*Intrinsically Safe Compact Controller*
# CTR 210 i



**User Manual**
**only valid in connection with the installation instructions CTR210i/BGI210i**

Device software version 2.05

Revision 3.05

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# General

**Attention!**

Please read the **installing and operating instructions** from cover to cover before installing this instrument. Qualified personnel that is authorised from the operating company should only install the compact controller.

Please read this **operating and programming instructions** from cover to cover before bringing this instrument into service.

The installation manual from intrinsically safe controllers is an integral part of this manual.

## Validity of Operating and Programming Instructions

- These Operating and Programming Instructions are valid from software version 2.00.

- Your IBS agent will be able to give you information about any improvements or modifications.

- If the controller is damaged by inexpert using the manufacturer don't guarantee. It is not allowed to make changes.

## Operational Safety

- The controllers were manufactured on our ISO 9001 / ATEX accredited premises and therefore conform to the appropriate requirements.

- The front of the compact controller is protected to IP 54. The rear is to IP 20.

- If the controller is inexpert used or not used as directed involve a certain risk. Kindly note the remarks with icons forceful.

## Technical Developments

The manufacturer reserves the right to modify technical data without notice.

## Repairs, Dangerous Chemicals

A note describing the fault must always accompany instruments sent to IBS BatchControl GmbH for repair.

**Attention!**

**Important!**
The following procedures must be carried out before a controller is sent in for repair:

- Remove all residues that may be present. Pay special attention to the gasket grooves and crevices where residue may collect.

- Please ensure that full precautions have been taken to remove all traces of substances that may represent a health risk before returning any instrument.

Costs of disposal of materials or of injury to personnel (acid burns etc.) arising because of defective cleaning of the equipment will be charged to the owner of the equipment.

# List of Contents

# 1. Operating and Display Elements



## 1.1. Display

The example above shows the tag number at the top. The control difference DEV is shown as a bar graph under the tag number. The setpoint with indication (e. g. SP, SP 1, SP ext...) is shown below the bar graph. Below the setpoint you will find the process variable. The chosen unit is indicated between setpoint and process variable. The bottom line shows the manipulated variable. Above the manipulated variable is manual or automatic mode displayed.

## 1.2. Keypad

The keypad consists of eight short-stroke keys.

### 1.2.1. Manual/automatic key

 toggles between automatic and manual operation. The key must be pressed for approximately one second. You can set the output in the manual mode directly with the adjustment keys (see section 1.2.3).

### 1.2.2. Programming key

 switches to the programming mode. The key must be pressed for approximately one second. The instrument number is displayed at the top and the software version in the centre of the display for a few moments.

### 1.2.3. Adjustment keys

or  enable direct adjustment of the setpoint in automatic mode. In manual mode these keys enable direct adjustment of manipulated variable. In programming mode, they are used to change the displayed value.

 enable the individual programming levels and parameters to be selected in programming mode. In the case of parameter values, they enable selection of the digit that is to be adjusted.

 enable the next segment to change.

### 1.2.4. 'Clear' key

 is used to leave the programming mode without saving.

### 1.2.5. 'Save' key

 saved the individual menu item. This change has not yet been taken into account from the controller.

### 1.2.6. Save all

Pressing  and  together saves all the settings you have made. The keys must be held down for approximately one second. The display clears for approximately two seconds. The settings are then implemented.

It is important that the P and S keys are both pressed simultaneously to retain setting changes permanently. If only the P key is pressed, the old settings will be retained.

Note!

## 2. Programming

It is easy to adapt the controller to the various requirements. No previous knowledge of programming languages is required.
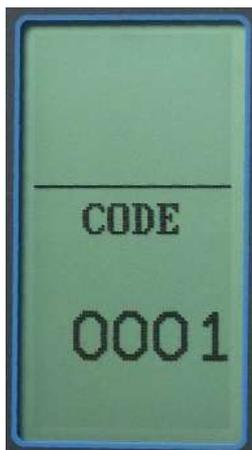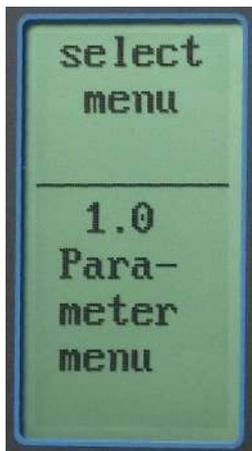
The button functions have already been described in section 1.2.

You access the programming level by pressing the P key. The instrument number and the software version number are then displayed for about two seconds.

You will then be prompted to select the desired menu level. The parameter level is always the first level displayed. You can switch between the individual levels using the ▲ or ▼ button. Some levels are not available for all controllers. They are then hidden.

Pressing the ▶ key will select the desired programming level. If a level is locked by a code number, the code query appears first.

The code can be entered using the four arrow buttons. The digit that can currently be adjusted flashes. Once the desired number has been set, press the S button to confirm and enter the selected level.

If you have entered the wrong code number, the controller returns to the selection level.

Changes are confirmed with S or cleared with C.

The changes are saved by pressing P and S together.

Everything can be saved directly with P and S from each level or sub-level. The controller is then back in operating mode.

Note!

| | | | | |
|---|---|---|---|---|
| | ↑ ↓ | | | |
| P S and | ← | man. autom. station | | |
| | ↑ ↓ | | | |
| P S and | ← | Setpoint profiler | | |
| | ↑ ↓ | | | |
| P S and | ← | linearisation | | |
| | ↑ ↓ | | | |
| P S and | ← | test | | |
| | ↑ ↓ | | | |
| P S and | ← | calibration | | |
| | ↑ ↓ | | | |
| P S and | ← | structure level | | |
| | ↑ ↓ | | | |
| P S and | ← | configure inputs and outputs | | |
| | ↑ ↓ | | | |
| P S and | ← | configure alarms | | |
| | ↑ ↓ | | ↑ ↓ | |
| P S and | ← | parameter level 2 | C ← Kd1 | |
| | ↑ ↓ | | ↑ ↓ | |
| Operating mode | P S and / P → | parameter level → → → | KP1 → S / → | Set value |
| | ↑ ↓ | | ↑ ↓ | |
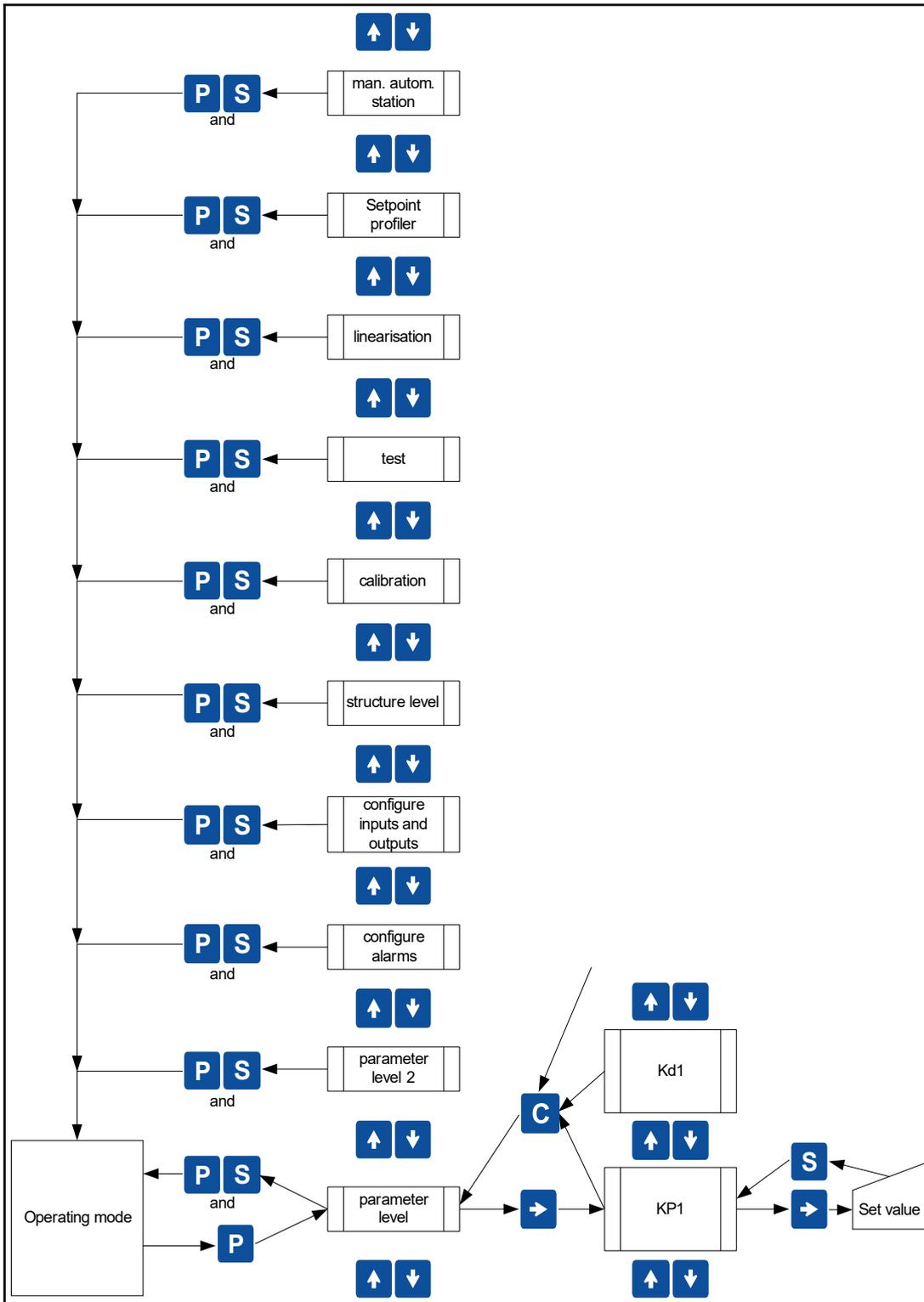
## 3. Calibration Menu

The controller is calibrated via the software. All settings are stored in an FRAM[1] and are retained even if the power supply fails.

**The controller may only be calibrated if doing so will not cause a malfunction or fault in the plant. Note that the controller blocks the analogue outputs or sets them to various current values when you enter the calibration menu.**

You access the calibration menu as in section 2 described. The calibration menu is protected at the factory with code 0001. This prevents unintentional alteration of the calibration parameters.

### 3.1. Calibration of Analogue Inputs

| Calibration of analogue inputs | current calibration source | Pt-100-calibration source 2- or 3- wire circuit |
|---|---|---|
| connect calibration source to input 1 | clamps 1 and 2 | clamps 1, 2 and 3 |
| select *analogue input 1 0%* with △ | apply 0% (e. g. 4 mA) | apply 0% (e. g. -20°C) |
| store with S or ▶ | | |
| select *analogue input 1 100%* with △ | apply 100% (e. g. 20 mA) | apply 100% (e. g. 100°C) |
| store with S or ▶ | | |
| connect calibration source to input 2 | clamps 4 and 5 | clamps 4, 5 and 6 |
| change level with △ to analogue input 2 0% | apply 0% (e. g. 4 mA) | apply 0% (e. g. -20°C) |
| store with S or ▶ | | |
| change level with △ to enter analogue input 2 100% | apply 100% (e. g. 20 mA) | apply 100% (e. g. 100°C) |
| store with S or ▶ | | |
| connect calibration source to input 3 | clamps 7 and 8 | clamps 7, 8 and 9 |
| change level with △ to enter analogue input 3 0% | apply 0% (e. g. 4 mA) | apply 0% (e. g. -20°C) |
| store with S or ▶ | | |
| change level with △ to enter analogue input 3 100% | apply 100% (e. g. 20 mA) | apply 100% (e. g. 100°C) |
| store with S or ▶ | | |

The displayed value in the lower display part is the ad-converter raw value.

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1 Ferroelectric Random Access Memory

## 3.2. Calibration of Analogue Outputs

| Calibration of analogue outputs | ammeter |
|---|---|
| connect a multimeter to analogue output 1 | clamps 13 (+) and 14 (-) |
| change level with ▲<br>enter analogue output 1 0% with ▶ | adjust 4 mA current with the ▲ and ▼ keys |
| store with S | |
| change level with ▲<br>enter analogue output 1 100% with ▶ | adjust 20 mA current with the ▲ and ▼ keys |
| store with S | |
| connect multimeter to analogue output 2<br>Note! Connect power supply 2 | clamps 15 (+) and 16 (-),<br>clamps 17 (+) and 18 (-) |
| change level with ▲<br>and enter to analogue output 2 0% with ▶ | adjust 4 mA current with the ▲ and ▼ keys |
| store with S | |
| change level with ▲<br>and enter to analogue output 2 100% with ▶ | adjust 20 mA current with the ▲ and ▼ keys |
| store with S | |
| P and S together | changes are saved in the FRAM of the controller |

The displayed value in the lower display part is the da-converter raw value.

Inputs or outputs that are not calibrated can be skipped by pressing ▲.

# 4.    Linearisation Menu

With the linearisation table you are able to correct non-linear input signals.

In the structure menu 5.29 you can select which analogue input is to be linearised. After this selection the linearisation menu appears.

There are 25 linearisation interpolation points available. These linearisation points are distributed in 5% steps across the range from –10% to +110%.

Example:

The current signal is non-linear with following values:

| current input in [%] | actual value in [%] | corrected value at linearisation point [%] |
| --- | --- | --- |
| 5 | 5 | 5 |
| 10 | 7,5 | 7,5 |
| 15 | 10 | 10 |
| 20 | 12,5 | 12,5 |
| 25 | 20 | 20 |
| 30 | 30 | 30 |
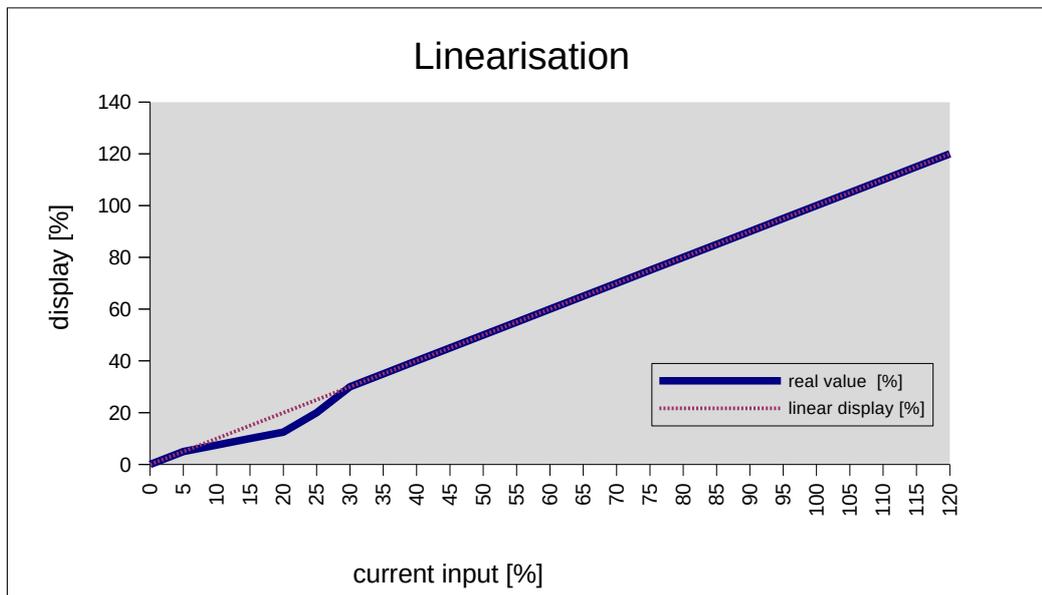


This illustration shows the effect that occurs with the linearisation from the table above. If you need no linearisation you can jump over the points with the △ key.

# 5. Input and Output Test

**The controller may only be tested if doing so will not cause a malfunction or fault in the plant. Note that the controller blocked the analogue and digital outputs after entering the test menu and set them to several values.**

Attention!

You access the test menu in the same way as the other menus. First enter the programming menu by pressing the P key. The parameter menu is always shown first. You access the test menu by pressing the ▲ or ▼ keys several times.

You enter the test menu with the ▶ key. If a code number has been specified for this menu, this will first be requested (factory setting 0001). By pressing the ▲ or ▼ keys you select the input or output for test.

The controller can indicate you which signal is at the analogue inputs. Therefore you have to enter the test menu with the ▶ -key. With the ▲ or ▼ keys you alternate to ad-converter raw-value. With the S or ◀ key you will go back.

By the analogue outputs the shown current is taken out by pressing the ▶ key.

In the function 7.10 the activated digital input is switched to the digital output and the LED at the front. Digital input 1 switches digital output 1. At the same time the input is shown in the display (hex-format).

## 5.1. Overview Test-Menu

| Function | | Remark |
|---|---|---|
| display analogue input 1 | 7.1 | value in % |
| display analogue input 2 | 7.2 | value in % |
| display analogue input 3 | 7.3 | value in % |
| current analogue output 1 | 7.4 | 0 % (4 mA) driven |
| current analogue output 1 | 7.5 | 50 % (12 mA) driven |
| current analogue output 1 | 7.6 | 100 % (20 mA) driven |
| current analogue output 2 | 7.7 | 0 % (4 mA) driven |
| current analogue output 2 | 7.8 | 50 % (12 mA) driven |
| current analogue output 2 | 7.9 | 100 % (20 mA) driven |
| Digital input and output test, LED (front) test | 7.10 | digital input 1 to 6 switches digital output 1 to 6 (LED 1 to 6), displayed at the LCD |

# 6. Structure Menu

The structure menu is called up in the same way as all the other menus.

Operation and selection takes place as described in sections 1.2 and 2.

## 6.1. Controller Type

The desired controller type must be select at first. Following controller types are available:

| Controller Type | Description section / page |
|---|---|
| Local setpoint controller | 6.1.1 / 14 |
| Local setpoint controller with external setpoint | 6.1.2 / 15 |
| Ratio controller | 6.1.3 / 16 |
| Difference controller | 6.1.4 / 17 |
| Manual automatic station | 6.1.5 / 17 |
| Cascade controller | 6.1.6 / 18 |
| Two separate controller | 6.1.7 / 19 |

### 6.1.1. Local setpoint controller

The process variable is measured on one analogue input. Section *6.4 Input Selection for Process Variable* describes the selection of analogue input for the process variable. The setpoint is set with the arrow keys or in the parameter menu.
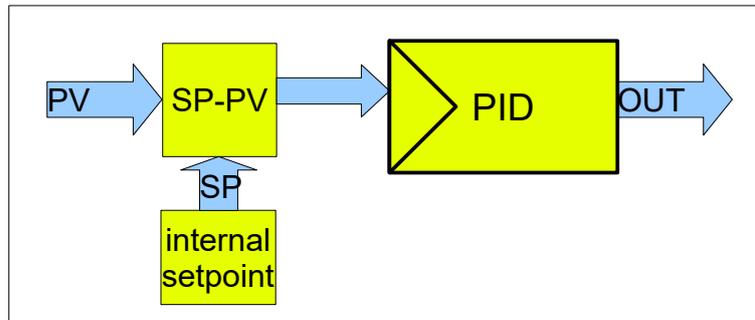


A setpoint adjustment with the arrow keys is only possible in automatic mode. In manual mode, the manipulated output will be adjusted.

## 6.1.2. Slave Controller

The slave controller is a local setpoint controller with external setpoint. The setpoint can not be set directly at the controller. It is determined by a mA signal at one analogue input. In section *6.7 Input selection for remote setpoint* the function for selection the analogue input for the setpoint will be described.

If an internal setpoint SP1 to SP6 is active, the external setpoint is not used as setpoint. The slave controller is a local setpoint controller.

You can also switch the slave controller on or off via a digital input. If the slave controller is switched off, the setpoint W from the parameter list is valid.
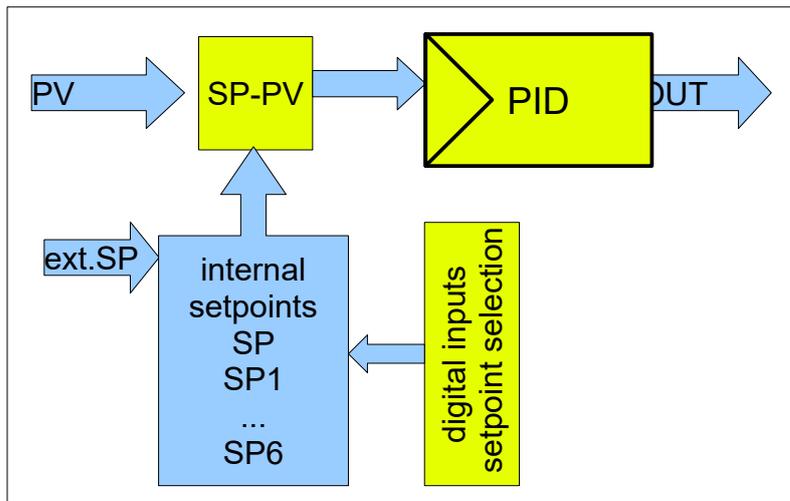


See structure menu:                          6.7 Input selection for remote setpoint
see input and output menu:        10.2.1

### 6.1.3. Ratio Controller

The ratio process value $\quad PV = \dfrac{Process\ Value\ 1}{Process\ Value\ 2}\quad$ is displayed as PV.

The process values 1 and 2 are read from the analogue inputs set in input selection (section 6.4).

The setpoint sp and the process value pv are shown without units. If the two analogue inputs have different measuring ranges, the correction factor C3 (section 7.8.3) set the ratio from measuring range 1 to measuring range 2. The ratio range can be set from 00,01 to 99,99.

$$C3 = \frac{measuring\ range\ 1}{measuring\ range\ 2} \cdot 1.00$$

Example:

measuring range 1: 0 to 10000 kg/h
measuring range 2: 0 to   5000 kg/h
C3:                        2,00
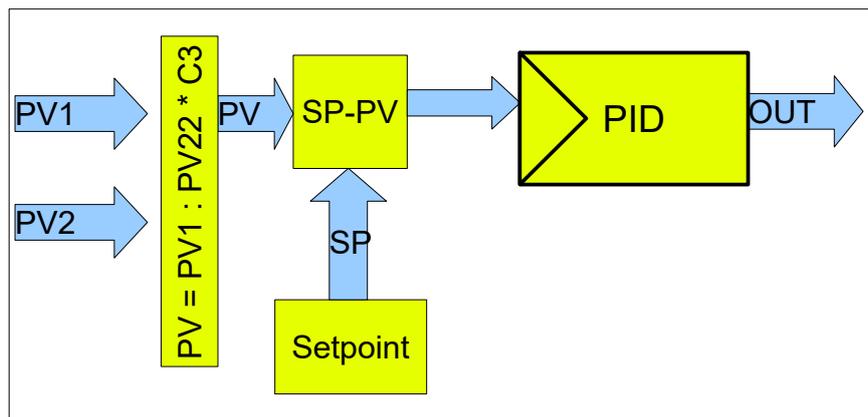


See structure menu:         6.4 Input Selection for Process Variable

                            6.7 Input selection for remote setpoint

see parameter menu:         7.8.3 Ratio constant C3

see input and output menu:  10.2.1 Function of the digital input

### 6.1.4. Difference controller

If you choose this controller type, the process variable is the difference between two analogue inputs. Both measuring ranges must be the same.

The measuring range is set in the parameter menu.

The display range of the process variable is plus / minus 100% from the measuring range.
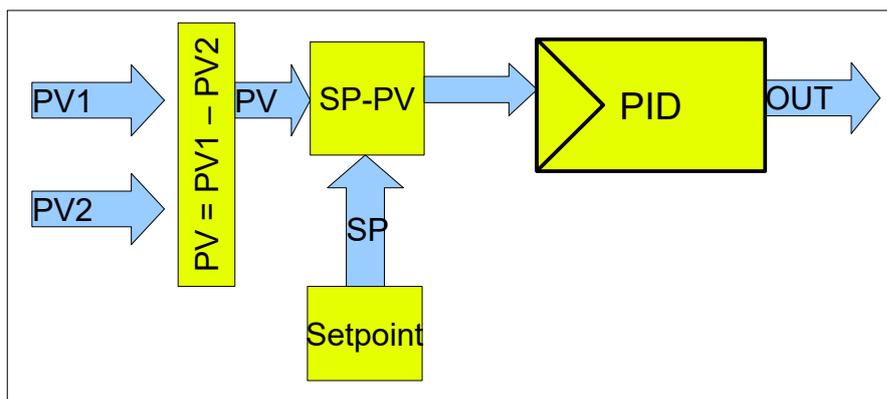


see also:
Structure menu:                    6.4 Input Selection for Process Variable

                                   6.7 Input selection for remote setpoint

input and output configuration:    10.2.1 Function of the digital input

### 6.1.5. Manual automatic station

The CTR 210 i could be used as a manual automatic station. Then the CTR has no controller function.

Setpoint, process value and/or manipulated variable could be displayed, drag along or set. The setting occurs in the manual automatic station menu. You can drag along or set the output or set points.

See section: 13 Manual Automatic Station

### 6.1.6. Cascade controller

In the case of cascade controller, two controllers are series connected by the software.
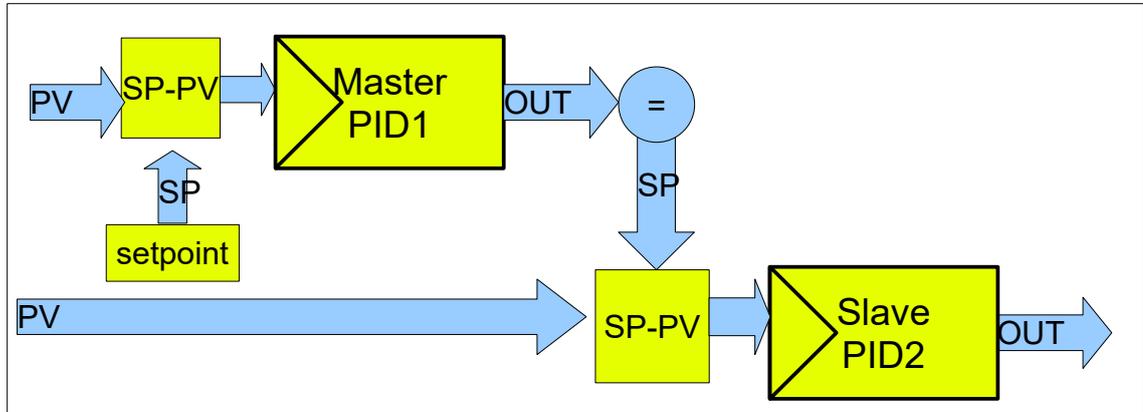


The manipulated out from master controller is the setpoint from slave controller. The first parameter set (KP1, Kd1, Tn1, Yo1, Tv1) applies to the master controller, the second parameter set (KP2, Kd2, Tn2, Yo2, Tv2) to the slave controller.

If alarms process variable or deviation are set, the process value from master will be monitored and output as an alarm.

See structure menu:            6.4 Input Selection for Process Variable

                         6.7 Input selection for remote setpoint

The TAG number on the LCD show which controller is currently being displayed on the LCD. The manipulated variable OUT from the slave is always displayed. You can switch between the controller displays from the master to the slave by pressing the S key.

The controller currently displayed can be switched from automatic to manual operation by means of the M/A key. The master and the slave controllers can be switched individually.

The current operating status of the cascade is shown on the display as follows: If AUTO is displayed above the control value, both controllers are in automatic mode. If MAN is displayed, both are in manual mode. If the operating status is different, the display shows MM SA or MA SM (master manual mode slave automatic mode and vice versa).

You can determine, how the setpoint of the slave controller works if you switch the master controller to manual mode. In the structure menu (see section 6.25 Cascade Controller break) you can choose the settings.

### 6.1.7. Double Loop Controller

It is possible to have two independent working controllers in one unit. The first controller uses the parameter settings 1 and the second parameter settings 2. The function of the manipulated output is set in the structure menu (see section 6.10 Manipulated variable by double loop controller). It is possible to give out the minimum manipulated output, the maximum manipulated output or two independent outputs from this two controllers. If the displayed manipulated output is flashing it is not active. The TAG number on the LCD show which controller is currently being displayed on the LCD.
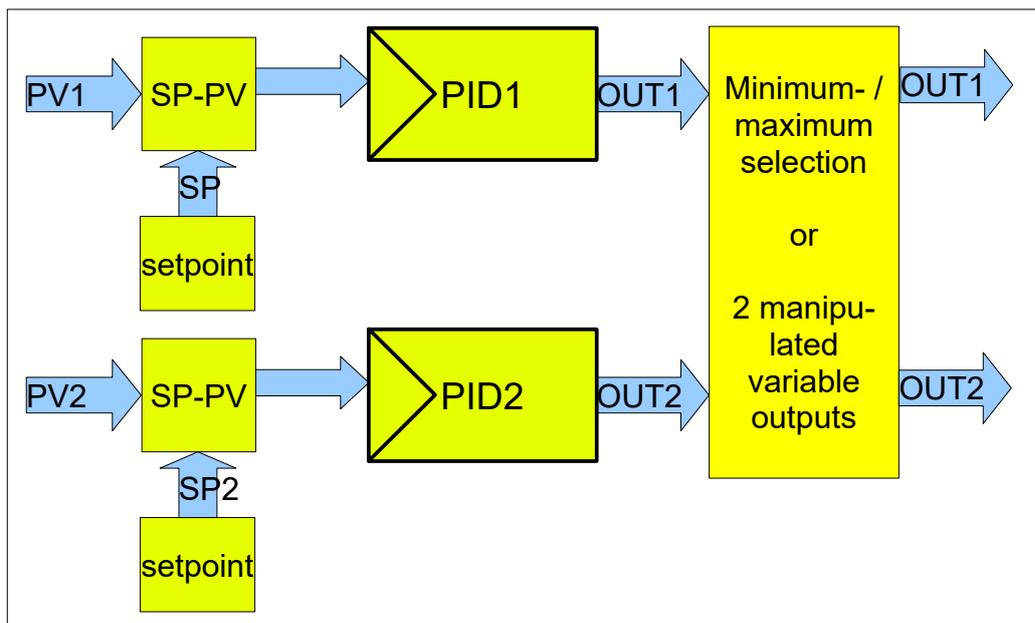


### 6.2. Operating point for P controller

You have with function 5.2 the option to offset the P controller operating point in various ways. This function is only active if no integral action time is set.

### 6.2.1. Operating point set as parameter

The P controller operating point (see section 7.1.4) is entered only in the parameter menu.

### 6.2.2. Tracking by the manual manipulated variable

If you change the manipulated variable with the controller in manual mode, the operating point is corrected by the same amount when you switch back to automatic mode.

Example:
In manual mode, you change the OUT from 40 % to 50 %. When you switch back to automatic mode, 10% is added to the previous operating point 1.

### 6.2.3. Tracking by the setpoint

The operating point is corrected as the setpoint changes (function 5.2.3).
If the manipulated variable is changed in manual mode, the operating point OP1 remains unchanged.

The manipulated variable is calculated from the formula:

$$OUT = DEV \cdot Kp + OP1 + C6 \cdot SP$$

| |
|---|
| DEV = control difference<br>Kp = proportional gain<br>OP1 = operating point<br>C6 = correction factor<br>SP = setpoint in % |

see parameter menu: 7.8.6

## 6.3. TAG-Number

The TAG-Number set in function 5.3 and 5.4 is shown in the upper display part. The setting is done by pressing the arrow keys. TAG-No. 1 is used by every standard controller, cascade controller master and the first controller at function two controller. TAG-No. 2 is only used for cascade controller slave and the second controller.

## 6.4. Input Selection for Process Variable

Changing over the input gives you the option of measuring the process variable on analogue input 1, 2 or 3 (function 5.5). This selection can be permanent, or determined via a digital input. You can therefore, for example, choose between two sensors or measuring inputs (e. g. Pt100, mA).

You can set one of the digital inputs to *input switch-over.* If the digital input is inactive, analogue input 1 is taken as the process variable. When the digital input is activated, analogue input 2 is taken as the process variable. The measuring range is adapt in the input and output menu (section 10.4) of each other.

Section 6.21 described how setpoints and parameters act if the input switches.

## 6.5. Feedforward control on the input

The disturbance value on the selected analogue input is added to the process variable on analogue input before calculating the control difference.
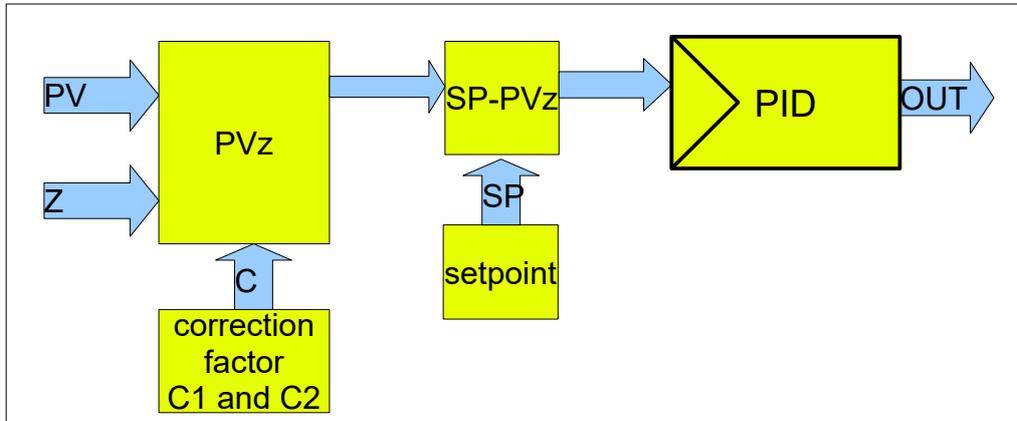


The formula is as follows:

$$PVz = PV + Z \cdot C1 + C2$$

C1 = function 1.33

C2 = function 1.34

Is the function input changeover active, the formula for the second analogue input is as follows:

$$PVz = PV + Z \cdot C7 + C8$$

C7 = function 1.39

C8 = function 1.40

This correction factors are described in sections 7.8.1 and 7.8.2.

## 6.6. Feedforward control on the output

The disturbance value from the selected analogue input is added to the manipulated variable OUT before being output. The formula is as follows:

$$OUTz = OUT + Z \cdot C1 + C2$$
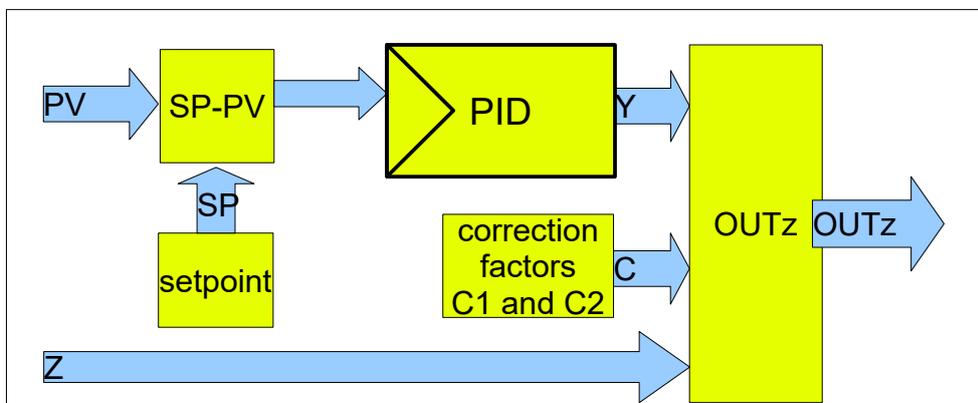


This correction factors are described in sections 7.8.1 and 7.8.2.

## 6.7.  Input selection for remote setpoint

You select on which analogue input the remote setpoint is connected (function 5.9).

Is "double loop controller" activated, for every controller an external setpoint could be given (additional function 5.10).

## 6.8.  External manipulated variable input

You determine on which analogue input the signal for external manipulated variable is active (function 5.11 manual/automatic station). In the menu *input and output configuration* you have to determine one digital input which activates the external manipulated variable. If the selected digital input is active, the analogue input variable is set to the analogue output.

## 6.9.  Dynamic Limiting the Manipulated Variable

You can select an analogue input that dynamically limits the manipulated variable (function 5.12). This function is often used to select the minimum output between the internal and external manipulated value.

OUTmin = AIx + C4          C4 = function 1.36
OUTmax = AIx + C5          C5 = function 1.37

AIx is the analogue input selected to limit the manipulated variable. The manipulated variable is always limited by parameters *manipulated variable start* and *manipulated variable end*. With *minimum dynamic manipulated variable* C-4 = -100 % function OUTmin is disabled. With *maximum dynamic manipulated variable* C-5 = 100 % function OUTmax is disabled. The *minimum dynamic manipulated variable* C-4 must be less than or equal to *maximum dynamic manipulated variable* C-5.

This function could be activated in submenu *digital inputs, too*. This function is directly working if no digital input set to dynamic limiting the manipulated variable.

## 6.10.  Manipulated variable by double loop controller

If the function *double loop controller* is used, you can set the mode of operation from the two manipulated variables in function 5.13. You can emit the minimum, the maximum or both manipulated variables.

## 6.11.  Starting conditions

You can determine in function 5.14 how the controller restart after a power supply failure. You can choose between defined *start manipulated variable* or *continuous start manipulated variable*.

## 6.12.  Setpoint Ramp time

You set in function 5.15 how the setpoint change is take over. The change can be directly or over a set-point ramp. The time from the ramp could be set over the full measuring range (the setpoint rate of change is every time the same) or over the setpoint change (the time of change is every time the same).

## 6.13. Time Basis of Setpoint Ramp

The time base of setpoint ramp (function 5.16) is in seconds or minutes. The time is set in the parameter menu function 1.14 (section 7.3.5).

## 6.14. Setpoint ramp interruption

In function 5.17 you set how the setpoint ramp works at switching to manual mode. Either the setpoint ramp is interrupted and only continues in automatic mode, or it continues to run internally despite manual operation.

## 6.15. Calculation of the Derivative Term

For the calculation of the Derivative term (function 5.18) the change of control difference or only the change of the process variable is taken into account.

## 6.16. Sensor Break monitoring

You can activate the sensor break monitoring (function 5.19-5.21) to every of the three analogue inputs separately.

The range limits are determined by the parameters *sensor break minimum* and *sensor break maximum*. A *sensor break delay time* (filter) can be set by the next parameter.

If the controller in automatic mode detects a sensor break, then the *safety manipulated variable* is activated. A flashing "sensor break" is displayed instead of the set point.
see section 7.5

## 6.17. Manipulated Variable limiting

In function 5.22 you can set that the manipulated variable is limited in manual and automatic modes or only in automatic mode. There is no limiting in manual operation.

## 6.18. PV tracking

If PV tracking (function 5.23) is activated and you set the controller to manual mode, then the set point is set to the same value as the process variable. Any change in the process variable is reflected immediately in the set point. When the controller is reset to automatic mode, the set point is the same as the process variable. The changeover mostly is bumpless.

## 6.19. SP tracking

If SP tracking (function 5.24) is activated and a changeover takes place from a slave controller to a local set point controller, the local set point is set to the same value as the remote set point. The changeover can take place using the structure menu or via digital inputs.

## 6.20.  Direct Set-point Adjustment

You can adjust the currently active set point directly using the ▲ and ▼ keys (function 5.25) or set point adjustment is only possible in the parameter menu. Direct adjustment from the keypad is blocked.

## 6.21.  Additional Functions for the Input Switch-over

Additional functions are available when changing inputs over using digital input.

- An input changeover using digital inputs has no effect on the set point and the parameter set.

- An input switch-over using digital inputs causes a set point switch-over. Set point SP1 is assigned to analogue input 1 and set point SP2 to analogue input 2. A remote set point is not possible.

- An input switch-over using digital inputs causes a switch-over of the parameter set.

- An input switch-over using digital inputs causes a switch-over of the parameter set and the set point. A remote set point is not possible.

## 6.22.  Output jump answer

In function 5.27 is set the reaction of the manipulated variable from the PID controller after switching from manual to automatic mode. Based by the last manipulated output and the control difference the controller answers:

- with a change of the manipulated output controlled by a PID term or
- only with a changing of manipulated variable calculated the integral term. There is no manipulated output jump.

The same function is used by parameter set changing.

## 6.23.  Activation of the Integral term

The integral term is activated in dependence of three conditions (function 5.28). If the integral part is active, the inside arrows from the deviation bar graph are flashing.

The conditions are:

1. The absolute changing rate from the process value is less than the set value

2. The absolute changing rate from the manipulated variable (only p and d part) is less than the set value.

3. The absolute control difference is less than the set value.

See sections 9.1.1 to 9.1.6.

## 6.24.  Activate Linearisation

The selected analogue input (function 5.29) is linearised with the linearisation points within the linearisation menu.

## 6.25.  Cascade Controller break

If the master controller is set to manual mode, following functions (5.30) are available:
- · The slave controller set point is equal to the master controller output.
- · The slave controller set point is equal to his process value.
- · The slave controller set point is equal to the last master controller set point. If the master controller is used with an external set point, this set point is used for the slave controller.

## 6.26.  Interface Protocol

You can connect the CTR to a serial interface by using the interface isolation card IPC 300 i. For Modbus register description please look to the manual "CTR Register Description". Following protocol types are available in function 5.31:

| MODBUS-RTU | 8 Data Bits | Parity Even | 1 Stop Bit |
| MODBUS-ASCII | 7 Data Bits | Parity Even | 1 Stop Bit |

## 6.27.  Data Transmission Speed

The desired transmission speed is entered in function 5.32. You can set it to 2400, 4800, 9600 and 19200 Baud

## 6.28.  Interface Address

You set the desired interface address in function 5.33 from 1 to 255

## 6.29.  Language Setting

In function 5.34  you can select English or German menu.

## 6.30.  Reset to Factory Settings

After confirmation with the ▶-key in function 5.35 the controller shows "NO". If you change this to YES and confirm it, all settings are reset to the factory settings. The calibration of the inputs and outputs remains unchanged.

## 6.31.  Coding the Menus

You have the options of restriction access to the individual menus and change-over to manual mode by using a four-figure code. The code is requested before entering the respective menu.

The code number of the calibration, linearisation and test menu is set to 0001 in the factory. This is to prevent unintentional overwriting of the calibration data.

## 6.32.  Display Contrast adjusting

If required you can adjust the display contrast in function 5.37.

# 7. Parameter Menu

The parameter menu is called up in the same way as all other menus.

Operations and selections are made as described in Sections 1.2 and 2.

If the controller is set up for engineering units, the parameters can also be entered as engineering units. The factory settings will then be based on the measuring range.

Example: With a measuring range of -20 °C to +140 °C, the factory 50% setting corresponds to a temperature of 60 °C.

The parameters from parameter menu 2 with the same function are set in brackets.

## 7.1. First Parameter Set

The first parameter set is always present. A second parameter set can be selected via the digital inputs. The first parameter set then becomes inactive. In the cases of a cascade controller or two controllers the first parameter set defines the control parameters for the master controller or the first controller.

### 7.1.1. Proportional Gain

Functions 1.1, 2.1, 2.15: Kp 1(Kp 2, Kp 3)

Setting range:        -100,0 bis +100,0
Unit:                 none
Factory setting:      +001,0

If you enter a negative Kp, the direction of action of the controller will be reversed.

### 7.1.2. Derivative Action Gain

Functions 1.2, 2.2, 2.16: Kd 1 (Kd 2, Kd 3)

Setting range:        1,00 bis 10,00
Unit:                 none
Factory setting:      +001,0

### 7.1.3. Integral Action Time

Functions 1.3, 2.3, 2,17:  Tn 1 (Tn 2, Tn3)

Setting range:        1 bis 4999, OFF (5000)
Unit:                 s
Factory setting:      OFF

### 7.1.4.  Operating Point of P controller

Functions 1.4, 2.4, 2.18: OP 1 ( OP 2, OP 3)

Setting range:          -150,0 bis +150,0
Unit:                   %
Factory setting:        +000,0

The operating point OP1 is only active in the case of P and PD controllers.

### 7.1.5.  Derivative action time

Functions 1.5, 2.5, 2.19: Tv 1 (Tv 2, Tv3)

Setting range:          0 bis 1000
Unit:                   s
Factory setting:        0

With a setting of 0, the derivative action is disabled (no D term).

### 7.2.  Measuring Range

You can display the measuring range of the analogue inputs as a physical value.

### 7.2.1.  Unit

You set the display (function 1.6) to percent or engineering units for the process variable and set point. The second parameter (function 2.6) is only used if a second controller (e. g. cascade controller, double loop controller) or the input switch-over is active.
The engineering unit must be set to °C by using Pt100 input because the controller need the values to calculate the correct linearisation. The measuring range is entered in the following functions.

### 7.2.2.  Decimal point

Functions 1.7, 2.7:  Decimal point range 1 (Decimal point range 2)

Setting range:          0000;  0,000;  00,00;  000,0
Unit:                   engineering unit (e. g. l, °C, bar, ...)
Factory setting:        0000

Enter the position of the decimal point.

### 7.2.3.  Start of scale value

Functions 1.8, 2.8:  Start of scale value 1 (start of scale value 2)

Setting range:          -9999 bis +9999
Unit:                   engineering unit (e. g. l, °C, bar, ...)
Factory setting:        000,0

Enter the value you want to display to represent 0% of the process variable. The decimal point is displayed as specified.

### 7.2.4. Full-scale value

Functions 1.9, 2.9:  Full scale value 1 (Full scale value 2)
Setting range:       -9999 bis +9999
Unit:                engineering unit (e. g. l, °C, bar, ...)
Factory setting:     100,0

Enter the value you want to display to represent 100% of the process variable. The decimal point is displayed as specified. The setting range is reduced according to the position of the decimal point.

## 7.3. Set point Parameters

### 7.3.1. Set point start value

Functions 1.10, 2.10: Setpoint start value 1 (Setpoint start value 2)

Setting range:       -10 % to set point end value
Unit:                % or engineering unit (e. g. l, °C, bar, ...)
Factory setting:     000,0 %

You specify a lower limit for the set point setting range. This setting also applies to remote set points.

### 7.3.2. Set point full scale value

Functions 1.11, 2.11: Setpoint full scale 1 (Setpoint full scale 2)

Setting range:       Set point start value to 110%
Unit:                % or engineering unit (e. g. l, °C, bar, ...)
Factory setting:     100,0 %

You specify an upper limit for the set point setting range. This setting also applies to remote set points.

### 7.3.3. Set point

Functions 1.12, 2.12: active setpoint (active setpoint 2)

Setting range:       set point start value to set point full scale value
Unit:                % or engineering unit (e. g. l, °C, bar, ...)
Factory setting:     000,0 %

The current set point can be set here.

### 7.3.4. Safety set point

Function 1.13

Setting range:       -10 % bis 110 %
Unit:                % or engineering unit (e. g. l, °C, bar, ...)
Factory setting:     000,0 %

For this function you must assign a digital input to *safety set point* (see page 40). When this input is activated, the controller switches to the specified safety set point.

### 7.3.5. Set point ramp

Function 1.14
Setting range:        0 bis 9999
Unit:                 s or min
Factory setting:      0000

See structure menu:        section 6.12 and 6.13

The set point ramp also works when a remote set point is configured.

## 7.4. Manipulated Variable Parameters

### 7.4.1. Manipulated variable start value (lower output clamp)

Function 1.15:

Setting range:        -10 % bis +110 %
Unit:                 %
Factory setting:      000,0 %

This start value define the lower limit of the manipulated variable.

### 7.4.2. Manipulated variable full-scale value (upper output clamp)

Function 1.16:

Setting range:        -10 % bis +110 %
Unit:                 %
Factory setting:      100,0 %

This full scale value defines the upper limit of the manipulated variable.

### 7.4.3. Safety manipulated variable

Function 1.17:

Setting range:        -10 % bis +110 %
Unit:                 %
Factory setting:      000,0 %

The safety manipulated variable is activated when a sensor break in automatic mode is detected.

You can define a digital input to *safety manipulated variable*. When this digital input is activated, the controller switches to the safety manipulated variable.

### 7.4.4. Safety manipulated variable 2

Function 1.18:

Setting range:        -10 % bis +110 %
Unit:                 %
Factory setting:      000,0 %

You can set a digital input to *safety manipulated variable* 2. When this digital input is activated, the controller switches to the safety manipulated variable 2. Safety manipulated variable 1 have priority over safety manipulated variable 2.

### 7.4.5. Start up manipulated variable

Function 1.19:

Setting range:      -10 % bis +110 %
Unit:               %
Factory setting:    000,0 %

### 7.4.6. Rate of change

Function 1.20:      rate of change for manipulated variable
Setting range:      0 bis 9999 s
Unit:               s
Factory setting:    0 s (off)

At the activation of the *safety manipulated variable* or the external manipulated variable the ramp don't work. If *safety manipulated variable or the external manipulated variable* is switched off, the ramp works.

## 7.5. Sensor Break Monitoring

For the individual analogue inputs, the values can be set for which a sensor break is to be indicated when the value is exceeded or undercut. The safety manipulated variable is activated in automatic mode.

### 7.5.1. Sensor break minimum limit

Function:     1.21

Setting range:      -10 % bis sensor break maximum limit
Unit:               %
Factory setting:    -010,0 %

### 7.5.2. Sensor break maximum limit

Function:     1.22

Setting range:      sensor break minimum limit bis 110 %
Unit:               %
Factory setting:    110,0 %

### 7.5.3. Sensor break time delay

Function 1.23      Sensor break time

Setting range:      000,0 bis 999,9
Unit:               s
Factory setting:    000,0

If a sensor break is detected, the process variable remains constant at its last value. If the sensor break is still present after the time delay, the sensor break is activated.

To ensure a rapid detection of a sensor break, the filter in the parameter menu (see section 7.6) should be set as low as possible.

## 7.6.  Filter

Functions 1.24 – 1.26

Setting range:        0,1 to 999,9 s
Unit:                 s
Factory setting:      0,1

The controller calculates an average between the set times.

## 7.7.  Set points (SP 1 – SP 6)

Functions 1.27 – 1.32

Setting range:        see section  7.3.1 and 7.3.2
Unit:                 as measuring range 1
Factory setting:      0,0 %

You can set six internal set points. They are chosen with the digital inputs. The highest set point is active.

## 7.8.  Setting of Constants

### 7.8.1.  Multiplier disturbance C1

Function 1.33

Setting range:        -99,99 to +99,99
Unit:                 %
Factory setting:      00,00

See structure menu:        section 6.5 and 6.6

You enter the factor that is also to be applied to the disturbance.

### 7.8.2.  Summand disturbance C2

Function 1.34:

Setting range:        -199,9 to +199,9
Unit:                 %
Factory setting:      000,0

See structure menu:        section 6.5 and 6.6

You enter the additive factor that is also to be applied to the disturbance as a constant.

### 7.8.3.  Ratio constant C3

Function 1.35:

Setting range:        -99,99 to +99,99
Unit:
Factory setting:      1,00

See structure menu:        6.1.3

This constant is the ratio from measuring range 1 to measuring range 2.

### 7.8.4. Dynamic manipulated variable minimum limit C4

Function 1.36:           min. manipul. var.

Setting range:                   -100,0 to +100,0
Unit:                            %
Factory setting:                 -100,0 (off)

See structure menu:              section 6.17

The minimum manipulated variable is calculated from OUTmin = AIx + C4.

### 7.8.5. Dynamic manipulated variable maximum limit C5

Function 1.37:           max. manipul. var.

Setting range:         -100 to +100
Unit:                  %
Factory setting:       +100,0 (off)

See structure menu:              section 6.17

The maximum manipulated variable is calculated from OUTmax = AIx + C5.

### 7.8.6. Operating point constant C6

Function 1.38:            op. point constant

Setting range:         -99,99 to +99,99
Unit:
Factory setting:       1,00

See structure menu:              section 6.2

The operating point tracks the set point according to the formula

$$OUT = DEV * Kp + OP1 + C6 * SP$$

### 7.8.7. Cooling unit run-on time for split-range operation

Function 1.41:            Cooling unit run-on time

Setting range:         0 bis 9999
Unit:                  s
Factory setting:       0

A digital output is parameterised to cooling unit ON. This digital output switches as soon as analogue output 1 provides a value greater than 0% (4 mA). If the analogue output becomes 0% or 4mA again, the set time runs. After the time has expired, the digital output is deactivated. If in the meantime cooling should take place again, the timer is stopped and reset. It starts again with the full set time as soon as 0% is reached again.

### 7.8.8. Heating run-on time for split-range operation

Function 1.42:          Overrun heating

Setting range:       0 bis 9999
Unit:                s
Factory setting:     0

A digital output is parametrised to heating ON. This digital output switches as soon as the analogue output 2 outputs a value greater than 0% (4 mA). If the analogue output becomes 0% or 4 mA again, the set time runs. After the time has expired, the digital output is deactivated. If in the meantime cooling should take place again, the timer is stopped and reset. It starts again with the full set time as soon as 0% is reached again.

## 8.    Second Parameter Set Menu

The second parameter set included the parameter set 2 and 3. The second or the third parameter set can be selected via a digital input (see section 10.2.1).

The slave controller in the case of a cascade controller uses the second parameter set (see section 6.1.6).

In the function *double loop controller* the second parameter set is used for the second controller (see section 6.1.7).

The same control parameters are available as for parameter set 1:

The ranges, the engineering units and the factory settings are as described for the first parameter set.

# 9. Alarm Menu

The six digital outputs and LEDs could be set to several functions. This is done in the input and output menu.

If the digital output is set as an alarm the classification is set in the alarm menu. These are the options:

| Function 3.1 | Remark |
|---|---|
| Process variable alarm | The process variable is monitored. |
| Process variable changing alarm | The process variable-changing rate is monitored. |
| Deviation alarm | The control deviation is monitored. |
| Deviation alarm absolute value | The control deviation is monitored by absolute values. |
| Process variable alarm 2 | The process variable 2 is monitored. |
| Analogue input 1 to 3 | The selected analogue input (1 – 3) is monitored. |
| Manipulated variable | The manipulated variable is monitored. |
| Difference analogue inputs | The difference between analogue input 1 and analogue input 2 is monitored. |
| Set point | The set point is monitored. |

The alarm can be set to minimum or maximum in functions 3.2, 3.5, ...

The alarm values are set in functions 3.3, 3.7, ...

The alarm hysteresis are set in function 3.4, 3.8, ...

## 9.1. Parameter for the dynamic activation of the I-term

### 9.1.1. Time Base for the Slew Rate

Function 3.25: time base slewrate

You can set the limit calculation time base for the function 5.28 (section 6.23) in seconds, minutes or hours. The calculation occurs in the setting seconds every 0.15s, in the setting minute every 30s and in the setting hour every 5min.

### 9.1.2. Limit Slew Rate for the process variable

Function 3.26: limit slewrate p. var.

In this parameter is set the process value changing rate limit.

### 9.1.3. Hysteresis Slew Rate for PV

Function 3.27: hyst. slewrate p. var.
In this parameter is set the accessory hysteresis.

### 9.1.4.  Manipulated variable Slew Rate limit

Function 3.28: limit slewrate man.var.

Enter the manipulated variable slew rate limit (only the calculated P and D term without I term) in this parameter.

### 9.1.5.  Hysteresis manipulated variable Slew Rate

Function 3.29: hyst. slewrate man.var

In this parameter is set the accessory hysteresis.

### 9.1.6.  Absolute control deviation

Funktion 3.30: absolute DEV

Enter the absolute control deviation in this parameter.

# 10. Input and Output Configuration

In this menu the inputs and outputs are configured.

## 10.1. Analogue Outputs Configuration

In this functions (4.1.1 and 4.1.8) various signals can be given out on the analogue output 1 or 2.

| Function | Remark |
|---|---|
| manipulated variable | The manipulated variable appears on the analogue output. |
| Analogue input x | The selected analogue input appears on the analogue output. |
| Set point | The active set point appears on the analogue output. |
| control difference | The control difference is issued as a current. With a current output that is calibrated from 4 to 20 mA, 12 mA is issued when the control difference is 0%. Thus, control differences of $\pm 50\%$ can be issued. |

### 10.1.1. Analogue output start

Functions 4.1.2 and 4.1.7: Analogue output start

Setting range:      -10 % to 110%
Unit:               %
Factory setting:    000,0 %

In this parameter you set the value for manipulated out (shown in the display) as start value for changing the current.

Example: If the manipulated variable is set to the analogue output, you set in this parameters from which value the output take a current changing.

### 10.1.2. Analogue output end

Functions 4.1.3 and 4.1.8: Analogue output end

Setting range:      -10 % to 110%
Unit:               %
Factory setting:    100,0 %

The end of the current changing is set.

Example: If the manipulated variable is set to the analogue output, you set in this parameters, up to which value the output take a current changing.

### 10.1.3.  Analogue output start current

Functions 4.1.4 and 4.1.9: Analogue output start current

Setting range:        -10 % to 110%
Unit:                 %
Factory setting:      000,0 %

You set the current (in %) at the analogue output start value. With the para-
meters start current and end current you are able to change the direction of
action.

### 10.1.4.  Analogue output end current

Functions 4.1.3 and 4.1.8: Analogue output end

Setting range:        -10 % to 110%
Unit:                 %
Factory setting:      100,0 %

You set the current (in %) at end value.

### 10.1.5.  Example Split range

If you need two different ranges of the manipulated variable with the analogue
outputs, use the split range function. Every analogue output is calibrated from 4
to 20 mA.

In the parameter start value you set the value for manipulated out (shown in the
display) as start value for changing the current. The parameter end value is the
end value for changing the current.

The action of direction (e. g. the current at start and stop of the manipulated
variable changing) is set with analogue output start current and end current.

See section 10.1.1, 10.1.2, 10.1.3, 10.1.4

### 10.1.5.1.  Example 1

| start value analogue output 1 | = | 0% | |
|---|---|---|---|
| end value analogue output 1 | = | 40% | |
| start current analogue output 1 | = | 20 mA | 100% |
| end current analogue output 1 | = | 4 mA | 0% |
| start value analogue output 2 | = | 60% | |
| end value analogue output 2 | = | 100% | |
| start current analogue output 2 | = | 4 mA | 0% |
| end current analogue output 2 | = | 20 mA | 100% |
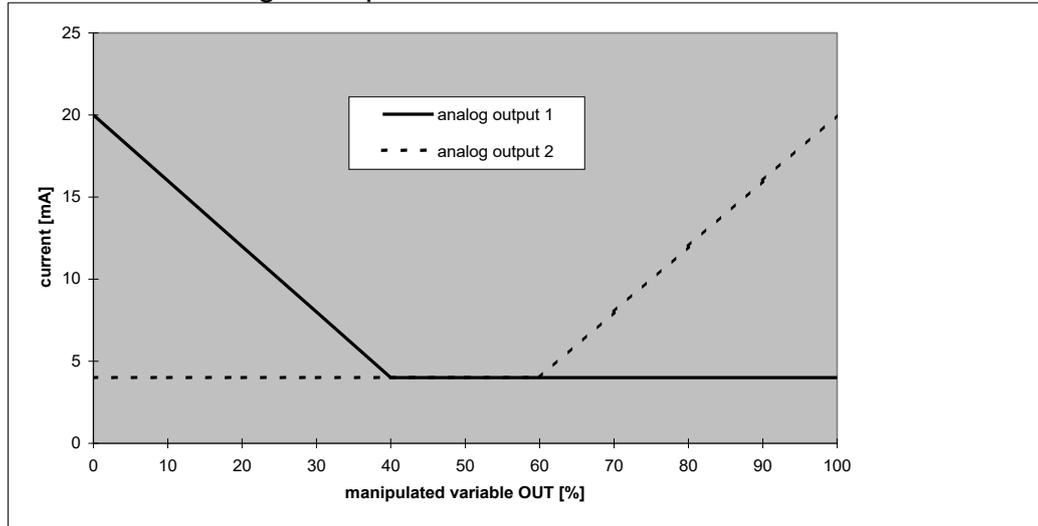


### 10.1.5.2.  Example2

| start value analogue output 1 | = | 0% | |
|---|---|---|---|
| end value analogue output 1 | = | 70% | |
| start current analogue output 1 | = | 4 mA | 0% |
| end current analogue output 1 | = | 20 mA | 100% |
| start value analogue output 2 | = | 50% | |
| end value analogue output 2 | = | 100% | |
| start current analogue output 2 | = | 4 mA | 0% |
| end current analogue output 2 | = | 20 mA | 100% |
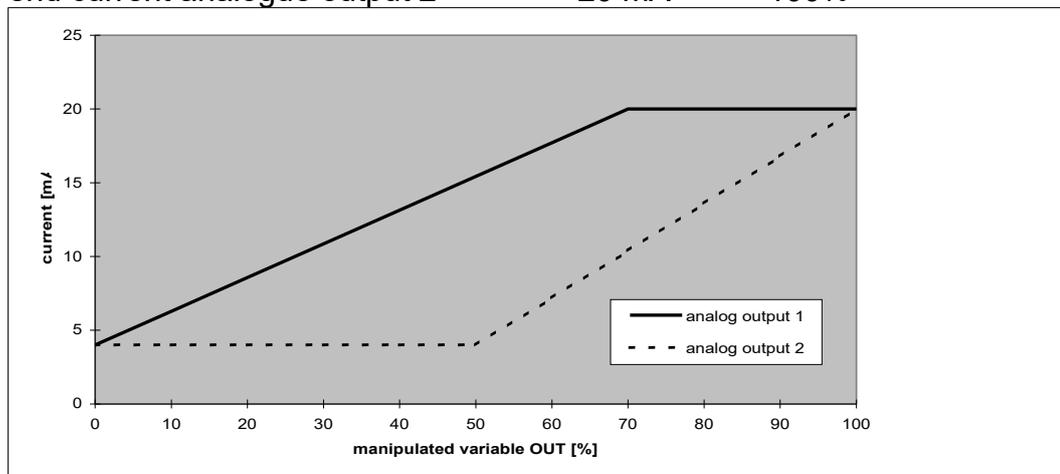
### 10.1.5.3. Example 3

| | | |
|---|---|---|
| start value analogue output 1 | = | 0% |
| end value analogue output 1 | = | 30% |
| start current analogue output 1 | = | 4 mA |
| end current analogue output 1 | = | 20 mA | 100% |
| start value analogue output 2 | = | 40% | 0% |
| end value analogue output 2 | = | 100% |
| start current analogue output 2 | = | 20 mA | 100% |
| end current analogue output 2 | = | 4 mA | 0% |
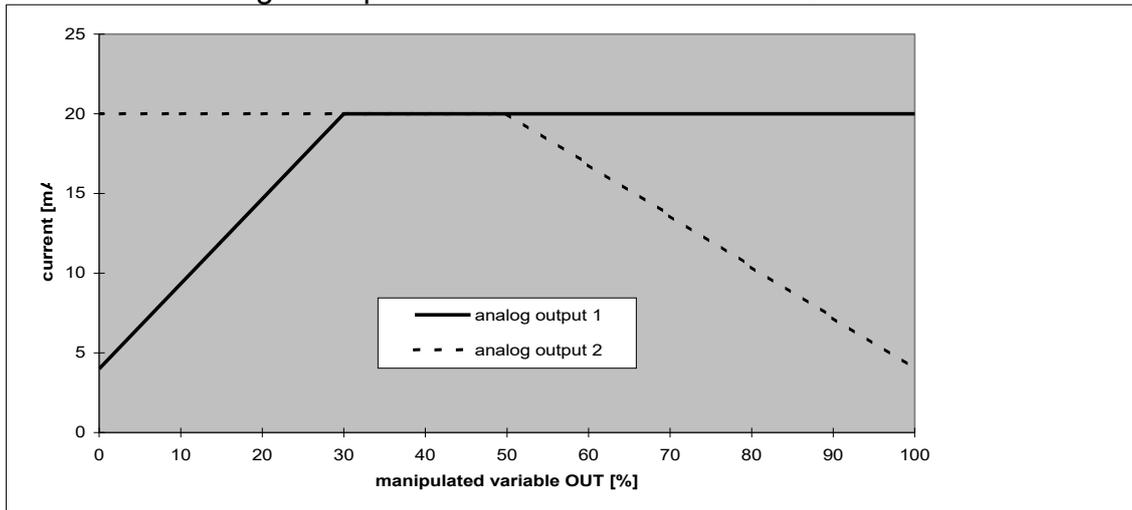
## 10.2. Digital inputs configuration

### 10.2.1. Function of the digital input

In this function (4.21 ...) various signals can be assigned to digital inputs 1 to 6.

| | Function | Description / Remark |
|---|---|---|
| 1 | OFF | The digital input is without a function. |
| 2 | Manipulated variable blocked | The digital input blocks the manipulated variable. |
| 3 | Switch first safety manipulated variable on | |
| 4 | Switch second safety manipulated variable on | Manipulated output safety value 1 take priority over value 2. |
| 5 | Switch safety manipulated variable 1 and manual mode on | The digital input switches the manipulated variable to the safety value 1 and at the same time to manual mode. If the input is inactive, the manipulated variable could be set. The controller switches not to automatic mode by self-acting. |
| 6 | Switch to remote manipulated variable | The analogue input set to remote manipulated variable is switched by the digital input to the analogue output. The internal manipulated variable is inactive. |
| 7 | Switch safety set point on | The digital input activates the safety set point. |
| 8 | Block set point | The digital input blocked the set point. This function is not usable for the remote set point controller. |
| 9 | set-point ramp on | see parameter menu section 7.3.5 |
| 10 | Stop set-point ramp | The digital input stops an active set-point ramp. The set-point ramp is continued as soon as the digital input is inactive. |
| 11 | Switch to manual mode | The controller is switched to manual or automatic mode by using the digital input. You cannot switch with the manual-automatic-key. |
| 12 | Switch to second parameter set | see parameter menu 2 |
| 13 | Switch to third parameter set | see parameter menu 2 |
| 14 | Input switchover | The digital input switches from the first analogue input to the second analogue input for process value. The measuring range from both analogue inputs is coordinated in the menu AIn (see Page 43). |
| 15 | Dynamic limiting manipulated variable on | The digital input activates the dynamic limiting of the manipulated variable given from the selected analogue input. (see structure menu section 6.17) |

| | Function | Description / Remark |
|---|---|---|
| 16 | UP keypad function on digital input | The digital input operates in the same way as the ⬆ key. |
| 17 | DOWN keypad function on digital input | The digital input operates in the same way as the ⬇ key. |
| 18 | Remote set-point controller on | The digital input switches from local set-point controller to remote set-point controller. One analogue input must be set to external set point (see structure list section 10.2.1) |
| 19 | Internal set point on | The digital input activates the internal set point SP1 to SP6. Digital input 1 switch only SP1, digital input 2 only SP2 |
| 20 | set point program pause finished | The digital input 2 switches the program during a pause to the next segment. |
| 21 | Start set point program | The digital input 3 starts the program. |
| 22 | Stop set point program | The digital input 4 stopped the program. |
| 23 | Reset set point program | The digital input 5 restarts the program. |
| 24 | Release set point program | The digital input 5 releases the program. If the digital input is inactive, the program ramp is stopped. After activation the ramp goes on. |

### 10.2.2. Direction of action

You are able to select between normally open or normally closed (function 4.2.2 ...).

## 10.3. Digital output configuration

In the functions 4.3 various signals can be output on digital outputs 1 to 6.

### 10.3.1. Function of digital output

You can choose between following settings:

| | Function | Description / Remark |
|---|---|---|
| 1 | Alarm indication | The alarm is signalised on the according digital output. Digital output 1 signalised only Alarm 1; digital output 2 only Alarm 2, etc. |
| 2 | Digital input indication | The digital output signalised an active digital input. Digital output 1 signalised only digital input 1; digital output 2 only digital input 2; … |
| 3 | Manual mode active | The digital output indicates if the controller is in manual mode. |
| 4 | Safety manipulated variable active | The digital output indicates if the safety manipulated variable is active. |
| 5 | Set-point ramp active | The digital output indicates if a set-point ramp is active. |

| | Function | Description / Remark |
|---|---|---|
| 6 | Set-point program active | The digital output indicates an active programmer. |
| 7 | Remote set point active | The digital output indicates if the remote set point is switched on. |
| 8 | Digital output off | The digital output is without a function. |
| 9 | Two-step output | The digital output is a two step output |
| 10 | Cooling unit after-run ON | In split-range operation, the digital output can provide cooling information to switch on a cooling unit. A run-on time is set in 1.41. |
| 11 | Overrun heating ON | In split-range operation, the digital output can provide heating to switch on a heating system. A run-on time is set in 1.42. |

### 10.3.2.  Direction of action

You are able to choose between normally open or normally close (function 4.3.2).

### 10.3.3.  Two step output start value

You set the start value from manipulated variable for the two-step output (function 4.3.3).

### 10.3.4.  Two-step output end value

You set the end value from manipulated variable for the two-step output (function 4.3.4).

### 10.3.5.  Cycle time for two-step controller

The cycle time in fuction 4.3.5 is constant. The control algorithm then switches the digital output at an on/off ratio proportional to the calculated manipulated variable.
Example:
If the cycle time is 20 sec and the calculated manipulated variable is 40%, digital output 1 is on for eight seconds (conductive) and off for 12 seconds (blocked). The total time is always 20 seconds. If the manipulated variable is 0%, the digital output remains off. If OUT = 100%, the digital output is on continuously.

## 10.4. Analogue Input Configuration

This function (4.4) is mainly used for the input selection to adapt the two measuring ranges together.

### 10.4.1. Measuring range start

You set in functions 4.4.1, 4.4.3 and 4.4.5 the measuring value for the start current signal (0%).

### 10.4.2. Measuring range end

You set in function 4.4.2, 4.4.4 and 4.4.6 the measuring value for the end current signal (100%).

Example:

Measuring range analogue input 1: 0 to 1200 mbar
Measuring range analogue input 2: 0 to 120 mbar

The software needs a correction for the second measuring range. Function "measuring range end" (4.4.4) is set to 10%.

## 11. User menu

You can decide which menu items of the parameter menu need to be modified quickly, and you will then not have to enter the parameter menu to make those changes.

### 11.1. Preparing the User Level

You enter the parameter menu in the usual way. Select required parameter by pressing the ▲ or ▼ keys. If the parameter is to be added to the user level, hold the M/A key down for approximately one second. *PARA* flashes in the upper display. After confirming your selection by pressing the S key, the parameter is added to the user level. The next parameter is added in the same way. Finally, you must save the changes by pressing the P and S keys simultaneously.

Parameters are deleted from the user level in the same way as they were entered. Hold the M/A key down for approximately one second. The upper display *PARA* stops flashing. Don't forget to confirm with the S key and store the changes by pressing the P and S keys simultaneously.

### 11.2. Calling Up Parameters

Parameters that have been placed in the user level are called up directly by pressing the ▶ key. If you have called a parameter from the user level, *USER* appears in the upper display. The parameter can be modified in the usual way. Confirm the new value by pressing the S key. The ▲ or ▼ keys switches to the next parameter in the user level and you save the changes by pressing the P and S keys together.

All parameters placed in the user level are displayed in the order in which they were entered.

# 12. Set-point Ramp Program

You can specify a program function when ordering. The program function is only available with fixed set-point controllers.

The program can accept up to 17 time intervals, set points and digital outputs settings.

If the controller is switched to manual mode at active set point profile, the set point profile will stop and will have to be restarted after switching back to automatic mode.

Program functions 9.1 select program, 9.4.0 start, 9.5.0 stop and 9.6.0 reset can be used with the user level (see section 11). Invalid functions are masked out (e.g. Start if the program is already running, Stop if the program is already stopped).

You can interrupt the program ramp with digital inputs. The digital input stopped the program function of the controller. If the program is stopped, the upper display flashes PAUSE with the set point within one second. If the digital input goes back, the ramp starts independently from the stop point.

Is the ramp stopped, you can only stop and reset the program with following functions:

*Reset*: The ramp will be reset

*Stop*: The ramp will be stopped, the flashing from PAUSE will be stopped, and after the digital input goes back the ramp doesn't start.

If you start and the digital input is stopped, the program goes into the PAUSE and start after the digital input goes back (see section 10.2.1).
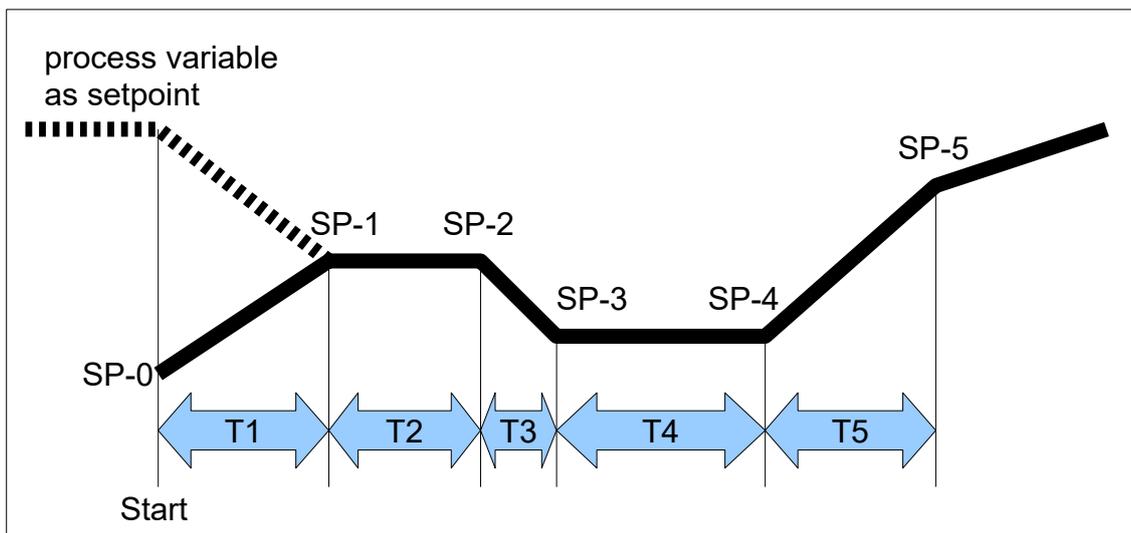


## 12.1. Select Program

You choose one of three program to start (function 9.1).

## 12.2.  Start Program

Function 9.2:        Start
Setting range:       NO, YES
Factory setting:     NO

If you select YES with the arrow keys and confirm this by pressing the P and S keys together, the programmer will start. If you have the user level option (see Section 11), you should transfer *Start* to this menu. To start after calling the sub-item, all you need to do then is to confirm by pressing the S key. The programmer starts immediately. The SP in front of the set point flashes while the program is active..

## 12.3.  Stop Program

Function 9.3:        Stop
Setting range:       NO, YES
Factory setting:     NO

If you select YES with the arrow keys and confirm this by pressing the P and S keys together, the programmer will stop. If you have the user level option (see Section 11), you should transfer *STOP* to this menu. To stop after calling the sub-item, all you need to do is to confirm by pressing the S key. The programmer stops immediately.

## 12.4.  Reset Program

Function 9.4:        Reset
Setting range:       NO, YES
Factory setting:     NO

If you select YES with the arrow keys and confirm this by pressing the P and S keys simultaneously, the program function is reset. The controller acts as though no program was present.

If you have the user level option (see Section 11), you should transfer Reset to this menu. To reset after calling the sub-item, all you need to do is to confirm by pressing the S key. The program stops immediately and is reset.

## 12.5.  Start Segment

Function 9.5:        Start Segment
Setting range:       OFF, rising curve, falling curve, absolute
Factory setting:     OFF

You set the function from program at the end of segment.

### 12.5.1.  Start Segment

Reaches the programmer the end of segment the next segment start immediately (if not End is set).

### 12.5.2. Start Segment by rising process variable if control difference is less

Reaches the programmer the end of segment by rising process variable, it was checked the value from the control difference (absolute value). If the deviation difference is less in function 9.6 (section 12.6) set the next segment start (if not End is set). If the control difference is greater the programmer goes to PAUSE and self-triggered start if the control difference is less enough.

### 12.5.3. Start Segment by falling process variable if control difference is less

Reaches the programmer the end of segment by falling process variable, it was checked the value from the control difference (absolute value). If the difference is less in function 9.6 (section 12.6) set the next segment start (if not End is set). If the control difference is greater the programmer goes to *PAUSE*.

### 12.5.4. Start Segment, if control difference is less

Reaches the programmer the end of segment (by rising and falling process variable), it was checked the value from the control difference (absolute value). If the difference is less in function 9.8 (section 12.6) set the next segment start (if not End is set). If the control difference is greater the programmer goes to PAUSE.

## 12.6. Maximum Control Difference for Segment Start

Function 9.6: value DEV for segment start

You set the maximum deviation to start the next segment.

## 12.7. Programming

Function 9.7- 9.9: Program 1 – 3

You choose the program in this three sub menu items.

### 12.7.1. Set-point Start Initialisation

Function 9.x.1: Start setpoint ramp

You set the start value for the set point.

#### 12.7.1.1. Start set point fixed

The start set point is set in parameter SP-0.

#### 12.7.1.2. Current set point as start set point

The current set point is taken as the start set point.

#### 12.7.1.3. Process variable as start set point

The process variable is used as the start set point (see sketch on page 45).

## 12.8. Digital Output indicate on LED

Funktion 9.7.2, 9.8.2, 9.9.2: Digital output 1

Setting range:          OFF, ON

You set the indicating from an active digital output at the front LED.

## 12.9. Programmer Set points

Funktion 9.7.3...: setpoint x

Setting range:          -10 bis +110 %
Unit:                   % or   engineering unit
Factory setting:        0 %

You can enter 17 set points that are applied in sequence.

## 12.10. Activate Digital Outputs

Function 9.7.4...: Digital output segment 1

Setting range:          OFF, ON
Factory setting:        OFF

With the ▲ or ▼ keys you change between OFF and ON. With the ◀ or ▶ key you switch to the next digital output.

## 12.11. Programmer Times

Function 9.7.5...: Time x

Setting range:          0 bis 9999, End, P-1, P-2, P-3
Unit:                   Minutes
Factory setting:        End
You can enter 17 times. The set-points ramp up to the next set point in turn during each period. Instead a time you can end the program or jump to the next program.

If the power supply fails, the current status is stored. When power is restored, the program resumes from this point.
After the last time interval, the program stops and remains at the last set point.

## 12.12. Activate Digital Inputs

Many programmer functions could be controlled by the digital inputs 2 to 6. These functions are described in chapters 10.2.1.

## 13.  Manual Automatic Station

You can use the CTR210i as manual automatic station. As soon you set the controller type in the structure menu to "Man. Autom. Station" a new menu *Manual Autom. Station* (6.1) appears.

If an analogue input is fed to an analogue output, you must set external manipulated variable (section 6.8) to the corresponding analogue input.

### 13.1.  Display

Functions 10.1, 10.2, 10.3  upper indication, middle indication, lower indication

Setting range:          OFF, analogue input 1, analogue input 2, analogue input 3, manipulated variable

You set the value that is shown in the display part.

### 13.2.  Display SP, PV, OUT

Functions 10.4, 10.5, 10.6 upper marking, middle marking, lower marking

Setting range:          ON, OFF

In this three menus you can set the display of SP, PV or OUT on or off.

### 13.3.  Adjustment

Function 10.7 Adjusting

Setting range:          only manual mode, only automatic mode, in manual and automatic mode

You set the adjustment from values in manual mode, automatic mode or manual and automatic mode.

### 13.4.  Manual automatic switchover

Function 10.8.0

Setting range:          enable, fixed manual mode, fixed automatic mode

If this parameter is *enable* you can switch between manual and automatic mode with the M/A key. In other cases only manual or automatic mode is allowed.

## 14.  Fault Indication

The controller monitors all functions and modules. If, for instance, a change to a setting cannot be stored correctly, a fault is indicated. This is very probably a hardware fault (e.g. a defective FRAM).

A fault message appears on the display.

The controller must be returned for repair.

# 15. Structure List

| Function | No. | see: | | Function | No. | see: | |
|---|---|---|---|---|---|---|---|
| set controller type | 5.1 | 6.1 | | remote setpoint 2. channel | 5.10 | 6.7 | |
| local setpoint controller | | 6.1.1 | | OFF | | | |
| ratio controller | | 6.1.3 | | from analogue input 1 | | | |
| difference controller | | 6.1.4 | | from analogue input 2 | | | |
| manual / automatic station | | 6.1.5 | | from analogue input 3 | | | |
| cascade controller | | 6.1.6 | | remote manipulated variab. | 5.11 | 6.8 | |
| double loop controller | | 6.1.7 | | OFF | | | |
| operating point | 5.2 | 6.2 | | from analogue input 1 | | | |
| fixed operating point | | 6.2.1 | | from analogue input 2 | | | |
| tracked by the output | | 6.2.2 | | from analogue input 3 | | | |
| operation point = setpoint | | 6.2.3 | | remote output limiting | 5.12 | 6.9 | |
| tag number 1 | 5.3 | 6.3 | | OFF | | | |
| tag number 2 | 5.4 | | | from analogue input 1 | | | |
| select process variable 1 | 5.5 | 6.4 | | from analogue input 2 | | | |
| analogue input 1 | | | | from analogue input 3 | | | |
| analogue input 2 | | | | output 2 channel controller | 5.13 | 6.10 | |
| analogue input 3 | | | | minimum manipul. variable | | | |
| switched by digital input | | | | maximim manipul. variable | | | |
| select process variable 2 | 5.6 | 6.4 | | both manipul. variables | | | |
| analogue input 1 | | | | restart manipulated variab. | 5.14 | 6.11 | |
| analogue input 2 | | | | start-up manipul. variable | | | |
| analogue input 3 | | | | last manipulated variable | | | |
| disturbance correction input | 5.7 | 6.5 | | time setpoint ramp | 5.15 | 6.12 | |
| OFF | | | | over setpoint range | | | |
| from analogue input 1 | | | | over setpoint change | | | |
| from analogue input 2 | | | | time base setpoint ramp in | 5.16 | 6.13 | |
| from analogue input 3 | | | | seconds | | | |
| disturb. correction output | 5.8 | 6.6 | | minutes | | | |
| OFF | | | | interruption setpoint ramp | 5.17 | 6.14 | |
| from analogue input 1 | | | | OFF | | | |
| from analogue input 2 | | | | ON | | | |
| from analogue input 3 | | | | d term calculation | 5.18 | 6.15 | |
| remote setpoint 1 | 5.9 | 6.7 | | to control difference | | | |
| OFF | | | | to process variable change | | | |
| from analogue input 1 | | | | sensor break AI1 | 5.19 | 6.16 | |
| from analogue input 2 | | | | OFF | | | |
| from analogue input 3 | | | | ON | | | |

| Function | No. | see: | |
|---|---|---|---|
| sensor break AI2 | 5.20 | 6.16 | |
| OFF | | | |
| ON | | | |
| sensor break AI3 | 5.21 | 6.16 | |
| OFF | | | |
| ON | | | |
| manipul. variable limiting | 5.22 | 6.17 | |
| in manual and auto mode | | | |
| only in automatic mode | | | |
| process variable tracking | 5.23 | 6.18 | |
| OFF | | | |
| ON | | | |
| setpoint tracking | 5.24 | 6.19 | |
| OFF | | | |
| ON | | | |
| direct setpoint adjustment | 5.25 | 6.20 | |
| with up and down keys | | | |
| only in setpoint level | | | |
| at input changeover | 5.26 | 6.21 | |
| switch only inputs | | | |
| switch setpoint | | | |
| switch parameter | | | |
| switch setpoint + parameter | | | |
| manual to automatic switch | 5.27 | 6.22 | |
| with PID jump answer | | | |
| only I term answer | | | |
| dynamic activation I-term | 5.28 | 6.23 | |
| off | | | |
| Parameter set 1 | | | |
| Parameter set 2 | | | |
| Parameter set 3 | | | |
| Linearisation | 5.29 | 6.24 | |
| off | | | |
| from analogue input 1 | | | |
| from analogue input 2 | | | |
| from analogue input 3 | | | |
| cascade break | 5.30 | 6.25 | |
| SP-slave = OUT-master | | | |
| SP-slave = PV-slave | | | |
| SP-slave = SP-master | | | |

| Function | No. | see: | |
|---|---|---|---|
| interface protocol | 5.31 | 6.26 | |
| Modbus RTU | | | |
| Modbus ASCII | | | |
| baud rate | 5.32 | 6.27 | |
| 9600 bps | | | |
| 19200 bps | | | |
| 2400 bps | | | |
| 4800 bps | | | |
| Interface address | 5.33 | 6.28 | |
| Language | 5.34 | 6.29 | |
| deutsch / German | | | |
| englisch / English | | | |
| Reset to factory settings | 5.35 | 6.30 | |
| no | | | |
| yes | | | |
| Codes | 5.36 | 6.31 | |
| code manual mode | | | |
| code parameter menu | | | |
| code structure menu | | | |
| code calibration menu | | | |
| code 16-step-setpoint-ramp | | | |
| code manual autom. station | | | |
| Contrast | 5.37 | 6.32 | |

# 16. Parameter List

| Function | No. | see: | | Function | No. | see: | |
|---|---|---|---|---|---|---|---|
| Kp1 proportional gain 1 | 1.1 | 7.1.1 | | filter analogue input 1 | 1.24 | 7.6 | |
| Kd1 derivative action gain 1 | 1.2 | 7.1.2 | | filter analogue input 2 | 1.25 | 7.6 | |
| Tn1 integral action time 1 | 1.3 | 7.1.3 | | filter analogue input 3 | 1.26 | 7.6 | |
| OP1 operating point 1 | 1.4 | 7.1.4 | | | | | |
| Tv1 derivative action time 1 | 1.5 | 7.1.5 | | internal setpoint 1 | 1.27 | 7.7 | |
| | | | | internal setpoint 2 | 1.28 | 7.7 | |
| unit 1 | 1.6 | | | internal setpoint 3 | 1.29 | 7.7 | |
| decimal point range 1 | 1.7 | 7.2.2 | | internal setpoint 4 | 1.30 | 7.7 | |
| start of scale value1 | 1.8 | 7.2.3 | | internal setpoint 5 | 1.31 | 7.7 | |
| full-scale value1 | 1.9 | 7.2.4 | | internal setpoint 6 | 1.32 | 7.7 | |
| | | | | | | | |
| setpoint start value 1 | 1.10 | 7.3.1 | | disturbance variable multiplier C-1 | 1.33 | 7.8.1 | |
| setpoint full-scale value 1 | 1.11 | 7.3.2 | | disturbance variable additive C-2 | 1.34 | 7.8.2 | |
| active setpoint | 1.12 | 7.3.3 | | | | | |
| safety setpoint | 1.13 | 7.3.4 | | ratio control constant C-3 | 1.35 | 7.8.3 | |
| setpoint ramp time | 1.14 | 7.3.5 | | | | | |
| | | | | minimum dynamic output limiting C-4 | 1.36 | 7.8.4 | |
| manipulated out. start value | 1.15 | 7.4.1 | | maximum dynamic output limiting C-5 | 1.37 | 7.8.5 | |
| manipul. out. end value | 1.16 | 7.4.2 | | | | | |
| safety manipul. output 1 | 1.17 | 7.4.3 | | | | | |
| safety manipul. output 2 | 1.18 | 7.4.4 | | Factor OP= C-6*SP | 1.38 | 7.8.6 | |
| start-up manipul. output | 1.19 | 7.4.5 | | | | | |
| manipul. out changing time | 1.20 | 7.4.6 | | disturbance variable factor C-7 | 1.39 | 7.8.1 | |
| | | | | disturbance variable additive C-8 | 1.40 | 7.8.2 | |
| sensor break minimum limit | 1.21 | 7.5.1 | | | | | |
| sensor break maximum limit | 1.22 | 7.5.2 | | Cooling unit after-run | 1.41 | 7.8.7 | |
| sensor break time delay | 1.23 | 7.5.3 | | After-run heating | 1.42 | 7.8.8 | |

## 17. Parameter List 2

| Function | No. | see: | |
|---|---|---|---|
| Kp2 proportional gain 2 | 2.1 | 7.1.1 | |
| Kd2 derivative action gain 2 | 2.2 | 7.1.2 | |
| Tn2 integral action time 2 | 2.3 | 7.1.3 | |
| OP2 operating point 2 | 2.4 | 7.1.4 | |
| Tv2 derivative action time 2 | 2.5 | 7.1.5 | |
| | | | |
| unit 2 | 2.6 | | |
| decimal point range 2 | 2.7 | 7.2.2 | |
| start of scale value 2 | 2.8 | 7.2.3 | |
| full-scale value 2 | 2.9 | 7.2.4 | |
| | | | |
| setpoint start value 2 | 2.10 | 7.3.1 | |
| setpoint full-scale value 2 | 2.11 | 7.3.2 | |
| active setpoint 2 | 2.12 | 7.3.3 | |
| | | | |
| manipul. out start value 2 | 2.13 | 7.4.1 | |
| manipul. out end value 2 | 2.14 | 7.4.2 | |
| start-up manipul. output 2 | 2.15 | 7.4.5 | |
| | | | |
| Kp3 propotional gain 3 | 2.16 | 7.1.1 | |
| Kd3 derivative action gain 3 | 2.17 | 7.1.2 | |
| Tn3 integral action time 3 | 2.18 | 7.1.3 | |
| OP3 operating point 3 | 2.19 | 7.1.4 | |
| Tv3 derivative action time 3 | 2.20 | 7.1.5 | |

# 18. Alarm menu

| Function | No. | see: | | Function | No. | see: | |
|---|---|---|---|---|---|---|---|
| function alarm 1 | 3.1 | 9 | | function alarm 3 | 3.9 | 9 | |
| process variable 1 | | | | process variable 1 | | | |
| process value changing | | | | process value changing | | | |
| deviation | | | | deviation | | | |
| deviation absolute | | | | deviation absolute | | | |
| process variable 2 | | | | process variable 2 | | | |
| analogue input 1 | | | | analogue input 1 | | | |
| analogue input 2 | | | | analogue input 2 | | | |
| analogue input 3 | | | | analogue input 3 | | | |
| manipulated variable | | | | manipulated variable | | | |
| difference analogue inputs | | | | difference analogue inputs | | | |
| setpoint | | | | setpoint | | | |
| effective direction of alarm 1 | 3.2 | 9 | | effective direction of alarm 3 | 3.10 | 9 | |
| minimum alarm | | | | minimum alarm | | | |
| maximum alarm | | | | maximum alarm | | | |
| alarm value 1 | 3.3 | 9 | | alarm value 3 | 3.11 | 9 | |
| alarm hysteresis 1 | 3.4 | 9 | | alarm hysteresis 3 | 3.12 | 9 | |
| | | | | | | | |
| function alarm 2 | 3.5 | 9 | | function alarm 4 | 3.13 | 9 | |
| process variable 1 | | | | process variable 1 | | | |
| process value changing | | | | process value changing | | | |
| deviation | | | | deviation | | | |
| deviation absolute | | | | deviation absolute | | | |
| process variable 2 | | | | process variable 2 | | | |
| analogue input 1 | | | | analogue input 1 | | | |
| analogue input 2 | | | | analogue input 2 | | | |
| analogue input 3 | | | | analogue input 3 | | | |
| manipulated variable | | | | manipulated variable | | | |
| difference analogue inputs | | | | difference analogue inputs | | | |
| setpoint | | | | setpoint | | | |
| effective direction of alarm 2 | 3.6 | 9 | | effective direction of alarm 4 | 3.14 | 9 | |
| minimum alarm | | | | minimum alarm | | | |
| maximum alarm | | | | maximum alarm | | | |
| alarm value 2 | 3.7 | 9 | | alarm value 4 | 3.15 | 9 | |
| alarm hysteresis 2 | 3.8 | 9 | | alarm hysteresis 4 | 3.16 | 9 | |

| Function | No. | see: | |
|---|---|---|---|
| function alarm 5 | 3.17.0 | 9 | |
| process variable 1 | | | |
| process value changing | | | |
| deviation | | | |
| deviation absolute | | | |
| process variable 2 | | | |
| analogue input 1 | | | |
| analogue input 2 | | | |
| analogue input 3 | | | |
| manipulated variable | | | |
| difference analogue inputs | | | |
| setpoint | | | |
| effective direction of alarm 5 | 3.18 | 9 | |
| minimum alarm | | | |
| maximum alarm | | | |
| alarm value 5 | 3.19 | 9 | |
| alarm hysteresis 1 | 3.20 | 9 | |
| | | | |
| function alarm 6 | 3.21 | 9 | |
| process variable 1 | | | |
| process value changing | | | |
| deviation | | | |
| deviation absolute | | | |
| process variable 2 | | | |
| analogue input 1 | | | |
| analogue input 2 | | | |
| analogue input 3 | | | |
| manipulated variable | | | |
| difference analogue inputs | | | |
| setpoint | | | |
| effective direction of alarm 6 | 3.22 | 9 | |
| minimum alarm | | | |
| maximum alarm | | | |
| alarm value 6 | 3.23 | 9 | |
| alarm hysteresis 6 | 3.24 | 9 | |
| | | | |

| Function | No. | see: | |
|---|---|---|---|
| time base slew rate | 3.25 | 9.1.1 | |
| seconds | | | |
| minutes | | | |
| hours | | | |
| limit slew rate process variable | 3.26 | 9.1.2 | |
| Hysteresis slew rate process variable | 3.27 | 9.1.3 | |
| limit slew rate manipulated variable | 3.28 | 9.1.4 | |
| Hysteresis slew rate manipulated variable | 3.29 | 9.1.5 | |
| absolute deviation | 3.30 | 9.1.6 | |

# 19. Input and Output Configuration

| Function | No. | see: | | Function | No. | see: | |
|---|---|---|---|---|---|---|---|
| analogue outputs | 4.1 | 10.1 | | digital inputs | 4.2 | 10.2 | |
| | | | | | | | |
| function analogue output 1 | 4.1.1 | | | function digital input 1 | 4.2.1 | 10.2.1 | |
| manipulated variable | | | | no function | | | |
| anlog input 1 | | | | manipul. variable blocked | | | |
| anlog input 2 | | | | 1. safety manipul. variable | | | |
| anlog input 3 | | | | 2. safety manipul. variable | | | |
| setpoint | | | | man.mode + safety output 1 | | | |
| control difference | | | | remote man.var.anal.input | | | |
| start value 1 splitrange | 4.1.2 | 10.1.1 | | safety setpoint | | | |
| end value 1 splitrange | 4.1.3 | 10.1.2 | | setpoint blocked | | | |
| start current 1 splitrange | 4.1.4 | 10.1.3 | | setpoint ramp on | | | |
| end current 1 splitrange | 4.1.5 | 10.1.4 | | setpoint ramp interrupted | | | |
| | | | | switch to manual mode | | | |
| function analogue output 2 | 4.1.6 | | | 2. parameter set | | | |
| manipulated variable | | | | 3. parameter set | | | |
| anlog input 1 | | | | input switch over | | | |
| anlog input 2 | | | | dyn. limiting man. var. | | | |
| anlog input 3 | | | | arrow up | | | |
| setpoint | | | | arrow down | | | |
| control difference | | | | remote setpoint on | | | |
| start value 2 splitrange | 4.1.7 | 10.1.1 | | internal setpoint 1 | | | |
| end value 2 splitrange | 4.1.8 | 10.1.2 | | direction of action dig. in. 1 | 4.2.2 | 10.2.2 | |
| start current 2 splitrange | 4.1.9 | 10.1.3 | | normally open | | | |
| end current 2 splitrange | 4.1.10 | 10.1.4 | | normally closed | | | |

| Function | No. | see: | | Function | No. | see: | |
|---|---|---|---|---|---|---|---|
| function digital input 2 | 4.2.3 | 10.2.1 | | function digital input 3 | 4.2.5 | 10.2.1 | |
| no function | | | | no function | | | |
| manipul. variable blocked | | | | manipul. variable blocked | | | |
| 1. safety manipul. variable | | | | 1. safety manipul. variable | | | |
| 2. safety manipul. variable | | | | 2. safety manipul. variable | | | |
| man.mode + safety output 1 | | | | man.mode + safety output 1 | | | |
| remote man.var.anal.input | | | | remote man.var.anal.input | | | |
| safety setpoint | | | | safety setpoint | | | |
| setpoint blocked | | | | setpoint blocked | | | |
| setpoint ramp on | | | | setpoint ramp on | | | |
| setpoint ramp interrupted | | | | setpoint ramp interrupted | | | |
| switch to manual mode | | | | switch to manual mode | | | |
| 2. parameter set | | | | 2. parameter set | | | |
| 3. parameter set | | | | 3. parameter set | | | |
| input switch over | | | | input switch over | | | |
| dyn. limiting man. var. | | | | dyn. limiting man. var. | | | |
| arrow up | | | | arrow up | | | |
| arrow down | | | | arrow down | | | |
| remote setpoint on | | | | remote setpoint on | | | |
| internal setpoint 2 | | | | internal setpoint 3 | | | |
| SP program pause finished | | | | start setpoint program | | | |
| | | | | | | | |
| direction of action dig. in. 2 | 4.2.4 | 10.2.2 | | direction of action dig. in. 3 | 4.2.6 | 10.2.2 | |
| normally open | | | | normally open | | | |
| normally closed | | | | normally closed | | | |

| Function | No. | see: | | Function | No. | see: | |
|---|---|---|---|---|---|---|---|
| **function digital input 4** | 4.2.7 | 10.2.1 | | **function digital input 5** | 4.2.9 | 10.2.1 | |
| no function | | | | no function | | | |
| manipul. variable blocked | | | | manipul. variable blocked | | | |
| 1. safety manipul. variable | | | | 1. safety manipul. variable | | | |
| 2. safety manipul. variable | | | | 2. safety manipul. variable | | | |
| man.mode + safety output 1 | | | | man.mode + safety output 1 | | | |
| remote man.var.anal.input | | | | remote man.var.anal.input | | | |
| safety setpoint | | | | safety setpoint | | | |
| setpoint blocked | | | | setpoint blocked | | | |
| setpoint ramp on | | | | setpoint ramp on | | | |
| setpoint ramp interrupted | | | | setpoint ramp interrupted | | | |
| switch to manual mode | | | | switch to manual mode | | | |
| 2. parameter set | | | | 2. parameter set | | | |
| 3. parameter set | | | | 3. parameter set | | | |
| input switch over | | | | input switch over | | | |
| dyn. limiting man. var. | | | | dyn. limiting man. var. | | | |
| arrow up | | | | arrow up | | | |
| arrow down | | | | arrow down | | | |
| remote setpoint on | | | | remote setpoint on | | | |
| internal setpoint 4 | | | | internal setpoint 5 | | | |
| stop setpoint program | | | | reset setpoint program | | | |
| | | | | | | | |
| **direction of action dig. in. 4** | 4.2.8 | 10.2.2 | | **direction of action dig. in. 5** | 4.2.10 | 10.2.2 | |
| normally open | | | | normally open | | | |
| normally closed | | | | normally closed | | | |

| Function | No. | see: | |
|---|---|---|---|
| function digital input 6 | 4.2.11 | 10.2.1 | |
| no function | | | |
| manipul. variable blocked | | | |
| 1. safety manipul. variable | | | |
| 2. safety manipul. variable | | | |
| man.mode + safety output 1 | | | |
| remote man.var.anal.input | | | |
| safety setpoint | | | |
| setpoint blocked | | | |
| setpoint ramp on | | | |
| setpoint ramp interrupted | | | |
| switch to manual mode | | | |
| 2. parameter set | | | |
| 3. parameter set | | | |
| input switch over | | | |
| dyn. limiting man. var. | | | |
| arrow up | | | |
| arrow down | | | |
| remote setpoint on | | | |
| internal setpoint 6 | | | |
| release setpoint program | | | |
| | | | |
| direction of action dig. in. 6 | 4.2.12 | 10.2.2 | |
| normally open | | | |
| normally closed | | | |

| Function | No. | see: | |
|---|---|---|---|
| digital outputs | 4.3 | 10.3 | |
| | | | |
| function output 1 | 4.3.1 | 10.3.1 | |
| Alarm 1 | | | |
| digital input 1 | | | |
| manual mode active | | | |
| safety output active | | | |
| setpoint ramp active | | | |
| setpoint program active | | | |
| remote setpoint active | | | |
| OFF | | | |
| remote output active | | | |
| | | | |
| direction of action | 4.3.2 | 10.3.2 | |
| normally open | | | |
| normally closed | | | |
| | | | |
| start value 2 step contr. 1 | 4.3.3 | 10.3.3 | |
| end value 2 step contr. 1 | 4.3.4 | 10.3.4 | |
| cycle time 2 step controller | 4.3.5 | 10.3.5 | |
| | | | |
| function output 2 | 4.3.6 | 10.3.1 | |
| Alarm 2 | | | |
| digital input 2 | | | |
| manual mode active | | | |
| safety output active | | | |
| setpoint ramp active | | | |
| setpoint program active | | | |
| remote setpoint active | | | |
| OFF | | | |
| remote output active | | | |
| | | | |
| direction of action | 4.3.7 | 10.3.2 | |
| normally open | | | |
| normally closed | | | |
| | | | |
| start value 2 step contr. 2 | 4.3.8 | 10.3.3 | |
| end value 2 step contr. 2 | 4.3.9 | 10.3.4 | |
| cycle time 2 step controller | 4.3.10 | 10.3.5 | |

| Function | No. | see: | |
|---|---|---|---|
| function output 3 | 4.3.11 | 10.3.1 | |
| Alarm 3 | | | |
| digital input 3 | | | |
| manual mode active | | | |
| safety output active | | | |
| setpoint ramp active | | | |
| setpoint program active | | | |
| remote setpoint active | | | |
| OFF | | | |
| remote output active | | | |
| | | | |
| direction of action | 4.3.12 | 10.3.2 | |
| normally open | | | |
| normally closed | | | |
| | | | |
| start value 2 step contr. 3 | 4.3.13 | 10.3.3 | |
| end value 2 step contr. 3 | 4.3.14 | 10.3.4 | |
| cycle time 2 step controller3 | 4.3.15 | 10.3.5 | |
| | | | |
| function output 4 | 4.3.16 | 10.3.1 | |
| Alarm 4 | | | |
| digital input 4 | | | |
| manual mode active | | | |
| safety output active | | | |
| setpoint ramp active | | | |
| setpoint program active | | | |
| remote setpoint active | | | |
| OFF | | | |
| remote output active | | | |
| | | | |
| direction of action | | | |
| normally open | 4.3.17 | 10.3.2 | |
| normally closed | | | |
| | | | |
| start value 2 step contr. 4 | | | |
| end value 2 step contr. 4 | 4.3.18 | 10.3.3 | |
| cycle time 2 step controller4 | 4.3.19 | 10.3.4 | |
| cycle time | 4.3.20 | 10.3.5 | |
| | | | |
| function output 5 | 4.3.21 | 10.3.1 | |
| Alarm 5 | | | |
| digital input 5 | | | |
| manual mode active | | | |
| safety output active | | | |
| setpoint ramp active | | | |
| setpoint program active | | | |
| remote setpoint active | | | |
| OFF | | | |
| remote output active | | | |
| | | | |
| direction of action | 4.3.22 | 10.3.2 | |
| normally open | | | |
| normally closed | | | |
| | | | |
| start value 2 step contr. 5 | 4.3.23 | 10.3.3 | |
| end value 2 step contr. 5 | 4.3.24 | 10.3.4 | |
| cycle time 2 step controller5 | 4.3.25 | 10.3.5 | |
| | | | |
| function output 6 | 4.3.26 | 10.3.1 | |
| Alarm 6 | | | |
| digital input 6 | | | |
| manual mode active | | | |
| safety output active | | | |
| setpoint ramp active | | | |
| setpoint program active | | | |
| remote setpoint active | | | |
| OFF | | | |
| remote output active | | | |
| | | | |
| direction of action | 4.3.27 | 10.3.2 | |
| normally open | | | |
| normally closed | | | |
| | | | |
| start value 2 step contr. 6 | 4.3.28 | 10.3.3 | |
| end value 2 step contr. 6 | 4.3.29 | 10.3.4 | |
| cycle time 2 step controller6 | 4.3.30 | 10.3.5 | |
| | | | |
| analogue inputs | 4.4 | 10.4 | |
| start range input 1 | 4.4.1 | 10.4.1 | |
| end range input 1 | 4.4.2 | 10.4.2 | |
| start range input 2 | 4.4.3 | 10.4.1 | |
| end range input 2 | 4.4.4 | 10.4.2 | |
| start range input 3 | 4.4.5 | 10.4.1 | |
| end range input 3 | 4.4.6 | 10.4.2 | |

## 20. Setpoint Ramp Program List

| Function | No. | see: | |
|---|---|---|---|
| select program | 9.1 | 12 | |
| Program 1 | | 12.1 | |
| Program 2 | | 12.1 | |
| Program 3 | | 12.1 | |
| Start | 9.2 | 12.2 | |
| Stop | 9.3 | 12.3 | |
| Reset | 9.4 | 12.4 | |
| Start Segment | 9.5 | 12.5.1 | |
| off | | | |
| rising curve | | 12.5.2 | |
| falling curve | | 12.5.3 | |
| absolute | | 12.5.4 | |
| value for segment start | 9.6 | 12.6 | |
| Program initialisation | 9.7 – 9.9 | | |
| start point ramp | 9.x.1 | 12.7.1 | |
| actual PV | | 12.7.1.3 | |
| SP-0 | | 12.7.1.1 | |

| Function | No. | see: | |
|---|---|---|---|
| actual setpoint | | 12.7.1.2 | |
| LED = digital output | 9.x.2 | 12.8 | |
| off | | | |
| on | | | |
| SP-0 start setpoint | 9.x.3 | 12.9 | |
| digital output segment 1 | 9.x.4 | 12.10 | |
| setpoint ramp time 1 | 9.x.5 | 12.11 | |
| setpoint ramp value 1 | 9.x.6 | 12.9 | |
| digital output segment 2 | 9.x.7 | 12.10 | |
| ... | | | |
| setpoint ramp value 17 | | 12.9 | |
| Program 2 as Program 1 | | | |
| | | | |
| Program 3 as Program 1 | | | |

# 21. Calibration List

| Function | No. | see: | |
|---|---|---|---|
| Analogue Input 1 0% | 6.1 | 3.1 | |
| Analogue Input 1 100% | 6.2 | 3.1 | |
| | | | |
| Analogue Input 2 0% | 6.3 | 3.1 | |
| Analogue Input 2 100% | 6.4 | 3.1 | |
| | | | |
| Analogue Input 3 0% | 6.5 | 3.1 | |
| Analogue Input 3 100% | 6.6 | 3.1 | |
| | | | |
| Analogue Output 1 0% | 6.7 | 3.2 | |
| Analogue Output 1 100% | 6.8 | 3.2 | |
| | | | |
| Analogue Output 2 0% | 6.9 | 3.2 | |
| Analogue Output 2 100% | 6.10 | 3.2 | |

# 22. Manual automatic station

| Function | No. | see: | |
|---|---|---|---|
| upper indication | 10.1 | 13.1 | |
| off | | | |
| analogue input 1 | | | |
| analogue input 2 | | | |
| analogue input 3 | | | |
| manipulated variable | | | |
| middle indication | 10.2 | 13.1 | |
| off | | | |
| analogue input 1 | | | |
| analogue input 2 | | | |
| analogue input 3 | | | |
| manipulated variable | | | |
| lower indication | 10.3 | 13.1 | |
| off | | | |
| analogue input 1 | | | |
| analogue input 2 | | | |
| analogue input 3 | | | |
| manipulated variable | | | |
| upper marking | 10.4 | 13.2 | |
| off | | | |
| on | | | |
| middle marking | 10.5 | 13.2 | |
| off | | | |
| on | | | |
| lower marking | 10.6 | 13.2 | |
| off | | | |
| on | | | |
| adjusting | 10.7 | 13.3 | |
| only in manual mode | | | |
| only in automatic mode | | | |
| in manual + auto mode | | | |
| switch manual/automatic | | 13.4 | |
| enable | | | |
| fixed manual mode | | | |
| fixed automatic mode | | | |

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