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 3.04

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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 authorized 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 bargraph under the tag number. The setpoint with indication (e. g. SP, SP 1, SP ext...) is shown below the bargraph. 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.

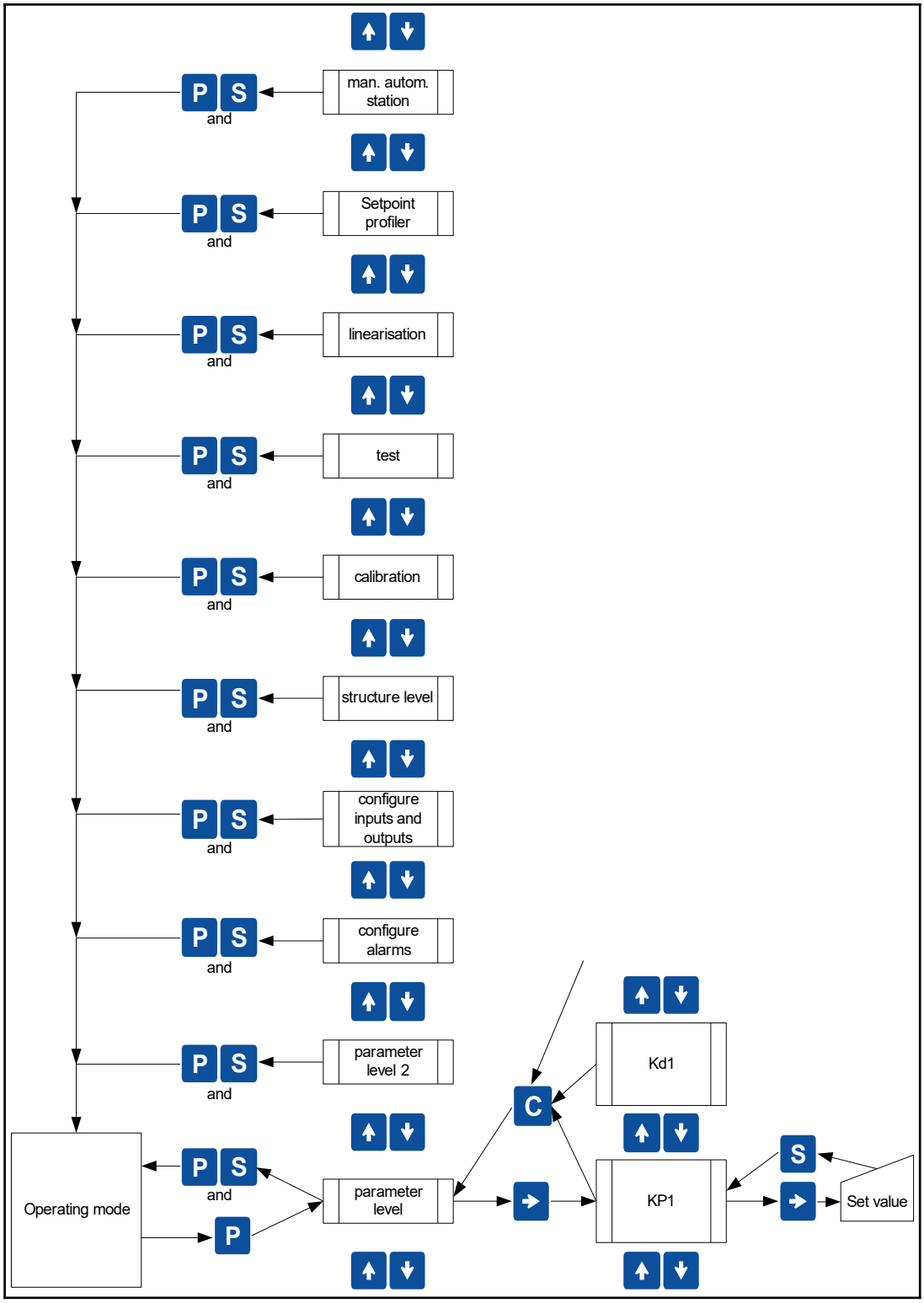
If you have entered the wrong code number, the controller returns to the selection level.

Changes are confirmed with S or cleared with C.

The changes are saved by pressing P and S together.


Note!

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


man. autom. station
Setpoint profiler
linearisation
test
calibration
structure level
configure inputs and outputs
configure alarms
parameter level 2
parameter level
Operating mode
P
S
and
C
Kd1
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.

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 ▲ enter analogue output 1 0% with ▶	adjust 4 mA current with the ▲ and ▼ keys
store with S	
change level with ▲ enter analogue output 1 100% with ▶	adjust 20 mA current with the ▲ and ▼ keys
store with S	
connect multimeter to analogue output 2 Note! Connect power supply 2	clamps 15 (+) and 16 (-), clamps 17 (+) and 18 (-)
change level with ▲ and enter to analogue output 2 0% with ▶	adjust 4 mA current with the ▲ and ▼ keys
store with S	
change level with ▲ 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.

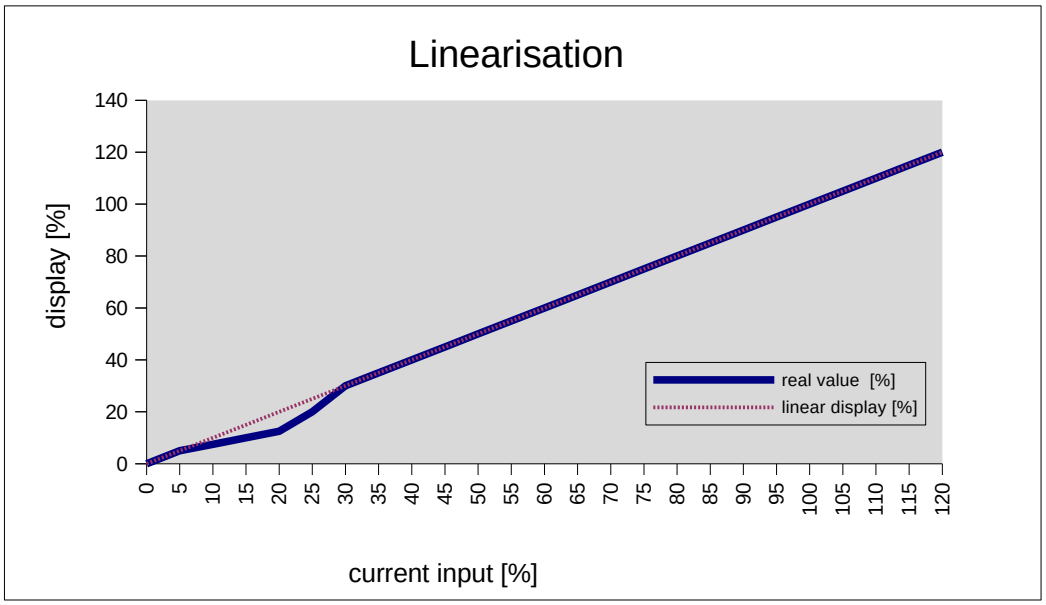
In the structure menu 5.29 you can select which analogue input is to be linearised. After this selection the linearisation menu appears.

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.

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.

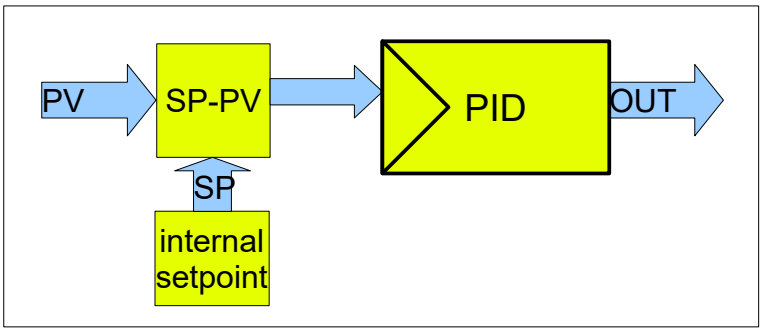
6.1. Controller Type

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.



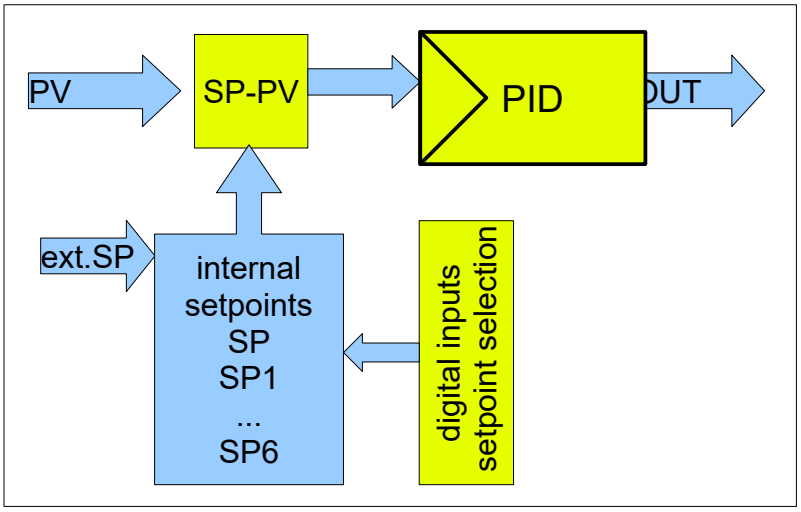
A setpoint adjustment with the arrow keys is only possible in automatic mode. In manual mode, the manipulated output will be adjusted.

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 $PV = \frac{Process\ Value\ 1}{Process\ Value\ 2}$ is displayed as PV.

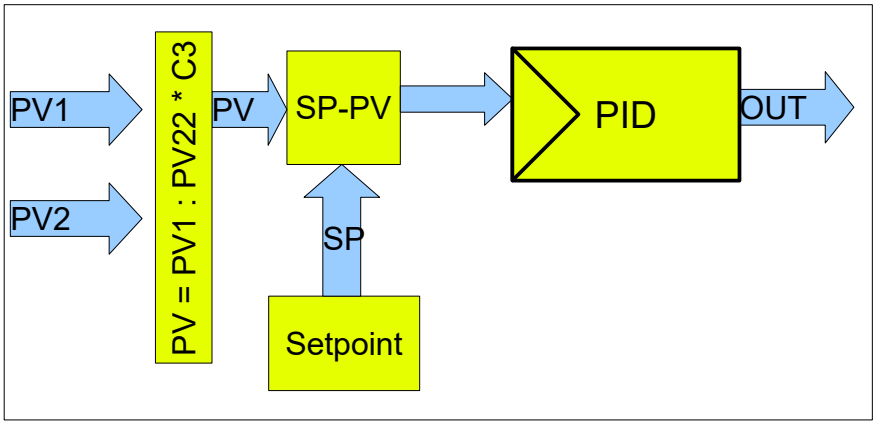
The process values 1 and 2 are read from the analogue inputs set in input selection (section 6.4).

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

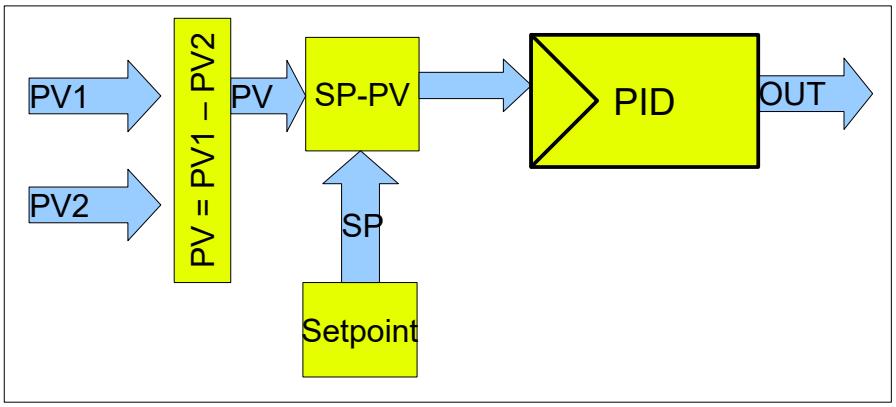
see input and output menu: 10.2.1 Function of the digital input

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

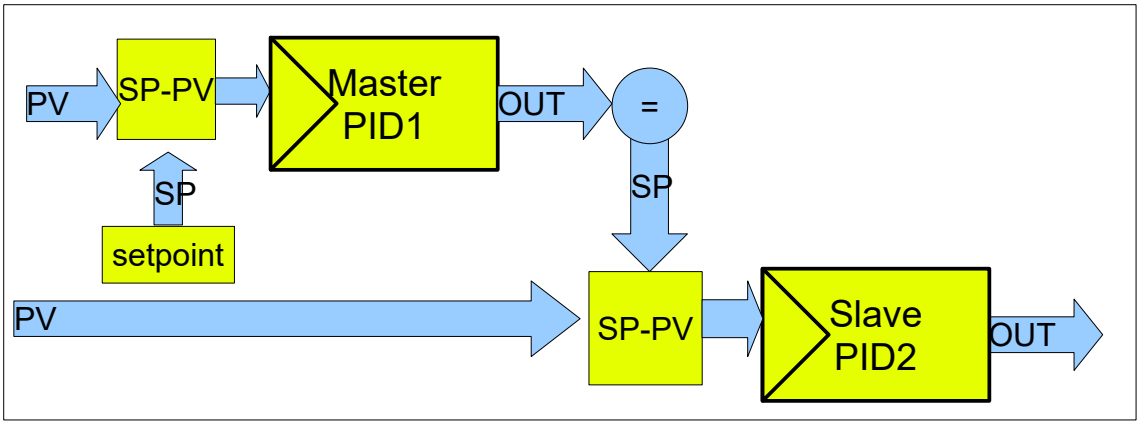
The CTR 210 i could be used as a manual automatic station. Then the CTR has no controller function.

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 setpoints.

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 masster to the slave by pressing the S key.

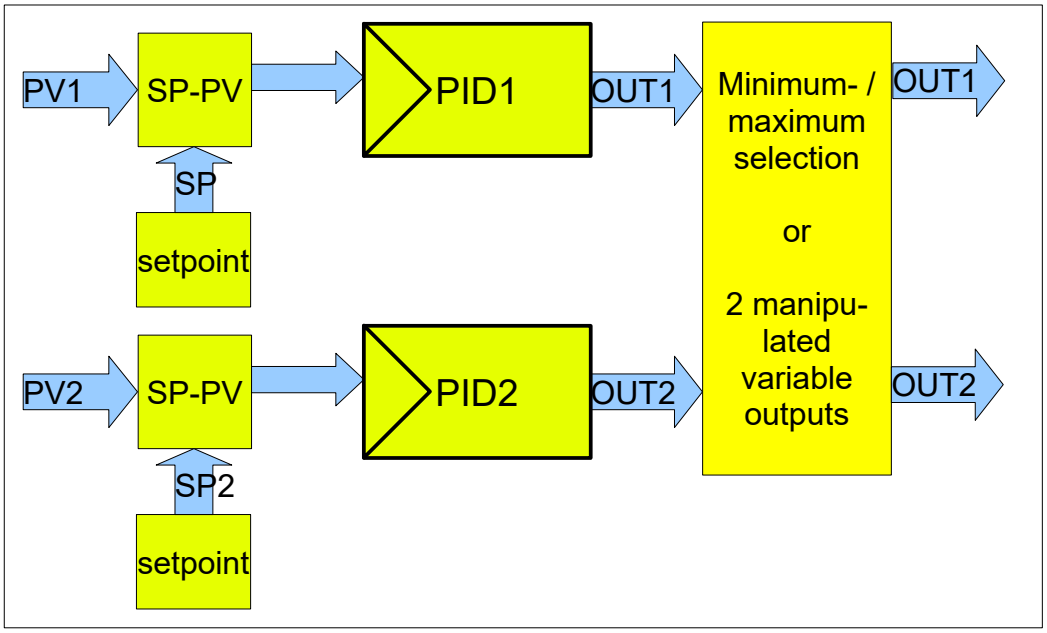
The controller currently displayed can be switched from automatic to manual operation by means of the M/A key. The master and the slave controllers can be switched individually.

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
Kp = proportional gain
OP1 = operating point
C6 = correction factor
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

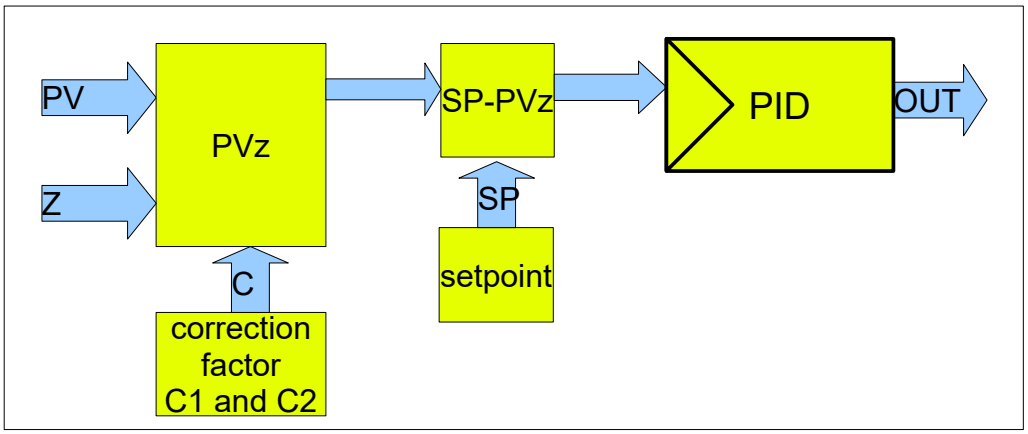
Changing over the input gives you the option of measuring the process variable on analogue input 1, 2 or 3 (function 5.5). This selection can be permanent, or determined via a digital input. You can therefore, for example, choose between two sensors or measuring inputs (e. g. Pt100, mA).

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

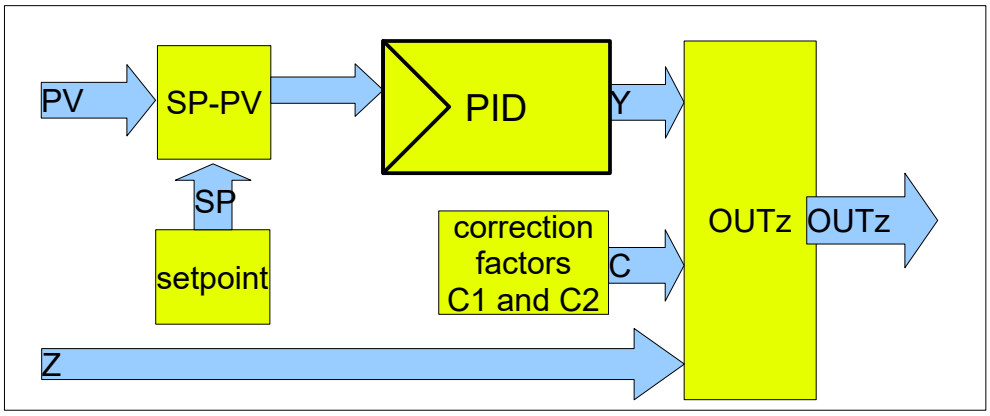
C8 = function 1.40

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 setpoint 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 setpoint.
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 setpoint is set to the same value as the process variable. Any change in the process variable is reflected immediately in the setpoint. When the controller is reset to automatic mode, the setpoint 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 setpoint controller, the local setpoint is set to the same value as the remote setpoint. The changeover can take place using the structure menu or via digital inputs.

6.20. Direct Setpoint Adjustment

You can adjust the currently active setpoint directly using the ▲ and ▼ keys (function 5.25) or setpoint 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 setpoint and the parameter set.
- An input switch-over using digital inputs causes a setpoint switch-over. Setpoint SP1 is assigned to analogue input 1 and setpoint SP2 to analogue input 2. A remote setpoint 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 setpoint. A remote setpoint 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 bargraph 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 setpoint is equal to the master controller output.
- The slave controller setpoint is equal to his process value.
- The slave controller setpoint is equal to the last master controller set-point. If the master controller is used with an external setpoint, 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 setpoint. 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. Setpoint Parameters

7.3.1. Setpoint start value

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

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

You specify a lower limit for the setpoint setting range. This setting also applies to remote setpoints.

7.3.2. Setpoint full scale value

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

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

You specify an upper limit for the setpoint setting range. This setting also applies to remote setpoints.

7.3.3. Setpoint

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

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

Hier kann der zur Zeit aktuelle Sollwert eingestellt werden.

7.3.4. Safety setpoint

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 setpoint* (see page 40). When this input is activated, the controller switches to the specified safety setpoint.

7.3.5. Setpoint 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 setpoint ramp also works when a remote setpoint 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 set 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. Setpoints (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 setpoints. They are chosen with the digital inputs. The highest setpoint 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 setpoint 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 parameterised 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.
Setpoint	The setpoint 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.
Setpoint	The active setpoint 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 ±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 parameters 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 Splitrange

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

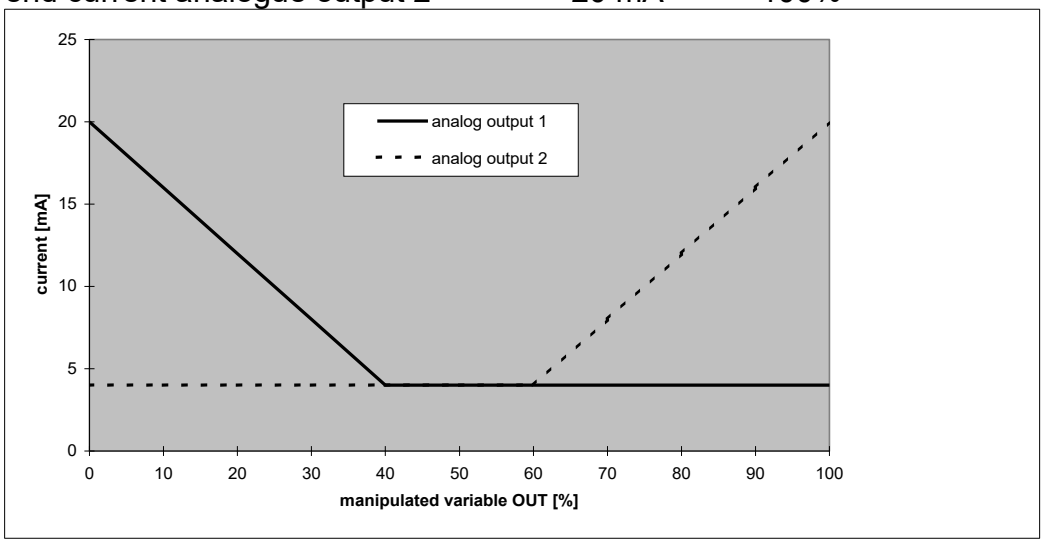
In the parameter start value you set the value for manipulated out (shown in the display) as start value for changing the current. The parameter end value is the end value for changing the current.

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

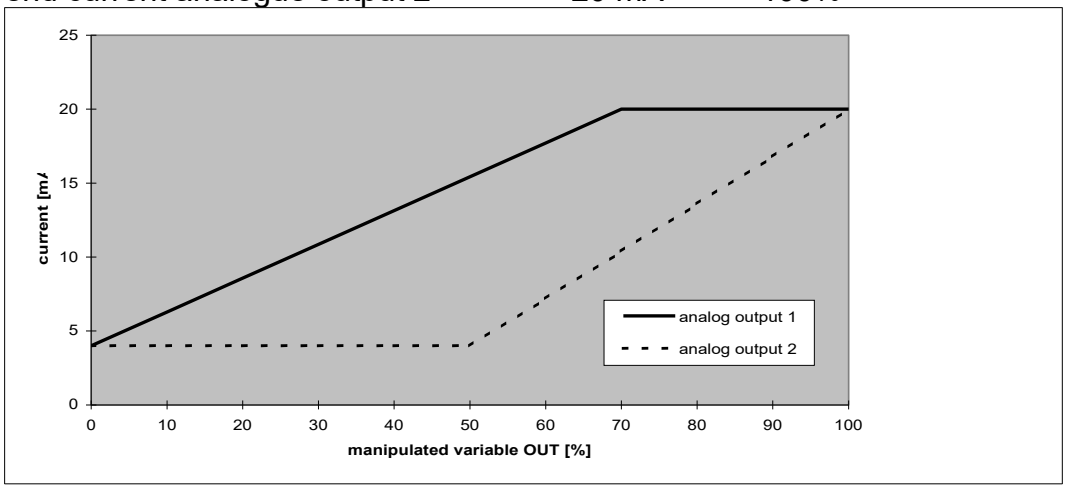
10.1.5.1. Example 1

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%



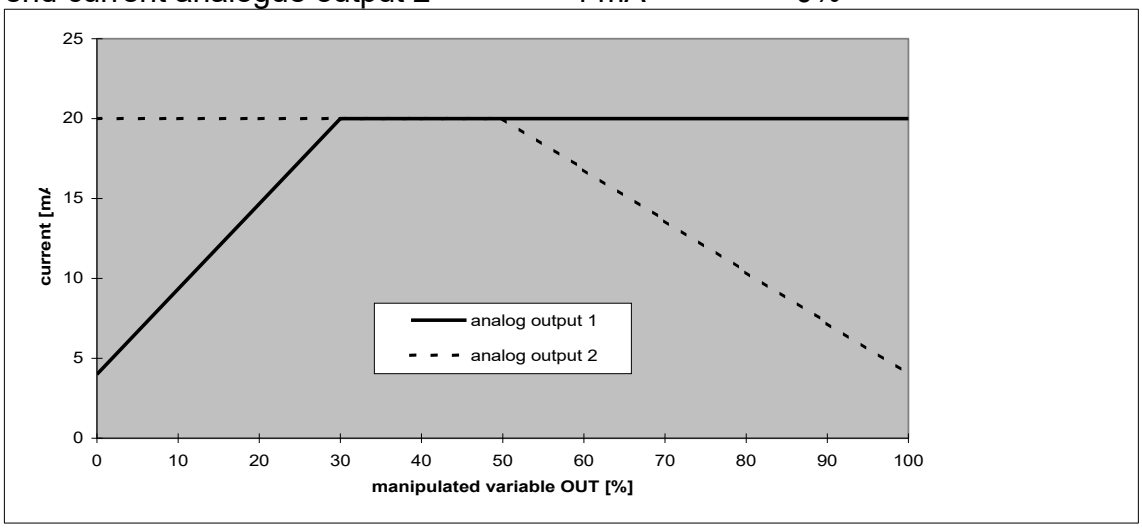
10.1.5.2. Example2

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 setpoint on	The digital input activates the safety setpoint.
8	Block setpoint	The digital input blocked the setpoint. This function is not usable for the remote setpoint controller.
9	Setpoint ramp on	see parameter menu section 7.3.5
10	Stop setpoint ramp	The digital input stops an active setpoint ramp. The setpoint 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 setpoint controller on	The digital input switches from local setpoint controller to remote setpoint controller. One analogue input must be set to external setpoint (see structure list section Fehler: Verweis nicht gefunden)
19	Internal setpoint on	The digital input activates the internal setpoint SP1 to SP6. Digital input 1 switch only SP1, digital input 2 only SP2
20	Setpoint program pause finished	The digital input 2 switches the program during a pause to the next segment.
21	Start setpoint program	The digital input 3 starts the program.
22	Stop setpoint program	The digital input 4 stopped the program.
23	Reset setpoint program	The digital input 5 restarts the program.
24	Release setpoint 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	Setpoint ramp active	The digital output indicates if a setpoint ramp is active.

	Function	Description / Remark
6	Setpoint program active	The digital output indicates an active programmer.
7	Remote setpoint active	The digital output indicates if the remote setpoint 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. Setpoint Ramp Program

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

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

If the controller is switched to manual mode at active setpoint profile, the setpoint 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).

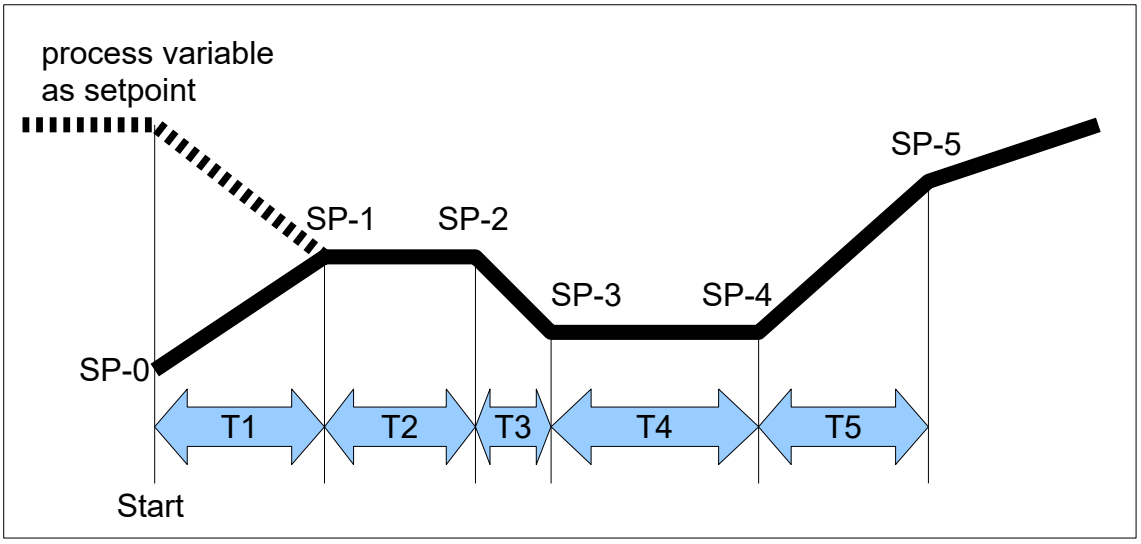
You can interrupt the program ramp with digital inputs. The digital input stopped the program function of the controller. If the program is stopped, the upper display flashes PAUSE with the setpoint within one second. If the digital input goes back, the ramp starts independently from the stop point.

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 Fehler: Verweis nicht gefunden).



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 setpoint 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. Setpoint Start Initialisation

Function 9.x.1: Start setpoint ramp

You set the start value for the setpoint.

12.7.1.1. Start setpoint fixed

The start setpoint is set in parameter SP-0.

12.7.1.2. Current setpoint as start setpoint

Der aktuelle Sollwert wird als Startsollwert genommen.

12.7.1.3. Process variable as start setpoint

The process variable is used as the start setpoint (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 Setpoints

Funktion 9.7.3...: setpoint x

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

You can enter 17 setpoints 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 setpoints ramp up to the next setpoint 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 setpoint.

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:	
set controller type	5.1	6.1	
local setpoint controller		6.1.1	
ratio controller		6.1.3	
difference controller		6.1.4	
manual / automatic station		6.1.5	
cascade controller		6.1.6	
double loop controller		6.1.7	
operating point	5.2	6.2	
fixed operating point		6.2.1	
tracked by the output		6.2.2	
operation point = setpoint		6.2.3	
tag number 1	5.3	6.3	
tag number 2	5.4		
select process variable 1	5.5	6.4	
analogue input 1			
analogue input 2			
analogue input 3			
switched by digital inputt			
select process variable 2	5.6	6.4	
analogue input 1			
analogue input 2			
analogue input 3			
disturbance correction input	5.7	6.5	
OFF			
from analogue input 1			
from analogue input 2			
from analogue input 3			
disturb. correction output	5.8	6.6	
OFF			
from analogue input 1			
from analogue input 2			
from analogue input 3			
remote setpoint 1	5.9	6.7	
OFF			
from analogue input 1			
from analogue input 2			
from analogue input 3			

Function	No.	see:	
remote setpoint 2. channel	5.10	6.7	
OFF			
from analogue input 1			
from analogue input 2			
from analogue input 3			
remote manipulated variab.	5.11	6.8	
OFF			
from analogue input 1			
from analogue input 2			
from analogue input 3			
remote output limiting	5.12	6.9	
OFF			
from analogue input 1			
from analogue input 2			
from analogue input 3			
output 2 channel controller	5.13	6.10	
minimum manipul. variable			
maximim manipul. variable			
both manipul. variables			
restart manipulated variab.	5.14	6.11	
start-up manipul. variable			
last manipulated variable			
time setpoint ramp	5.15	6.12	
over setpoint range			
over setpoint change			
time base setpoint ramp in	5.16	6.13	
seconds			
minutes			
interruption setpoint ramp	5.17	6.14	
OFF			
ON			
d term calculation	5.18	6.15	
to control difference			
to process variable change			
sensor break AI1	5.19	6.16	
OFF			
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:	
Kp1 proportional gain 1	1.1	7.1.1	
Kd1 derivative action gain 1	1.2	7.1.2	
Tn1 integral action time 1	1.3	7.1.3	
OP1 operating point 1	1.4	7.1.4	
Tv1 derivative action time 1	1.5	7.1.5	
unit 1	1.6		
decimal point range 1	1.7	7.2.2	
start of scale value1	1.8	7.2.3	
full-scale value1	1.9	7.2.4	
setpoint start value 1	1.10	7.3.1	
setpoint full-scale value 1	1.11	7.3.2	
active setpoint	1.12	7.3.3	
safety setpoint	1.13	7.3.4	
setpoint ramp time	1.14	7.3.5	
manipulated out. start value	1.15	7.4.1	
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	
start-up manipul. output	1.19	7.4.5	
manipul. out changing time	1.20	7.4.6	
sensor break minimum limit	1.21	7.5.1	
sensor break maximum limit	1.22	7.5.2	
sensor break time delay	1.23	7.5.3	

Function	No.	see:	
filter analogue input 1	1.24	7.6	
filter analogue input 2	1.25	7.6	
filter analogue input 3	1.26	7.6	
internal setpoint 1	1.27	7.7	
internal setpoint 2	1.28	7.7	
internal setpoint 3	1.29	7.7	
internal setpoint 4	1.30	7.7	
internal setpoint 5	1.31	7.7	
internal setpoint 6	1.32	7.7	
disturbance variable multiplier C-1	1.33	7.8.1	
disturbance variable additive C-2	1.34	7.8.2	
ratio control constant C-3	1.35	7.8.3	
minimum dynamic output limiting C-4	1.36	7.8.4	
maximum dynamic output limiting C-5	1.37	7.8.5	
Factor OP= C-6*SP	1.38	7.8.6	
disturbance variable factor C-7	1.39	7.8.1	
disturbance variable additive C-8	1.40	7.8.2	
Cooling unit after-run	1.41	7.8.7	
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:	
analogue outputs	4.1	10.1	
function analogue output 1	4.1.1		
manipulated variable			
anlog input 1			
anlog input 2			
anlog input 3			
setpoint			
control difference			
start value 1 splitrange	4.1.2	10.1.1	
end value 1 splitrange	4.1.3	10.1.2	
start current 1 splitrange	4.1.4	10.1.3	
end current 1 splitrange	4.1.5	10.1.4	
function analogue output 2	4.1.6		
manipulated variable			
anlog input 1			
anlog input 2			
anlog input 3			
setpoint			
control difference			
start value 2 splitrange	4.1.7	10.1.1	
end value 2 splitrange	4.1.8	10.1.2	
start current 2 splitrange	4.1.9	10.1.3	
end current 2 splitrange	4.1.10	10.1.4	

Function	No.	see:	
digital inputs	4.2	10.2	
function digital input 1	4.2.1	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 1			
direction of action dig. in. 1	4.2.2	10.2.2	
normally open			
normally closed			

Function	No.	see:	
function digital input 2	4.2.3	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 2			
SP program pause finished			
direction of action dig. in. 2	4.2.4	10.2.2	
normally open			
normally closed			

Function	No.	see:	
function digital input 3	4.2.5	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 3			
start setpoint program			
direction of action dig. in. 3	4.2.6	10.2.2	
normally open			
normally closed			

Function	No.	see:	
function digital input 4	4.2.7	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 4			
stop setpoint program			
direction of action dig. in. 4	4.2.8	10.2.2	
normally open			
normally closed			

Function	No.	see:	
function digital input 5	4.2.9	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 5			
reset setpoint program			
direction of action dig. in. 5	4.2.10	10.2.2	
normally open			
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 strat	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	
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 Prrogram 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 Ouput 1 0%	6.7	3.2	
Analogue Ouput 1 100%	6.8	3.2	
Analogue Ouput 2 0%	6.9	3.2	
Analogue Ouput 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			

Index