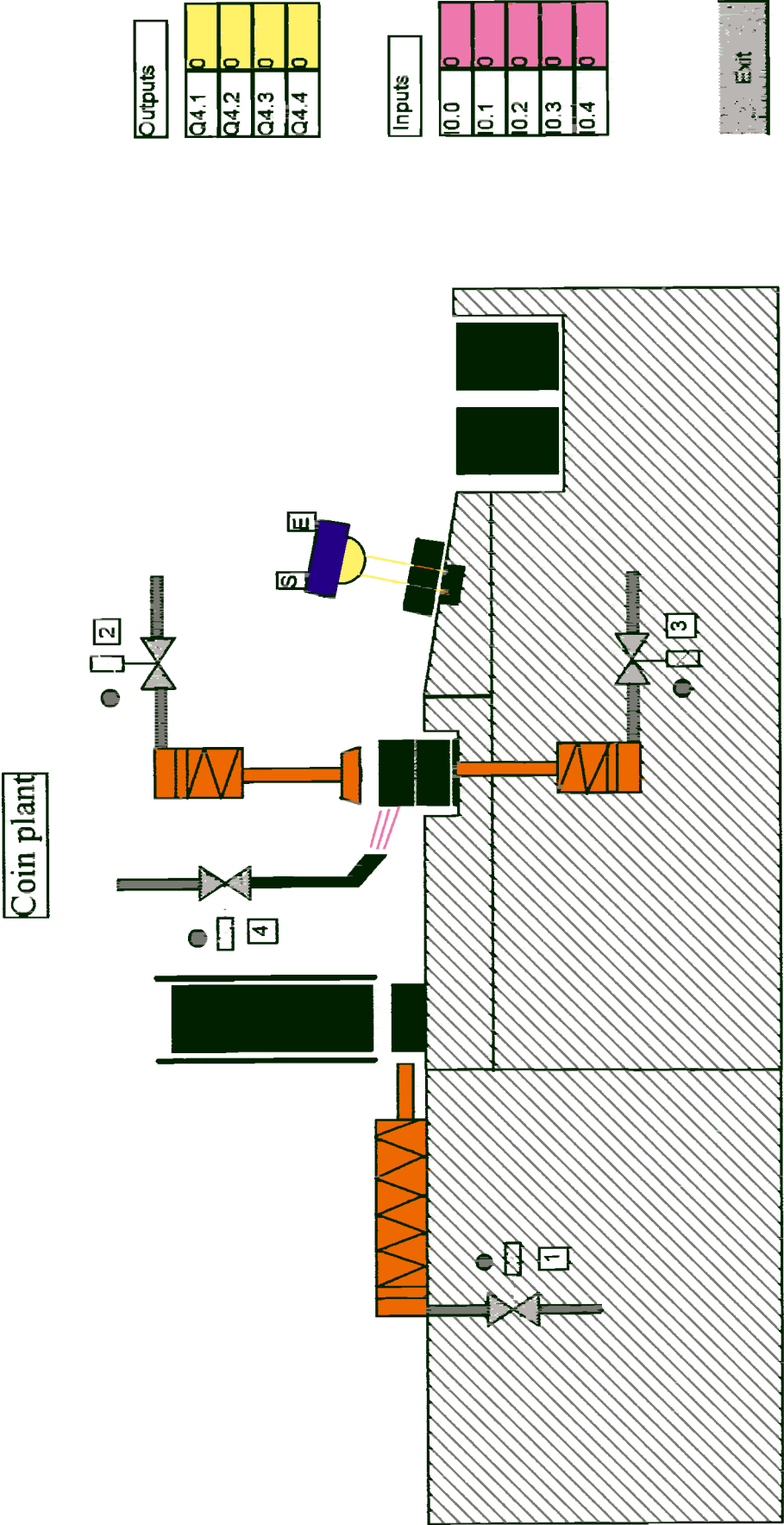
5.1 Technology schematics



5.2 Problem description

The cylinder of valve 1 pushes the work piece from the magazin (position switch S0 is operated) to the pressing place and moves back when position switch S2 is not operated. Afterwards the cylinder of the coinstamp should extend (valve 2) until position switch S3 is operated. When the position switch operates, the cylinder should run in again. Further the work piece should be raised up by the cylinder of valve 3, S2=0. In 3 seconds valve 4 should open to blow an airstream at the coin and move it over the slope to the catching reservoir. On the way the coin passes a light barrier LI, which switches off valves 3 and 4. The procedure can repeat itself after a 4 seconds pause, when the precondition for the home position is fulfilled (end switch S0, S1 and LI are closed, S2 and S3 are opened).

6 Pattern for the graphic representation of the process



7 List of variables

Name	Type	Parameter	
S0	Binary Tag	I 0.0	} Inputs
S1	Binary Tag	I 0.1	
S2	Binary Tag	I 0.2	
S3	Binary Tag	I 0.3	
LI	Binary Tag	I 0.4	
Valve1	Binary Tag	Q 4.1	} Outputs
Valve2	Binary Tag	Q 4.2	
Valve3	Binary Tag	Q 4.3	
Valve4	Binary Tag	Q 4.4	
Q 4,5	Binary Tag	Q 4.5	

Q 4,5 is the rising edge of the sequential control program of the installation for valve 3.

8 Procedure for the input of the object properties

Signal-lamps

Object \rightarrow \rightarrow Properties

In the box Properties:

--Flashing \rightarrow Attribute Static Dynamic


Flashing Back Yes

Flashing Background \rightarrow \rightarrow Edit..

Background Flash Frequency Fast

In the box Dynamic value ranges:

\rightarrow Tag. In select Tag Name – corresponding valve

 \rightarrow In the box Change trigger \rightarrow Standard cycle 2s, change to „Upon change“, then Ok.

Bool \rightarrow Valid range Display

 True \rightarrow Edit..

 False } Select color, then Ok.

\rightarrow

--Miscellaneous \rightarrow Attribute Static Dynamic

 Display Yes

Valves (group) and lines

Object ⇨, → ⇨R, → Properties ⇨

In the box Properties:

--**Colors** ⇨, → Attribute Static Dynamic
 Background →⇨R → Edit..⇨,

In the box Dynamic value ranges:
 -⇨, → Tag⇨. In select Tag Name – corresponding valve⇨ ⇨,
 -⇨, → In the box Change trigger → Standard cycle 2s ⇨,
 Change to „Upon change“ ⇨, then Ok.

⊙ Bool → Valid range Back..
 True } ⇨R → Edit..
 False } *Select color, then Ok.*

⇨.

--**Miscellaneous** ⇨, → Attribute Static Dynamic
 Display Yes

Airstream (group)

Object ⇨, → ⇨R, → Properties⇨

In the box Properties:

--**Colors**⇨, → Attribute Static Dynamic
 Line Color →⇨R → Dynamic-Dialog ⇨,




In the box Dynamic value ranges:
 -⇨, → Tag⇨. In select Tag Name – Valve4 ⇨ ⇨,
 -⇨, → In the box Change trigger → Standard cycle 2s ⇨,
 Change to „Upon change“ ⇨, then Ok.

⊙ Analog → Valid range Up to Line
 Other⇨R, →New ⇨, (for 2 Value Range)
 Value Range 1 0,99 } ⇨R, → Edit..
 Value Range 2 1,99 } *select color, then Ok.*








⇨.

--**Miscellaneous**⇨, → Attribute Static Dynamic
 Display No






Light barrier (Line E)





Object , → , → Properties 

In the box Properties:


Miscellaneous , Attribute Static Dynamic
 Display Yes → , → Dynamic-Dialog ,
 Flashing Background → R → Edit.. ,
 Select Colors , ,

In the box Dynamic value ranges:




 - , → Tag . In select Tag Name – Valve4 + LI  ,

 - , → In the box Change trigger → Standard cycle 2s ,
 Change to „Upon change“ , then Ok.




Bool → Valid range Display
 True Yes
 False No

.






Work piece under the magazine





Object , → , → Properties 

In the box Properties:


--**Geometry** , → Attribute Static Dynamic
 Position X given → , → Dynamic-Dialog ,

In the box Dynamic value ranges:

 - , → Tag . In select Tag Name – Valve1  ,


 - , → In the box Change trigger → Standard cycle 2s ,
 Change to „Upon change“ , then Ok.





Bool → Valid range Up to Display
 True enter new value
 False Value is given



.


--**Miscellaneous** , → Attribute Static Dynamic
 Display No → , → Dynamic-Dialog ,

In the box Dynamic value ranges:




 - , → Tag . In select Tag Name – Valve1 + S0  ,

 - , → In the box Change trigger → Standard cycle 2s ,
 Change to „Upon change“ , then Ok.









Analog → Valid range Up to Display
 Other , → New , (for 2 Value Range)
 Value Range 1 0,99 No
 Value Range 2 1,99 Yes



.

Work piece in embossing position

Object , → R, → Properties 

In the box Properties:

--Color 	→ <u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>	
	Background Color →  R			→ Edit 
	Select Color  			
--Miscellaneous 	→ <u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>	
	Display	No		→  R → C-Action 




 - , → In the box Change trigger enter 250ms, → Ok.

Write program:









```
{
if (GetTagBit("Valve1")==1){
SetVisible("Project Name.Pdl","RectangleNo",1);}
if (GetTagBit("Valve3")==1){
SetVisible("Project Name.Pdl","RectangleNo",0);}
return 0;
}
```



Workpiece over the embossing position

Object , → R, → Properties 


In the box Properties:

--Color 	→ <u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>	
	Background Color →  R			→ Edit 
	Select Color  			
--Miscellaneous 	→ <u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>	
	Display	No		→  R → C-Action 




 - , → In the box Change trigger enter 500 ms → Ok.

Write program:







```
{
if (GetTagBit("ValveNo")==1){
SetVisible("Project Name.Pdl","RectangleNo",1);}
if (GetTagBit("Valve4")==1){
SetVisible("Project Name.Pdl","RectangleNo",0);}
return 0;
}
```








Work piece at the light barrier





Object  →  Properties 

In the box Properties:


--Colors 	→	<u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>
		Background Color → 		→ Edit  , → Select Color
--Miscellaneous 	→	<u>Attribute</u>	<u>Static</u>	<u>Dynamic..</u>
		Display	No	→  → Dynamic-Dialog  ,

In the box Dynamic value ranges:




 - , → Tag . In select Tag Name - Valve4  ,

 - , → In the box Change trigger → Standard cycle 2s ,
change to 1 s , then Ok.









<input checked="" type="radio"/>	Bool	→	<u>Valid range</u>	<u>Display</u>
			True	Yes
			False	No

.






Work piece in outlet position





Object  →  Properties 



In the box Properties:


----Colors 	→	<u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>
		Background → 		→ Edit.. 
		Select Color   .		
--Miscellaneous 	→	<u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>
		Display	No	→  → Dynamic-Dialog  ,

In the box Dynamic value ranges:




 - , → Tag . In select Tag Name – LI + Valve4  ,

 - , → In the box Change trigger → Standard cycle 2s ,
Change to 1s , then Ok.











<input checked="" type="radio"/>	Analog	→	<u>Valid range</u>	<u>Up to</u>	<u>Display</u>
			Other  , → New  , (for 2 Valid range)		
			Valid range 1	0,99	No
			Valid range 2	1,99	Yes

.












Cylinder of Valve 1 (Rectangle)

Object , → , → Properties ,

--Geometry ,

→ <u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>
Width	given	→  → Dynamic-Dialog  ,
<i>In the box</i> Dynamic value ranges:		
<input type="text" value="..."/>	 → Tag  . <i>In select Tag Name -Valve1  ,</i>	
	→ <i>In the box</i> Change trigger → Standard cycle 2s  ,	
<i>Change to 250 ms , then Ok.</i>		
<input checked="" type="radio"/> Bool → <u>Valid range</u>	<u>Width</u>	
True	<i>enter new value</i>	
False	<i>value is given</i>	
<input type="text" value="Apply"/>  .		

--Colors ,

→ <u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>
Background Color		→  → Dynamic-Dialog  ,
<i>In the box</i> Dynamic value ranges:		
<input type="text" value="..."/>	 → Tag  . <i>In select Tag Name -Valve1  ,</i>	
	→ <i>In the box</i> Change trigger → Standard cycle 2s  ,	
<i>Change to 250 ms , then Ok.</i>		
<input checked="" type="radio"/> Bool → <u>Valid range</u>	<u>Back...</u>	
True	<input type="text"/>	}  → Edit
False	<input type="text"/>	
<input type="text" value="Apply"/>  .		

--Miscellaneous ,



→ <u>Attribute</u>	<u>Static</u>	<u>Dynamic</u>
Display	Yes	

Valve 2 (group, rectangle and die)

Object \rightarrow \rightarrow Properties



In the box Properties:

Geometry \rightarrow Attribute Static Dynamic
Height given \rightarrow \rightarrow Dynamic-Dialog

In the box Dynamic value ranges
 - \rightarrow Tag In select Tag Name – Valve2
 - \rightarrow *In the box* Change trigger \rightarrow Standard cycle 2s
Change to 250 ms, then Ok.

Bool \rightarrow Valid range Height
True enter new value
False value is given

Colors \rightarrow Attribute Static Dynamic
Background \rightarrow \rightarrow Dynamic-Dialog


In the box Dynamic value ranges:
 - \rightarrow Tag In select Tag Name – Valve2
 - \rightarrow *In the box* Change trigger \rightarrow Standard cycle 2s
Change to 250 ms, then Ok.


Bool \rightarrow Valid range Display
True } \rightarrow Edit
False } Select color, then Ok.


Miscellaneous \rightarrow Attribute Static Dynamic
Display Yes

Cylinder of Valve 3 (Rectangle)

Object → Properties, In the box Properties:

---Geometry → Attribute Static Dynamic
 Position Y given → → Dynamic-Dialog
In the box Dynamic value ranges
 - → Tag . In select Tag Name - Valve3
 - → *In the box* Change trigger → Standard cycle 2s
 Change to 250 ms , then Ok.
 Bool → Valid range Position
 True enter new value
 False value is given

--Geometry → Attribute Static Dynamic
 Heighth given → → Dynamic-Dialog
In the box Dynamic value ranges:
 - → Tag . In select Tag Name - Valve3
 - → *In the box* Change trigger → Standard cycle 2s
 Change to 250 ms , then O k.
 Bool → Valid range Heighth
 True enter new value
 False value is given

--Colors → Attribute Static Dynamic
 Background Color → → Dynamic-Dialog
In the box Dynamic value ranges:
 - → Tag . In select Tag Name - Valve3
 - → *In the box* Change trigger → Standard cycle 2s
 Change to 250 ms , then Ok.
 Bool → Valid range Back...
 True } → Edit
 False } Select color, then Ok.

--Miscellaneous → Attribute Static Dynamic
 Display Yes

Valve 3 - palette


Object \rightarrow Properties

In the box Properties :

Geometry \rightarrow Attribute Static Dynamic
Position Y given \rightarrow \rightarrow Dynamic-Dialog

In the box Dynamic value ranges:

- \rightarrow In select Tag Name - Valve3


 - \rightarrow In the box Change trigger \rightarrow Standard cycle 2s
Change to 250 ms, then Ok.

Bool \rightarrow Attribute Position
True enter new value.
False value is given

Colors \rightarrow Attribute Static Dynamic
Background Color \rightarrow \rightarrow Dynamic-Dialog

In the box Dynamic value ranges:

- \rightarrow In select Tag Name - Valve3



 - \rightarrow In the box Change trigger \rightarrow Standard cycle 2s
Change to 250 ms, then Ok.

Bool \rightarrow Attribute Back..
True } \rightarrow Edit
False } Select color, then Ok.

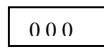
Miscellaneous \rightarrow Attribute Static Dynamic
Display Yes



In-/Output - fields

In the Object palette:

Smart-Object , → I/O-Field ,



Place the cursor at the position of the process image, where the field (e.g. rectangle) shall be represented, and click the mouse.




- R → Configuration ,

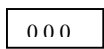
In the box I/O-field Configuration:

- Tag (yellow field) ,

→ Select tag from the tag list ,







- Update → Select time

- Type → Select , then Ok.






- R → Properties ,

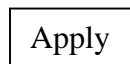
In the box Properties :


	<u>Attribute</u>	<u>Sta..</u>	<u>Dy..</u>	
- Color  , →	Background Color	→  ,		→ Edit  , Select color, Ok.
- Miscellaneous  , →	display	yes		
- Output/Input  , →	Output value	0	→  R,	Dynamic-dialog
	Data type	binary		
	Output format	1111		

In the box Dynamic value range:



- , → In select Tag Name – (select tag)  ,



- .


Input of operation functions

Runtime „Exit“

In the Object Palette:

Windows - Objects , →  Button ,

Place the operation button in picture Praktikum1.pdl.

Enter the text “Exit” in the text field of the configuration dialog. Ok ,

Select the button “Exit” ,

In Dynamic Wizard → Exit WCC Runtime ,

→ Select left mouse key as trigger

→ Close with Finish.