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SIMATIC HMI

WinCC/PerformanceMonitor V7.2
WinCC/PerformanceMonitor - Getting Started

Getting Started
Legal information

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**WARNING**

indicates that death or severe personal injury may result if proper precautions are not taken.

**CAUTION**

indicates that minor personal injury can result if proper precautions are not taken.

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1.1 Purpose of this Getting Started

Purpose of this Getting Started

Welcome to the "WinCC/PerformanceMonitor Getting Started". We use a simple sample project to show you how to configure in PerformanceMonitor and how PerformanceMonitor works in WinCC Runtime.

For this purpose you learn the following configuration steps in this Getting Started:

- Mastering KPI in five steps
  In this section you learn the main configuration sequence.
- Working with PerformanceMonitor
  In this section you learn the additional features of PerformanceMonitor.
  You test the result of this configuration in WinCC Runtime.

Sample projects

Two sample projects have been prepared for this Getting Started:

- "GettingStartedPerformanceMonitorV72_start"
  If you want to perform the configuration steps shown in this Getting Started, use the project "GettingStartedPerformanceMonitorV72_start". Pictures and WinCC tags are already configured in this project. By completing all the steps of this Getting Started you obtain a complete project.

- "GettingStartedPerformanceMonitorV72_complete"
  If you only want to view the configuration steps and results shown in this Getting Started, use the project "GettingStartedPerformanceMonitorV72_complete". This project contains the complete, executable project in which all of the configuration steps shown in the Getting Started have already been completed.

For whom is this Getting Started intended?

This Getting Started is intended for experienced WinCC users who want to get to know the new "PerformanceMonitor" option. The Getting Started supplements the documentation on PerformanceMonitor with actual configuration examples.

If you still have to install the "PerformanceMonitor" option, execute the steps shown in the Getting Started for a "user-defined installation". Select the following components:

- "Editor and Service"
- "Controls"

Additional information on this subject is available on the Internet.
1.2 Why WinCC PerformanceMonitor?

Definition

The WinCC/PerformanceMonitor is used to calculate and analyze plant-specific indicators for individual assemblies, machines or entire production lines in machine- or line-oriented production plants, such as:

- OEE (Overall Equipment Efficiency) - Overall efficiency
- MTBF (Mean Time Between Failures) - Frequency of disturbances
- MRT (Mean Repair Time) - Maintenance time

WinCC/PerformanceMonitor shows you weak points in your production processes and suggests ways to optimize them.

Application

Using PerformanceMonitor supports the requirements of management and quality assurance, service and maintenance, as well as line management and the operation of the plant.

PerformanceMonitor offers the following benefits, among others, for management and quality assurance:

- Complete transparency for all machines as basis for optimizing plant productivity
- Recording of downtimes, localizing causes and reasons for downtimes, and monitoring of equipment efficiency
- Recognition of production correlations by combining associated values with indicators such as material used

PerformanceMonitor offers the following benefits, among others, for service and maintenance:

- Addition of more plant indicators from existing process data during operation
- Weak-point analysis in production processes and recording of undesirable process activities
- Identification of the events that result in cost-intensive failures

PerformanceMonitor offers the following benefits, among others, for line management and plant operation:

- Continuous information at the operator station thanks to integration in the WinCC user interface
- Quick detection of weaknesses in the process using cyclic calculation of key indicators

By the way: Developers do not have to adapt existing control programs. Operators as well as project engineers can quickly grasp the configuration environment, which is based on existing WinCC tools.
1.3 Sample projects

Scope of delivery

To perform the steps shown in this Getting Started yourself, use the sample project "GettingStartedPerformanceMonitorV72_start". The following configuration data is already contained in this sample project:

- Complete picture navigation including Runtime controls and dynamic picture objects
- WinCC tags
- Complete PerformanceMonitor configuration for four plant units including calculation of KPIs

Note

"SIEMENS" is entered as computer name for the local server in the sample project. After you have changed the PC name, reboot the PC.
In this figure you simulate the calculation of the key indicators for four pre-configured plant units in the sample project. In addition, an operator panel, in which you specify simulation values, has been prepared in advance for the KPIs / operands to be created during this Getting Started.

The figure below shows the functions of the individual operator panels and which objects are used in the operator panels in the PerformanceMonitor Configuration Studio:

1. Operator panel for the following actions (from right to left):
   - Logging on users. User name and password are displayed in the tooltip.
   - Toggle between English and German.
   - Exiting Runtime

2. Operating elements for simulation of KPI calculations and context information for four plant components.
   The plant components are completely configured in the PerformanceMonitor Configuration Studio and interconnected with WinCC tags.
   - "On/Off" button: Activates/deactivates simulation of the plant components.
   - "Manual/Auto" button: Activates/deactivates the name generation for the "Supplier" context information.
Welcome
1.3 Sample projects

③ Operator panel for the simulation of all plant components from ②:
• “On/Off” button: Activates/deactivates the simulation of all plant components
• “Random” button: Toggles the plant components on or off randomly.
• “Stop” button: Activates/deactivates the simulation of “Supplier” context information.

④ Operator panel for specifying values for the plant components of the Getting Started. In this Getting Started you add two additional plant components in the PerformanceMonitor Configuration Studio. This button is used to open the specific Runtime control for displaying the simulation values entered in the operator panel.
Note: In order to update the display in the Runtime controls, log on with the user “perfmon”.

⑤ Display of Runtime controls for evaluating the values simulated in ②. Each Runtime control is displayed in a separate picture window. Meaning of buttons (from left to right):
• Display of a WinCC PerformanceViewControl with two items of equipment and three KPIs each with two time ranges.
• Display of a WinCC PerformanceViewControl with two items of equipment and two KPIs and context information.
• Display of a WinCC PerformanceTableControl with two items of equipment and three operands.
• Display of a WinCC PerformanceGanttontrol with four items of equipment, two operands and two time ranges.

⑥ Change to the “CalculationCycle” picture.
Welcome

1.3 Sample projects

Fig. "CalculationCycle.pdl"

In this figure you learn how to write cyclically calculated KPIs in a WinCC tag.

For more information on this topic, refer to the PerformanceMonitor help under the keyword "Cyclic output".

The figure below shows the functions of the individual operator panels and which objects are used in the operator panels in the PerformanceMonitor Configuration Studio:

① In this operator panel the "Availability" KPI for the "StrawApplicator" equipment is calculated cyclically. The result is written and output in a WinCC tag depending on the calculation cycle. The calculation of the two KPIs below is triggered by a tag trigger. To do this, push the slider to the right.

② In this operator panel the "CycleTime" KPI for the "MultiShrink" equipment is calculated cyclically; the cycle time and interval are defined during runtime.

③ In WinCC OnlineTrendControl the values calculated for the "Availability" KPI are output cyclically from a log.

④ Change to the "Start" picture.
2.1 Overview

To make statements about the profitability of a plant, determine the Overall Equipment Efficiency (OEE), for example. The OEE is made up of various factors such as plant availability and quality rate. The PerformanceMonitor is used to define the KPIs for the calculation of the individual factors—independently of a specific plant.

\[
\text{Overall Equipment Efficiency (OEE)} = \text{Availability} \times \text{performance factor} \times \text{quality rate}
\]

In this section, we will show you how to configure the calculation of the availability factor using the PerformanceMonitor:

1. You create the "CanManufacturing" equipment, which represents your plant.
2. You define the operands, which determine the operating time and runtime of the plant.
3. You define the KPI, which calculates the availability from the two operands.
4. You assign the KPI to the equipment, thus creating an actual relationship between the two.
5. You then assign the WinCC tags to the two operands, which provide the plant state from the process.

To check if this has been successful, output the plant availability in "WinCC PerformanceViewControl".
2.2 Step 1: Creating equipment

Introduction

An equipment represents a plant or a plant unit. An equipment has one of two forms in the PerformanceMonitor Configuration Studio:

- Plant
- Group

You can assign one or more "Plant" equipment forms to the "Group" equipment form. In this way you can define, for example, simple production lines with one hierarchy level.

Procedure

1. Open the "PerformanceMonitor Configuration Studio" in the WinCC Explorer.

![Figure 2-1 02_KPI5Steps_00_StartEditor](image-url)
2. Create an equipment with the name "CanManufacturing".

Result

The equipment is created and assigned by default to the group "Not_Assigned". The colors for representation of the equipment in the Runtime controls are assigned automatically. You can change the colors if required.
2.3 Step 2: Creating operands

Introduction

You now define the operands, which represent the operating time and actual runtime of the plant. PerformanceMonitor provides the evaluation type "Time/Counter" to determine periods. This evaluation type is used to determine how long or how often a value has changed.

Procedure

1. Create the "DemoOperatingTime" operand that records the plant's operating time:
2. In the same way, create the "DemoLoadingTime" operand to record the actual runtime.

Result

You have defined the operands. Now create the KPI that calculates the plant's availability from the two operands.
2.4 Step 3: Creating KPI

Introduction

You need a KPI to calculate the availability. The KPI represents the indicator that is calculated on request for a time range. A request is, for example, the evaluation in a Runtime control. You define the calculation formula of the KPI from one or more operands and KPIs—independently of the equipment.

Procedure

1. Create the KPI "DemoAvailability" for calculating the plant availability:
2. Enter the formula for calculating the availability:

By typifying the operand with the expression ".Time", you evaluate the duration.

Result

The KPI definition is now complete. Assign the KPI to your plant "DemoEquipmentAvailability".
2.5 Step 4: Assigning KPI to the equipment

Introduction

To calculate the plant availability, assign the KPI to the equipment.

Procedure

1. Assign the KPI "DemoAvailability" to the equipment "CanManufacturing".

Result

The KPI is assigned to the plant together with the operands used in the calculation formula.
2.6 Step 5: Assigning parameters for operands

Introduction

For the PerformanceMonitor to calculate availability, it requires values from the process. To obtain these values, connect the two operands to the WinCC tag "RunningState". The plant states "turned on" and "turned off" are stored in this tag. The tag is already configured.

The plant availability is calculated from the period in which the plant was turned on and turned off. Therefore, when you assign the parameters for the operands, you also indicate which tag value is to be interpreted as "turned on" and which as "turned off".

Procedure

1. Assign the WinCC tag that supplies this state to the operand for the plant operating time:
2. Change the data type and use the "calculation type" to define the condition that will be recognized as edge change of a state:

3. Enter the value which is to be interpreted as "turned on":

![Image of WinCC/PerformanceMonitor Configuration Studio interface showing operand configuration and data entry fields.](image-url)
4. You use the same WinCC tag to determine the loading period but you evaluate the state "turned off":

Result

The configuration in PerformanceMonitor is complete. Save the configuration with <Ctrl+S>.
2.7 Result in WinCC PerformanceViewControl

Introduction

PerformanceMonitor provides various Runtime controls for the output of KPIs; you configure these controls in Graphics Designer. Plant availability is best displayed in WinCC PerformanceViewControl.

Selection of an equipment

In the configuration dialog of the "WinCC PerformanceViewControl" you select the equipment, the operand, and the time range to be used:

![Configuration dialog of WinCC PerformanceViewControl](image)
Display of calculation

The availability of the plant is represented based on the operands calculated in the KPI:

Double-clicking the KPI bar shows the operands from which the KPI is calculated ("drilldown"): 

Result

Congratulations!

The "DemoKPIAvailability" KPI has been completely configured and is prepared for output in WinCC Runtime. To find out more, go to the "Working with PerformanceMonitor (Page 25)" section to add to your already acquired configuration know-how.
Generating KPI in five steps

2.7 Result in WinCC PerformanceViewControl
3.1 Overview

In the “Generating KPI in five steps (Page 11)” section you have learned about configuring in the PerformanceMonitor Configuration Studio and about the most important objects in PerformanceMonitor.

In this section you will expand your already acquired know-how and learn about additional objects and configuration options. This section ends with a demonstration of the evaluation of KPIs in runtime.
3.2 Part 1: Configuring types

3.2.1 Introduction

PerformanceMonitor uses the type and instance concept. You create operands, operand formulas, structured operands, KPIs, and context information as types with unique names:

- You define the calculation formula for KPIs.
- You define the calculation formula and the evaluation type for operand formulas.
- You define the evaluation type for operands.
- You define the available entries for structured operands and context information.

The figure below shows the principle of the type-instance concept. The quality and rejection rate was calculated for each of the two plant units "Processing 1" and "Processing 2". Types are operands "TotalParts", "GoodParts" and "RejectedParts", which are already used as instances in the two KPI types "QualityRate" and "RejectionRate". The KPI types are used as instances on the two items of equipment.

Thanks to the type-instance concept you require only three operands, instead of the original five WinCC tags, to calculate the two KPIS in PerformanceMonitor.
3.2.2 Configuring structured operands

3.2.2.1 Introduction

Definition

"Structured operands" save a state including time stamp. The states are stored in a list in which a value or value range is assigned to each state.

Usage

Use a structured operand when you want to evaluate plant states based on a state model. You can, for example, import the OMAC state model in PerformanceMonitor.

Task

Create a list of states with two states and assign a structured operand to this state list. Create a new KPI with a formula which adds the number of state changes.
3.2.2.2 Creating equipment

Procedure

1. Create an equipment with the name "DemoEquipmentStructuredOperand":

![Equipment Configuration](image-url)
2. Assign the equipment to the group "GettingStarted" and specify colors for the display in Runtime Control:

Result

The equipment "DemoEquipmentStructuredOperand" has been created.
3.2.2.3 Creating the state list

Procedure

1. Create a list with the name "StructuredOperandListDemo" for structured operands:
2. Define the list entries "StateOFF" and "StateON" with their value ranges:

Result

The "StructuredOperandListDemo" list has been created.
3.2.2.4 Creating an operand

Procedure

1. Create a structured operand with the name "OperandDemoStructuredOperand" and select the "StructuredOperandListDemo" state list as evaluation type:

Result

The "OperandDemoStructuredOperand" operand has been created.
3.2.2.5 Creating KPI

Introduction

In the following section you define the "DemoKPIStructuredOperand" KPI, which adds the number of evaluated states of the structured operand.

Procedure

1. Create a KPI with the name "DemoKPIStructuredOperand".
2. Define a formula for the KPI.
3. Define the bar color and the text color for display in the Runtime control.

Result

The KPI "DemoKPIStructuredOperand" has been created. To evaluate the individual states of the structured operand, use "WinCC PerformanceGanttControl". To do this, instantiate the operand type on an equipment and select, for example, a WinCC tag as data source.
3.2.3 Configuring operand formula

3.2.3.1 Introduction

Definition
The "operand formula" calculates a value from the process values. The result is returned to an operand.

Usage
Use the operand formula to calculate a value that is not, for example, provided by the PLC. You can interconnect the operand formula like a WinCC tag as data source to an operand.

Example
The "Temperature" operand type is used to store the operating temperatures in various plant units. Most plant units supply the operating temperature directly in the unit "degrees Celsius". A temperature probe that supplies the temperature only in "Fahrenheit" is used in a plant unit. In the operand formula you define the conversion formula including the "Fahrenheit" parameter. You then assign this operand formula to the operand instance of "Temperature" and configure the parameter with the WinCC tag which returns the temperature value in Fahrenheit.

Task
Create an operand formula with two parameters that are added in the operand formula. Create a new operand and a new KPI. Insert the newly created operand as calculation formula.
3.2.3.2 Creating equipment

Procedure

1. Create an equipment with the name "DemoEquipmentOperandFormula".
2. Assign the equipment to the "GettingStarted" group and define the colors for the display in the Runtime control:

Result

The equipment "DemoEquipmentOperandFormula" has been created.
3.2.3.3 Creating an operand formula

Procedure

1. Create an operand formula with the name "OperandFormulaParameter":

![Image of Performance Monitor Configuration Studio interface showing steps to create an operand formula]
2. Define the parameters "P1" and "P2".
3. Enter the formula in the formula editor.

Result

The operand formula has been created.
3.2.3.4 Creating an operand

Procedure

1. Create an operand with the name "OperandDemoOperandFormula":

![Image of PerformanceMonitor Configuration Studio interface showing the creation of an operand]
2. In Runtime control, define the bar color for the display:

![Performance Monitor Configuration Studio](image)

Result

The "OperandDemoOperandFormula" operand has been created.
3.2.3.5 Creating KPI

Procedure

1. Create a KPI with the name "DemoKPIOperandFormula":

![Image of Performance Monitor Configuration Studio showing the creation of a KPI]

- Click on the "New KPI" button.
- Enter the name "DemoKPIOperandFormula".
- Select the calculation mode and formula as shown in the image.
- Apply the changes to create the KPI.
2. Define the formula for the KPI:
3. In the Runtime control, define the bar color and the text color for the display:

![Performance Monitor Configuration Studio screenshot]

**Result**

The "DemoKPIOperandFormula" KPI has been created.
3.2.4 Creating context information

Introduction

Context information is evaluation and filter criteria that describe a piece of equipment in detail. Using context information you show in the evaluation, for example, connections between the production figures and the production materials used from various suppliers.

In this Getting Started you create a context information that saves the actually produced product. You enter the product in runtime via WinCC tag.

Procedure

1. Create a context information with the name "DemoContextInformationProduct".
2. Define the bar color and the text color for display in the Runtime control.

Result

The context information "DemoContextInformationProduct" has been created.
3.2.5 Configuring cyclic calculation of the KPI

Introduction

You can calculate a KPI cyclically in Runtime and store the result in a WinCC tag with a process connection. In this way, for example, you can create a line dashboard or store the values in WinCC Tag Logging.

The calculation is always performed cyclically from the current point in time to a definable point in time in the past. The anchor point is used to define the point in time as of which the calculation for the next occurrence of the point in time is performed.

Procedure

1. Define a new calculation cycle for the required KPI:
2. Configure the calculation cycle so that the KPI is calculated each minute within a one-hour interval:

![Image of PerformanceMonitor Configuration Studio](image)

**Result**

The cyclic calculation has been configured for the "DemoKPIOperandFormula" KPI.
3.3 Part 2: Assigning parameters for instances

3.3.1 Introduction

Instances

Once you have mapped your plant in PerformanceMonitor with equipment, you assign the KPI types to the equipment. One instance of each object is generated for this. At each place of use, you configure the object instances and assign values, tags or operand formulas to them.

① The items of equipment defined are listed in tree form under “Instances”.
② The KPI types not yet assigned to this equipment are listed in the detailed view.
③ The KPI types already assigned to this equipment are displayed as instances in the working area. The operands calculated in the KPIs are automatically added as operand instances.
### 3.3.2 Assigning KPI to the equipment

**Procedure**

1. Assign the KPI "DemoKPI\StructuredOperand" to the equipment "DemoEquipment\StructuredOperand":
2. Assign the KPI "DemoKPIOperandFormula" to the equipment "DemoEquipmentOperandFormula":

Result

The two KPIs are assigned to the respective equipment. The instances of the operands used in the calculation formulas have been created automatically.
3.3.3 Assigning context information to a KPI

Procedure

1. Assign the KPI "DemoContextInformationProduct" to the equipment "DemoEquipmentOperandFormula":

![Diagram showing the assignment process in PerformanceMonitor Configuration Studio](image)
2. Set the parameters for the context information so that the values are defined by a WinCC tag:

Result

The context information is assigned to the instance of the KPI.
3.3.4 Assigning parameters for operands

Procedure

1. Assign the parameters for the operand "OperandDemoStructuredOperand":

![Diagram showing the assignment of parameters for an operand in WinCC/PerformanceMonitor Configuration Studio.]

[Diagram showing the assignment of parameters for an operand in WinCC/PerformanceMonitor Configuration Studio.]
2. Assign the parameters for the operand "OperandDemoOperandFormula":
3. Then assign the two parameters of the operand:

Result

The parameters of the operands "OperandDemoStructuredOperand" and "OperandDemoOperandFormula" have been assigned.
3.3.5 Assigning parameters for cyclic calculation

Procedure

1. Add the calculation cycle configured on type to the KPI “DemoKPIOperandFormula”:
2. Select a WinCC tag in which the calculated values are saved:

Result

The cyclic calculation of the KPI has been configured.
3.4 Part 3: Configuring evaluation and displaying result

3.4.1 Overview

Introduction

PerformanceMonitor provides three runtime controls for evaluating KPIs and operands:
- WinCC PerformanceViewControl
- WinCC PerformanceGanttControl
- WinCC PerformanceTableControl

You configure the runtime controls in the Graphics Designer. Export and print functions are integrated in all runtime controls.

WinCC PerformanceViewControl

In WinCC PerformanceViewControl you display the indicators of various plant components, also in relation to associated values. An analysis of the cause with "drilldown" to individual operands is possible alongside analysis or comparison of data from a time range.
WinCC PerformanceGanttControl

You display the time-based input values in WinCC PerformanceGanttControl. You can also add comments subsequently provided you have the necessary authorization.

WinCC PerformanceTableControl

In WinCC PerformanceTableControl you display the input and associated values in chronological order. You can also add comments subsequently provided you have the necessary authorization.
3.4.2 Configuring Runtime controls

Introduction

The runtime controls for evaluation are already included in the picture "Start.pdl". The "Period with relative start time" mode is set as time range so that your entries can be displayed immediately in Runtime.

Procedure

1. Open the picture "Start.pdl" in WinCC Explorer:
2. Add the two new items of equipment to the "WinCC PerformanceViewControl":

![Image showing the process to add new items of equipment to WinCC PerformanceViewControl]
3. Similarly, add the two items of equipment to the "WinCC PerformanceTableControl".

4. Save the changes and start WinCC Runtime:

![Image of WinCC PerformanceMonitor interface]

**Result**

The Runtime controls are configured and Runtime is started.
### 3.4.3 Starting simulation in WinCC Runtime

**Procedure**

1. Open "WinCC PerformanceViewControl" in Runtime:
2. Simulate the calculation of the indicator by entering values:
3. Enter values again, e.g., "5" and "7":

Result

The values you have entered are added. The result is visualized in "WinCC PerformanceViewControl" by the bar "OperandFormula".
3.4.4 Evaluating context information in WinCC Runtime

Introduction

In the section below we will show you how to work with context information / associated values.

Procedure

1. Enter any product name and the number of products produced:

2. Repeat the input for another product:
3. Group the display in "WinCCPerformanceViewControl":
Result

The produced product is displayed as associated value in addition to the equipment.
3.4.5 Evaluating plant states

Introduction

In the section below we show you how to display status changes in PerformanceViewControl.

Procedure

1. Enter a value and refresh the display:
2. Enter the following sequence of values: "12, 13, 7, 20":

In PerformanceViewControl the counter for each recognized status change was incremented by "1". The value change from "12" to "13" is not recognized as status change because these values are within the defined value range of the structured operand.
3.4 Part 3: Configuring evaluation and displaying result