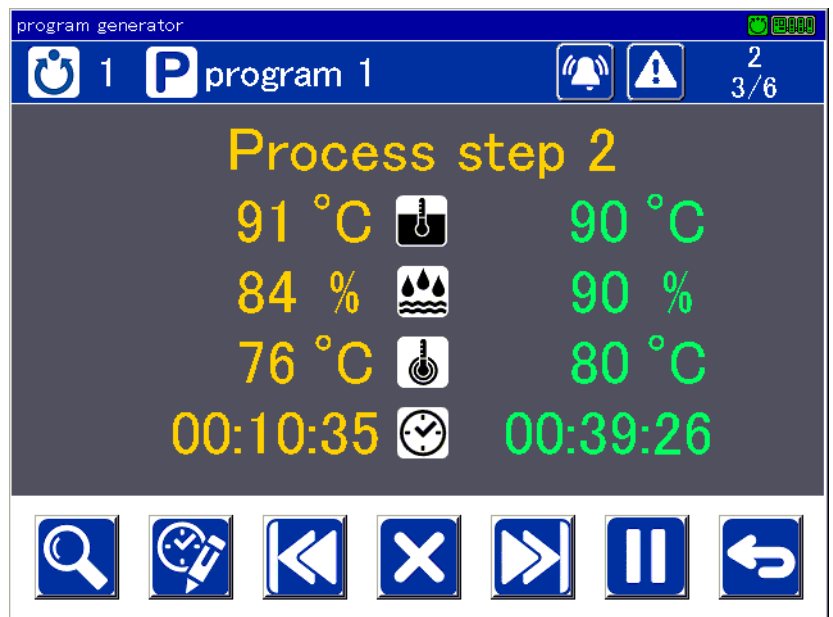


# JUMO mTRON T

## Measuring, Control, and Automation System Process Engineering Application



Operating Manual



70500152T90Z001K000

V2.00/EN/00642561



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## 1.1 Available technical documentation

The documents specified below are available for the measuring, control, and automation system.

### 1.1.1 General information

Product	Type of documentation	No.	Printed	PDF file
Measuring, control, and automation system	Data sheet	7050000T10...	-	X
	System manual <sup>1</sup>	B 705000.0	X	-
	Setup program manual	B 705000.6	-	X
	System description <sup>2</sup>	B 705000.8	-	X

<sup>1</sup> Accessory subject to charge

<sup>2</sup> Includes an overview of the purpose and content of all documents

### 1.1.2 Base units

Product	Type of documentation	No.	Printed	PDF file
Central processing unit	Data sheet	70500100T10...	-	X
	Operating manual	B 705001.0	-	X
	Modbus interface description	B 705001.2.0	-	X
	PROFIBUS-DP interface description	B 705001.2.3	-	X
	Installation instructions	B 705001.4	X	X
	CODESYS OPC server operating manual	B 705001.5.1	-	X
	Process engineering application operating manual	70500152T90...	-	X

### 1.1.3 Input/output modules

Product	Type of documentation	No.	Printed	PDF file
Multichannel controller module	Data sheet	70501000T10...	-	X
	Operating manual	B 705010.0	-	X
	Installation instructions	B 705010.4	X	X
Relay module 4-channel	Data sheet	70501500T10...	-	X
	Operating manual	B 705015.0	-	X
	Installation instructions	B 705015.4	X	X
Analog input module 4-channel	Data sheet	70502000T10...	-	X
	Operating manual	B 705020.0	-	X
	Installation instructions	B 705020.4	X	X
Analog input module 8-channel	Data sheet	70502100T10...	-	X
	Operating manual	B 705021.0	-	X
	Installation instructions	B 705021.4	X	X

# 1 Introduction

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Product	Type of documentation	No.	Printed	PDF file
Analog output module 4-channel	Data sheet	70502500T10...	-	X
	Operating manual	70502500T90...	-	X
	Installation instructions	70502500T94...	X	X
Digital input/output module 12-channel	Data sheet	70503000T10...	-	X
	Operating manual	B 705030.0	-	X
	Installation instructions	B 705030.4	X	X

## 1.1.4 Special modules

Product	Type of documentation	No.	Printed	PDF file
Router module	Data sheet	70504000T10...	-	X
	Installation instructions	B 705040.4	X	X

## 1.1.5 Operating, visualization, recording

Product	Type of documentation	No.	Printed	PDF file
Multifunction panel 840	Data sheet	70506000T10...	-	X
	Operating manual	B 705060.0	-	X
	Modbus interface description	B 705060.2.0	-	X
	Installation instructions	B 705060.4	X	X
Operating panels	Data sheet	70506500T10...	-	X

## 1.1.6 Power supply units

Product	Type of documentation	No.	Printed	PDF file
24 V power supply units	Data sheet	70509000T10...	-	X
	Operating instructions QS5.241		X	-
	Operating instructions QS10.241		X	-

## 1.2 Safety information

### 1.2.1 Warning symbols



#### **DANGER!**

This symbol indicates that **personal injury caused by electrical shock** may occur if the respective precautionary measures are not carried out.



#### **WARNING!**

This symbol in connection with the signal word indicates that personal injury may occur if the respective precautionary measures are not carried out.



#### **CAUTION!**

This symbol in connection with the signal word indicates that **damage to assets or data loss** will occur if the respective precautionary measures are not taken.



#### **CAUTION!**

This symbol indicates that **components could be destroyed** by electrostatic discharge (ESD = Electro Static Discharge) if the respective cautionary measures are not taken. Only use the ESD packages intended for this purpose to return device inserts, assembly groups, or assembly components.



#### **READ DOCUMENTATION!**

This symbol – placed on the device – indicates that the associated **device documentation has to be observed**. This is necessary to recognize the kind of the potential hazards as well as the measures to avoid them.

### 1.2.2 Note signs



#### **NOTE!**

This symbol refers to **important information** about the product, its handling, or additional use.



#### **REFERENCE!**

This symbol refers to **further information** in other sections, chapters, or manuals.



#### **FURTHER INFORMATION!**

This symbol is used in the tables and refers to **further information** in connection with the table.



#### **DISPOSAL!**

This device and the batteries (if installed) must not be disposed in the garbage can after use! Please ensure that they are disposed properly and in an **environmentally friendly manner**.

# 1 Introduction

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## 1.2.3 Intended use

The measuring, control, and automation system is intended for use in an industrial environment, as specified in the technical data of the individual system modules. Other uses beyond those defined are not viewed as intended uses.

The modules are manufactured in compliance with applicable standards and directives as well as the applicable safety regulations. Nevertheless, incorrect use may lead to bodily injury or property damage.

To avoid dangers, the modules may only be used:

- for the intended use
- when in good order and condition
- when taking into account the technical documentation provided

Even if a module is used correctly and according to the intended use, it may still pose application-related dangers, for example as the result of missing safety devices or incorrect settings.

To avoid incorrect settings, this manual contains relevant safety information and warnings. These must be complied with.

## 1.2.4 Qualification of personnel

This document contains the information required to ensure that the measuring, control, and automation system described is used as intended.

It is intended for technically qualified personnel who have received special training and have the appropriate knowledge in the field of automation technology (measuring and control technology).

Understanding and technically correct observance of the safety information and warnings contained in the supplied technical documentation are prerequisites for safe startup as well as safety during operation. Only qualified personnel have the required specialist knowledge to correctly interpret and implement the safety information and warnings contained in this document in specific situations.

## 1.3 Required system version

The process engineering application is supported from system version 03.

The system version of the measuring, control, and automation system is determined using the compatibility index of the base unit. Further information on the compatibility index:

⇒ Setup program manual (B 705000.6)

## 1.4 Brief description

The process engineering application is based on the functions of the measuring, control, and automation system. It represents an extension of the standard PLC application and is offered as a setup project.

The process engineering application is a sample application, which can be easily adapted to customer-specific requirements in different industries (for example air-conditioning, meat processing). It is independent from the hardware configuration of the system, with the exception of the central processing unit and the multifunction panel.

Operation does not take place via the standard functions of the multifunction panel but via special process screens. The PLC can switch process screens or change from the individual standard visualizations (controller, generator, and recorder screen) to a single process screen.

The process engineering application offers the following functions:

- System user log-on
- User administration
- Display of the configured program generator via special process screens (overview screen, detailed screen, detailed information)
- Special process screen for the program editor
- The program generator has easy-to-use button operation
- Central processing unit event list
- Alarm list for each program generator
- Special PLC functions (section changeover, F value calculation, deltaT setpoint value calculation) with simple configuration (no PLC knowledge necessary)



### NOTE!

In this document the term "program generator" is used. A program generator is a function unit within the central processing unit of the measuring, control, and automation system and it is used to execute a program. For this, the program generator must be configured accordingly. Up to nine program generators are available, so nine programs can be run simultaneously. Therefore, for example, nine individual plants can be controlled.

## 1.5 Use

The process engineering application is supplied as a project file for the setup program.

In order to be able to use the process engineering application, the options "PLC" and "Program generator with process steps" (central processing unit extra code) are required.

⇒ Setup program manual (B 705000.6)

# 1 Introduction

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## 2 Process screen operation



### NOTE!

Process screen operation is fundamentally only possible in system status "run". In system status "stop", certain inputs are accepted (for example, user log-on and log-out), but no process screens are updated. In system status "stop", the toolbar is automatically displayed and its functions are activated.

### 2.1 Overview screen

The overview screen is the access point to the process screen operation. Here, up to 9 program generators (plants) are displayed.

#### Default status



- (1) Status bar: user log-on and call up of central processing unit event list  
The event list can also be called up without logging on (acknowledgement only possible with log-on).

- (2) Overview of the pre-configured and active program generators 1 through to 9, in each case without a program  
Inactive program generators (= without function) are not displayed.

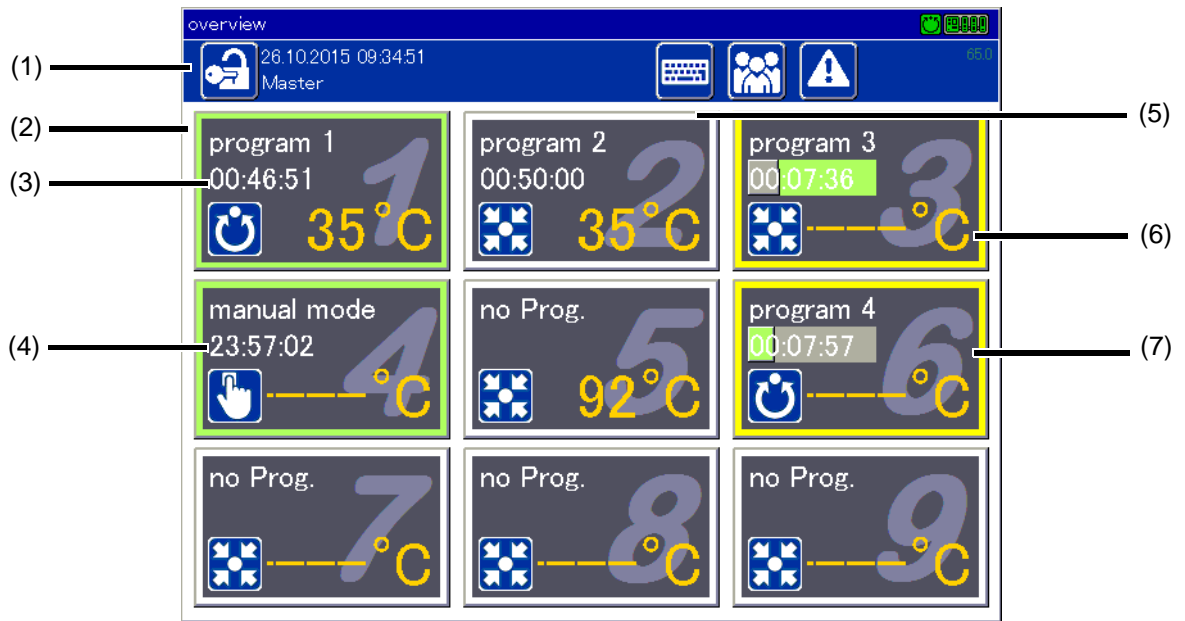


### NOTE!

If only program generators 1 to 4 are active, these will be displayed larger in the overview so that all of the available screen surface is used. If only program generator 1 is active, this will again be displayed larger.

## 2 Process screen operation









### Program generators with programs







- |   |   |
|---|---|
| <p>(1) Status bar: "master" user is logged on; "toolbar", "user administration", and "event list" symbols</p> <p>(2) Overview of all configured program generators<br/>Touch the corresponding field to call up a program generator (detailed screen). To do this a user must be logged on.</p> <p>(3) Program generator display:<br/>Program generator number (in this case: 1)<br/>Symbol for the program generator status (in this case: automatic mode)<br/>Frame colour to identify status (in this case: green = automatic mode)<br/>Program name<br/>Remaining running time<br/>Chamber temperature (actual value)</p> <p>(4) Program generator in manual mode:<br/>Frame colour green</p> | <p>(5) Program generator in basic status<br/>Frame colour white</p> <p>(6) Program generator in basic status with active program end signal:<br/>Frame colour yellow<br/>The remaining time of the program end signal is displayed numerically and as a bar graph.</p> <p>(7) Program generator with delayed program start:<br/>Frame colour yellow<br/>The lead time (time until the program start) is displayed numerically and as a bar graph.</p> <p>Meaning of frame colors:<br/>White = basic status<br/>Green = automatic mode or manual mode<br/>Yellow = delayed program start or expiry of the program end signal<br/>Red = alarm</p> |
|---|---|

## 2 Process screen operation

### Status bar symbols and buttons

Symbol/Button	Meaning/Function
	No user logged on Tap the symbol to log on.
	User is logged on (user name is displayed). Tap the symbol to log off.
	Display toolbar (user-dependent)
	Hide toolbar (user-dependent)
	Open "log-on" menu (log-on/log-off and user administration)
	No new event in the event list Tap the symbol to open the event list. ⇒ Chapter 2.3.10 "Event list", page 38
	New event in the event list Tap the symbol to open the event list. After closing the event list, the symbol will turn blue again (no new event).
	Collective alarm Tap the symbol to open the event list, acknowledge the alarm, and the symbol will turn blue again. If the event list is closed without acknowledgement, the symbol will remain red.

### Symbols for the generator status

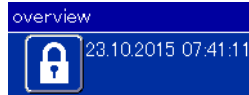
Symbol	Meaning
	Program generator in basic status
	Program generator in automatic mode
	Program generator stopped (pause)
	Program generator in manual mode

## 2 Process screen operation

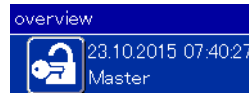
### 2.2 User log-on

Users can log on from the status bar on the overview screen.

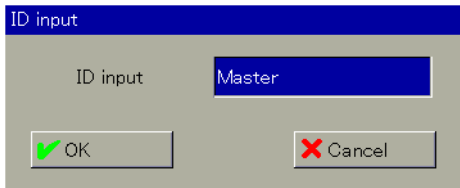
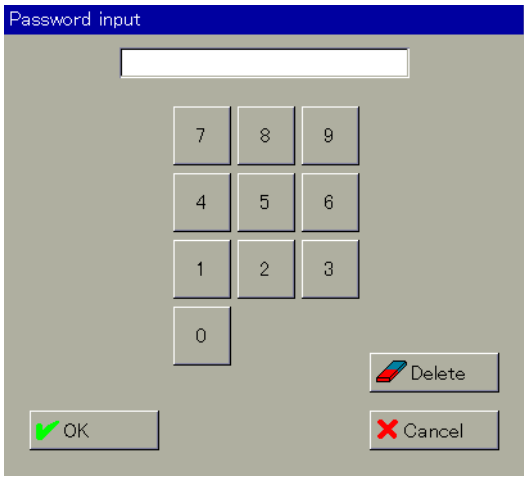
If no user is logged on, the relevant symbol is displayed (as well as date and time):



If a user is already logged on, the relevant symbol together with the user name (in this case: master) is displayed:



#### User log-on

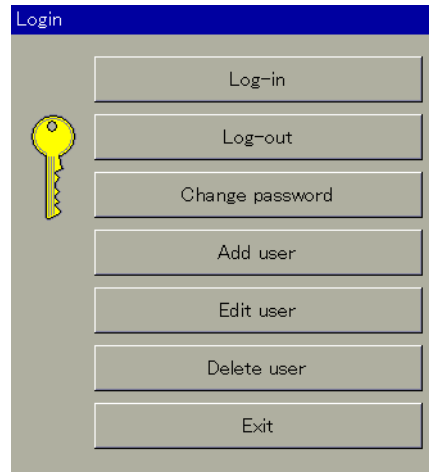
Step	Activity
1	<p>Tap the user log-on symbol in the status bar.</p> <p>The window for entering the user name is displayed:</p> 
2	<p>Accept user (the last user selected is displayed, in this case: master) or select another user (tap the field where the name is displayed and choose a user from the list).</p> <p>The window for entering the password is displayed:</p> 
3	<p>Enter password.</p> <p>The user is logged on.</p>

#### User administration

If the logged on user has user administration rights, different options are available in the log-on dialog:

## 2 Process screen operation

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### User groups and user rights

A user is assigned to a user group and therefore possesses the rights that are associated with that user group.

The user groups available in the process engineering application are identical to those in the measuring, control, and automation system standard application:

- User group 1: Masters  
The user has all rights (administrator).
- User group 2: Users 1  
The user cannot manage users but has all other rights.
- User group 3: Users 2  
The user cannot manage users and cannot configure or parameterize the system.
- User group 4: Users 3  
The user cannot manage users and cannot configure or parameterize the system. The user also cannot edit programs (not even temporarily), operate the controller or adjust the time.
- User group 5: Services  
The user has the rights that are typically required for a service technician. That includes, among others, rights for user administration, configuration, parameterization, and time adjustment.

A user who is not logged on will only be able to view the overview screen and can log on from there. The user can also open and view the event list.

Making changes to the user groups (names, rights) is not possible with the process engineering application. User groups are essentially established as part of the project configuration with the setup program.

⇒ Setup program manual (B 705000.6)

## 2 Process screen operation

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The following users are already set up by default:

<b>User</b>	<b>ID</b>	<b>Name</b>	<b>Password</b>	<b>User group</b>
User 1	Master	System master	9200	1: Masters
User 2	User 1	Data management	1	2: Users 1
User 3	User 2	Data management	2	3: Users 2
User 4	User 3	Data management	3	4: Users 3
User 5	User 4	Service	9200	5: Services

### 2.3 Program generator (detailed screen)

By tapping a program generator on the overview screen, you are taken to the detailed screen of the program generator (user log-on required). The detailed screen display depends on the current operating status of the program generator:

- Program generator in basic status
- Program generator in automatic mode
- Program generator in manual mode

From the detailed screen, further functions and screens can be called up via buttons (symbols).

In the basic status:

- Detailed information (process data of the program generator)
- Program editor (with previous program selection)
- Program quickstart of the selected program
- Manual mode of the program generator (selection of the process step, input of section time and setpoint values, activation of operating contacts)
- Program selection for the program generator (program, start section, lead time) and program start, if necessary






In automatic mode

- Temporary program changes
- Section change (forward/back)
- Program stop (pause) and program abort

In manual mode:

- Temporary changes
- Stop (pause) and abort









#### Status bar symbols and buttons

Symbol/Button	Meaning/Function
	No alarm in the program generator alarm list Tap the symbol to open the alarm list. ⇒ Chapter 2.3.11 "Alarm list", page 40
	Alarm in the program generator alarm list Tap the symbol to open the alarm list. The alarm can be acknowledged, but this has no effect on the color of the symbol. This remains red until the alarm stops.
	No new event in the event list Tap the symbol to open the event list. ⇒ Chapter 2.3.10 "Event list", page 38
	New event in the event list Tap the symbol to open the event list. After closing the event list, the symbol will turn blue again (no new event).
	Collective alarm Tap the symbol to open the event list, acknowledge the alarm, and the symbol will turn blue again. If the event list is closed without acknowledgement, the symbol will remain red.

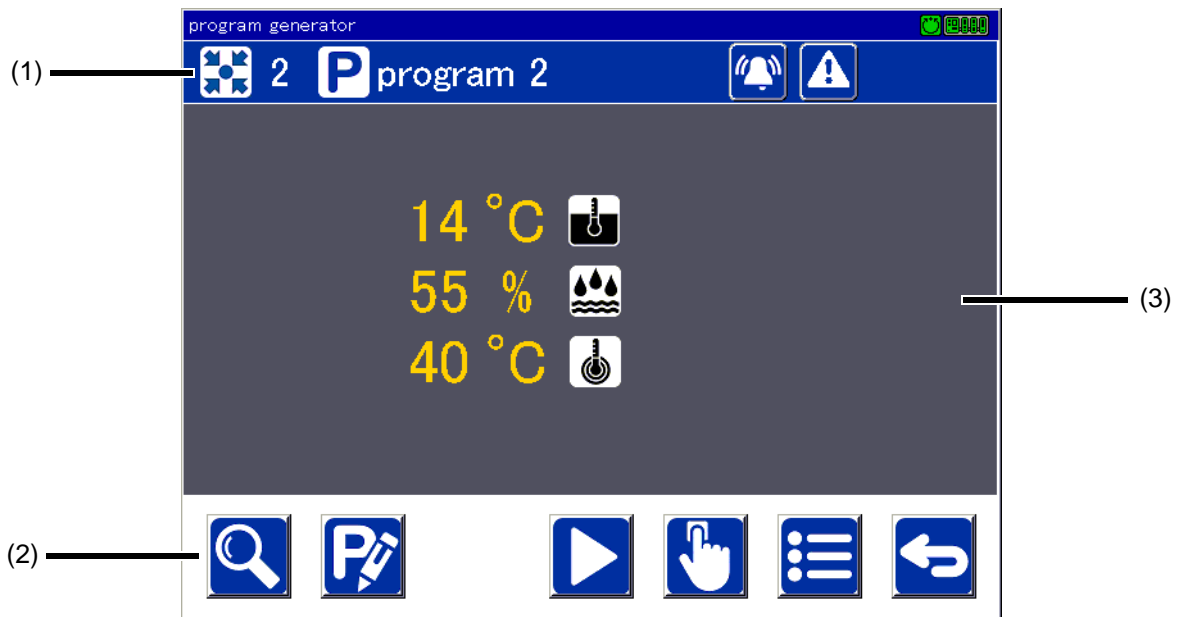
## 2 Process screen operation

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### Status bar symbols

Symbol	Meaning
	Program generator in basic status
	Program generator in automatic mode
	Program generator stopped (pause)
	Program generator in manual mode
	Program editor
	Temporary program change
	Program (followed by program name or "manual mode")
	Program section (followed by section number)

### 2.3.1 Basic status



- (1) Status bar:
- Symbol for program generator status (in this case: basic status)
  - Program generator number (in this case: 2)
  - "P" symbol (program) and program name
  - "Alarm" button symbol to call up the plant-specific program generator alarm list
  - "Event" button symbol to call up the central processing unit event list
- (2) Control elements (from left to right):
- Detailed information
  - Program editor
  - Program quickstart
  - Manual mode
  - Program selection/start
  - Back (overview screen)
- (3) Display of process data:
- Background dark grey
  - Actual values orange
  - Symbols to identify process data (see Chapter 2.3.7 "Automatic mode", page 33)

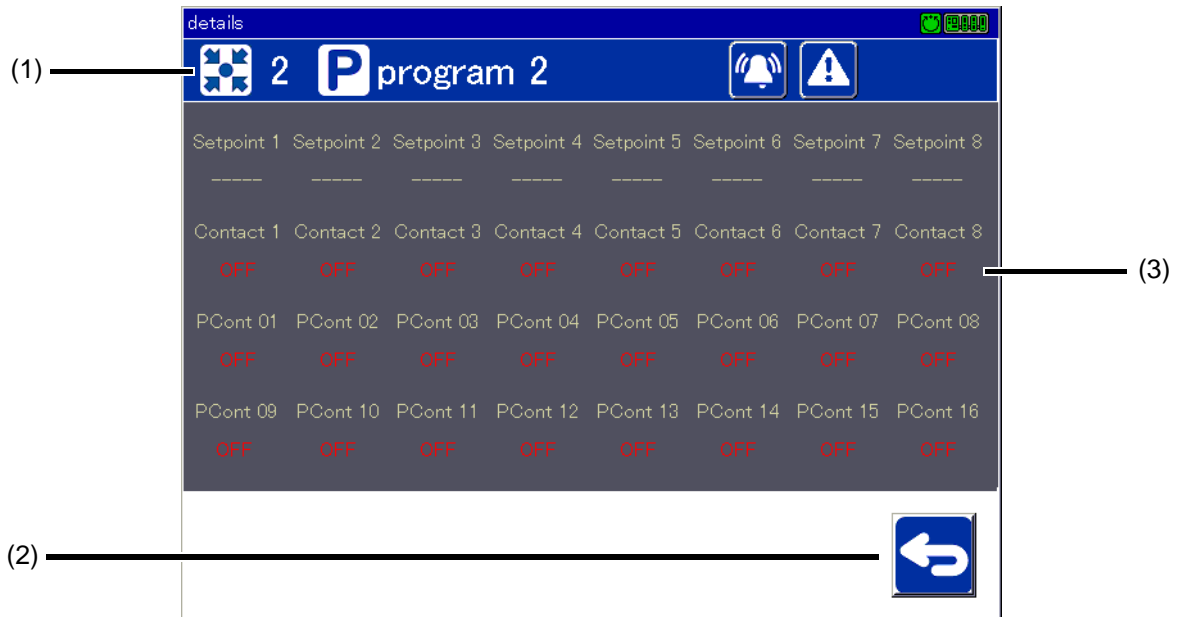
## 2 Process screen operation

### 2.3.2 Detailed information

Call up from the basic status



Process screen



- (1) Status bar:
- Symbol for program generator status (in this case: basic status)
  - Program generator number (in this case: 2)
  - "P" symbol (program) and program name

- (2) Control element:
- Back (basic status or automatic mode)

- (3) Display of detailed information (program generator process data; in this case: program has not yet been started):
- Setpoint values
  - Operating contacts (in this case: contact 1 to 8)
  - Process contacts (in this case: PCont 01 to 16)

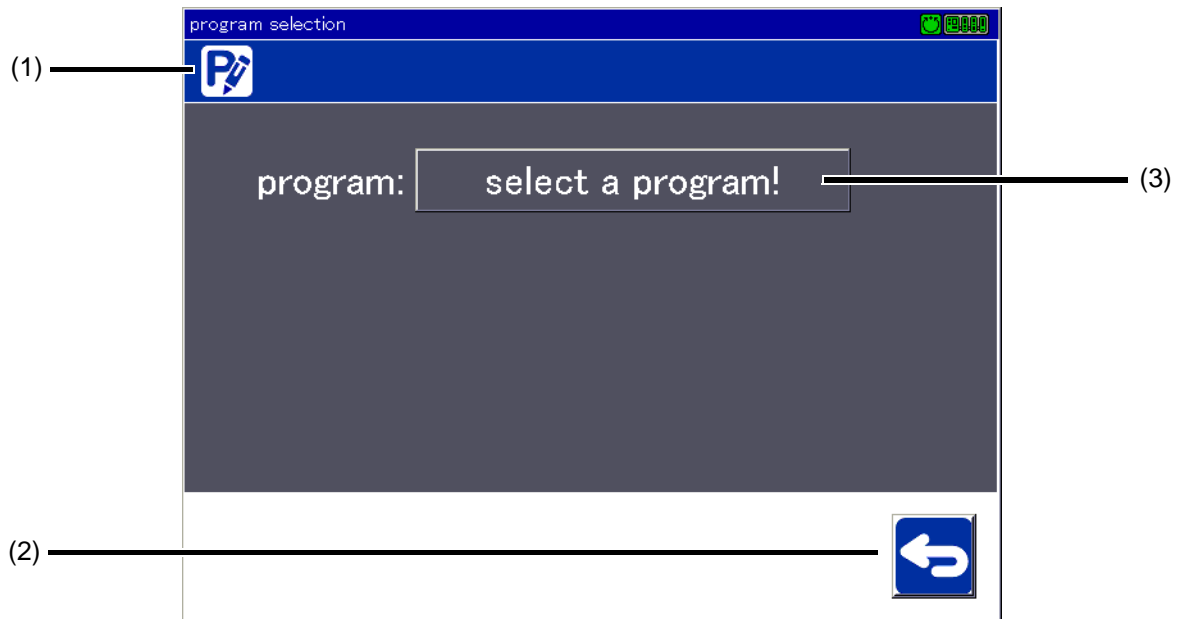
## 2 Process screen operation

### 2.3.3 Program editor

Call up from the basic status



Select program



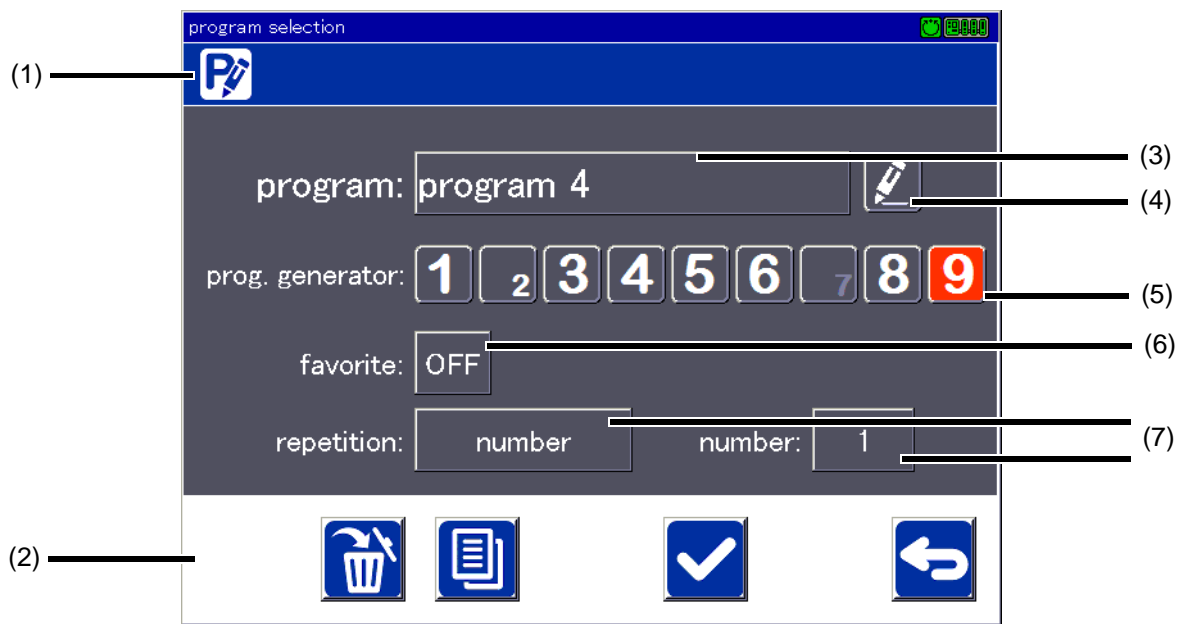
(1) Status bar:  
"Edit program" symbol

(2) Control element:  
Back (basic status)

(3) Program selection:  
Select program from the program list

## 2 Process screen operation

### Select a program

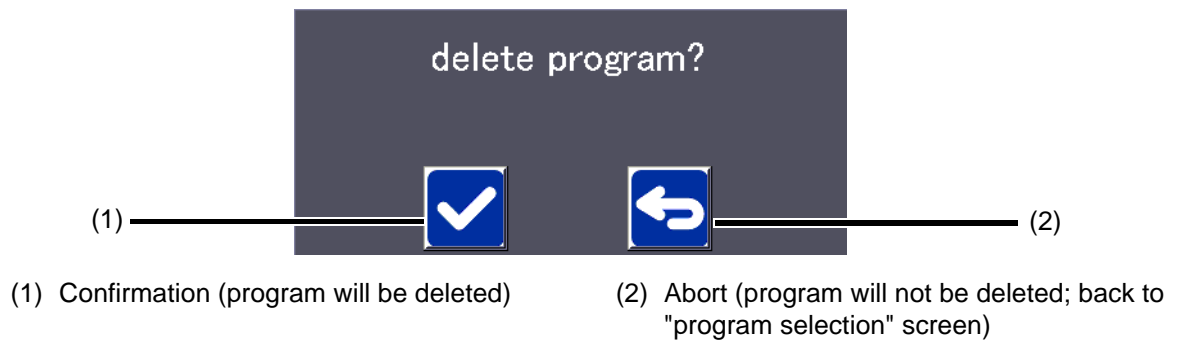


- (1) Status bar:  
"Edit program" symbol
- (2) Control elements (from left to right):  
Delete program  
Copy program  
Start program editor  
Back (basic status)
- (3) Program selection:  
Previously selected program (new program selection possible)
- (4) Edit:  
Edit name of selected program
- (5) Assign program generator:  
Select one or several program generators with which the program can be run (in this case: program generator 2 was not selected, program generator 7 is not configured).  
In the case of a limit value violation due to a setpoint value, the corresponding program generator will be displayed as red (in this case: program generator 9).
- (6) Favorite:  
Identify a program as a favorite, then it will be placed at the start in the program selection list.
- (7) Program repetition/Number:  
Define program repetition (inactive, infinite or number) and state the number of repetitions if necessary.

## 2 Process screen operation

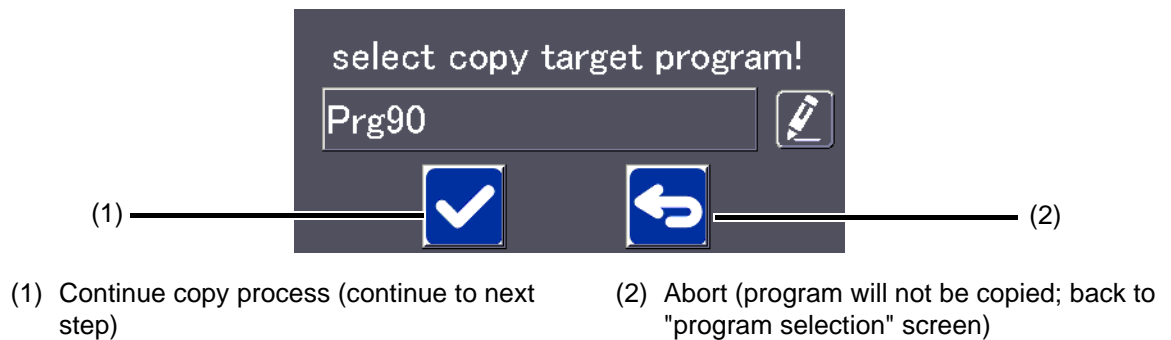
### Delete program

After pressing the "delete program" control element (button), the confirmation prompt needs to be answered:

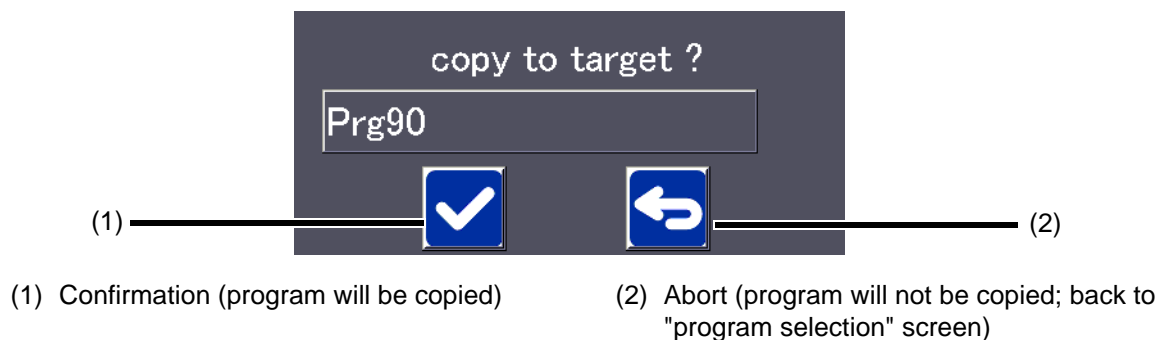


### Copy program

After pressing the "copy program" control element (button), the program space where the program is to be copied is first of all selected and, if necessary, the program name edited. The copy process can then be continued or canceled.



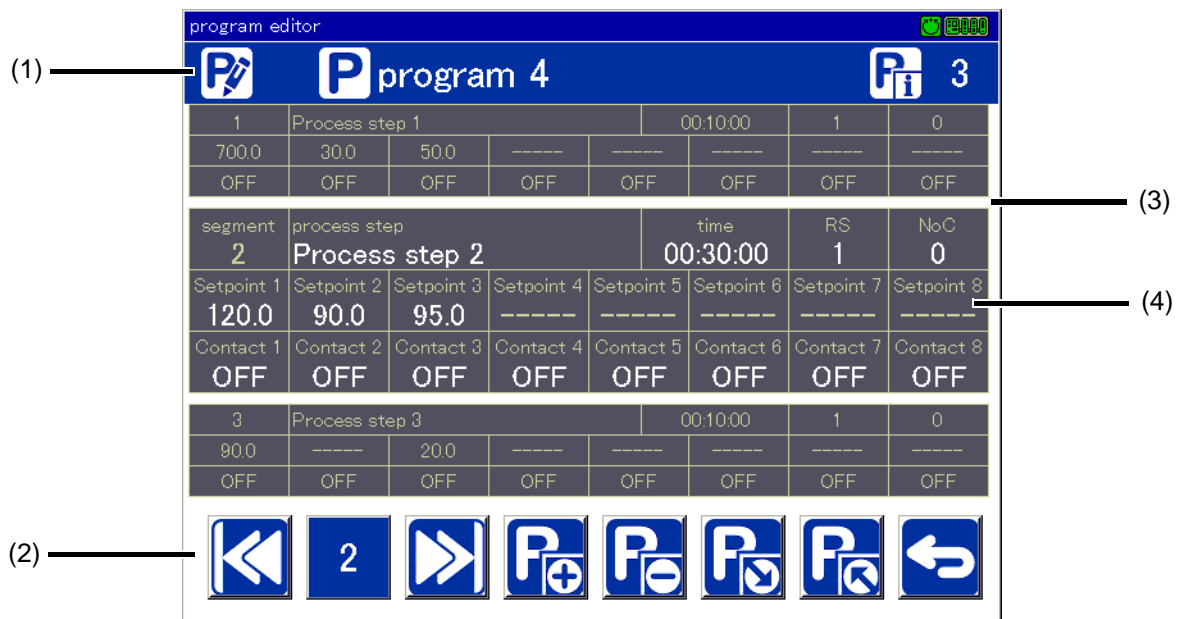
Then the confirmation prompt needs to be answered:



## 2 Process screen operation

### Edit program

After pressing the "start program editor" control element (button), the program editor process screen is displayed:



- |   |   |
|---|---|
| <p>(1) Status bar:</p> <ul style="list-style-type: none"> <li>"Edit program" symbol</li> <li>"P" symbol (program) and program name</li> <li>"P/i" symbol (number of program sections; in this case: 3)</li> </ul> <p>(2) Control elements (from left to right):</p> <ul style="list-style-type: none"> <li>Previous section</li> <li>Selected section (direct selection possible by entering section number)</li> <li>Next section</li> <li>Insert empty section after the selected section</li> <li>Delete selected section</li> <li>Copy selected section to cache</li> <li>Insert copied section into any position in the same program</li> <li>Back (basic status)</li> </ul> | <p>(3) Program sections:</p> <ul style="list-style-type: none"> <li>Previous section (for information only)</li> <li>Selected section</li> <li>Next section (for information only)</li> </ul> <p>(4) Selected program section (partially editable):</p> <ul style="list-style-type: none"> <li>Section number (not editable)</li> <li>Process step</li> <li>Section time</li> <li>Target (start section of the repetition)</li> <li>Cycles (number of repetitions)</li> <li>Setpoint values 1 to 8</li> <li>Operating contacts 1 to 8</li> </ul> <p>Setpoint values and section time are displayed in red in the case of limit value violation.</p> |
|---|---|

### Process step

When editing a program section, the process step must first be specified. The process step determines which setpoint values are available and which limits are valid for the section time.

Process steps are created via configuration with the setup program.

⇒ Chapter 3.4 "Process steps", page 48

## 2 Process screen operation

### Setpoint values and section time

The description of the setpoint values and of their limits are specified in the program generator configuration; the limits of the section time are specified via the process step. Entries in the program editor are only possible within these limits.

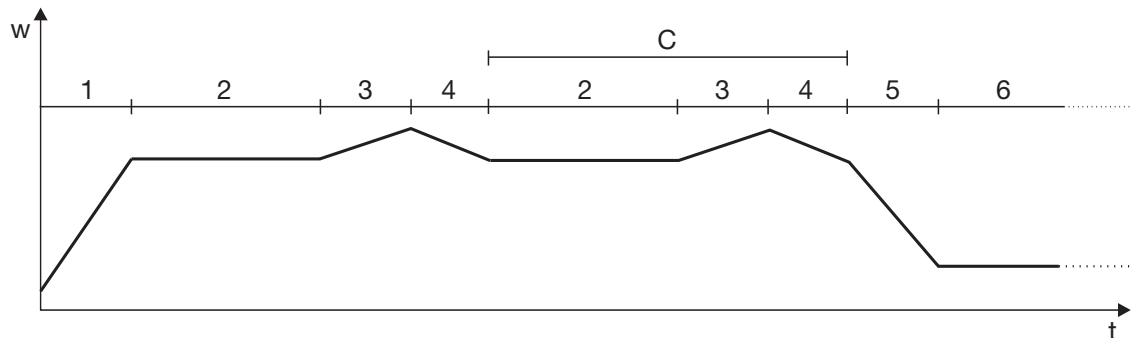
If there is a limit value violation, because the configuration or assignment of program generators is subsequently changed, then the setpoint value in question is displayed in red.

If subsequently a different process step is selected, the section time, in the case of a limit value violation, will also be displayed in red. Setpoint values that are not enabled in the process step are deactivated. If the original process step is selected again, the previously deactivated setpoint values will be pre-assigned with "-----" (no value); the original values must then be re-entered.

### Target (RS), Cycles (NoC)

Several program sections can form a repetition cycle (C). In the last section of a repetition cycle, the number (cycles) and the start section (target) can be entered.

Example: Sections 2 to 4 should be repeated once. In section 4, the following entries are required: cycles = 1; target = 2



Overlaps of repetition cycles (interlaced jumps) are not admissible.

### Operating contacts

The description of the contacts is specified in the program generator configuration.

### Editing and running programs simultaneously

While a program that is assigned to a particular program generator (a particular plant) is running, no other program can be created or edited for this program generator. Only programs that are assigned to different program generators can be edited and run at the same time.

## 2 Process screen operation

### Display of limit value violations

In the case of a limit value violation concerning a setpoint value or the section time, the relevant value will be displayed as red. It is possible to move forwards or backwards to the sections that also contain a limit value violation using the additional buttons in the status bar.

segment	process step	time	RS	NoC			
1	Process step 1	00:10:00	1	0			
70.0	30.0	50.0	-----	-----			
OFF	OFF	OFF	OFF	OFF			
2	Process step 2	00:30:00	1	0			
Setpoint 1	Setpoint 2	Setpoint 3	Setpoint 4	Setpoint 5	Setpoint 6	Setpoint 7	Setpoint 8
120.0	90.0	95.0	-----	-----	-----	-----	-----
Contact 1	Contact 2	Contact 3	Contact 4	Contact 5	Contact 6	Contact 7	Contact 8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3	Process step 3	00:10:00	1	0			
30.0	60.0	51.0	-----	-----	-----	-----	-----
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

(1) Section time violates the limit value

(3) Jump (back/forward) to the next incorrect section

(2) Setpoint value violates the limit value

### 2.3.4 Program quickstart

Call up from the basic status



With this function, the last active program will be started directly. If a lead time was set for the program, this will not be observed.

This function is also available when a new program was selected but has not yet started.

After the program start, the symbol on the button changes to enable immediate program abort.

## 2 Process screen operation

### 2.3.5 Manual mode

Call up from the basic status



With this function manual mode is selected and the program editor is initially called up.

#### Create program for manual mode

A program that consists of a single program section is created for the manual mode of a program generator.

segment	process step				time	RS	NoC
1	Process step 1				00:20:00	1	0
Setpoint 1	Setpoint 2	Setpoint 3	Setpoint 4	Setpoint 5	Setpoint 6	Setpoint 7	Setpoint 8
70.0	30.0	50.0	-----	-----	-----	-----	-----
Contact 1	Contact 2	Contact 3	Contact 4	Contact 5	Contact 6	Contact 7	Contact 8
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF

- (1) Status bar:  
 "Create program for manual mode" symbol  
 Program generator number (in this case: 4)
- (2) Control elements (from left to right):  
 Start manual mode  
 Back (basic status)

- (3) Program section (partially editable):  
 Section number (not editable)  
 Process step  
 Section time  
 Target (not editable)  
 Cycles (not editable)  
 Setpoint values 1 to 8  
 Operating contacts 1 to 8

In the case of a limit value violation, the section time is displayed in red.

### Process step

When editing a program section, the process step must first be specified. The process step determines which setpoint values are available and which limits are valid for the section time.

Process steps are created via configuration with the setup program.

⇒ Chapter 3.4 "Process steps", page 48

### Setpoint values and section time

The description of the setpoint values and of their limits are specified in the program generator configuration; the limits of the section time are specified via the process step. Entries in the program editor are only possible within these limits.

If subsequently a different process step is selected, the section time, in the case of a limit value violation, will also be displayed in red. Setpoint values that are not enabled in the process step are deactivated. If the original process step is selected again, the previously deactivated setpoint values will be pre-assigned with "-----" (no value); the original values must then be re-entered.

### Target (RS), Cycles (NoC)

Repetition cycles are not possible in manual mode.

### Operating contacts

The description of the contacts is specified in the program generator configuration.

### Manual mode active

After starting manual mode, the program generator automatic screen is displayed. To distinguish from the automatic mode, the symbol for manual mode is used in the status bar.

Temporary changes to the program (program section) are possible.

### No control via digital signals

Controlling the program generator via digital signals is not possible in manual mode.

If the digital signal is a digital variable (digital signal via interface), no error message is generated for the interface in manual mode.

## 2 Process screen operation

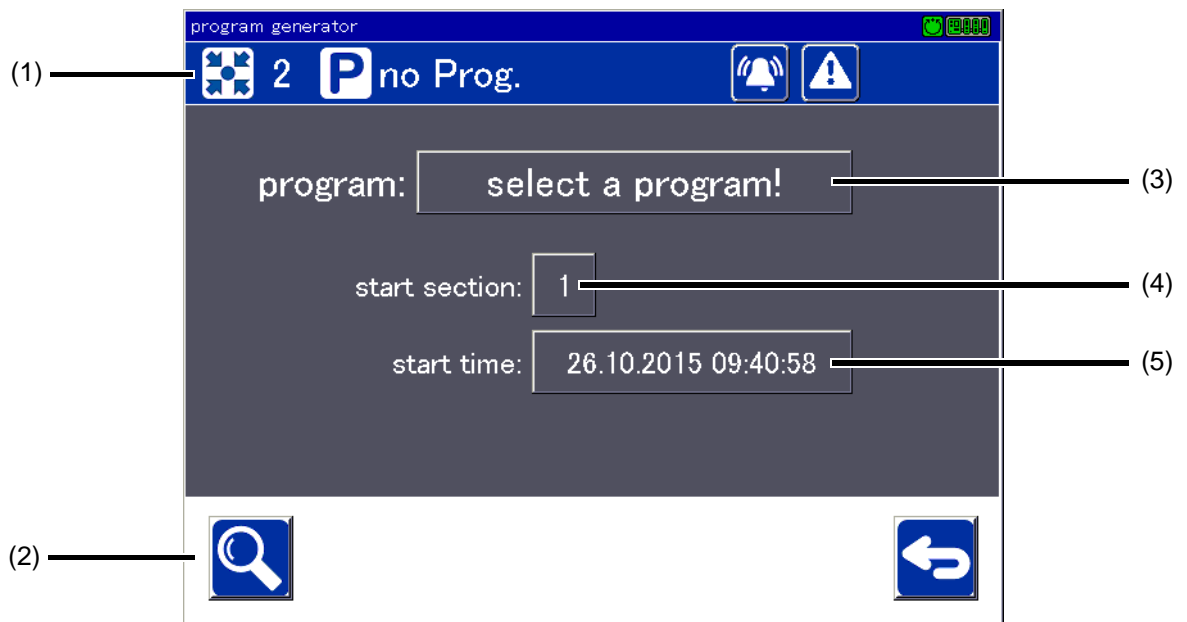
### 2.3.6 Program selection/start

Call up from the basic status



With this function, a program is selected and started. There is the option to choose the start section and to specify a delay time or a start time (date and time).

#### Select program

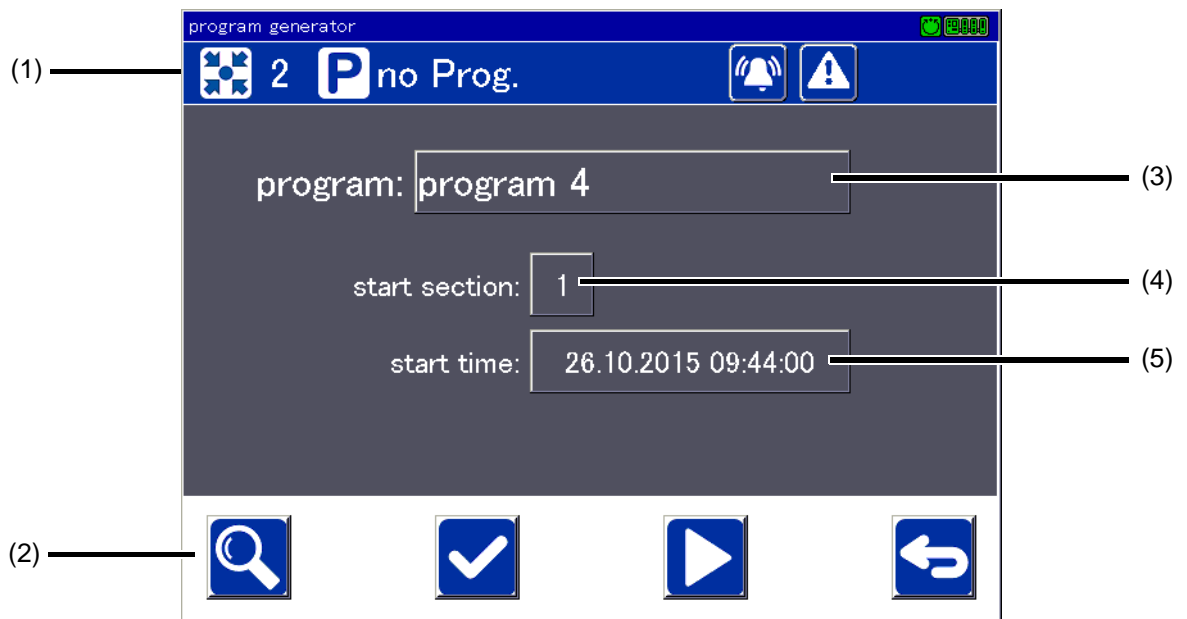


- |   |  |
|---|--|
| <p>(1) Status bar:<br/>"Program generator in basic status" symbol<br/>Program generator number (in this case: 2)<br/>"P" symbol (program) and program name<br/>(in this case: no program has been<br/>selected yet)</p> <p>(2) Control elements (from left to right):<br/>Detailed information about the program<br/>generator<br/>Back (without program selection)</p> | <p>(3) Select program:<br/>List of all programs that were assigned to<br/>this program generator<br/>Select program from the list</p> <p>(4) Specify start section:<br/>Input section number (default setting: sec-<br/>tion 1)<br/>With "start at actual value" (program gener-<br/>ator configuration), no start section can be<br/>specified.</p> <p>(5) Activate lead time, if required:<br/>Start time (start time with date and time)<br/>Delay (lead time in hh:mm:ss)<br/>The input option depends on the program<br/>generator configuration (start with time:<br/>yes/no).</p> |
|---|--|

## 2 Process screen operation

### Start the program

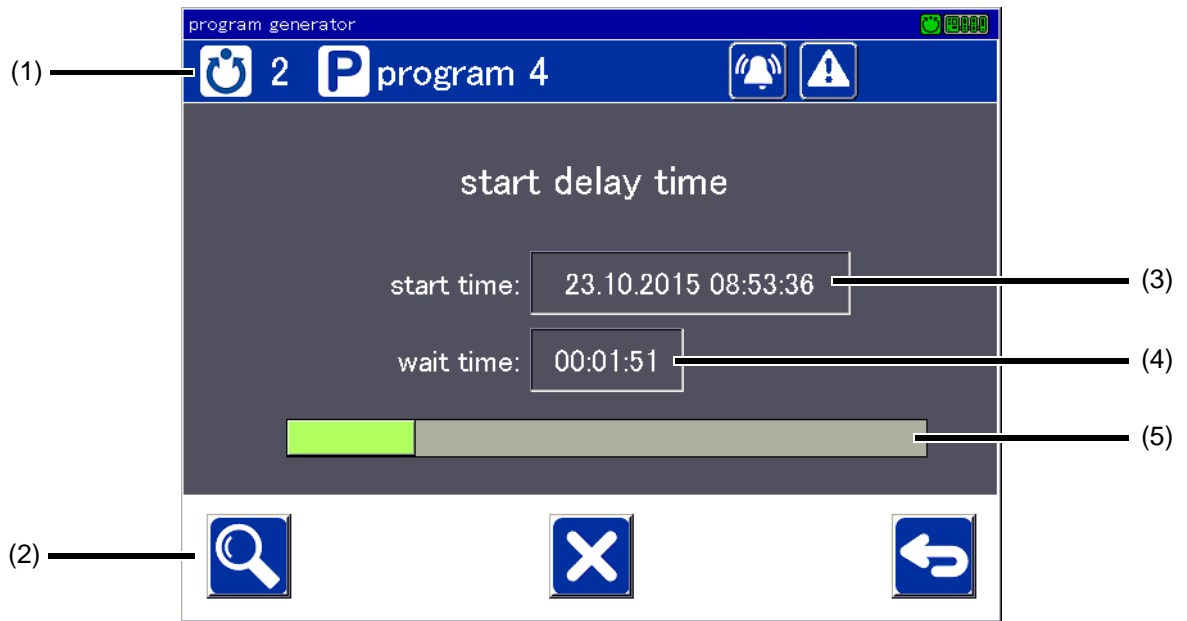
After selecting the program – and, if necessary, entering the start section and lead time – the program can be started.



- |  |   |
|--|---|
| <p>(1) Status bar:<br/>"Program generator in basic status" symbol<br/>Program generator number (in this case: 2)<br/>"P" symbol (program) and program name</p> <p>(2) Control elements (from left to right):<br/>Detailed information about the program generator<br/>Adopt program for the program generator and start later (lead time will be observed automatically)<br/>Start program (lead time will be observed automatically)<br/>Back (without program selection)</p> | <p>(3) Selected program:<br/>Program name is displayed (reselection possible)<br/>Red background for limit value violation due to setpoint value: the program can not be adopted for the corresponding program generator.</p> <p>(4) Entered start section:<br/>Section number is displayed (reselection possible)</p> <p>(5) Starting time (after pressing the start button):<br/>Running (current) time: program starts immediately<br/>Time (date and time): program starts at the displayed time<br/>Time span (hh:mm:ss): program starts after time span has elapsed</p> |
|--|---|

## 2 Process screen operation

### Delayed program start



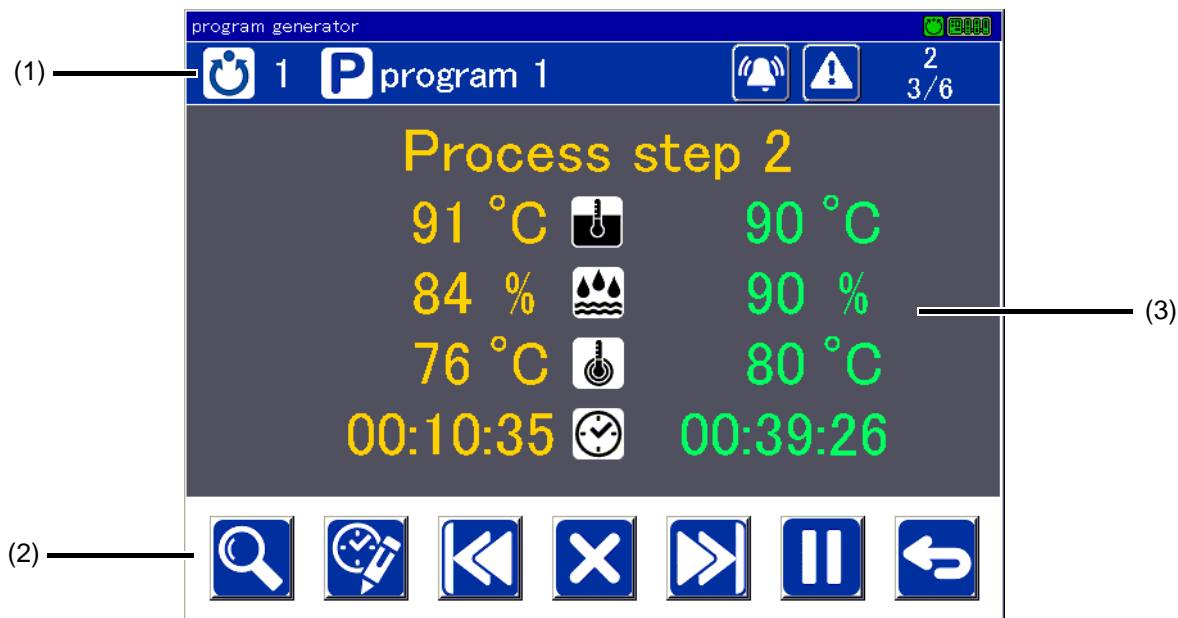
- |   |  |
|---|--|
| (1) Status bar:<br>"Program generator in automatic mode"<br>symbol<br>Program generator number (in this case: 2)<br>"P" symbol (program) and program name | (3) Start time:<br>Pre-assigned start time (date and time) or<br>Calculated start time (date/time at start +<br>lead time)<br>The display depends on the configuration<br>of the program generator (start with time:<br>yes/no). |
| (2) Control elements (from left to right):<br>Detailed information about the program<br>generator<br>Program abort<br>Back (overview screen)              | (4) Wait time until program start<br>Time display is decremented   |
|   | (5) Bar graph display of the elapsed wait time<br>Display is incremented   |

## 2 Process screen operation

### 2.3.7 Automatic mode

After the program start, the process screen for automatic mode is displayed.

#### Process screen



(1) Status bar:

Symbol for the program generator status  
(in this case: automatic mode)  
Program generator number (in this case: 1)  
"P" symbol (program) and program name  
"Alarm" symbol  
"Event" symbol  
Current program section (in this case: 2)  
and number of program cycles (in this case  
3/6; the program is in the third cycle of a  
total of six cycles, this is equal to 5 repeti-  
tions)

(2) Control elements (from left to right):

Detailed information  
Temporary changes to the program (pro-  
gram editor)  
Previous section  
Program abort (with additional confirmation  
prompt)  
Next section  
Pause  
Back (overview screen)

(3) Display of process data:

Active process step  
Actual values (orange) and setpoint values  
(green) of the plant  
Program run time (orange) and remaining  
running time (green)  
Symbols to identify process data (see  
below)

## 2 Process screen operation

---

### Section change

A section change (previous/next section) is carried out directly without additional confirmation prompt. If the program generator is in the last section, the program will end immediately with "next section".

### Actual values and setpoint values in the process screen





The actual value for the display is selected in the PLC configuration of the central processing unit from the analog selector (system analog signals).

⇒ Chapter 3.2 "Actual values", page 43

### Controlling the program generators

The program generators can be controlled using the process screen and also via digital signals according to the configuration of the program generator (start, section change, pause, abort).

### Symbols to identify process data

Symbol	Meaning
	Chamber temperature
	Humidity
	Core temperature
	Program run time and remaining program time

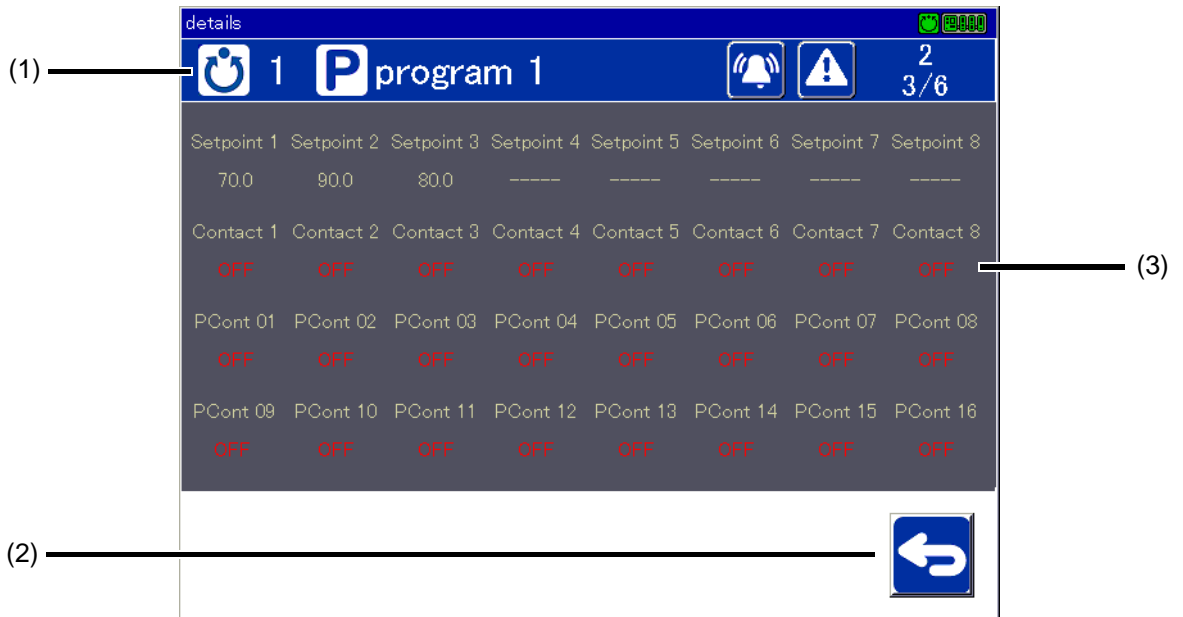
## 2 Process screen operation

### 2.3.8 Detailed information in automatic mode

Call up from automatic mode



Process screen



- (1) Status bar:
- Symbol for the program generator status (in this case: automatic mode)
  - Program generator number (in this case: 2)
  - "P" symbol (program) and program name
  - "Alarm" symbol
  - "Event" symbol
  - Current program section (in this case: 2) and number of program cycles (in this case: 3/6)
- (2) Control element:
- Back (automatic mode)

- (3) Display of detailed information (all program generator process data):
- Setpoint values
  - Operating contacts (in this case: contact 1 to 8)
  - Process contacts (in this case: PCont 01 to 16)

## 2 Process screen operation

---

### 2.3.9 Temporary changes

Call up from automatic mode



With this function, the program editor is started in order to implement temporary changes in the current program. During start, the program editor jumps to the current program section. Here, the display of the section time will be updated cyclically. Previous sections (past) and subsequent sections (future) are also editable.

Temporary changes to setpoint values, program contacts, and section times are possible. If it concerns the currently running program section, the remaining section time or alternatively the section time (section duration) is changed. The changes to the section time or the remaining section time are effective immediately after the time is entered. If it is the case that the section status changes (from "in progress" to "not in progress" or the reverse) during the alteration of the section time or the remaining section time, the time entry will be rejected.

Inserting or deleting program sections is not possible. Similarly, no changes can be made to repetition cycles.

When the program ends (also via program abort), the temporary changes are deleted. When the program restarts, the original program data is valid again.

## 2 Process screen operation

### Program editor

The screenshot shows the 'program editor' interface. At the top, a status bar (1) contains a 'Temporary change' symbol, the program generator number '2', a 'P' symbol, the program name 'program 4', a 'P/i' symbol, and the program section number '3'. Below this is a table of process steps. The first section is 'Process step 1' with a time of '00:10:00', RS '1', and NoC '0'. The second section is 'Process step 2' with a time of '00:29:27', RS '1', and NoC '0'. This section is further divided into 8 columns: Setpoint 1 (120.0), Setpoint 2 (90.0), Setpoint 3 (95.0), Setpoint 4 (---), Setpoint 5 (---), Setpoint 6 (---), Setpoint 7 (---), and Setpoint 8 (---). Below the setpoints are 8 columns for Contact 1 through Contact 8, all currently 'OFF'. The third section is 'Process step 3' with a time of '00:10:00', RS '1', and NoC '0'. At the bottom, a control bar (2) contains icons for: Previous section, Section 2 (selected), Next section, P+, P-, P with a downward arrow, P with a rightward arrow, and Back.

(1) Status bar:

"Temporary change" symbol  
 Program generator number (in this case: 2)  
 "P" symbol (program) and program name  
 "P/i" symbol (program section in which the running program is currently located; in this case: 3)

(2) Control elements (from left to right):

Previous section  
 Section selected for editing (direct selection by entering section number possible)  
 Next section  
 Back (automatic mode)

(3) Program sections:

Previous section (for information only)  
 Selected section  
 Next section (for information only)

(4) Selected program section (partially editable):

Section number (not editable)  
 Process step  
 Section time (or remaining section time of the active section)  
 Cycles (number of repetitions; not editable)  
 Target (start section of the repetition; not editable)  
 Setpoint values 1 to 8  
 Operating contacts 1 to 8

## 2 Process screen operation




### 2.3.10 Event list

The last 150 events are listed in the central processing unit event list with dates and times. The events include:

- Events, such as, configuration change, status change of a program generator (start, pause, abort, section change), limit value violation, system status change (RUN, STOP), power on/off
- Malfunctions, such as module failure
- System collective alarm

The event list is called up via the button (symbol) in the status bar

#### Status bar symbols and buttons

Symbol/Button	Meaning/Function
	No new event in the event list Tap the symbol to open the event list.
	New event on the event list (event or malfunction) Tap the symbol to open the event list. A single event cannot be acknowledged. After closing the event list, the symbol will turn blue again. If it concerns a malfunction, this can be acknowledged, resulting in a "malfunction acknowledged" entry. But even if there is no acknowledgement, the event list symbol will turn blue again after it is closed.
	Collective alarm Tap the symbol to open the event list, acknowledge the alarm, and the symbol will turn blue again. If the event list is closed without acknowledgement, the symbol will remain red. The acknowledgement is listed as a new "acknowledged collective alarm" entry in the event list.

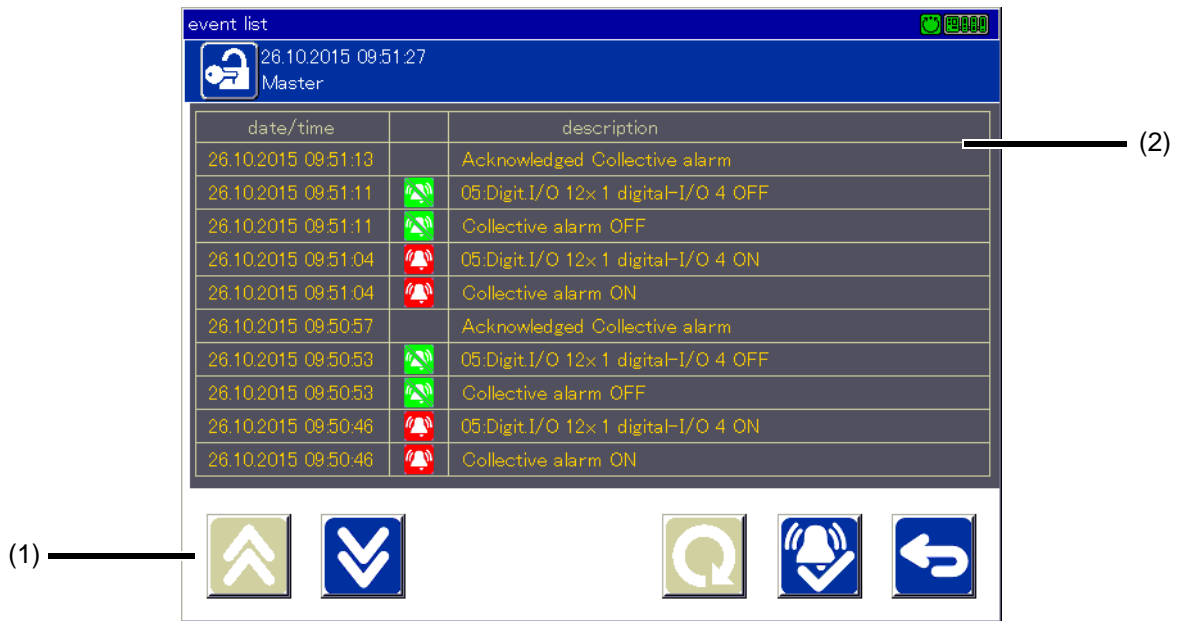


#### NOTE!

The "acknowledgement" function is only available when a user is logged on and acknowledgement rights have been assigned to him/her.

## 2 Process screen operation

### Event list



(1) Control elements (from left to right):

Advance to more recent events  
(in this case: button inactive since no more recent events exist)

Advance to older events

Update event list  
(in this case: button inactive since it has already been updated)

Acknowledgement of collective alarm






Back (overview screen, detailed screen or alarm list)

(2) Event list:



Time (date/time) when the event happened

Description (event texts from the central processing unit configuration)

### Symbols to identify events

Symbol	Meaning
	Power on
	Power off
	Malfunction (yellow)
	Collective alarm on (red)
	Collective alarm off (green)

## 2 Process screen operation

Symbol	Meaning
	Event on
	Event off
(no symbol)	Additional events



### 2.3.11 Alarm list

There is a separate alarm list for each program generator in which the alarm texts of eight digital signals are listed. These digital signals are assigned individual parameters in the PLC configuration (configuration level of the central processing unit), which are then analyzed by the PLC.

The alarm texts are also specified in the configuration of the central processing unit (setup/texts for PLC digital outputs only). In the case of an alarm, the corresponding alarm text is displayed against a red background and the date and time are displayed (alarm on, alarm off).

The alarm list is called up via the button (symbol) in the status bar of the corresponding program generator (detailed screen).

#### Status bar symbols and buttons

Symbol/Button	Meaning/Function
	No alarm in the alarm list Tap the symbol to open the alarm list.
	At least one alarm in the alarm list Tap the symbol to open the alarm list. The bell turns red as soon as an alarm goes off. This remains red until the alarm stops and has been acknowledged. A digital signal controlling a horn is activated by the alarm. This stays active until it has been acknowledged and it is reactivated with each new alarm. The signal is available in the digital selector (CPU > Digital signals > Program generator > PGx_horn).

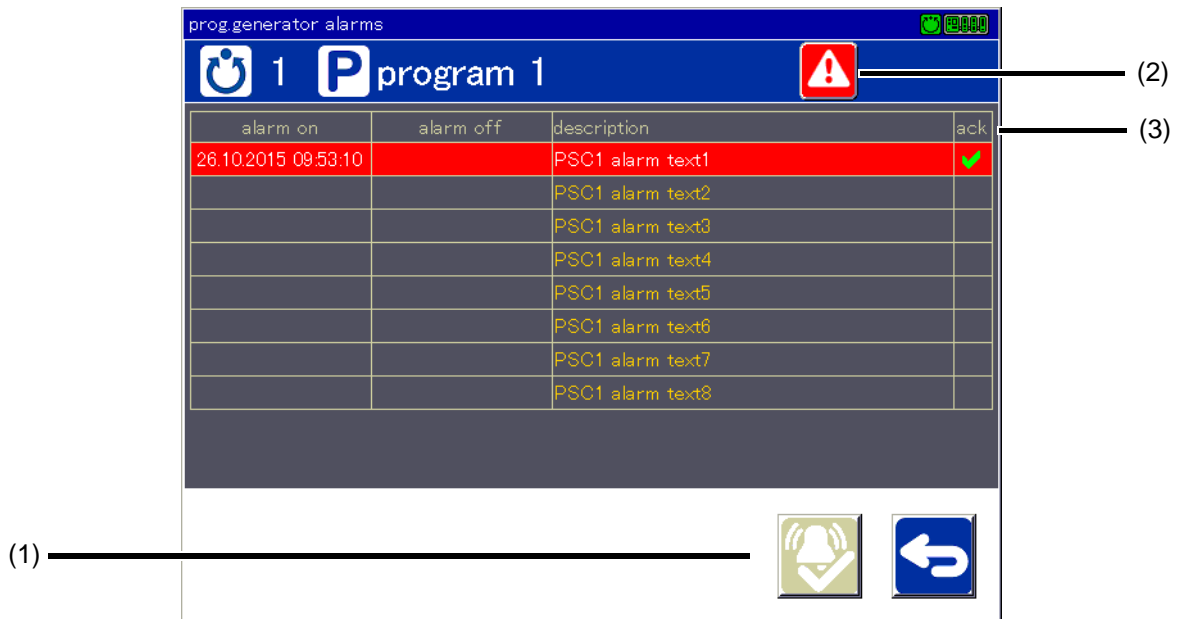


#### NOTE!

The "acknowledgement" function is only available if the logged on user has acknowledgement rights.

## 2 Process screen operation

### Alarm list



(1) Control elements (from left to right):

Acknowledgement (ack)

Back (detailed screen)

(2) Collective alarm in the event list

Tap the symbol to open the event list.

(3) Alarm on: time when the alarm was triggered

Alarm off: time when the alarm stopped (if it has not yet been acknowledged)

Description (alarm texts of the eight digital signals of the program generator)

Ack: alarm is still present but it has already been acknowledged (green check mark)

The bar with the alarm text turns red as soon as the corresponding alarm goes off. This remains red until the alarm stops and has been acknowledged.

## 2 Process screen operation

---

## 3.1 Overview of the configuration steps

The configuration of different input and output signals, texts, process steps, and program generators is required to use the process engineering application. This will be demonstrated here as an example of a program generator.

The following steps are required for configuration:

- 1) Actual values: select analog signals to be displayed as actual values in the program generator
- 2) Alarms: select digital signals to trigger an alarm in the program generator; determine the alarm texts; determine the alarm signal description; connect a signal to control a warning device (e.g. horn) with a digital output
- 3) Process steps: define process steps including process contacts
- 4) "Door open" and "pause" events: deactivate process contacts (yes/no); select digital signal (door contact)
- 5) Using process contacts: connect process contacts with digital outputs
- 6) Program generator: activate program generator; enter setpoint limits and descriptions; define temperature (setpoint value) for the section changeover (core temperature); determine changeover condition (time/setpoint value)
- 7) Configure special PLC functions: section changeover; F value calculation; deltaT setpoint value calculation
- 8) Setpoint values (program generator outputs): connect setpoint values with analog outputs; use setpoint values as controller setpoint values

The following chapters describe the configuration with the setup program. Program creation will not be dealt with here (for this see Chapter 2.3.3 "Program editor", page 21).

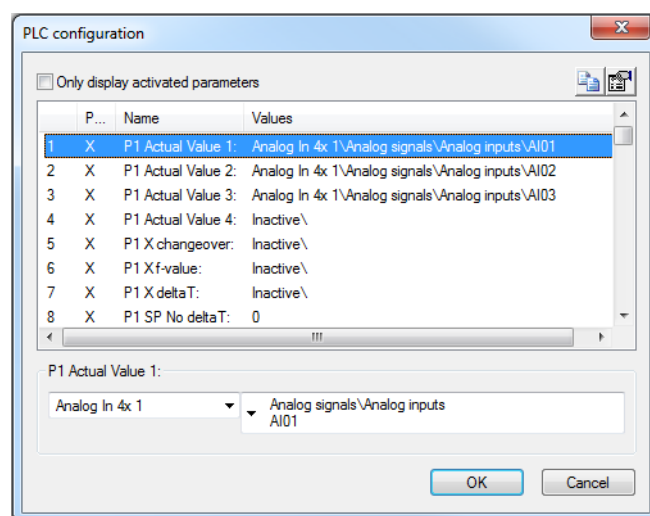
Further information about configuration can be found in the technical documentation of the measuring, control, and automation system, particularly the central processing unit operating manual (705001).

⇒ Chapter 1.1 "Available technical documentation", page 5

## 3.2 Actual values

Select analog signals to be displayed as actual values in the program generator

CPU > Configuration level > PLC configuration

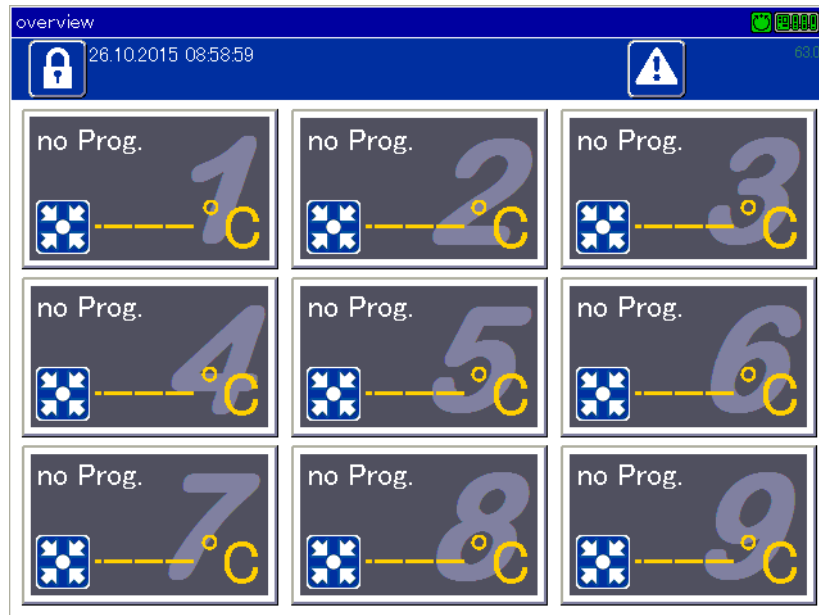


## 3 Configuration

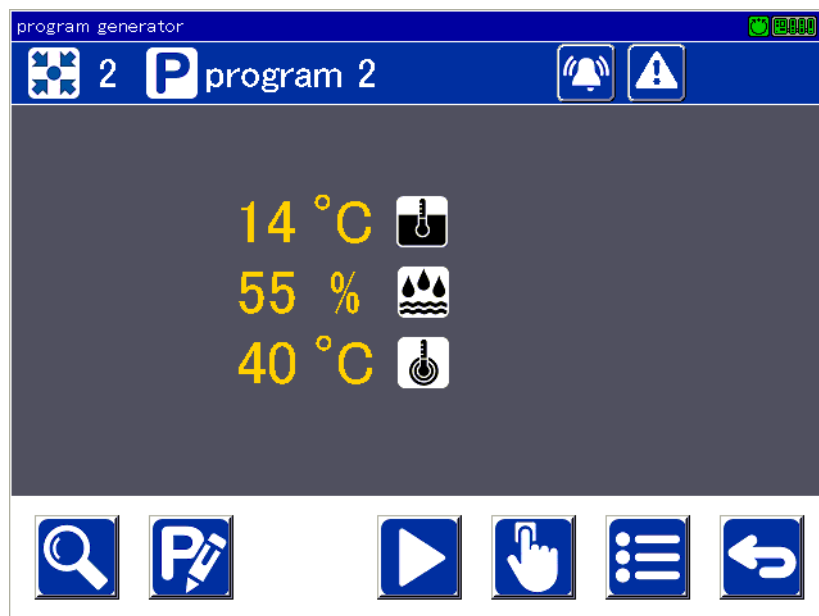
All analog selector signals are available here. In this example, the analog inputs 1 (AI01) to 3 (AI03) of the 4-channel analog input module (Analog In 4x\ ...) will be used.

The actual values "Px actual value 1" to "Px actual value 3" (x = 1 to 9) are used in the following process screens:

Program generator overview screen: Px actual value 1 (in this case: ----)



Detailed screen of the program generator: Px actual value 1, Px actual value 2, Px actual value 3 (from top to bottom)



Meaning of actual values:

Px actual value 1: chamber temperature

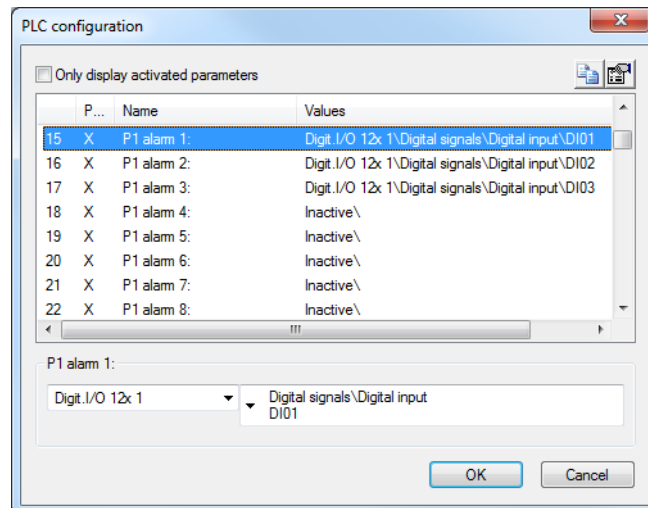
Px actual value 2: humidity

Px actual value 3: core temperature

## 3.3 Alarms

### Select digital signals which trigger an alarm in the program generator

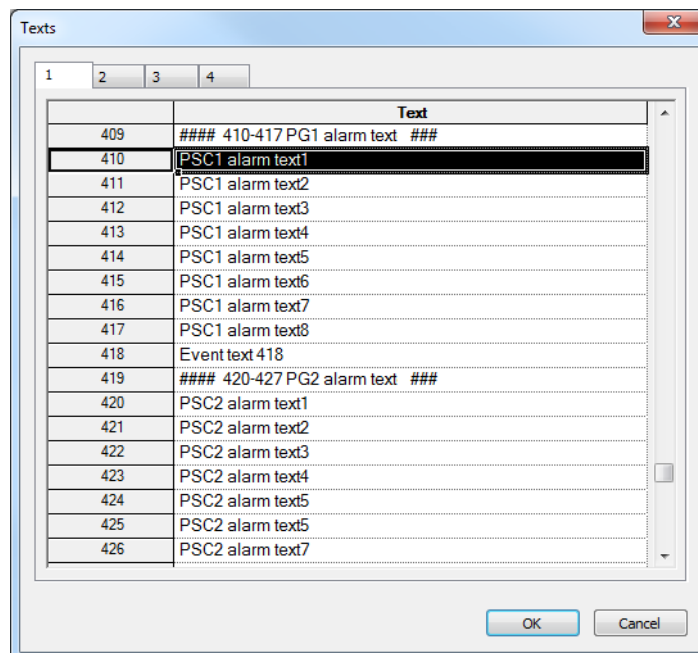
CPU > Configuration level > PLC configuration



All analog selector signals are available here. In this example, three input signals of the 12-channel input/output module (Digit. I/O 12x \ ...) are used. Each program generator can be assigned up to eight digital alarm signals.

### Determine alarm texts

CPU > Setup only > Texts:



The alarm texts are used in the alarm list of the corresponding program generator. For each program generator (PG1 to PG9), eight alarm texts (malfunction1 to malfunction8) are provided. The existing default text can be individually adapted to the circumstances of each plant.

### 3 Configuration

Text numbers of the alarm texts of each program generator:

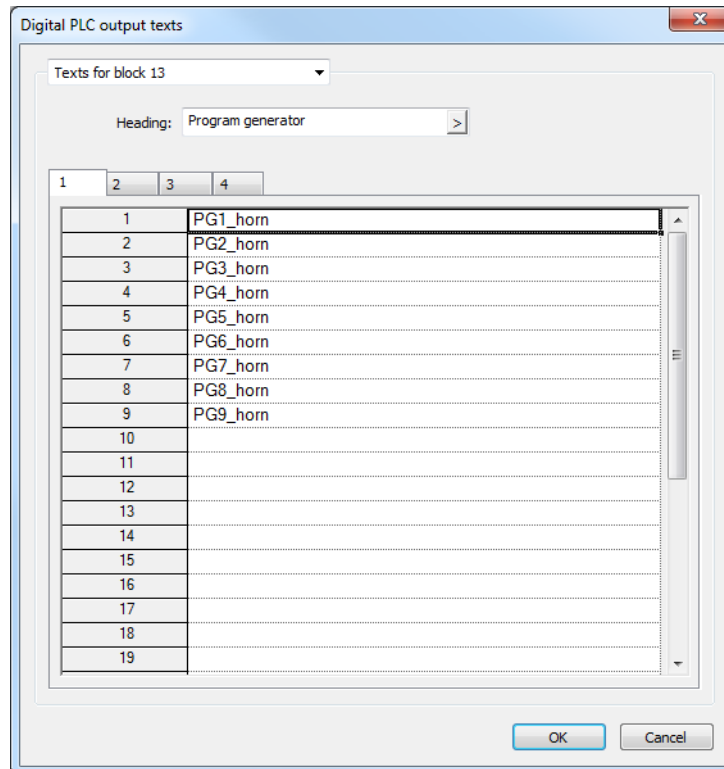
Generator	Text numbers
1	410 to 417
2	420 to 427
3	430 to 437

Generator	Text numbers
4	440 to 447
5	450 to 457
6	460 to 467

Generator	Text numbers
7	470 to 477
8	480 to 487
9	490 to 497

#### Determine alarm signal description

CPU -> Setup only -> Texts for PLC digital output. (> Texts for block 13):

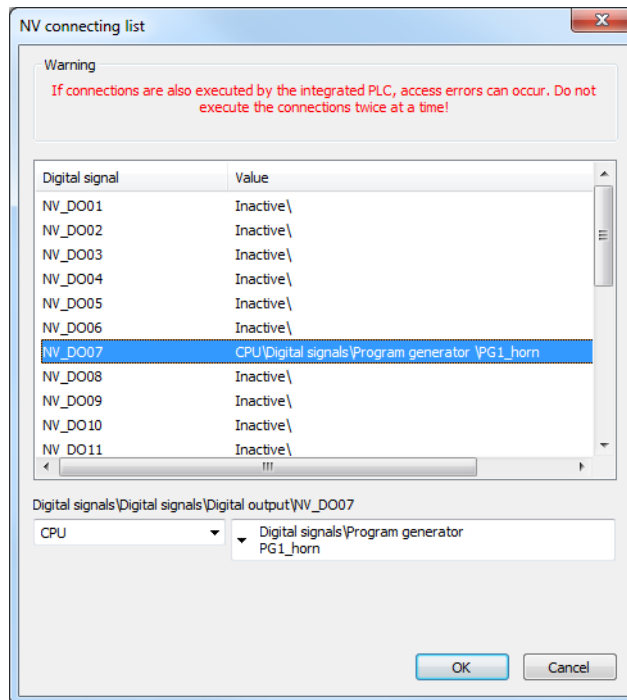


The description is used in the digital selector for the program generator alarm signal. Each program generator (PG1 to PG9) issues an alarm signal, which is activated as soon as an alarm goes off. It is reset with the acknowledgment of the alarm (regardless of whether the cause for the alarm is still present or not).

The existing default text can be changed individually.

## Connect a signal to control a warning device (e.g. horn) with a digital output

[Module] > Configuration level > NV connecting list:



In this example, the alarm signal (PG1\_horn) is issued via output 7 (NV\_DO07) of the 12 channel digital input/output module.



### NOTE!

If other actions need to be executed via the alarm, additions to the PLC code of this application are required. If necessary, the manufacturer should be contacted.

# 3 Configuration

## 3.4 Process steps

### Define process steps including process contacts

In a process step, requirements for creating the program with the program editor are defined. A certain process step is assigned to each program section. In this way, it is guaranteed that in the program section, only admissible setpoint values are used and the section time stays within the pre-assigned limits. Furthermore, process contacts are available in process step 16 through which step-specific digital signals are activated.

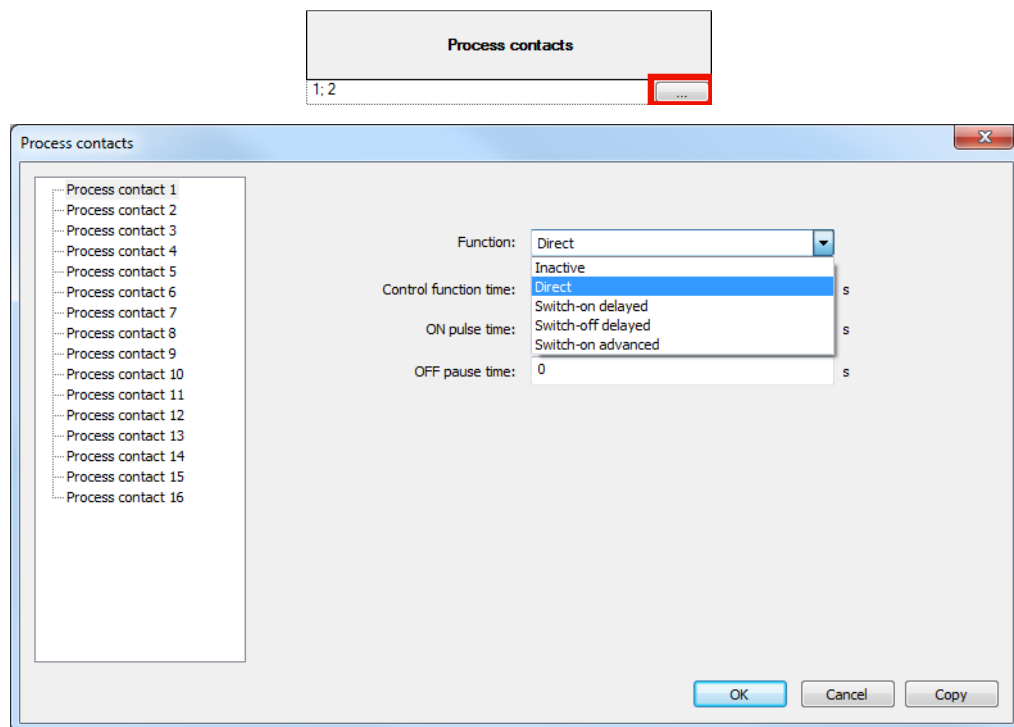
CPU -> Setup only -> Process steps:

No.	Process step name	Min. section time	Max. section time	Enabled setpoints	Assigned generators	Process contacts
1	Process step 1	00:10:00	00:20:00	1,2,3,4	1,2,3,4,5,6,7,8,9	1; 2
2	Process step 2	00:20:00	00:30:00	1,2,3,4	1,2,3,4,5,6,7,8,9	1; 2
3	Process step 3	00:10:00	00:20:00	1,2,3,4	1,2,3,4,5,6,7,8,9	1; 2
4	Process step 4	00:00:00	99:59:59			
5	Process step 5	00:00:00	99:59:59			
6	Process step 6	00:00:00	99:59:59			
7	Process step 7	00:00:00	99:59:59			
8	Process step 8	00:00:00	99:59:59			
9	Process step 9	00:00:00	99:59:59			
10	Process step 10	00:00:00	99:59:59			
11	Process step 11	00:00:00	99:59:59			
12	Process step 12	00:00:00	99:59:59			
13	Process step 13	00:00:00	99:59:59			
14	Process step 14	00:00:00	99:59:59			
15	Process step 15	00:00:00	99:59:59			
16	Process step 16	00:00:00	99:59:59			
17	Process step 17	00:00:00	99:59:59			
18	Process step 18	00:00:00	99:59:59			
19	Process step 19	00:00:00	99:59:59			

In this example, three fictitious process steps have been defined (process step 1 to process step 3). In a real application, names should be selected to identify the purpose of the process step (example from the meat industry: smoking, showering, reddening).

The "min. section time" and "max. section time" parameters determine the limits for the section time of the program section. Under "enabled setpoints", setpoint values are selected that are available in the program sections. Under "assigned generators" the program generators are selected through which the program can be run. In the "process contacts" column, active contacts are listed.

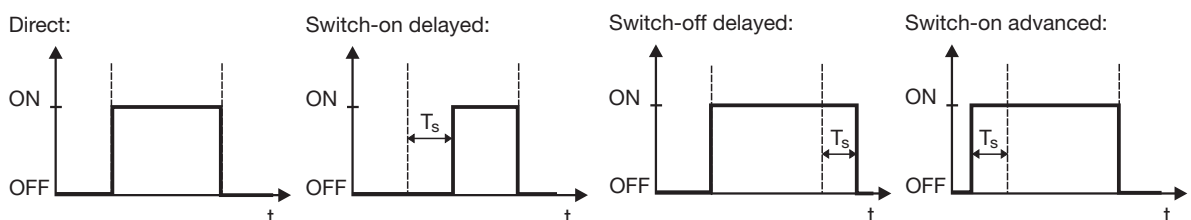
The "..." button opens the menu for configuring the process contacts:



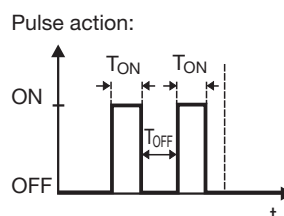
Function:

- Inactive: process contact is not active
- Direct: process contact is active during the process step (no special switching behavior)
- Switch-on delayed: process contact activation is delayed
- Switch-off delayed: process contact deactivation is delayed
- Switch-on advanced: process contact is activated before the start of the process step

Control function time  $T_S$ : time span of the switch-on or switch-off delay or of the advance



On pulse time  $T_{ON}$ , off pulse time  $T_{OFF}$ : both times together define a process contact pulse action. Both must be greater than zero. The pulse action only occurs when the process contact is active (delay or advance time is observed) and always starts with an on pulse.



## Example for using a process contact

A smoke generator needs a specified lead time in order to provide the smoke that is required for the "smoking" process step. For this purpose, in the corresponding process step, the pro-

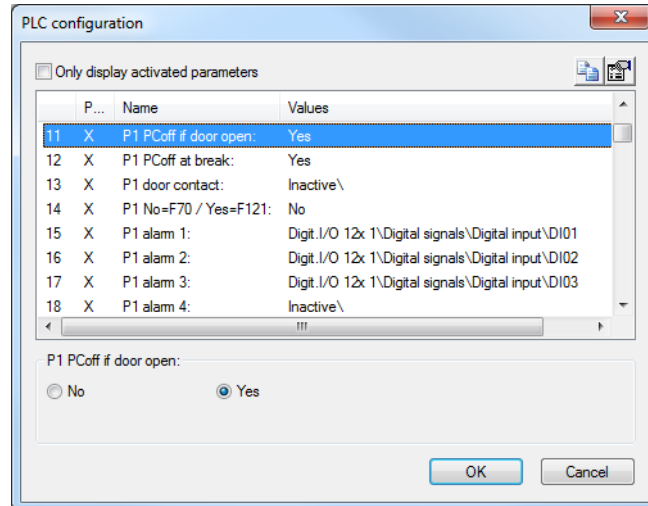
## 3 Configuration

cess contact for starting the smoke generator is set to "switch-on advanced" and the lead time (control function time) is specified.

### 3.5 "Door open" and "pause" events

#### Deactivate process contacts (yes/no)

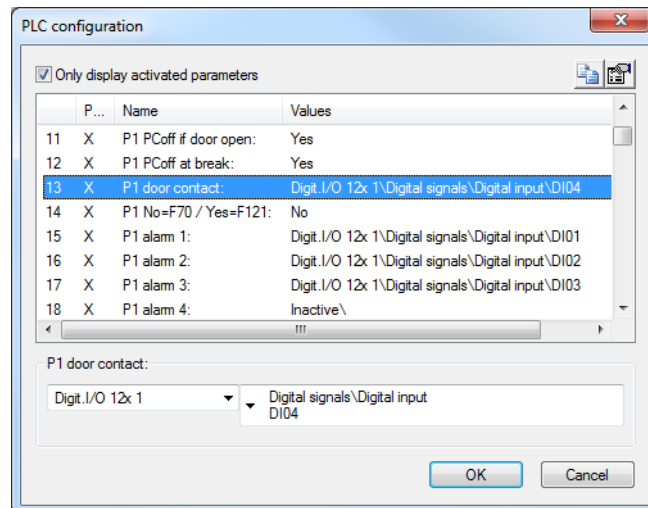
CPU > Configuration level > PLC configuration



In this example, all process contacts of program generator 1 are deactivated for the duration of the "door open" (signal of the door contact) or "pause" (program stopped) event.

#### Select digital signal (door contact)

In the same dialog, the door contact digital signal is selected:

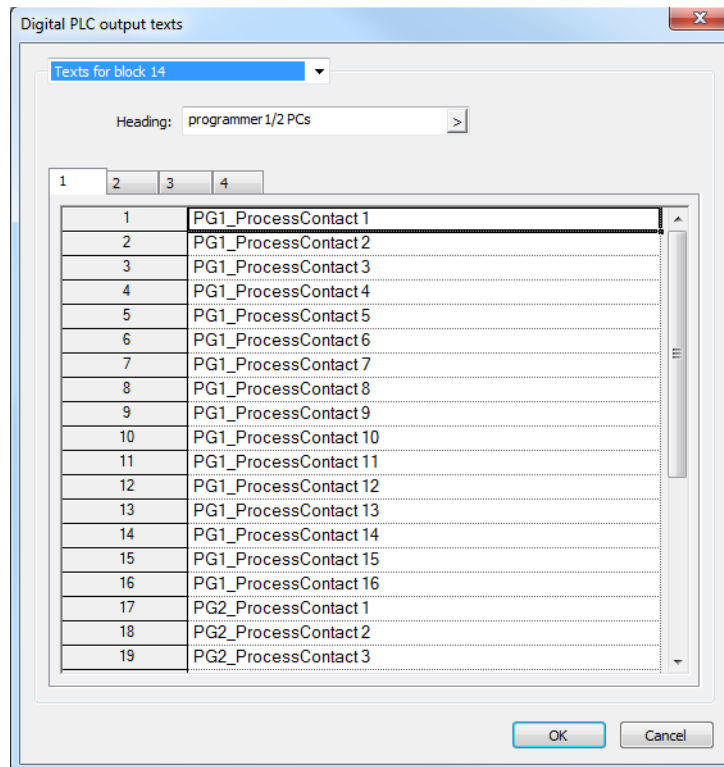


In this example, an input signal of the 12-channel digital input/output module (Digit.I/O 12x ...) is used. With an open door, the signal must be TRUE.

## 3.6 Use of process contacts

### Determine descriptions of the process contacts

CPU -> Setup only -> Texts for PLC digital output. (> Texts for block 14):

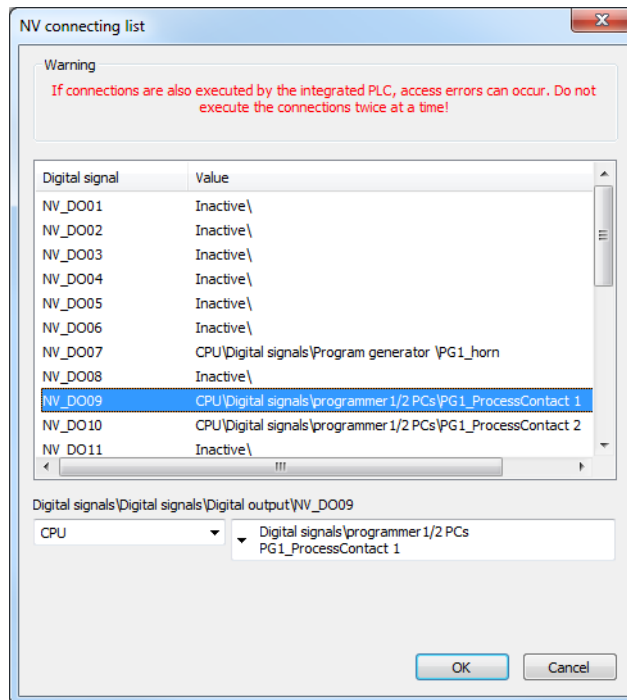


The descriptions are used in the digital selector for the program generator process contacts. Each program generator (PG1 to PG9) provides up to 16 process contacts. The existing default text can be changed individually.

# 3 Configuration

## Connect signals of the process contacts with digital outputs

[Module] > Configuration level > NV connecting list:

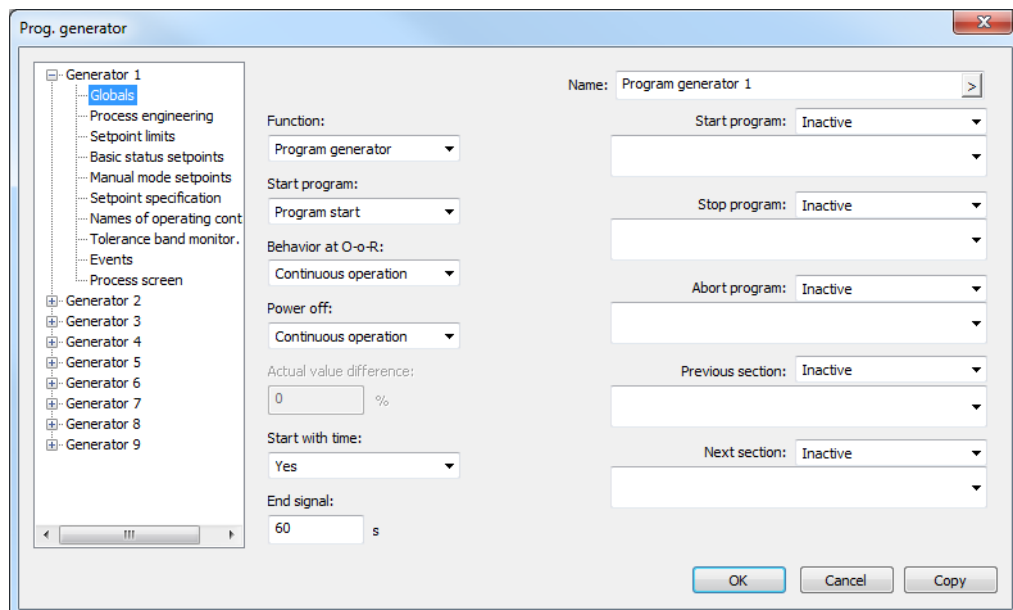


In this example, both the process contacts of program generator 1 are issued via outputs 9 and 10 (NV\_DO09, NV\_DO10) of the 12 channel digital input/output module.

## 3.7 Program generators

### Activate program generators and implement general settings

CPU -> Configuration level -> Program generator (> General)



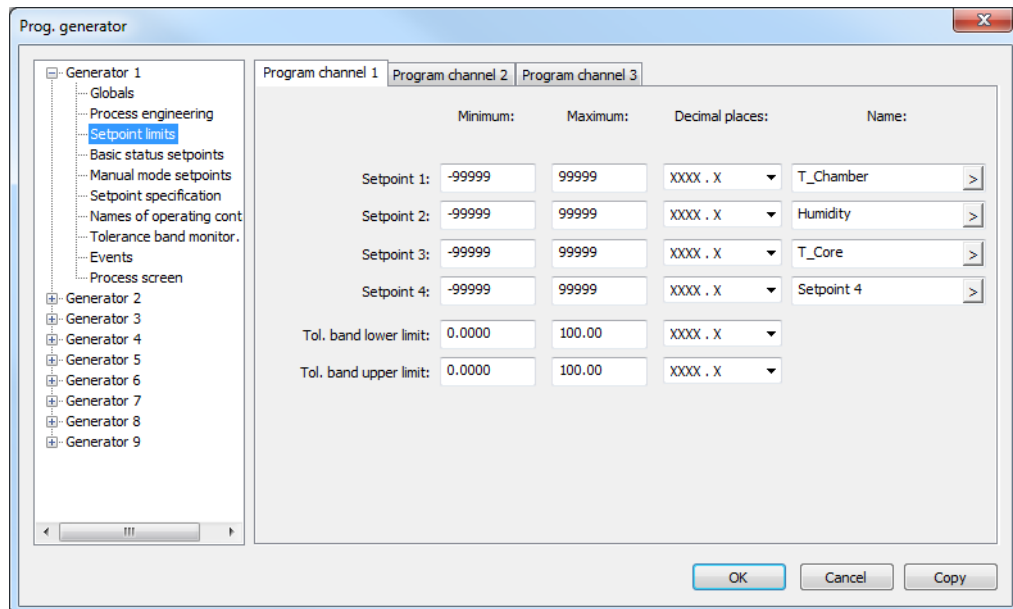
The program generator is activated via the function (= program generator). In this example, the "start with time" parameter was activated (yes), so a program start according to date and time specification is possible (see Chapter 2.3.6 "Program selection/start", page 30). In addition, the

# 3 Configuration

duration of the end signal was set at 60 seconds, whereby the signal is active for 60 seconds after the program end (remaining time of the signal is displayed in the process screen of the program generator).

## Enter setpoint limits and descriptions

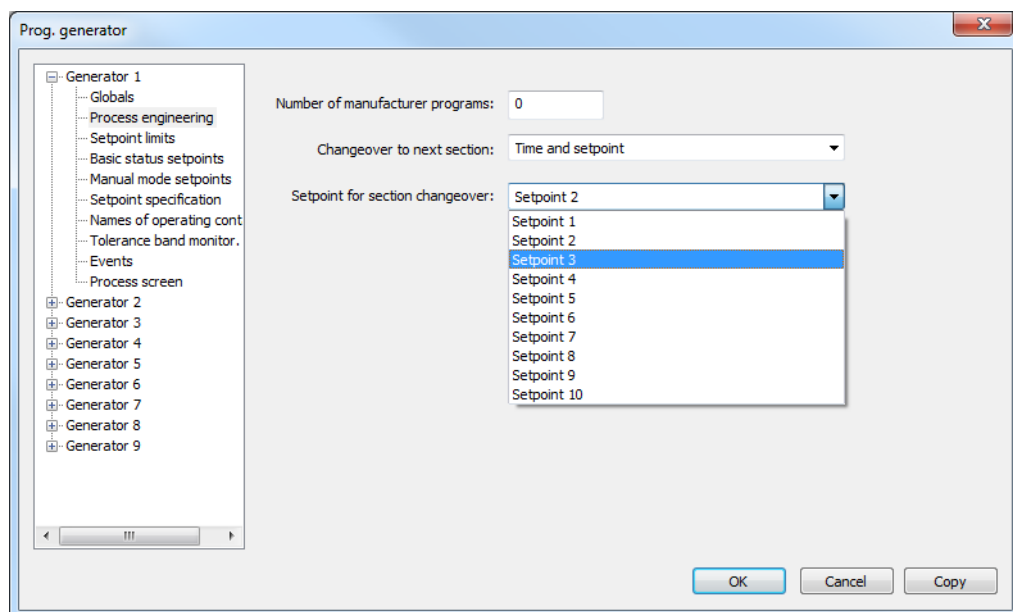
CPU -> Configuration level -> Program generator (> Setpoint limits)



The setpoint values descriptions 1 to 3 are already specified in the process engineering application and, if necessary, need to be adapted to the individual plant. Furthermore, the entry limits (minimum, maximum) of the setpoint values are determined in this dialog.

## Select setpoint value for section changeover

CPU -> Configuration level -> Program generator (> Process engineering):

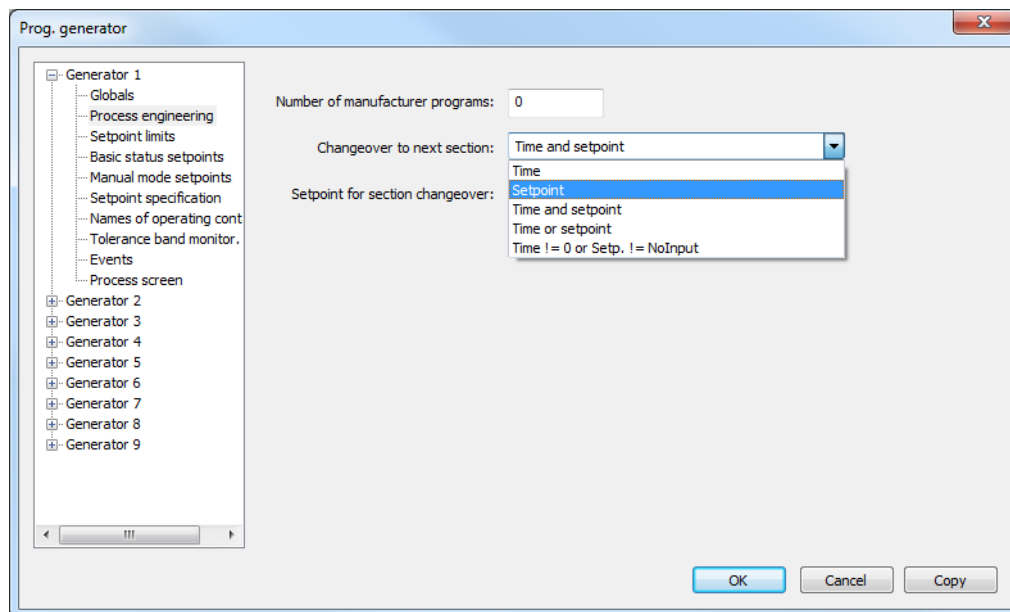


In this example, the setpoint value 3 (T\_core) is selected. The value of setpoint value 3 in the program section is then crucial for the section changeover.

# 3 Configuration

## Set changeover condition (time/setpoint value)

In the same window, the condition for section changeover is also defined:



Section changeover:

- Time: after expiry of section time
- Setpoint value: after reaching the setpoint value (core temperature = core setpoint value) (No section time can be entered in the program plan.)
- Time and setpoint value: after expiry of section time AND after reaching the setpoint value
- Time or setpoint value: after expiry of section time OR after reaching the setpoint value
- Time != 0 or Setp. != NoInput: special option with no meaning in the process engineering application (in this case, has the same function as "time or setpoint value").

Setpoint value 3 (T\_core) was previously selected as the setpoint value for the section changeover (core setpoint value).

## 3.8 Special PLC functions:

### 3.8.1 Section changeover

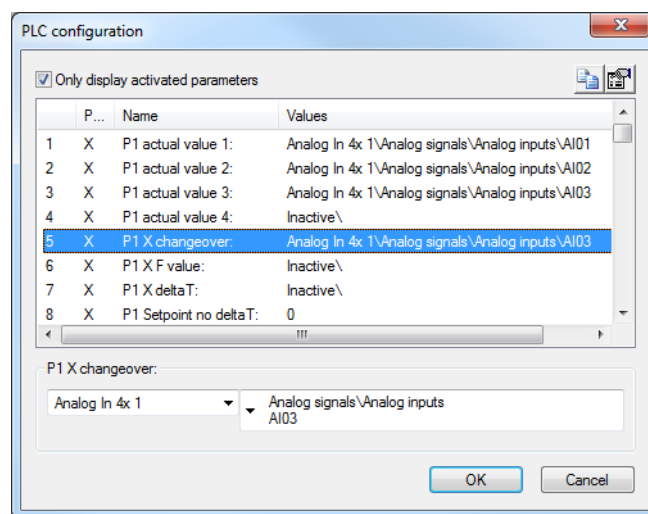
With section changeover, moving to the next program section occurs once the actual value (core temperature) has reached the setpoint value. Here, the section time can serve as an additional criterion for the changeover.

The setpoint value for the section changeover (core setpoint value) must be selected in the program generator configuration and be specified in the program. The different combinations for the section changeover (time/setpoint value) are supported (except "Time != 0 or Setp. != NoInput").

The following setting is required for PLC configuration:

- Actual value (parameter 5): select analog signal to supply the actual value.

CPU > Configuration level > PLC configuration



In this example, input 3 (AI03) of the 4-channel analog input module (Analog In 4x) is used as the actual value for the section changeover (P1 X changeover) (the same input as for displaying the actual value, see Chapter 3.2 "Actual values", page 43).

# 3 Configuration

## 3.8.2 F value calculation

The F value is calculated from the actual value (core temperature) and the exposure time. The calculation is based on the F value table F70 (meat processing) or F121 (preserves). The F values of the corresponding table are added up as soon as the actual value has exceeded the respective temperature limit (F70:  $\geq 55\text{ }^{\circ}\text{C}$ ; F121:  $\geq 95\text{ }^{\circ}\text{C}$ ). The F value is reset to 0 when the temperature limit is not met.

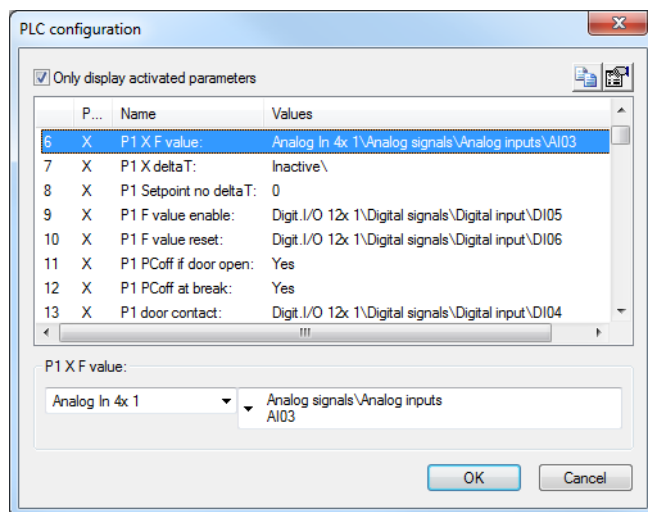
The F value calculation is controlled by two digital signals which enable the calculation or reset the F value to 0. The calculated F value is made available in the analog selector.

The section changeover is not part of the F value calculation, but can be implemented via the PLC configuration.

The following settings are required for PLC configuration:

- Actual value (parameter 6): select analog signal to supply the actual value.
- F value enable (parameter 9): select digital signal to enable the F value calculation (high active). If the digital signal has Low status, the calculation is interrupted and the current F value is stored. Once the digital signal has High status again, the calculation resumes.
- F value reset (parameter 10): select digital signal to reset the F value (for an ascending edge).
- F value table (parameter 14): select table for calculating the F value.  
Yes = F121 (preserves); No = F70 (meat processing)

CPU > Configuration level > PLC configuration



In this example, input 3 (AI03) of the 4-channel analog input module (Analog In 4x) is used as the actual value for the F value calculation (P1 X F value).

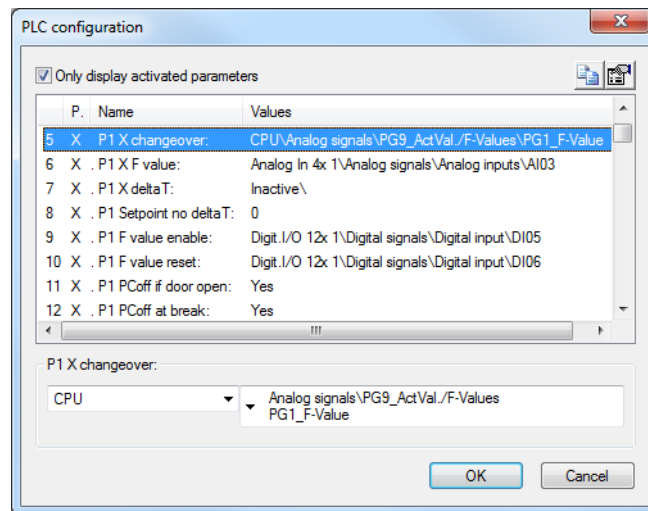
The enabling of the F value calculation (P1 F value enable) is controlled with input 5 (DI05) of the 12-channel digital input/output module (Digit.I/O 12x).

For resetting the F value (P1 F value reset), input 6 (DI06) of the 12-channel digital input/output module (Digit.I / O 12x) is used.

F121 (yes) is selected as the F value table (P1 J:F121 / N:F70).

## F value as actual value for the section changeover

The calculated F value is available in the analog selector and can be used as the actual value for the section changeover.



In this example, the F value of program generator 1 (PG1\_F-Value) is used as the actual value for section changeover (P1 X changeover).

# 3 Configuration

## 3.8.3 DeltaT setpoint value calculation

With deltaT cooking, the setpoint value (chamber temperature) is continuously adapted to the actual value (core temperature) throughout the entire program section. So a constant difference between the two temperatures is maintained (deltaT value). The process technology application provides the deltaT setpoint value calculation.

For the deltaT setpoint value calculation, a setpoint value track (setpoint value 1 to 8) of the programmer generator is used. The user specifies a fixed setpoint value, which serves as the deltaT value. This is added to an analog signal (actual value) in the PLC and issued as the setpoint value.

The section changeover is not part of the deltaT setpoint value calculation, but can be correspondingly configured via the PLC configuration.

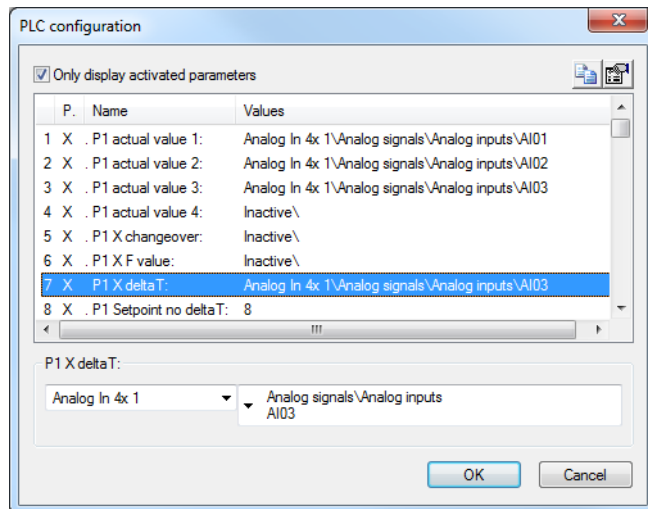
The following settings are required for PLC configuration:

- Actual value (parameter 7): select analog signal to supply the actual value.
- Setpoint value track (parameter 8): select number of the setpoint value to be used to set the deltaT value and to issue the calculated setpoint value.

The deltaT value is specified by the user in the program. The output of the program generator supplies the setpoint value calculated by the PLC.

If 0 is entered as the setpoint value number, the deltaT setpoint value calculation is deactivated.

CPU > Configuration level > PLC configuration



In this example, input 3 (AI03) of the 4-channel analog input module (Analog In 4x) will be used as the actual value (P1 X deltaT).

Setpoint value 8 is selected (value = 8) as setpoint value track (P1 Setpoint no. deltaT).



### NOTE!

In a process, it may be necessary to switch the setpoint value of the controller. If switching between the deltaT setpoint value and the fixed setpoint value, for example when deltaT cooking, this can be done dependent on the process step. For this, the setpoint changeover of the multi-channel controller module has to be controlled by a process contact of the process step.

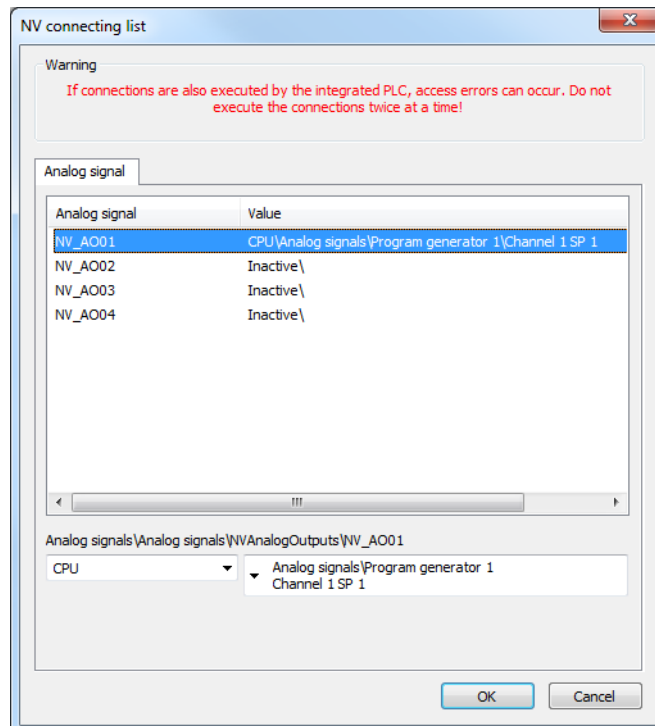
### 3.9 Setpoint values (program generator outputs)

Setpoint values of the program generator (outputs) are to be used in a plant-specific manner. Here are just two examples of how a setpoint value is connected to an analog output of the 4 channel analog output module or is used as a controller setpoint value for the multichannel controller module.

Further configuration of the relevant module is not part of this description.

#### Connect setpoint value with analog output of the 4 channel analog output module

[Module] > Configuration level > NV connecting list:

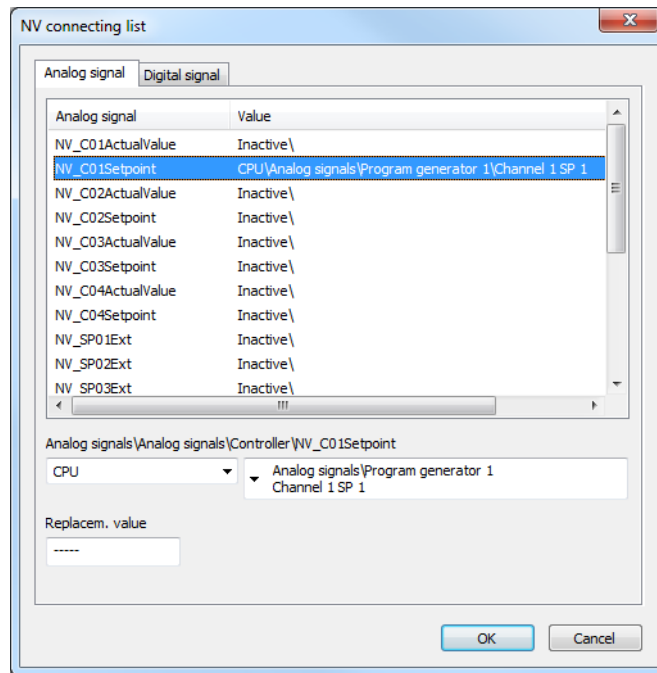


In this example, setpoint value 1 (Channel 1 SP1) of program generator 1 is issued via output 1 (NV\_AO01) of the 4 channel analog output module.

# 3 Configuration

## Use setpoint value as setpoint value controller of the multichannel controller module

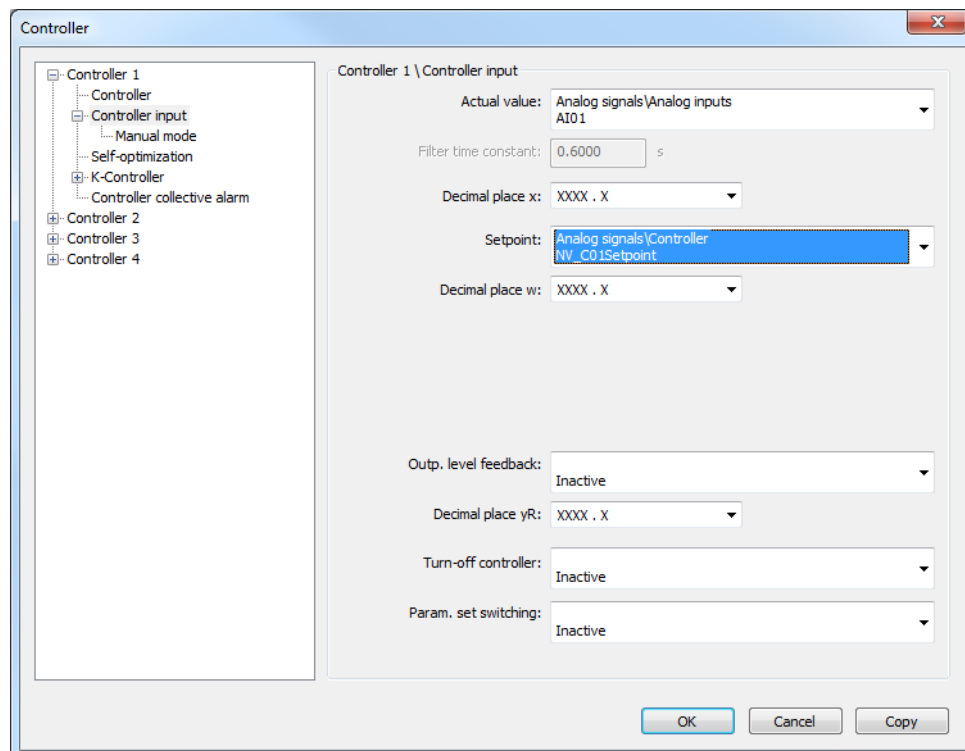
[Module] > Configuration level > NV connecting list (> Analog signal):



In this example, setpoint value 1 (Channel 1 SP1) of program generator 1 is connected with an input signal (NV\_C01Setpoint) of the multichannel controller module.

This signal is designated as a setpoint value for the first controller channel (controller 1) of the module, but it must also be selected in the controller configuration as an input signal.

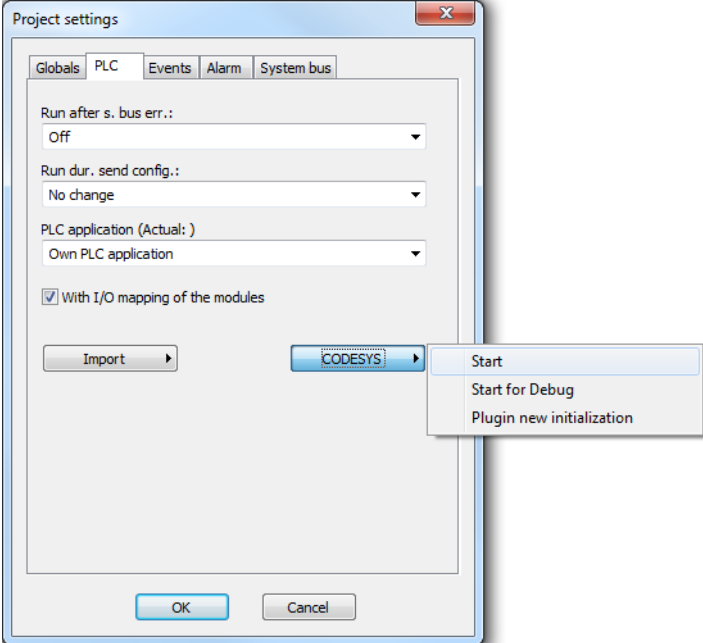
[Module] > Configuration level > Controller (> Controller 1 > Controller input):



In this example, the input signal (NV\_C01Setpoint) of the multichannel controller module is connected with the setpoint value input of the first controller channel (Controller 1).

## 3.10 Adapt PLC application to hardware assignment

The PLC application for process engineering only uses the central processing unit (CPU) and the multifunction panel 840 (HMI) as supplied. If the hardware assignment is changed by the user in the setup program to adapt it to an individual system (adding modules), the PLC application must also be adapted:

Step	Activity
1	<p>Start CODESYS in the setup program: Project &gt; Project settings &gt; PLC</p>  <p>➔ CODESYS starts and the PLC application is transferred from the setup program to CODESYS. The new modules appear in the device list.</p>
2	<p>Transfer the project in CODESYS : Create &gt; Retransfer</p> <p>➔ The new modules are adopted in the PLC application.</p>
3	<p>In CODESYS, close the project (and CODESYS): File &gt; Close</p> <p>➔ The PLC application is transferred to the setup program again and CODESYS is closed.</p>
4	<p>In the setup program, confirm the CODESYS note with "OK" and exit the "project settings" dialog with "OK"</p> <p>➔ The changes are adopted</p>
5	<p>Transfer the project to the system in the setup program</p> <p>➔ The PLC application is stored permanently in the central processing unit.</p>

## 3 Configuration

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