How to Configure WinCC with MGate 5105

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1 Application Description

This application describes how to set up a **WinCC** system to control and monitor **Allen-Bradley PLC** tags which are transmitted from **MGate 5105** in an HVAC application project.

This document includes the following information about WinCC:

- User interface to display and operate the processes on controllable devices.
- Tags to transfer data between devices during installation and operation.

For more information about Allen-Bradley PLC communication using MGate 5105, refer to the documents *Configuring Allen-Brandly ControlLogix PLC with Moxa MGate 5105-MB-EIP* and *How to Configure Pro-face HMI with Allen-Bradley PLC.*

2 System Topology

The following figure shows a system topology where Modbus end devices, **PowerFlex 4M** (Converter) and IAQPoint2 (Meter), are connected to the serial ports on MGate 5105-MB-EIP through RS-485-2W wiring. MGate 5105-MB-EIP and PC (with RSLogix 5000 and WinCC installed) are connected to switch ports on Allen-Bradley ControlLogix PLC via Ethernet cables. A fan is connected to PowerFlex 4M that outputs electric current to power the fan.



3 Hardware and Software Requirements

• Allen-Bradley ControlLogix PLC:

- Processor: 1756 L71 ControlLogix5571
- Chassis: 1756-A7
- **EIP Module:** 1756-EN2TR

• PowerFlex 4M:

PowerFlex 4M is an adjustable frequency AC drive (converter).

• IAQPoint2:

IAQPoint2 is an indoor air quality monitor. It can detect CO2, temperature and humidity levels.

• WinCC

A SCADA system developed by Siemens AG. Rev.: V7.2.

• RS Logix 5000:

Allen-Bradley ControlLogix PLC Edit Program from Rockwell Automation. Rev.: V20

4 About WinCC

WinCC allows you to **visualize the process and configure a graphic user interface**. You can use the user interface to operate and observe the process.

WinCC allows you to:

- **Observe** the process. The process is displayed graphically on a screen. The **display** is updated each time a process status changes.
- **Operate** the process. For example, you can configure a setpoint or open a valve using the user interface.
- **Monitor** the process. An alarm automatically signals in the event of a critical process status. If, for example, a predefined value is exceeded, a message will appear on the screen.

WinCC Components

The major components of WinCC are the **Configuration Software (CS)** and **Runtime Software (RT)**.

The core of the Configuration software is **WinCC Explorer** that displays the entire project structure.

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The following table lists the major systems in WinCC.

Process unit	Editor	Function
Graphics System	Graphics Designer	Configuring Screens
Signaling system	Alarm Logging	Configuring messages
Archiving system	Tag Logging	Archiving data
Report system	Report Designer	Create layouts
User Administration	User Administrator	Administering users and user rights
Communication	Tag management	Configure communication

When you execute a project in process mode in **WinCC Runtime**, the project will then be in Runtime. WinCC Runtime allows you to operate and observe the processes.

WinCC Runtime performs the following tasks:

- Read configuration data that has been saved in the CS database.
- Display graphical user interface on the monitor.
- Communicates with the automation systems.
- Archive current Runtime data, such as process values and message events.
- Control processes, for example, through setpoint settings or ON/OFF switch.



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5 WinCC Configuration

5.1 Creating a Project

1. Start the WinCC Explorer Program by clicking Start → Program → Siemens Automation → SIMATIC → WinCC → WinCC Explorer.

🔋 Siemens Automation
🔛 Automation License Manager
🔛 Security Controller
Documentation
J SIMATIC
Documentation
퉬 Information
퉬 PH-Ready
퉬 WinCC
Autostart
\land WinCC Explorer
👔 WinCC Information System
🌗 Tools

- 2. In WinCC Explorer, create a new project. Click **File** \rightarrow **New** or click the **New** icon.
- 3. In the WinCC Explorer dialog box, select **Single-user project** and click **OK**. A Single-user project runs on only **one computer**. Other computers cannot access this project. The project runs on the computer that serves as the server for data processing and as an operating station.



4. In the **Create New Project** dialog box, enter a name in the **Project Name** field and click **Create**.

Create New Project		? <mark>x</mark>
Project name:		
MGate5105		
Project path:		
C:\Users\Public\Doc	cuments\Siemens\WinCCProjects	
New subfolder:		
MGate5105		
	Help Create	<u>C</u> ancel

5.2 Configuring Communication Settings

This section contains information on configuring the communication between WinCC and an automation system.



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5.2.1 About Communication

Use the **WinCC Configuration Studio** editor to configure communication settings.

The following lists the minimum components required to configure communication settings in the system:

- One channel with channel units
- One connection
- One or more process **tags**

Channels

Channels are specialized **communication drivers**. Channels enable the transmission of process values from the automation system to the process tags. WinCC provides a variety of channels to connect different automation systems.

In WinCC, you can use channels, via which values are transferred to the automation system from WinCC. You can also control processes via these channels.

Channel Units

Channels have different channel units for the different communication networks. A channel unit is used to access a specific type of automation system. A channel unit serves as an interface with exactly one underlying hardware driver and therefore to exactly one communication processor in the computer.

Connections

In channel units, you configure connections to the various automation systems. Each connection describes the interface to a single, defined automation system. The data exchange takes place via the connections in Runtime.



Tags in WinCC

A tag in WinCC represents either a real value or internal value. Internal values are calculated or simulated within WinCC.

Process Tags

External tags serve as connection links for the exchange of data between WinCC and the automation systems. Each external tag in WinCC corresponds to a certain process value in the memory of one of the connected automation systems. **External tags** are therefore referred to as process tags.

Internal tags

WinCC also contains internal tags. These tags are not linked to a process and only transfer values within WinCC.

5.2.2 Adding a Channel

1. In WinCC Explorer, right-click **Tag Management** and select **Open**. The **WinCC Configuration Studio** screen appears.



 Click Tag Management → Add new driver → Allen Bradley – Ethernet IP to add a new channel.

MinCC Configuration Studio	en lange die Augen Maarin 1	1
File Edit View Help		
Tag Management	« 📗 Tag Management	
🕞 🛄 Tag Manag	Nie ee e	
Add new driver	Allen Bradley - Ethernet IP	
Scr. Import	Mitsubishi Ethernet	
a TagLoggingRt	Modbus TCPIP	
Structure tags	OPC	
	Profibus DP	
	Profibus FMS	
	SIMATIC 505 TCPIP	

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The WinCC Configuration Studio screen displays the **Allen Bradley – Ethernet IP** channel that you have added. The Allen Bradley – E/IP ControlLogix channel provides several channel units for different communication networks.

Use the **Allen Bradley – E/IP ControlLogix** channel for the application described in the document.



5.2.3 Creating a Connection

 Right-click Allen Bradley – E/IP ControlLogix and select New Connection to create a new connection.



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- 2. Enter "ab1756" as the connection name. MinCC Configuration Studio File Edit View Help **i** ab1756 Tag Management ~ 🖃 🛄 Tag Management Name 🖶 🍄 Internal tags 1 2 ---- 😤 Script 3 🛯 🗧 TagLoggingRt 4 🗄 🖳 📙 Allen Bradley - Ethernet IP 5 Allen Bradley E/IP ControlLogix 6 ----**19** ab1756 7 Allen Bradley E/IP PLC5 8 Allen Bradley E/IP SLC50x
- 3. Right-click ab1756 and select Connection parameter.
- 4. In the **IP address** field, enter the IP address of the PLC. In the **Communication path** field, enter "1,0" for the CIP path from the Ethernet module to the controller.

Tag Management	~~	164	ab175	
□			Name	
🗄 🍄 Internal tags		1	byManu	
🖃 📙 Allen Bradley - Et	hernet IP	2	byModt	
- II Allen Bradley	E/IP ControlL	3	outSpe	
ia. ₩ ab1756		4	speedR	
— 🥞 Т. 🝍	New Group		ľ	
📔 Allen Bra 📭	Сору			
	Paste			
	Delete			
	Rename			
10	Connection pa	ramel		
	Gernreenerrpu		C12	
	our needer po	Gine	ici s	
Allen Bradley E/IP Conn	ection Param	eter	rs	x
Allen Bradley E/IP Conne	ection Param	eter	5	x
Allen Bradley E/IP Conn	ection Param 192 . 168	eter	2 . 231	x
Allen Bradley E/IP Conne IP address: Communication path:	ection Param 192 . 168	eter	2 . 231	x
Allen Bradley E/IP Connormality IP address:	ection Param 192 . 168 1,0	eter	2 . 231	x
Allen Bradley E/IP Conne IP address: Communication path:	ection Param 192 . 168 1,0	. 3	2 . 231	x
Allen Bradley E/IP Conno IP address: Communication path:	ection Param 192 . 168 1,0	. 3	2 . 231	x
Allen Bradley E/IP Conn IP address: Communication path:	ection Param 192 . 168 1,0	. 3	2 . 231	x

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5.2.4 Creating Tags

 Right-click **ab1756** and select **New Group** to create a new tag group named "NewGroup1".



2. For the **NewGroup1** tag group, add the tags as indicated in the following figure.

🚈 WinCC Configuration Studio	-	the Sugar Sta	and the second			ĺ
File Edit View Help						
Tag Management «	8	NewGroup_1				
🖃 📶 Tag Management		Name	Data Type	Length	Format adaptation	
🖶 🍄 Internal tags	1	byManual	Binary Tag	1		
Script	2	byModbus	Binary Tag	1		
	3	outSpeedReal	Floating-point number 32-bit IEEE 754	4	FloatToFloat	
🖃 📙 Allen Bradley - Ethernet IP	4	speedReal	Floating-point number 32-bit IEEE 754	4	FloatToFloat	
Allen Bradley E/IP ControlLogix	5	temperatureReal	Floating-point number 32-bit IEEE 754	4	FloatToFloat	
	6					
NewGroup 1	7					
Allen Bradley E/IP PL C5	8					
	0					

6 Configuring Process Screens

6.1 About Process Screens

The process screens are the main elements of a project. They represent a process and allow you to operate and observe this process.

You can use the **Graphics Designer** editor to configure the process screens. This editor is the configuration component of the graphic system in WinCC.

A process screen consists of the following objects:

- Statistic objects: These objects remain unchanged during runtime.
- Dynamic objects: These objects will change depending on the individual process values.
- Controllable objects: These objects allow you to control the process. For example, you can use the buttons, sliders, or I/O fields to set process parameters (input/output field).

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6.2 About the Graphics System

The Graphics System is part of WinCC. You can use the Graphics System to configure process screens.

The Graphics System performs the following tasks:

- Display static and operator-controllable objects, such as texts, graphics, or buttons.
- Update dynamic objects. For example, modifies the length of a bar graph in relation to a process value.
- Respond to operator input. For example, the clicking of a button, or the entry of a text in an input field.



6.3 Creating Process Screens

1. In WinCC Explorer, right-click **Graphics Designer** and select **New picture** to create a new process picture.



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2. Rename the new process picture to "START".

WinCC Explorer - C:\Users\Public\Documents\Siemens\WinCCProjects\MGate5105\MGate5105.M File Edit View Tools Help MGate5105 MGate5105 MGate5105 Mame A Graphics Designer Menus and toolbars Alarm Logging

3. Click the **START** process screen to edit.

The following figure shows the settings after the configuration. Refer to the subsequent sections for information on how to add graphic objects in the work space of a process.



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6.3.1 Library Elements

From **Library** \rightarrow **Global Library**, you can get the meter and motor graphic objects as shown in the following figures.

• Meter

· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	Operation Otatus
Temperature (C)	Cooling Fan (Mhz.)	Operation Status
		Start Stop Running
	• • • • • • • • • • • • • • • • • • •	
	:::. 	Manual Control Status
	27	On Off Manual
Library		
📸 X 🖻 🖻 🗙 🔚 🔚 🔠 🗰	i 📐	
🤤 Global Library		
Displays	- <u>.</u>	
Meters	Meter1_0-100	Meter1_Min Meter2_Min
Scaling		
Tags Library Cynamic Wiza	rd	

• Motor



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6.3.2 Standard Objects

In the **Standard** object window, you can get the Button, Static Text, and I/O Fields graphic objects.

• Button (under Windows Objects)



• Static Text (under Standard Objects)





I/O Field (under Smart Objects)

6.4 Adding Links

1. Right-click the temperature **IO Field** and click **Linking** \rightarrow **Tag Connections**.



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 In the Linking of the Tag Connection dialog box, click the ... icon to select the temperatureReal tag.



3. Add other links as shown in the following figure.

HVAC System	
Cooling Fan (Mhz.) Operation Status 0 - by	Modbus
Start Stop Running	Manual
Manual Control Status Modify Speed	
On Off Manual 0.0	
0.0 - speedReal outSpeedRe	al

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6.5 Adding Scripts

- 1. Click Start and select Mouse.
- 2. Right-click Mouse Click and select VBS-Action to add a script for the event.



The script program appears as shown in the following figure. The script sets the value of the **byModbus** tag to "1" when the **Start** button is clicked.



The following sections describe the scripts for other events.

Stop Button

The script sets the value of the **byModbus** tag to "0" when the **Stop** button is clicked.



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byModbus I/O Field

The script sets the value of the **txtOperate** static text to "Running" or "Stop" based on the value of the byModbus I/O field.



byManual I/O Field

The script sets the value of the **txtManual** static text to "Manual" or "Program" based on the value of the byManual I/O field.



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Because the **byModbus** and **byManual** I/O fields are used as script reference, it is not necessary to display them on the screen. Thus, you can set their **Display** property to **No**.



6.6 Adding Trend Curves

1. From the **Controls** window, select and drag the **WinCC OnlineTrendControl** option to the WinCC OnlineTrend Control screen as shown in the following figure.



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Toolbar		Status Bar	Online Configuration Expo	t
Trends	General	Font	Trend Window Time Axes Value	Axes
Trends:			Object name:	
V Temp	erature		Temperature	
Speed	а 🔪		Trend window:	
	\sim		Trend window 1	-
	```		Time axis:	
		$\mathbf{N}$	Time axis 1	-
			Value axis:	
			Value axis 1	-
			Label:	_
New	Remove	Up	own N	
Data Cor	nnection			
	ine teres		- temperatureReal	3
2-0n	ine tags			
Effects				
Trend t	ype:		Trend color:	
1 - Cor	nnect dots line	arly	💌 🔤 Filled	
Line sty	/le:		Line weight:	_
0 - Soli	id		• 1	
Dot typ	e:		Dot width:	
2 - Squ	Jares		• 3	
Dot col	or:	Fill color:		
			Extended Limit values	J
				- 1 -
			UK Cancel Ap	piy

2. Add the **temperatureReal** and **speedReal** trend curve tags.

## **7** Defining Runtime Properties

- 1. In WinCC Explorer, open the Computer Properties dialog box.
- 2. Click the **Startup** tab and select the **Graphics Runtime** check box.



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 Set the START.pdl process picture as the startup screen. Click the Graphics Runtime tab and click the ... button to select the START.pdl process picture in the Start Picture field; then, click OK to finish.

Computer properties	X
General Startup Parameters Graphics F	Runtime Runtime
Project File:	
\\WIN-GU7H52R3J6S\WinCC_Project_M	IGate5105\MGate5105.mcp
Start Picture:	Start Configuration Menu and Toolbars:
Window Attributes:	Tum Off:
Tala	
Pictures:	2 ×
□□□   b- b-b- □□□	
Hierarchy:	
····· 😤 WIN-GU7H52R3J6S File N	ame
	Y
-∳r <mark>ST</mark>	ART.Pdl
	OK Cancel Help
Up: None	Navigation backward: INone

## 8 Runtime Test

In WinCC Explorer, click the **Activate** button to start **WinCC Runtime**.



The system starts Graphics Runtime and the **START.pdl** process picture is displayed as the startup screen.

WinCC polls the tags of **Allen-Bradley ControlLogix PLC** and displays the updated values on the screen. For example, WinCC displays the current temperature and speed values.

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To start or stop the PowerFlex 4M converter, click the **Start** or **Stop** button.

If you use a hairdryer to increase the meter temperature, the converter will increase its output speed. In WinCC, the **Speed/Temperature Trend Chard** area will also show the trend of the temperature and speed change.

If you click the **Manual On** button to enable manual control speed, you can change the **Modify Speed** value.

	HVAC	System
Temperature (C)	Cooling Fan (Mhz.)	Operation Status
		Start Stop Running
	Powerfly	
		Manual Control Status Modify Speed
	20	0n 0ff Manual 40.5
23.6	40.5	
23.6	40.5	 
23.6	40.5	[ <u></u>
23.6		S S S S S S S S S S S S S S S S S S S
23.6   Wincc OnlineTrendControl   Image: State Sta		
23.6 WinCC OnlineTrendControl	40.5	<u></u>
23.6 WincC OnlineTrendControl	40.5	23
23.6	40.5	23
23.6 WinCC OnlineTrendControl	40.5	1 10:24-12 PM 10:24-18 PM 10:24-24 PM 10:24-26 PM 10:2