Test Project

Industrial Control

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Contents

Introduction **3**
Process Overview **3**
PROFINET Network **4**
Servo Driver Configuration **4**
HMI Configuration **5**
HMI and PLC Variables **5**
Part A Screen **7**
Details Part A – Size and Rectangles *8*
Details Part A – Texts 9
Details Part A – Variables 10
Details Part A – Screen Window *17*
Part B Screen **18**
Details Part B – Size, Rectangles and Texts 19
Details Part B – Variables 20

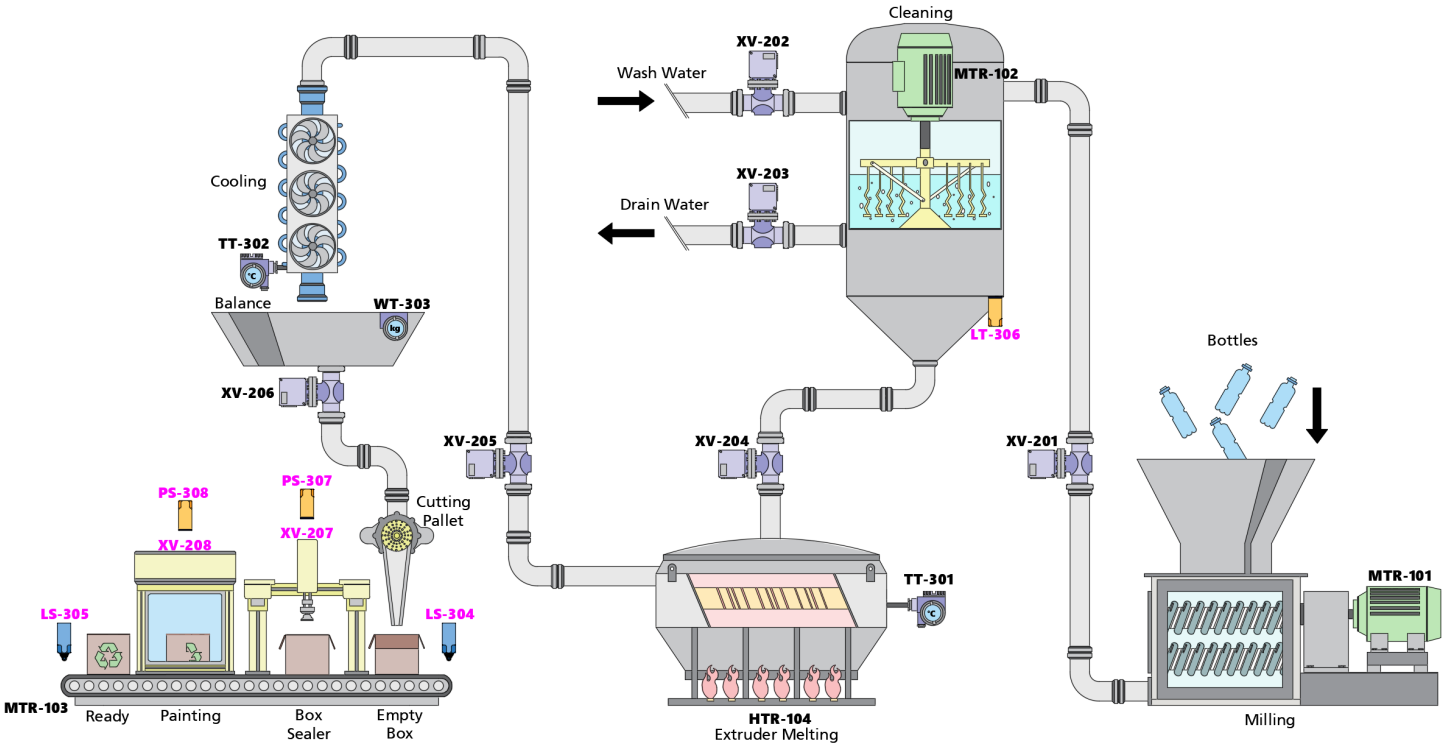
Introduction

The Competitor must configure the hardware and configure the HMI and Simulate all Inputs and Outputs for the Test Project.

Using **TIA Portal**, develop the Hardware Setup and HMI Functionality accordance with:

- **The operating flowchart;**
- **The HMI screen and Hardware requirements;**

Process Overview



MTR-101: Milling Motor

MTR-102: Mixing/Cleaning Motor

MTR-103: Belt Motor

HTR-104: Heater

XV-201: Discharge Valve

XV-202: Wash Water Inlet Valve

XV-203: Drain Outlet Valve

XV-204: Discharge Valve

XV-205: Discharge Valve

XV-206: Discharge Valve

TT-301: Heating Temperature Sensor

TT-302: Cooling Temperature Sensor

WT-303: Balance Sensor

XV-207: Box Closing Valve

XV-208: Painting Valve

LS-304: Empty Box Position

LS-305: Ready Position

LT-306: Level Sensor

PS-307: Box Sealer Sensor Position

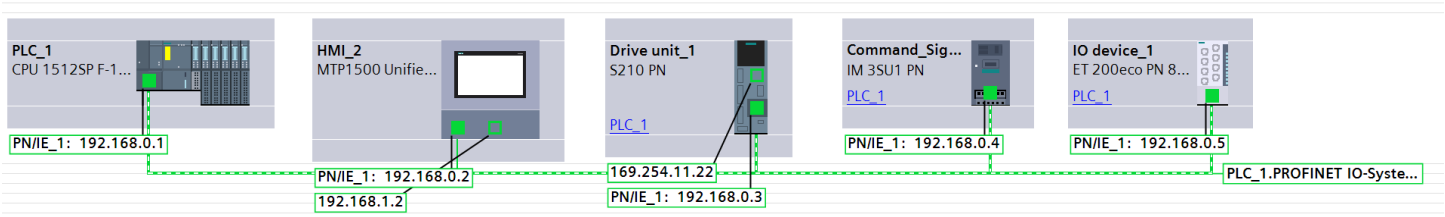
PS-308: Painting Sensor Position

} Part B

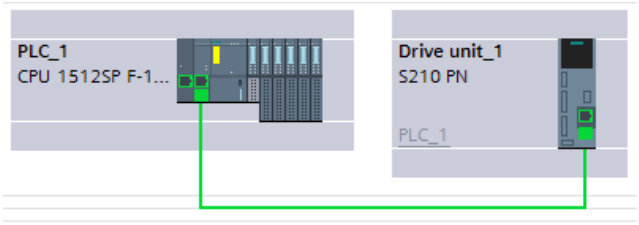
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PROFINET Network

The Competitor shall configure the **PROFINET network** according to the configuration shown in the figure below.

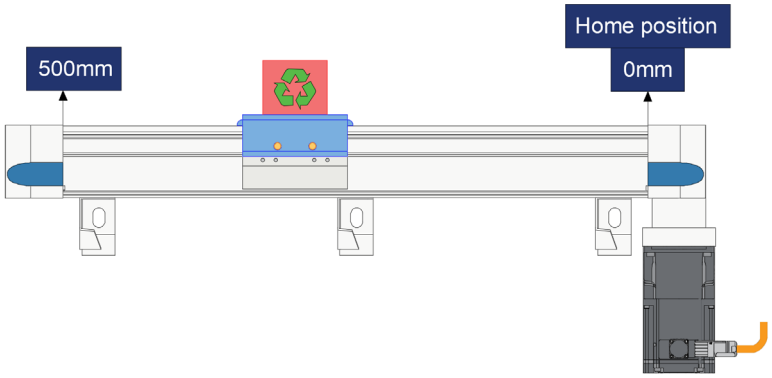


Mandatory topology for the use of **Telegram 750 (Send Torque / Receive Torque)**.

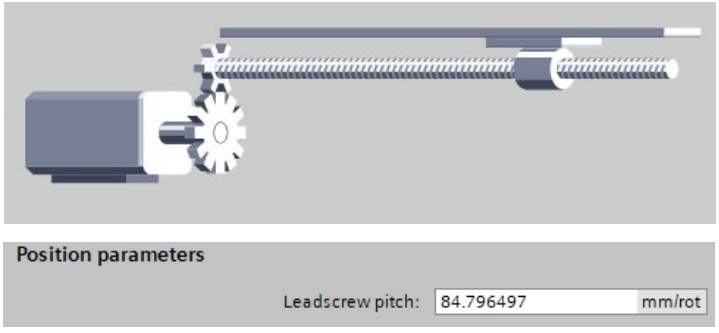


Servo Driver Configuration

Festo Axis Setup – Position:



Position Parameters for the Servo Driver

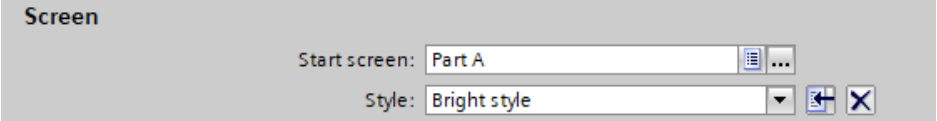


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HMI Configuration

The **HMI Runtime** must start automatically with no waiting time:
HMI Screen → Home → Runtime Properties → Automatic Runtime Start → **Waiting Time (s) = 0**

Screens Settings:



HMI and PLC Variables

TAG	LOCATION	TYPE	ADDRRES
S4	PLC/HMI Variable	Bool	%I50.0
P3	PLC/HMI Variable	Bool	%Q43.0
S3_R	PLC/HMI Variable	Bool	%I151.1
S3_L	PLC/HMI Variable	Bool	%I151.0
P2	PLC/HMI Variable	Bool	%Q44.0
S2	PLC/HMI Variable	Bool	%I52.0
E-stop	PLC/HMI Variable	Bool	%I0.0
QF1	PLC/HMI Variable	Bool	%I0.3
Status_Out	PLC/HMI Variable	Bool	%I0.1
LSitop_PseDiag_DB_channelState	PLC/HMI Variable	Byte	LSitop_PseDiag_DB
LSitop_PseDiag_DB_statChannelActive1	PLC/HMI Variable	Bool	LSitop_PseDiag_DB
LSitop_PseDiag_DB_statChannelActive2	PLC/HMI Variable	Bool	LSitop_PseDiag_DB
LSitop_PseDiag_DB_statChannelActive3	PLC/HMI Variable	Bool	LSitop_PseDiag_DB
LSitop_PseDiag_DB_statChannelActive4	PLC/HMI Variable	Bool	LSitop_PseDiag_DB
Enable_MTR103	PLC/HMI Variable	Bool	%M2.0
MTR103_forward	PLC/HMI Variable	Bool	%M2.1
MTR103_reverse	PLC/HMI Variable	Bool	%M2.2
XV208	PLC/HMI Variable	Bool	%Q45.6
XV207	PLC/HMI Variable	Bool	%Q45.4
XV206	PLC/HMI Variable	Bool	%Q1.0
XV205	PLC/HMI Variable	Bool	%Q1.1

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TAG	LOCATION	TYPE	ADDRRES
XV204	PLC/HMI Variable	Bool	%Q1.2
XV203	PLC/HMI Variable	Bool	%Q1.3
XV202	PLC/HMI Variable	Bool	%Q1.4
XV201	PLC/HMI Variable	Bool	%Q1.5
MTR102	PLC/HMI Variable	Bool	%Q38.0
MTR101	PLC/HMI Variable	Bool	%Q40.0
PS308	PLC/HMI Variable	Bool	%I13.0
PS307	PLC/HMI Variable	Bool	%I11.0
LS305	PLC/HMI Variable	Bool	%I153.2
LS304	PLC/HMI Variable	Bool	%I153.0
TT302_hmi	PLC/HMI Variable	Int	%MW4
TT301_hmi	PLC/HMI Variable	Int	%MW6
WT303_hmi	PLC/HMI Variable	Int	%MW8
MTR103_real_position	PLC/HMI Variable	Int	%MW10
MTR103_real_aceleration	PLC/HMI Variable	Int	%MW12
MTR103_real_torque	PLC/HMI Variable	Int	%MW14
MTR103_real_velocity	PLC/HMI Variable	Int	%MW16
HTR104_hmi	PLC/HMI Variable	Int	%MW18
LT306_hmi	PLC/HMI Variable	Int	%MW20
LT306	PLC Variable	Int	%IW14
TT302	PLC Variable	Int	%IW4
TT301	PLC Variable	Int	%IW2
WT303	PLC Variable	Int	%IW8
HTR104_pwm	PLC Variable	Int	%QW2
"PositioningAxis".ActualAcceleration	PLC Variable	LReal	-
"PositionAxis".ActualVelocity	PLC Variable	LReal	-
"PositionAxis".ActualAcceleration	PLC Variable	LReal	-
"PositionAxis".StatusTorqueData.ActualTorque	PLC Variable	LReal	-
PLC_Outputs_INT	HMI Variable	Int	-

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Part A Screen



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Details Part A – Size and Rectangles



ITEM	NAME	DIMENSION
-	Part A	Start Screen Background - color = 255, 255, 255 Size - height = 768 Size - width = 1366

ITEM	TAG / EXPRESSIONS	OPTIONS	ACTION	COMMENT
1	-	Rectangle	-	Background - color = 40, 45, 58
2	-	Rectangle	-	Background - color = 143,143,143 Background - color -> Transparency = 95% Border - width = 2 Corners = 10

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Details Part A – Texts



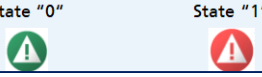
ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
1	-	Button	Events - Press	Graphic = Navigate & operate -> Button icons [PNG] -> White -> 36x30 -> Robot.png 'Font - Size = 19 Text - color = 255,255,255 OpenScreenInPopup Popup name = Popup_Part_B Screen name = Part B Header = Part B Left = 226 Top = 20
2	-	Graphic_view	-	Import from PC = recycling_1.svg
3	-	Text	-	Font - Size = 32 Foreground - color = 255,255,255
4	-	Text	-	Font - Size = 19 Foreground - color = 255,255,255
5	-	Text	-	Font - Size = 19 Foreground - color = 40, 45, 58

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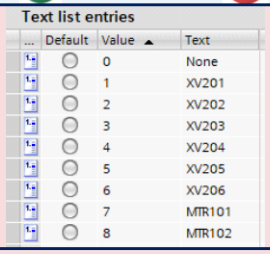
Details Part A – Variables



ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
1	S4	Circle	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 51, 102, 255 State "0" State "1"
2	P3	Circle	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 255, 85, 85 State "0" State "1"
		Button	Events - Press	InvertBitInTag
3	S3_L == true S3_R == true S3_L == false **AND** S3_R == false	Circle	Background - color	color = 255, 0, 255 color = 255, 102, 0 color = 200, 205, 215 S3_L == true S3_R == true S3_L == false AND S3_R == false

ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
4	P2	Circle segment	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 51, 153, 102 State "0" State "1" 
		Button	Events - Press	InvertBitInTag
5	S2	Circle segment	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 51, 153, 102 State "0" State "1" 
6	E-stop	Rectangle	Background - color	State "0" = color = 255, 255, 255 State "1" = color = 0, 255, 0 State "0" State "1" 
7	QF1	Rectangle	Background - color	State "0" = color = 255, 255, 255 State "1" = color = 0, 255, 0 State "0" State "1" 
8	Status_Out	Rectangle	Background - color	State "0" = color = 255, 255, 255 State "1" = color = 0, 255, 0 State "0" State "1" 
9	LSitop_PseDiag_DB_channelState > 0	Line	Lines - color	State "false" = color = 0, 255, 0 State "true" = color = 255, 0, 0 State "false" State "true" 
10	LSitop_PseDiag_DB_channelState	IO field	Process value	Range 0000 0000 to 1111 1111 Mode: Output Output format: {B8}
11	LSitop_PseDiag_DB_statChannelActive1 == 0	DynamicSVG: Diagnosis_Overlays -> InfoDangerDark	BasicColor	State "0" = color = 51, 153, 102 State "1" = color = 255, 85, 85 State "0" State "1" 
12	LSitop_PseDiag_DB_statChannelActive2 == 0	DynamicSVG: Diagnosis_Overlays -> InfoDangerDark	BasicColor	State "0" = color = 51, 153, 102 State "1" = color = 255, 85, 85 State "0" State "1" 
13	LSitop_PseDiag_DB_statChannelActive3 == 0	DynamicSVG: Diagnosis_Overlays -> InfoDangerDark	BasicColor	State "0" = color = 51, 153, 102 State "1" = color = 255, 85, 85 State "0" State "1" 

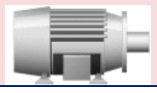
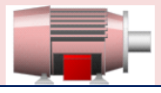
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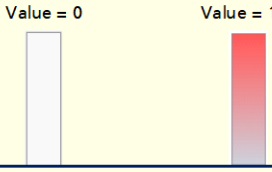
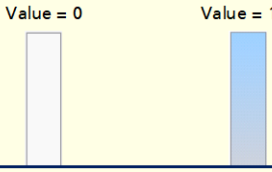
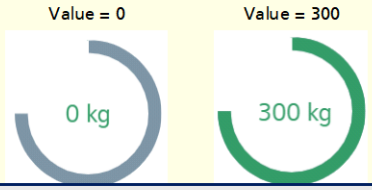
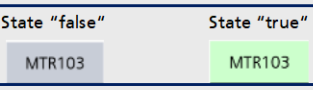
ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
14	LSitop_PseDiag_DB_statChannelActive4 == 0	DynamicSVG: Diagnosis_Overlays -> InfoDangerDark	BasicColor	State "0" = color = 51, 153, 102 State "1" = color = 255, 85, 85 State "0"  State "1" 
15	PLC_Outputs	Text list	-	
	PLC_Outputs_INT	Symbolic IO field	Process value	Resource list: PLC_Outputs Value = 0 -> None Value = 1 -> XV201 Value = 2 -> XV202 Value = 3 -> XV203 Value = 4 -> XV204 Value = 5 -> XV205 Value = 6 -> XV206 Value = 7 -> MTR101 Value = 8 -> MTR102

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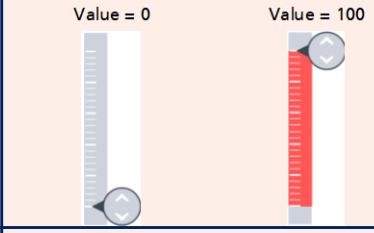
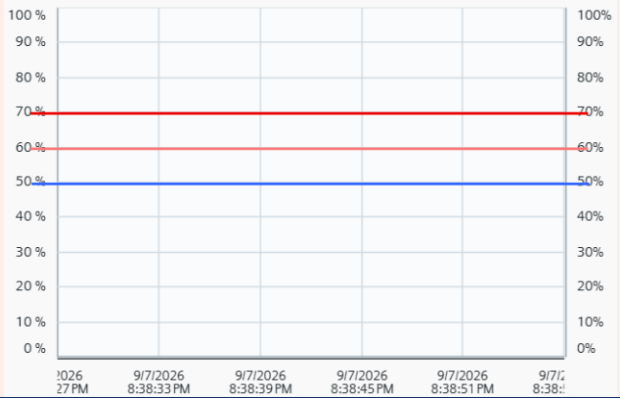
ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
16	XV201	Button Events	Events - Press	InvertBitInTag
	PLC_Outputs_INT == 1		Visibility	State "false" = not visible State "true" = visible State "false" State "true" ON/OFF
	XV202	Button Events	Events - Press	InvertBitInTag
	PLC_Outputs_INT == 2		Visibility	State "false" = not visible State "true" = visible State "false" State "true" ON/OFF
	XV203	Button Events	Events - Press	InvertBitInTag
	PLC_Outputs_INT == 3		Visibility	State "false" = not visible State "true" = visible State "false" State "true" ON/OFF
	XV204	Button Events	Events - Press	InvertBitInTag
	PLC_Outputs_INT == 4		Visibility	State "false" = not visible State "true" = visible State "false" State "true" ON/OFF
	XV205	Button Events	Events - Press	InvertBitInTag
	PLC_Outputs_INT == 5		Visibility	State "false" = not visible State "true" = visible State "false" State "true" ON/OFF
	XV206	Button Events	Events - Press	InvertBitInTag
	PLC_Outputs_INT == 6		Visibility	State "false" = not visible State "true" = visible State "false" State "true" ON/OFF
	MTR101	Button Events	Events - Press	InvertBitInTag
	PLC_Outputs_INT == 7		Visibility	State "false" = not visible State "true" = visible State "false" State "true" ON/OFF
	MTR102	Button Events	Events - Press	InvertBitInTag
	PLC_Outputs_INT == 8		Visibility	State "false" = not visible State "true" = visible State "false" State "true" ON/OFF

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ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
17	PLC_Outputs_INT	DynamicSVG: Valves ->SafetyShutoffValve	Visibility	Value = 0 not visible Value = 1 visible Value = 2 visible Value = 3 visible Value = 4 visible Value = 5 visible Value = 6 visible Value = 7 not visible Value = 8 not visible State "false" State "true"  OR 
	(PLC_Outputs_INT == 1 **AND** XV201 == 1) **OR** (PLC_Outputs_INT == 2 **AND** XV202 == 1) **OR** (PLC_Outputs_INT == 3 **AND** XV203 == 1) **OR** (PLC_Outputs_INT == 4 **AND** XV204 == 1) **OR** (PLC_Outputs_INT == 5 **AND** XV205 == 1) **OR** (PLC_Outputs_INT == 6 **AND** XV206 == 1)	DynamicSVG: Valves ->SafetyShutoffValve	BasicColor ContrastColor	State "false" = BasicColor = 238, 238, 238 ContrastColor = 205, 205, 205 State "true" = BasicColor = 255, 187, 187 ContrastColor = 255, 0, 0 State "false" State "true"  
	PLC_Outputs_INT	DynamicSVG: Motors -> Motor3	Visibility	Value = 0 not visible Value = 1 not visible Value = 2 not visible Value = 3 not visible Value = 4 not visible Value = 5 not visible Value = 6 not visible Value = 7 visible Value = 8 visible State "false" State "true"  OR 
	(PLC_Outputs_INT == 7 **AND** MTR101 == 1) **OR** (PLC_Outputs_INT == 8 **AND** MTR102 == 1)	DynamicSVG: Motors -> Motor3	BasicColor ContrastColor	State "false" = BasicColor = 238, 238, 238 ContrastColor = 205, 205, 205 'State "true" = color = 255, 187, 187 color = 255, 0, 0 State "false" State "true"  

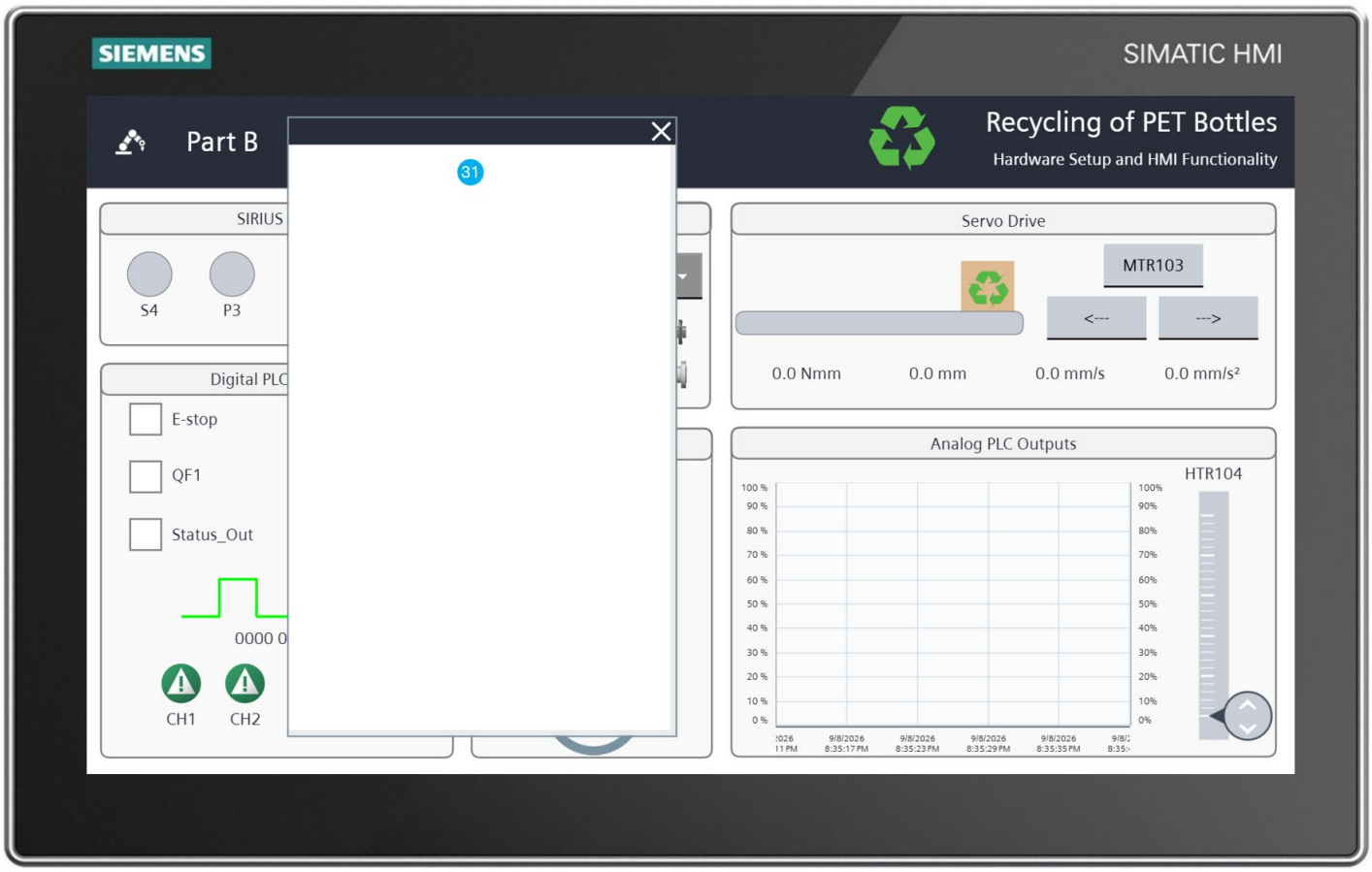
ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
18	TT301_hmi	Rectangle	Fill Level	Range 0 to 100 Background - alternative color = 255,85,85 Background - color = 200,205,215 Fill direction = Top to bottom 
19	TT302_hmi	Rectangle	Fill Level	Range 0 to 100 Background - alternative color = 153,204,255 Background - color = 200,205,215 Fill direction = Top to bottom 
20	WT303_hmi	Gauge	Process value	Range 0 to 300 Output format: {I} kg Font - Size = 19 Angle - range = 270 Angle - start = 270 Normal range - color = 51, 153, 102 
21	Enable_MTR103	Button Events	Events - Press	InvertBitInTag
		Button Events	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 204, 255, 204 
22	MTR103_forward	Button Events	Events - Press/Release	Set/Reset BitInTag
23	MTR103_reverse	Button Events	Events - Press/Release	Set/Reset BitInTag
24	MTR103_real_position	Movement	Linear movement	Range 0 to 500 Import from PC = recycling_1.svg Background - color = 223, 186, 145 Background - fill pattern: Solid *Start position left: 988* *Target position - left: 734* 

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ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
25	**ABS** (MTR103_real_torque)	IO field	Process value	Range 0 to 50 Mode: Output Output format: {I} Nmm
26	MTR103_real_position	IO field	Process value	Range 0 to 500 Mode: Output Output format: {I} mm
27	**ABS** (MTR103_real_velocity)	IO field	Process value	Range 0 to 50 Mode: Output Output format: {I} mm/s
28	**ABS** (MTR103_real_aceleration)	IO field	Process value	Range 0 to 25 Mode: Output Output format: {I} mm/s²
29	HTR104_hmi	Slider	Process value	Range 0 to 100 Output format: {I} Normal range - color = 255, 102, 102 Scale - foreground color = 200,205,215 
30	HTR104_hmi TT301_hmi TT302_hmi	Trend Control	[0] Trend- Y: HTR104_pwm [1] Trend- Y: TT301 [2] Trend- Y: TT302	[0] Trend- Y Line Color = 238, 0, 0 [1] Trend- Y Line Color = 255, 119, 119 [2] Trend- Y Line Color = 51, 102, 255 Trend: Line - width = 3 Trend: Line - type = Solid Miscellaneous: Online = TRUE Aparence styte = SimplifiedTrendControl Background - color = 100% Transparency Value axis: Output format = {I} % Value axis: Scale value = 0 to 100 Time axis: Show current = TRUE Time axes: Time range = Time Interval 30s Time axes: Scaling automatic = TRUE TIme axes : Automatically adapt = FALSE 

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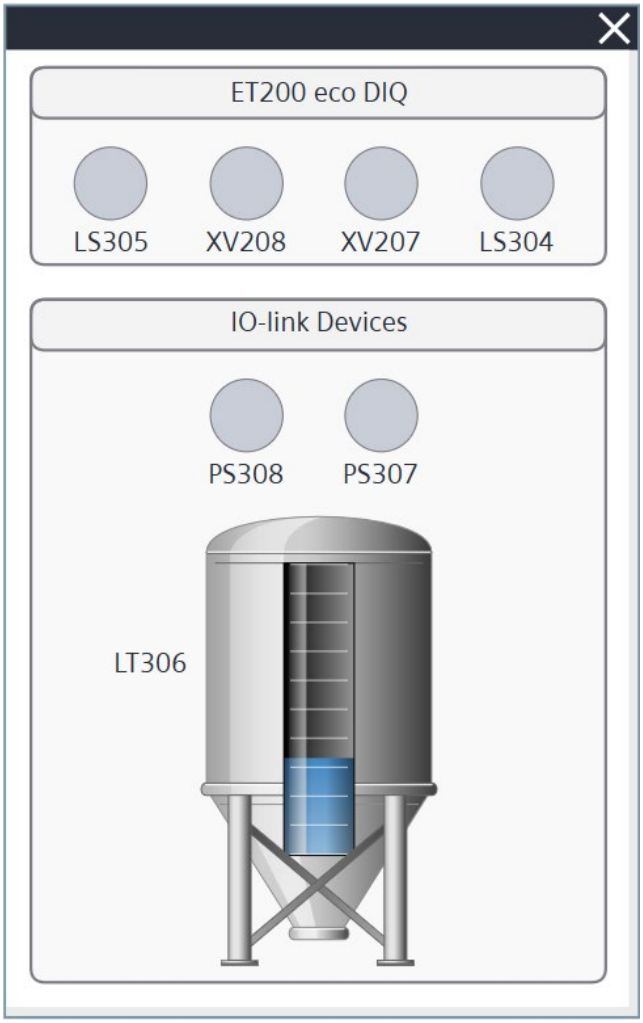
Details Part A – Screen Window



ITEM	NAME	OPTIONS	ACTIONS	COMMENT
31	Popup_Part_B	Screen window	-	Screen = Part B Size - height = 660 Size - width = 430

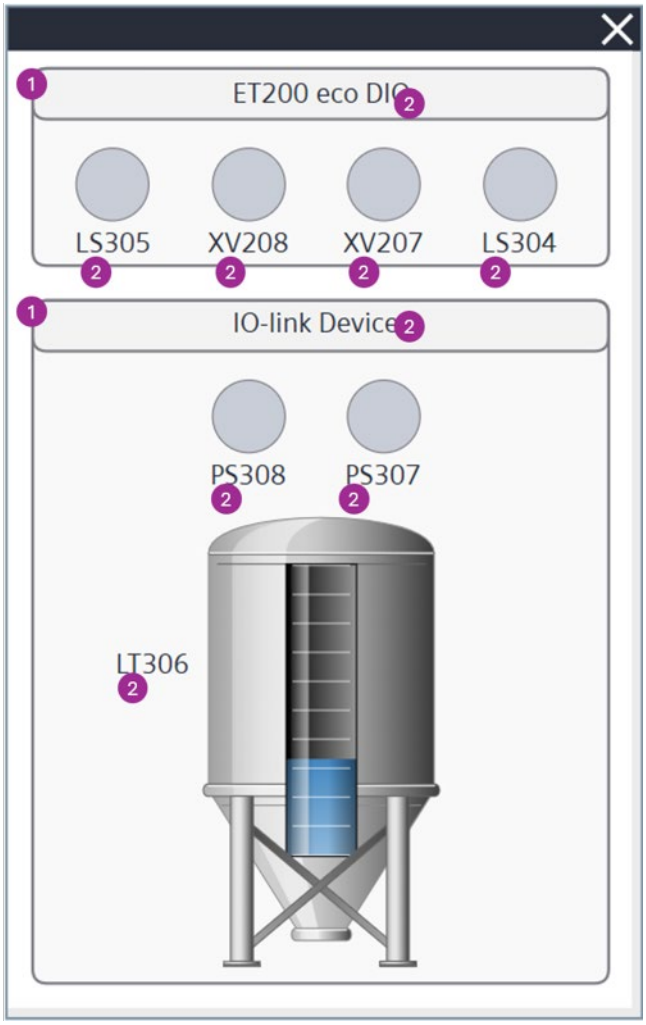
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Part B Screen



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Details Part B – Size, Rectangles and Texts

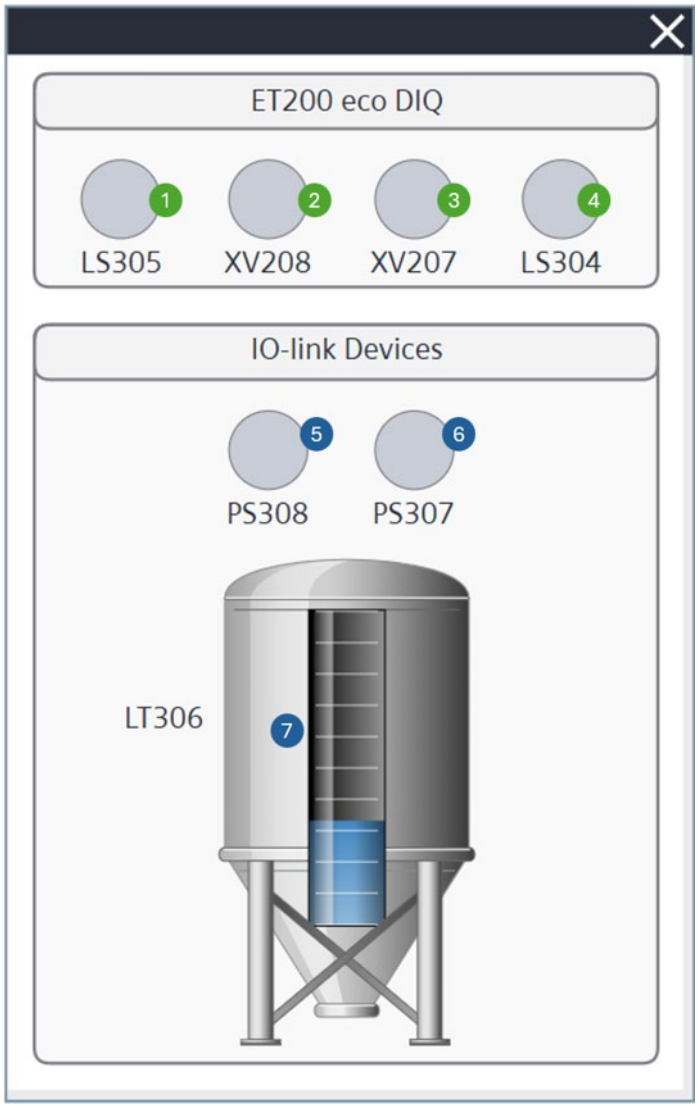


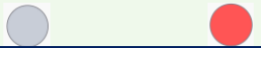
ITEM	NAME	DIMENSION
-	Part B	Background - color = 255, 255, 255 Size - height = 660 Size - width = 430

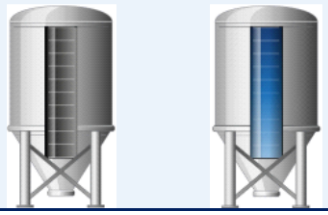
ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
1	-	Rectangle	-	Background - color = 143,143,143 Background - color -> Transparency = 95% Border - width = 2 Corners = 10
2	-	Text	-	Font - Size = 19 Foreground - color = 40, 45, 58

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Details Part B – Variables



ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
1	LS305	Circle	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 255, 85, 85 State "0" State "1" 
2	XV208	Button	Events - Press	InvertBitInTag
		Circle	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 255, 85, 85 State "0" State "1" 

ITEM	TAG / EXPRESSIONS	OPTIONS	ACTIONS	COMMENT
3	XV207	Button	Events - Press	InvertBitInTag
		Circle	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 255, 85, 85 State "0" State "1" 
4	LS304	Circle	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 255, 85, 85 State "0" State "1" 
5	PS307	Circle	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 255, 85, 85 State "0" State "1" 
6	PS308	Circle	Background - color	State "0" = color = 200, 205, 215 State "1" = color = 255, 85, 85 State "0" State "1" 
7	LT306_hmi	DynamicSVG: Water_Wastewater -> WaterTank2	FillLevelValue	Range 0 to 100 FillLevelColorBottom = 142,184,219 FillLevelColorMiddle = 29,111,181 FillLevelColorTop = 25,63,119 Value = 0 Value = 100 

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