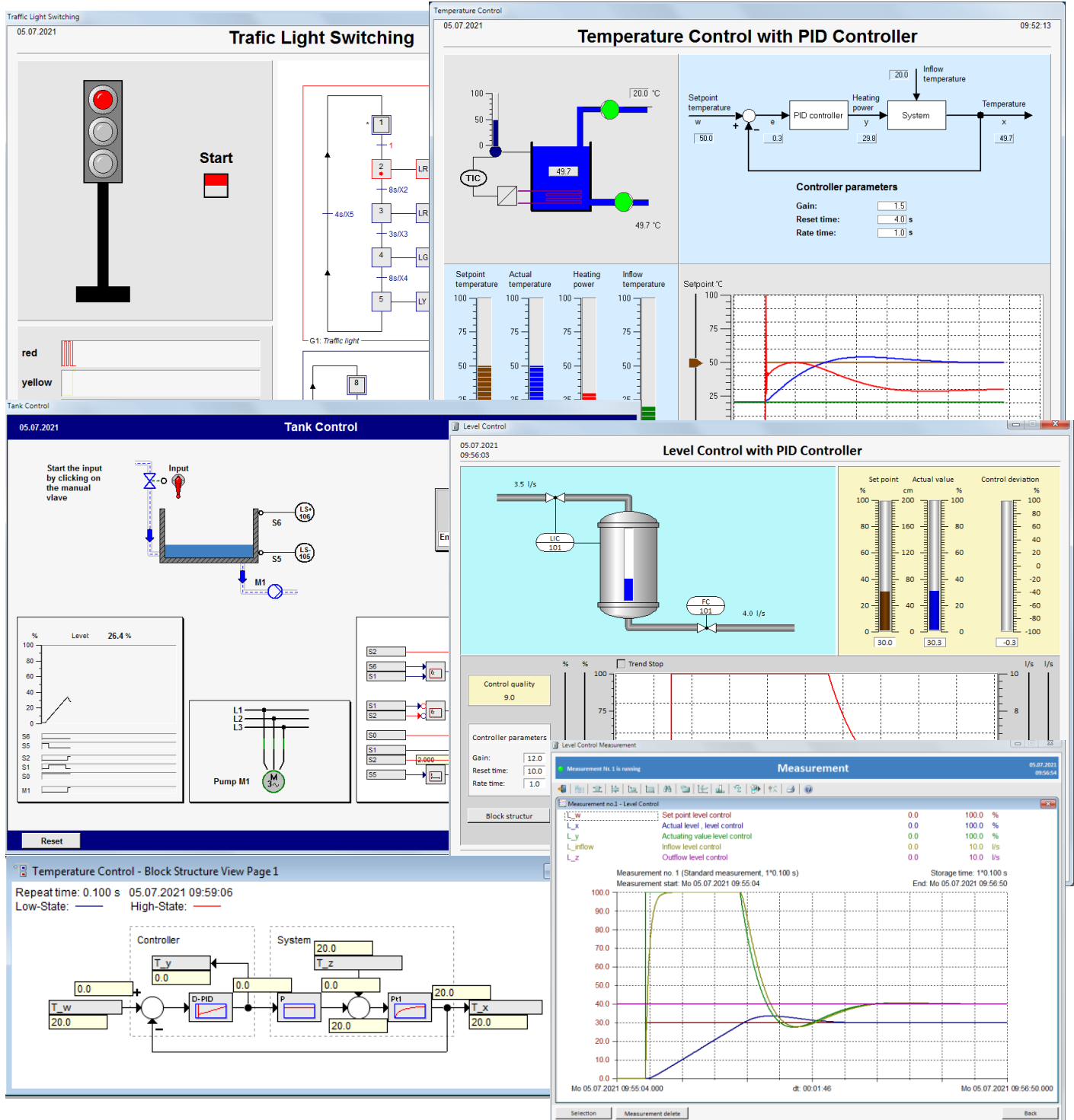


WinErs

Labor- and Simulationsversion 7

Quick Start Guide

WinErs-Version for Automation, Simulation and Experimentation



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1 Introduction

1.1 WinErs-Laborversion 7, WinErs-Simulationsversion 7

The WinErs-Laborversion and the WinErs-Simulationsversion are limited versions of the WinErs process control and automation system. They only differ in the option for the WinErs-Laborversion 7 of connecting systems (plants) using predefined drivers and to automatize the plants. With the WinErs-Simulationsversion only process simulation can be implemented.

Projects created with WinErs-Laborversion 7 can also be opened with WinErs-Simulationsversion 7 and vice versa. The number of signals is fixed at: 32x binary inputs, 32x binary outputs, 16x analog inputs, 8x analog outputs, 80x binary marker signals, 80x analog marker signals. The WinErs laboratory version 7 can be connected to the process / system via different process interfaces. With both versions you can create process pictures for operating and monitoring the system or the simulation. Controls and simulations are implemented with the help of block structures, logic plans, GRAFCET plans and the instruction script. All measurement and signal values can be saved and graphically evaluated.

1.2 Sample Project Labor7

The WinErs-Laborversion or Simulationsversion is supplied with a sample project "Labor7". You can start the sample project directly via the start menu or via the WinErs menu under *File - Open project* and select the project. There are 5 sample applications available in the project that you can use as a template or as a suggestion for implementing your own ideas:

- The simulation of a level control (closed loop control)
- A traffic light control using GRAFCET plans
- The simulation of a temperature control (closed loop control)
- A waste water tank control using logic plans
- Process picture "I / O signals" for testing the process interface (only useful for the WinErs-Laborversion)

It is best to use the process pictures to view and operate the behavior of the applications. You start this in the menu via *View - Process displays...* and selection of the corresponding pictures or via *View -* and selection of the layout:

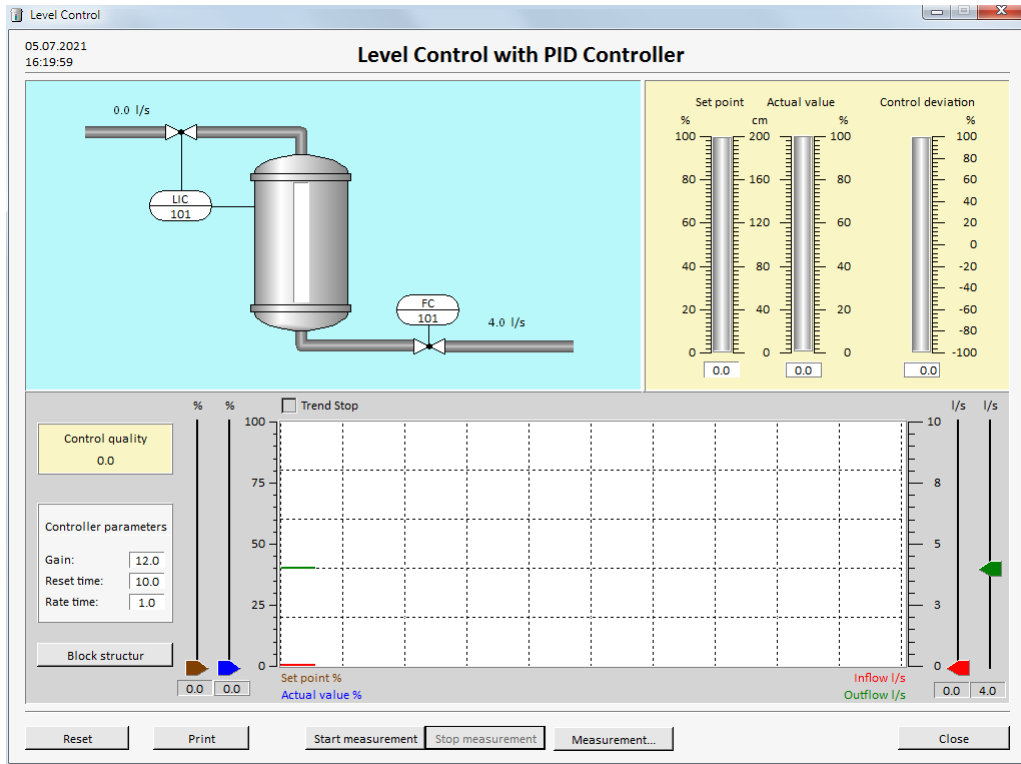
1. Level control
2. Traffic light switching
3. Temperature control
4. Tank control
5. I/O Signals

Save Layout	
1 Level control	Ctrl+1
2 Traffic light switching	Ctrl+2
3 Temperature control	Ctrl+3
4 Tank control	Ctrl+4
5 I/O-Signals	Ctrl+5

A detailed description of how the individual application examples were implemented can be found in an extra document. In the project, containers are defined for each application example with the corresponding names, in which all elements (signals, block structures, Grafcet pages, recipes, process images) are summarized for each application example that were used to create the application example. The signal groups of older WinErs versions were integrated into the container. You can of course change the process pictures or the controls of the application examples in the example project. You can change the process pictures in the menu via *Edit - Edit Process Displays...*, the block structures via *Edit - Edit Block Structures...* and the Grafcet plans via *Edit - Edit Grafcet Pages....*

1.2.1 Closed Loop Level Control

In the menu, the application example “Level Control” can be started via *View - Process Displays...* and then select *Level Control*.

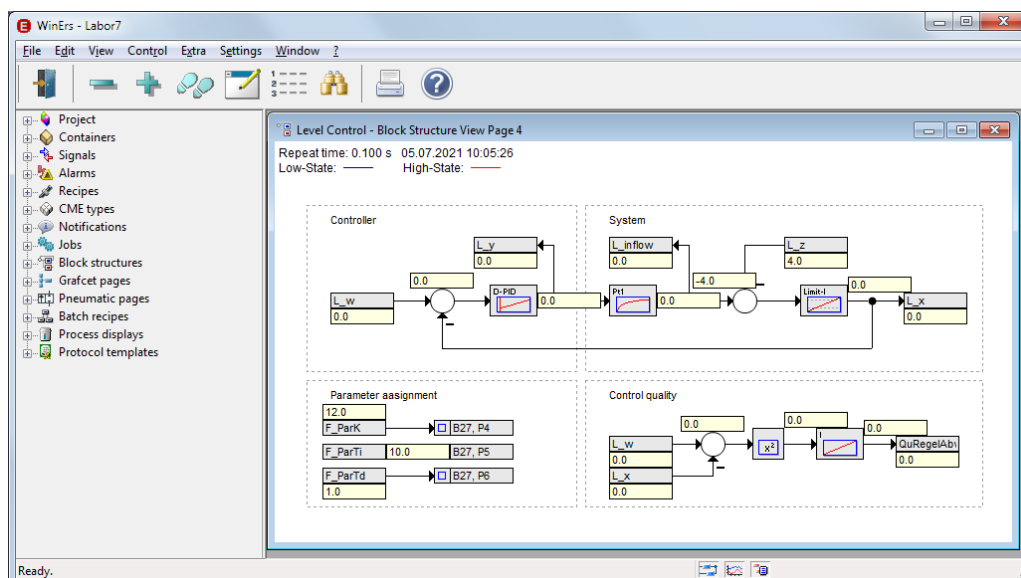


The level control can be operated and monitored via this process display.

Two more process screens are called from this page: *Level Control Measurement* and *Level Control Blockstructure*.

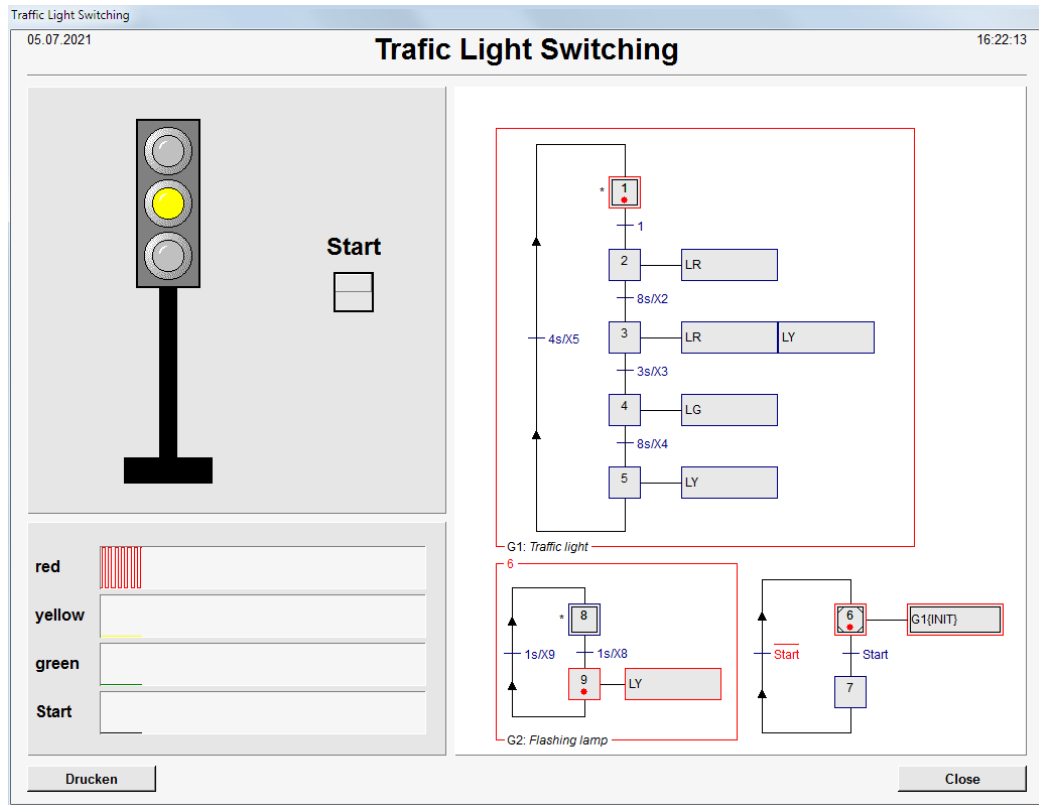
With the help of the recipe *Level Control Reset*, the control simulation can be reset to its initial state.

The level control is simulated using the level control block structure.



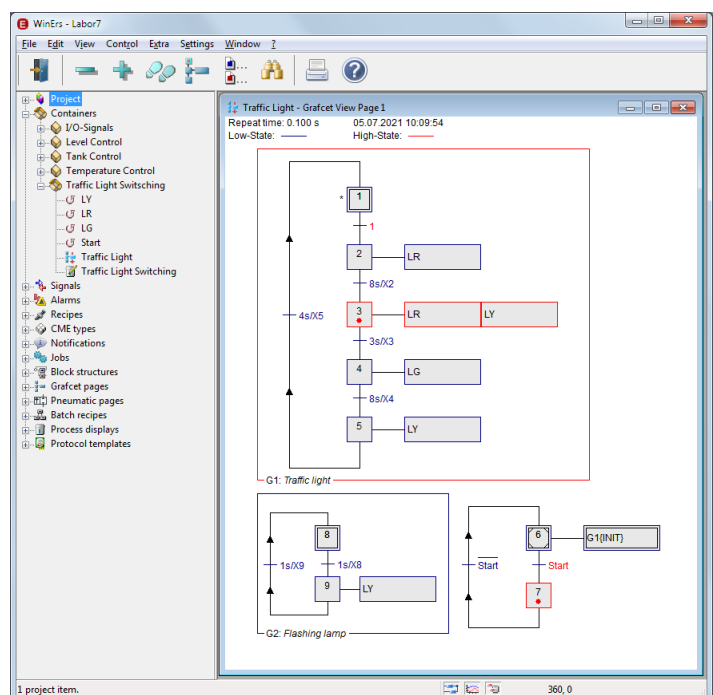
1.2.2 Traffic Light Switching

In the menu, the application example “Traffic Light Switching” can be started via *View - Process Displays...* and then selecting *Traffic Light Switching*.



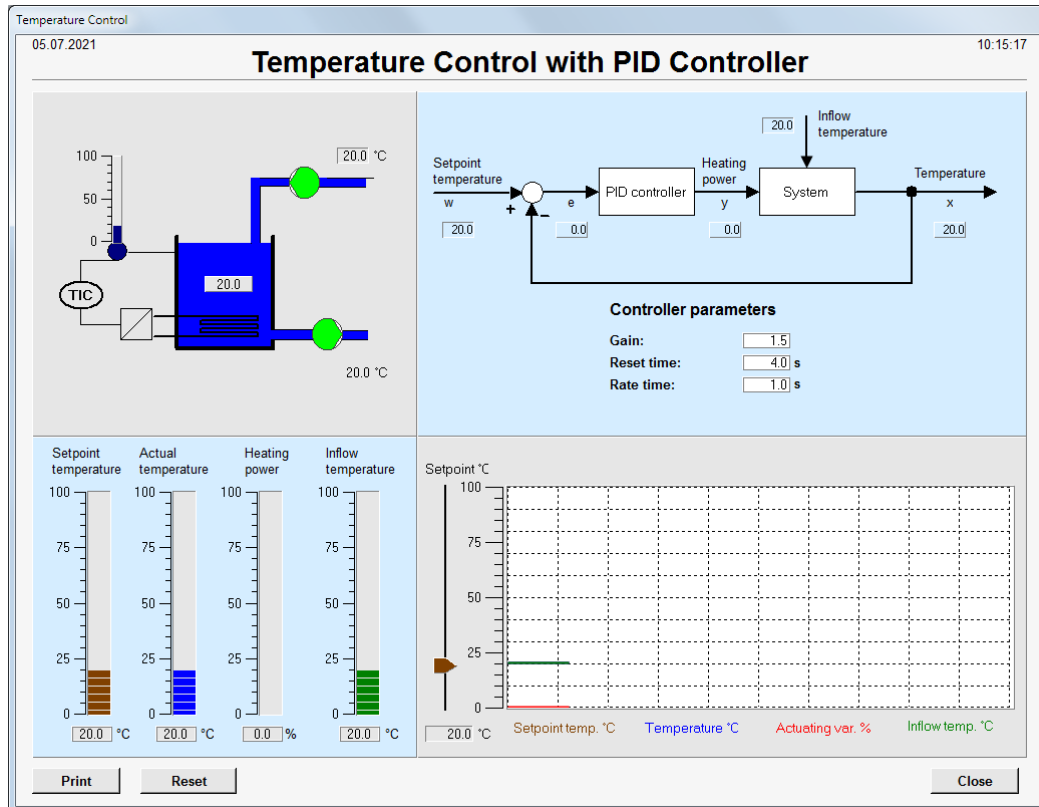
The traffic light switching can be started and monitored via this process picture.

The control of the traffic light circuit is realized by the GRAFCET side
Traffic Light



1.2.3 Temperature Control

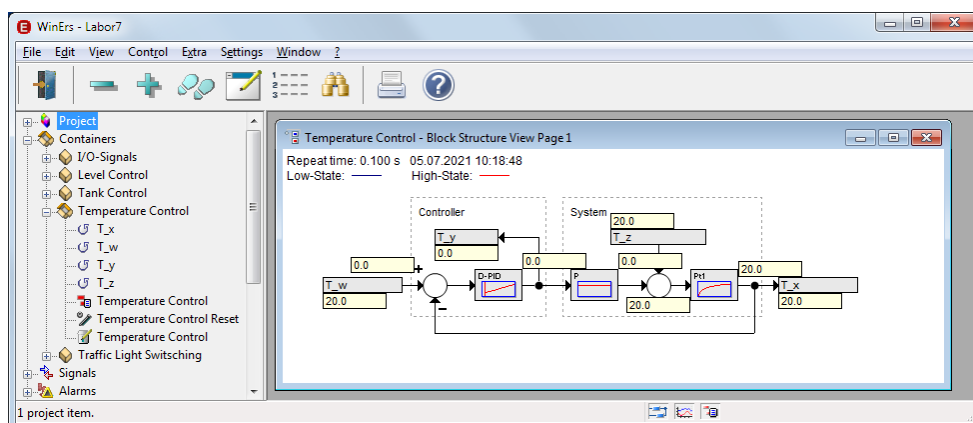
In the menu, the application example “Temperature Control” can be started via *View - Process Displays...* and then select *Temperature Control*.



The temperature control can be operated and monitored via this process display.

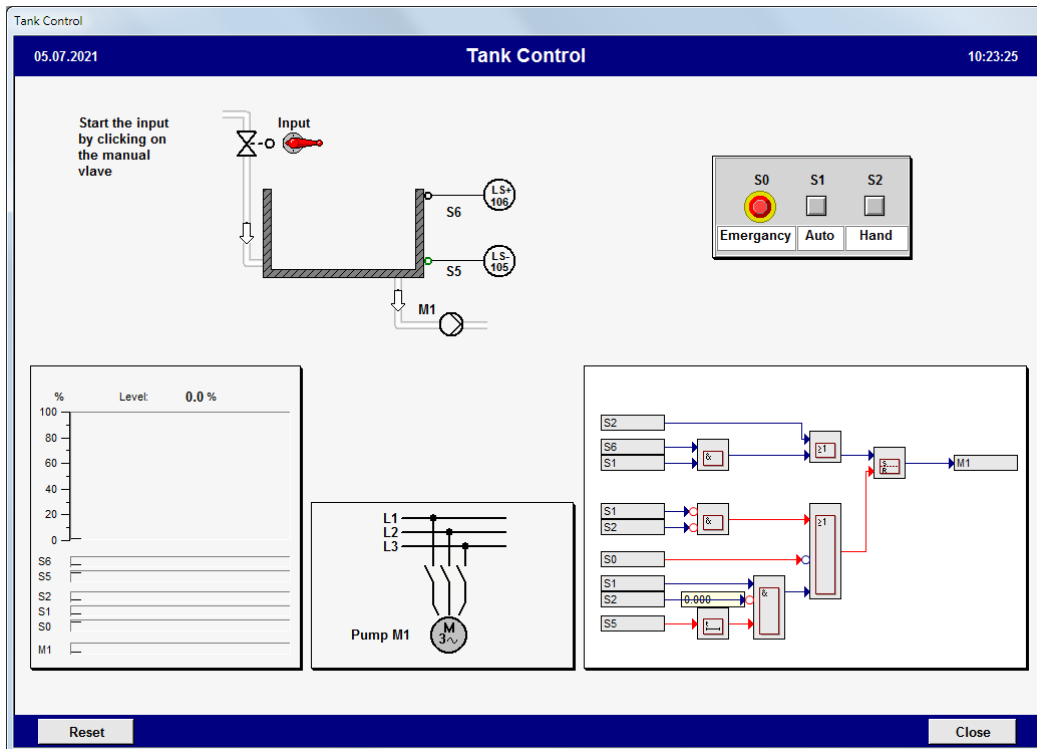
With the help of the recipe *Temperature Control Reset*, the control simulation can be reset to its initial state.

The temperature control is simulated using the Block Structure *Temperature Control*.



1.2.4 Tank Control

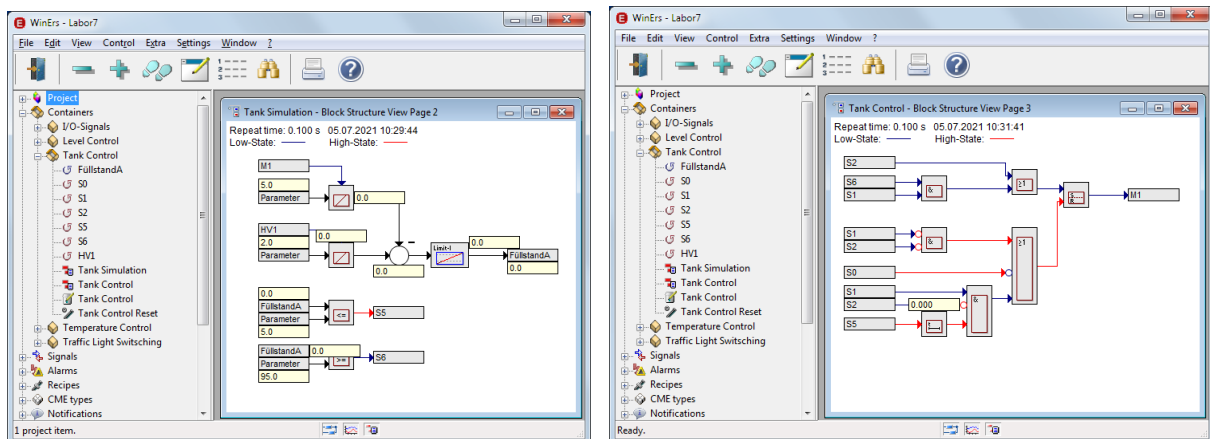
In the menu, the application example “Tank Control” can be started via *View - Process Displays...* and then selecting *Tank Control*.



The tank control can be started and monitored via this process picture.

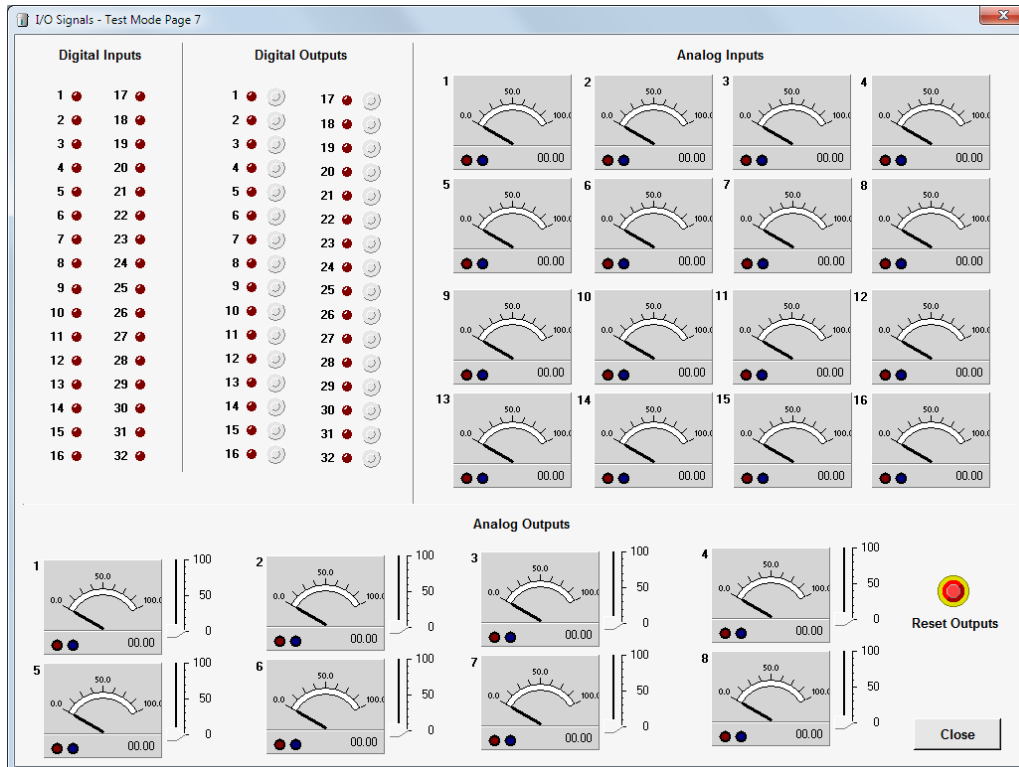
With the help of the recipe *Tank Control Reset*, the control simulation can be reset to its initial state.

The simulation of the tank was realized with the Block Structure *Tank Simulation* and the control was realized with the Block Structure *Tank Control*.



1.2.5 I/O Signals

In the menu, the application example “I/O Signals” can be started via *View - Process Displays...* and then selecting *I/O Signals*.



In this process picture, the values of the analog and binary input signals read in via the hardware are displayed and the analog and binary output signals can be set and thus transferred to the hardware.

This application example is used to test the process interface when the driver has been selected and the associated hardware (I / O interface) is connected. Since the WinErs-Simulationsversion does not provide a hardware connection, this application example is only intended for the WinErs-Lavorversion.

1.3 WinErs-Server and Hardware Connection

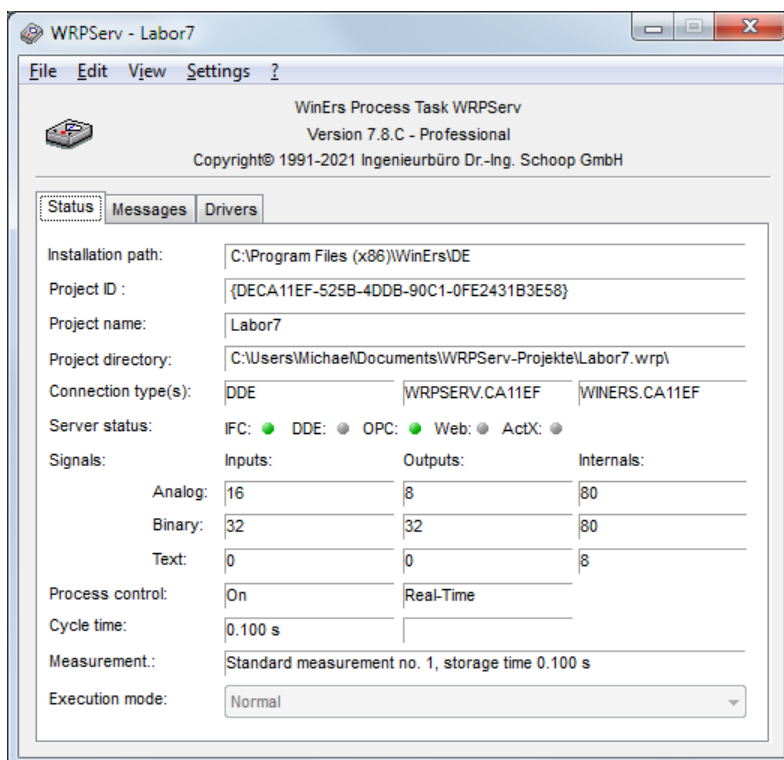
After starting the WinErs-Laborversion or the WinErs-Simulationsversion, the WinErs server (WRPServ) is started at the same time. The WRPServ runs in the background and works as a soft PLC. For the WinErs laboratory version, the interface to the process is also set on the WRPServ. It reads in the input signals in the specified cycle time, carries out the controls, regulation and simulations (specified by the active block structures, the Grafcet plans and the instruction script), outputs the calculated control signals and saves the selected signal values when the measured value acquisition is switched on.

The WinErs laboratory version is supplied with different drivers for the process connection (I / O interface). The driver is selected using the additional program in the program group "WinErs-Lab - Select Process Driver"

The following drivers are currently available:

- TCP/IP Modbus-Driver, Ethernet-Connection for Beckhoff, Wago, Phoenix Contact
- S7-Driver for MPI-Bus or Ethernet CP of S7 (S7, LOGO, S7-1200, S7-1500)
- OPC-Driver, Easyport, NI_DAQ, Arduino, etc.

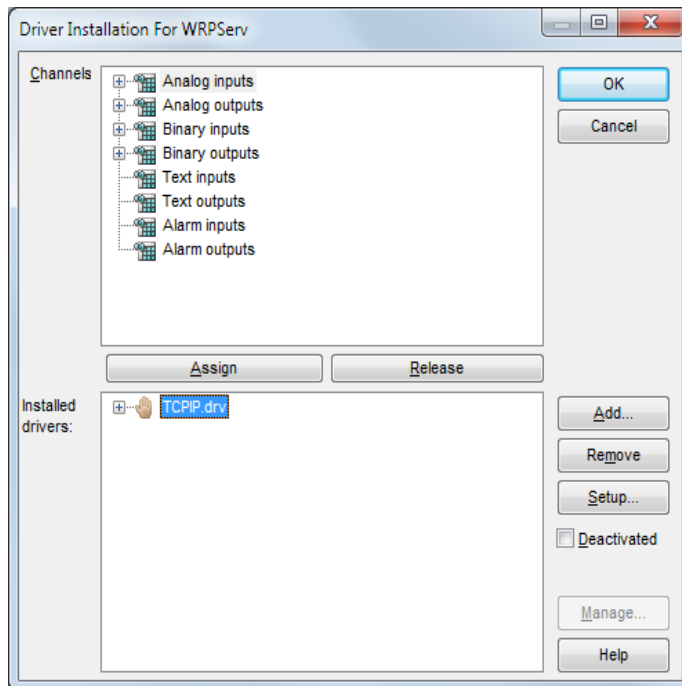
The settings for the drivers are different because they address different hardware (I/O interfaces). The WinErs-Laborversion is always delivered with a standard setting for the driver, so that normally no settings have to be made in the driver. For further information please use "Laborversion - Documentation".



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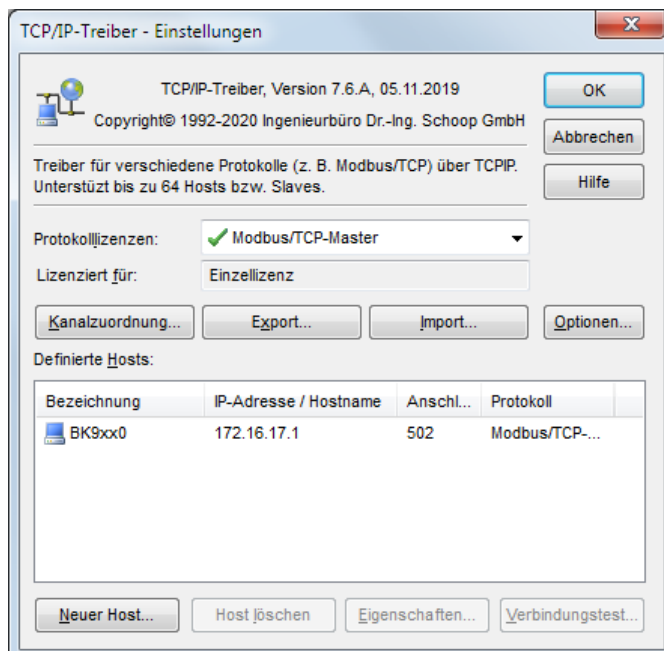
Quick Start Guide

You can call up the driver installation in WRPServ via *Settings - Set Process Drivers*. Highlight your driver here and press *Setup*. You will then come to the special dialog for setting up the driver.



By selecting the driver and pressing Setup, you get to the special setup dialog for the selected driver. Here you can, for example, change the IP address or set the channel assignment.

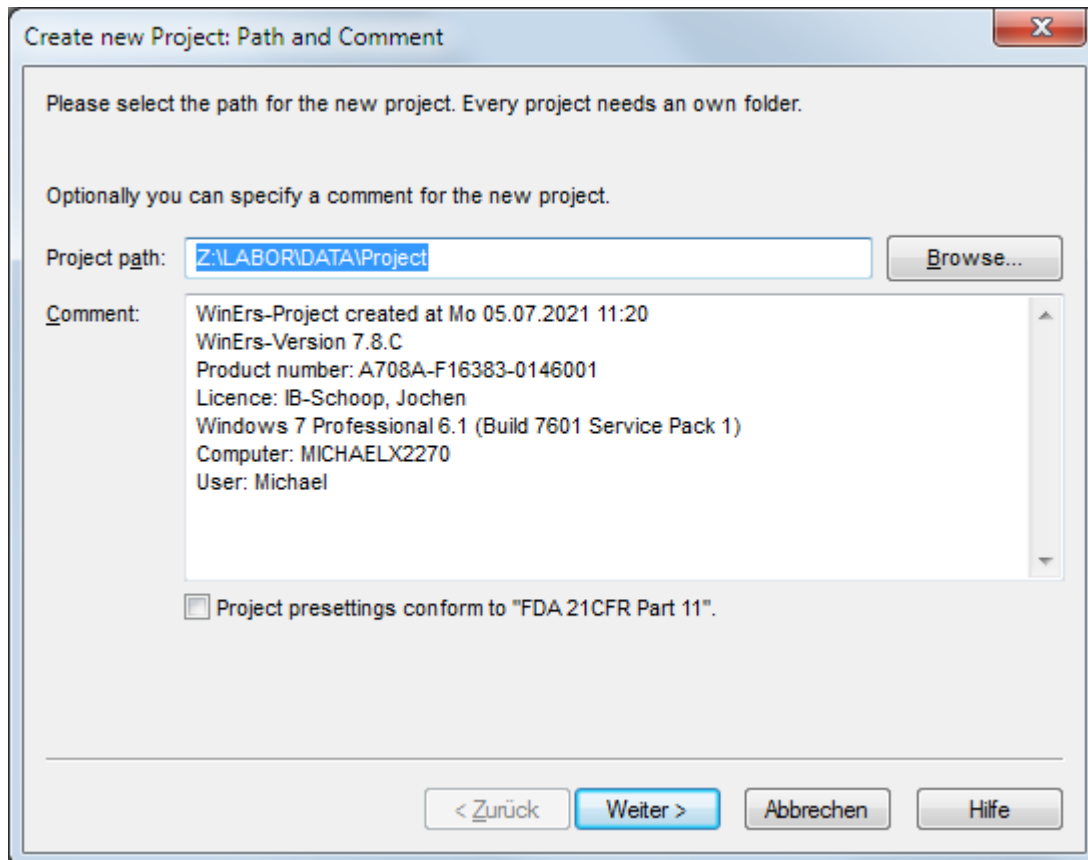
You can obtain further information by pressing the Help button or through the documentation supplied (e.g. in the installation folder).



2 New Project

2.1 Create new Project

You create a new project for a new task via *File - New Project....*



- Enter the project name and project path
- Enter a comment for this project

After pressing *Next*, further windows appear, which you can skip with *Next*. Among other things, the cycle time is asked here. It is set to 100ms by default. At the last window you have to press *Finish*. Then you will be prompted to restart by pressing *OK*. The data (project name, number of signals, cycle time, etc.) are transferred to the WinErs server (WRPServ), which runs in the background and works as a soft PLC. It carries out the controls and regulations that have been created, saves and manages the measured values, etc.

The project is now set up and you can now edit your project. The first thing you need to do is define your signals. Controls, regulation and simulations can then be implemented using the block structures, the Grafcet plans or the instruction script. You create operating and monitoring screens with the help of process visualization.

2.2 Define Signals

In automation technology, one works with signals. A distinction is made between analog signals, binary signals and text signals. These three types of signals are again divided into input signals, output signals and flags. Input signals are measurement signals that are read in by the system (by the process), output signals are output to the system as control signals and flags are internal signals that are used for setpoints, calculations, states, simulations, etc. In the WinErs-Laborversion 7 or the WinErsSimulationsversion 7, 32x binary inputs, 32x binary outputs, 80x binary flags, 16x analog inputs, 8x analog outputs, 80x analog flags and text signals are available.

Important: When defining signals, each signal is given a unique name. The signal is accessible under this name in the project, e.g. for block structures, Grafset plans, process visualizations, trends, containers, etc.

Signals are defined in the menu via *Edit - Define Signals*.

- Binary Signals

Select signal type (Input, Output, Internal (Flag))

Enter the signal name (for input signals and output signals, the assignment of the signal name to the signal number is important, since the assignment to the channels of the process interfaces takes place via the driver)

Enter signal description (description of the signal)

Define the signal state (description for the binary state 0 and 1)

The screenshot shows the 'Define Binary Signals' dialog box with the 'Internal' tab selected. The 'Signal number' is set to 3, and the 'Signal name' is LG. The 'Description' field contains 'lower lamp'. The '0-state' is set to 'off' and the '1-state' is set to 'on'. There are buttons for 'New signal...', 'Delete', 'Statistic...', 'OK', 'Cancel', 'Apply', and 'Help'.

- Analog Signals

Select signal type (Input, Output, Internal (Flag))

Enter the signal name (for input signals and output signals, the assignment of the signal name to the signal number is important, since the assignment to the channels of the process interfaces takes place via the driver)

Enter signal description (description of the signal)

Define the definition range

Possibly define the display area (is used as the default area for the graphic displays, trend display and measured value acquisition. If no display area is specified, the definition area is used for the display)

The screenshot shows the 'Define Analog Signals' dialog box with the 'Internal' tab selected. The 'Signal number' is set to 3, and the 'Signal name' is 'T_y'. The 'Description' field contains 'Contr. signal, electr. power for heater'. Under 'Domain (physical range)', the 'Lower limit' is 0 and the 'Upper limit' is 100.0. Under 'Display range (logical range)', both 'Lower limit' and 'Upper limit' are set to '<None>'. The 'Unit' is set to '%', and the 'Format' is '<None>'. There are buttons for 'Conversion...', 'Units...', and 'Statistic...'. At the bottom, there are 'OK', 'Cancel', 'Apply', and 'Help' buttons.

The definition of virtual signals and text signals is not discussed here. Refer to the online help for more information.

2.3 Define Container

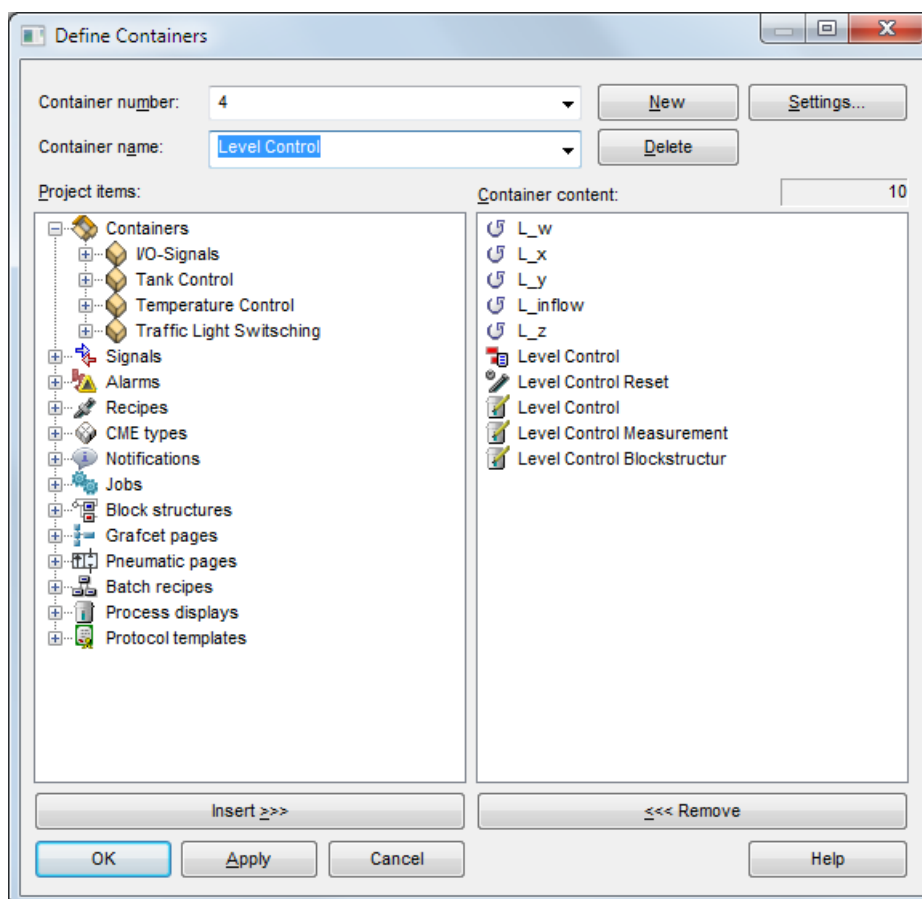
In WinErs you have the possibility to structure your project with the help of containers. Thematically related project entries (e.g. signals, alarms, process images, block structures, Grafcet plans, protocols, etc.) can be grouped together in containers in order to have faster access to related project entries for large projects.

You can also use containers to combine signals in groups, as was possible in older WinErs versions via "Create signal groups". The signals can be structured thematically and are therefore easier to find. The signal groups were replaced by the containers.

You define containers in the menu via *Edit - Define Container....*

In the lower container, all project entries created for the simulation of the level control are summarized under the container name level control. In this example, these are: signals, block structure, recipe and process pictures.

For example, if you want to view the signals that belong to the level control graphically or numerically, you only need the container name for the numeric (*View - Online Measured Values, Numerical ...*) or graphic view (*View - Online Measured Values, Graphical ...*) to choose.



2.4 Start / Stop Process Control

You can start or stop the control and regulation in WinErs, i.e. the processing cycle is started or stopped.

When the processing cycle is running, the signal values are read in cyclically in the specified cycle time, active controls, regulation, simulations (block structures, Grafcet pages, instruction script) are carried out, the signal values are saved when the measured value acquisition is switched on and control signals are output to the process.

By default, the Laborversion and Simulationsversion is set so that the processing cycle runs (control and regulation has started).

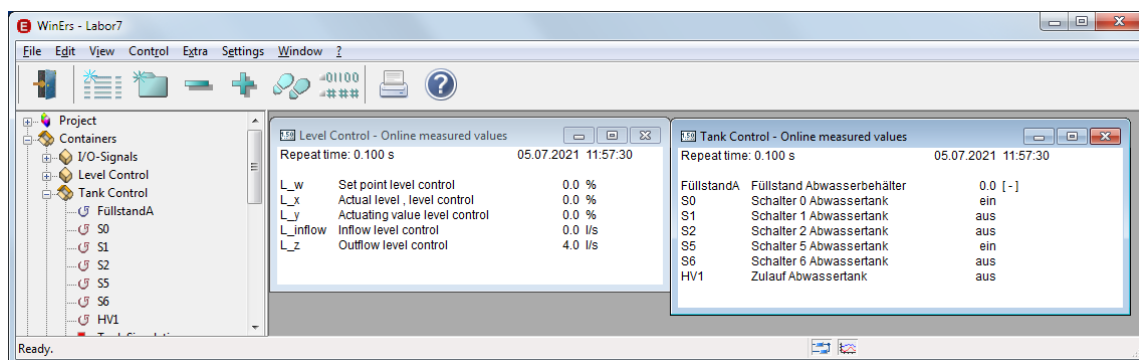
Start (stop) control and regulation can be reached in the menu via *Control - Start (stop) Process Control....* A colored symbol in the lower status line shows when the processing cycle is running.



2.5 Online Measured Values, Numerical

You can view the current values of the signals numerically and graphically. You start the current numerical view of the signal values in the menu via *View - Online Measured Values, Numerical ...*

- Selection via container name or
- Direct selection via signal names.

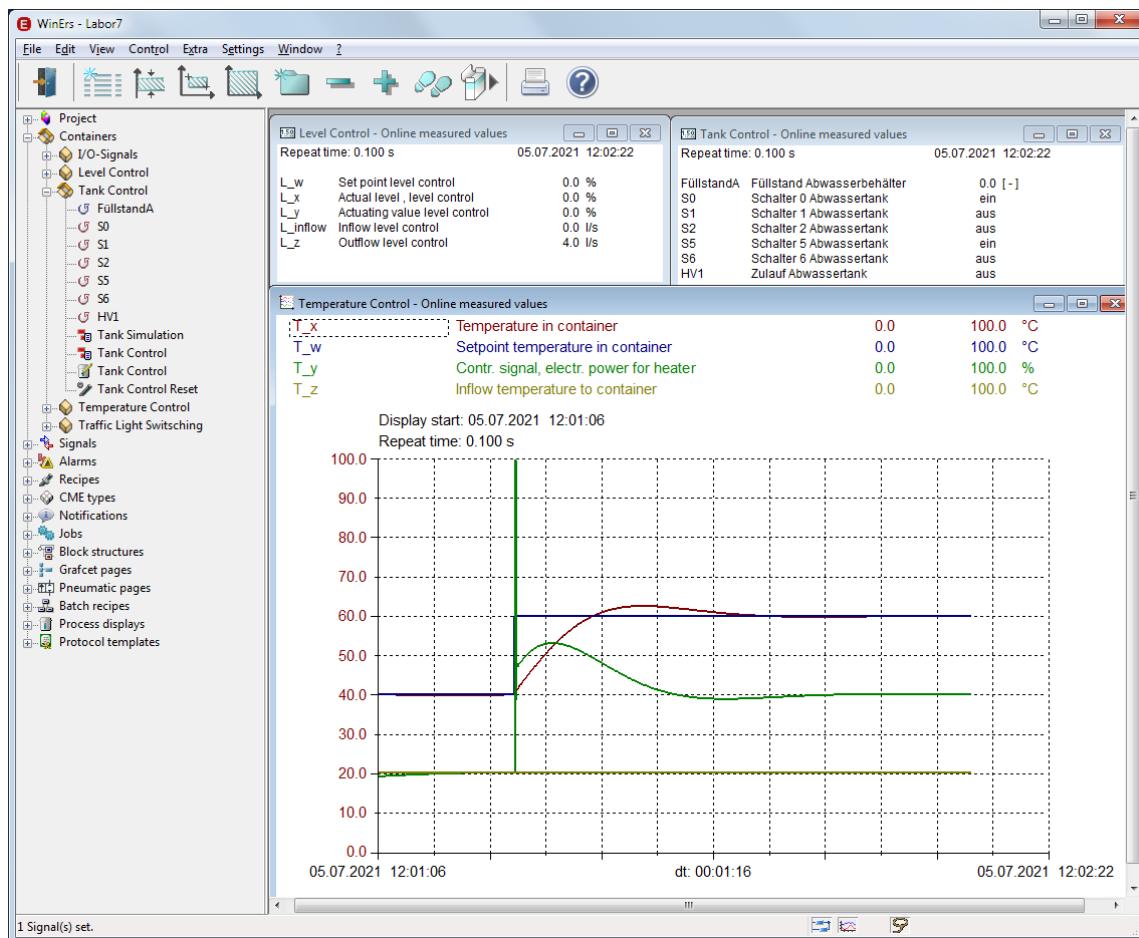


You start the current graphic view of the signal values (trend display) in the menu via *View - Online Measured Values, graphical ...*

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- Selection via container name or
- Direct selection via signal names.
- Selection of the display form (in a diagram or each signal in a separate diagram).

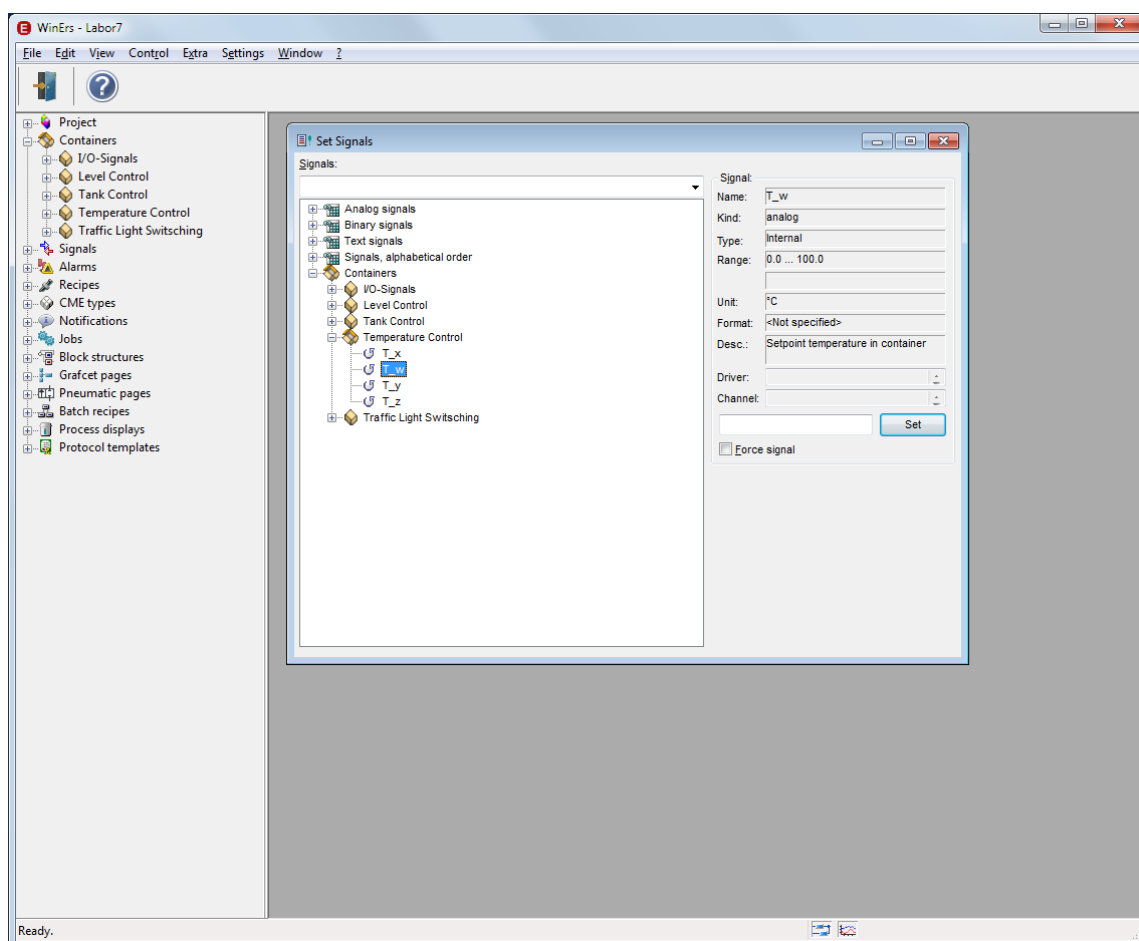


In the picture you can see three windows with the current numerical and current graphic display (trend display) of the signal values

2.6 Set Signal values

You can change the values or states of signals in the menu via *Control - Signal Values*.

- Selection of the signal
- Enter the value to which the signal is to be set
- Pressing Set
- You can also toggle binary signals simply by selecting them and double-clicking them.



3 Create Controls and Simulations

You can create your control systems and simulations in WinErs with the help of signal flow diagrams (block structures) and logic diagrams, Grafcet plans and / or the instruction script. The instruction script is not discussed here (see online help).

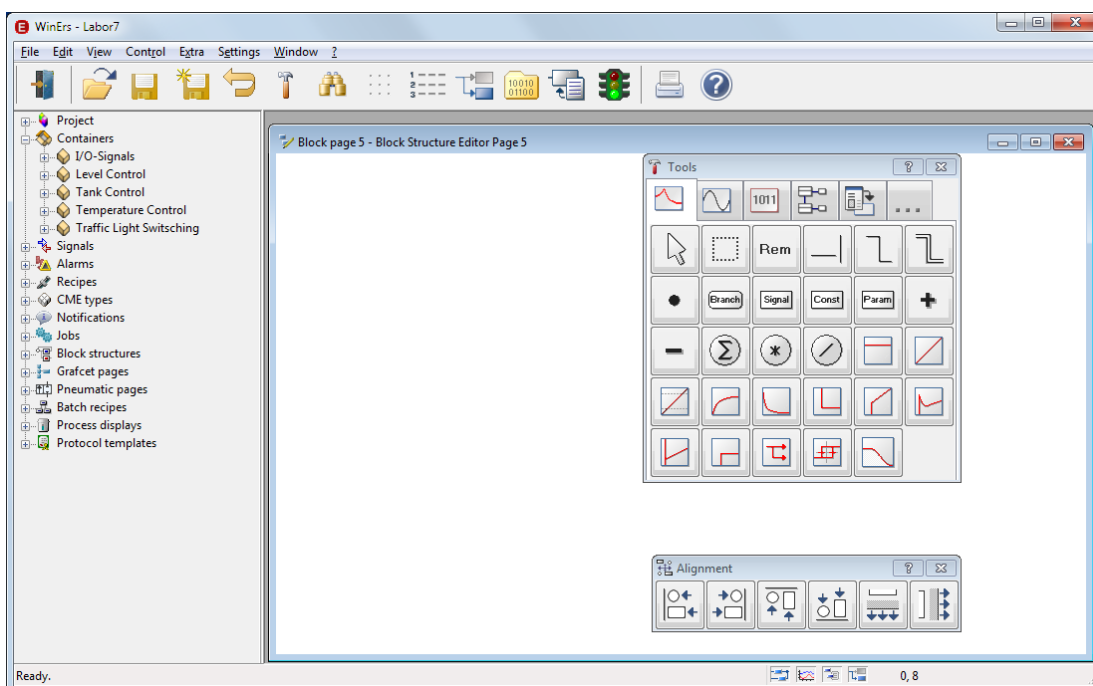
3.1 Block Structures and Logic Diagrams

3.1.1 Create Block Structures and Logic Diagrams

The block structure editor for creating block structures is called up in the menu via *Edit - Edit block structures....*

Enter a name for the block structure page.

A blank page will open.

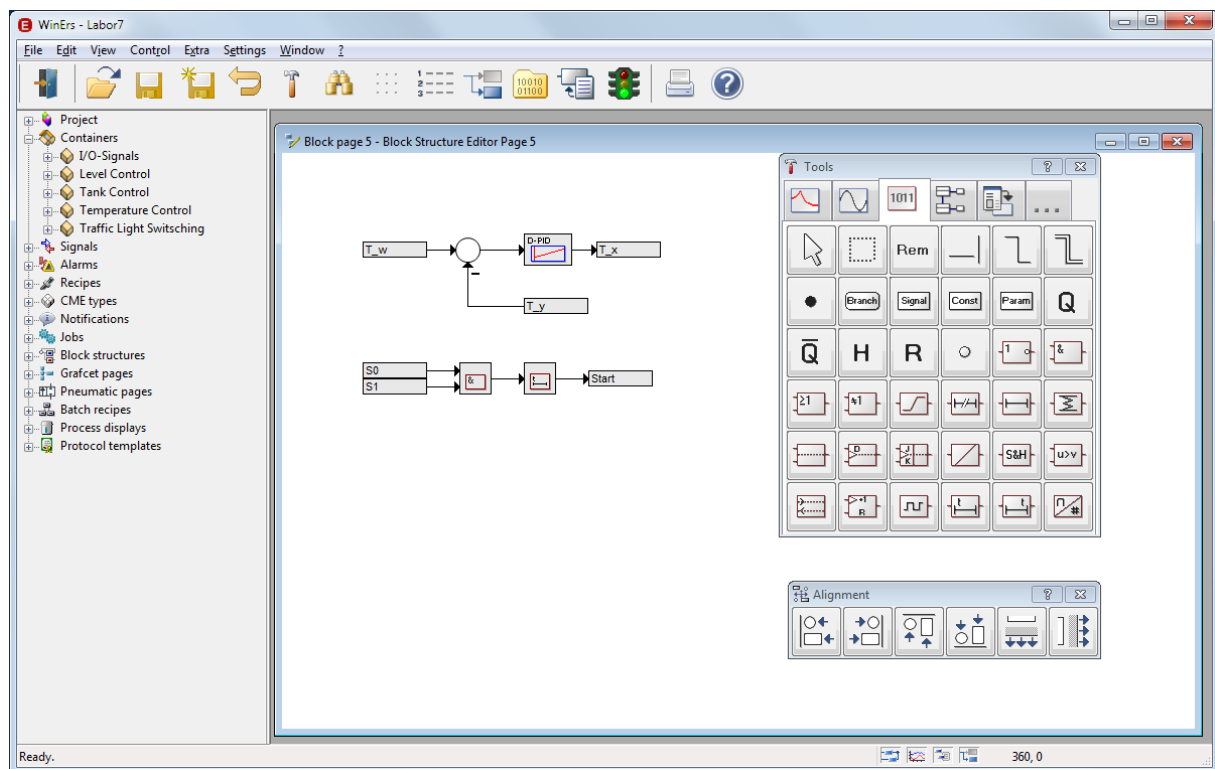


Create your block structures and logic plans using the tool box. In the upper row of the tool box (index cards) you can switch between controller blocks (analog blocks), algebraic blocks, logic blocks (binary blocks), sequence controls and other blocks.

Pick your blocks and place them on the page. Connect the blocks with connecting lines or connecting polygons. You integrate the signals into your block structures using the signal input / output blocks. For this you have to have defined your signals beforehand. You can select the previously defined signal name by double-clicking on these blocks.

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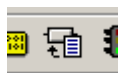


After you've created your block structure page, you need to compile the page. This is done using the "Compile block structure page" button in the top button bar.



When compiling, the syntax is checked, e.g. whether the number of inputs and outputs for the blocks is correct. If errors occur, they are displayed in a window. Double-clicking on the error message marks the point (block) on the page where the error occurred.

After the page has been compiled without errors, you can set the parameters of the blocks (if necessary). You can do this by pressing the button "Turns the parameter mode after compilation on or off". It is then possible to set the parameter values by double-clicking on the blocks.



The block parameters can also be set in the block structure view (*View - Block Structures*) by double-clicking on the blocks.

You can now activate the block structure page by pressing the little traffic light in the upper button bar. This means that the page is executed immediately if the "Process Control" is running.

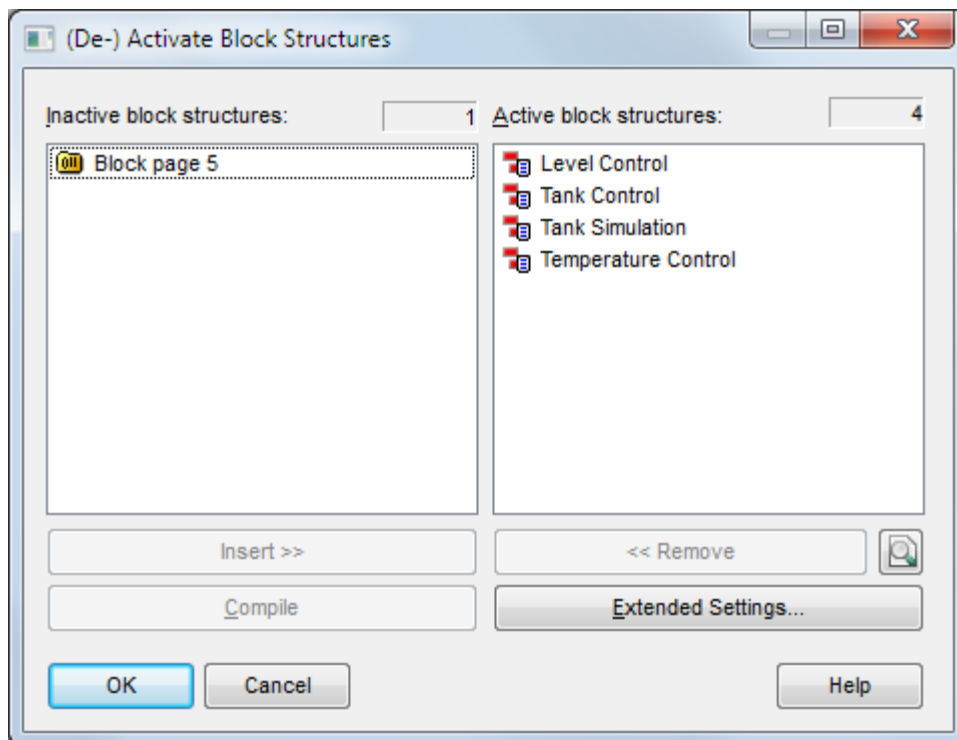


Instead of activating the block structure page by pressing the traffic light, you can also do this in the menu via *Control - (De) Activate - (De) Activate Block Structures....*

3.1.2 (De-) Activate Block Structures

The block structure pages to be executed must be activated. Any number of block structure pages can be activated at the same time. If the "Process Control" is running, the active pages are executed. Block structure pages can also be activated or deactivated while "Process Control" is running.

Via *Control - (De-) Activate - (De-) Activate Block Structures* you get to the dialog for activating the block structure page.

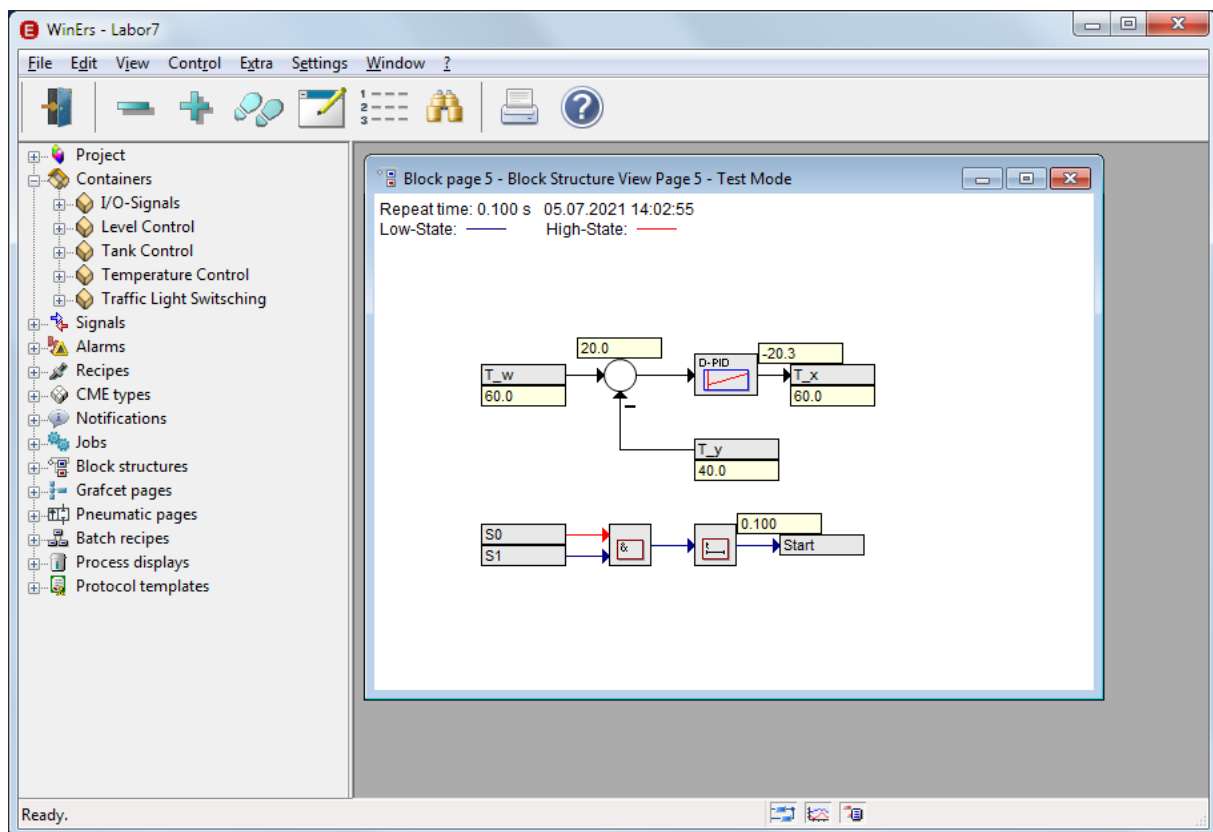


- The block structure pages that are to be executed must be brought into the right window by selecting and inserting or double-clicking
- By pressing OK, the pages selected as active are transferred to the WinErs server (WRPServ) and executed immediately if the "Process Control" is running

3.1.3 View Block Structures

The view of your block structure page is called up via *View - Block Structures....* You select the block structure via the block structure name or the page number.

In the block structure view you can monitor the behavior of your block structure page. The numerical values of the signals and block outputs are output and updated cyclically. The arrows and lines of the binary signals are shown in color depending on the status.



In the block structure view, you can change the parameters of the blocks by double-clicking on the blocks.

Using the button "Turn editing mode on / off" in the upper button bar, it is possible to move or delete the displayed numerical values of the signals or block outputs.



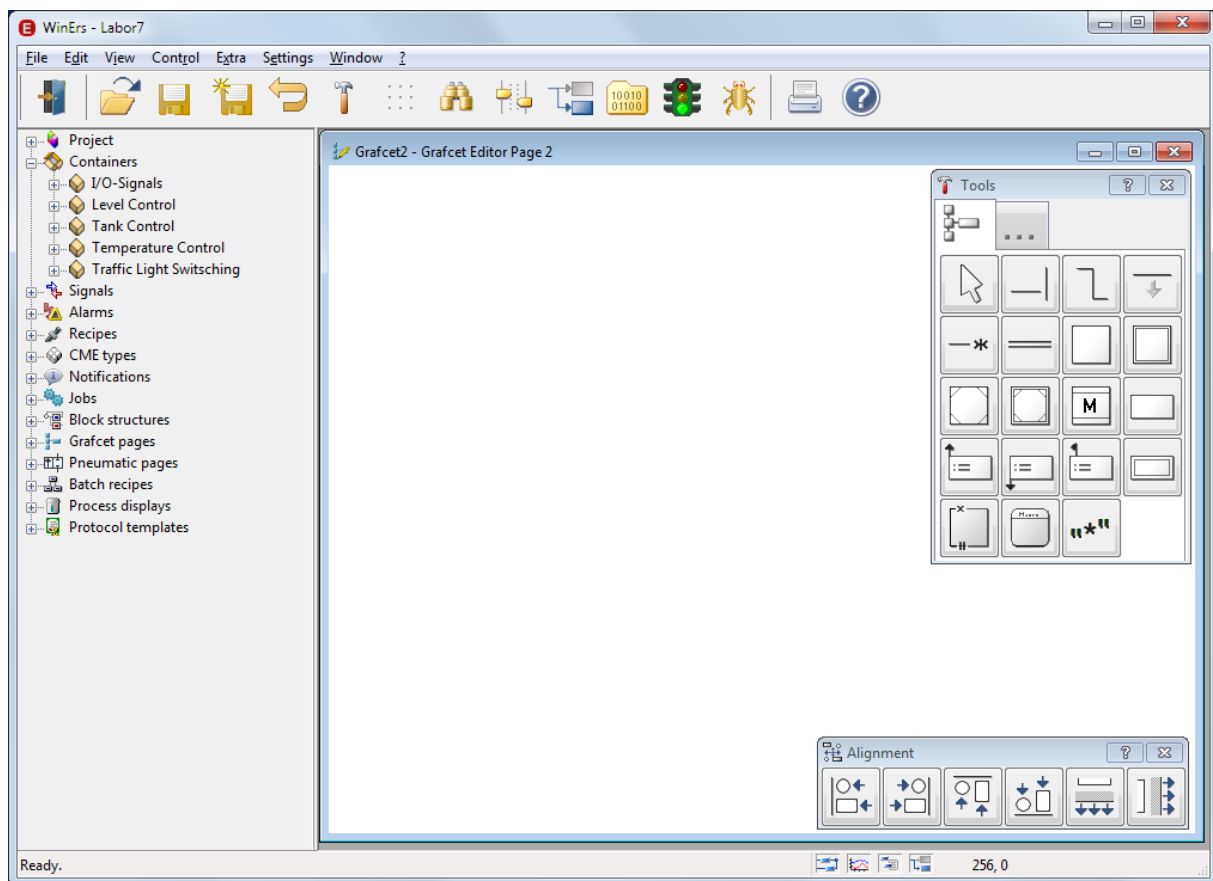
3.2 Grafcet Pages

3.2.1 Create Grafcet Pages for Sequence Controls

The editor for editing Grafcet plans is called up in the menu via *Edit - Edit Grafcet Pages*....

Enter a name for the Grafcet page.

A blank page will open.

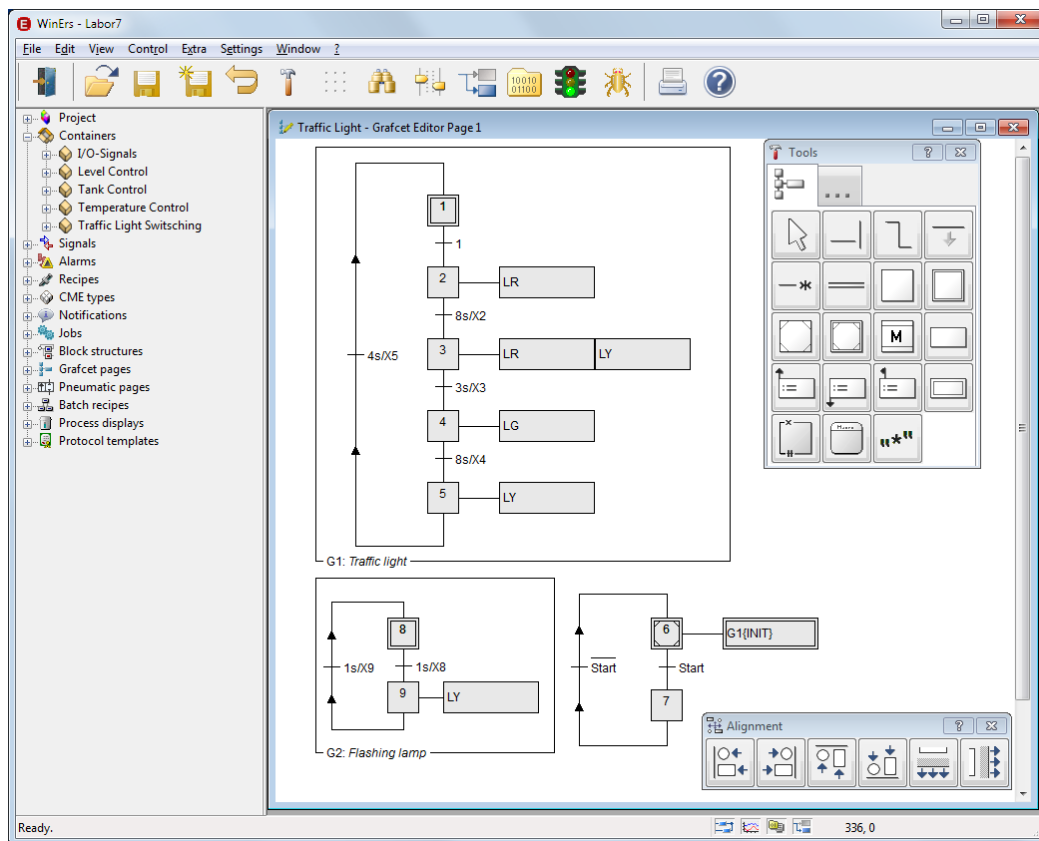


Create your Grafcet plan using the tool box. In the upper row of the tool box you can differentiate between "Standard Grafcet elements" and "Extended Grafcet elements".

Pick your items and place them on the page. Connect the blocks with the action lines or action polygons. You can set them up by double-clicking on the elements (e.g. entering the transitions). Here, too, you need the previously defined signal names.

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After you've created your Grafcet page, you need to compile the page. This is done using the "Compile page" button in the top button bar.

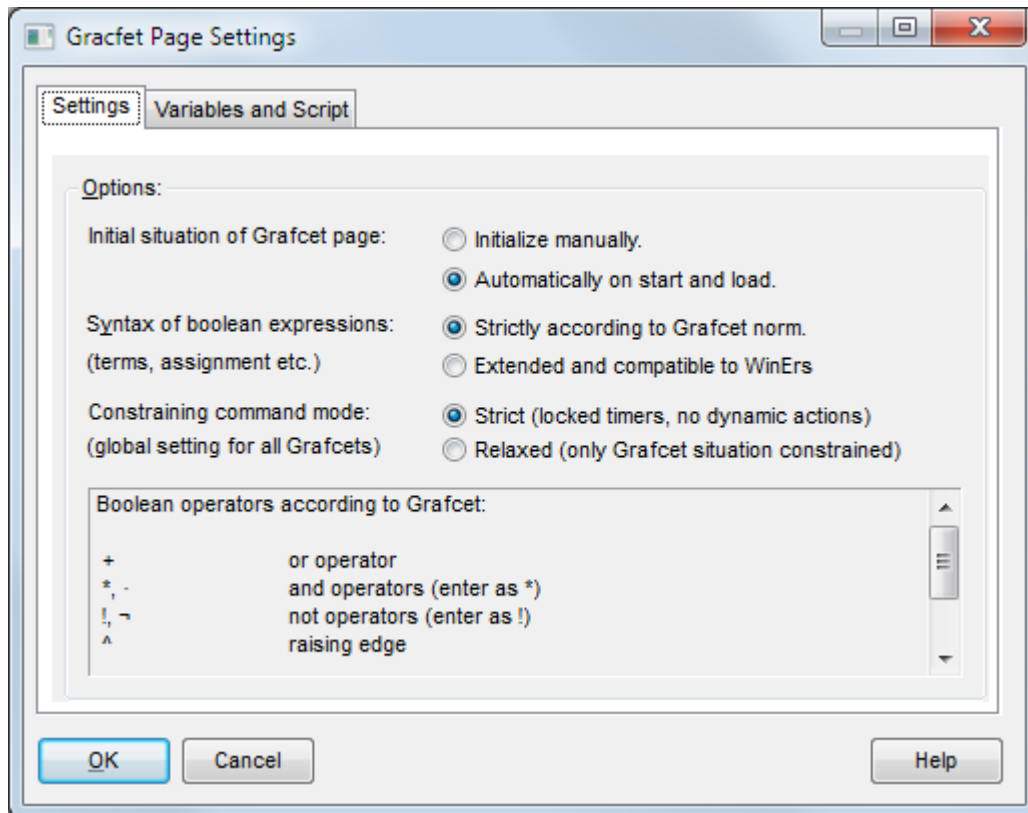


When compiling, the syntax is checked, e.g. it is checked whether all blocks have the correct number of inputs and outputs. If errors occur, they are displayed in a window. Double-clicking on the error message marks the point (block) on the page where the error occurred.

You can use the "General settings for the active window" button in the top button bar to make settings.



For example, it can make sense to set the initial situation (initial steps) of the Grafcet page to "Automatic on start and load". This means that the initial steps of the Grafcet page are set immediately when the Grafcet page is activated. The window also describes which keys are used for which operators. You need this, for example, when entering the transitions.



You can now activate the Grafcet page by pressing the little traffic light in the upper button bar. This means that the page is executed immediately if the "Process Control" is running.

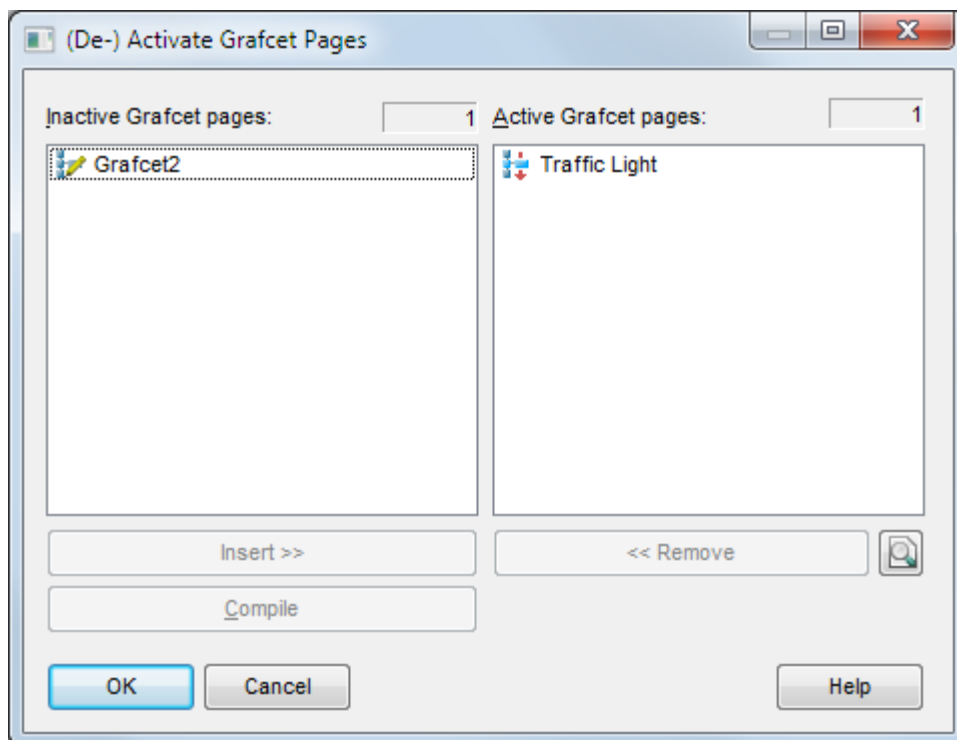


Instead of activating the Grafcet page by pressing the traffic light, you can also access it in the menu via *Control - (De-) activate - (De-) Activate Grafcet Page*.

3.2.2 (De-) Activate Grafcet Pages

The Grafcet pages to be executed must be activated. Any number of Grafcet pages can be activated at the same time. If the "Process Control" is running, the active pages are executed. Grafcet pages can also be activated or deactivated while open-loop and closed-loop control is running.

Via *Control - (De-) Activate - (De-) Activate Grafcet Pages* you get to the dialog for activating the Grafcet pages. You will also get an overview of your active and translated pages here.

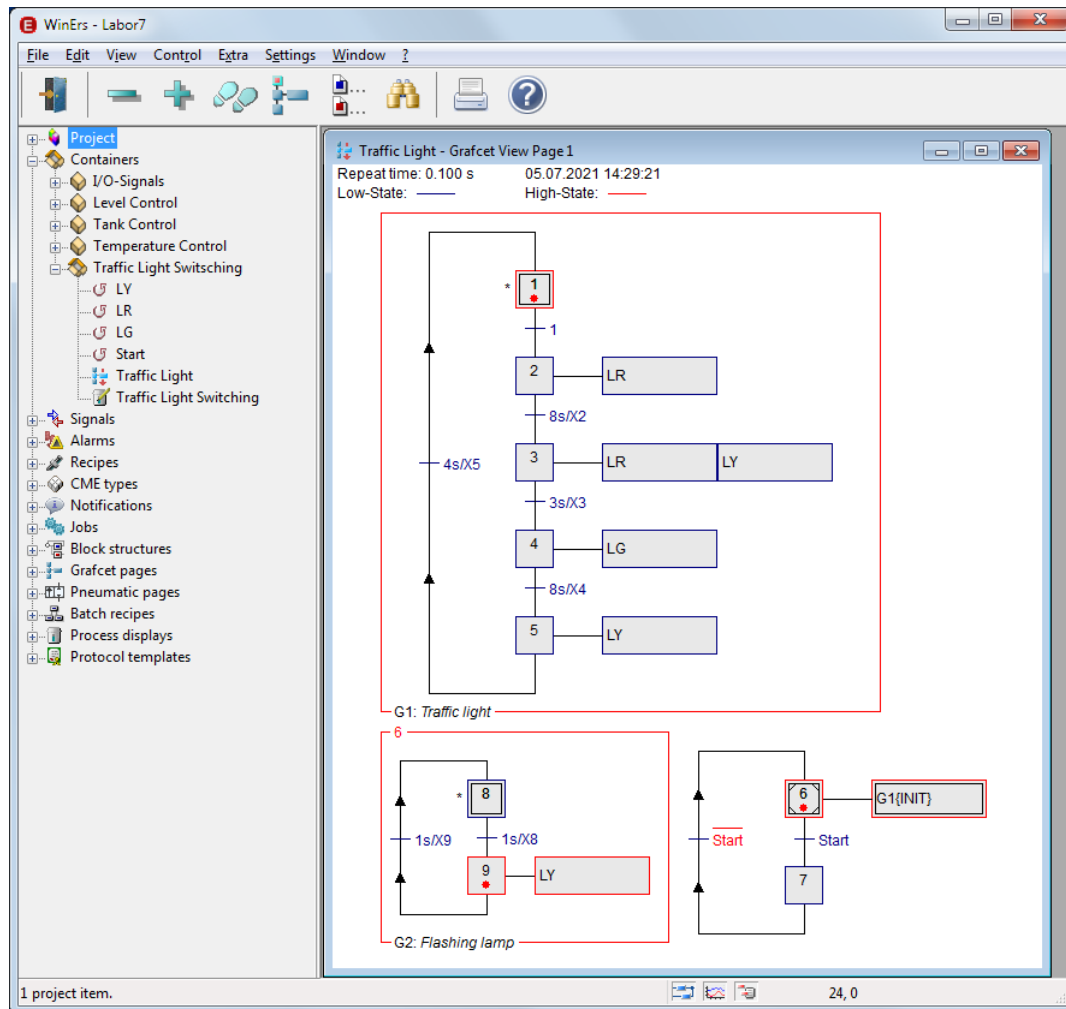


- The Grafcet pages that are to be executed must be brought into the right window by selecting and inserting or double-clicking
- By pressing OK, the pages selected as active are transferred to the WinErs server (WRPServ) and executed immediately if the "Process Control" is running

3.2.3 View Grafcet Pages

The progress of the Grafcet pages can be monitored in a Grafcet side view. The states of the steps and transitions are displayed in color and updated cyclically.

In the menu you can go to *View - Grafcet Pages...* to view the Grafcet Pages. You can select it using the name of the Grafcet page or the page number.



With the button "Initialize Grafcet" you have the possibility to initialize the Grafcet page, i.e. to set initial steps, to set selected steps or to reset all states.



With the "Show script status" button, you can view the current status or values of the signals and change them.



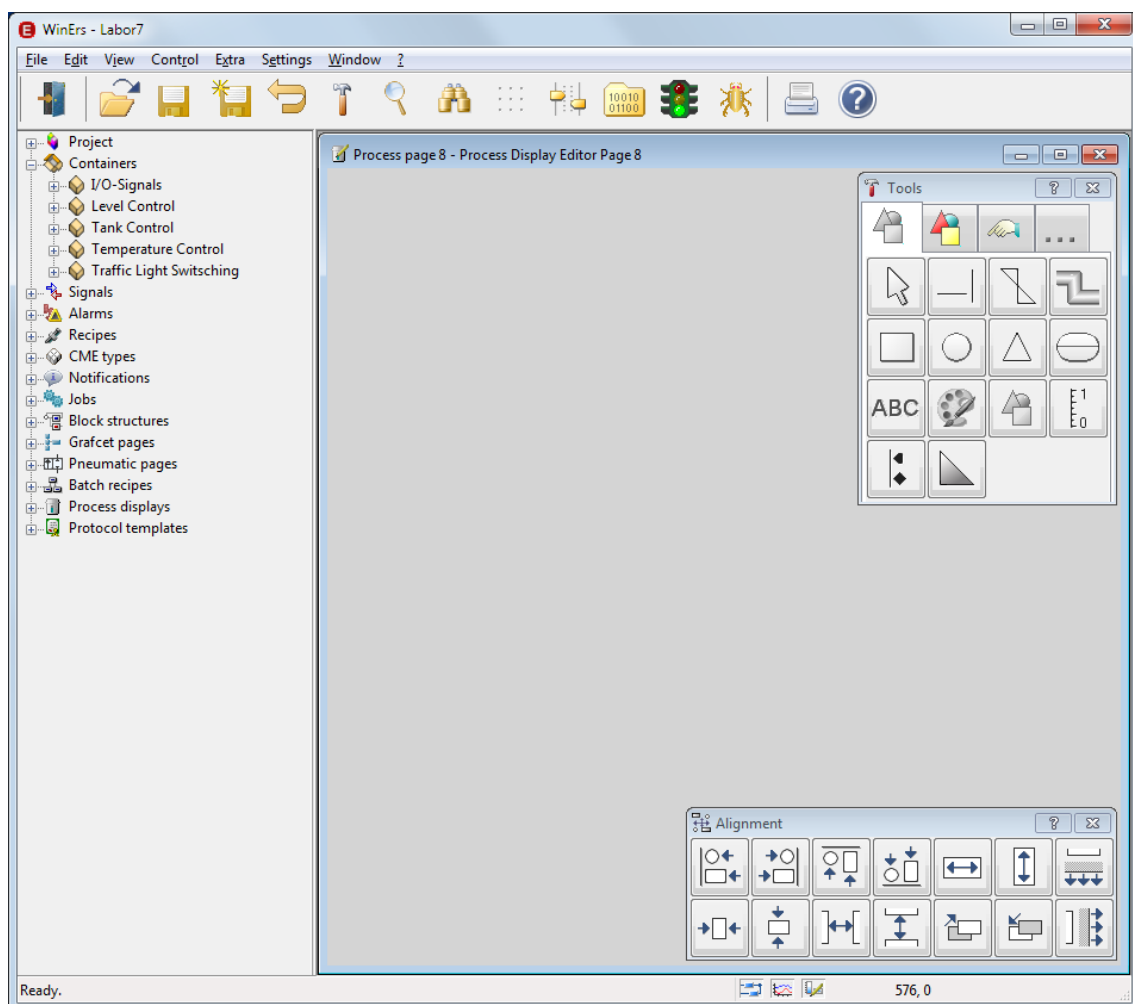
4 Prozess Displays

With the help of process visualization, it is possible to create your own images for operating and monitoring the system or the simulation.

4.1 Create Prozess Displays

To create the pictures, call the process picture editor. You can do this in the menu via *Edit - Edit Process Displays....*

Enter a name for your process picture page. A blank page will open.



Create your process displays using the tool box.

Select items from the tool box and place them on the page. You have the option of using static and dynamic process picture elements. You can also use your own pictures on the site. A library with different images is available. You can set up your elements by double-clicking the elements. Here, too, you need the previously defined signal names.

Via the button "General settings for the active window" the appearance of the window is specified: settings, colors, script.



- Settings: WinErs window or desktop window,
Window with title bar, window frame and scroll bars,
Always in the foreground,
Image size: automatic, full screen, custom,
Possibly background image or background pattern,
- Adjust the color palette, if necessary
- Define variables, if necessary; the input of terms is used to switch images (bitmaps) or to change the color of lines and bars (see online help: process image terms)

To test the process pictures, you can click on the small traffic light in the upper button bar (test mode).



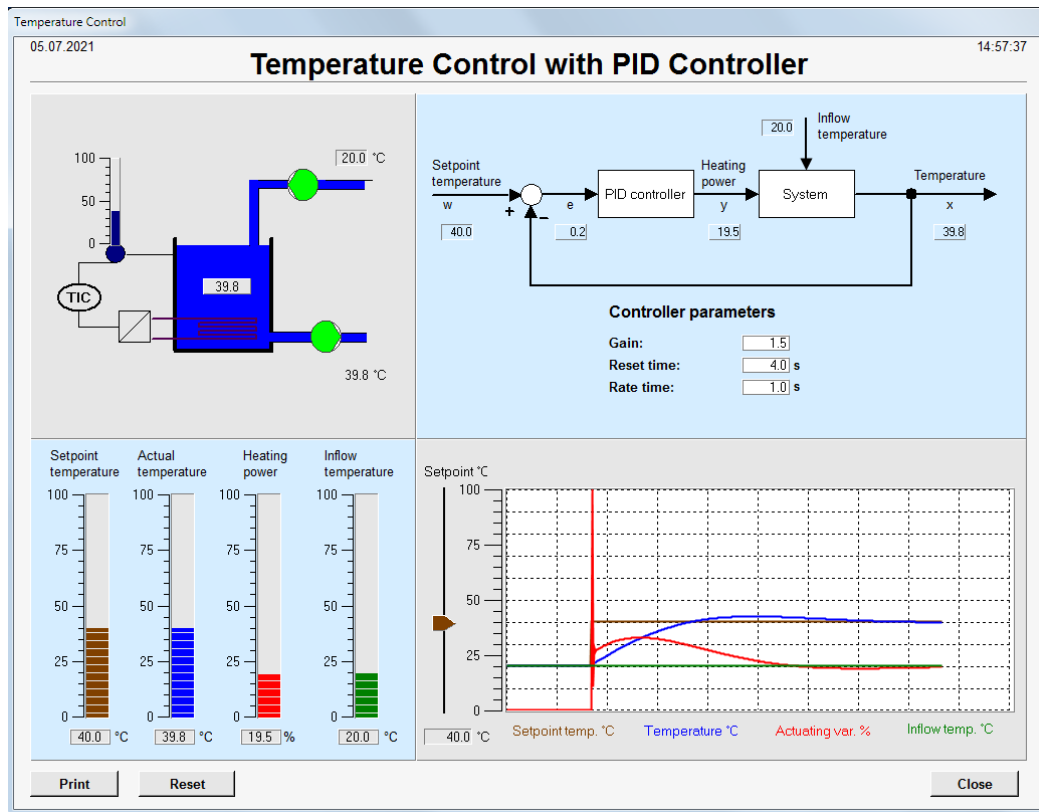
The process picture goes into the process picture view and you can test the page and check whether and how your dynamic elements switch.

When you close the process picture view, you come back to the process picture editor (if you started the view via the traffic light).

Instead of starting the view of the process picture via the editor with the traffic light, you can also start it in the menu via *View - Process Displays....*

4.2 View Prozess Displays

The process picture view can be called up in the menu via *View - Process Displays....* Select the name of the process picture or a page number.



To start a process picture directly using a key combination or to call up a specific window arrangement, you have the option of saving a layout and reloading it.

4.3 Save WinErs-Windows as a Layout

A certain window arrangement can be saved via the layout (*View - Save Layout*) and reloaded again.

- Create a window combination and save the layout
- Call via view - "Name of the layout"
- The view of the layout can also be reloaded using the key combination "Ctrl + 1" to "Ctrl + 9".

5 Recipes

With the WinErs recipes, you have the option of creating sets of signal values, parameter values and states and transferring them to the controller.

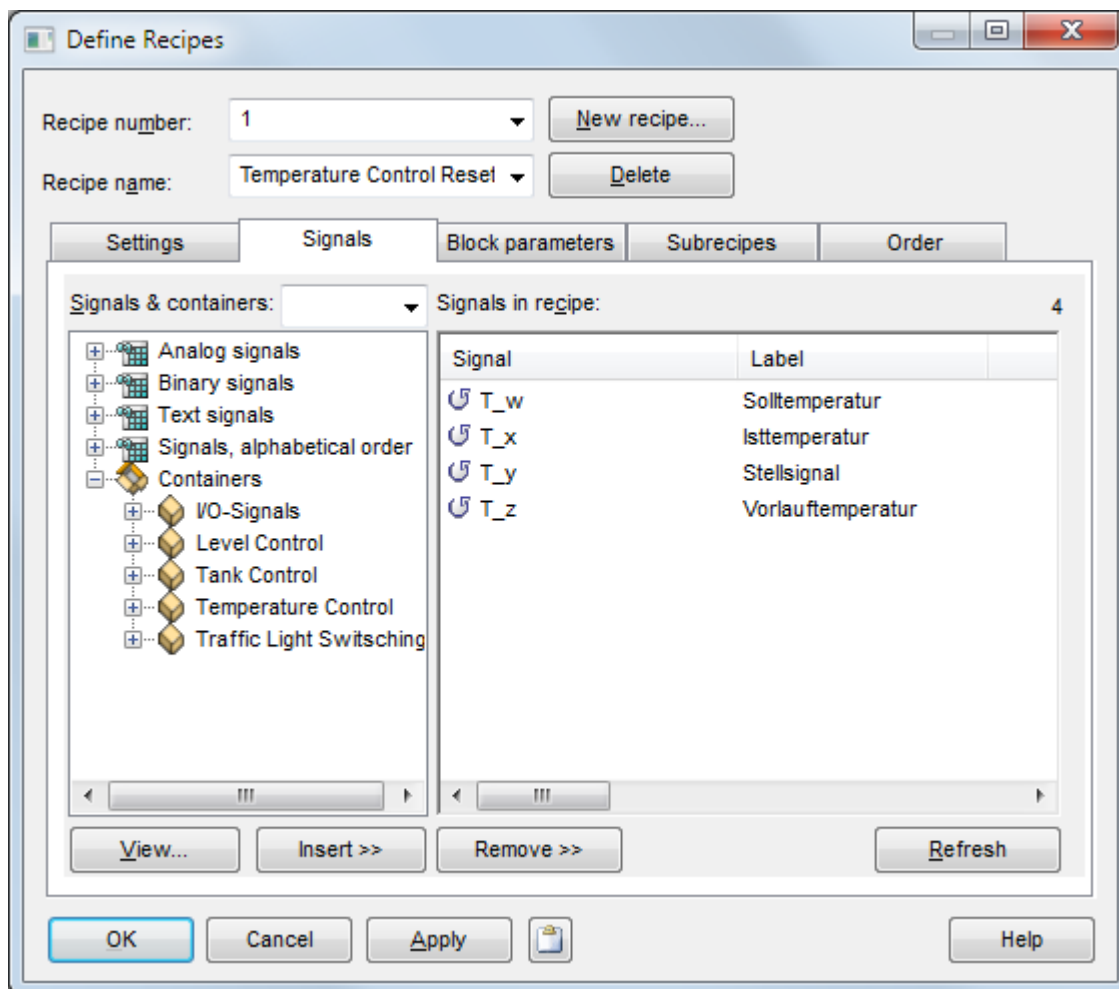
In the example project, recipes are used to bring the controls to a defined initial state with the push of a button.

Instead of setting the initial states with the recipe, the user also has the option of setting the parameters and the signal values in the block structure to defined values using the "parameter setting block" or the "analog setting command" or the "signal interface" and the "parameter interface".

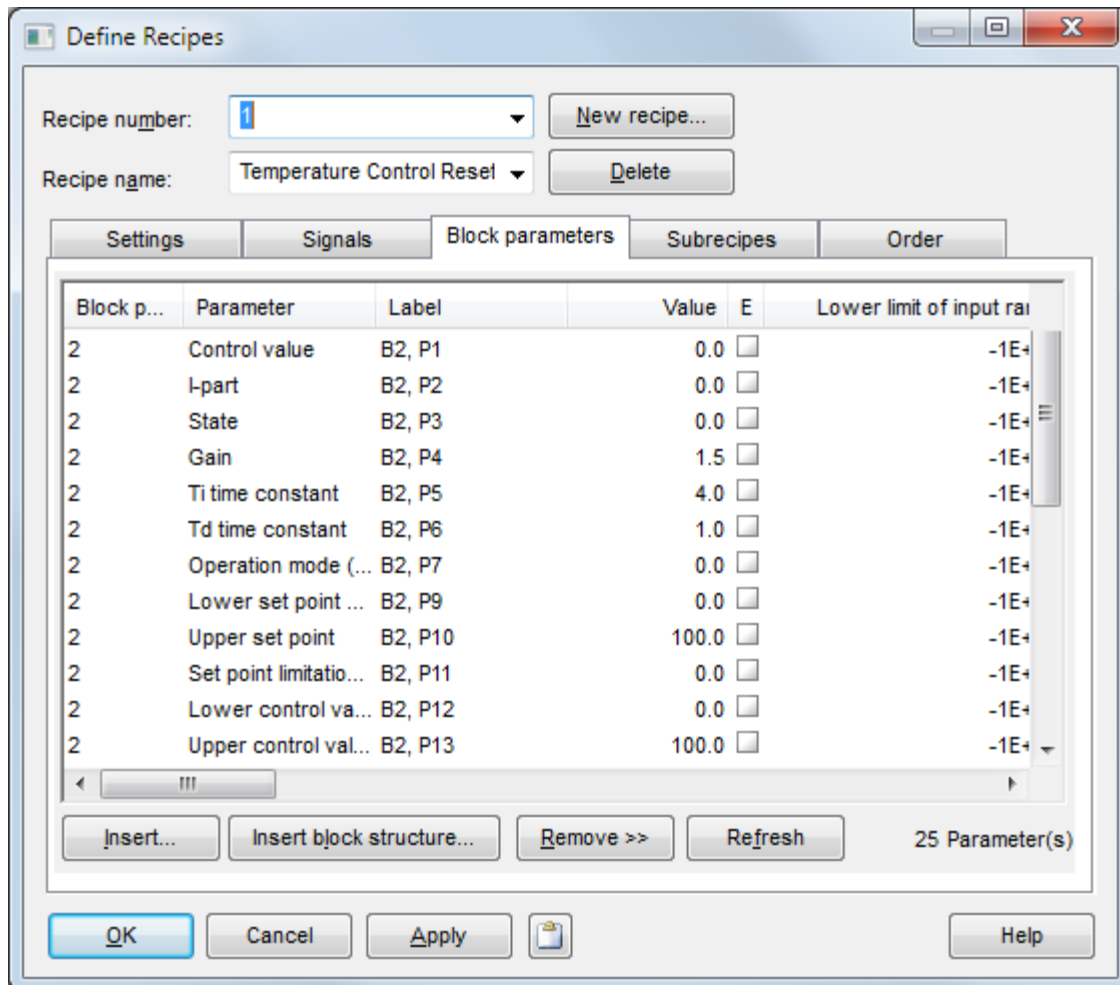
5.1 Define Recipes

You can create a recipe via *Edit - Define recipe....* Select a recipe name via "New recipe ...", e.g. "Temperature Control Reset".

Via the "Signals" tab you specify the values to which your signals are to be set when the recipe is triggered.



"Block parameters" can be used to set initial states and parameters that are used in the block structures to specified values.



You can trigger the recipe via the menu or in your process displays e.g. via a link button (see process picture "View temperature control")

5.2 Trigger Recipe (aktivate)

In the menu you can trigger the recipe via *Control - Trigger Recipe....* The recipe values are then immediately transferred to the WinErs-Server (WRPServ) and used in the control.

Instead of triggering the recipe via the menu, there is also the option of starting recipes via process pictures (e.g. macro, link button).

6 Measurement (Data Acquisition)

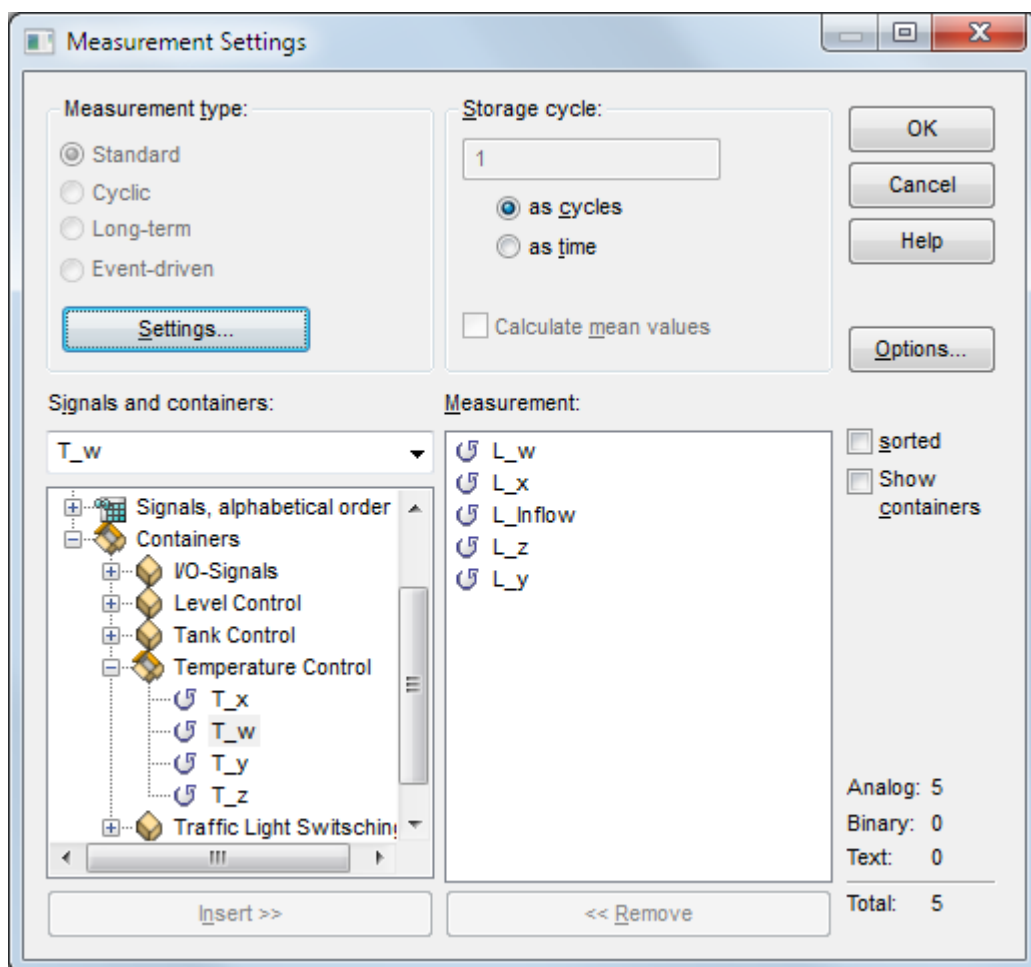
With WinErs you have the possibility to save the temporal course of your signals and to evaluate them graphically, numerically or statistically later.

To do this, you have to set the measurement value acquisition (storage) and start or stop the measurement. You can then graphically view and evaluate the saved measured values. You can also delete, archive and export measurements.

6.1 Setup Measurement

Via *Control – Measurement Setup...* you set the measured value acquisition and storage in the menu.

- Selection of the type of measured value acquisition (standard or cyclical; long-term and event-oriented are deactivated in the laboratory version)
- Selection of the storage cycle time (multiple of the set cycle time for this project), possibly selection of averaging
- Selection of the signals to be saved.



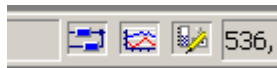
6.2 Start Measurement

The measured value acquisition (storage) is started in the menu via *Control - Start Measurement...*

When the measurement is running, all signal values that you selected when recording the measured values are saved in the specified storage time.

When the measured value acquisition is running, the middle symbol in the lower status line becomes colored.

Wenn die Messwerterfassung läuft, wird das mittlere Symbol in der unteren Statuszeile bunt.

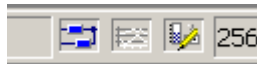


The symbol on the left (blue) must also be colored because the "Process Control" must be running.

6.3 Stop Measurement

You can stop the measured value acquisition in the menu via *Control - Stop Measurement...*

The middle respectively the right symbol in the lower button bar turns gray again.

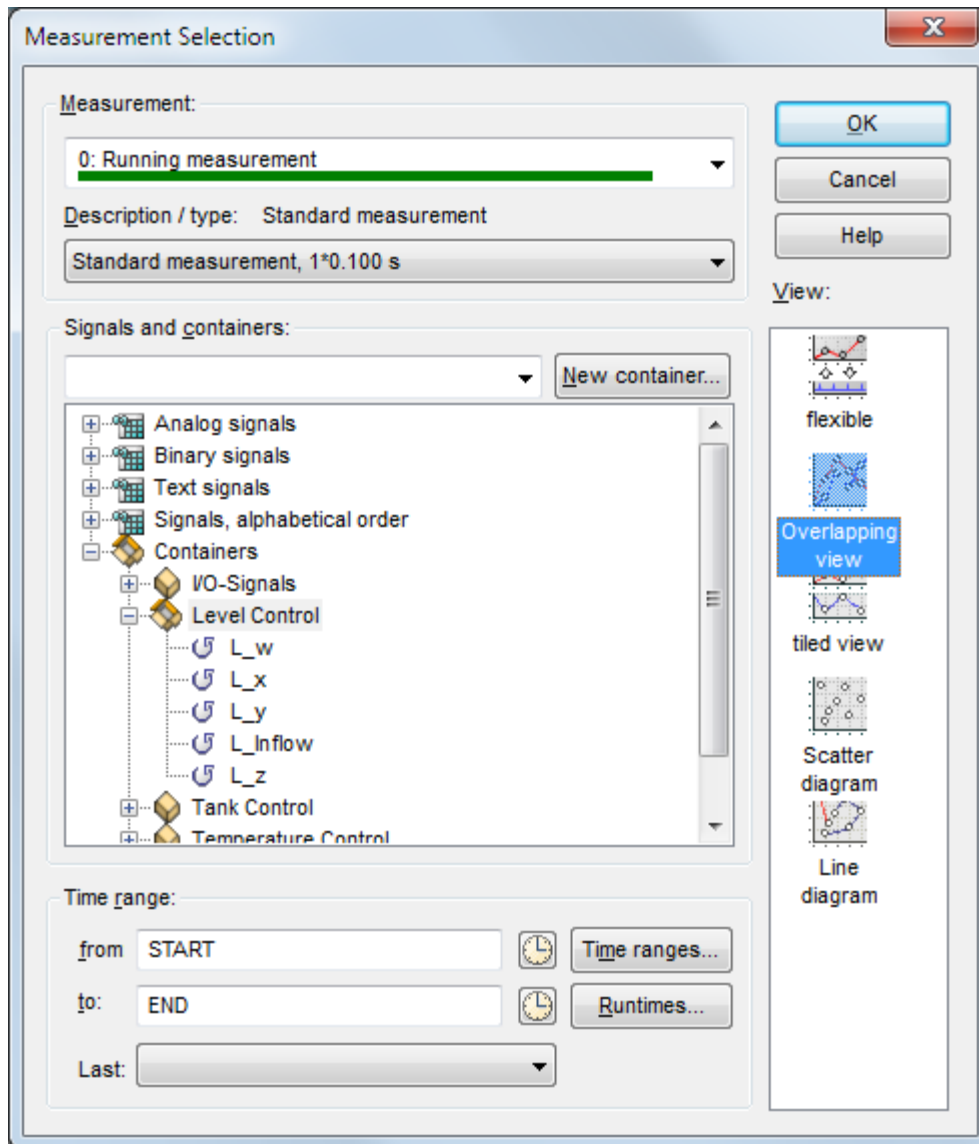


6.4 View Measurements

You can view and evaluate saved measured values under *View - Measurements, Graphical ...*

In the measurement selection, choose

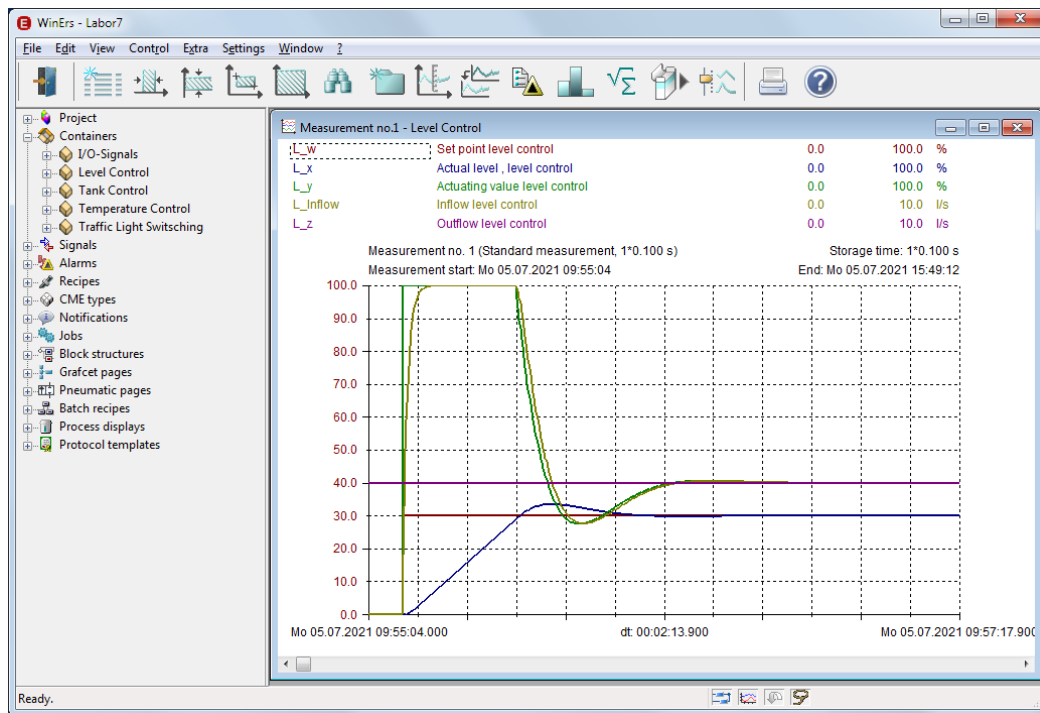
- Selection of measured value acquisition via measurement number or comment
- Select container (signal group) or signals
- Select display view
- Select a time segment



After the selection, the corresponding measurement view appears.

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In the measurement view, you can choose from various functions for evaluating the measurement in the upper button bar (select time range, select display range, ruler, measure, export to text file, print, online help, statistical evaluation, etc.; see online - Help).



6.5 Export Measurements

Via *File - Export – Measurements...* you can export your measurements to an Excel table or an ASCII file

- Enter the file name for the export file
- Select measurement
- Set options
- Select Export

6.6 Remove Measurements data

You can delete measurements in the menu via *File - Delete – Measurement Data ..*

- Select measurement
- Select Remove

We would be grateful for any information about errors, inaccuracies, expansion options, etc.

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Send E-Mail to: info@schoop.de

Would you like information on the
Process control and simulation system WinErs
or to the learning software (WinErs didactics) please contact:

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