SIEMENS

Training Document

for Comprehensive Automation Solutions

Totally Integrated Automation (T I A)

MODULE F6

Operator Control

with

WinCC flexible 2005

and

TP177B

The following symbols are provided as a guide through Module F6:

Information

Installation

Programming

Sample Exercise

Notes
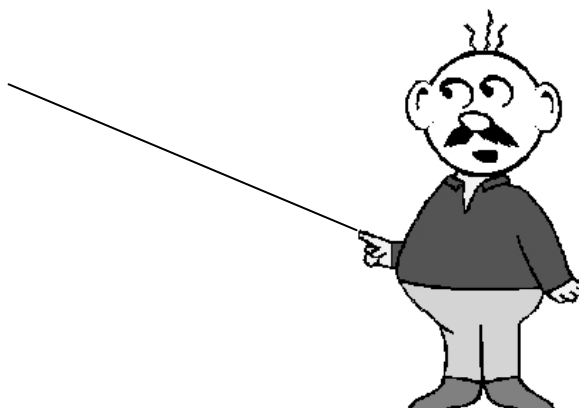
PREFACE

In terms of its contents, Module F6 is part of the teaching unit entitled **'Process Visualization'**.

```
┌─────────────────────────┐
│   Fundamentals of       │
│   STEP7 Programming      │
│  2 to 3 days    Modules A │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐        ┌─────────────────────────┐
│  Additional Functions of │        │  Plant Simulation with   │
│   STEP7 Programming      │        │     SIMIT SCE            │
│  2 to 3 days   Modules B  │        │  1 to 2 days   Modules G  │
└─────────────────────────┘        └─────────────────────────┘
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┌──────────────────┐   ┌──────────────────┐   ┌──────────────────┐
│  Programming     │   │ Industrial Fieldbus │  │  Process         │
│  Languages       │   │ Systems          │   │  Visualization   │
│ 2 to 3 days Modules C │ 2 to 3 days Modules │  2 to 3 days Modules │
└──────────────────┘   └──────────────────┘   └──────────────────┘
```

```
        ┌──────────────────┐      ┌──────────────────┐
        │ Frequency Converter │   │ IT Communication │
        │ on SIMATIC S7    │      │ wirh SIMATIC S7  │
        │ 2 to 3 days Modules │   │ 2 to 3 days Modules  F │
        └──────────────────┘      └──────────────────┘
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Learning Objective:

In Module F6, the reader is introduced to the essential functions of the software WinCC flexible 2005.
Typical task definitions are processed using a sample system.

- Installing the software

- Steps for generating a Step7 project

- Inserting an HMI station

- Interface of WinCC flexible

- Configuring display and operator objects

- Configuring messages

- Generating recipe management

- Setting up user management

Prerequisites:

- Knowledge in handling Windows

- Fundamentals of PLC programming with STEP 7 (for example, Module A3 - 'Startup'

  PLC Programming with STEP 7)

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Hardware and software required

1 PC, operating system Windows 2000 SP4 or Windows XP Professional SP1 and SP2 with MS Internet Explorer V6.0 SP1

Pentium IV with 1.6 GHz, 512MB RAM, approx. 1.5GB free hard disk storage

2 Software STEP7 V 5.4

3 Configuring software WinCC flexible 2005 Advanced

4 MPI interface for the PC (for example, PC Adapter USB)

5 Sample configuration for PLC SIMATIC S7-300:

- Power supply: PS 307 2A

- CPU: CPU 314

- Digital inputs: DI 16x DC 24V

- Digital outputs: DO 16x DC 24V/0.5A

6 Touch Panel TP177B

7 MPI or Profibus DP data cable for connecting the TP177B to the controller

1 PC

2 STEP7 V5.3

4 PC Adapter

3 Configuring Software WinCC flexible 2005 Advanced

5 SIMATIC S7-300

7 MPI or Profibus DP Data Cable

6 Touch Panel TP177B

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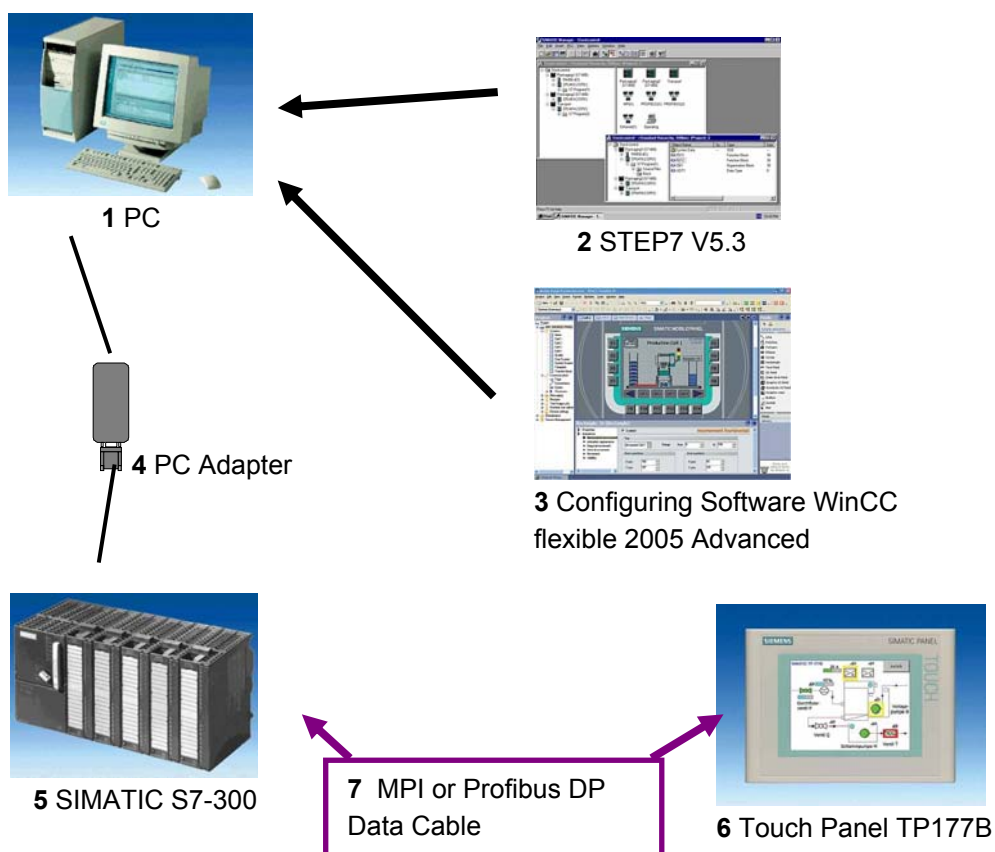
2. OPERATOR CONTROL WITH WINCC FLEXIBLE

2.1 System Description

Since processes are becoming more and more multi-layered and the demands on the functionality of machines and plants are increasing, the operator needs a high-performance tool for controlling and monitoring production plants. An HMI system (Human Machine Interface) represents the interface between a human being (the operator) and the process (machine/plant). The controller actually controls the process. That is, there are two interfaces: one between the operator and WinCC flexible (at the operator panel), and another interface between WinCC flexible and the controller.
The WinCC flexible Engineering System is the software that is used to handle all required configuring tasks. The WinCC flexible Edition determines which operator panels of the SIMATIC HMI spectrum can be configured.
WinCC flexible Runtime is the software for process visualization. In runtime, the project is executed in the process mode.

WinCC flexible performs the following tasks:

• Displaying the process
The process is mapped to the operator panel. If a status changes in the process, for example, the display at the operator panel is updated.
• Operating the process
The operator can operate the process by means of the graphic operator interface. For example, the operator can specify a setpoint for the controller, or start a motor.
• Reading out messages
If critical process states occur in the process, a message is triggered automatically; for example, if the specified limit is exceeded.
• Archiving process values and messages
The HMI system can archive messages and process values. In this way, you can document the process characteristics, and you can also access older production data later.
• Documenting process values and messages
The HMI system can read out messages and process values as protocol. Thus, you can have production data read out after the end of a shift, for example.
• Managing process parameters and machine parameters
The HMI system can store parameters for processes and machines in recipes. With one operational step, you can transfer these parameters from the operator panel to the controller, in order to change production to another product variant.

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2.2   Installation/Deinstallation

2.2.1   System Prerequisites

WinCC flexible supports all common PC platforms that are IBM/AT compatible. Although values for a minimum configuration are specified, you should use as a guide the recommended values for an optimum configuration, for WinCC flexible to operate efficiently.

System Prerequisites for	WinCC flexible ES
Operating System	Windows 2000 SP4, Windows XP Professional SP1 and SP2
	For multi-lingual configurations: Windows 2000 SP4 MUI, Windows XP Professional SP1 and SP2 MUI
Processor	
• Minimum	Pentium 4
• Recommended	$\geq$ Pentium 4, 2.0 GHz
Resolution	
• Minimum	1024 x 768
• Recommended	$\geq$ 1280 x 1024
RAM	
• Minimum	512 Mbyte
• Recommended	$\geq$ 1 Gbyte, $\geq$ 512 Mbyte for WinCC flexible micro
Hard disk drive (free memory) [1]	$\geq$ 1 Gbyte
Diskette drive [2]	3.5"/1.44 Mbyte
CD-ROM	for software installation

1) In addition to WinCC flexible, Windows also makes demands on the free hard disk drive capacity.

For example, free memory should be provided for the swap out file. The following formula has proven successful: Size of swap out file = 3 times the size of the RAM.

Additional information is provided in the Windows documentation

2) To transfer the License Key

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2.2.2 Installing WinCC flexible

After all system requirements that have been mentioned are met, install WinCC flexible from the CD-ROM. Select the scope for installing components and product languages.

- Standard installation: recommended
- Minimum installation: to save memory
- User defined installation: to specify yourself which components and product languages are installed

In addition, the required licenses have to be transferred. You can install the licenses along with the components and product languages, or you can install them subsequently. If you have obtained WinCC flexible options, install each option separately. An option is installed by loading the associated license key.

Detailed information regarding the installation are provided in the Installation Instructions on the CD-ROM 'WinCC flexible Software CD1' in the folder "Documents\<Language>\Installation Guides".

2.2.3 Deinstalling WinCC flexible

Close all applications that are open, particularly the WinCC flexible Engineering System and WinCC flexible Runtime. Deactivate WinCC flexible Smart Start.
Additional notes on WinCC flexible Smart Start are provided in the chapter "WinCC flexible Smart Start".

Open the system control by means of "Start ► Settings ► System Control".

In the system control, double click on the entry "Software". The dialog "Software" is opened.

In the dialog "Software", select the entry "SIMATIC WinCC flexible 2005". The button "Change/remove" is displayed.

Click on the button "Change/Remove". The WinCC flexible InstallShield Wizard is opened.

Activate the option "Remove program" and click on the button "Continue".

Confirm the deinstallation with "OK". WinCC flexible is removed from the configuring computer.

In the dialog that follows, close the deinstallation with the button "Complete".

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2.2.4   Totally Integrated Automation

| i |

In addition to an HMI system such as WinCC flexible, a complete automation solution includes other components, such as controller, process bus and periphery. WinCC flexible offers a particularly extensive integration with components from the SIMATIC product family:

• Integrated configuring and programming
• Integrated data management
• Integrated communication

Integration in SIMATIC STEP 7

Process variables are the connecting link for communication between controller and the HMI system. Without the advantages of Totally Integrated Automation, you have to define each variable twice: once for the controller, and once for the HMI system.
Integrating SIMATIC STEP7 into the configuration interface lowers error frequency and configuring effort. While you are configuring, you are directly accessing the STEP7 symbol table and the communication settings:

- The STEP7 symbol table includes the data point definitions (for example, addresses or data types) that were specified when you generated the control program.
- The communication settings contain the bus addresses and the control protocols
- Communication is set with NetPro, for example.

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3. PROJECT DESCRIPTION

3.1 Hardware Configuration

In our sample program for a color mixing plant, we are using a programming device with the WinCC flexible 2005 Advanced Engineering System and WinCC flexible 2005 Runtime.
The color mixing plant is controlled by means of a SIMATIC S7-300. By using a touch panel (TP177B), the operator can operate the process using the graphic operator interface. For example, the operator can specify a setpoint for the controller, or start a motor.

The programming device, the SIMATIC S7-300 controller and the operator panel TP177B are connected to each other by means of the MPI.
The color mixing plant is connected to the controller with digital inputs and outputs.

PC for Configuring
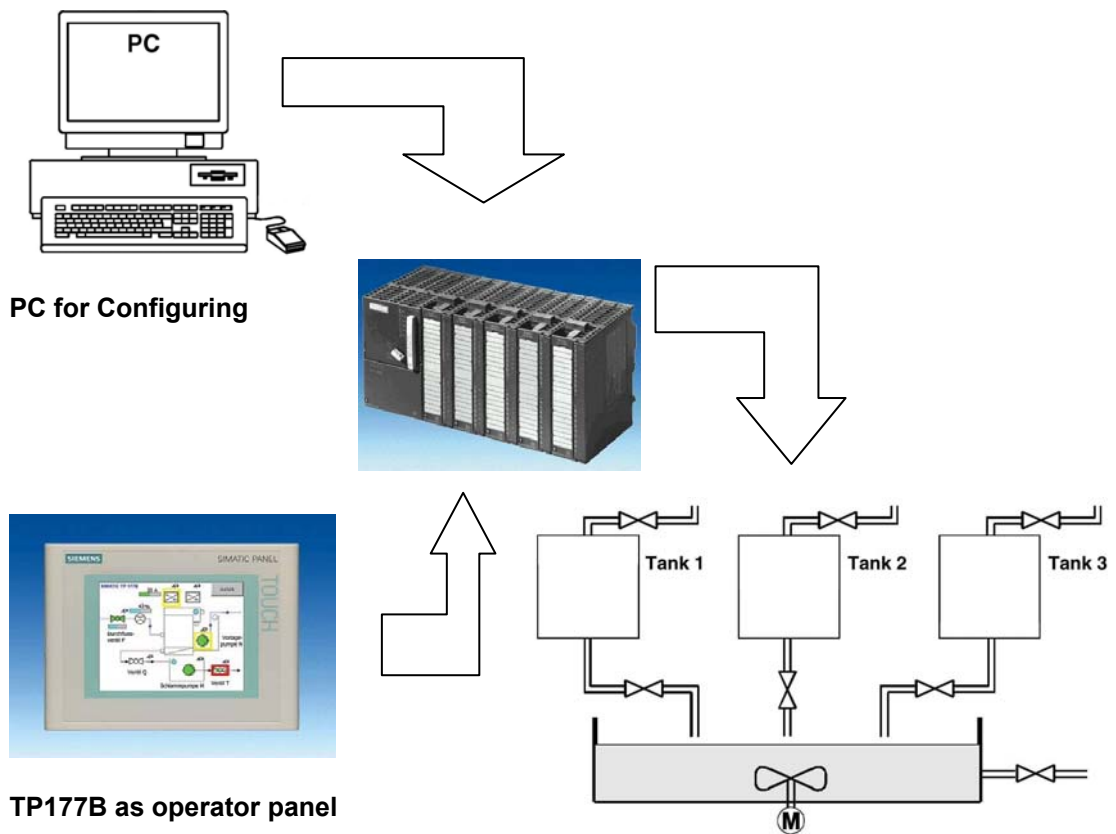
TP177B as operator panel

Note
With WinCC flexible 2005 Runtime, the touch panel TP177B can also be represented on the programmer. However, when starting WinCC flexible Runtime, the MPI address of the panel (MPI=1) is set automatically on the programmer. When using a real panel, the MPI address has to first be reset on the programmer to MPI=0.

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3.2   Plant Description
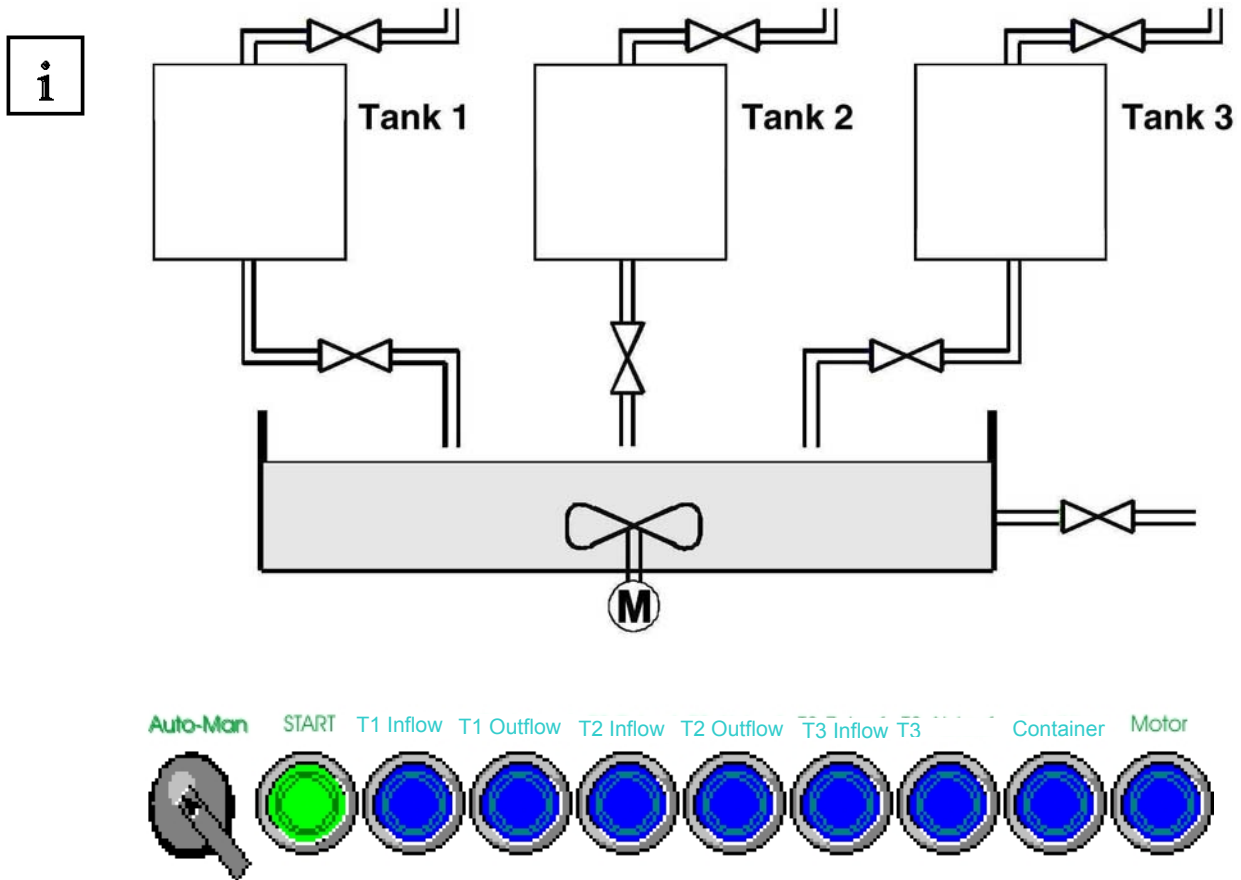
A color mixing plant is controlled with a SIMATIC S7-300 in the automatic or in the manual mode. In the "Automatic" mode, the three tanks are filled with a two step control. At the minimum level, the inflow valve opens automatically, and after the maximum level is reached, it is closed again. After the start button is operated, the specified program is executed: first, the outflow valves are opened and the container is filled from tanks with the specified amounts. After the outflow valves are closed, the mixer motor is started. After the mixing time has expired and after a short idle phase, the outflow valve of the container is opened and the finished color mixture is drained. When the container is empty, the lamp of the start button lights up, and a new color mixture can be started.
In the "Manual" mode, the automatic outflow is canceled, and all valves as well as the mixer motor can be operated manually. The lamps in the buttons for manual operation are lit.

Note

The specified amounts and the time base are determined by the program. If you want another color mixture, the specified amounts and the time base have to be changed, and a new program has to be loaded to the controller.

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3.3 Task Definition

At the color mixing plant, the program was changed with the programmer each time the mixing ratio changed. Since such changes are not only time consuming, but also dangerous if wrong entries are made, it was decided to expand the color mixing plant with a TouchPanel TP177B.

By using the panel, the following requirements are to be met:

- The color mixing plant can also be operated with the panel.
- The levels of the tanks and the container are to be displayed as a bar and also as a numerical value.
- The motion of the mixing motor is to be shown graphically.
- The specified amounts are to be entered on the panel.
- The minimum and maximum levels of the three tanks are to be entered in separate tank graphics.
- The operating modes can be switched using the panel; the respective operating mode is displayed on the panel.
- The completed mixtures are to be stored on the panel as recipes; the operator only has to select them.
- The levels are monitored. If danger arises, messages are to be read out.
- The color mixing plant can only be operated after a password was entered.
- Panel TP177B is to communicate with the SIMATIC S7-300 controller by means of the MPI.

3.4 Configuration

On the programmer, process visualization is generated for the color mixing plant, using the configuring software WinCC flexible 2005 Advanced. The process values are represented by graphics and graphic objects. Default values can be transferred to the controller with operating elements. The operator panel and the machine or the process communicate by means of **variables** via the controller. The value of a variable is written to a memory area (address) in the controller. There, it is read by the operator panel.
Process visualization is stored and after generation, it is transferred by the programming device to the operator panel TP177B.
After the panel is powered up, the process can be monitored and the plant can be operated.

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4 STEP7 PROJECT "COLOR MIXING PLANT"

4.1 New Project

Start the SIMATIC Manager.
Create a new project with the **Name** "Color Mixing Plant".

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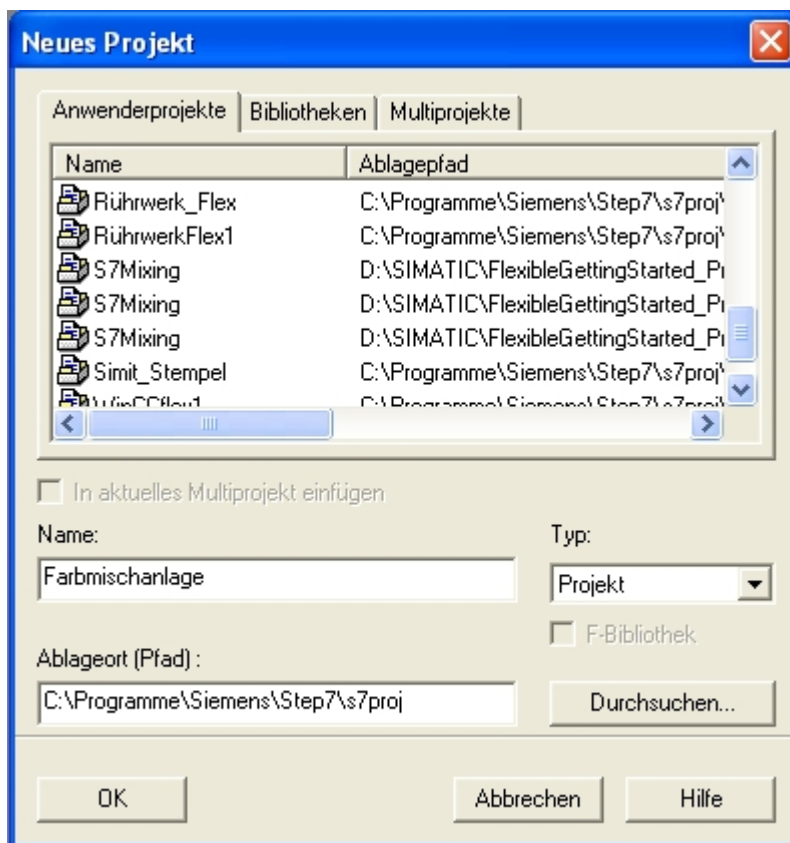
Insert the **SIMATIC 300 Station**.
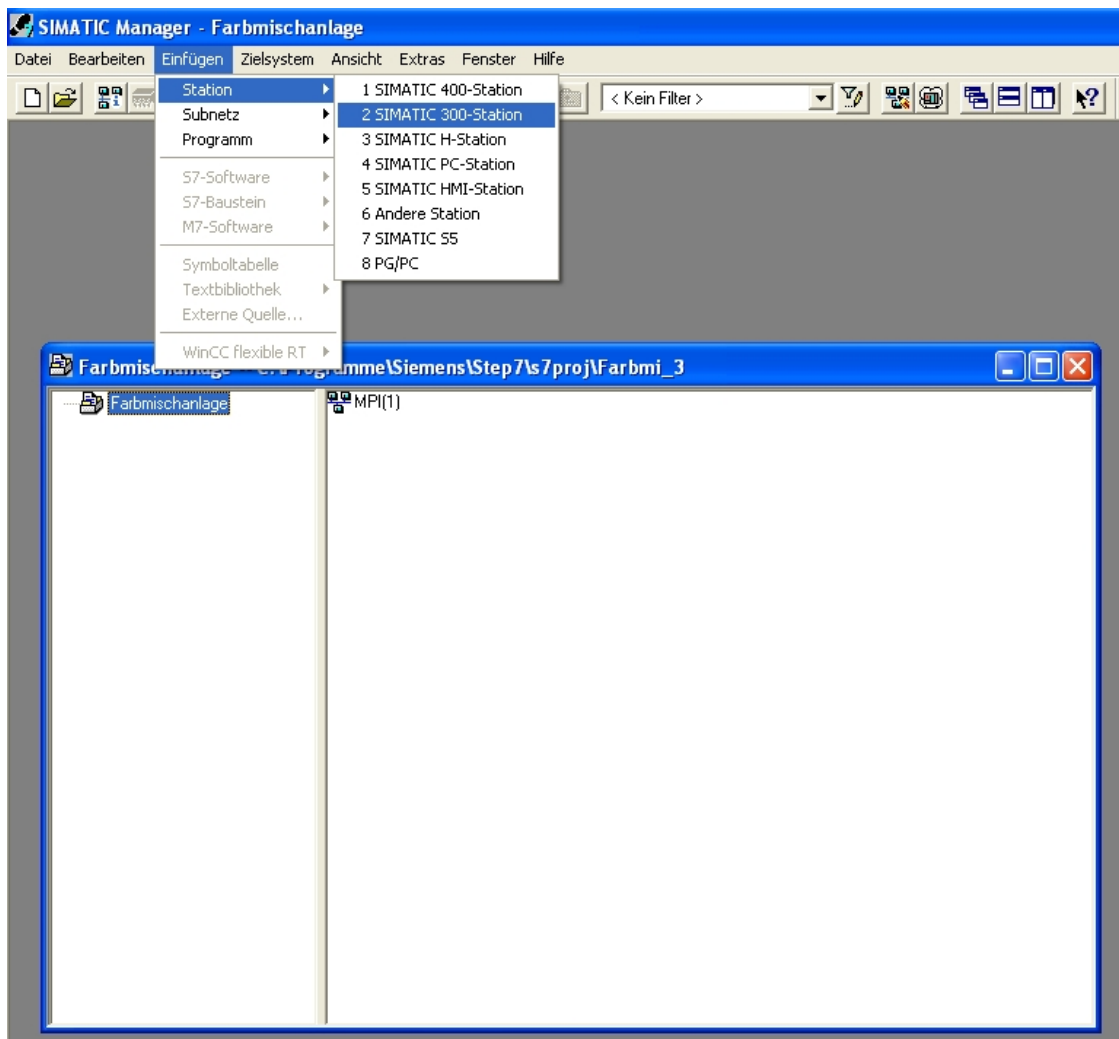
By double clicking on **Hardware**, start the hardware configuration.

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4.2 Hardware Configuration

Enter the hardware configuration of the controller you are using. Take note of the settings in the sample configuration.

For our mixing plant, we are using the following hardware:

Slot 1: PS307 2A   6ES7 307-1BA00-0AA0
Slot 2: CPU 314C-2DP   6ES7 314-6CF00-0AB0

The CPU 314C-2DP is assigned the Profibus DP Addr.2 and is connected.
The CPU 314C-2DP is assigned the MPI Addr.2 and is connected.
The clock flag is set to MB100.
At the integrated inputs and outputs DI24/DO16, the inputs are set starting with Address 0, and the outputs starting with Address 4.
Save and compile the hardware configuration.
Load the hardware to the PLC.
Close the hardware configuration.

Note
The SIMATIC S7 controller can also be simulated with the PLC simulator PLC SIM.
However, the simulator has to be started prior to loading the hardware to the CPU.

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4.3   Library of the Color Mixing Plant

First, the library with the program blocks has to be imported to the SIMATIC Manager. To this end, select the function **Dearchive** in the menu File.
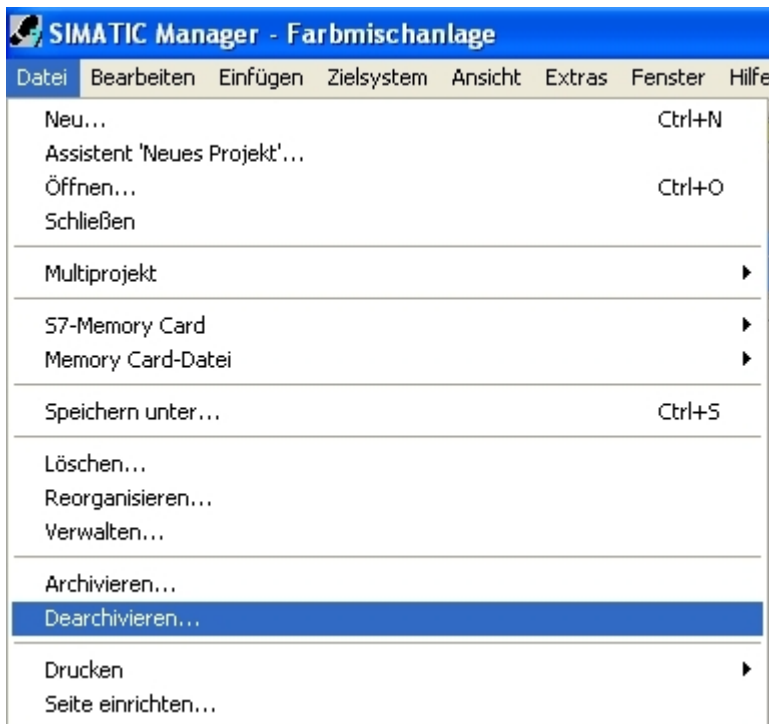
From the template directory, select the file "**Color mixing plant_Library**".
Click on the button "**Open**".

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As destination directory, select the folder "**S7LIBS**" in the Step7 directory.
Confirm with **OK**.
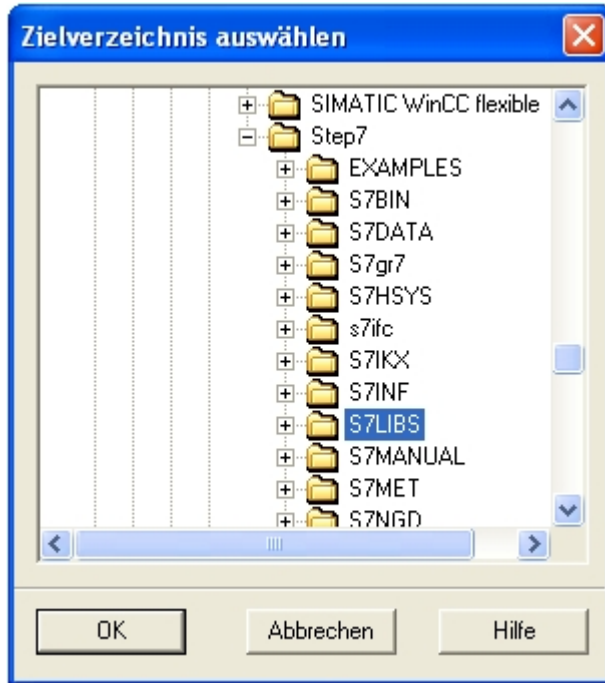
In the following window, click on the button "**No**"

<<the following objects were dearchived: Projects: None. Libraries: color mixing plant. Do you want to open them now?>>
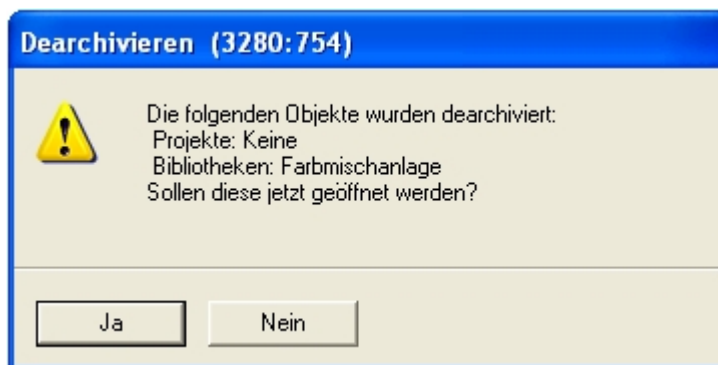
The project library "Color mixing plant" was copied to the library directory. Here, all required program blocks are stored.

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4.4 Assignment List

Open the project window in the symbol table.
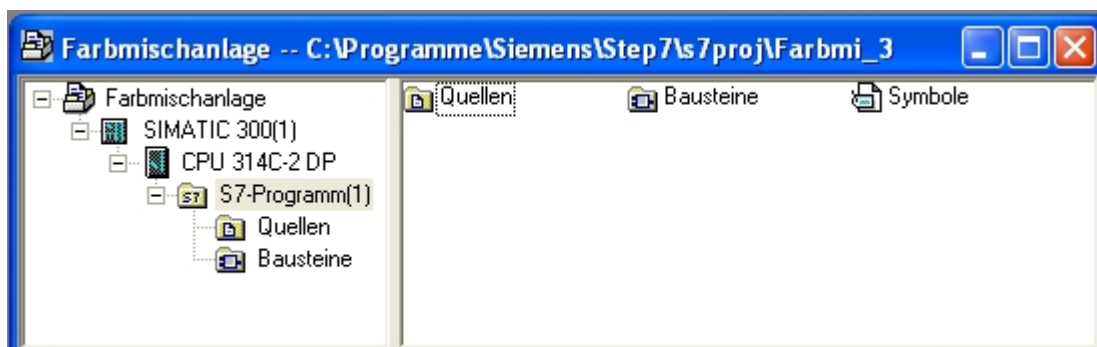
Enter the symbol assignments in the symbol table.

| Symbol	Address	Data Type	Comment
ZULAUF_T1	A 4.0	BOOL	Inflow valve Tank 1
ABLAUF_T1	A 4.1	BOOL	Outflow valve Tank 1
ZULAUF_T2	A 4.2	BOOL	Inflow valve Tank 2
ABLAUF_T2	A 4.3	BOOL	Outflow valve Tank 2
ZULAUF_T3	A 4.4	BOOL	Inflow valve Tank 3
ABLAUF_T3	A 4.5	BOOL	Outflow valve Tank 3
ABLAUF_BEH	A 4.6	BOOL	Outflow valve Container
MISCHERMOTOR	A 4.7	BOOL	Motor for the mixer
H1_STARTFREIGABE	A 5.0	BOOL	Lamp for program start enable
H2_AUTO	A 5.1	BOOL	Lamp for automatic mode
H3_MAN	A 5.2	BOOL	Lamp for manual mode
MAN_AUTO	E 0.0	BOOL	Manual-Automatic switch Auto = 1
START	E 0.1	BOOL	Start program
HAND_IN_T1	E 1.0	BOOL	Manual operation for inflow valve of Tank 1
HAND_OUT_T1	E 1.1	BOOL	Manual operation for outflow valve of Tank
HAND_IN_T2	E 1.2	BOOL	Manual operation for inflow valve of Tank
HAND_OUT_T2	E 1.3	BOOL	Manual operation for outflow valve of Tank
HAND_IN_T3	E 1.4	BOOL	Manual operation for inflow valve of Tank 3
HAND_OUT_T3	E 1.5	BOOL	Manual operation for outflow valve of Tank
HAND_OUT_BEH	E 1.6	BOOL	Manual operation for outflow valve of container
HAND_MOTOR	E 1.7	BOOL	Manual operation for mixer motor
VORGABE_T1	MW 120	INT	Specified amount for Tank1
VORGABE_T2	MW 122	INT	Specified amount for Tank2
VORGABE_T3	MW 124	INT	Specified amount for Tank 3
INHALT_T1	MW 126	INT	Tank content Tank1
INHALT_T2	MW 128	INT	Tank content Tank2
INHALT_T3	MW 130	INT	Tank content Tank3
INHALT_BEH	MW 132	INT	Tank content of container
MISCHERZEIT	T 1	TIMER	Mixer time in S5 format
RUHEZEIT	T 2	TIMER	Idle time in S5 format

Save and **Close** the symbol table.

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4.5 Control Program

4.5.1 Function Block FB1

With the right mouse key, generate the FB1 in the folder Blocks.
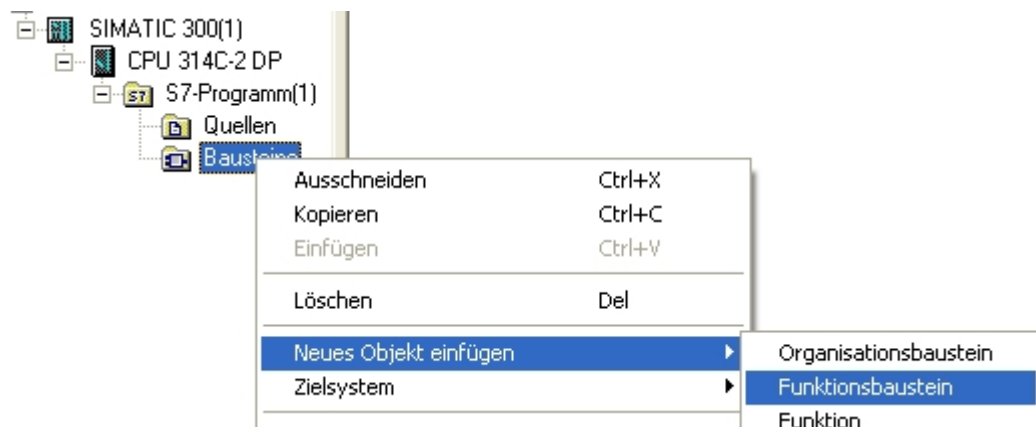
Enter the symbolic name and the symbol comment.
Select the programming language "**FBD**".
Place the check mark at **Multi-instance capability**.
Confirm with **OK**.

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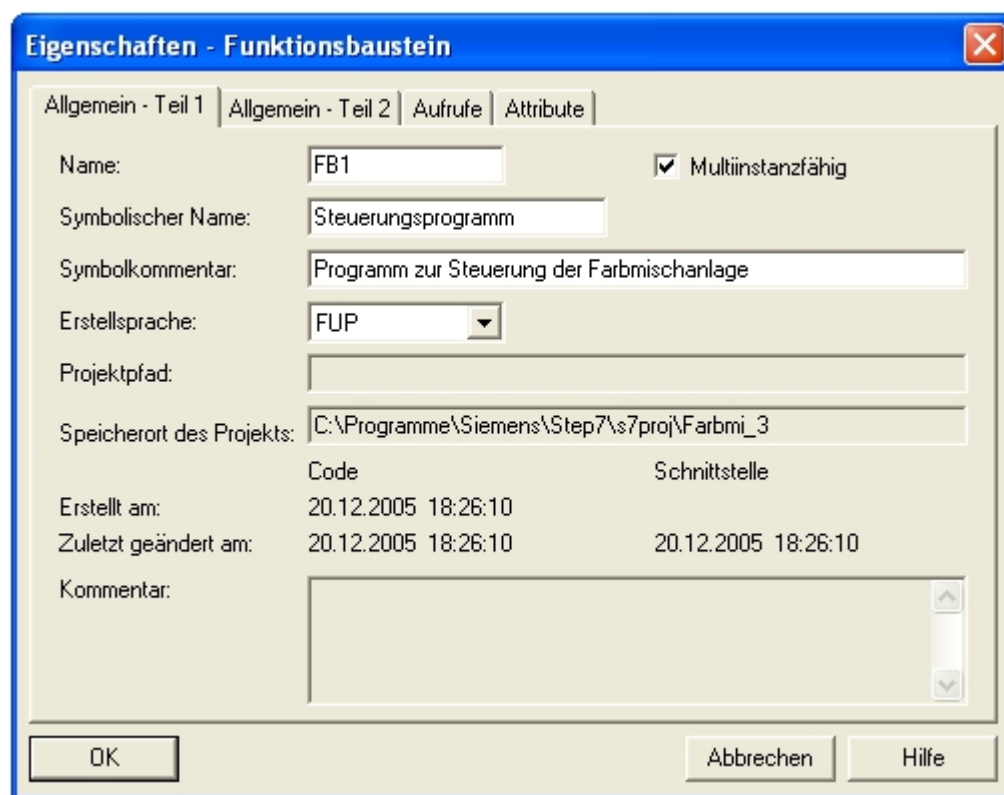
4.5.2 Variable Declaration

Open FB1 with a double click.
Enter the following STAT variables.

	Name	Datentyp	Adresse
	man_auto	Bool	0.0
	start_prog	Bool	0.1
	hand_ablauf_tank1	Bool	0.2
	hand_ablauf_tank2	Bool	0.3
	hand_ablauf_tank3	Bool	0.4
	hand_zulauf_tank1	Bool	0.5
	hand_zulauf_tank2	Bool	0.6
	hand_zulauf_tank3	Bool	0.7
	hand_mischermotor	Bool	1.0
	hand_ablauf_behaelter	Bool	1.1

Inhalt von: 'Umgebung\Schnittstelle\STAT'

Tree view: IN_OUT, STAT (man_auto, start_prog, hand_ablauf_tank1, hand_ablauf_tank2, hand_ablauf_tank3, hand_zulauf_tank1, hand_zulauf_tank2, hand_zulauf_tank3, hand_mischermotor, hand_ablauf_behaelter), TEMP

<<hand_ablauf = manual outflow; hand-zulauf = manual inflow; hand_ablauf_behaelter = manual outflow container>>

Enter the following TEMP variables.

Inhalt von: 'Umgebung\Schnittstelle\TEMP'

	Name	Datentyp	Adresse
	ablaufmenge_tank1	Int	0.0
	ablaufmenge_tank2	Int	2.0
	ablaufmenge_tank3	Int	4.0

Tree view: Schnittstelle (IN, OUT, IN_OUT, STAT, TEMP (ablaufmenge_tank1, ablaufmenge_tank2, ablaufmenge_tank3))

<<ablaufmenge = outflow amount>>

Note
The STAT variables are connected to the operator buttons on touch panel TP177B.
The TEMP variables are needed for passing on values in FB1.

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4.5.3 Inserting Panel Inputs FB5 as Multi Instance Block from the Program Library

Drag **FB5** for the panel inputs from the library "Color mixing plant" to Network 1.
This block is needed for connecting the input signals from the panel to the inputs of the controller.
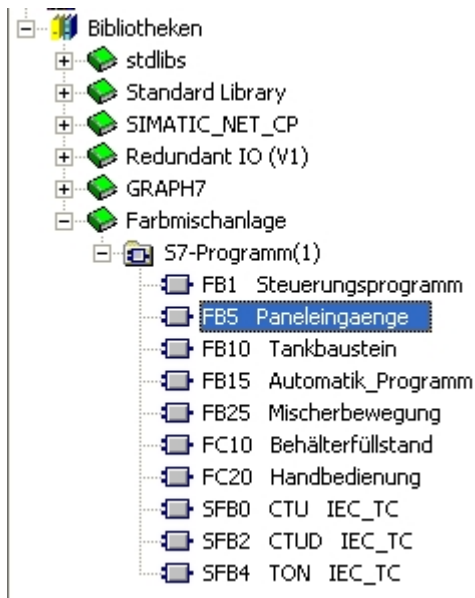
Right click on the inserted block and select "**Change in multi-instance call**".
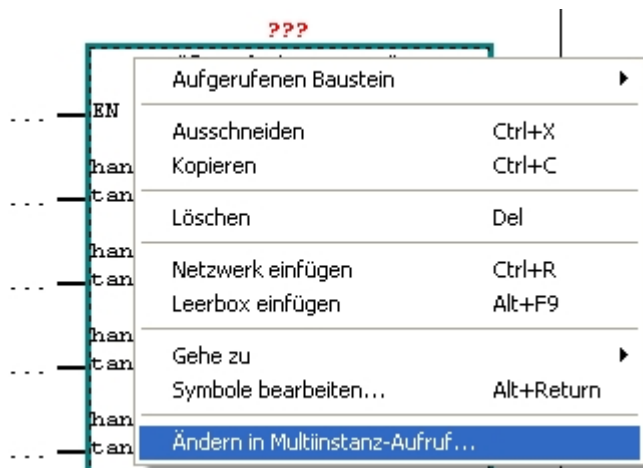
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Enter the name "**panel inputs**".

Confirm with **OK**.

Definieren des Multiinstanz-Aufrufs	✕
Name der Multiinstanz:	paneleingaenge
Kommentar:	
OK	Abbrechen	Hilfe

Wire the upper 10 inputs of the block to the STAT variables.

```
                        #paneleingaenge
                    ┌─────────────────────────┐
            ... ──── EN
                    │
  #hand_zulauf_     │ hand_zulauf_
          tank1 ──── tank1
                    │
  ┌─────────────┐   │ hand_zulauf_
  │             │   │ tank2
  └─────────────┘   │
```

hand_zulauf_tank2					
HAND_IN_T1	BOOL	E	1.0	H
HAND_IN_T2	BOOL	E	1.2	H
HAND_IN_T3	BOOL	E	1.4	H
hand_mischermotor	Bool	DIX	1.0	
HAND_MOTOR	BOOL	E	1.7	H
HAND_OUT_BEH	BOOL	E	1.6	H
HAND_OUT_T1	BOOL	E	1.1	H
HAND_OUT_T2	BOOL	E	1.3	H
HAND_OUT_T3	BOOL	E	1.5	H
hand_zulauf_tank1	Bool	DIX	0.5	
hand_zulauf_tank2	Bool	DIX	0.6	
hand_zulauf_tank3	Bool	DIX	0.7	
man_auto	Bool	DIX	0.0	
MAN_AUTO	BOOL	E	0.0	M
MISCHERMOTOR	BOOL	A	4.7	M
MISCHERZEIT	TIMER	T	1	M
paneleingaenge	Paneleing...	DID	2	
RUHEZEIT	TIMER	T	2	R
START	BOOL	E	0.1	P
start_prog	Bool	DIX	0.1	

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Wire the lower 10 inputs of the block with the symbolic names.

```
#hand_zulauf_          hand_zulauf_
      tank3 ──────     tank3

#hand_ablauf_          hand_ablauf_
      tank1 ──────     tank1

#hand_ablauf_          hand_ablauf_
      tank2 ──────     tank2

#hand_ablauf_          hand_ablauf_
      tank3 ──────     tank3

#hand_ablauf_          hand_ablauf_
   behaelter ──────    behaelter

 #start_prog ──────    start_prog

      #hand_           hand_
 mischermotor ──────   mischermotor

   #man_auto ──────    man_auto

                       hand_zulauf_
 "HAND_IN_T1" ──────   tank1_plc

                       hand_zulauf_
 "HAND_IN_T2" ──────   tank2_plc

                       hand_zulauf_
 "HAND_IN_T3" ──────   tank3_plc

                       hand_ablauf_
 "HAND_OUT_T1" ─────   tank1_plc

                       hand_ablauf_
 "HAND_OUT_T2" ─────   tank2_plc

                       hand_ablauf_
 "HAND_OUT_T3" ─────   tank3_plc

                       hand_ablauf_
 "HAND_OUT_BEH" ────   behaelte_plc

   "MAN_AUTO" ──────   man_auto_plc

                       start_prog_
      "START" ─────    plc

                       hand_
                       mischermotor_
 "HAND_MOTOR"          plc                  ENO
```

"HAND_MOTOR"				
HAND_MOTOR	BOOL	E	1.7	H
HAND_OUT_BEH	BOOL	E	1.6	H
HAND_OUT_T1	BOOL	E	1.1	H
HAND_OUT_T2	BOOL	E	1.3	H
HAND_OUT_T3	BOOL	E	1.5	H

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4.5.4 Tank Block FB10

Create a new network.
Drag the tank block **FB10** from the library to Network 2.
Right click on the inserted block.
Select "**Change to multi-instance call**"
Enter the name "**tank1**".
Confirm with **OK**.

This block contains the two step control and the calculations for simulating the level. When level sensors are used, only the two step control would be necessary. Wire the block's inputs.
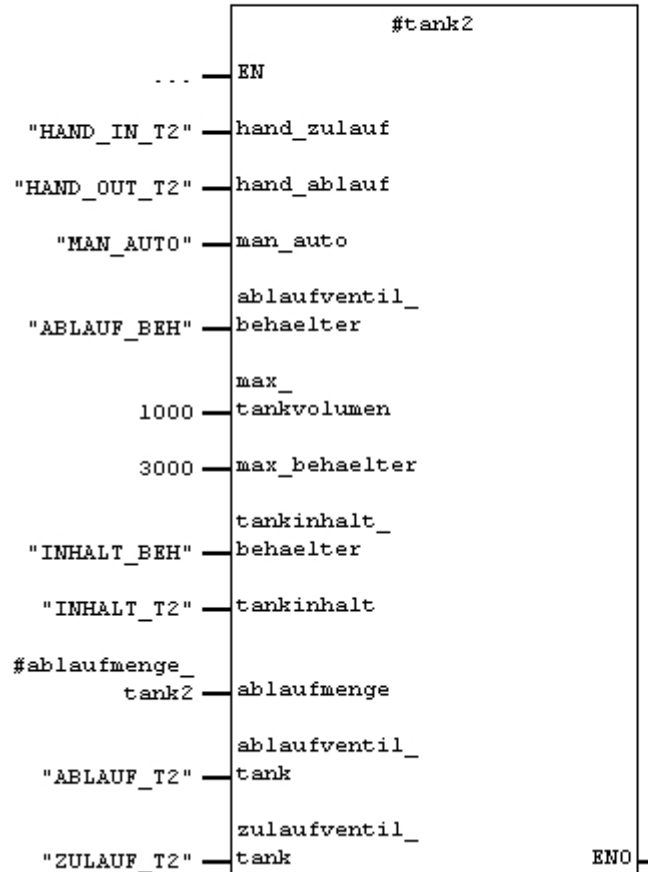
Netzwerk 2: Tank1

Kommentar:

```
                                          #tank1
                          ...  ──── EN
           "HAND_IN_T1"  ──── hand_zulauf
          "HAND_OUT_T1"  ──── hand_ablauf
            "MAN_AUTO"   ──── man_auto
                              ablaufventil_
          "ABLAUF_BEH"   ──── behaelter
                              max_
                 1000    ──── tankvolumen
                 3000    ──── max_behaelter
                              tankinhalt_
          "INHALT_BEH"   ──── behaelter
           "INHALT_T1"   ──── tankinhalt
         #ablaufmenge_
                 tank1   ──── ablaufmenge
                              ablaufventil_
          "ABLAUF_T1"    ──── tank
                              zulaufventil_
          "ZULAUF_T1"    ──── tank              ENO ──
```

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Repeat the steps for Tank2 in Network 3.

```
Netzwerk 3 : Tank2

Kommentar:
```

```
                                    #tank2
                  ... ──┤EN

        "HAND_IN_T2" ──┤hand_zulauf

       "HAND_OUT_T2" ──┤hand_ablauf

         "MAN_AUTO" ──┤man_auto

                        ablaufventil_
        "ABLAUF_BEH" ──┤behaelter

                        max_
              1000 ──┤tankvolumen

              3000 ──┤max_behaelter

                        tankinhalt_
        "INHALT_BEH" ──┤behaelter

         "INHALT_T2" ──┤tankinhalt

       #ablaufmenge_
            tank2 ──┤ablaufmenge

                        ablaufventil_
         "ABLAUF_T2" ──┤tank

                        zulaufventil_
         "ZULAUF_T2" ──┤tank              ENO├──
```
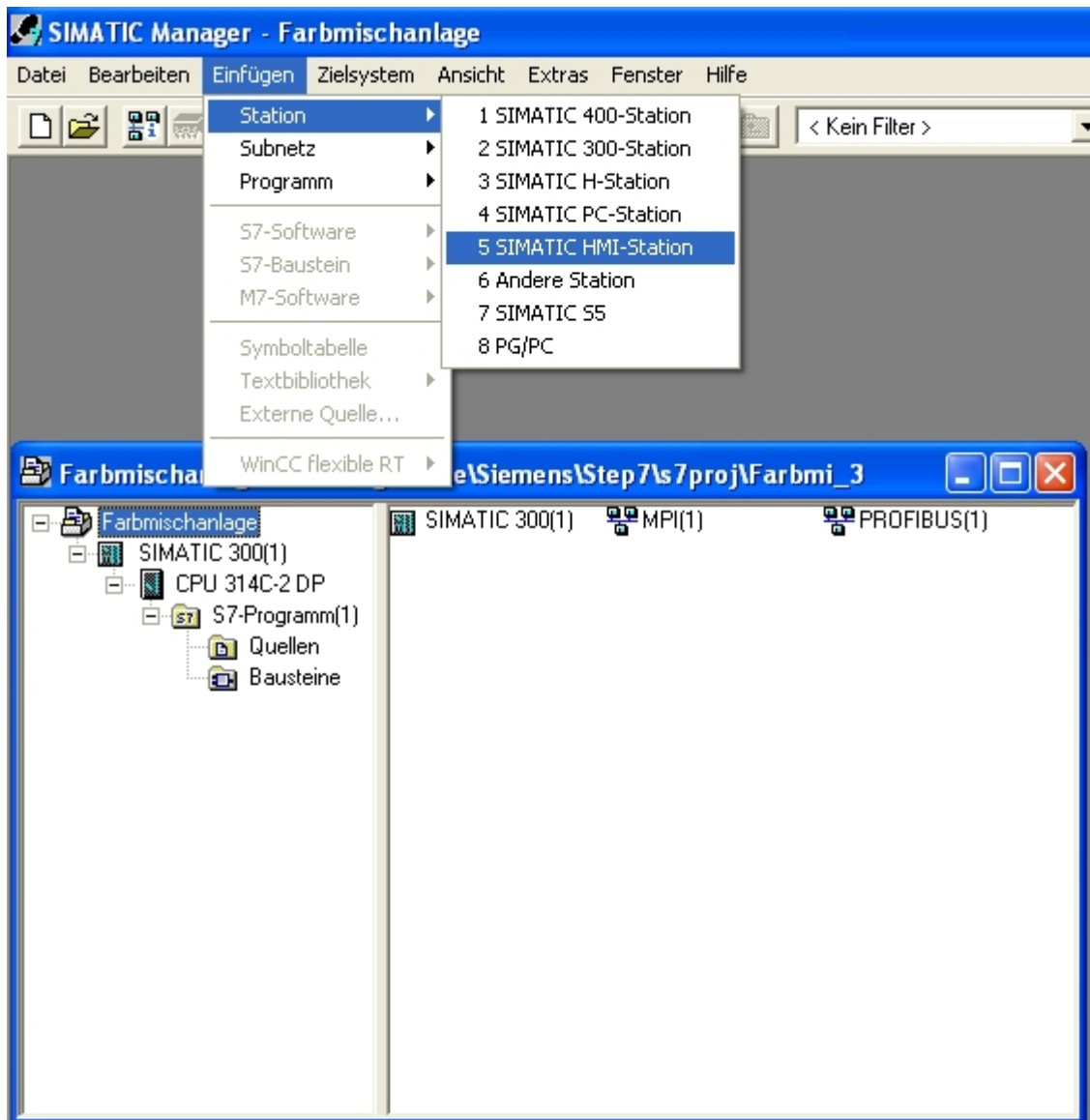
Note

Writing the symbolic names in "CAPITALS" and the variables in "lower case letters" makes better assignments possible.

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Repeat the steps for Tank3 in Network 4.

Netzwerk 4 : Tank3

Kommentar:

```
                              #tank3
          ...  ──│EN
   "HAND_IN_T3" ──│hand_zulauf
  "HAND_OUT_T3" ──│hand_ablauf
     "MAN_AUTO" ──│man_auto
                  │ablaufventil_
   "ABLAUF_BEH" ──│behaelter
                  │max_
          1000  ──│tankvolumen
          3000  ──│max_behaelter
                  │tankinhalt_
  "INHALT_BEH"  ──│behaelter
   "INHALT_T3"  ──│tankinhalt
 #ablaufmenge_
        tank3  ──│ablaufmenge
                  │ablaufventil_
  "ABLAUF_T3"   ──│tank
                  │zulaufventil_
  "ZULAUF_T3"   ──│tank                 ENO│──
```
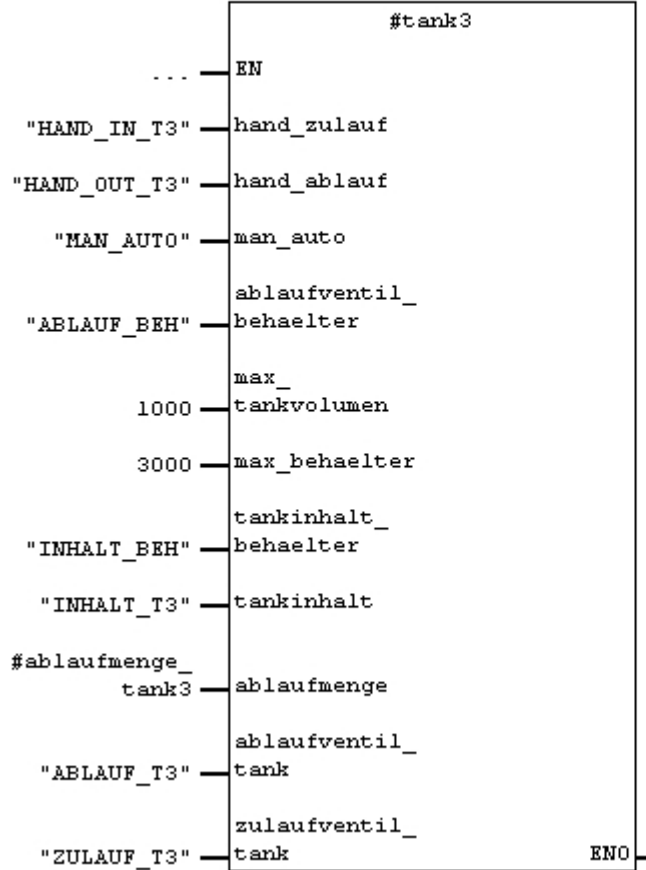
Create a new network and drag tank block **FC10** from the library to Network 5.

Netzwerk 5 : Calculating the container level

Kommentar:

```
                Container Level        '
          ...  ──│EN
 #ablaufmenge_   │ablaufmenge_
        tank1  ──│tank1
 #ablaufmenge_   │ablaufmenge_
        tank2  ──│tank2      tankinhalt_
                 │           behaelter│── "INHALT_BEH"
 #ablaufmenge_   │ablaufmenge_
        tank3  ──│tank3              ENO│──
```

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4.5.5   Automatic Program Sequence FB15

The automatic program sequence is described in the plant description.

Netzwerk 6 : Automatic Program Sequence

Kommentar:

```
                                  #automatik_programm
               ...   ──EN
           "START"   ──start_prog
        "MAN_AUTO"   ──man_auto
                       hand_ablauf_
     "HAND_OUT_BEH"  ──beh_plc
                       hand_motor_
      "HAND_MOTOR"   ──plc
                       tankinhalt_
        "INHALT_T1"  ──tank1
                       tankinhalt_
        "INHALT_T2"  ──tank2
                       tankinhalt_
        "INHALT_T3"  ──tank3
       "VORGABE_T1"  ──vorgabe_tank1
       "VORGABE_T2"  ──vorgabe_tank2
       "VORGABE_T3"  ──vorgabe_tank3
      #ablaufmenge_    ablaufmenge_
             tank1   ──tank1
      #ablaufmenge_    ablaufmenge_
             tank2   ──tank2        ablaufventil_
      #ablaufmenge_    ablaufmenge_        tank1 ──"ABLAUF_T1"
             tank3   ──tank3        ablaufventil_
                       tankinhalt_          tank2 ──"ABLAUF_T2"
       "INHALT_BEH"  ──behaelter    ablaufventil_
     "MISCHERZEIT"   ──mischerzeit         tank3 ──"ABLAUF_T3"
        "RUHEZEIT"   ──ruhezeit       mischermotor ──"MISCHERMOTOR"
                       vorgabe_       ablaufventil_
                       mischerzeit_      behaelter ──"ABLAUF_BEH"
         S5T#15S     ──s5                          "H1_
                       vorgabe_       startfreigabe ──STARTFREIGABE"
          S5T#5S     ──ruhezeit_s5            ENO ──
```

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4.5.6 Manual Operation FC20

Create a new network and drag the **FC20** from the library to Network 7.
This block contains the manual operation of the tanks' outflow valves in the manual mode.
This FC20 has to be called after the FB15, since the automatic valve operations of the FB15 have to be overwritten by the manual mode in FC20.
Wire the inputs of the block.

Netzwerk 7: Manual mode of the outflow valves of the tanks

Kommentar:

```
                          "Handbedienung"
              ... ——| EN

     "MAN_AUTO" ——| man_auto

                   | hand_
                   | ablaufventil_
  "HAND_OUT_T1" ——| tank1

                   | hand_
                   | ablaufventil_
  "HAND_OUT_T2" ——| tank2

                   | hand_
                   | ablaufventil_
  "HAND_OUT_T3" ——| tank3

            3000 ——| max_behaelter

                   | tankinhalt_
    "INHALT_BEH" ——| behaelter

                   | ablaufventil_
    "ABLAUF_T1" ——| tank1

                   | ablaufventil_
    "ABLAUF_T2" ——| tank2

                   | ablaufventil_
    "ABLAUF_T3" ——| tank3          ENO |——
```

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4.5.7 Mixer Motion FB25

This block is necessary to simulate the mixer motion. When the mixer motor is in operation, a count in 150ms cycles, of the value 0 to 12 is incremented.

Netzwerk 8 : Simulate mixer motion

Kommentar:

```
                        #mischerbewe
                            gung
            ...  ── EN

  "MISCHERMOTOR" ── start        ENO
```
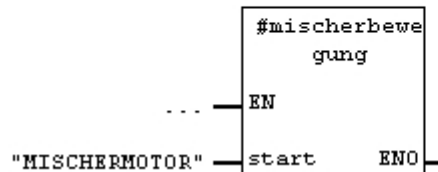
4.5.8 Automatic and Manual Lamps

In the last FB1 network, assignments for the automatic and manual lamps are generated.

Netzwerk 9 : Assign authomatic and manual lamp

Kommentar:

```
                                            "H2_AUTO"
                                                =
                    ┌─────────┐
  "MAN_AUTO" ───────│    &    │────────┐
                    └─────────┘        │
                                       │   "H3_MAN"
                                       │       =
                                       └──○
```
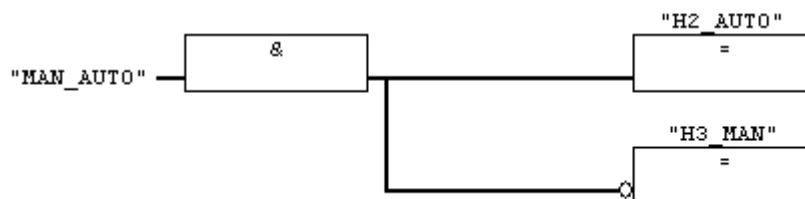
FB1 is now completed.
Save and **Close** FB1.

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4.5.9   Organization Block OB1

Open **OB1** by double clicking on it.
Drag **FB1** from the folder "FB Blocks" to Network 1 for the control program

```
FB Bausteine
    FB1   Steuerungsprogramm
    FB5   Paneleingaenge
    FB10  Tankbaustein
    FB15  Automatik_Programm
    FB25  Mischerbewegung
FC Bausteine
SFB Bausteine
SFC Bausteine
Multiinstanzen
Bibliotheken
```

Enter **DB1** as instance data block.
In the message window, click on the button "**Yes**".

```
OB1 :   "Main Program Sweep (Cycle)"

Kommentar:



Netzwerk 1: Programmaufruf

Kommentar:


                          db1
                   "Steuerungsprogramm"
           ---   EN                    ENO
```

```
KOP/AWL/FUP  (30:150)

   ⚠   Der Instanz-Datenbaustein DB 1 existiert nicht. Soll er
       generiert werden?


        Ja            Nein            Hilfe
```
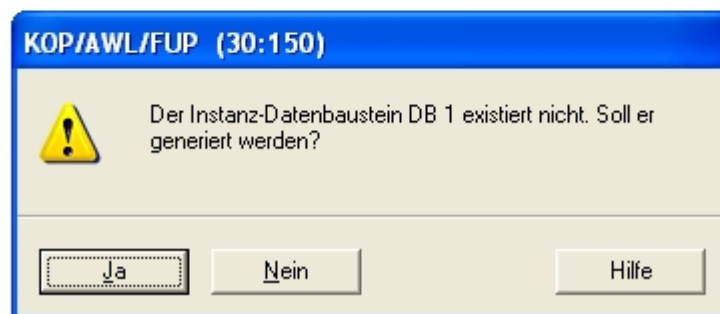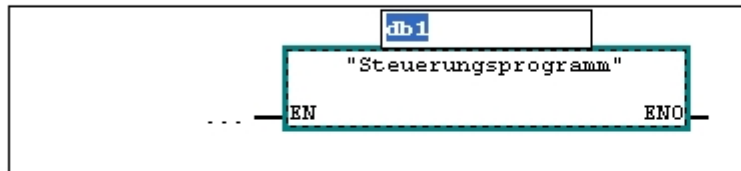
OB1 is now complete.
Save and **Close** OB1.

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4.6 Loading to the CPU

The control program for the color mixing plant is not completed.
In the project window, highlight the folder **Blocks** and then click on the button "**Load**"
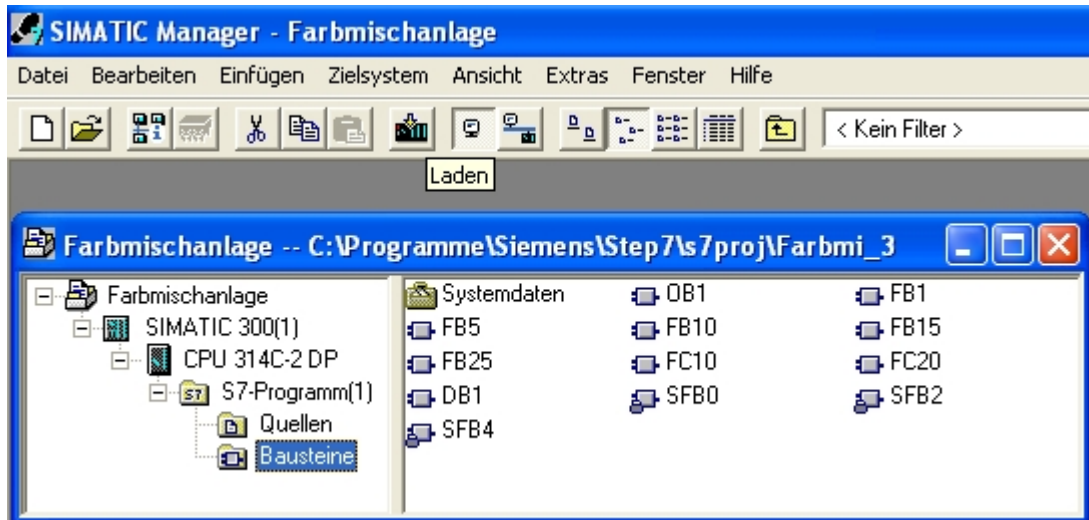
4.7 Program Test

After loading the control program to the CPU, switch the controller to the RUN mode.
Test your program. For example, at the tank blocks, you can monitor the levels.
With "Monitor/control variables", you can enter levels (MW120 to MW124).

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5 SIMATIC HMI STATION

5.1 Inserting an HMI Station

In your project window, highlight the project name "Color mixing plant" (Farbmischanlage) and insert a SIMATIC HMI station.

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The properties of WinCC flexible RT are opened.
As device type, select **TP 177B color PN/DP**.
Confirm with **OK**.
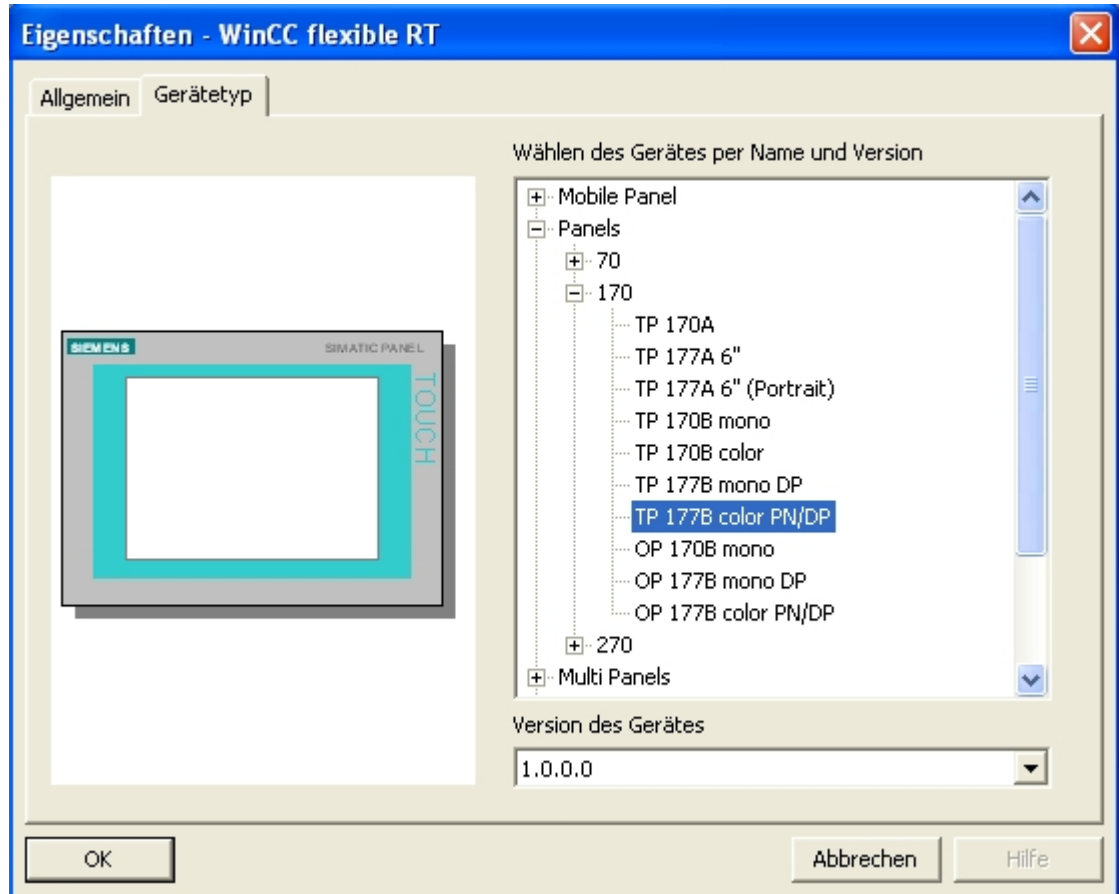
SIMATIC WinCC flexible ES is started and a SIMATIC HMI station is inserted.

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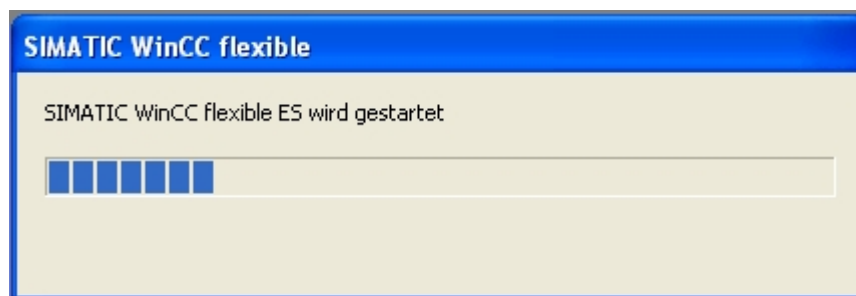
5.2 Configuring the HMI Station

At the inserted SIMATIC HMI station, click on **Configuration**.

Connect the SIMATIC HMI station with the MPI network.
Click on Save and Compile.
Close the configuration.
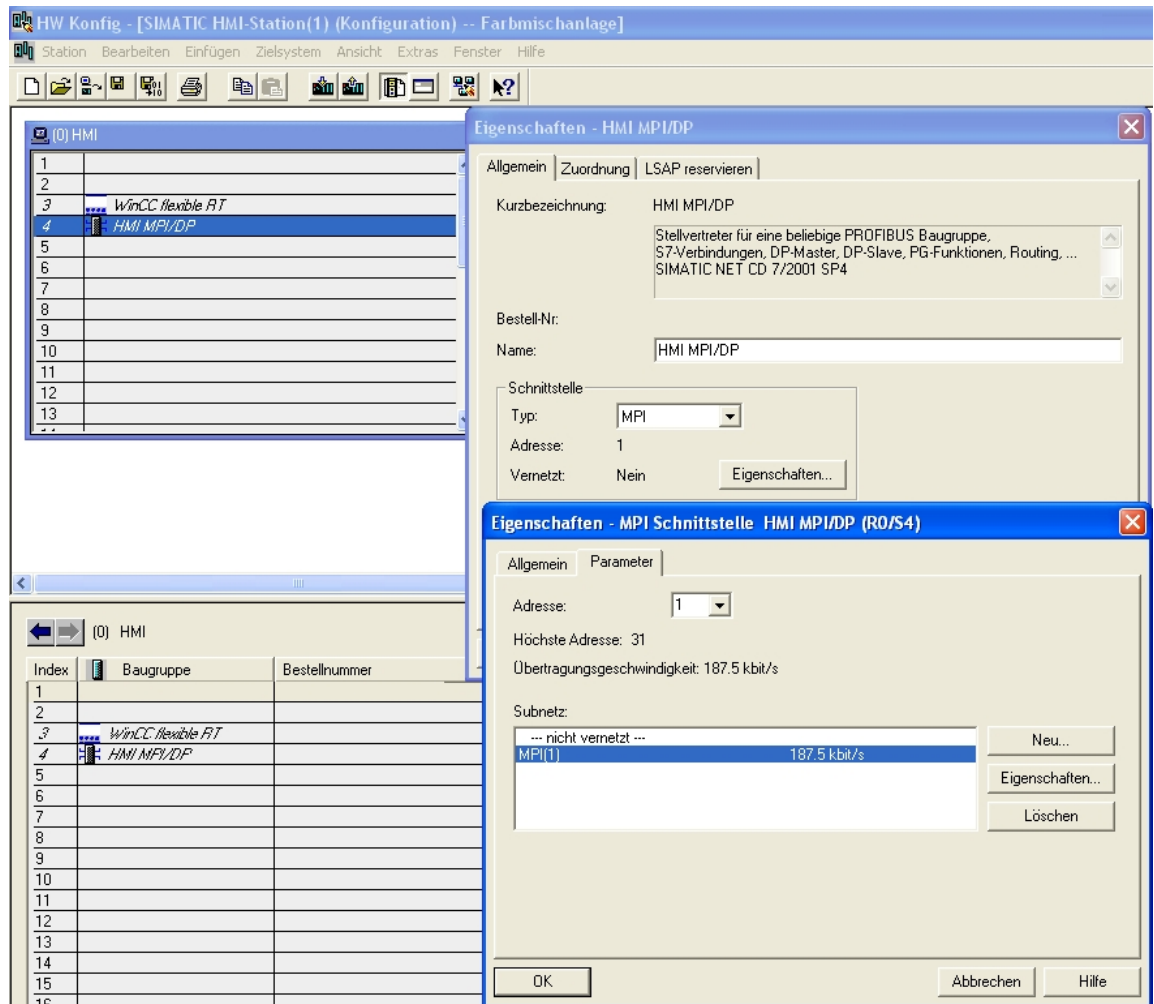
Note
In the WinCC flexible project, a connection via the MPI is generated automatically.

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5.3 Checking the Connection with NetPro

Start NetPro by clicking on the button in the SIMATIC Manager.
Here, you can check the communication connections very easily.
Also, you can make changes or corrections subsequently with NetPro.
With a double click, the module's properties are opened.
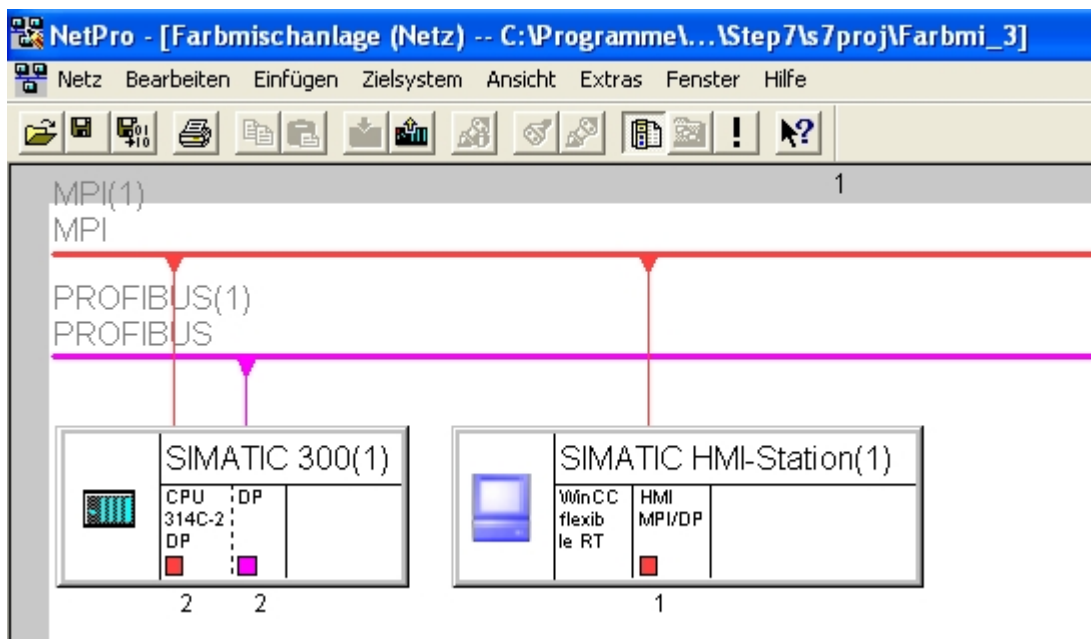
IMPORTANT NOTE

NetPro, the hardware configuration, and WinCC flexible access a joint data base and must not be opened at the same time.
If one of these programs is opened, only reading functions are often possible in the next program.
The advantage is that a change of the MPI address, for example, is accepted in all programs.

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5.4 Opening the HMI Station
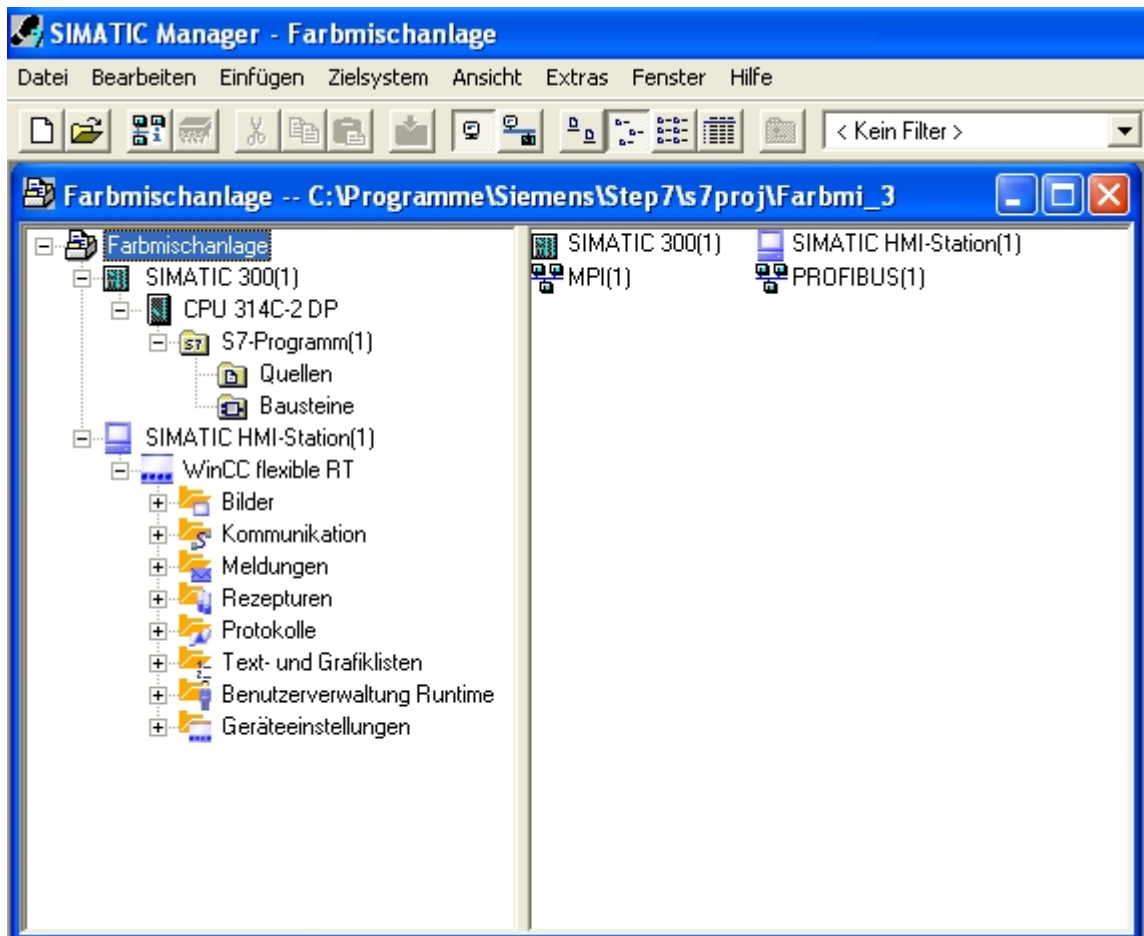
Right click on "**WinCC flexible RT**" and select **Open Object**.

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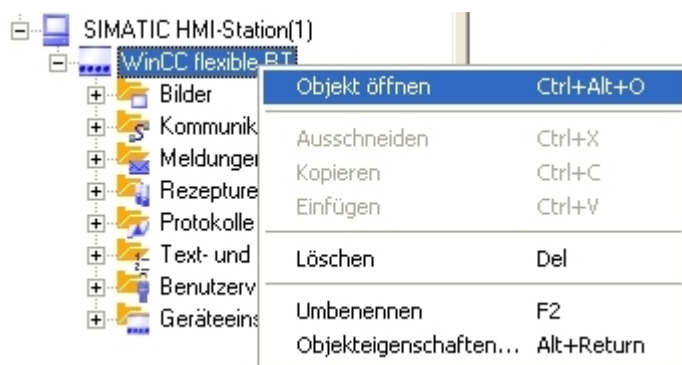
6 WINCC FLEXIBLE ENGINEERING SYSTEM

6.1 Program Interface

The work environment of WinCC flexible consists of several elements. Some of these elements are coupled to certain editors and are visible only if the corresponding editor is active.

WinCC flexible consists of the following elements:

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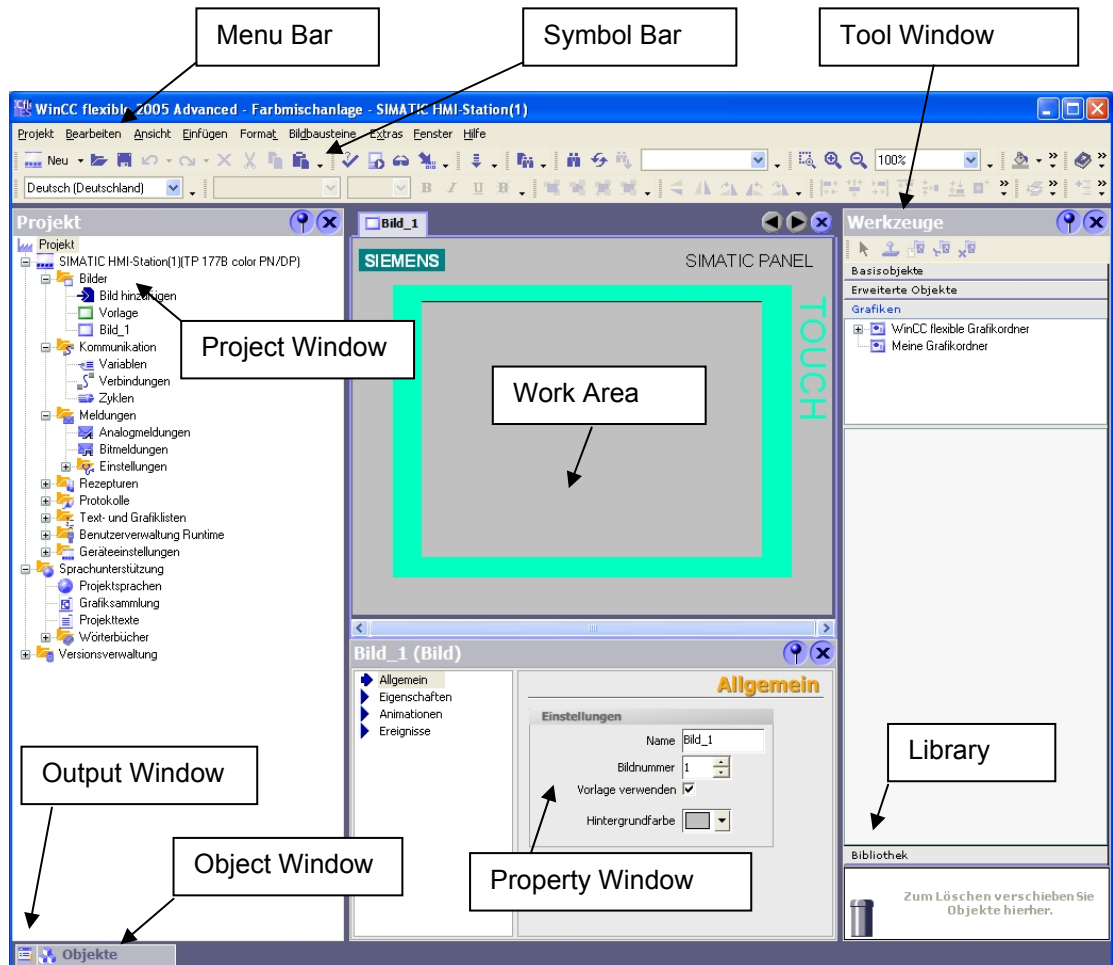
6.1.1   Menus and Symbol Bars

| i | The menus and the symbol bars contain all the functions you need to configure your operator panel. If a corresponding editor is active, menu commands or symbol bars are visible specific to the editor. If you point to a command with the mouse pointer, you will get a corresponding QuickInfo for each function. |
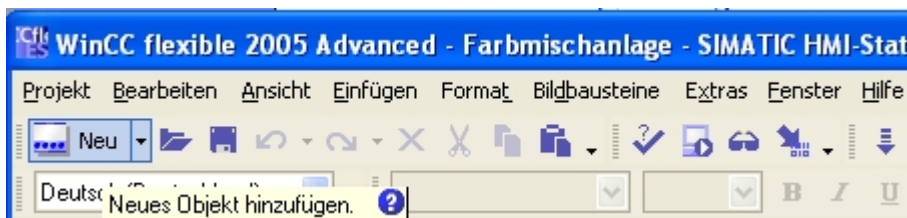
When a new project is set up, the symbol bars are positioned at the upper screen boundary as a matter of standard. The position of the symbol bars is coupled to the user that is signed on in Windows. If you have moved symbol bars with the mouse, the positions that the symbol bars had at the last close are restored after starting WinCC flexible.

The following menus are available in WinCC flexible:

Menu	Brief description
"Project"	Contains commands for project management.
"Edit"	Contains commands for clipboard and search functions.
"View"	Contains commands for opening / closing elements, and for zoom / layer settings. To reopen a closed element, select the "View" menu.
"Paste"	Contains commands for pasting new objects
"Format"	Contains commands for organizing and formatting screen objects.
"Tools"	Contains commands for changing the user interface language and configuring the basic settings in WinCC flexible, for example.
"Window"	Contains commands for managing multiple windows in the work area, e.g. for changing to other windows.
"Help"	Contains commands for calling help functions.

The availability of the menus and their instruction set depends on the editor that is used.

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6.1.2 Work Space

In the work space, the objects of the project are edited. All elements of WinCC flexible are arranged around the work space. Except for the work space, you can arrange and configure all elements according to your own requirements; for example, shifting or hiding.

In the work space, project data is edited either in table form (for example, variables) or graphically (for example, a process image). Each opened editor is represented in the work space on its own tab sheet. For graphic editors, each element is represented by a separate tab sheet. If you have several editors opened at the same time, only one tab sheet is active. To switch to another editor, click on the corresponding register sheet. You can have a maximum of 20 editors opened at the same time.

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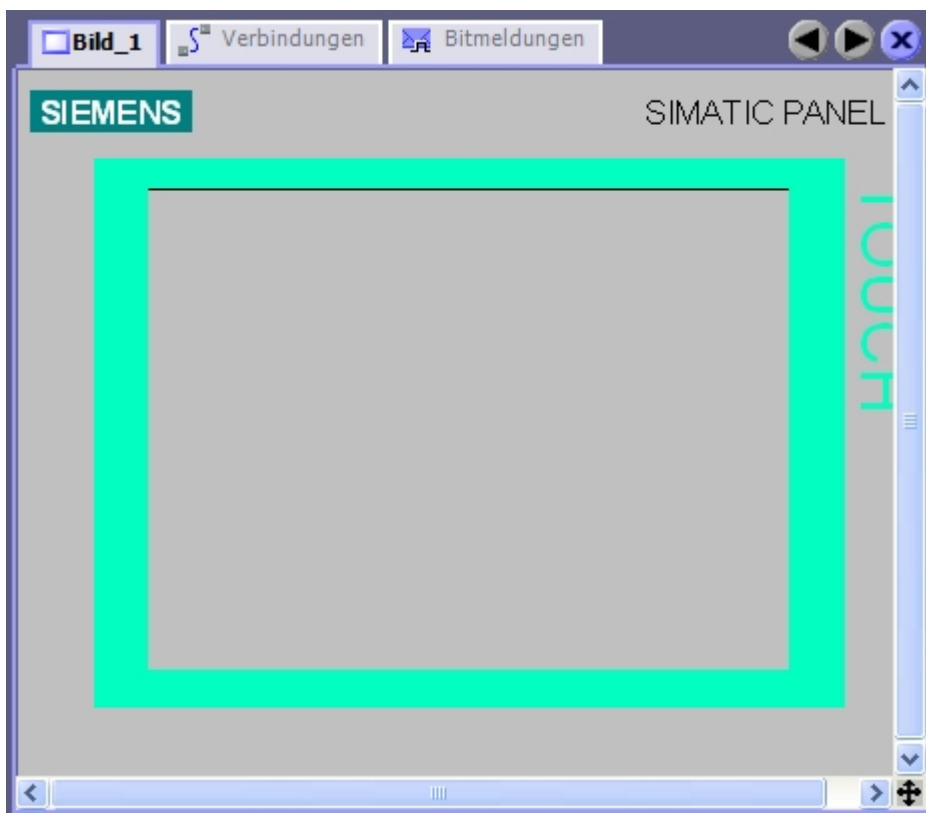
6.1.3 Project Window

The project window is the central control point for project processing. All constituent parts and all available editors of a project are displayed as a tree structure in the project window and can be opened from there. To each editor, a symbol is assigned. With it, you can identify the associated objects. Only those elements are displayed in the project window that the selected operator panel supports. In the project window, you can access the device settings of the operator panel, language support, and version management.
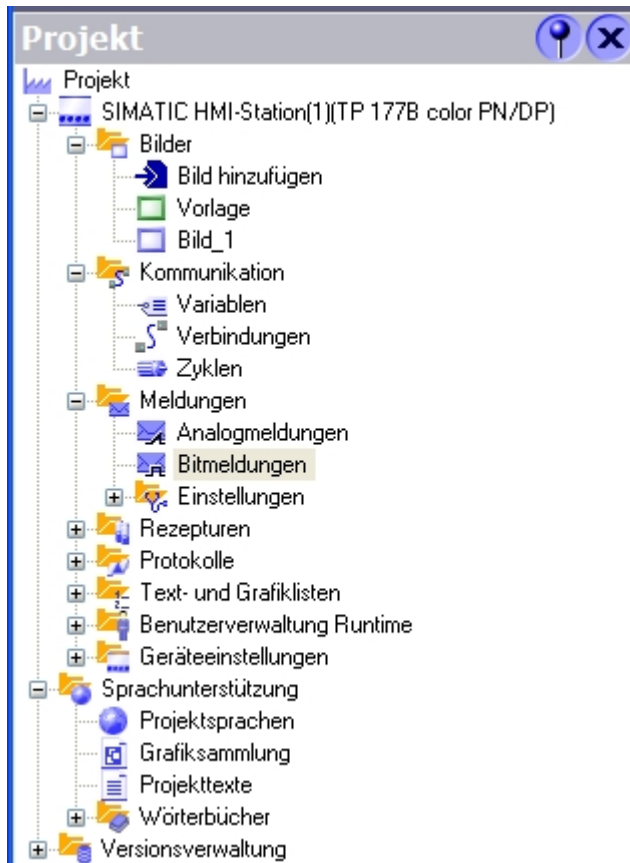
The project window represents the structure of the project hierarchically

• Project
• Operator panels
• Folders
• Objects

In the project window, objects are set up and opened for processing. You can set up folders to structure the objects of your project. The project window is operated similar to the Windows Explorer. For all objects, you can call a context menu where the most important commands are combined.
Elements of graphic editors are shown in the project window and in the object window. Elements of tabular editors are displayed only in the object window.

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6.1.4 Property Window

In the property window, the properties of objects are edited; for example, the color of picture objects. The property window is available only in certain editors.

In the property window, the properties of the selected object, arranged by categories, are displayed.

As soon as you exit an input field, the values that were changed are effective.

If you enter an invalid value, it is displayed with a background color.

Using QuickInfo, information is provided about the valid value range, for example.
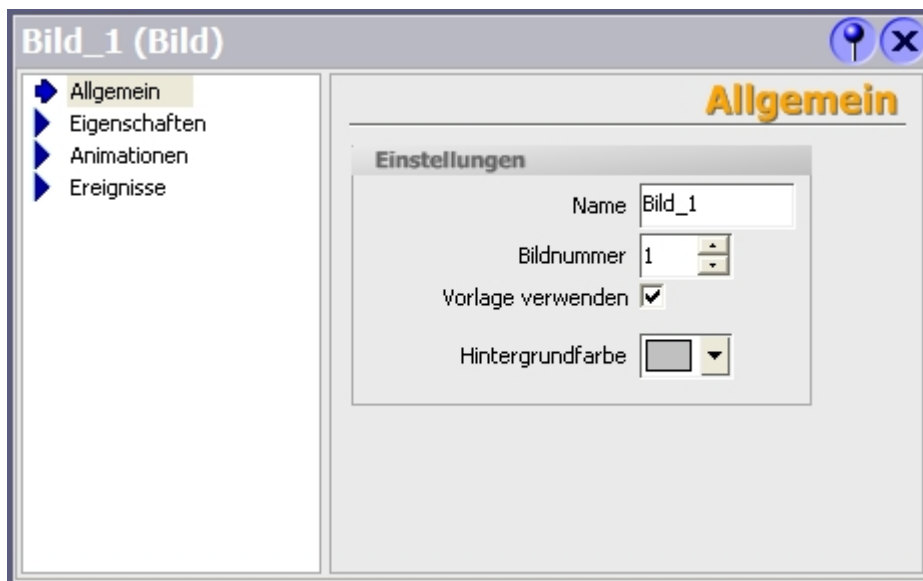
IMPORTANT NOTE

The inputs in the property window are not accepted by operating the input key, but by exiting the field, or by clicking on another field. Please note where you are clicking after making inputs via the keyboard. Otherwise, you will possibly be changing to the properties of the selected object, or a check mark is placed in a check box in the property window, since the area of focus is very large.

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6.1.5 Tool Window

The tool window provides you with a selection of objects that you can insert in your pictures; for example, graphic objects and control elements. In addition, the tool window includes libraries with completed library objects, and collections of picture blocks.

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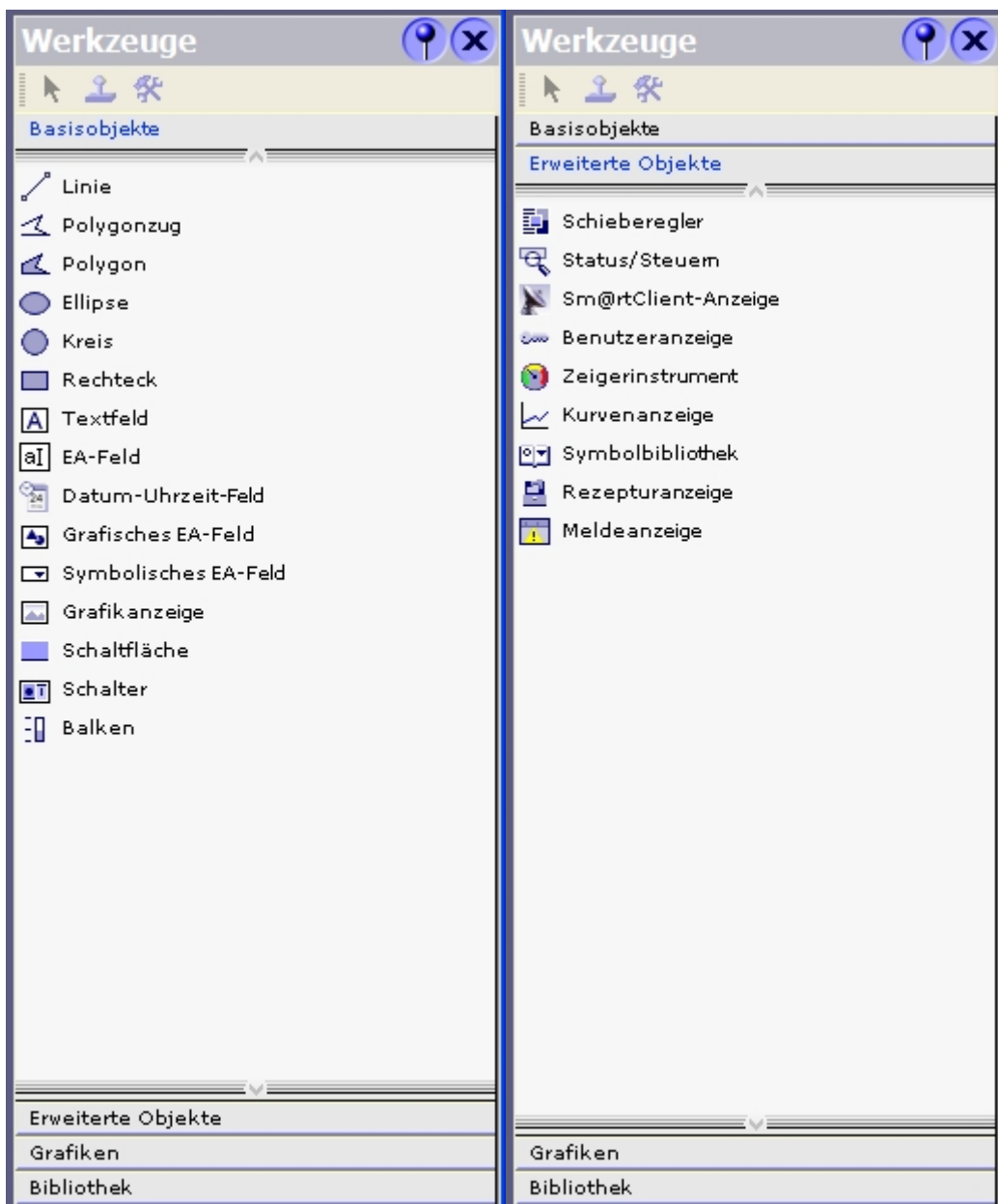
6.1.6 Output Window

In the output window, system messages are displayed standard in the sequence in which they occur. The categories identify each WinCC flexible submodule that generated a system message. System messages of the category "Generator" are generated, for example, during the consistency check. To arrange the system messages, click on the header of the corresponding column. The output window displays all system messages of the last action. If there is a new action, all previous system messages are overwritten.
To provide continued access to existing system messages, they are stored in a separate log file.
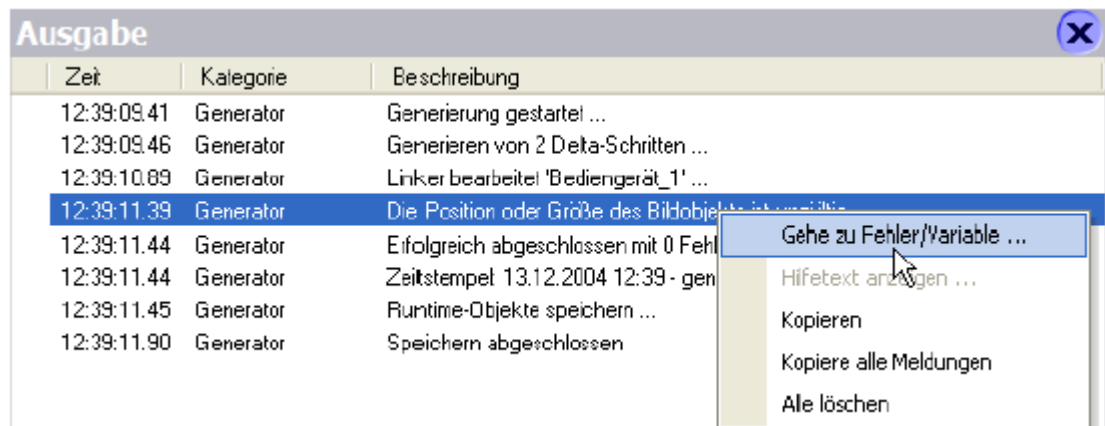
Errors -for example, during generation- are displayed in color and can be selected by using the context menu. You can jump to an error location or to a variable, copy system messages, or clear them.

6.1.7 Object Window

In the object window, the contents of the folders in the project window are displayed.
The object window can be displayed permanently by docking it onto or shifting it into the project window.
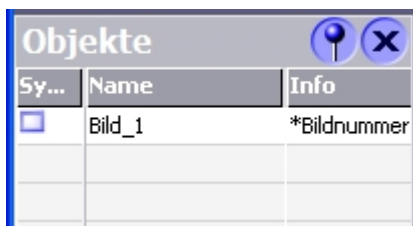
6.1.8 Resetting the Arrangement

In the menu "**View**", click on "**Reset arrangement**".

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ksj... no

6.2   Configuring Displays

> A display can consist of static and dynamic parts. The controller does not update static parts, such as texts and graphics.
> Dynamic parts are connected to the controller, and visualize current values from the controller's memory. Visualization can be in the form of alpha-numerical displays, curves, and bars. Dynamic parts also consist of inputs made at the OP that are written to the controller's memory. They are interfaced with the controller by means of **Variables**.

For our color mixing plant, five displays are to be generated initially.

Display Template
This display is set up automatically, and contains central functions.
In the upper area of the display, a permanent window is generated. Here, the levels of the tanks, of the container and the project name are shown.
In the lower area of the display, the message window and the message indicator are shown. These objects are also embedded in all displays, and are opened in the display's foreground if there is a message, for example.

Basic Display
This display also is set up automatically, and it is also defined as start picture. Here, the entire plant is shown
Changing the operating mode, starting the mixing process, operating the mixer motor manually, and opening the outflow valve can be performed by means of buttons. The motion of the mixer and the states of the valves are shown graphically. By means of input fields, the amounts of the individual additives are specified. In addition, it is to be possible to jump to the other displays. Using the button END, the runtime at the panel is terminated, and a new transfer can be made.

Tank1
In the third picture, the valves of Tank1 can be operated manually. The maximum and minimum amount of filling has to be preset at linear regulators. By means of buttons (Open valve), the inflow and outflow valve can be opened or closed. The valves are shown graphically, and change color when they are open.
The level is indicated in red. If the maximum level is reached, the inflow valve is closed in the automatic mode. When the tank is completely full, the inflow valve can not be opened.
With additional buttons, you can switch to the other tanks, or to the basic display.

Tank2, Tank3
The displays for Tank2 and Tank3 are structured exactly like the display for Tank1.
The valves and the level of Tank2 are colored green.
The valves and the level of Tank3 are colored blue.

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6.2.1   Display Template

Specifying the permanent area, and changing the background color.

With a double click on **Template**, open the display Template in the project window.
Drag the bar in the upper area of the panel display window a little downward.
Change the background color in the property window for the permanent area to yellow.
Change the background color in the property window for the work area to white.
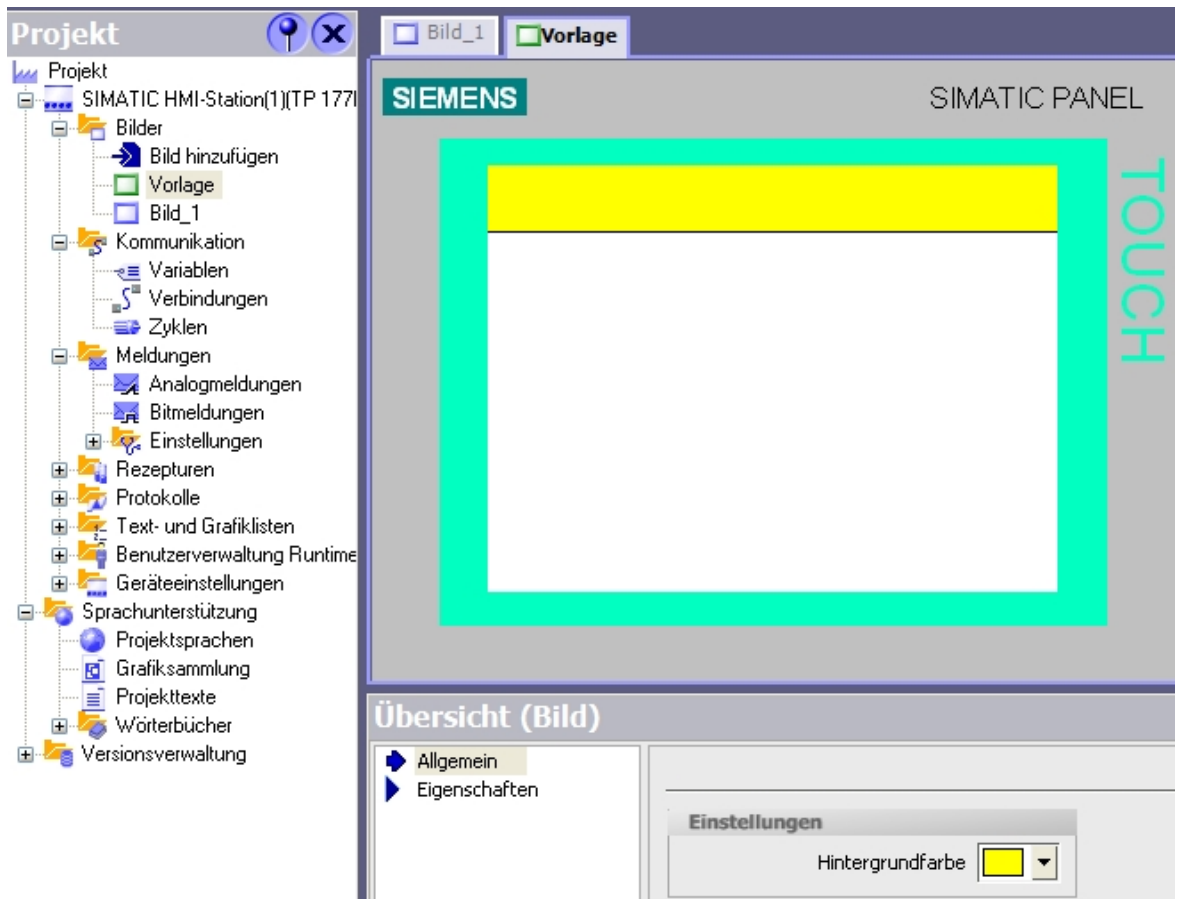
Note

If you open the **Settings** in the menu **Options** and display the **Grid** (**Raster anzeigen**), you can set the permanent window to a size of 32 pixels.

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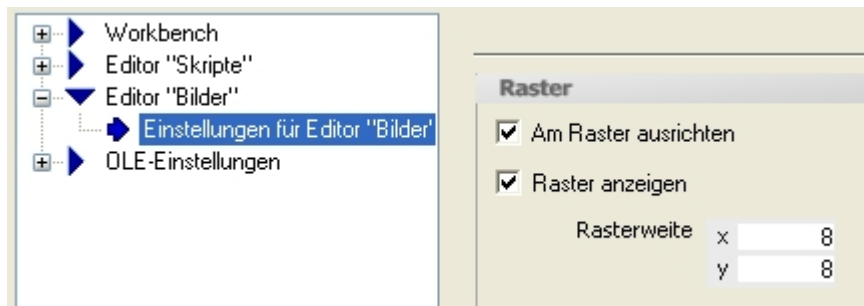
Inserting a text field

Drag and drop a text field from the tool window to the permanent window.
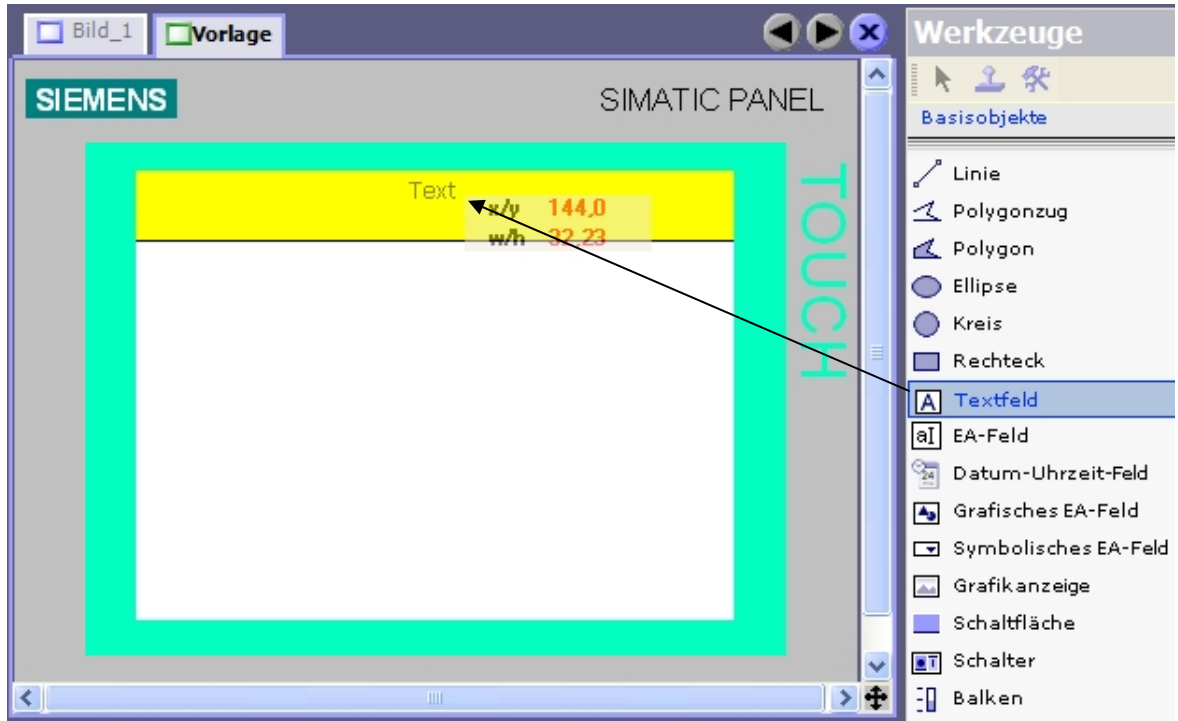
For the properties in the text field, enter "Color mixing plant".
Caution! Do not press the input key.
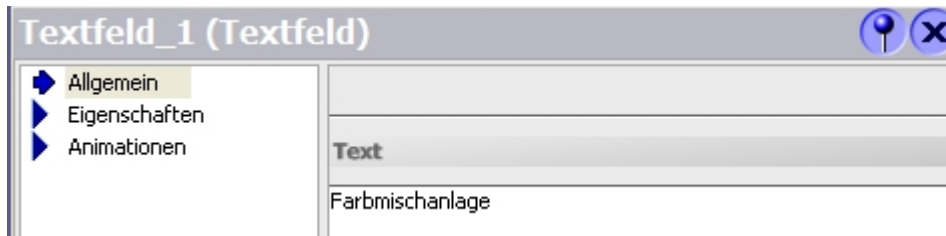
Under **Properties**, click on **Representation** and remove the checkmark **adjust automatically**.
Change the size and the position of the text field.

Preface Installation Project Description Step7 Project HMI Station **WinCC flexible Projekt** Messages Recipes User Management
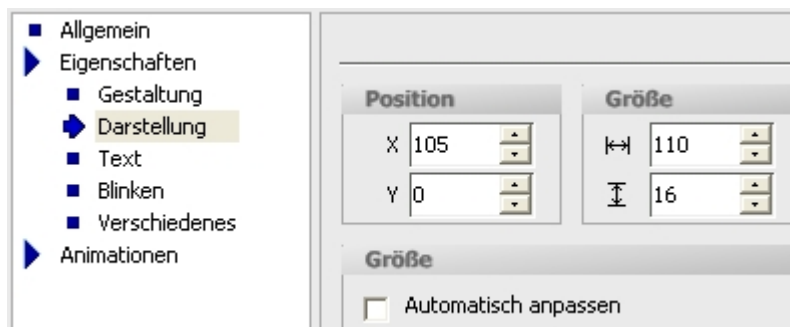
Under **Properties**, click on **Text** and
change the font size and the text orientation.
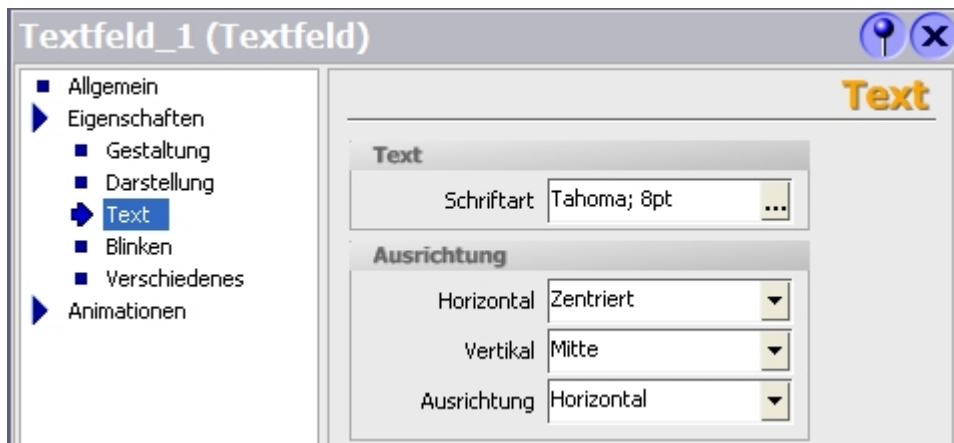
Inserting the date and time of day field

Drag a date/time of day field from the tool window and drop it in the permanent window.

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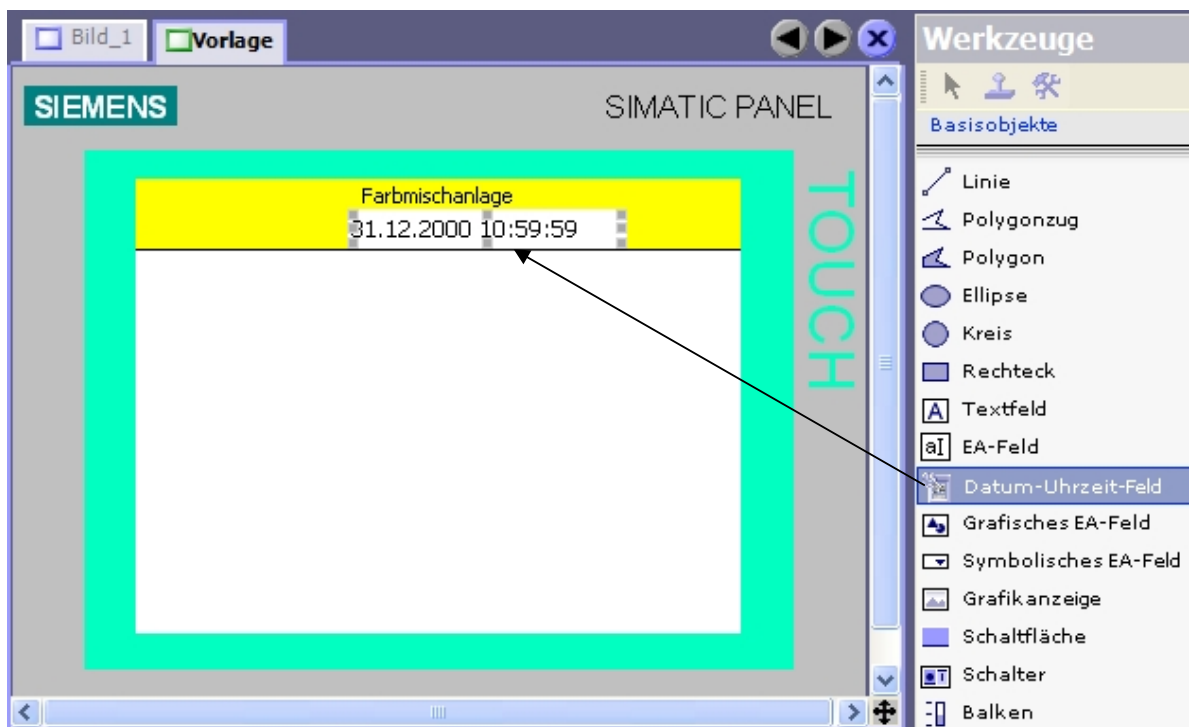
Under Properties, change the style of the fill type to "**Transparent**"
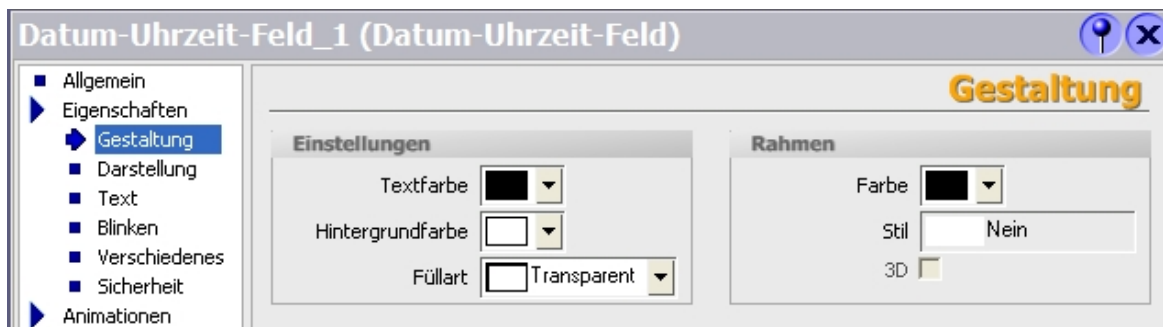
Under **Properties**, click on **Representation** and remove the check mark **Adjust automatically**.
Change the size and the position.
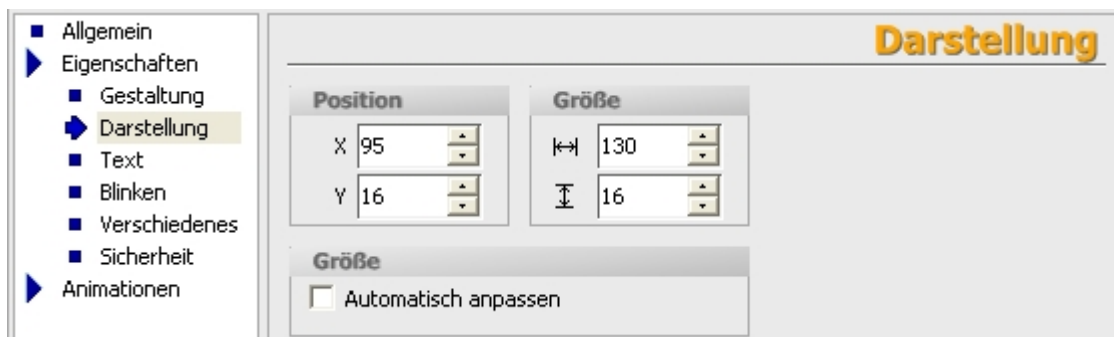
Under **Properties**, click on **Text**.
Change the font size and the orientation of the text.

For the time being, the display Template is completed.

Note
Now and then, you should save your project by clicking on the diskette symbol.

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6.2.2 Generating Displays

In the project window, right click on **Display1** and select **Rename**.
Enter "Basic display" as the name for the picture.
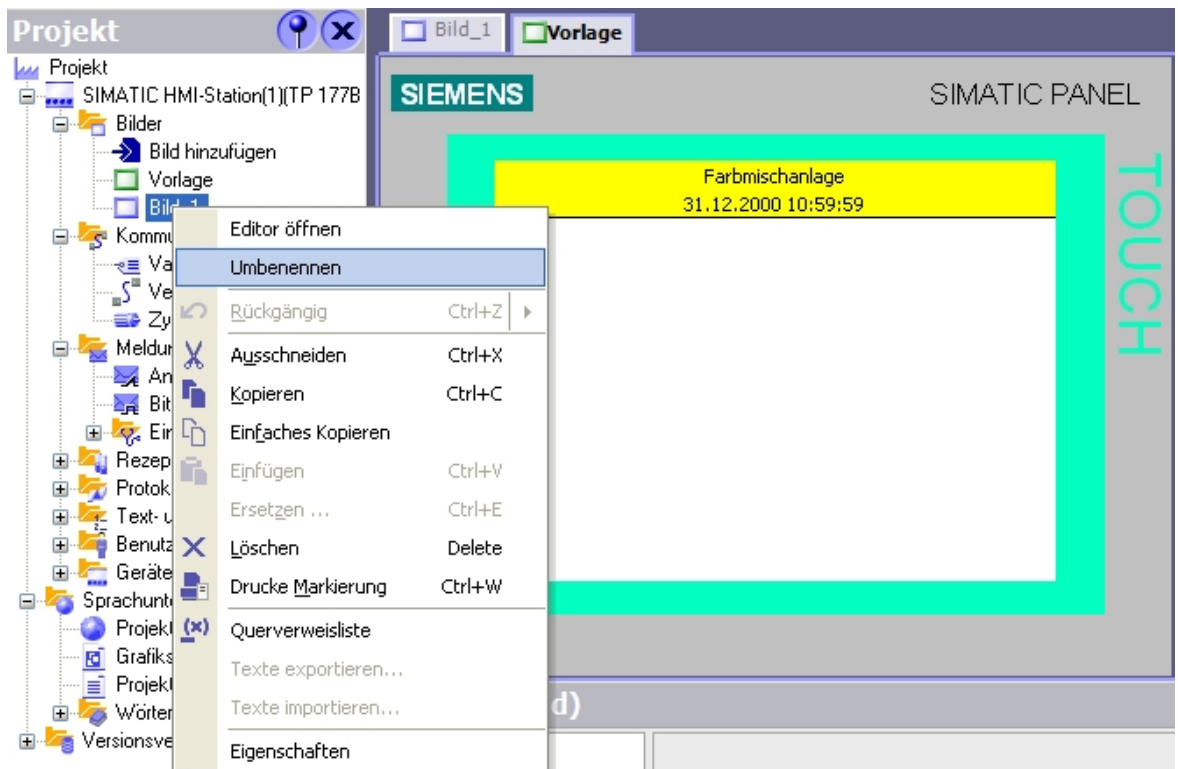
Double click on **Add picture** and assign the name "**Tank1**".
Generate the pictures for Tank2 and Tank3 also.
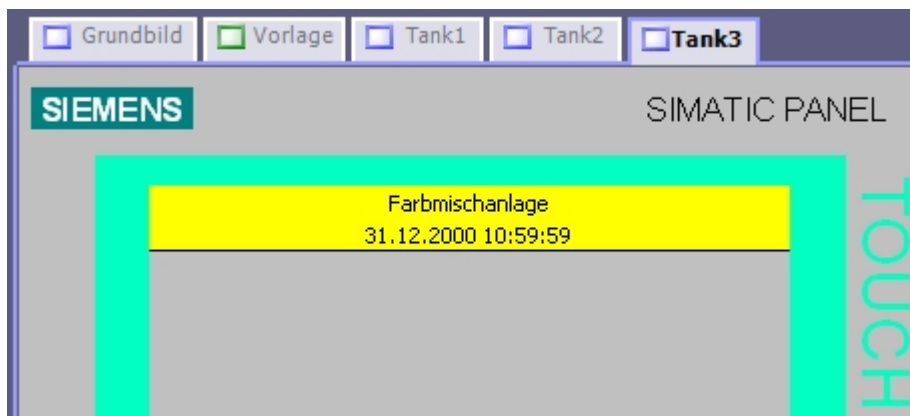
For all pictures, change the background color of the work area to white. To do this, click on the tabs of the figures.

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6.2.3   Inserting Graphic Displays

Drag a graphic display to the work area of the basic figure.
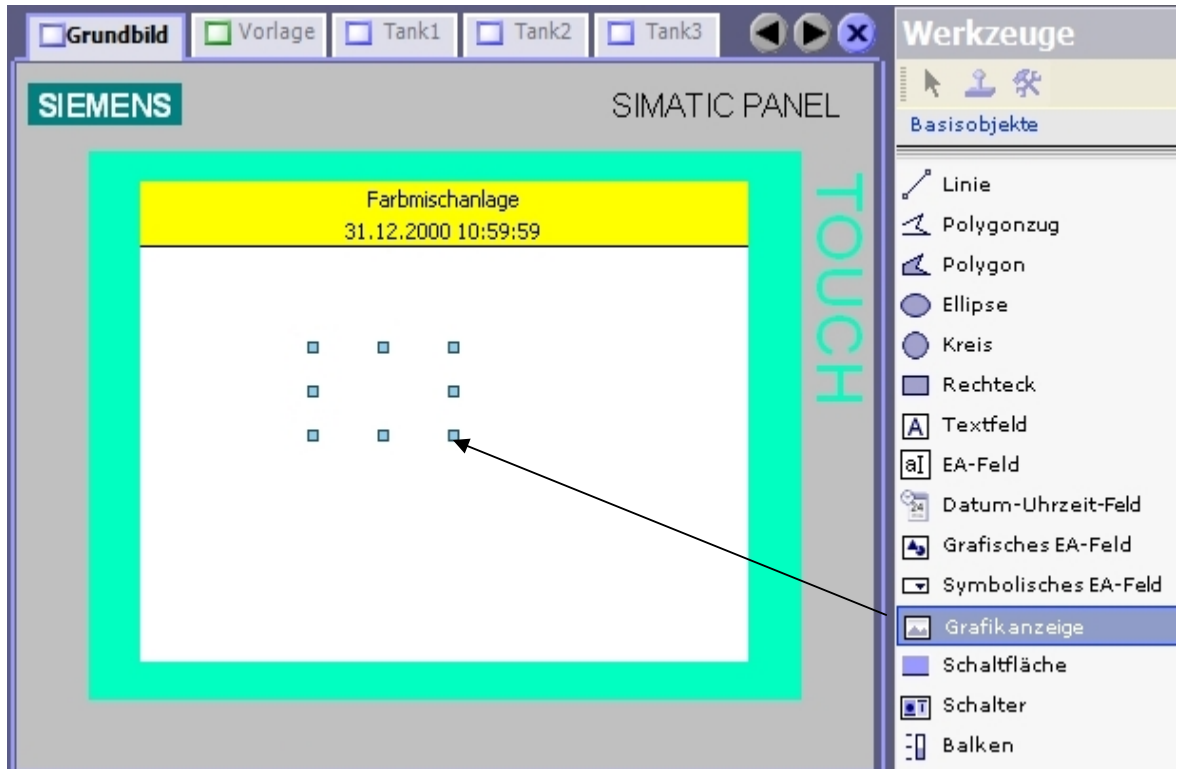
In the property window of the graphic display, graphics can now be selected from the list. Using the buttons, you can create new graphics from files or from OLE objects. You can also delete graphics from the list.

The selected graphic appears in the preview window, and has to be inserted or removed with the button Select or Deselect.

Double clicking on the graphic opens the graphics program.

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Click on **Generate new graphic from OLE object**.

Neue Grafik aus OLE-Objekt erstellen.

Pfeil_nach_links
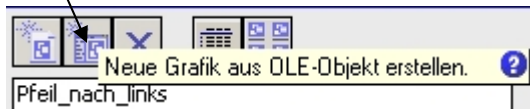
Select **Generate from file** and click on **Browse**.

Objekt einfügen

○ Neu erstellen

◉ Aus Datei erstellen

Datei:

C:\Vorlagen_Farbmischanlage\Bilder

Durchsuchen...

OK

Abbrechen

Ergebnis

Fügt den Inhalt der Datei als Objekt so in Ihr Dokument ein, dass Sie es mit dem Programm aktivieren können, mit dem es erstellt wurde.
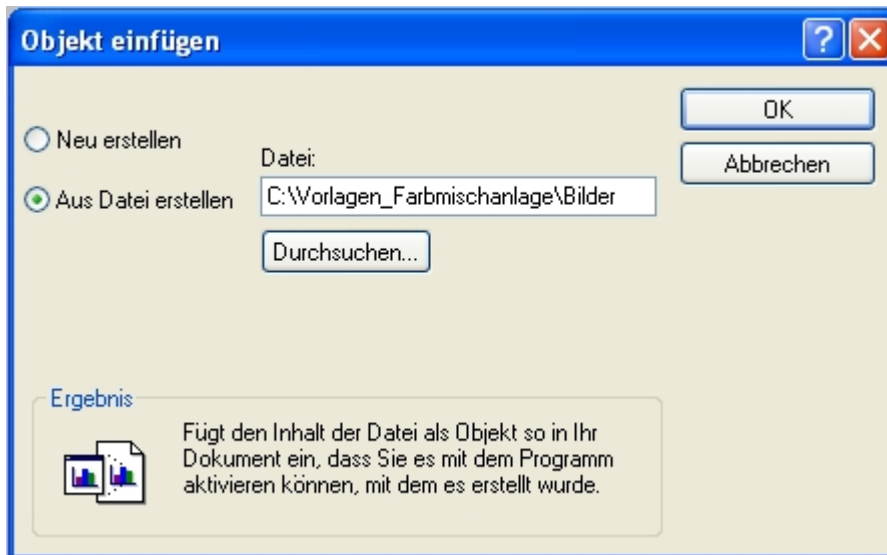
Highlight the figure "**Plant.bmp**" and click on **Open**.

Browse

Suchen in: Bilder

Zuletzt verwendete D...

Desktop

Eigene Dateien

Arbeitsplatz

Netzwerkumgeb

Anlage.bmp
Mixer1.bmp
Mixer2.bmp
Mixer3.bmp
Mixer4.bmp
Mixer5.bmp
Mixer6.bmp
Mixer7.bmp
motor_aus.bmp
motor_ein.bmp
Tank1.bmp
Tank2.bmp
Tank3.bmp

Dateiname: Anlage.bmp

Dateityp: Bitmap

Öffnen

Abbrechen
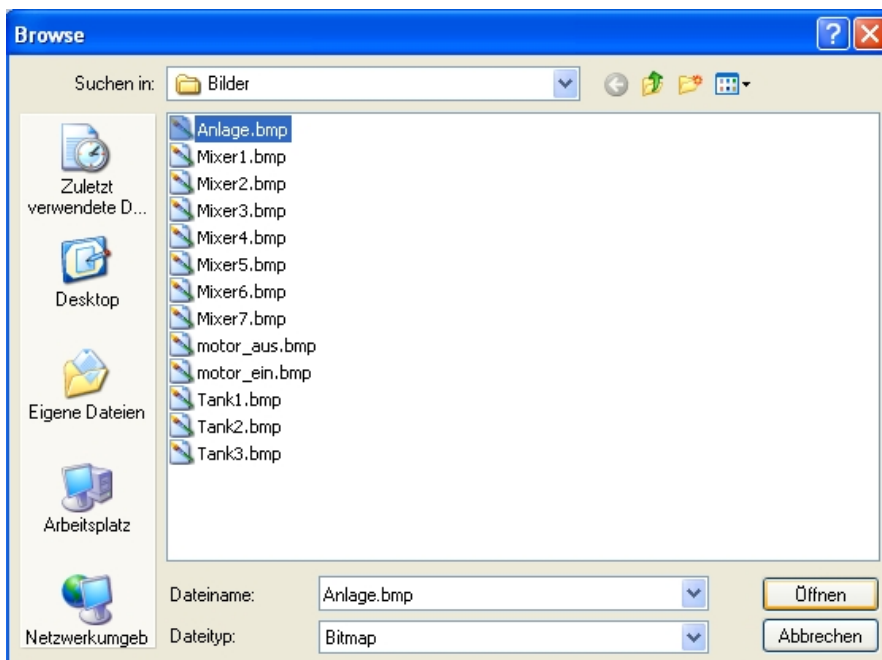
In the window that follows, confirm your selection with **OK**.

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Under **Representation**, change the size and position of the graphic.

Repeat these steps for inserting the graphics in figures Tank1 to Tank3.

Under **Representation**, change the size and the position of the three inserted graphics.

Note

If a graphic is inserted by means of an OLE object, the file name is retained.

Don't forget to save!

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6.2.4   Configuring Display Changes

By means of buttons, it is to be possible in each figure to change to the other three figures. In the case of WinCC flexible, only the names of the figures have to be dragged from the project window to the figure. The buttons are generated automatically.
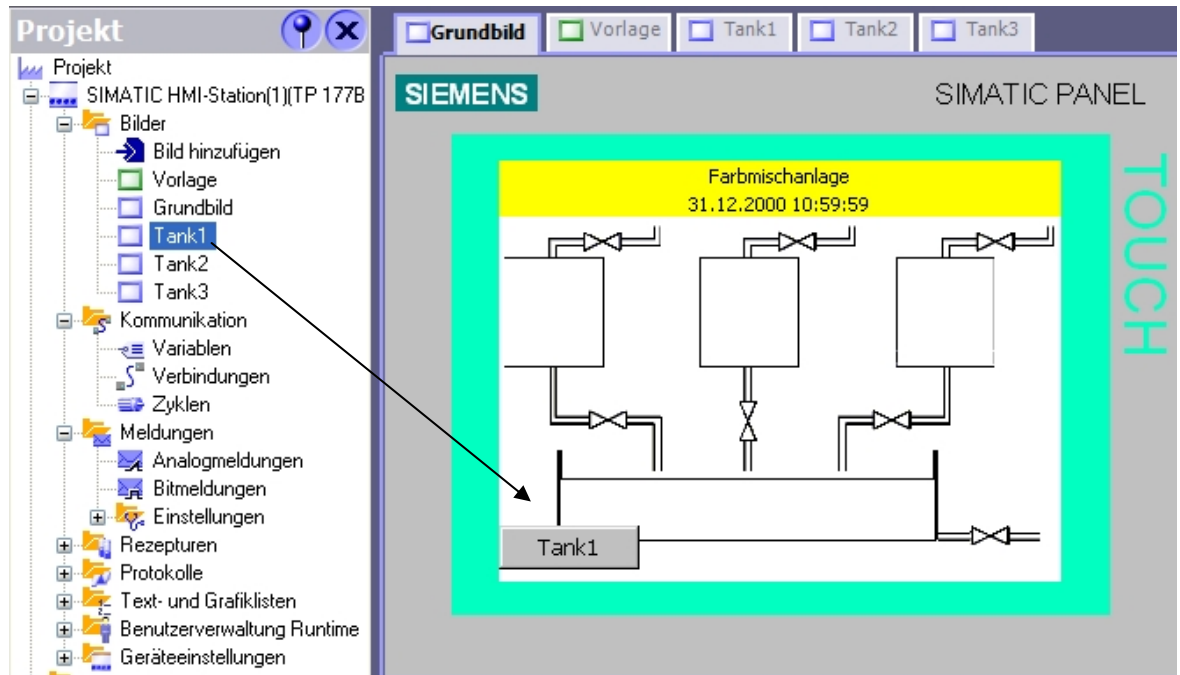
Change the size and the position of the button.
Under text, select the font "Tahoma; 8pt".
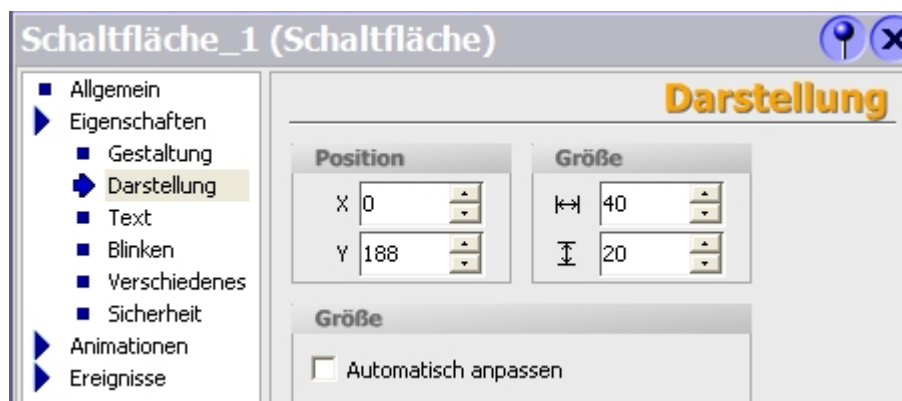
Repeat these steps for the buttons for Tank2 and Tank3.
In the tank figures, generate the buttons for the display change.
Change the width of the button "Basic display" to 60.
You can also copy and insert prepared buttons.

Don't forget to save!

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Basic Display

Figure Tank1

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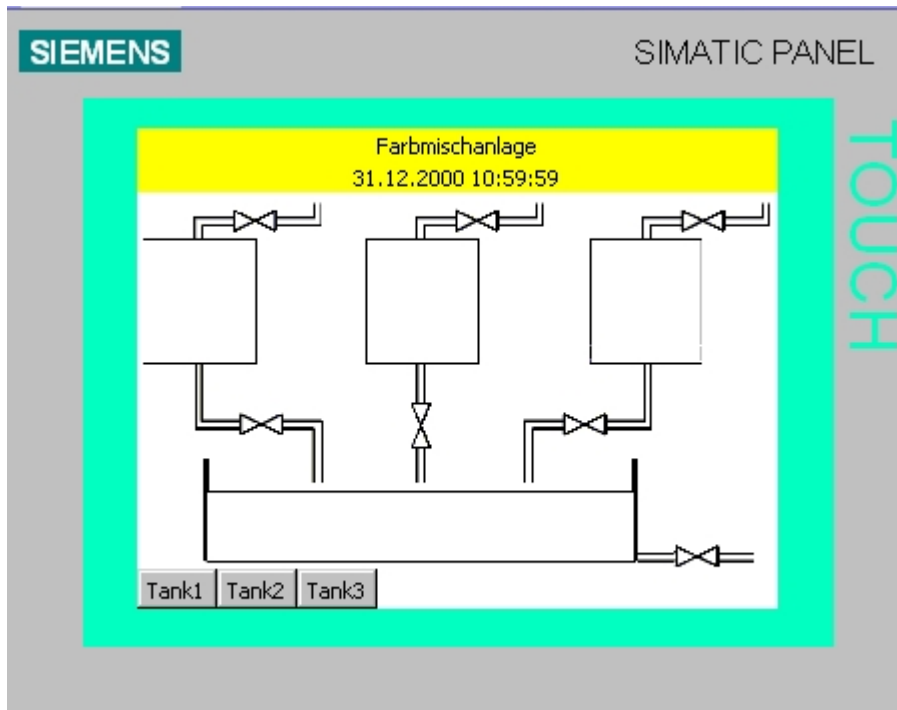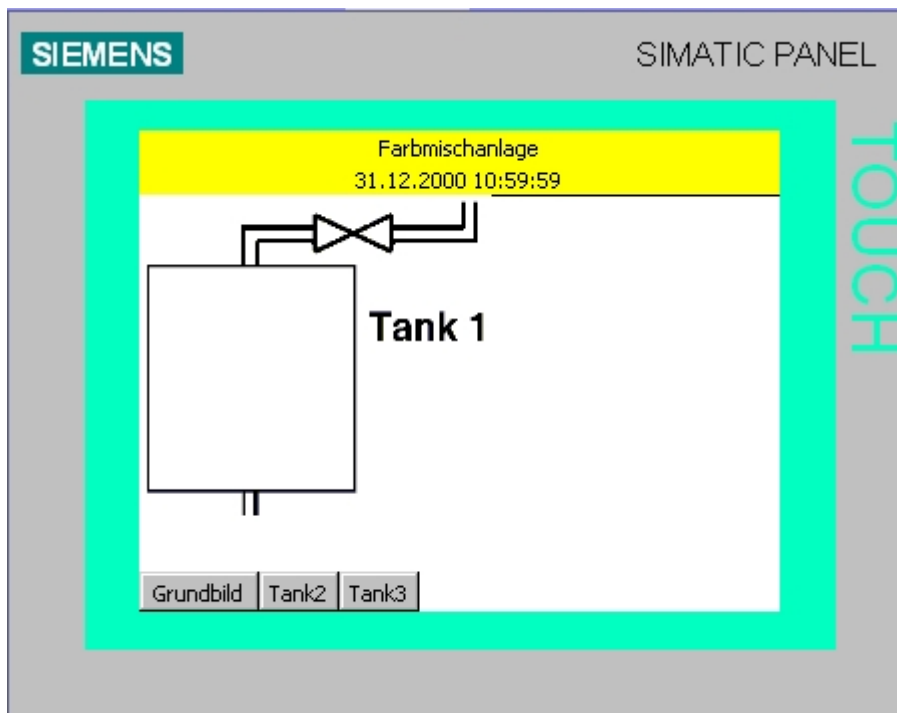
Figure Tank2

Figure Tank3

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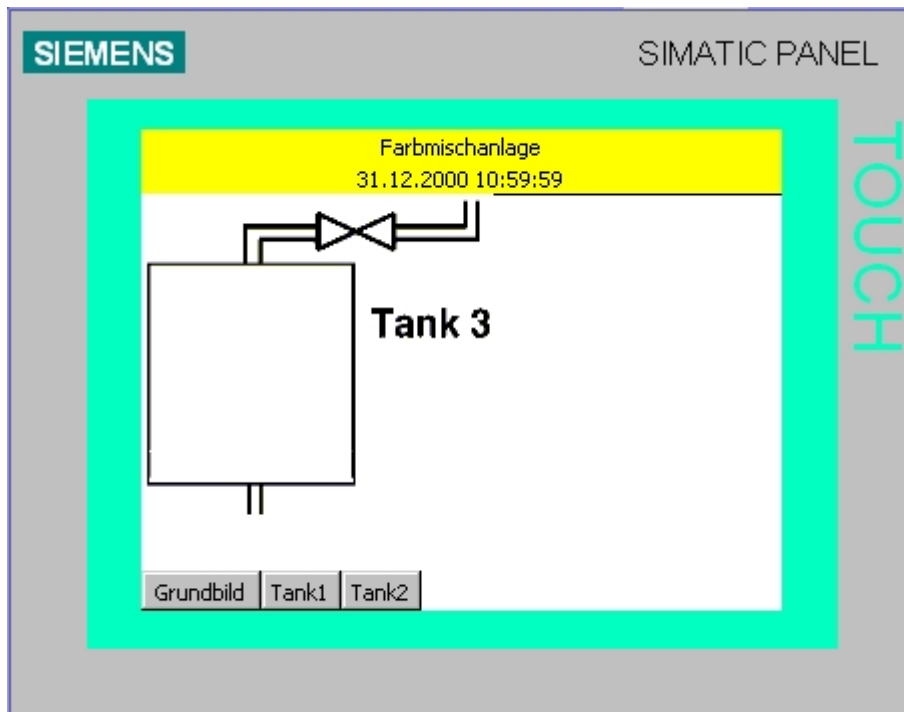
6.3   Settings at the Touch Panel TP177B color PN/DP

[i]

Before we can perform the first test, the settings on the touch panel have to be executed first.

The following settings have to be made:

- Setting the date and time of day
- Assigning the MPI or Profibus DP address
- Assigning the Ethernet address
- Setting the transfer properties

Touch Panel TP177B processes with the operating system Windows CE and can, like all touch panels, be operated directly on the screen. For better operation, you should use a touch pen, or connect a mouse at the panel's USB interface.

After starting the panel, the desktop appears and the window of the loader. At the lower edge of the screen, the start bar is located. With it, you can -just as with other Windows systems- start the programs or make settings.
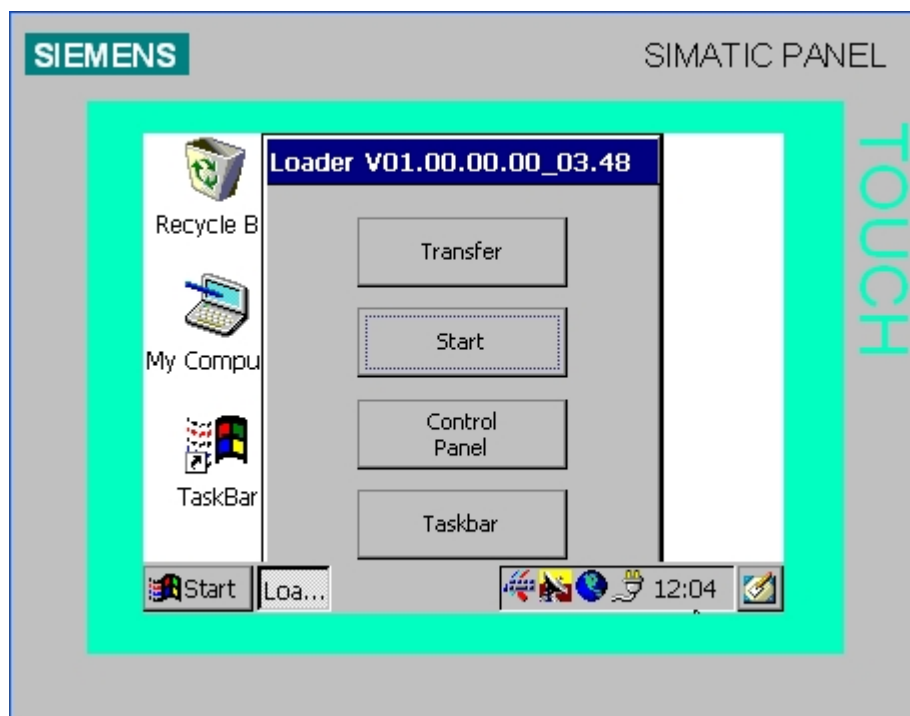
Buttons in the Loader:
Transfer: Data transfer becomes active, and data can be entered by WinCC flexible
Start: Runtime is started, and process visualization appears on the panel
Control Panel: The Windows CE desktop is called
Taskbar: The start bar is opened

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6.3.1 Setting the Date and the Time of Day

To set the date and the time of day, operate the button **Control Panel**.
This opens the desktop of Windows CE.
Select **Date/Time** to make the settings.
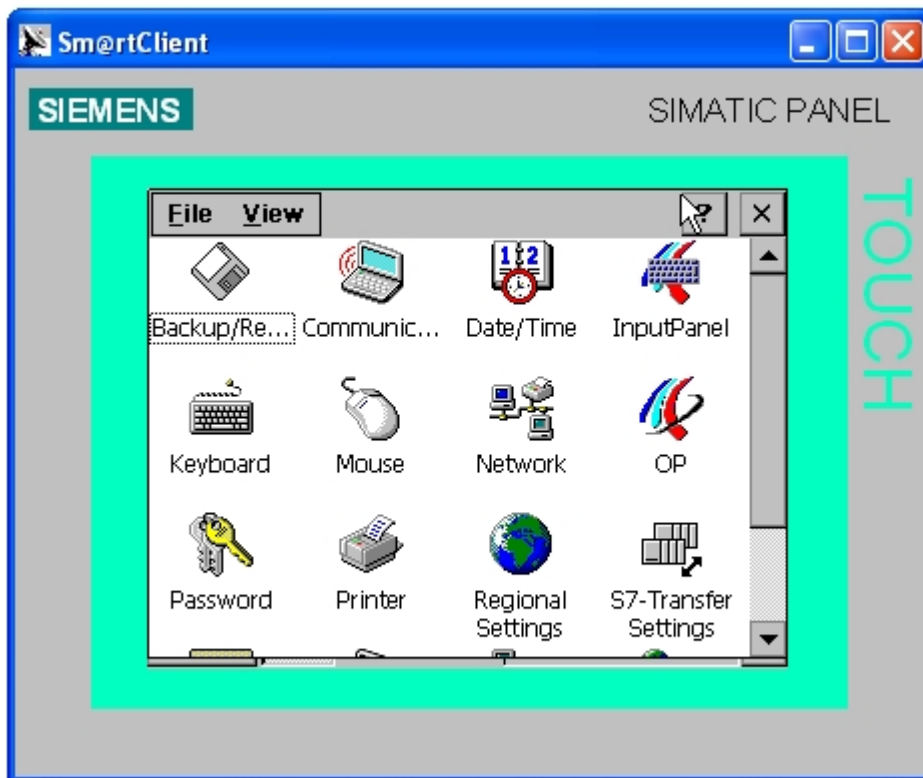
Set the time zone, the date and the time. Confirm with **OK**.

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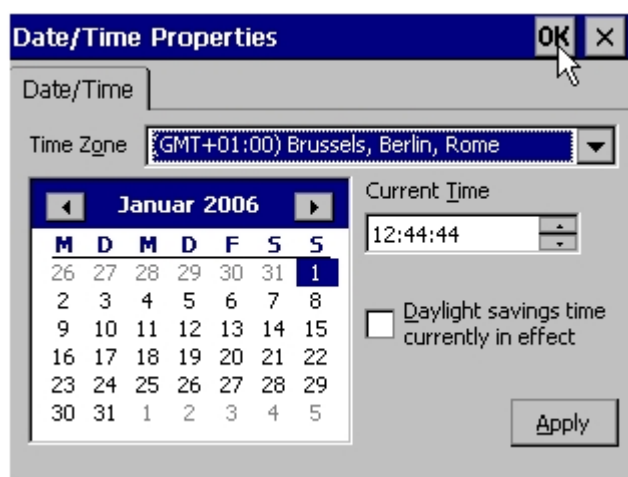
6.3.2 Setting the MPI Address

To set the MPI address on the panel, click on "**S7 Transfer Settings**"
Select **MPI** and click on **Properties**.
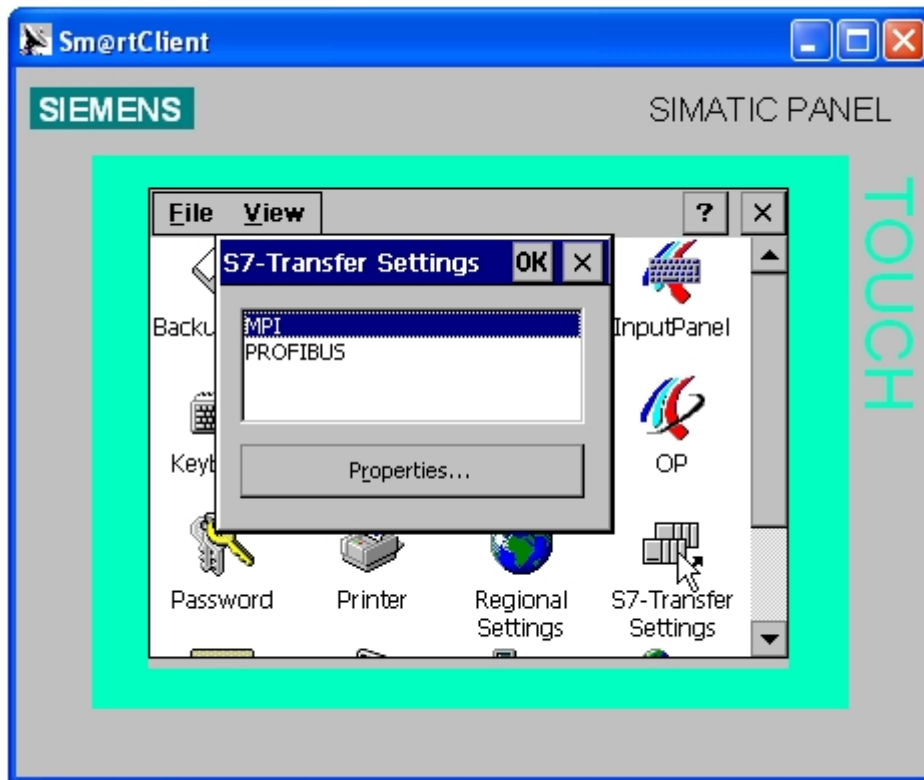
Place a checkmark at "Panel is the only master on the bus".
Assign the MPI Address **1** and confirm with **OK**.
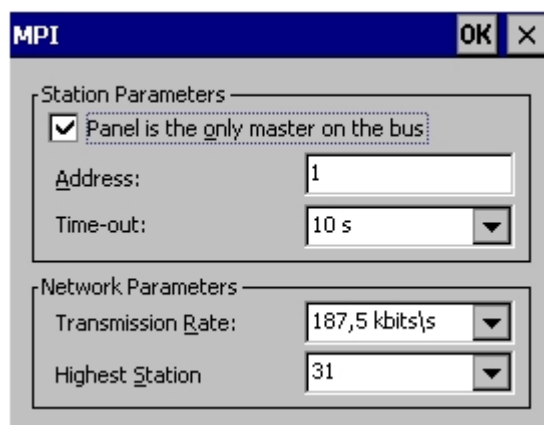
Note

Many panels allow data transfers only if either the panel or the programmer is set as the only master on the bus.

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6.3.3   Setting the Profibus DP Address

To set the Profibus DP address, click on "**S7 Transfer Settings**" on the desktop.
Select **Profibus** and click on the button **Properties**.
Place the checkmark at "Panel is the only master on the bus".
Assign the Profibus DP Address **1** and confirm with **OK**.
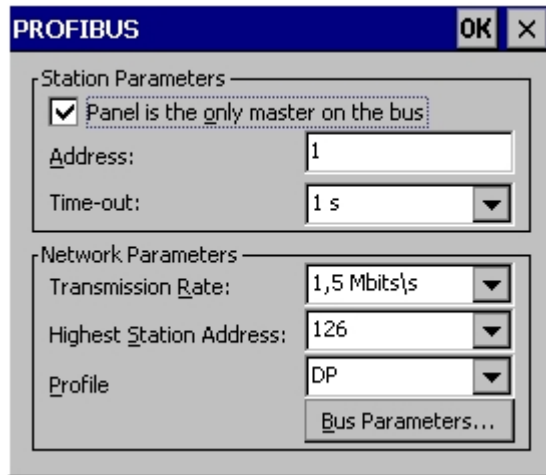
6.3.4   Assigning the Ethernet Address

On the desktop, operate the symbol   Network
and select the **Onboard LAN Ethernet Driver**.
Click on the button **Properties**.
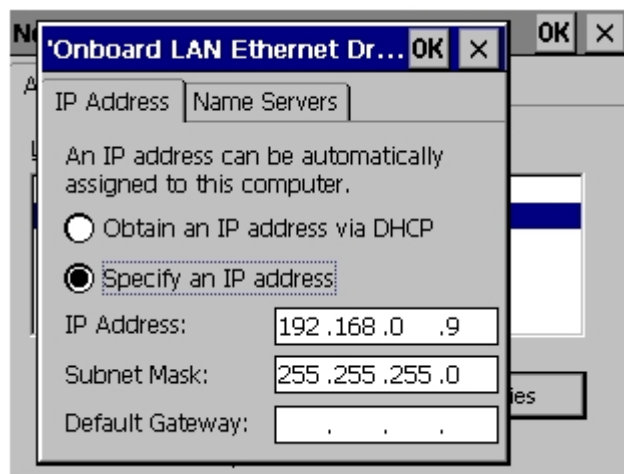
Here, you can make the settings for the Ethernet.

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6.3.5   Setting the Transfer Properties

On the desktop, click on the symbol [Transfer]
Select **MPI/Profibus** and click on the button **Advanced**.
In the window that follows, select **MPI** and confirm with **OK**.
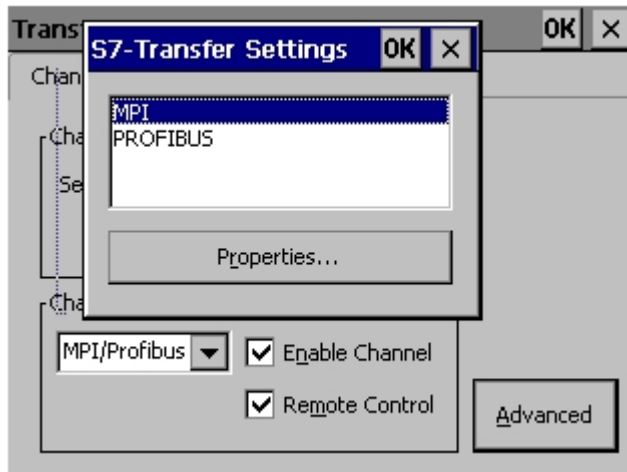
Note
The settings at Transfer Settings have nothing to do with the connection settings in the
WinCC flexible project.
For example, data can be transferred between Panel TP177B and WinCC flexible by means of the
Ethernet interface, and the panel and the SIMATIC S7 controller can communicate by means of the
MPI.

6.3.6   Transfer Mode

Close the desktop and switch the panel to the Transfer Mode.
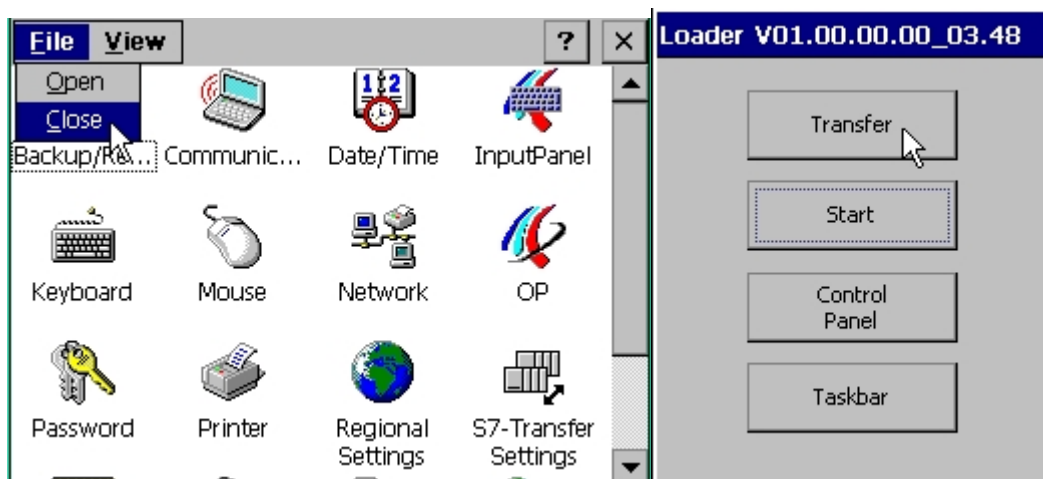
Connecting to host … appears in the transfer window.

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6.4   Checking for Consistency

Before you transfer the WinCC flexible project to the panel, the consistency should be checked. The project is checked and generated.
Click on **Consistency check of the project**.

The result is displayed in the output window.

Ausgabe

Zeit	Kategorie	Beschreibung
10:42:52.53	Generator	Generierung gestartet ...
10:42:52.54	Generator	Generieren von 1 Delta-Schritten ...
10:42:52.82	Generator	Linker bearbeitet 'SIMATIC HMI-Station(1)' ...
10:42:52.82	Generator	Erforderliche Lizenz: WinCC flexible /Sm@rtService for Panel
10:42:52.83	Generator	Erforderliche Lizenz: WinCC flexible /Sm@rtAccess for Panel
10:42:53.32	Generator	Erfolgreich abgeschlossen mit 0 Fehler(n), 0 Warnung(en)
10:42:53.33	Generator	Zeitstempel: 22.12.2005 10:42 - genutzt 63180 Bytes von maximal 2097152 Bytes
10:42:53.34	Generator	Compiling finished!

6.5   Transfer Settings and Data Transfer under WinCC flexible

In WinCC flexible, the settings have to be made for the transfer. Click on the button **Settings for the Transfer**.

For Mode, select **MPI/DP**; enter **1** as station address.
Click on **Transfer**.

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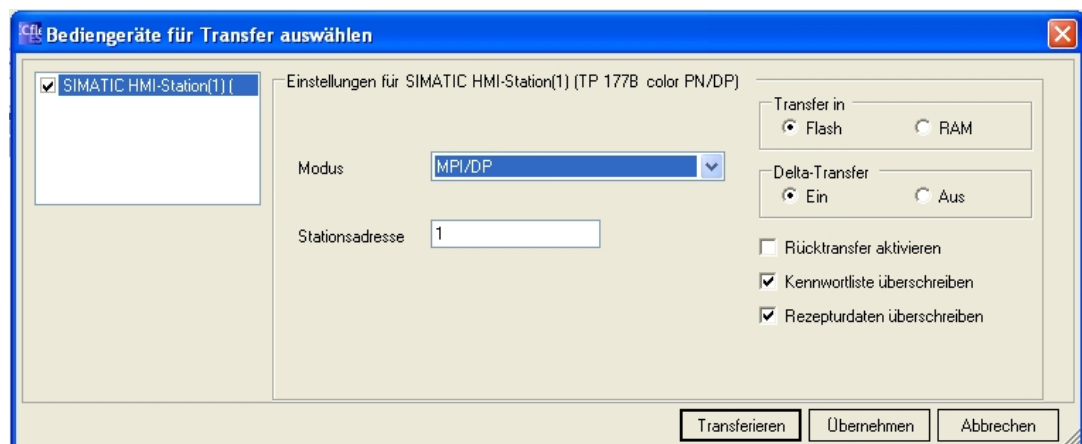
Confirm overwriting the keyword list.

<<Do you want to overwrite the existing keyword list on the operator panel?>>
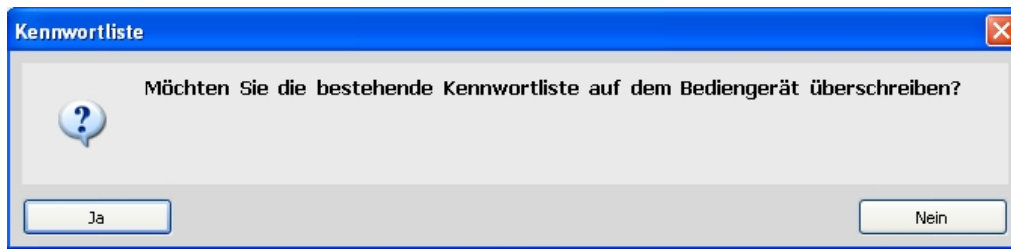
If the transfer settings are correct on the panel and in WinCC flexible, the transfer starts now.
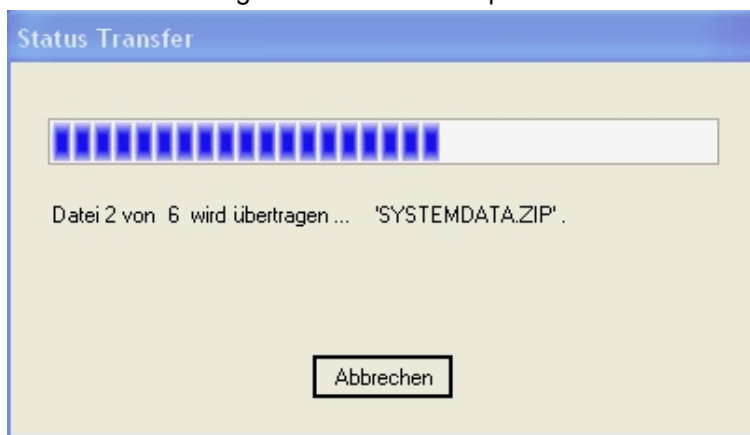
After restarting the panel, the start picture appears in runtime.
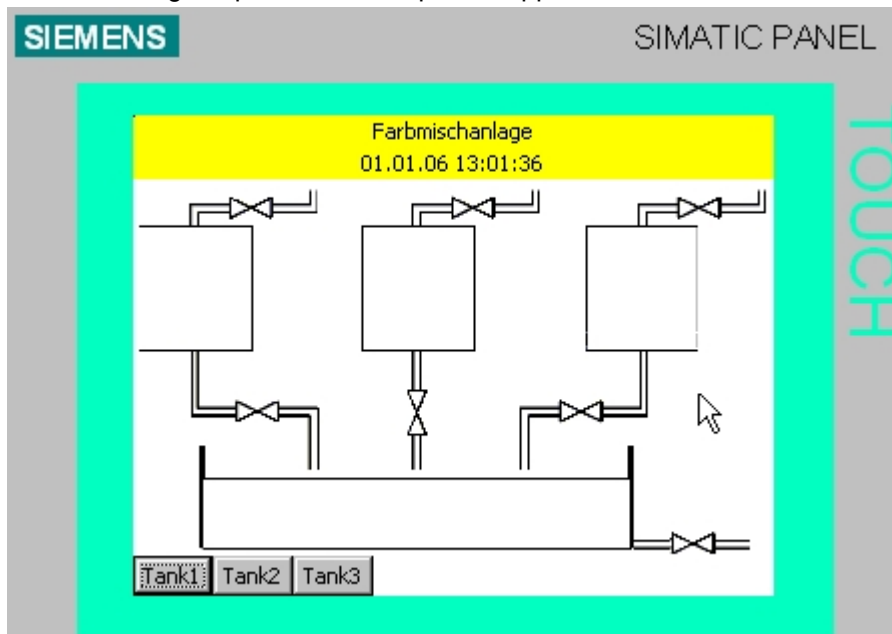
Test all buttons for the display change.

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6.6   Button END

The project can only be transferred again if the panel TP177B is in the transfer mode. When the panel powers up, the loader appears for a few seconds with the button "Transfer". Before each transfer, the panel would have to be taken off load so that a switchover to the transfer mode is possible. Data is lost in that case; for example, the date and the time of day have to be reset.

For that reason, in our basic display we are creating a button for ending the runtime mode. Drag a button into your basic display.
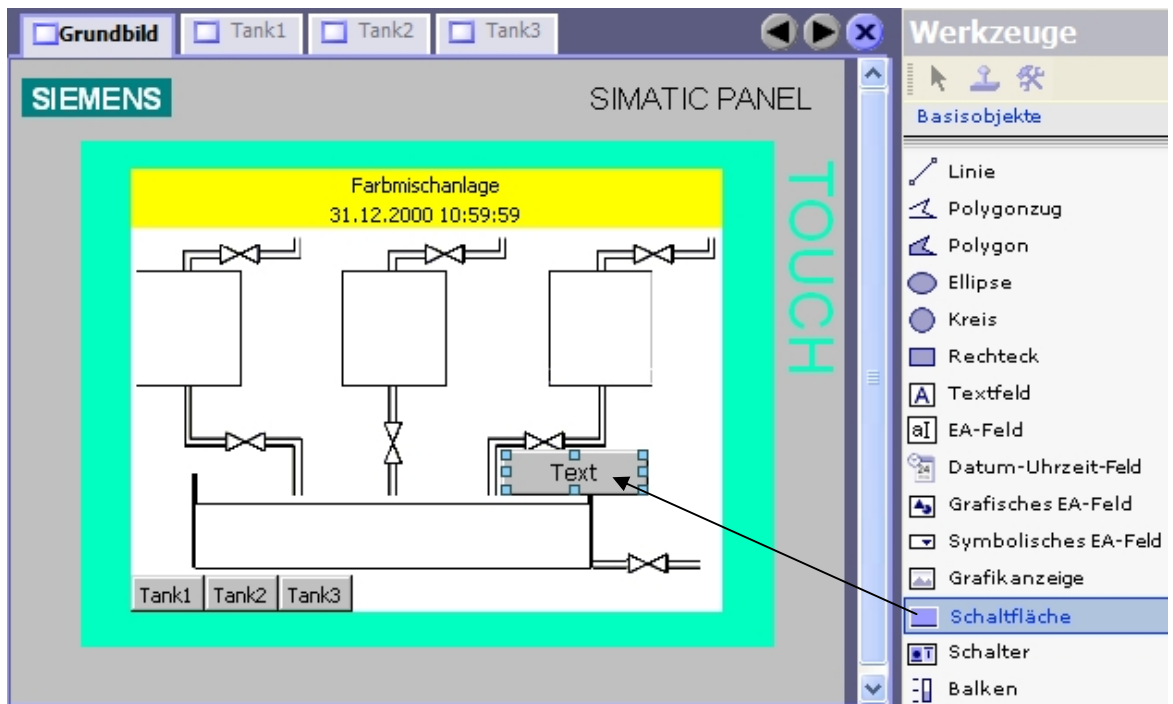
Change the text, the font size, the size 40 x 20, the position and the color (red) of the button.

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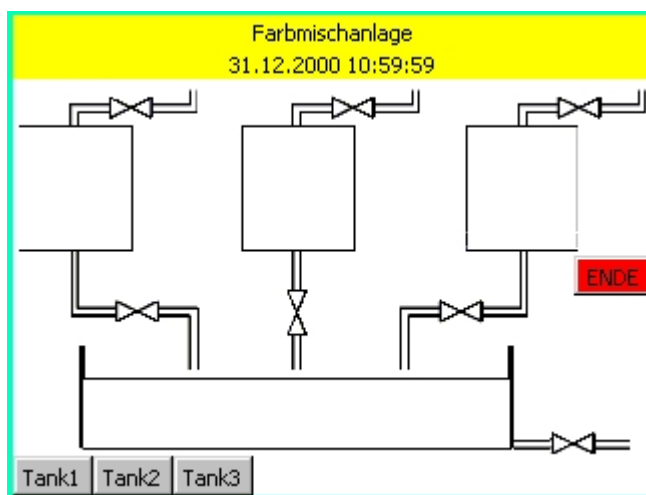
Under **Events**, select the function **StopRuntime** by **Clicking** on the function.
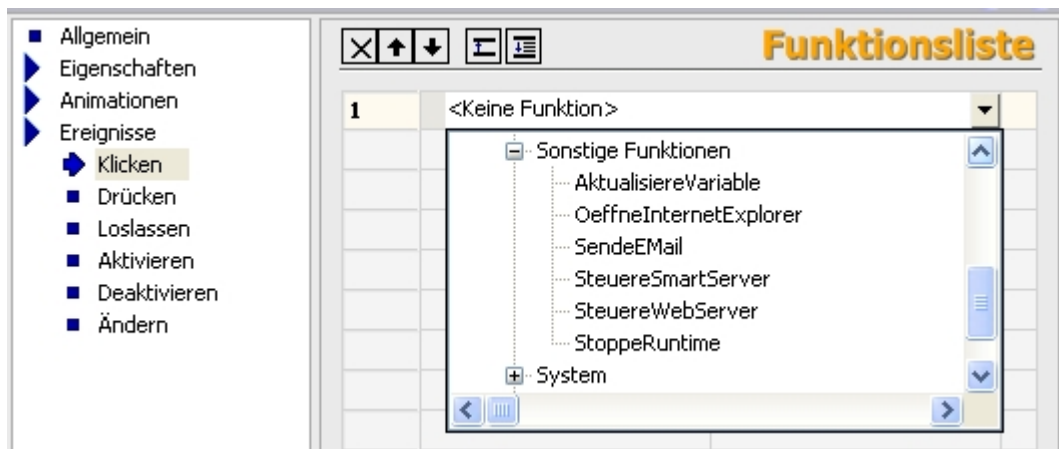
A configured function is referred to in bold print.
Under mode, other settings can be made.
For our panel TP177B, only Runtime is to be terminated.
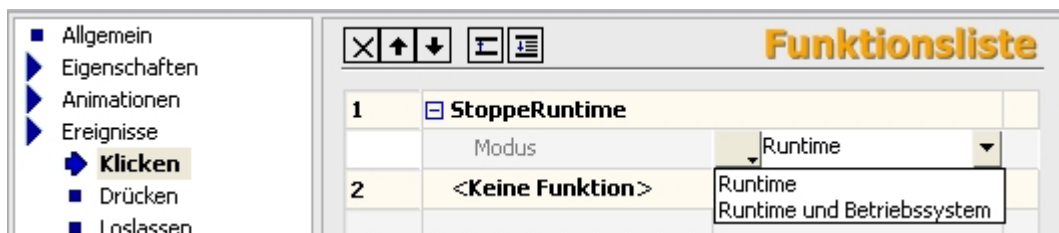
Save your project and start the consistency check.

Note
If during the consistency check, lines that are marked blue that contain internal warnings occur, you have to regenerate the entire project first.
In the menu "Project", click on Generator and select **Regenerate everything**.

Perform a restart at the panel (take it briefly off load).
Switch the panel to the transfer mode.
Transfer your project to the panel.
Click on the END button
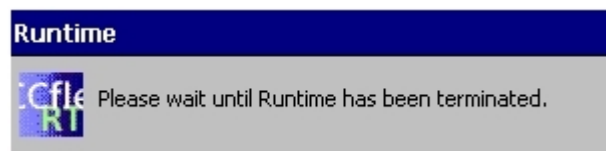
Reset the date and the time, and start Runtime.

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6.7   Configuring a Connection

So far, we worked in our project without accessing the SIMATIC S7 controller.

On our panel, levels are to be displayed and fill setpoints are to be entered.

For operator and display objects that access the process values of a controller, first the connection to the controller has to be configured.

Here, you specify how and by means of what interface the panel communicates with the controller.

Double click on the window **Connections**.

All parameters are already set through the settings in the hardware configuration.

Note

To set up a new connection, double click in the free field in the first column. Change the connection parameters of the newly created connection

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7   DISPLAY AND OPERATOR OBJECTS

Display and operator objects are graphic elements with which process displays are designed.
In Runtime, all display and operator objects behave dynamically.
In addition, you can make the properties of objects dynamic.
One example of this is the graphic of a tank whose liquid level is displayed as varying, depending on the corresponding process value.
Another example for the dynamic behavior of an object is a button that triggers a certain function. In principle, you can make all graphic objects dynamic.

You can configure the following:

-       The object changes its appearance: color and blinking.
-       The object moves in the picture.
-       The object is inserted/removed.

For operator elements, you can configure the following:

-       The object is enabled or disabled for operation.
-       By operating the object -for example, by clicking on it- an event is triggered to which the processing of a function list is configured.

7.1   Levels

For differentiated representation of a picture and for editing the objects in it, levels and multi- layering of the objects are provided.
A picture has 32 levels. You can insert objects in each level. The assignment to a level specifies the depth of the layer of an object in the picture. Objects of Level 0 are located deep in the background of the picture, objects of Level 31 in the very foreground.
In addition, objects in a single level are also staggered.
When creating a process image, the objects of an individual level are -by default- arranged in the sequence in which they were configured. Within the level, the object that was inserted first is located at the very back. Each additional object is inserted one position ahead of it. The position of the objects in relation to each other can be changed within the level. There is always an active level.
When you insert objects in a figure, they are assigned to the active level by default. The number of the active level is indicated in the symbol bar "Level".
In the level palette, the active level is highlighted in color.
When you open a picture, all its 32 levels are always displayed.
With the level palette, you can hide, after opening, all levels except for the active level. This allows you to specifically edit the objects in the active level.

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7.2 Basic Objects

Symbol	Object	Instructions
	"Line"	You can select straight, rounded or arrow-shaped line ends.
	"Polyline"	A polyline consists of linked paths and can have any number of corners. The corner points are numbered in the order of their creation. The corner points can be modified or deleted individually. You can select straight, rounded or arrow-shaped polyline ends. The polyline is an open object. Although the start and end points may have the same coordinates, the area they enclose cannot be filled in.
	"Polygon"	The corner points of a polygon are numbered in the order of their creation. The corner points can be modified or deleted individually. You can fill a polygon area with a color or a pattern.
	"Ellipsis"	You can fill an ellipsis with a color or a pattern.
	"Circle"	You can fill the circle with a color or a pattern.
	"Rectangle"	The corners of a rectangle can be rounded. You can fill the rectangle with a color or a pattern.
A	"Text box"	You can enter one or several lines of text in a "Text box" and define the font and the font color. You can add a background color or pattern to a text box.
abI	"I/O box"	An I/O box may have the following runtime functions: • Output of the values in a tag • Operator input of values; these input values are saved to a tag. • Combined input and output; the operator can here edit the output value of the tag and thus set a new value. You can define limits for the tag values shown in the I/O box. Set "Hide input" if you want to hide operator input in runtime.
	"Date-time box"	A "Date / time box" may have the following runtime functions: • Output of the date and time • Combined input and output; the operator can here edit the output values in order to reset the date and time. The system time or a corresponding tag may be used as source to define the date and time. The date can be output in extended format, for example, Tuesday, December 31, 2003, or in short format, for example, 12/31/2003.
	"Graphic I/O box"	A "Graphic I/O box" may have the following runtime functions: • Output of graphic list entries • Combined input and output; the operator can here select a graphic from an graphic list in order to change the content of the "Graphic IO field." Example of its use as output field: To indicate the runtime status of a valve, the "Graphic I/O box" outputs the image of a closed or open valve.

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Symbol	Object	Instructions
▼	"Symbolic I/O box"	The "Symbolic I/O box" may have the following runtime functions: • Output of text list entries • Combined input and output; the operator can here select a text from a text list in order to change the content of the "Symbolic I/O box." Example of its use as combination I/O box: To control a motor in runtime, the operator selects the text "Motor OFF" or "Motor ON" from the text list. The motor is either started or stopped as selected, and the "Symbolic IO field" indicates the current status of the motor (motor OFF / motor ON.)
🖼	"Graphic view"	The "Graphic view" shows you on one screen all of the graphic objects created by means of an external graphic programming tool. Graphic objects can be shown in the following formats: "*.emf", "*.wmf", "*.dib", "*.bmp", "*.jpg", "*.jpeg", "*.gif" and "*.tif". In the "Graphic view", you can also integrate graphic objects of other graphic programming tools as OLE (object linking and embedding) objects, for example. OLE objects opened and edited in the graphic program in which they were created directly from the property view of the graphic view.
OK	"Button"	The operator can use a button to control a process. You can configure functions or scripts for a button.
0 1	"Switch"	The switch is used in runtime to input and visualize two states, for example, ON and OFF, or pressed and not pressed. It can be labeled with text or a graphic that indicates the runtime status of the switch.
▐	"Bar"	The "Bar" represents a process value in the form of a scaled bar graph. A bar graph allows you to visualize, for example, dynamic values of filling levels.

Note
Depending on the operator panel for which you are configuring, some objects from the tool window are not available, or only with limited modes of operation.
Objects that are not available are displayed in the tool window grayed, and can not be selected.

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7.3　　　　Expanded Objects

Symbol	Object	Description
	"Slider"	The "Slider" is used for operator input and monitoring of numeric values. • When used as display instrument, the slider position indicates a process value which is output by the controls. • The operator inputs values by changing the slider position. You can customize the slider, so that it operates only in vertical direction.
	"Clock"	On your HMI device, you can view the clock in runtime either in digital or in analog format.
	"Status force"	The "Status / control" functions provide direct read / write access to specific address areas of the connected SIMATIC S7 or SIMATIC S5 CPU.
	"Sm@rtClient view"	The operator can monitor and operate a remote operator station by means of the "Sm@rtClient view ."
	"HTML browser"	The operator can view pages in HTML format by means of the HTML browser.

Symbol	Object	Description
	"User view"	In WinCC flexible, you can use passwords to control access to screen objects. In the "User view", an administrator can manage users on the HMI device in Runtime. In the "User view", user who do not have administrator privileges can change their password in runtime.
	"Gauge"	The "Gauge" dial can display numerical values in runtime. The layout of the "Gauge" is configurable. You can customize the background image or the dial layout, for example.
	"Trend view"	In the "Trend view", you can show a group of trends which represent process values read from the PLC or from a log. The trend coordinates are configurable, i.e. the scaling, units etc.
	"Recipe view"	The operator can use the "Recipe view" in runtime to view, edit and manage data records.
	"Alarm view"	In the alarm view, the operator can view selected alarms or alarm events in the alarm buffer or the alarm log in runtime.
	"Alarm window"	In the "Alarm window", the operator can view selected alarms or alarm events in the alarm buffer or the alarm log in runtime. You always edit the template to configure the alarm window.
	"Alarm indicator"	The "Alarm indicator" warns the operator of alarm events which are not acknowledged yet. You always edit the template to configure the alarm indicator.
	Help indicator	The help indicator indicates available help texts for the screen being displayed or the objects contained on the screen. The help indicator is available for the HMI devices OP 73 and OP 73micro. You always edit the template to configure the help indicator.

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8 DISPLAY AND OPERATOR OBJECTS IN THE PROJECT "COLOR MIXING PLANT"

8.1 Configuring Display and Operator Objects in the Picture"Tank1"

First, a bar, two sliders (linear regulators), and two buttons are configured.

Configuring the Bar Display

To display the current level of Tank1, we configure a bar.
Drag a bar into the picture Tank1.

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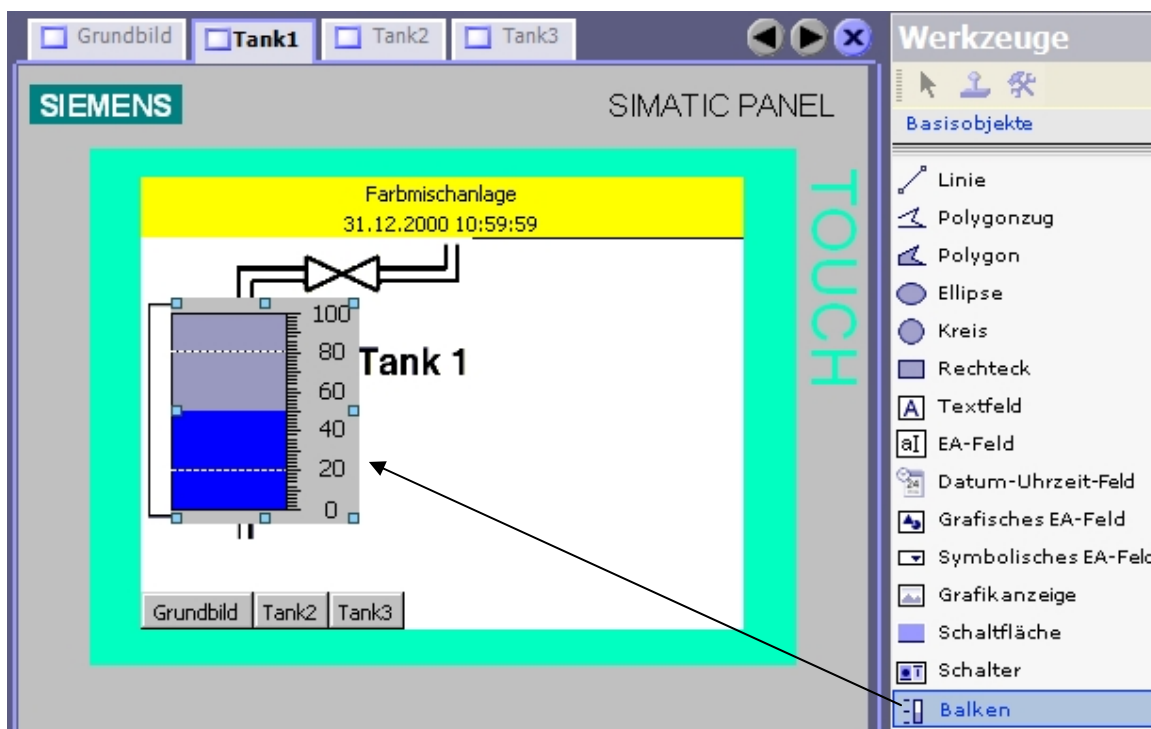
As a Maximum Value, enter **1000**.

From the symbols of the color mixing plant, select the variable "**CONTENT_T1**" as process variable.
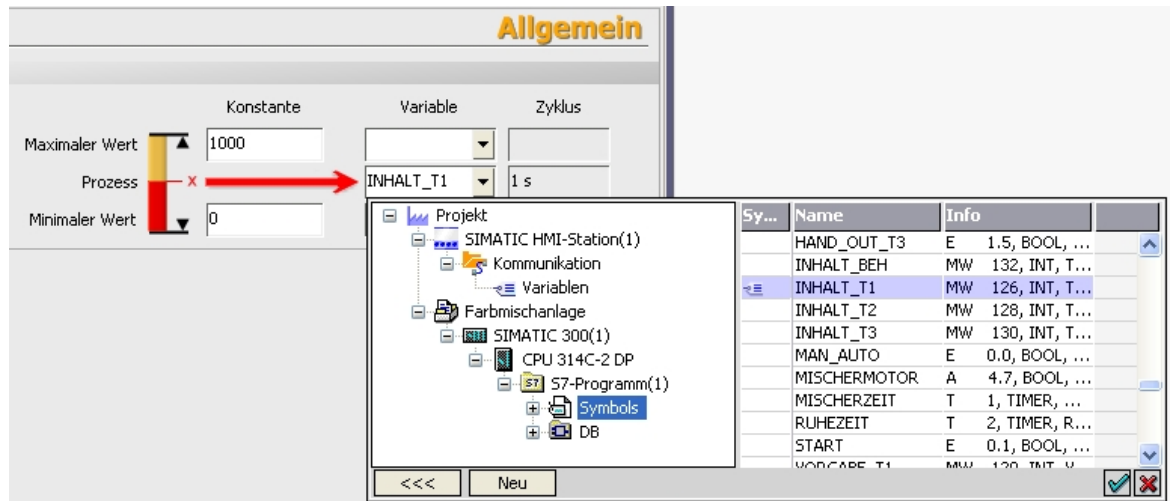
The WinCC flexible variable "CONTENT_T1" was generated automatically as process variable.

By double clicking on **Variables** in the project window, additional settings can be made.
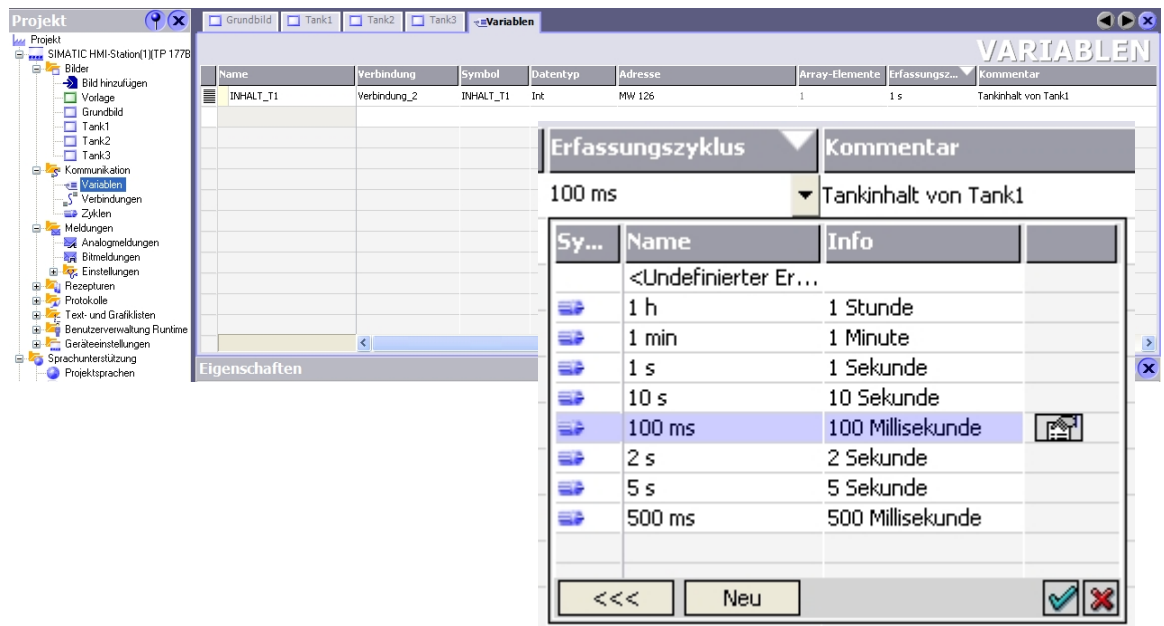
Change the data collection cycle of the variable to **100ms**. The variable will now be updated every 100ms. The movement of the bar -that is, the tank level- is now shown as flowing.

Note

Communication influences the cycle time of the SIMATIC S7 300 controller. If there is a large number of variables, the data collection cycle of each variable should be weighed carefully.

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In the property window, under Style (Gestaltung), change the color assignments of the foreground color to **red** and the background of the bar to **white**.

At Scale, remove the check mark "**Display scale**" (Skala anzeigen).
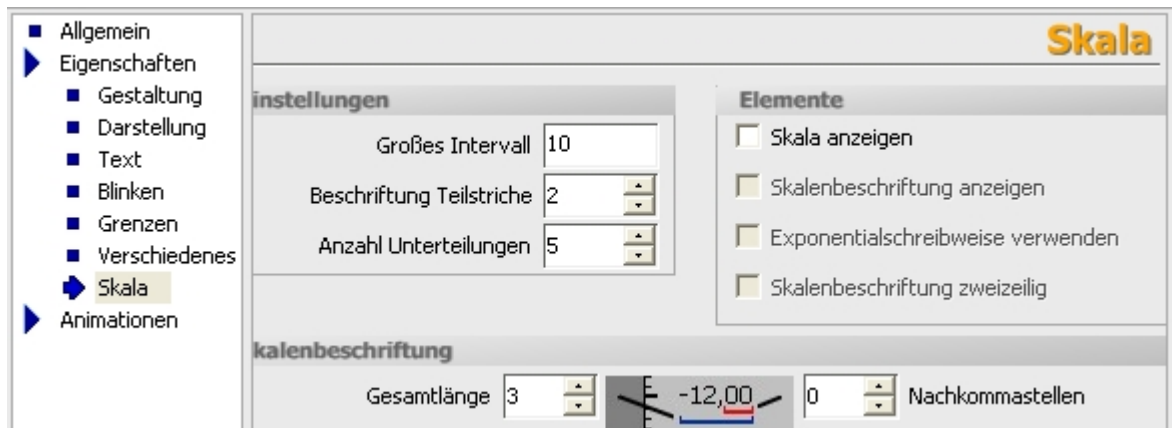
At the limits, remove the check mark for "**Display limit lines**" (Grenzwertlinien anzeigen).

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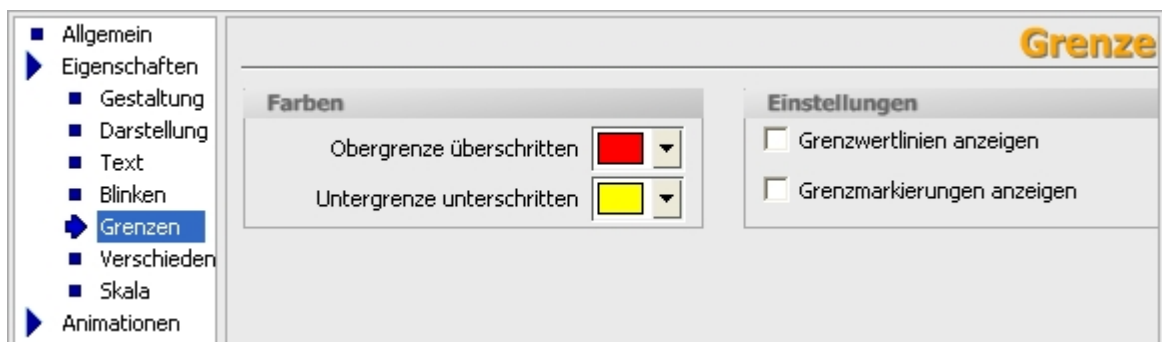
At Representation, change the position and the size of the bar.
Bar direction is already preset to **UP** (**Oben**).

| Grundbild | **Tank1** | Tank2 | Tank3 | Variablen |

SIEMENS   SIMATIC PANEL

Farbmischanlage
31.12.2000 10:59:59

TOUCH

Tank 1

Grundbild | Tank2 | Tank3

Balken_1 (Balken)

- Allgemein
- Eigenschaften
  - Gestaltung
  - Darstellung
  - Text
  - Blinken
  - Grenzen
  - Verschieden
  - Skala
- Animationen

Darstellung

Position		Größe		Darstellung	
X	5	↔	102	Position Skala	Rechts oder unten
Y	36	↨	112	Balkenrichtung	Oben

The bar for indicating the level in the picture Tank1 is now completed.

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8.1.2 Configuring the Slider (Linear Regulator)

To set the minimum level, we are configuring a slider. From the tool window under **Expanded Objects**, drag the **Slider** into the picture "Tank1".
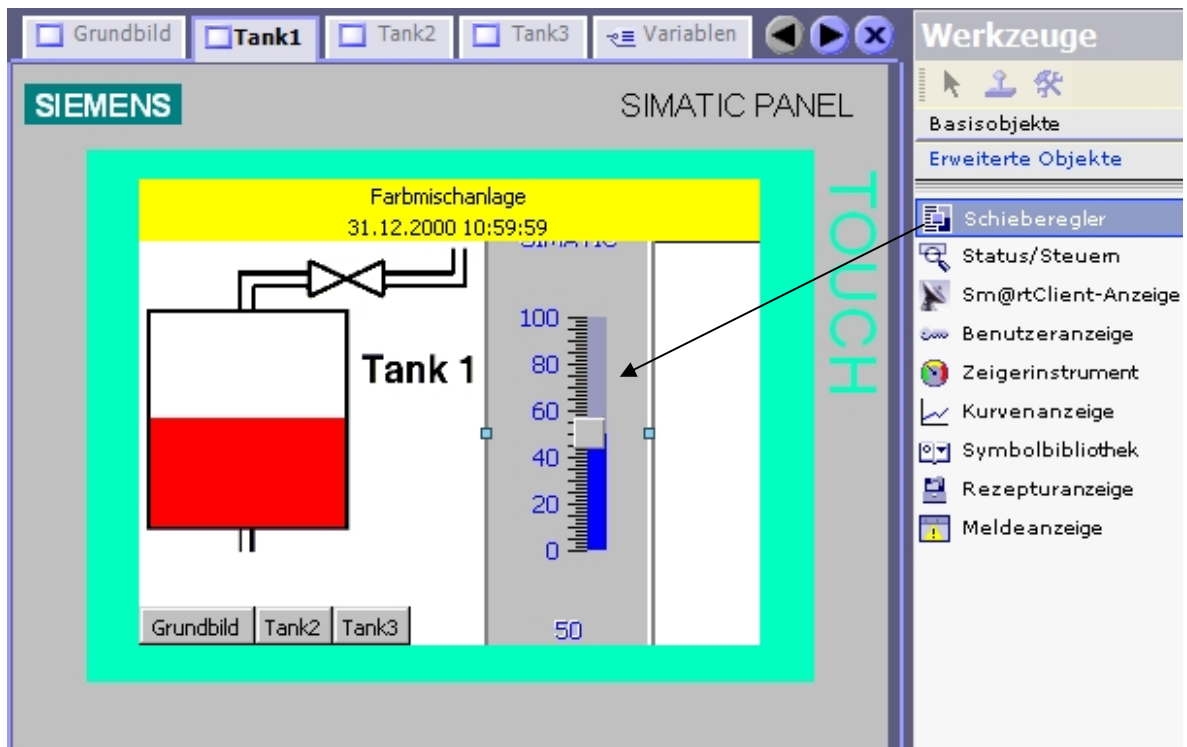
As the maximum value, enter **450**, as the minimum value, enter **10** and select as process variable the variable "**low_level**" from the FB call "**tank1**" of **DB1** of the color mixing plant.
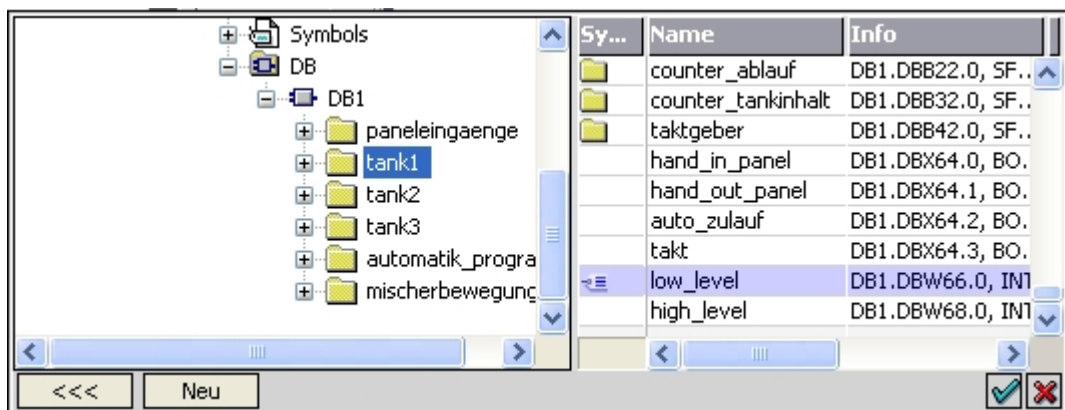
Note
Under WinCC flexible, you can also access the variable declaration in a data block.

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At Design, enter "**MIN**" for labeling.

At Representation, change the position and the size of the slider.
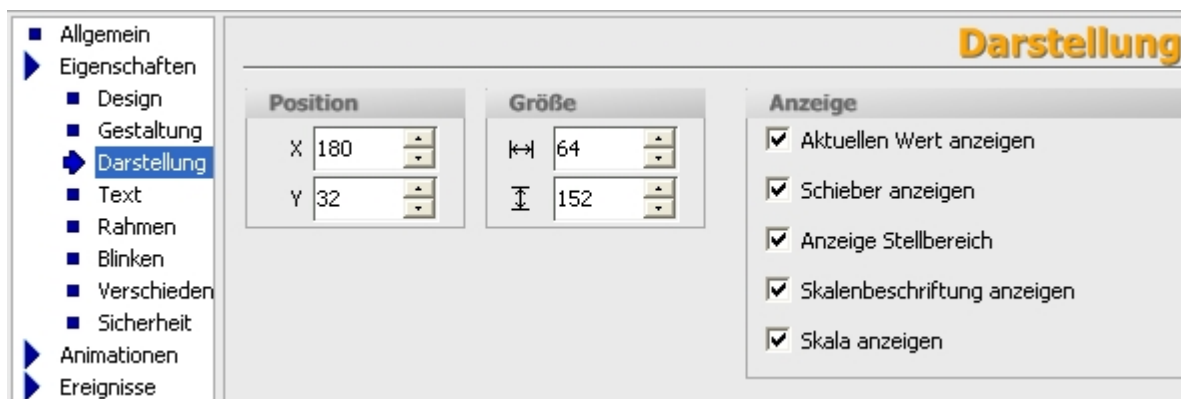
At text, change the font size.
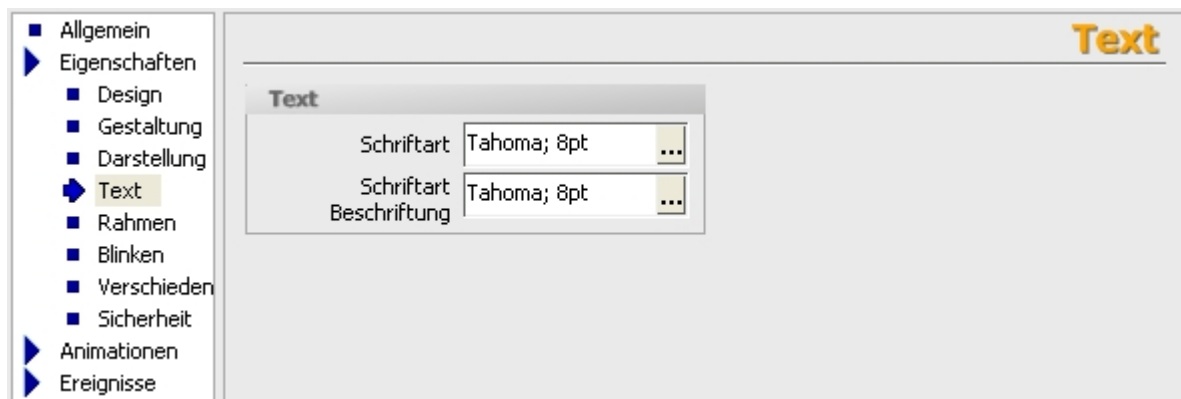
Insert a second slider for setting the maximum level in Tank1. Change the Minimum Value to **550**, the Maximum Value to **990**, and select the variable "**high_level**" as process variable from the FB call "**tank1**" of **DB1**.

For labeling, enter "**MAX**" at Design.

Position the slider on **X244** and **Y32** and change the size to **64** x **152**.

Finally, change the font size at Text.

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The picture Tank1 now looks like this.

In the meantime, three variables were set up automatically. If there should be additional variables, highlight the line and delete the variable (right mouse key).

Name	...	Symbol	Datentyp	Adresse
INHALT_T1	...	INHALT_T1	Int	MW 126
DB1.tank1.low_level	...	low_level	Int	DB 1 DBW 66
DB1.tank1.high_level	...	high_level	Int	DB 1 DBW 68

Don't forget to save!

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8.1.3   Configuring a Button

To open the valves, we are configuring a button.
From the tool window under **Basic Objects**, drag a **Button** into the picture "Tank1".
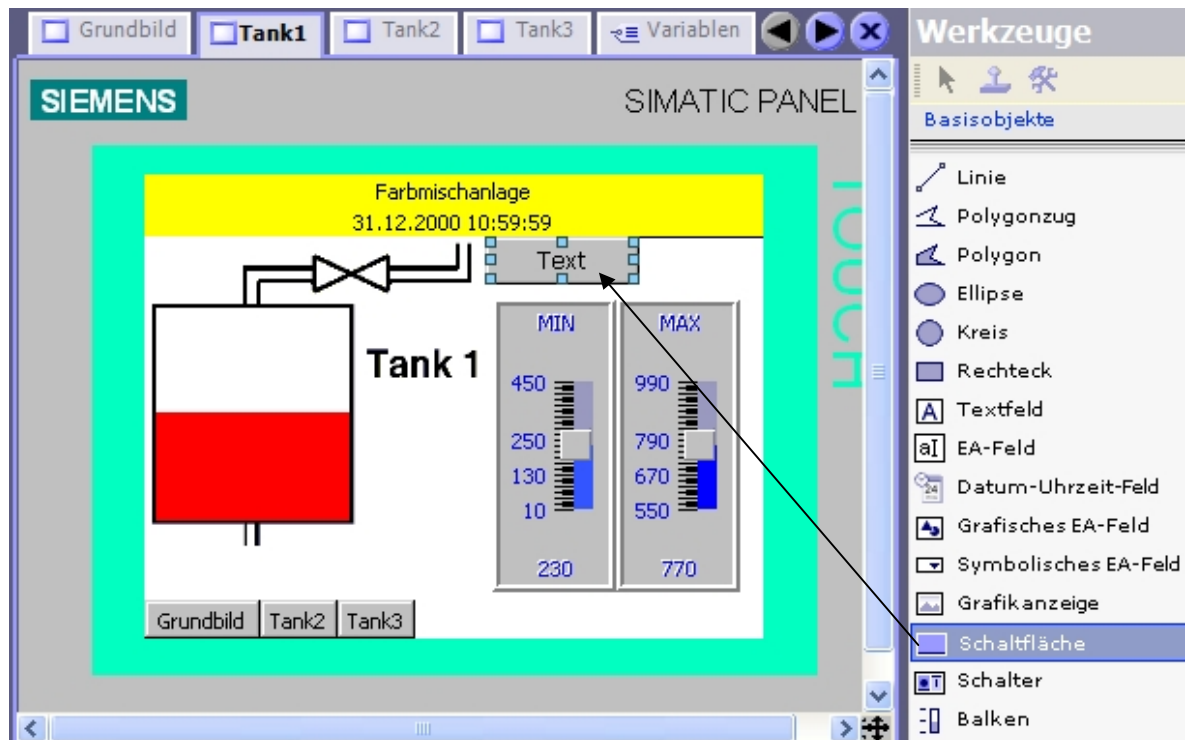
In General, place a check mark at **Text EIN** (open inflow valve) and enter the texts.
Caution! Don't press the enter key after entering the text; otherwise, a new line is generated.
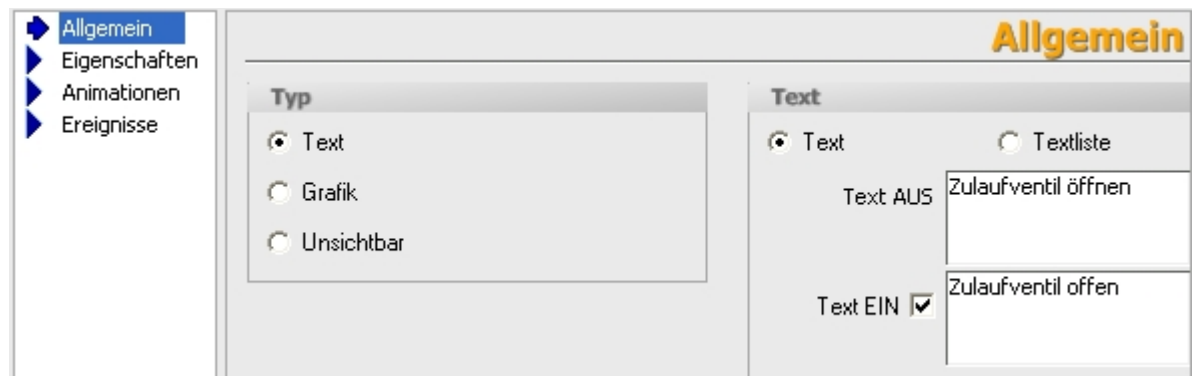
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Change the background color to white, and select a smaller font size.
Set the position and the size.
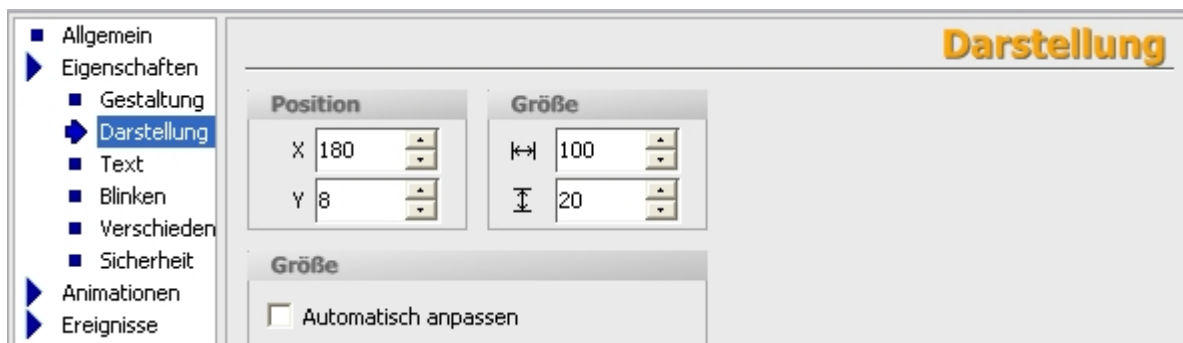
In the function list, at Drücken (Press), select the function "**SetzeBit**" (set bit).
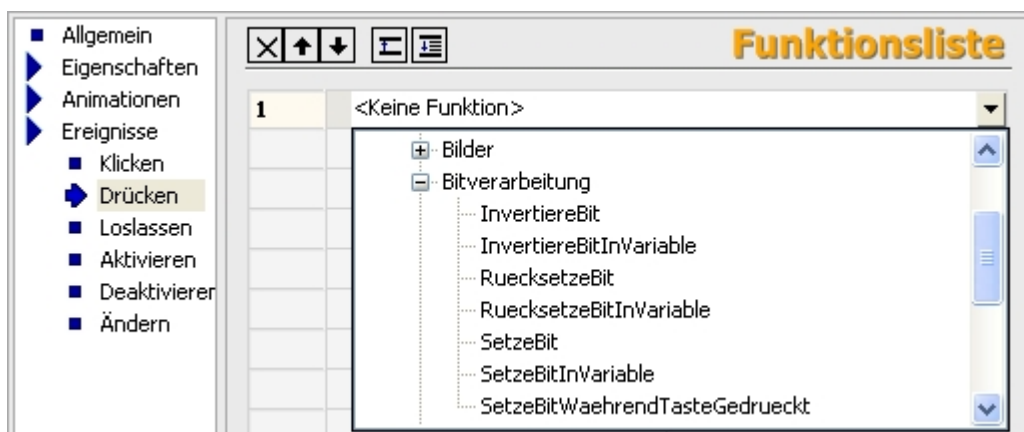
From DB1, select as variable "**hand_zulauf_tank1**" (manual inflow tank1).

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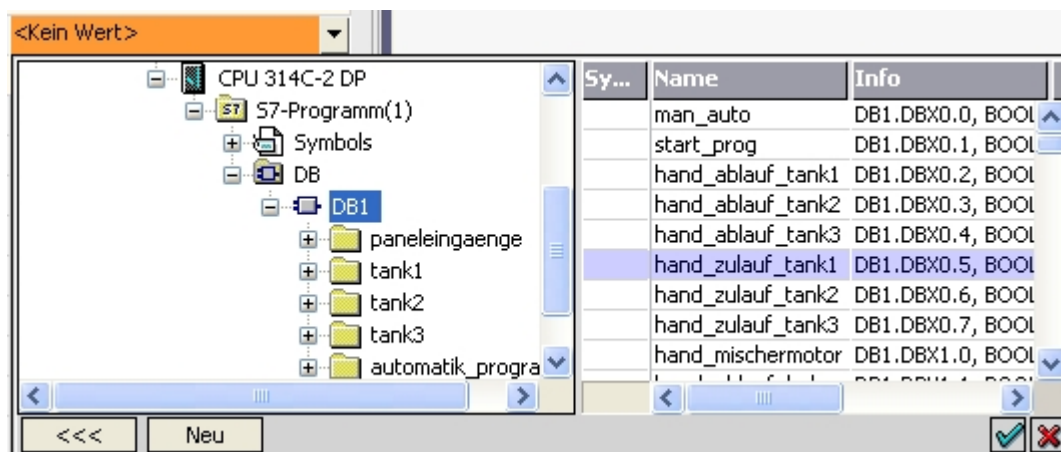
We want to generate the function of a button; for that reason, configure now the function "**RuecksetzeBit**" (reset bit) with the variable "**hand_zulauf_tank1**" at Loslassen (releasing) the button.
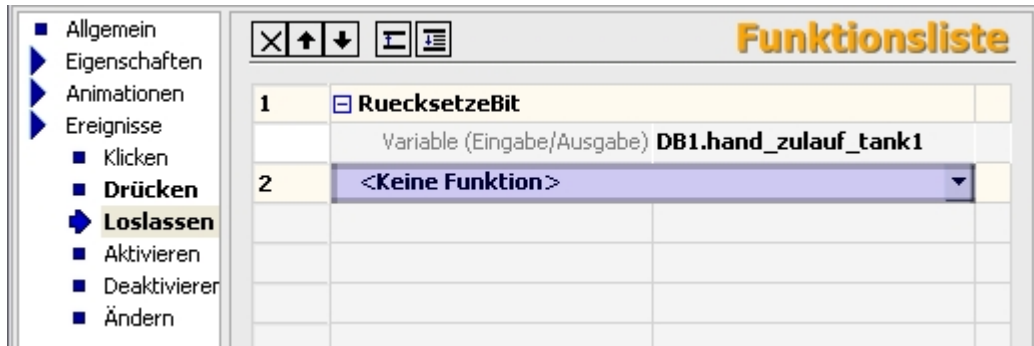
The button is to be operable only in the manual mode.
Under **Animations**, select **Operability**.
Set the check mark at **Activated**.
From the symbols, select "**H3_MAN**" as variable.
Enter **1** at "From" and **1** at "To".
Set the status to **Activated**.
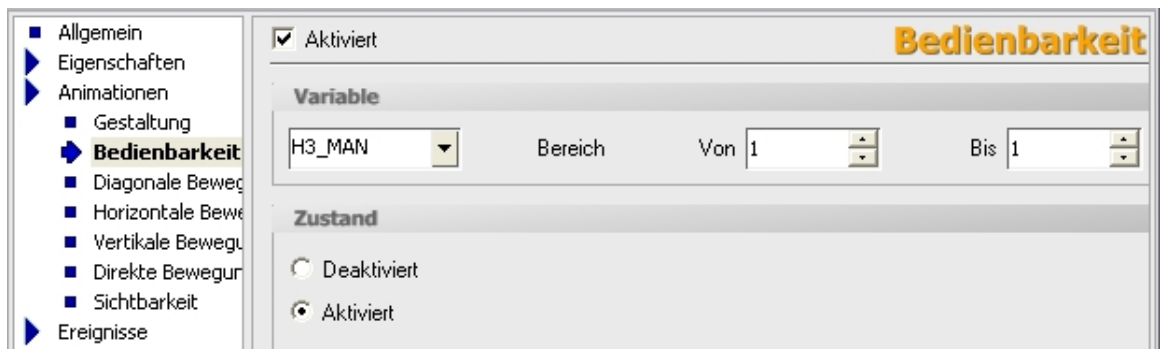
The button can only be operated if the variable "H3_MAN" has the value 1.
For operability (Bedienbarkeit) to be visible, change the background color to **Blue** at **Style** (Gestaltung).

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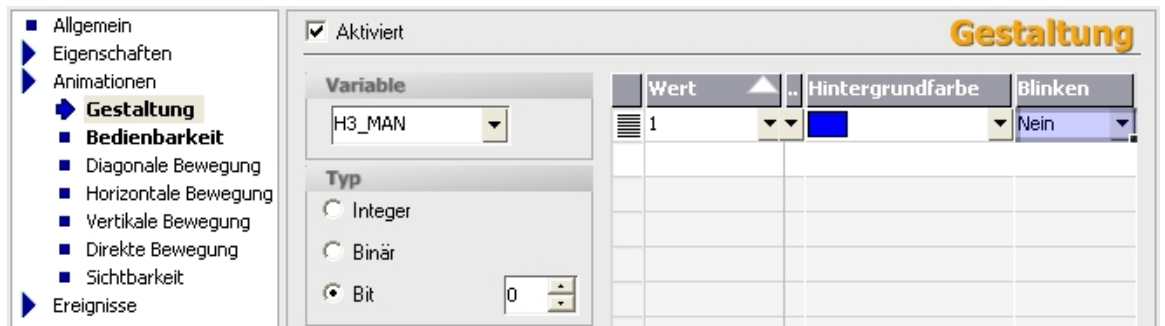
Copy and insert the button.

Change the text to "**Ablaufventil**" (outflow valve), the position to **X80**, **Y158**.

Under Ereignisse (events) **Drücken** and **Loslassen** (press and release), select the variable "**hand_ablauf_tank1**" (manual outflow Tank1).

In our variable list, only three additional variables were set up automatically.

Name	...	Symbol	Datentyp	Adresse	Array-El...	Erfassungszyklus
INHALT_T1	...	INHALT_T1	Int	MW 126	1	100 ms
DB1.tank1.low_level	...	low_level	Int	DB 1 DBW 66	1	1 s
DB1.tank1.high_level	...	high_level	Int	DB 1 DBW 68	1	1 s
DB1.hand_zulauf_tank1	...	hand_zulauf...	Bool	DB 1 DBX 0.5	1	1 s
H3_MAN	...	H3_MAN	Bool	A 5.2	1	1 s
DB1.hand_ablauf_tank1	...	hand_ablauf...	Bool	DB 1 DBX 0.2	1	1 s

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8.1.4   Showing the Valve Function in Color

The switching states of the valves are to be visible by changing color.
To this end, first set the zoom factor of the view to **400%** and select the picture excerpt of the valve.
Then, in the tool window, highlight the **Polygon**.
.
Trace the valve by clicking on each corner, and by double clicking at the end.
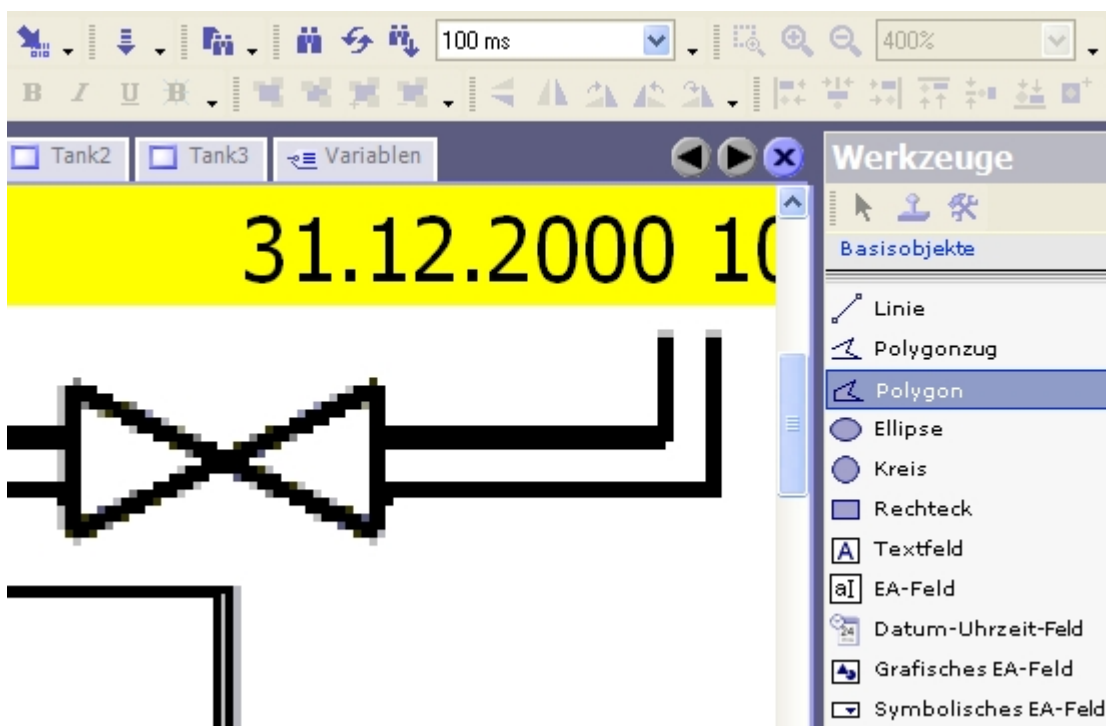
Because of the grid function, the polygon is a little larger than it is in the graphic.
The size and the position will be adjusted in the Properties.

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SIEMENS
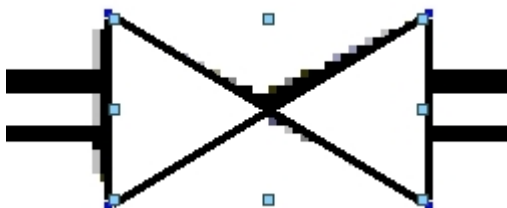
Change the position and the size in a way so that the graphic and the polygon fit together.

| Grundbild | Tank1 | Tank2 | Tank3 | Variablen |

31.12.2000 10

Tank 1

Polygon_2 (Polygon)

- ► Eigenschaften
  - ■ Gestaltung
  - ► Darstellung
  - ■ Blinken
  - ■ Verschiedenes
- ► Animationen

Darstell

Position

X 89

Y 11

Größe

↔ 36

↕ 16

Radien

Nr.	Pos. X	Pos. Y
1	89	11
2	125	27
3	125	11
4	89	27

In the Properties at Style, change the fill color to **yellow**.

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Under Animation, activate **Style** and use the variable "**ZULAUF_T1**" (Inflow T1).
Set the Type to **Bit 0,** and at Value **1**, change the background color to **Red**.

Copy and insert the polygon. Rotate the polygon by 90 degrees and position it below the tank (the button for rotating by 90 degrees is in the symbol bar above).

Use the variable "**ABLAUF_T1**" (Outflow T1) for the color change in Style.

Don't forget to save!

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8.1.5 Testing the Picture "Tank1" in Runtime

Check the consistency of the project.

12:50:15.26	Generator	46% processed, 63 steps remain ....
12:50:15.77	Generator	Linker processed 'SIMATIC HMI Staton(1)' ....
12:50:17.28	Generator	Number of power tags used: 8
12:50:17.32	Generator	Required license: WinCC flexible Sm@rtService for panel
12:50:17.32	Generator	Required license: WinCC flexible Sm@rtAccess for panel
12:50:17.33	Generator	Completed successfully: 0 error(s), 0 warning(s)
12:50:17.33	Generator	Time stamp 12.28.2005 12:50 utilized 68320 bytes of maxi
12:50:18.32	Generator	Compiling finished!

Note

If during the consistency check, lines marked blue with internal warnings occur, the entire project has to be regenerated.

In the menu "Project", click on Generator and select **Regenerate everything** (alles neu generieren).

Switch the TP177B to the transfer mode.
Transfer the project.
Test the functions in the picture "Tank1".
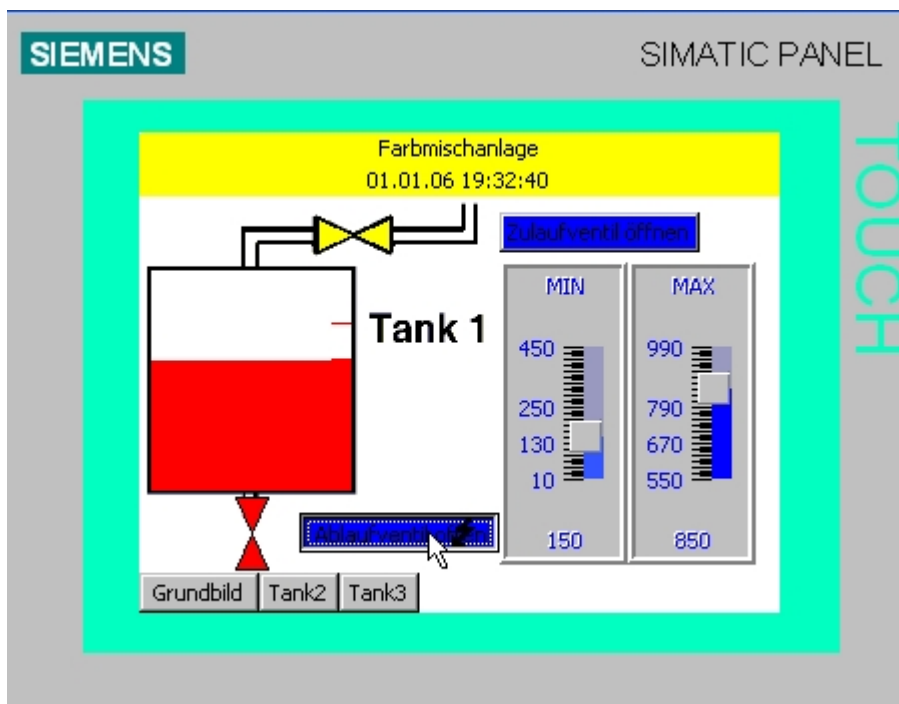
Note

If the container is full, the outflow valve can no longer be opened.
You first have to empty the container using the button "HAND_OUT_BEH (E1.6)".
If you set the data collection cycle of all variables to 100ms, the operation of the buttons and the valve function are updated faster.

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8.2   Configuring the Display and Operator Objects in the Pictures "Tank2" and "Tank3"

The picture for Tank2 and Tank3 is structured exactly like the picture for Tank1.
In the picture "Tank2", the level of the tank and the valve function are to be displayed in the color **green** and the variables for Tank2 are used; for example, "**INHALT_T2**" (Content Tank2).
In the picture "Tank3", the level of the tank and the valve function are to be displayed in the color **blue** and the variables for Tank3 are used; for example, "**INHALT_T3**".
Configure the tank pictures by either repeating the steps described in 8.1 and using a different color and variable assignment, or by copying the objects of the picture "Tank1" and inserting them in the picture "Tank2" and "Tank3".
You can highlight and copy several objects with SHIFT+mouse click.
Then switch to the picture "Tank2" and "Tank3" and insert the objects.
After you inserted the objects, only the color assignments and the variables have to be changed. For the bars and the valves, the size and the position have to be adjusted to the background graphic in addition.
Check the generated variables and test the objects of the pictures in runtime.

Name	...	Symbol	Datentyp	Adresse	A...	Erfassungszyklus
OUTFLOW_T1	...	ABLAUF_T1	Bool	A 4.1	1	100 ms
ABLAUF_T2	...	ABLAUF_T2	Bool	A 4.3	1	100 ms
ABLAUF_T3	...	ABLAUF_T3	Bool	A 4.5	1	100 ms
DB1.man_outflow_tank	...	hand_ablauf...	Bool	DB 1 DBX 0.2	1	100 ms
DB1.hand_ablauf_tank2	...	hand_ablauf...	Bool	DB 1 DBX 0.3	1	100 ms
DB1.hand_ablauf_tank3	...	hand_ablauf...	Bool	DB 1 DBX 0.4	1	100 ms
DB1.man_inflow_tank1	...	hand_zulauf...	Bool	DB 1 DBX 0.5	1	100 ms
DB1.hand_zulauf_tank2	...	hand_zulauf...	Bool	DB 1 DBX 0.6	1	100 ms
DB1.hand_zulauf_tank3	...	hand_zulauf...	Bool	DB 1 DBX 0.7	1	100 ms
DB1.tank1.high_level	...	high_level	Int	DB 1 DBW 68	1	100 ms
DB1.tank1.low_level	...	low_level	Int	DB 1 DBW 66	1	100 ms
DB1.tank2.high_level	...	high_level	Int	DB 1 DBW 130	1	100 ms
DB1.tank2.low_level	...	low_level	Int	DB 1 DBW 128	1	100 ms
DB1.tank3.high_level	...	high_level	Int	DB 1 DBW 192	1	100 ms
DB1.tank3.low_level	...	low_level	Int	DB 1 DBW 190	1	100 ms
H3_MAN	...	H3_MAN	Bool	A 5.2	1	100 ms
CONTENT_T1	...	INHALT_T1	Int	MW 126	1	100 ms
INHALT_T2	...	INHALT_T2	Int	MW 128	1	100 ms
INHALT_T3	...	INHALT_T3	Int	MW 130	1	100 ms
ZULAUF_T1	...	ZULAUF_T1	Bool	A 4.0	1	100 ms
ZULAUF_T2	...	ZULAUF_T2	Bool	A 4.2	1	100 ms
ZULAUF_T3	...	ZULAUF_T3	Bool	A 4.4	1	100 ms

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View of picture "Tank2"

View of picture "Tank3"

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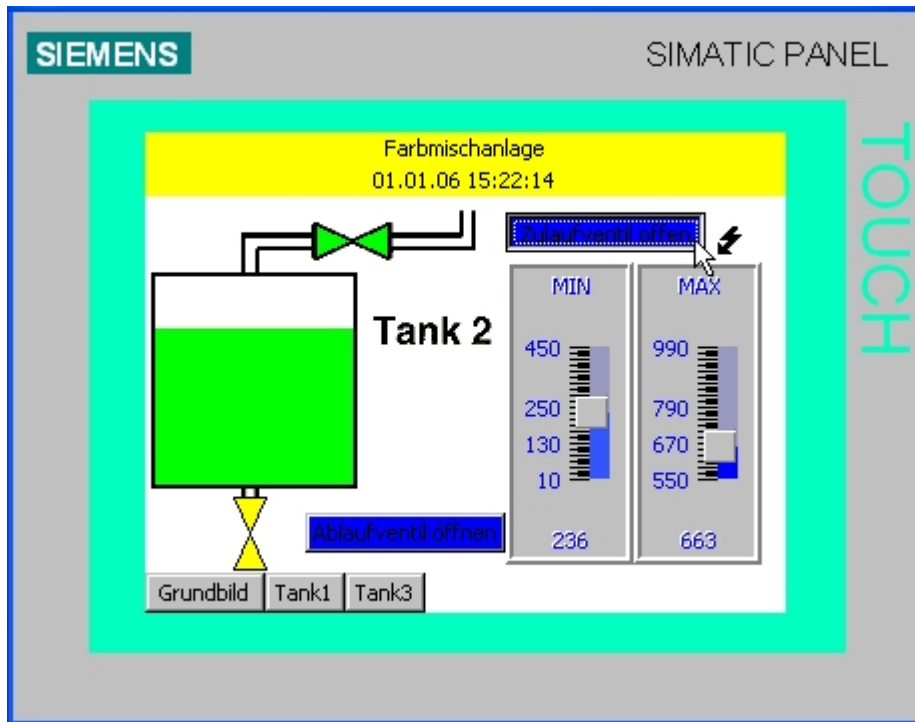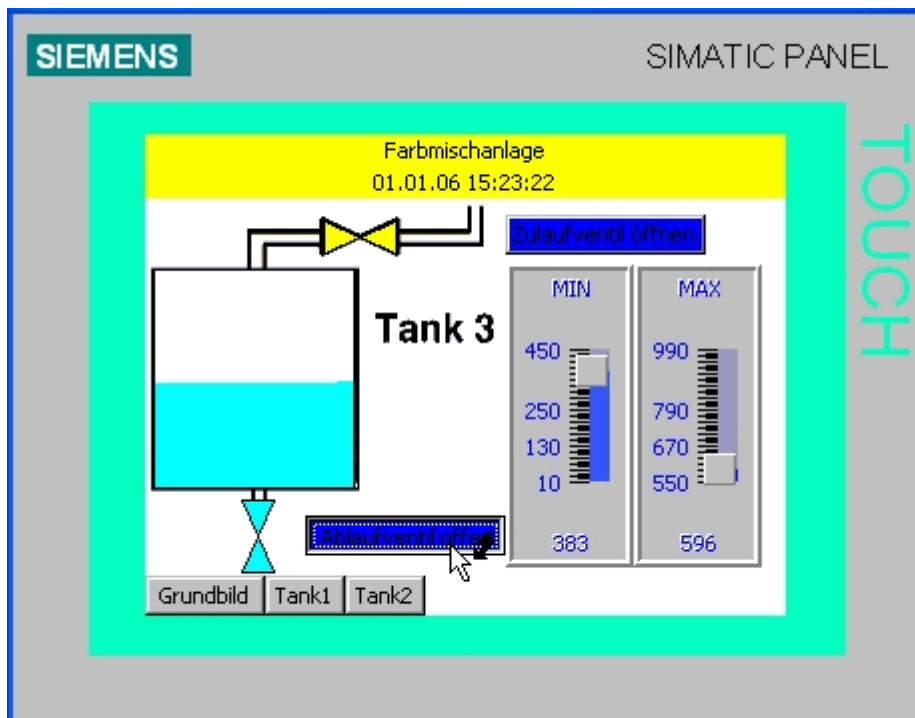
8.3 Objects in the Basic Display

8.3.1 Tank Levels and Valve Representations

In the basic display, the levels and the valve functions of the three tanks are to be shown. In addition, the level of the container and the function of the outflow valve at the container are to be displayed graphically.

From the three tank pictures, copy the bars of the tanks, and the polygons of the inflow and outflow valves to the basic display.
After you inserted the objects, only change their size and position.
Create a new bar for the level of the container. Use the variable "**INHALT_BEH**" (content_container) for the process value, and enter as Maximum Value **3000**.
Use the color **violet** as the fill color for the bar (foreground color).
Remove the scale and the limit lines.
Adjust size and position to the background graphic.
Copy and insert one of the polygons for representing the valve in the basic display.
Position the polygon over the outflow valve of the container, and change the color to **violet** in Properties under Animation.
As control variable, use the variable "**ABLAUF_BEH**" (outflow_container).
Test the basic display in Runtime.

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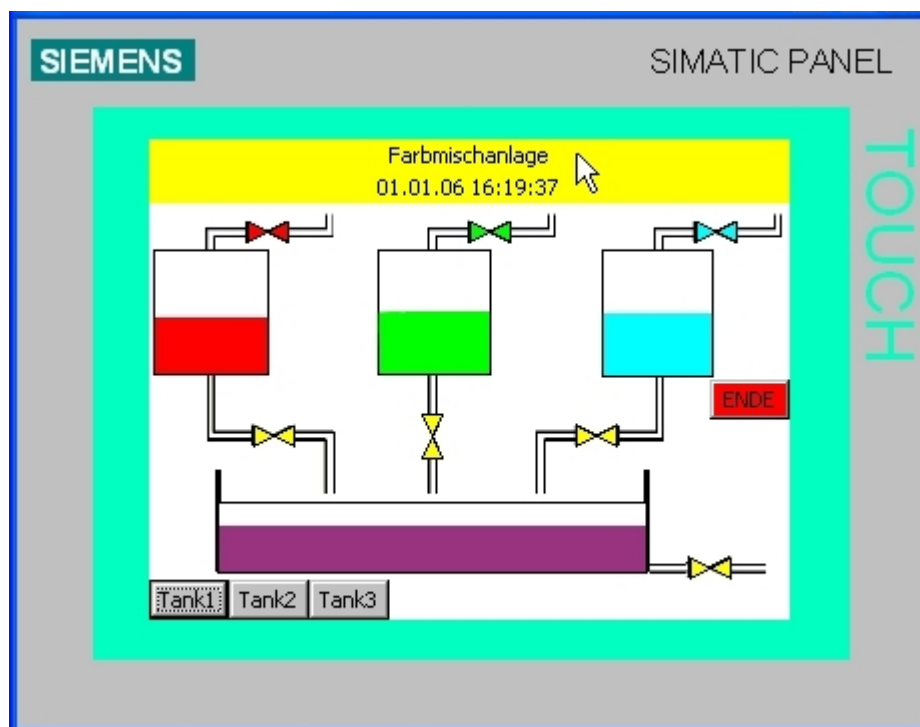
8.3.2   Configuring the Mixer Motor

To represent the mixer motor, a graphic EA field that is connected to a graphic list is used.
For manual operation by means of the panel, we are using a symbolic EA field that is connected to a text list.

Generating the Graphic List

In the project window, click on **Graphic Lists** in the folder "Text and Graphic Lists".
In the column Name, double click on the first line, and in this way generate a new graphic list.
Change the name of the graphic list to "**Motor**".
Under Selection (Auswahl), select "**Range (0-…)**".
Below, at Value **0**, insert the graphic "**motor_off**", and at Value **1**, the graphic "**motor_on**" as OLE object from the template (Vorlage) directory Pictures (Bilder) (is described in Section 6.2.3).

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Inserting a Graphic EA Field

Drag a Graphic EA field into the basic display.
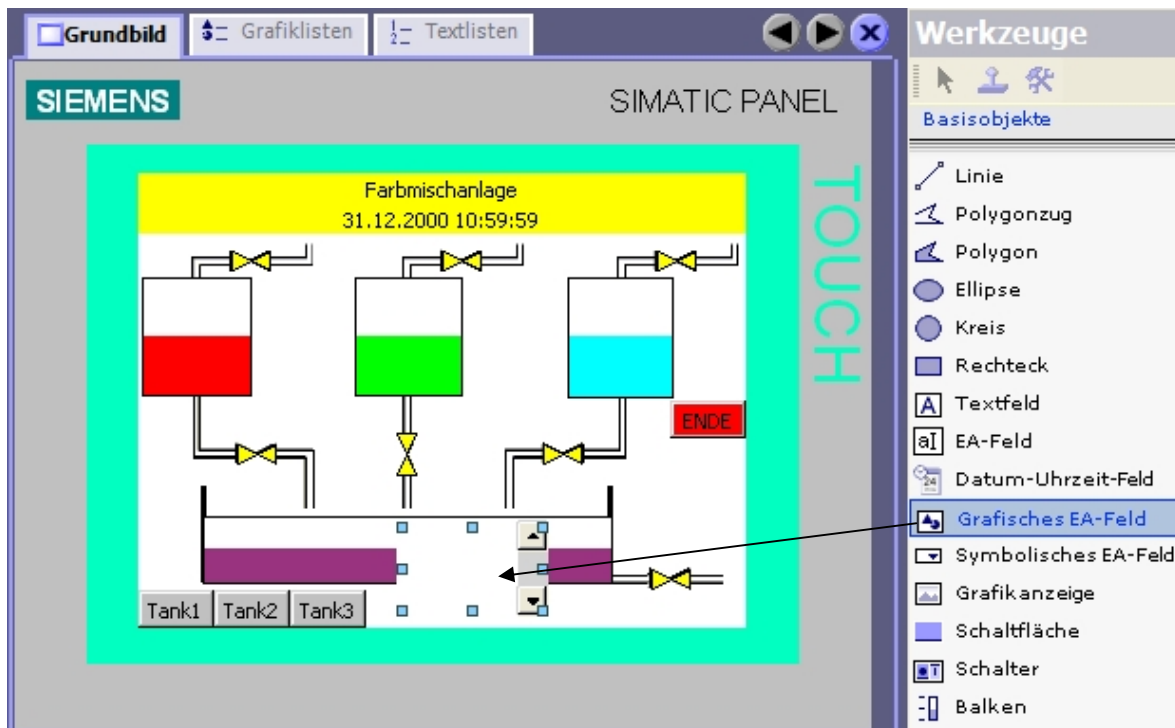
In the properties, set the mode **Ausgabe** (output) and select the graphic list **Motor** and the variable "**MISCHERMOTOR**".
Adjust size and position.

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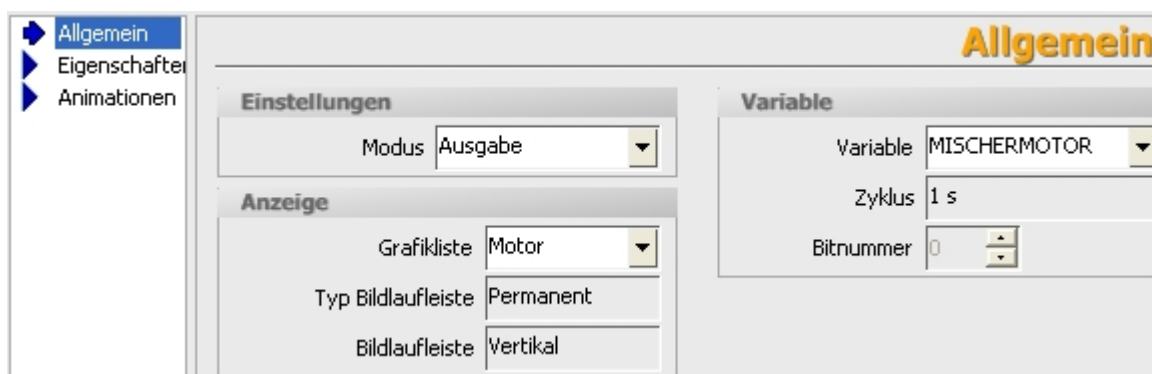
Generating a Text List

In the project window, double click on **Text Lists** in the folder "Text and Graphic Lists".
In the column Name, double click on the first line, and create a new text list in this way.
Change the name of the text list to "**Motor text**".
At Auswahl (selection), select "**Range (0-…)**".
Below at Value **0**, enter the text "**Motor aus**" (motor off), and at Value **1** the text "**Motor ein**" (motor on).

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Inserting a Symbolic EA Field

Drag a Symbolic EA field into the basic display.
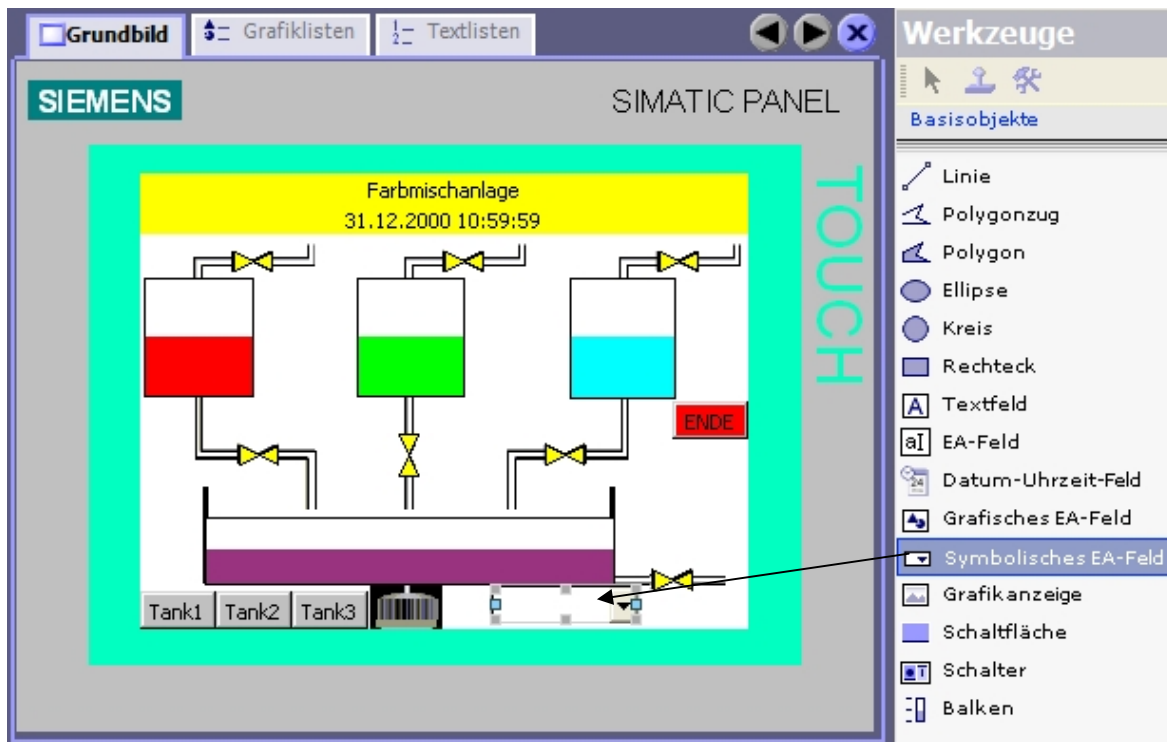
Set the mode to **Eingabe/Ausgabe** (input/output) and select the text list **Motortext** and the variable "**hand_mischermotor**". Adjust the **font size**, **size** and **position**.

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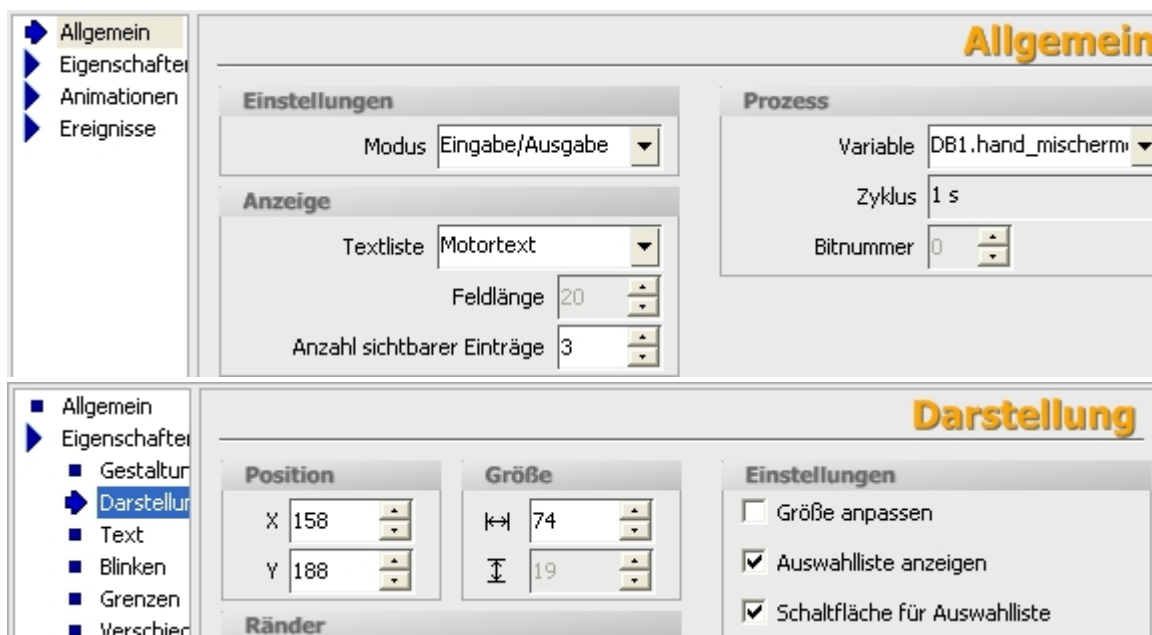
Under Animation at manual mode, activate the background color **blue**.
In addition, manual operation is to be possible only in the manual mode.

Test the function in runtime.

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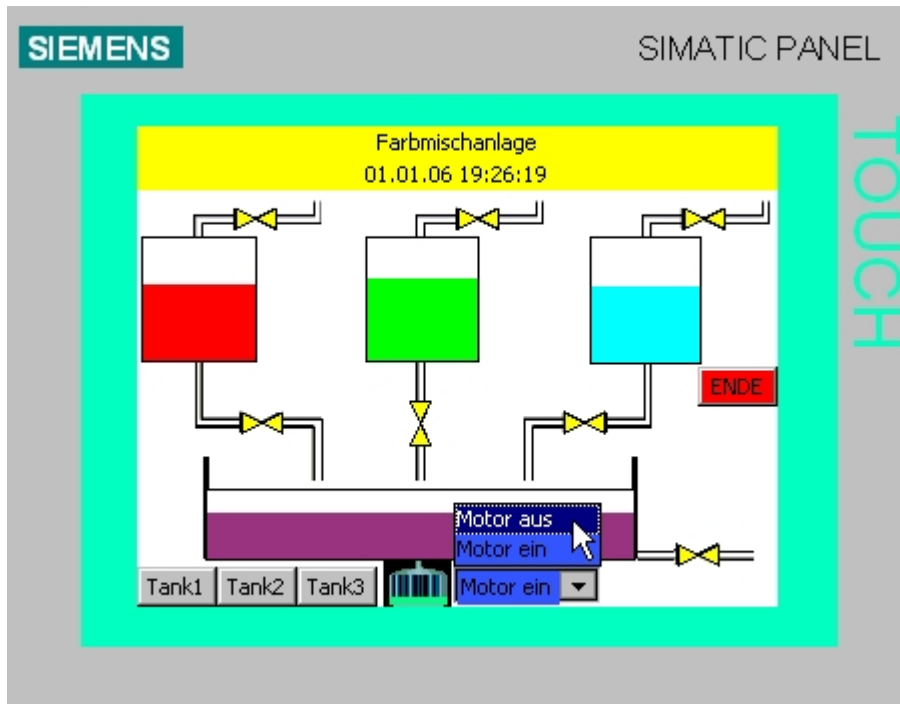
8.3.3 Configuring the Manual Mode for the Outflow Valve of the Container

We are creating an additional button for opening the outflow valve.
From the tool window, under **Basic Objects**, drag a **Button** into the basic display.
Under Allgemein (General), at Text AUS, enter "**Ablauf öffnen**" (open outflow). Set the check mark for **Text EIN**, and enter the text "**Ablauf offen**" (outflow open).
Caution! After entering the text, don't press the enter key; otherwise, a new line is generated.

Change the background color to white, and select a smaller font size.
Set the position and the size.
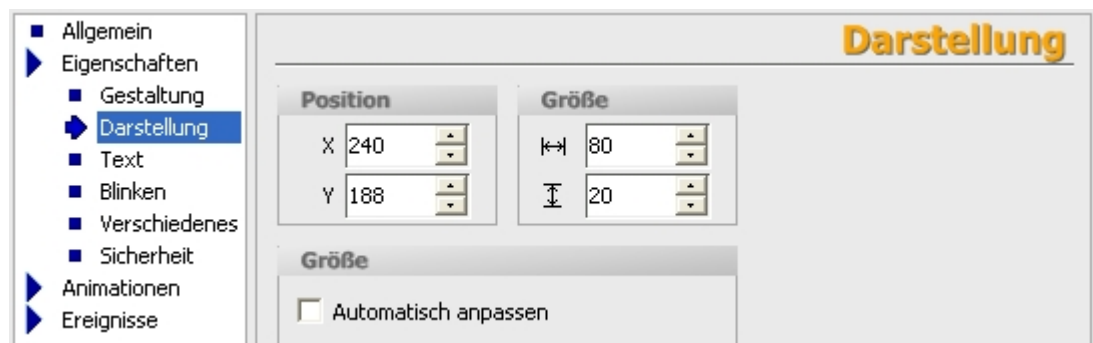
In the function list, select the function "**SetzeBit**" at Drücken (press).
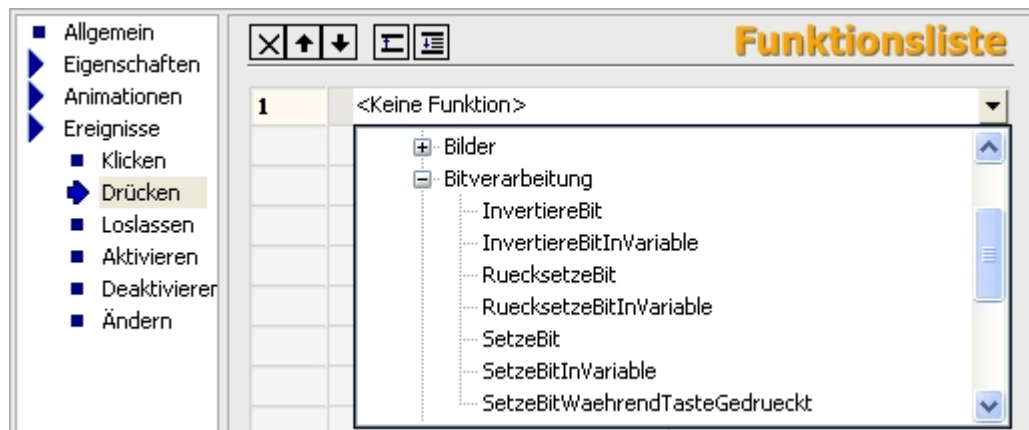
From DB1, select as variable "**hand_ablauf_behaelter**" (manual outflow container).
We want to generate the function of a button; for that reason, we are now configuring the function "**RuecksetzeBit**" (reset bit) with the variable "**hand_ablauf_behaelter**" when releasing the button.

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The button is to be operable only in the manual mode.
Under **Animationen**, select **Bedienbarkeit** (operability) and place the checkmark at **Activated**.
As variable, select "**H3_MAN**" from the symbols.
Enter **1** for "Von" (from) and **1** for "Bis" (to). Set the status to **Activated**.
The button can only be operated if the variable "H3_MAN" has the value 1.
For operability to be visible, change the background color to **blue** at **Style**.

Test the function of the button in the manual and in the automatic mode.

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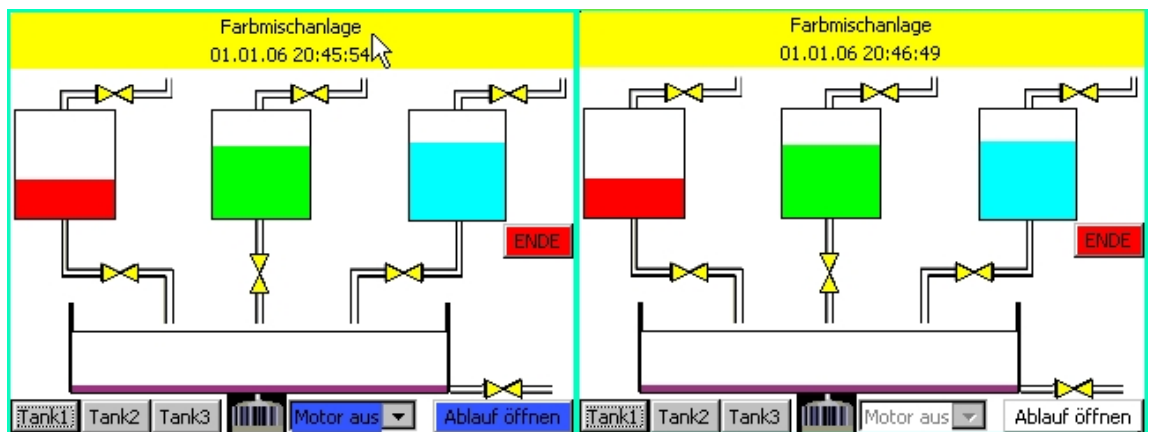
8.3.4 Switching the Operating Modes

Selecting the operating mode is also to be possible on the TP177B.
We are using a switch for this function.
Drag a switch into the basic display.
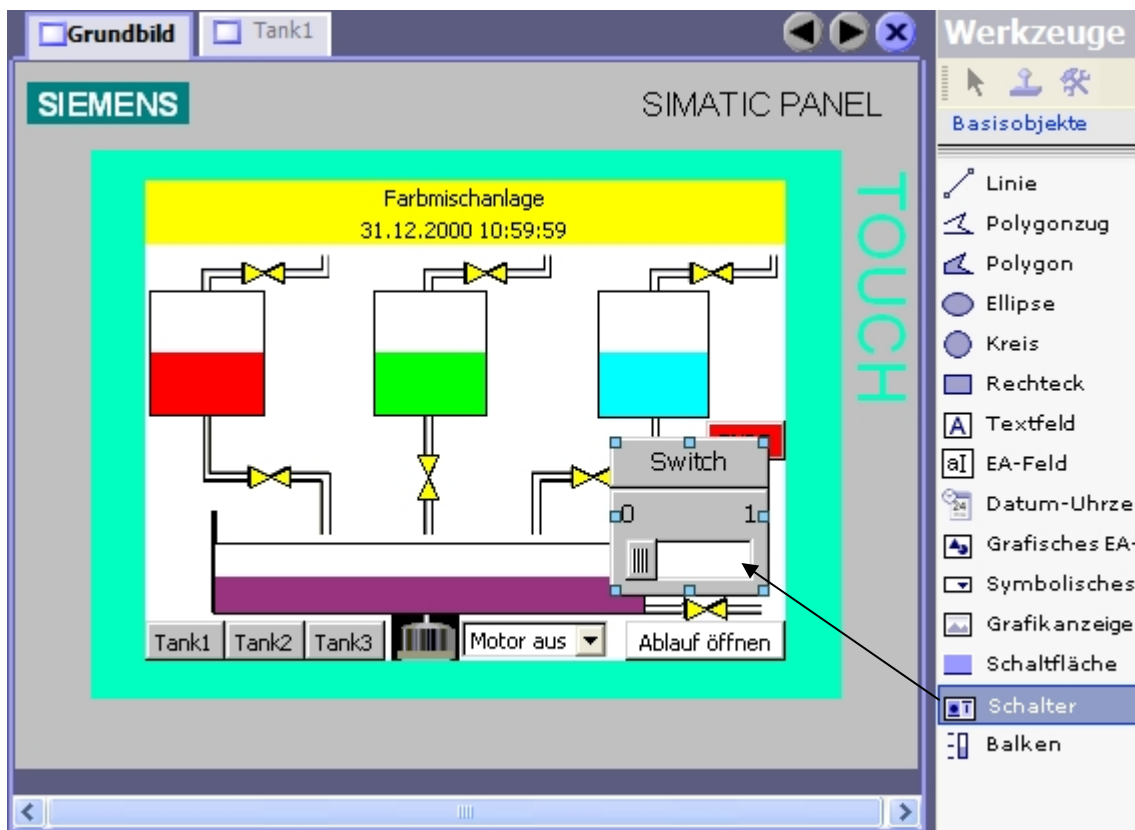
When making settings, select the switch with text, and enter the texts.
As variable, use "**man_auto**" from DB1.

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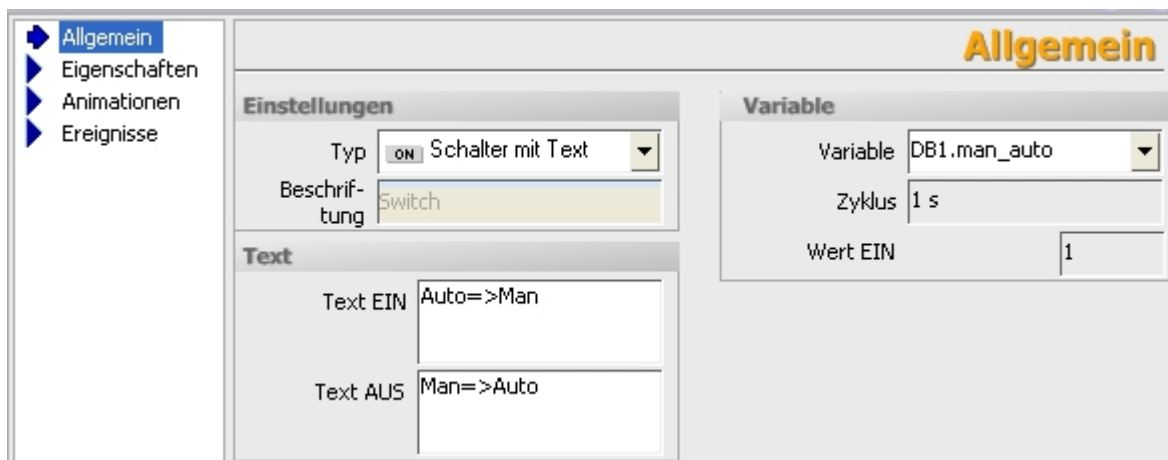
Change the background color to blue, and select a smaller font size.
Set the position and the size.

At Style (Gestaltung), select the variable "**H2_AUTO**" from the symbol table.
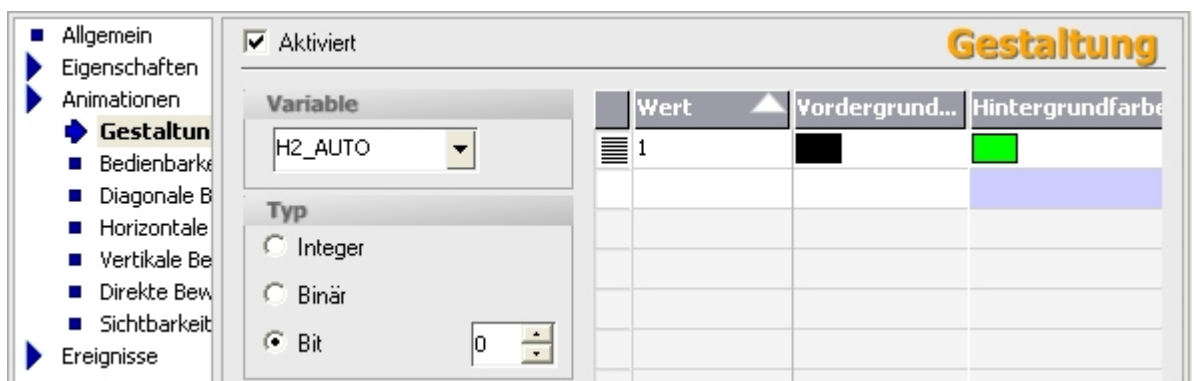
Test the manual/automatic switchover in runtime.

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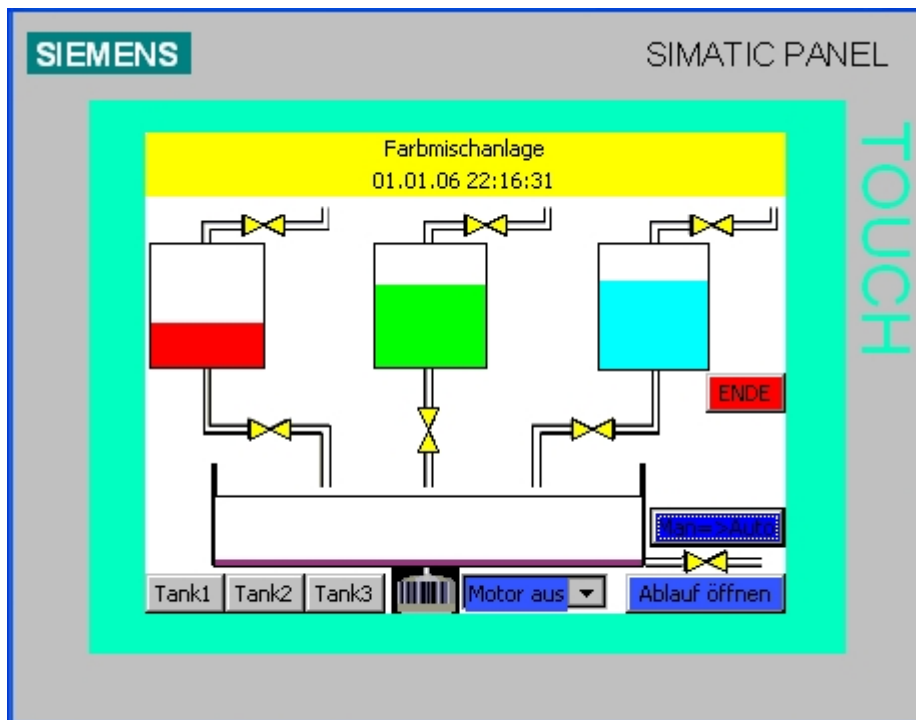
8.3.5 Configuring the Fill Setpoints

The fill amounts for the tanks are to be entered by means of the TP177B.
To this end, input fields are configured.
Drag an EA field into the basic display.
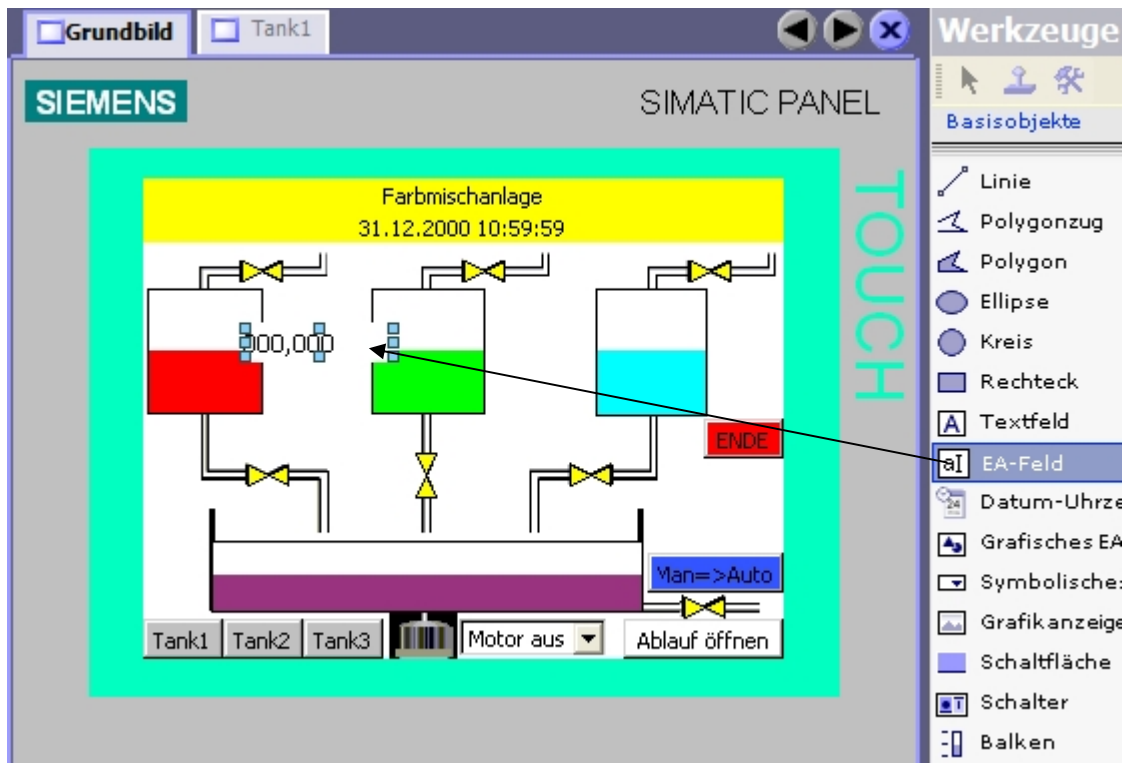
Change the settings at General (Allgemein). Use the variable "**ENTRY_T1**".

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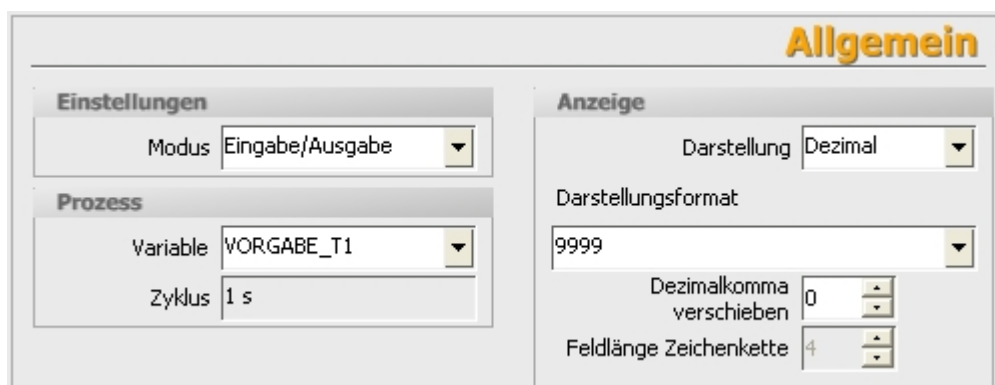
Change the properties at Representation (Darstellung).

Darstellung

Position		Größe		Ränder	
X	60	↔	38	Links	2
Y	32	↕	20	Rechts	2
Größe				Oben	2
☐ Automatisch anpassen				Unten	2

Change the properties at Text.

Text

Text

Schriftart Tahoma; 10pt ...

Ausrichtung

Horizontal Zentriert ▼

Vertikal Mitte ▼

Copy and **Insert** the EA field. Position it each once next to Tank 2 on **X171** and Tank 3 on **X282**. Change the variables to **VORGABE_T2** and **VORGABE_T3**.

Allgemein

Einstellungen

Modus Eingabe/Ausgabe ▼

Prozess

Variable VORGABE_T3 ▼

Zyklus 1 s

Anzeige

Darstellung Dezimal ▼

Darstellungsformat

9999 ▼

Dezimalkomma verschieben 0

Feldlänge Zeichenkette 4

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8.3.6 Configuring the "START" Button

To start the color mixing plant, we still need the button "START".
The button is to blink green when the start enable of the program is activated.
The button can only be operated when start enable is active.

From the tool window, under **Basic Objects**, drag a **Button** into the basic display.
Under Allgemein (General), at Text AUS, enter "**START**".
Change the background color to white, and select a smaller font size.
Set position **X280**, **Y110** and the size **40 x 20**.

In the function list, select the function "**SetzeBit**" at Press (Drücken).
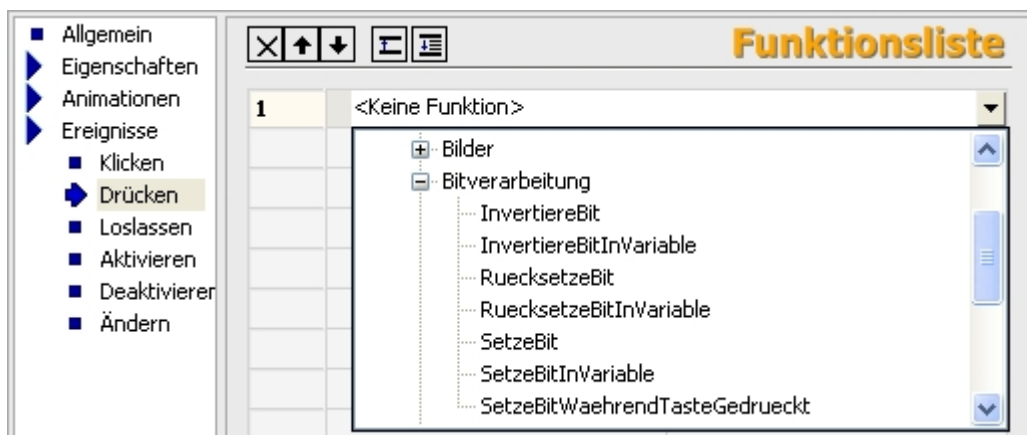
As variable, select "**start_prog**" from DB1.
We want to generate the function of a button; for that reason, you are now configuring the function
"**RuecksetzeBit**" with the variable "**start_prog**" when releasing (loslassen) the button.

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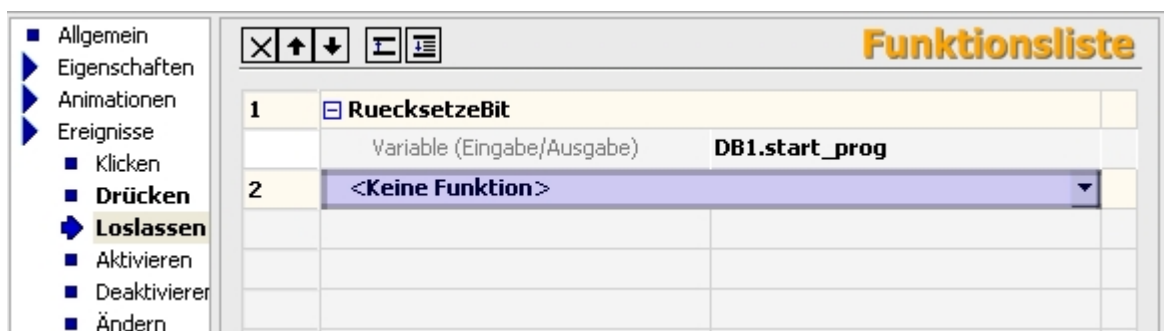
Under **Animations**, select **Bedienbarkeit** (operability) and place the check mark at **Activated**.

From the symbols, select "**H1_STARTFREIGABE**" (start enable) as variable.

Enter **1** at "Von" (from) and **1** at "Bis" (to). Set the status to **Activated**.

Now, the button can only be operated if the start is enabled.

For the start enable to be visible, **activate Style** (Gestaltung) also.

Use the variable "**H1_STARTFREIGABE**".

In addition, change the foreground color to **white** and the background color to **green**.

At Blinken, set to "**Yes**".
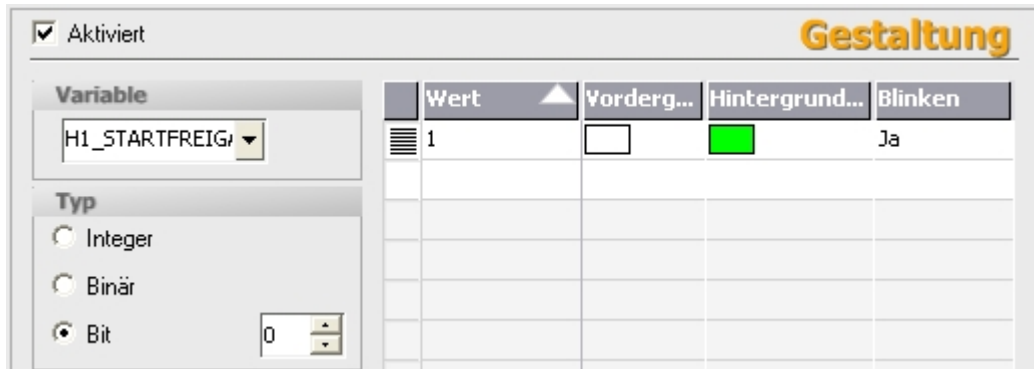
Test the function of the input fields and the START button in runtime.
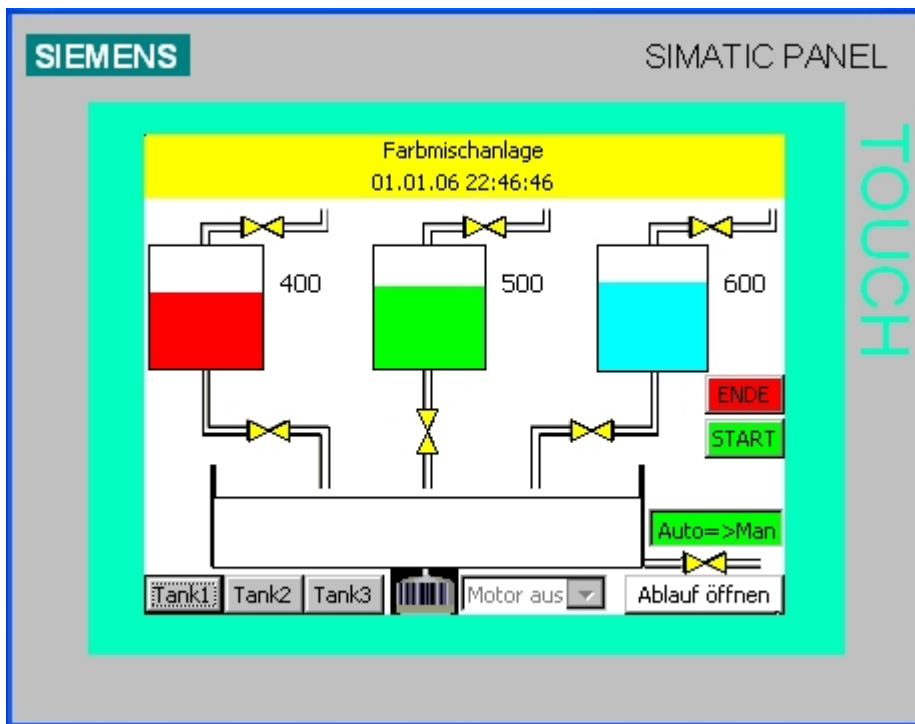
By means of the input fields, specify the fill amounts, and start the program. The start is enabled only if the lower tank container is empty; that means possibly opening the outflow valve beforehand in the manual mode until the container is empty.

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8.3.7 Configuring the Mixer Motion

We are using a graphic EA field for animating the mixer motion. By means of a graphic list, the mixer motion is shown as in an animated cartoon.

Create a new graphic list with the name "Mixer Motion".
At Value (Wert) 0 to 12, insert from the template directory the graphics "Mixer1" to "Mixer7" first in an ascending sequence and then in a descending sequence.

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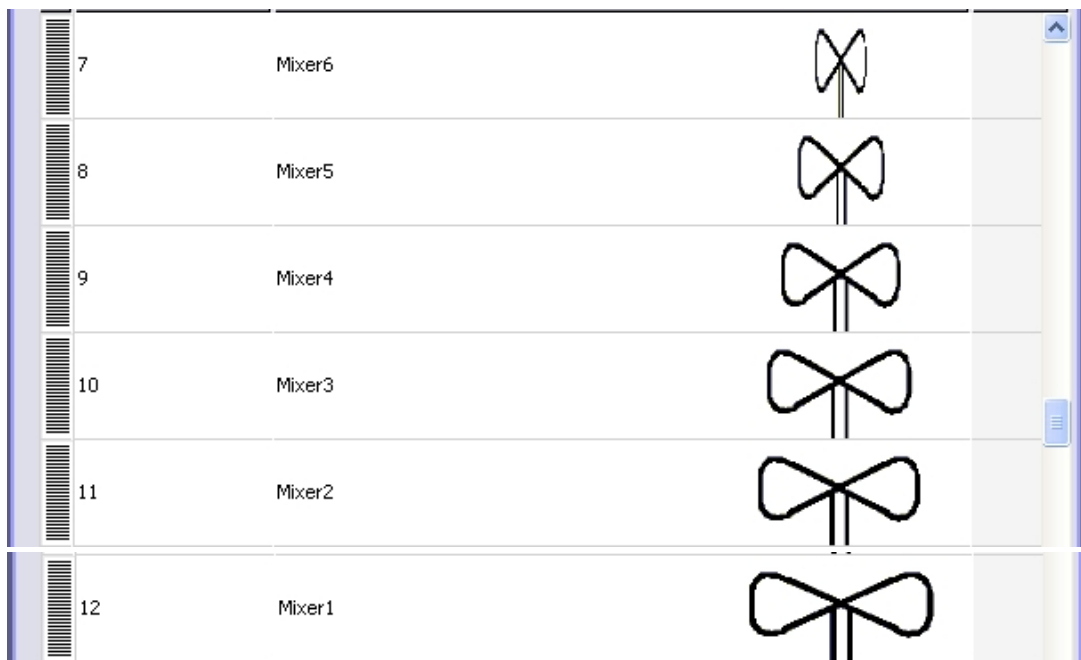
Drag a graphic EA field into the basic display. At mode "**Ausgabe**" (output), and under Display (Anzeige), select the graphic list "**Mixer motion**" (mischerbewegung).
As variable use "**Count**" (zaehlwert) from the FB **"mischerbewegung"** in DB1.

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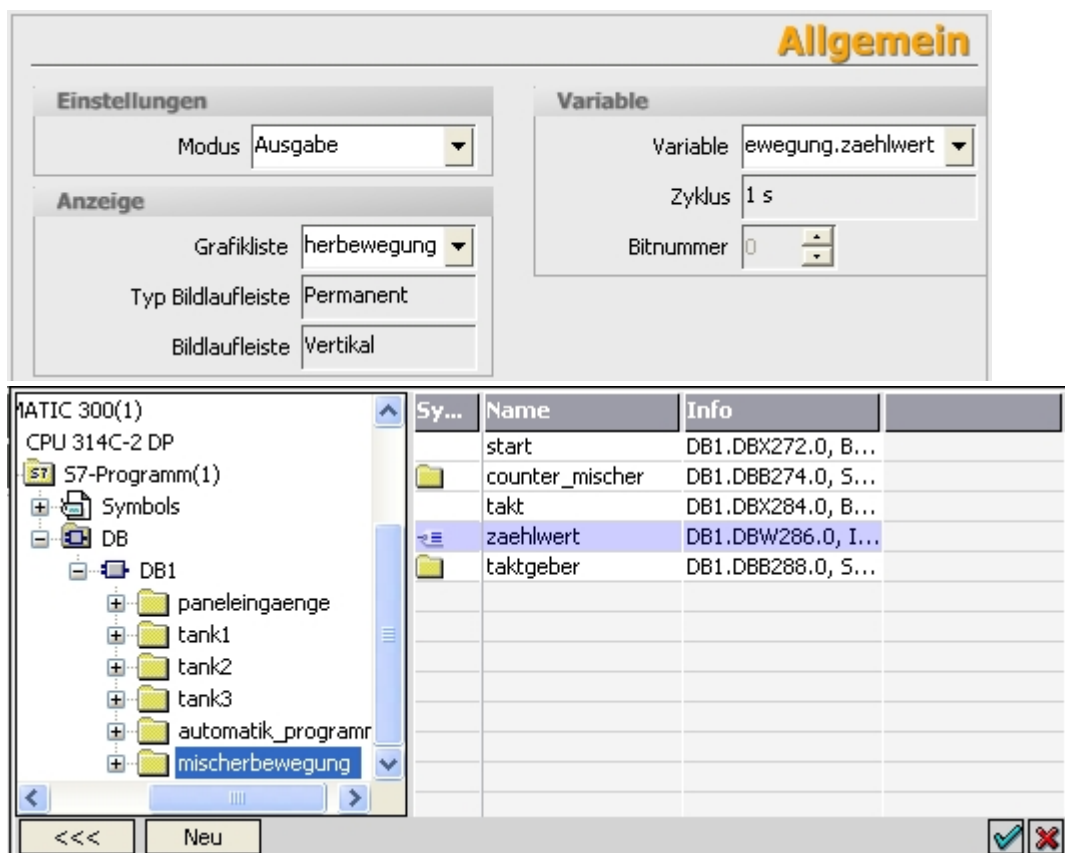
As Transparent Color select white, and place the checkmark.

Set the position and the size.

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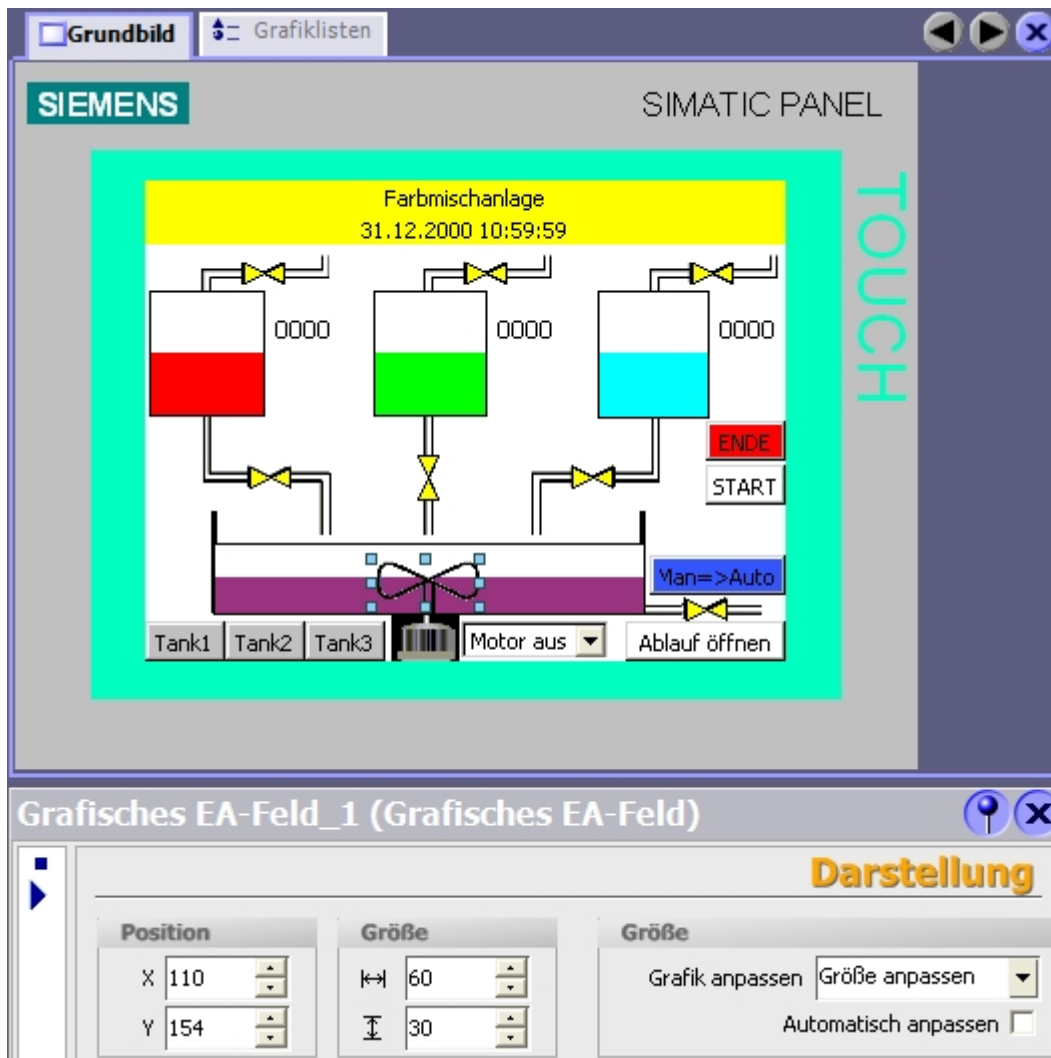
Test the mixer motion in runtime.

Note

For jerk-free motion, set the data collection cycle of the variables to 100ms.

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8.4 **Configuring Objects in the Permanent Window**

The levels of the three tanks and of the container are to be displayed in the permanent window.

8.4.1 **Configuring Text Fields**

Drag a text field to the permanent window of the basic display.
As text, enter "**Tank1**:".
Set the fill type to **Transparent**.
Set the position and the size.
Select a small font size and change the text alignment.
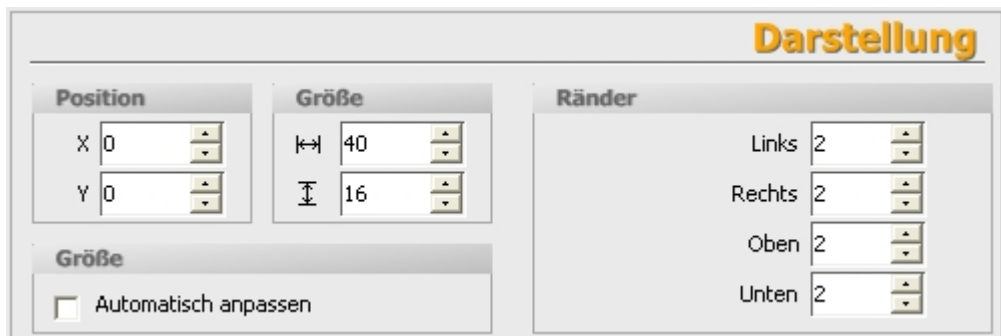
Copy and **Insert** the text field. Change the text, and position the text field in a way that another output field the size of **40 x 16** fits next to it to the right.

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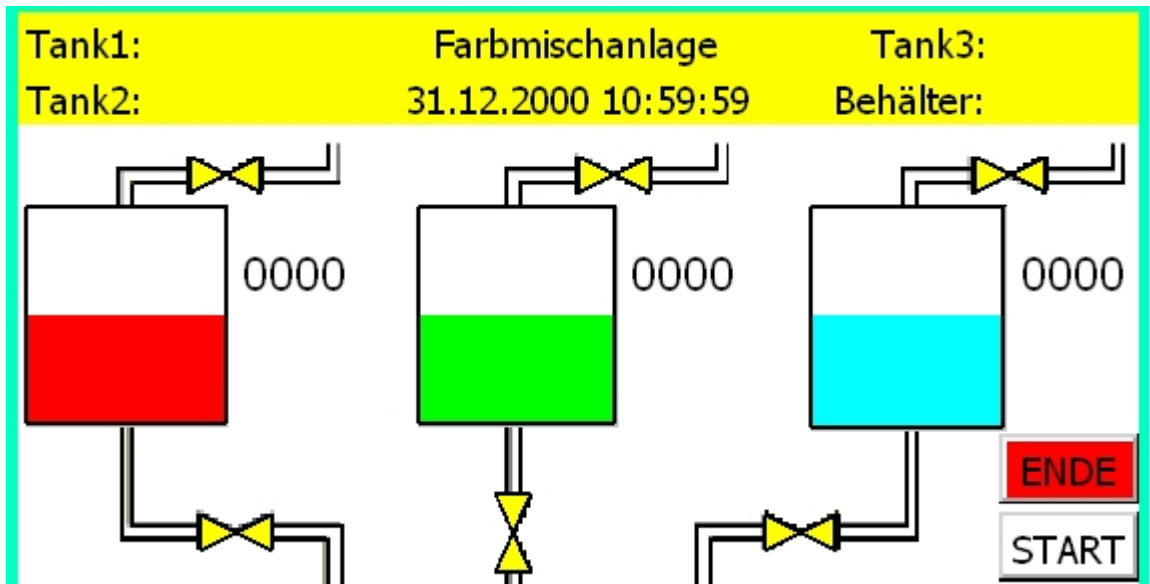
8.4.2 Configuring the Output Fields

We want to utilize a new WinCC flexible function for the output fields.
To this end, open the window of the objects, and pin it down.
In the project window, click on Variables, and all variables are displayed in the object window.
Scroll to the variables of the tank levels (INHALT_...) (content_...).
Drag the variable "INHALT_T1" into the permanent window; it will be inserted automatically in an EA field that is connected to the variable.

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Set the properties. (General; Style; Representation; Text)

Allgemein

Einstellungen

Modus | Ausgabe

Prozess

Variable | INHALT_T1

Zyklus | 100 ms

Anzeige

Darstellung | Dezimal

Darstellungsformat

9999

Dezimalkomma verschieben | 0

Feldlänge Zeichenkette | 4

Gestaltung

Einstellungen

Textfarbe |

Hintergrundfarbe |

Füllart | Transparent

Rahmen

Farbe |

Stil | Nein

3D |

Darstellung

Position

X | 40

Y | 0

Größe

↦ | 40

↕ | 16

Größe

☐ Automatisch anpassen

Ränder

Links | 2

Rechts | 2

Oben | 2

Unten | 2

Text

Text

Schriftart | Tahoma; 8pt | ...

Ausrichtung

Horizontal | Zentriert

Vertikal | Mitte

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Drag the variables of the other tank levels from the object window to the permanent window, and change the properties; or copy and insert the EA_field and change the variables and the position in the properties.

| Tank1: | 0000 | Farbmischanlage | Tank3: | 0000 |
| Tank2: | 0000 | 31.12.2000 10:59:59 | Behälter: | 0000 |

0000   0000   0000
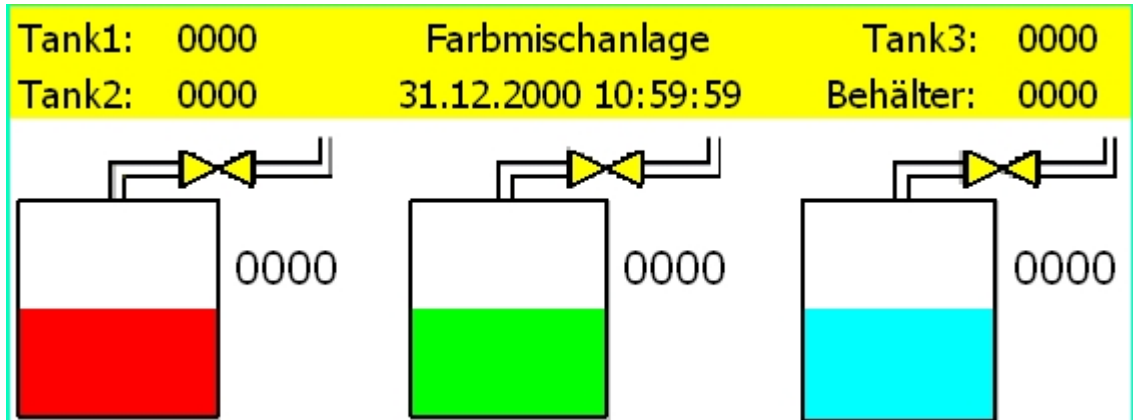
Note

In the menu **View**, click on **Anordnung wiederherstellen** (restore arrangement), to reset the window arrangement to the basic setting.

Save tour project and check it for consistency.
Transfer the project to the panel only if the check has returned no errors and no warnings. Test the objects in the permanent window in runtime. Also switch to the tank pictures.

SIEMENS   SIMATIC PANEL

| Tank1: | 616 | Farbmischanlage | Tank3: | 553 |
| Tank2: | 568 | 01.01.06 23:56:16 | Behälter: | 1800 |

500   600   700

ENDE
START

Auto=>Man

Tank1 Tank2 Tank3   Motor aus   Ablauf öffnen

TOUCH

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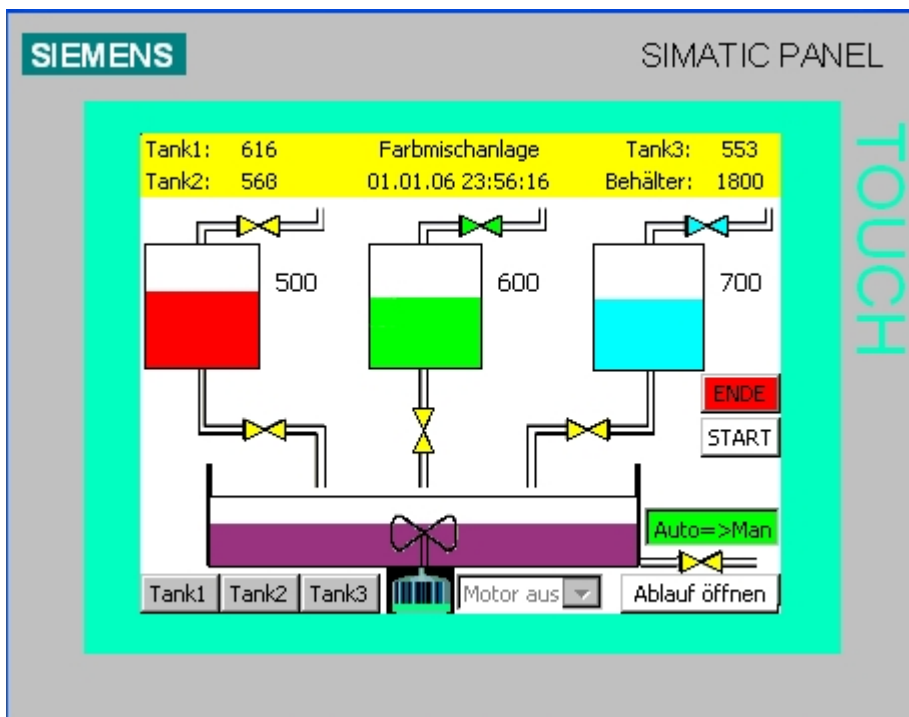
9 CONFIGURING MESSAGES

The representation of the color mixing plant is by and large completed. What still needs to be done are the messages. Messages are generated if an event bit occurs (bit messages), or when a limit is overrange or underrange (analog messages).

The message texts contain a description of the cause for the message with the message status, or only notes on the current operation of the plant.

We differentiate message classes such as warnings or errors for operational messages and fault messages. Operational messages refer to the states of a machine or a process. Fault messages indicate alarms of a machine or a process and have to be acknowledged.

9.1 Analog Messages

The levels of the three tanks and of the container are to be monitored.
If a tank or the container is full, a fault message is to be read out.

In the project window, double click on analog messages.
Enter the message texts and the monitored variables.
For the tank limits, use the variable of the maximum fill setpoint.
For the container limit, enter as the constant value 2999.

	Text		Melde...	Überwachte Variable	Grenze	Triggermodus
	Tank1 Maximum level reached	1	Error	CONTENT_T1	DB1.tank1.high_level	At rising edge
	Tank2 maximaler Füllstand erreicht	2	Fehler	INHALT_T2	DB1.tank2.high_level	Bei steigender Flanke
	Tank3 maximaler Füllstand erreicht	3	Fehler	INHALT_T3	DB1.tank3.high_level	Bei steigender Flanke
	Container full	4	Fehler	INHALT_BEH	2999	Bei steigender Flanke

Note
You can also generate several messages for one monitored variable.
You only have to set different limits with the rising or falling edge.

9.2 Bit Messages

Bit messages are configured just like analog messages; only here, the message is read out when an event bit is pending.

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9.3 Message Window

The message texts are to be displayed in a message window.
The message window is configured into the template picture. This inserts it automatically in the background of all other pictures.

With a double click, open the picture "Template" in the project window.
From the tool window under **Expanded Objects**, drag the **Message Window** into the template picture. Set the inserted message window. Use the message window for **pending** and **acknowledged messages**. At Message Classes, select **Error** and **System**.

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At Style (Gestaltung), change the background color to **white**, and at Text, change the font size for the table and the heading to **Tahoma; 8pt**.

In the display (Anzeige) settings, set the checkmark for the buttons "Help text" (Hilfetext) and "Acknowledge" (Quittieren).

Select the Visible Columns (Sichtbare Spalten) of the message window.

At Mode, assign the window title, and set other properties. (Display automatically, Can be closed, Tied, Size can be changed); (Activated; Messages; Window Title)

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9.4   Message Indicator

The message indicator is displayed if messages of the specified message class are pending or have to be acknowledged. The message indicator can have two states:
- Blinking: At least one unacknowledged message is pending.
- Static: The messages are acknowledged, but at least one of them is not cleared.
When clicking on the message indicator, the configured action is performed.
In the template picture, set the active level to 1; that puts the message indicator in the foreground.
Drag a message indicator into the template picture, and assign the function
"**ZeigeMeldefenster**" (show message window) at Click and Click with blinking.

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9.5   Testing the Message Configuration in Runtime

Open the inflow valves of the tanks, and let the tanks fill up beyond the maximum value. The message window and the message indicator appear. Close the message window. The message indicator remains until the messages are cleared (that is, the cause is removed) and acknowledged, even if you are switching to another picture.

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10 CONFIGURING RECIPES

Recipes can be set up for the different mixing ratios of the color mixing plant. By using recipes, it is possible to transfer several variables simultaneously to the controller. Recipes can be stored in the controller or in the panel.

10.1 Adding Recipes

In the project window, double click on "**Add Recipe**".

As recipe name and as display name, enter "**Color Mixtures**" (Farbmischungen).

Generate three recipe elements with the names "**RED, GREEN, BLUE**", and connect them with the variables for the setpoint of Tank1 to Tank3.

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10.2 Specifying Data Sets

Click on "**Data sets**" and enter the data sets for the recipes "**Color mixtures**".

Elemente	**Datensätze**	ROT	GRÜN	BLAU	Ko
Name					
Red tone		750	200	150	
Green tone		120	850	230	
Blue tone		200	170	690	

10.3 Generating the Pictures "Recipe Input" and "Recipe Selection"

Two additional pictures have to be created for new inputs od recipes and for selecting recipes. By means of recipe displays with definable buttons, new recipes can be entered, or merely a selection can be made.

10.3.1 Configuring the Picture "Recipe Input"

Create a new picture with the name "Recipe Input".
From the tool window, under **Expanded Objects** (Erweiterte Objekte), drag a **Recipe Display** (Rezepturanzeige) into the picture.

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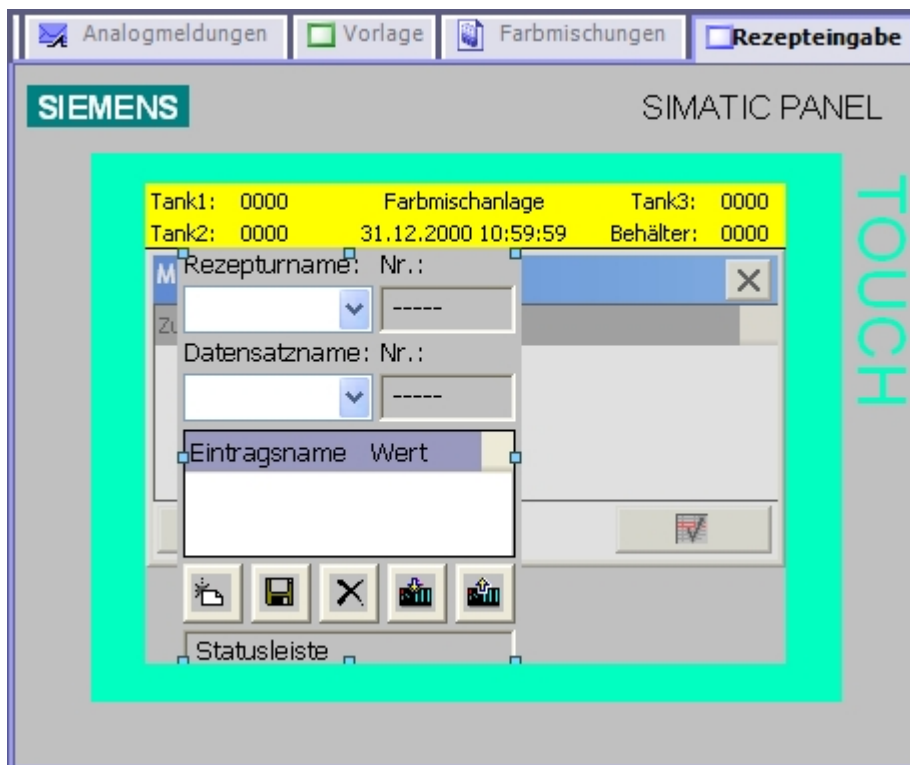
Select the recipe "**Color mixtures**" (Farbmischungen).

Remove the checkmark at **Auswahlfeld anzeigen** (Display Selection Field).

Set the background color to white and at Text, select a smaller font size.

Change the position to **X0** and **Y0**, the size to **320 x 188**.

Accept the settings for Display (Anzeige) and Buttons (Schaltflächen) .

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10.3.2 Configuring the Picture "Recipe Selection"

Create a new picture with the name "Recipe Selection".
From the tool window under **Expanded Objects**, drag a **Recipe Display** into the figure.
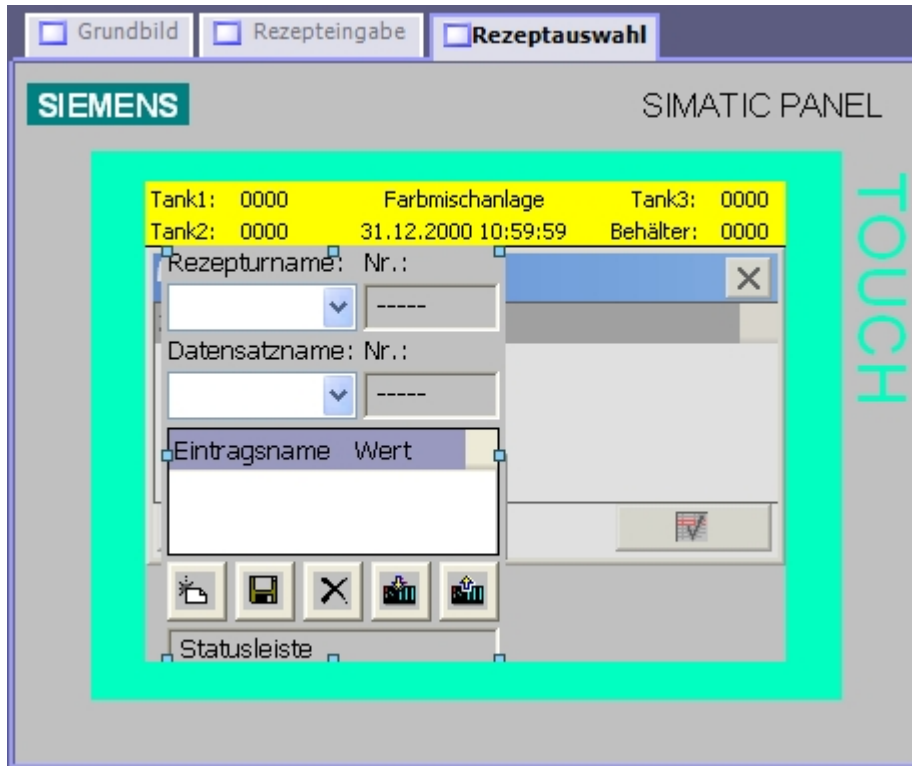
Select the recipe "**Color Mixtures**" (Farbmischungen).
Remove the checkmark at **Display selection field** (Auswahlfeld anzeigen).
Set the background color to white, and at Text, select a smaller font size.
Change the position to **X0** and **Y0**, the size to **320 x 188**.

Remove all buttons (Schaltflächen) in the recipe display.

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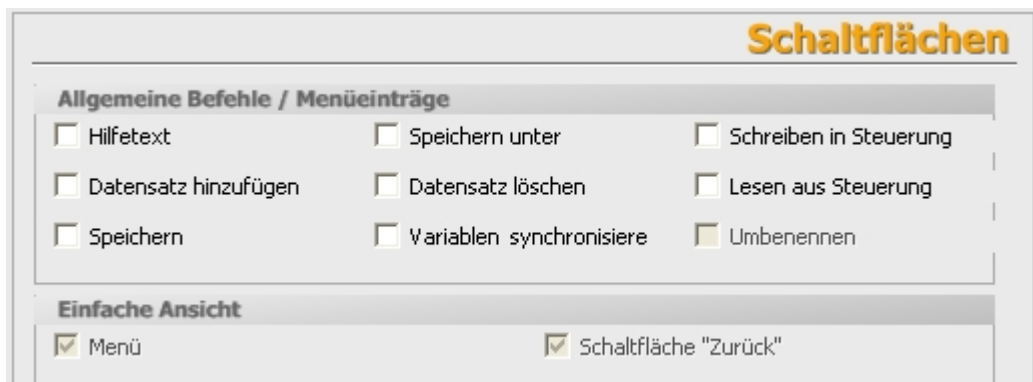
10.3.3 Configuring Buttons for Display Change

Drag the **Basic Display** and the picture "**Recipe Input**" (Rezepteingabe) into the picture "Recipe Selection".

Change the font size, the position and the size of the buttons.

In exactly the same way, create the button in the picture "Recipe Input" (Rezepteingabe).
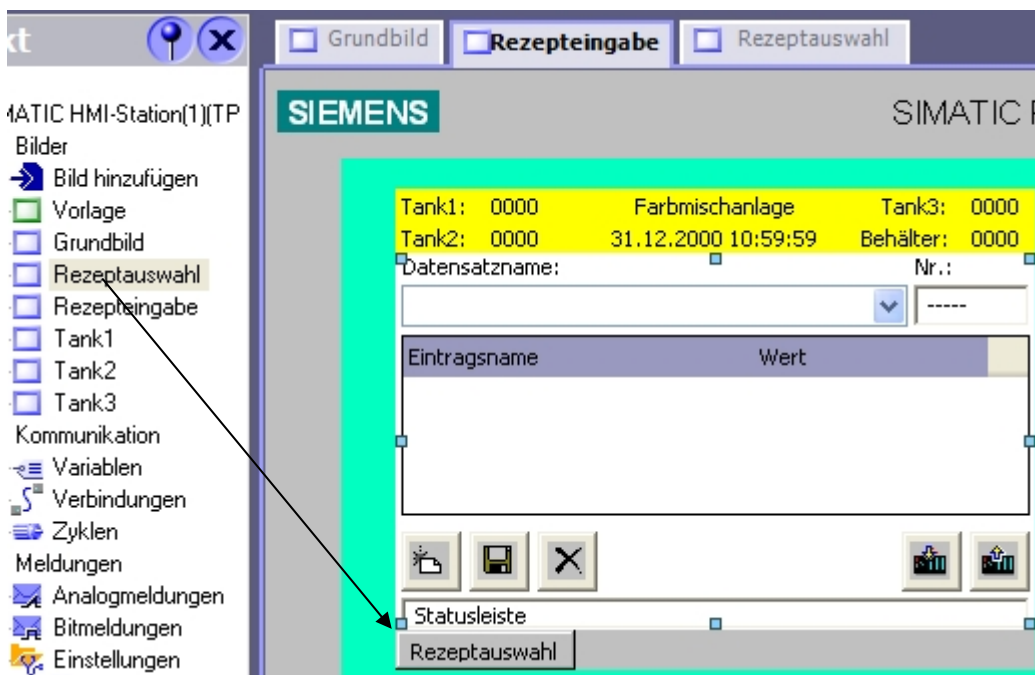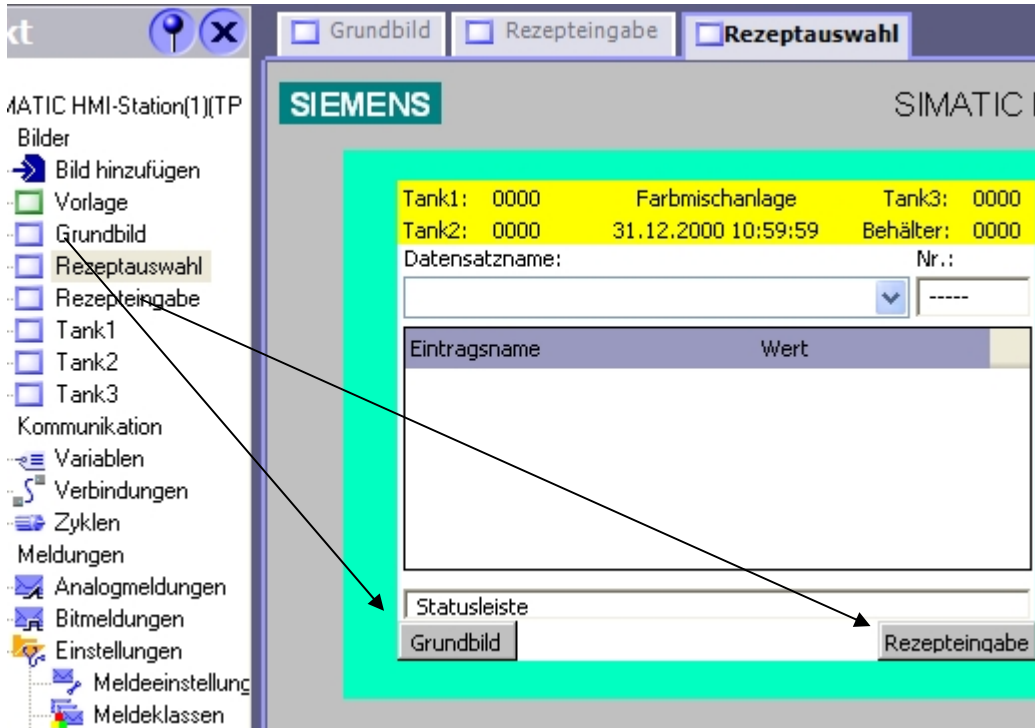
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Change to the Basic Display.

Drag the picture "**Recipe selection**" into the basic display.

At General (Allgemein), change Text AUS to "**Recipes**".

Change the font size, the position and the size of the button.
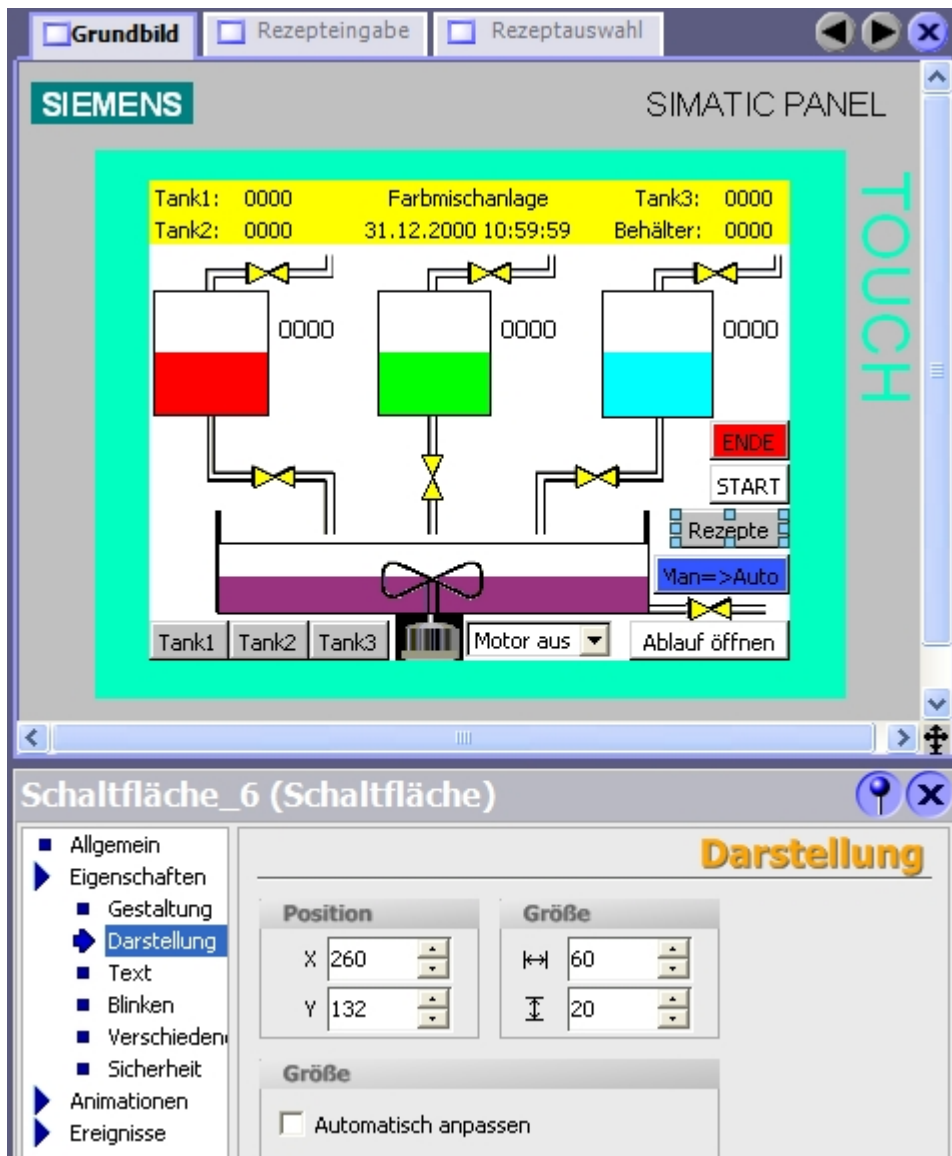
Save your project and check it for consistency.

Transfer the project to the panel only if the check returns no errors and no warnings.
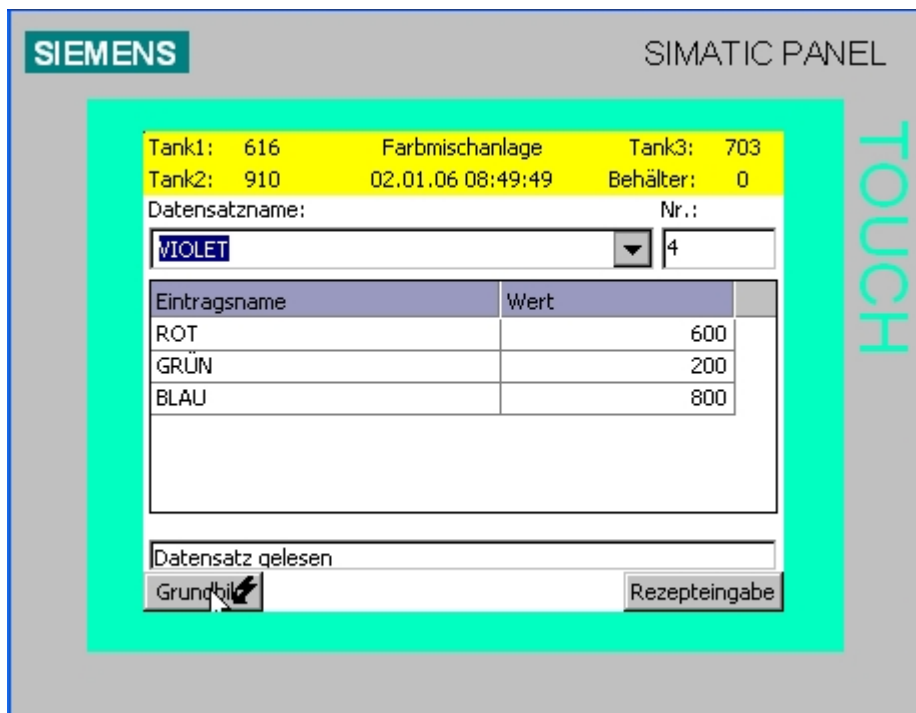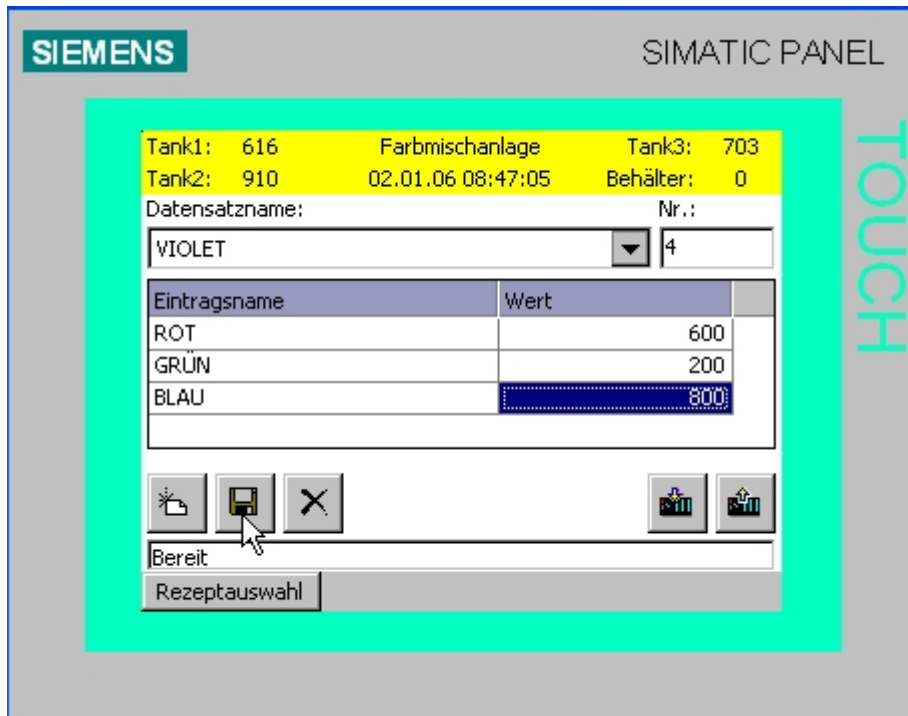
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10.4   **Selecting Recipes in Runtime**

Change to the picture "Recipe Selection" and select a data set.
After the selection, the values have been written to the variables.

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10.5   Entering New Recipes in Runtime

Change to the picture "Recipe Input" and click on the button "**New**".
Enter the name of the data set and the values.
Click on the Save button, and select the data set in the selection picture.

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11 CONFIGURING USER MANAGEMENT

User groups and users can be set up by means of user management. The access rights are granted to a user group. These access rights govern the access to data and functions to protect them from unauthorized operation. A user is then assigned to a user group.

11.1 Setting up User Groups

In the project window, double click on **Gruppen** (groups) in the folder Benutzerverwaltung Runtime (user management runtime). By default, two user groups are already set up: the group of administrators with all authorizations, and the group of users with authorization to operate. However, we can grant users additional authorizations.

For our color mixing plant, we need two more user groups with additional authorizations.

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Create the group "**Einsteller**" (setters) with the authorization "**Betriebsarten umschalten**" (switch operating modes).

Gruppen						Berechtigungen der Gruppe		
Name	Anzeigen...	Num...	Kor		☐	Name	Num.
Administratoren	Gruppe (9)	9	Adm		☑	Bedienen	1
Benutzer	Gruppe (1)	1	Ben		☐	Überwachen	2
Einsteller	Gruppe (2)	2			☐	Verwalten	0
					☑	Betriebsarten umschalten	3

Create the group "**Entwickler**" (developers) with the authorization "**Rezepte eingeben**" (enter recipes).

Gruppen						Berechtigungen der Gruppe		
Name	Anzeigen...	Num...	Kor		☐	Name	Num.
Administratoren	Gruppe (9)	9	Adm		☑	Bedienen	1
Benutzer	Gruppe (1)	1	Ben		☐	Überwachen	2
Einsteller	Gruppe (2)	2			☐	Verwalten	0
Entwickler	Gruppe (3)	3			☐	Betriebsarten umschalten	3
					☑	Rezepte eingeben	4

11.2   Setting Up Users

In the project window, double click on **Benutzer** (users) in the folder Benutzerverwaltung Runtime (user management runtime).
Here, we are setting up three new users, and assign them to the user groups.

Create a user with the name "**MEIER**" and the Kennwort (password) "**HANS**".

Benutzer					Gruppen des Benutzers		
Name	Kennwort				Grupp...	Num...	Name
Admin	********				○	9	Administratoren
MEIER	********	▼			●	1	Benutzer
	Kennwort eingeben	****			○	2	Einsteller
	Kennwort bestätige	****			○	3	Entwickler

Note
Please take note of upper and lower case writing.

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Create an **Einsteller** (setter) with the name "**SCHMIDT**" and the Kennwort (password) "**KLAUS**".

Create an **Entwickler** (developer) with the name "**HUBER**" and the password "**FRANZ**".

11.3 Assigning Authorizations

Operating the start button and selecting the color mixture from the recipes is permitted only to users who are authorized.
Only the setter is permitted to switch the operating mode of the plant to manual operation.
Modifying or reentering data sets for recipes is permitted only to developers. No access protection is required for all other functions, such as display change.

11.3.1 Protecting the Start Button

Open the basic display and highlight the button "**START**".
At Sicherheit (security), select the authorization "**Bedienen**" (operate). Place the checkmark at **Activated**.

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### 11.3.2 Protecting Data Selection

In the picture "**Rezeptauswahl**" (recipe selection), highlight the Rezepturanzeige (recipe display), and change the security settings.
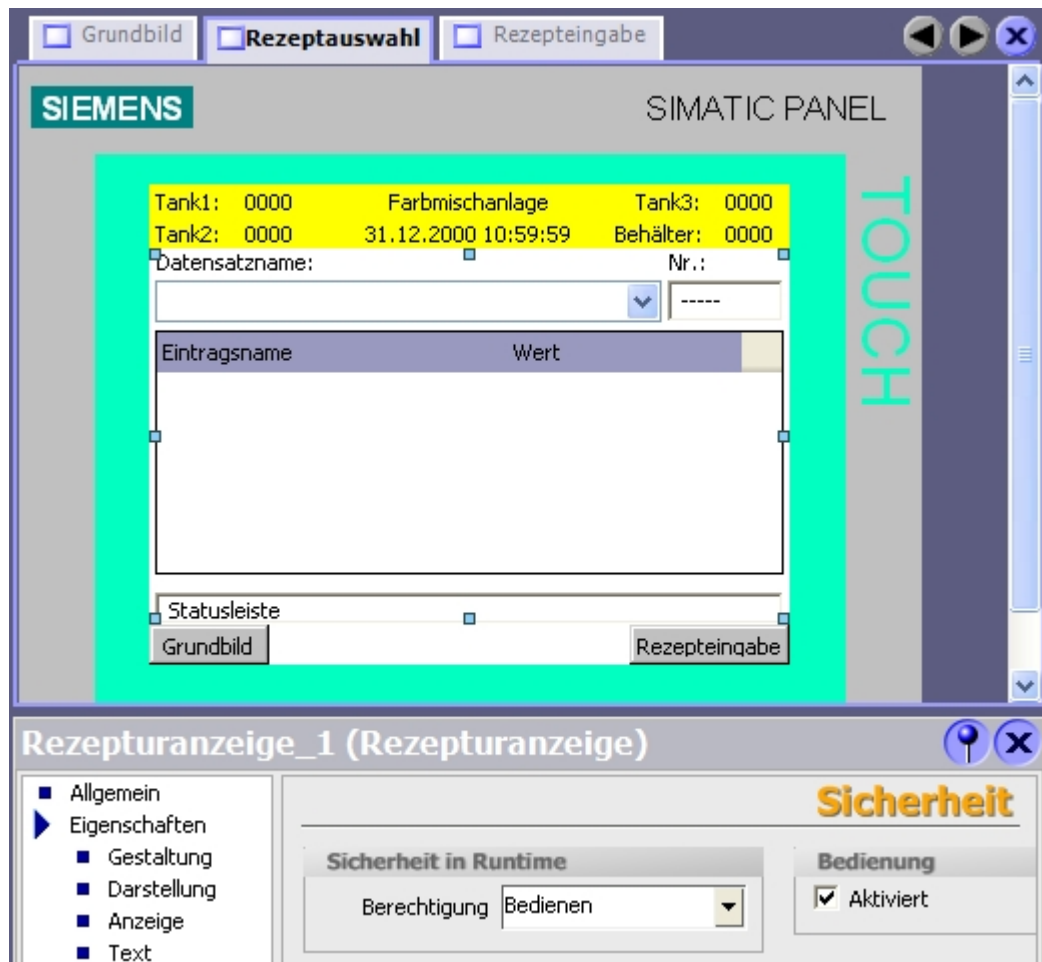
11.3.3 Protecting Recipe Input

Change the security settings of the recipe display in the picture "**Rezepteingabe**" (recipe input).

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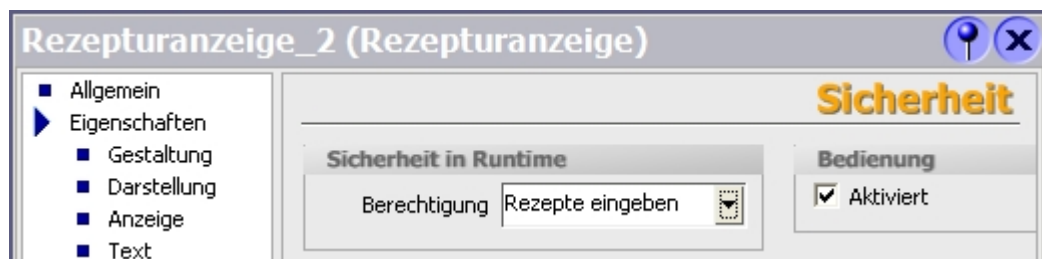
11.3.4 Protecting the Operating Mode Selection

Also change the security settings for auto/manual switching.
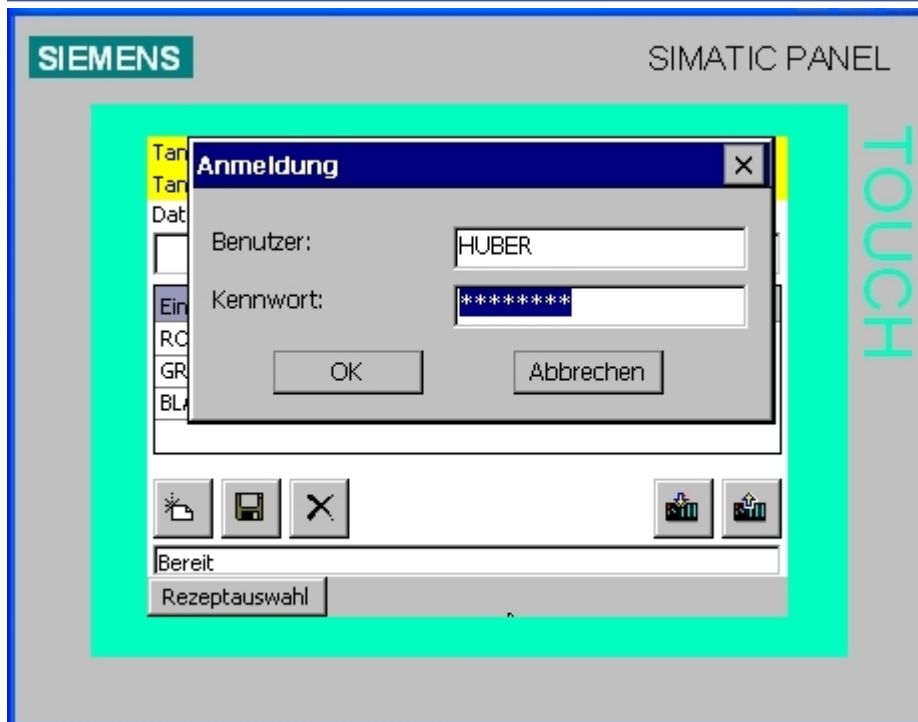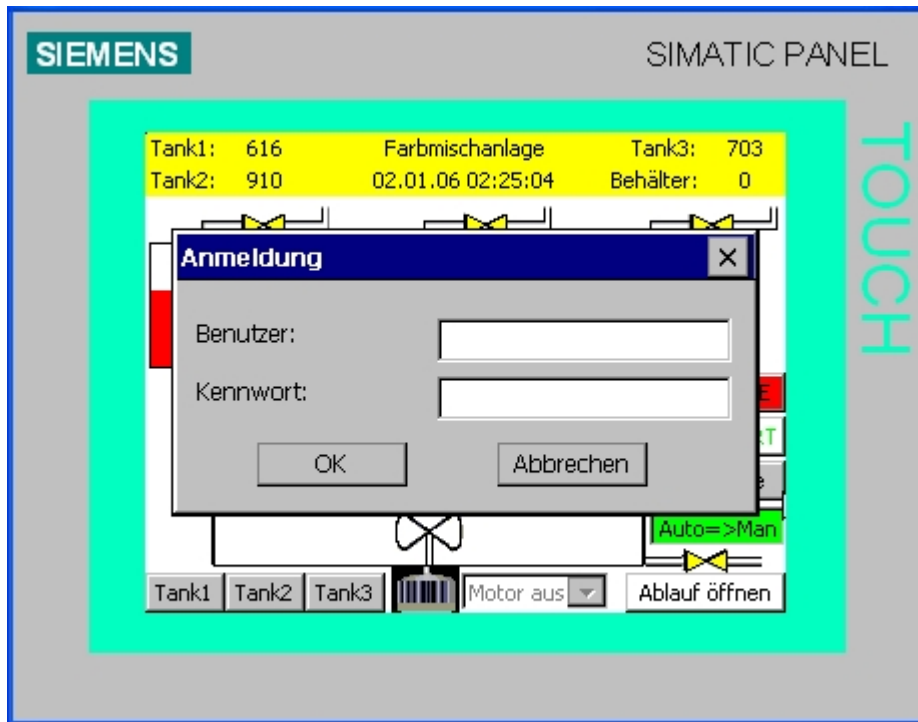

Save your project and check it for consistency.
Transfer the project to the panel only when the check returns no errors and no warnings.
Confirm the overwritten recipe data and password list with "Yes".

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11.4 Testing User Management in Runtime

If you are actuating a protected object in runtime, a log-on window will prompt you to enter the user name and the password.
After input, you have to reactuate the object.

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