HAEHNE

General Operating Manual

Digital Controller Module DCM

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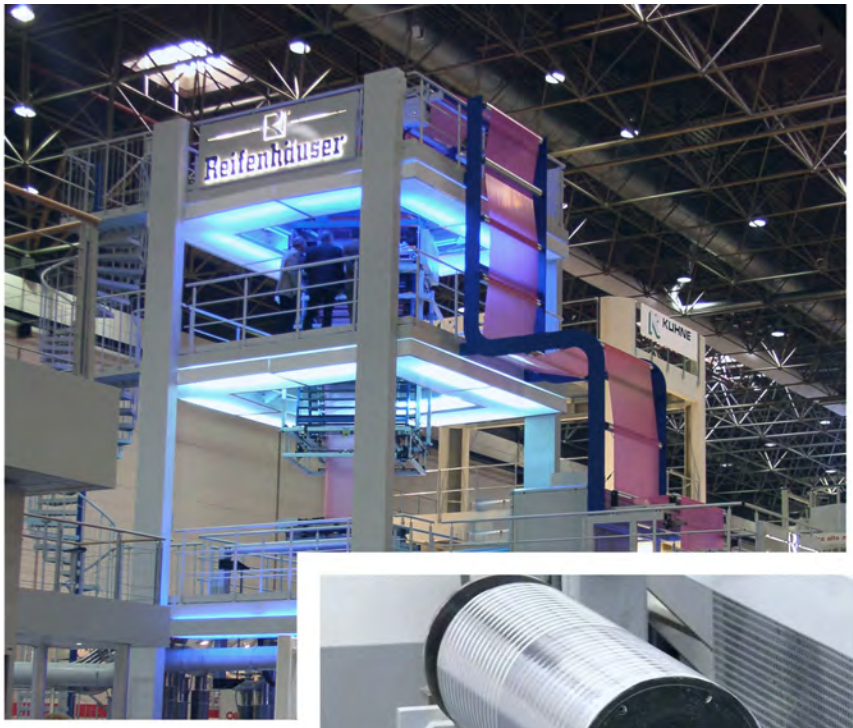
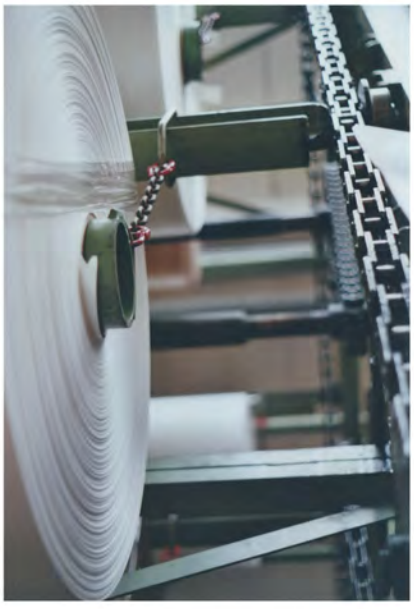
1. System Description

The DCM is a complete multi-functional unit, an optimal solution for the processing of force signals. Via the two amplifier inputs, two force measurement channels are made available and can be modified with additional process parameters. The calculation of averages or the wrap angle correction are only two such modifications. The signal processor calculates even complex functions in a very short cycle time, e.g. the analysis of X-Y-signals. The major application is the use as Web Tension Controller. The DCM supersedes the analog controller module MAC and offers additional special functions. A number of different control models are programmable or modifications of the controller behavior are possible through the knowledge of winding diameter or web velocity.

Several Applications of Web Tension Measurement



Blown Film Lines



Calander

Tissue Machine

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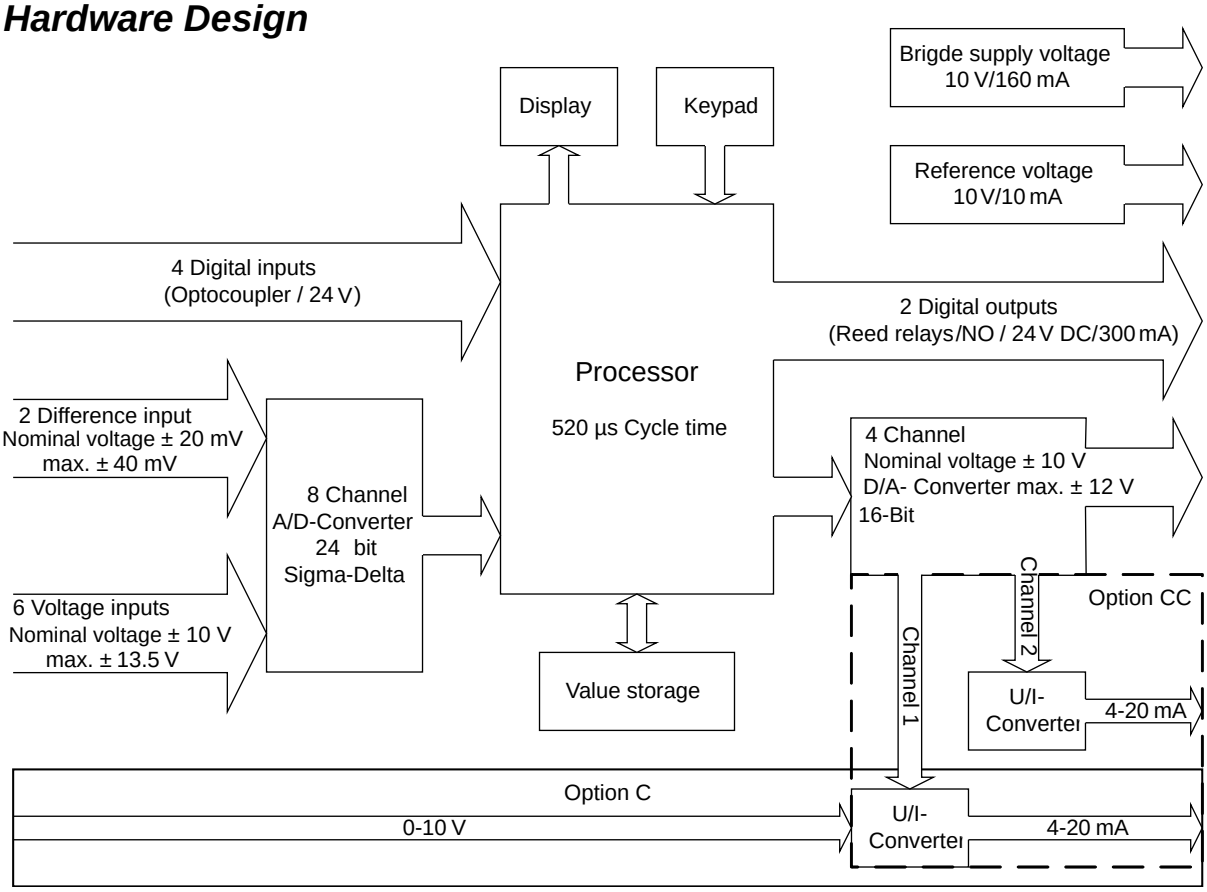
2. Hardware Design



The DCM is an application oriented combination of functional units with the digital signal processor as core unit.

Analog Inputs

Of the eight inputs two can be configured as amplifier differential inputs for the connection of strain gauge sensors. The six remaining inputs accept +/--10 V signal voltages. The sensors are powered with 10 V / 160 mA VDC. A 10 V / 10 mA output is available as reference voltage. This can be used e.g. for external potentiometers.

Digital Inputs

Four galvanically isolated 24 V inputs are available for control functions.

CPU

The core of the DCM is a Digital Signal Processor with the corresponding programs. The process has a cycle time of 520 µs. In one cycle all eight signals available in the A/D converter are read, processed and issued with 16 bit resolution after conversion in a four channel D/A converter. Parallel in the same cycle is the conversion of the eight analog input signals in the 24 Bit-Sigma-Delta-Converter into digital signals. These are now available in the next cycle for further processing.

Analog Outputs

Four +/-10 V outputs can be configured as required with regard to functions and designation

Additional current outputs are available as options C and CC. In case of option C a voltage-current converter is also available. This converter transforms each standard signal 0 - 10 V in an 4 - 20 mA signal and can be arbitrarily assigned to any signal via an external terminal. In case of option CC two 4 - 20 milliamps outputs are permanently assigned to the first and second voltage output.

Digital Outputs

The two digital outputs are designed as Reed relays in the version SPNO. Based on the very short reaction time of 1 msec very fast acting limit switches can be realized.

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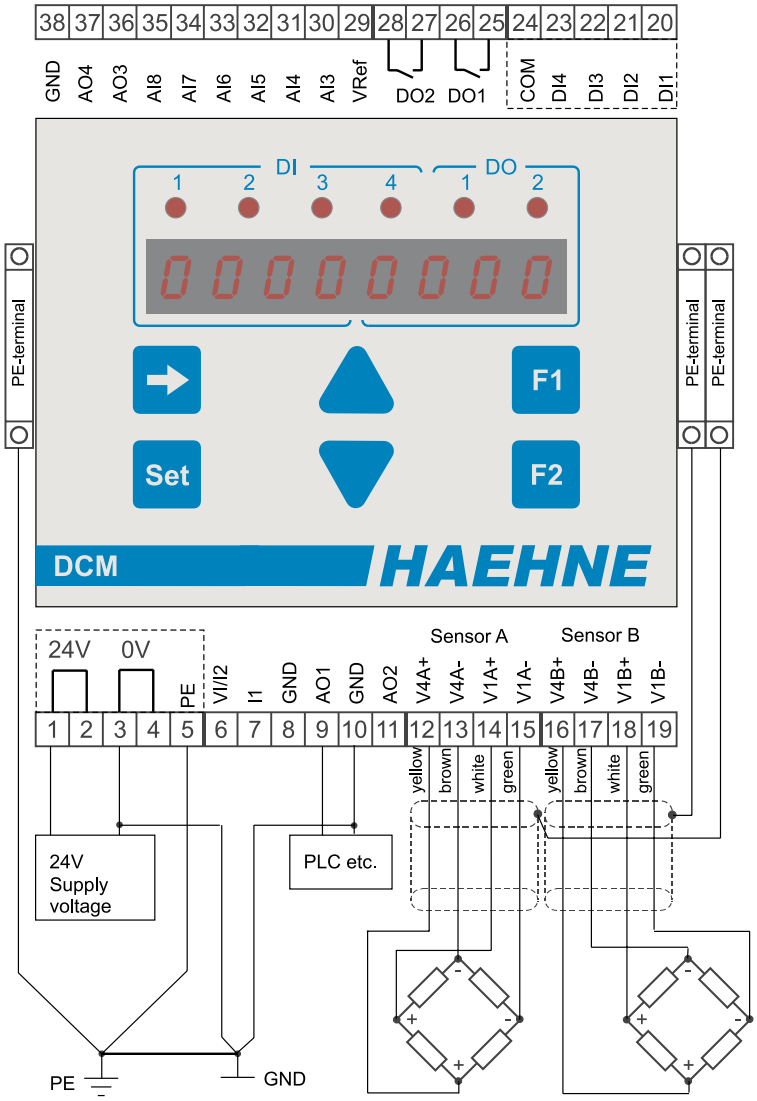
3. Terminal Assignment



Terminal No	Description
1 and 2	24 V Supply voltage
3 and 4	0 V Supply voltage
5	PE-Connction
6	Option C: Voltage input for U/I-converter
	Option CC: Current output channel 2
7	Option C: Current output U/I-Converter
	Option CC: Current output channel 1
8	Reference for terminals 6 a. 7
9 and 11	Voltage outputs AO1 a. AO2 +-10 V
10	Reference for terminals 9 a. 11

Terminal No	Description
12/13	Bridge supply voltage 10 V (5 V Option J) sensor A
14/15	Signal voltage sensor A
16/17	Supply voltage 10 V (5 V Option J) Sensor B
18/19	Signal voltage sensor B
20-23	Digital inputs DI1-DI4
24	Reference of digital inputs COM
25-28	Digital outputs DO1 u. DO2 (NO)
29	Reference voltage 10 V based on GND
30-35	Voltage inputs AI3 - AI8 +-10 V
36-37	Voltage outputs AO3 u. AO4 +-10 V
38	Reference for terminals 29-37 GND

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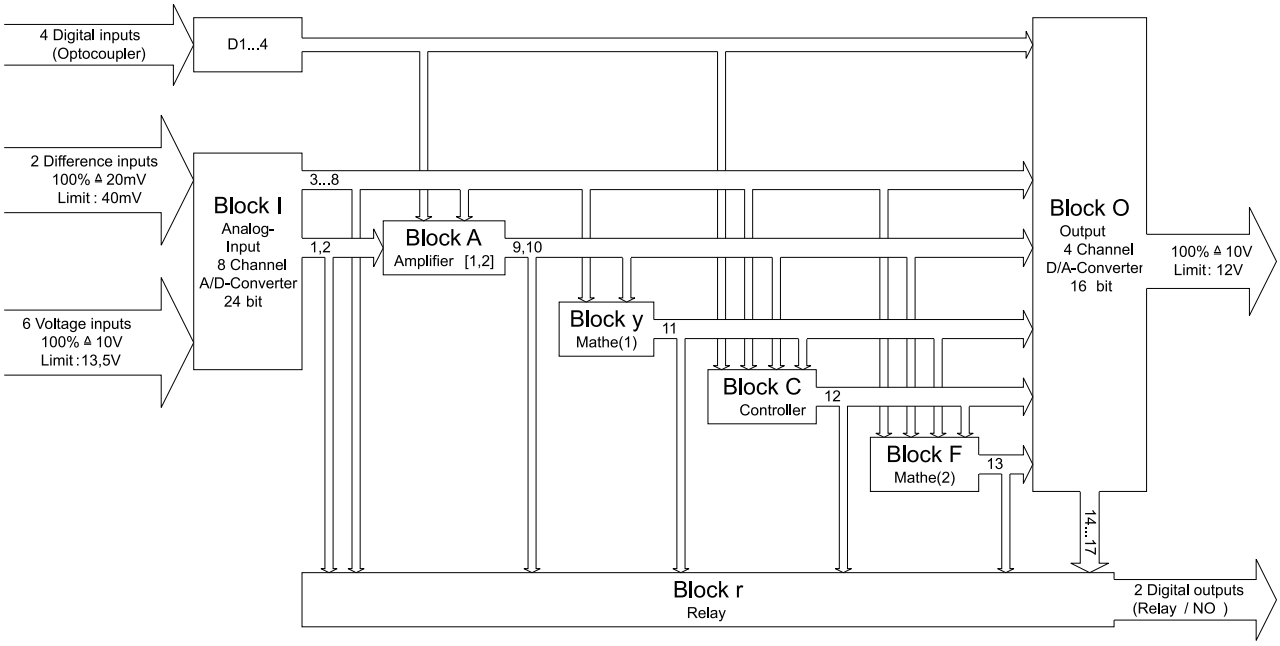
4. Software Design



4.1. Functional Blocks

The software of the DCM is designed in blocks. These blocks are independently working functional units which can therefore be independently configured and their inputs and outputs can be assigned at will.
All outputs can be visualized via the display. This simplifies fault diagnostics in customer equipment, e. g. the raw data signals of the sensor signals can reviewed without a measuring instrument.

Block I - 8 Signal Input

In this block the filter behavior of the individual analog inputs can be adjusted independently of each other, which e.g. makes the processing of very noisy signals possible.

Block A - 2 Amplifiers

This block is used to adjust the amplifier inputs to the different sensors. Here the configuration of the following can be made:

- Zero adjust
- Amplification
- Coupling (a common adjustment for both amplifiers)
- Wrap angle correction

Zero adjust and amplifier adjustment can also be triggered via external signals.

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Block Y - Mathe1

In the Mathematical Function Block 1 (Mathe1) the following general calculations are made:

- Adding function
- Multiplication
- Division
- Analysis two axis sensor
- Scaling

Block C - Controller

This block is designed as PID controller with additional functions especially for web tension measurement. Two actual values can be individually assigned, analyzed and filtered. This is also true for the two set points, in addition, an internal setpoint is available. This selection of the controller polarity (also via external control signals) enables the optimum adjustment to the application under consideration, e.g. unwinding or rewinding. By influencing the setpoint, diameter dependent force control (Taper tension) or roll changing functions can be realized. This controller block can also simulate the functions of the analog controller MAC.
There is a second controller available. Here, the parameter settings of the first controller are mirrored. Each controller has its own actual value, setpoint and output.

Block F - Mathe 2

The sum of eight signals is calculated here. These can be external input signals as well as internal values. By separate adjustment of the scaling, different valuations are possible.

Block O - 4 Analog Voltage Outputs

Independent of each other four analog voltage outputs can be configured here.
This applies to:

- Terminal assignment
- Filter behavior
- Output voltage range
- Peak value storage

Block r - 2 Relay Outputs

Via the independently selectable assignment of external and internal signals, control inform of limit switches with adjustable characteristics or condition monitoring is possible.

Block d - Digital Display

In this block the features of the 8-digits 7-segments display are configured.
Specifically these are:

- Display range (2 x 4 or 1 x 8)
- Scaling (actual value)
- Filter behavior
- Illumination

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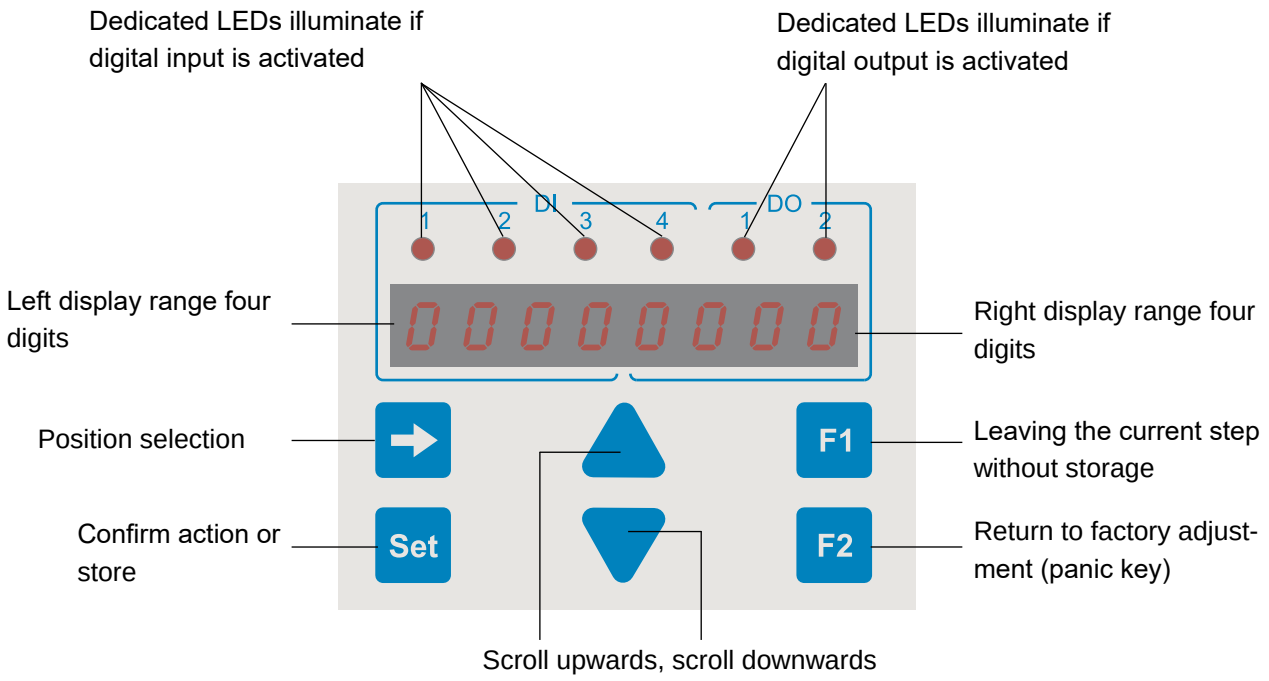
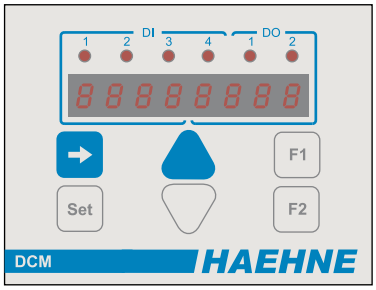
4.2. Set Up



Operating Mode

In the operating mode the previously selected signals are shown in the display in the desired format, e.g. input signals from web tension measurement or output values of certain blocks.
Factory adjustment is displayed after applying power.

Peak Value Mode

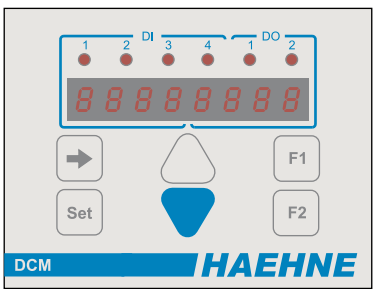


Start
Press ⇨-key for a minimum of 5 seconds, afterwords press the menu key in addition press ▲ or ▼.

The system switches into the peak value display, the number display blinks

Displays
Depending on the pressed key the maximum or minimum values are displayed

Maximum value



Minimum value

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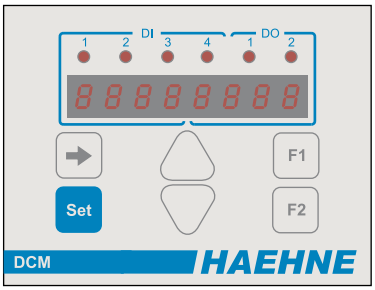
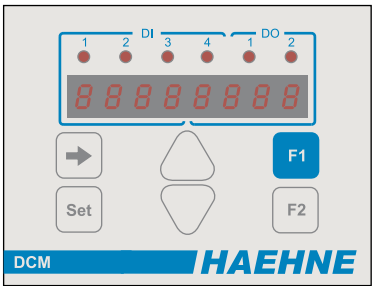


Reset

Pressing the SET-key deletes the displayed peak value; the unit displays the actual value.

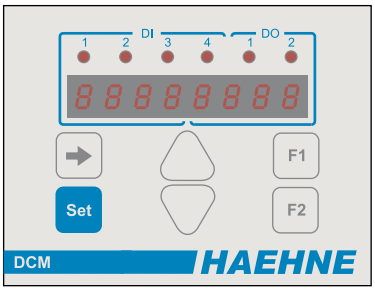


Back

Pressing F1-key switches the unit into the operating mode

Adjustment Mode

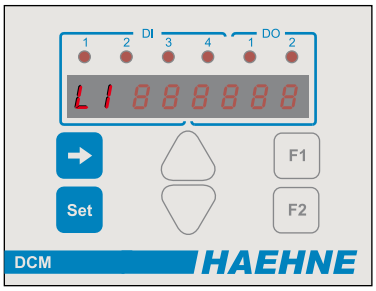
In the adjustment mode parameters are specified or changed. Pressing SET after the input will move them into intermediate storage. Changes of these values in the intermediate storage can be made, e.g. when optimizing the controller under running conditions but can be reversed with the F2-key. This activates the parameters stored in the long-term memory which were previously stored separately for each block.



Start

Press the SET-key for a minimum of 5 seconds,

Afterwards press ⇨-key in addition.



In the adjustment mode the following selections are made sequentially:

1. Level adjustments
2. Password input (if available)
3. Block selection
4. Parameter menu selection
5. Parameter value changes

In each state pressing the up or down keys increases or decreases the value in the blinking position, confirm with SET-key.

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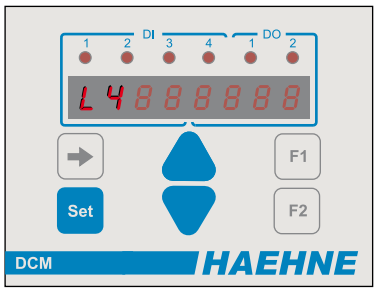


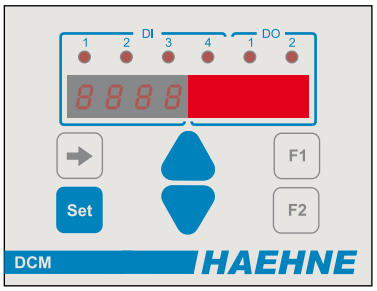
1. Level adjustment

In the left LED field an L is displayed (level adjustment 1... 5).

Presently occupied levels:

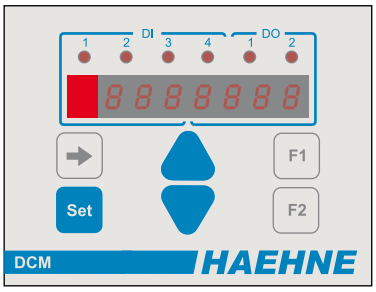
1. Display adjustment
3. Parameter changes
4. Basic adjustment/basic configuration

Level 3 and 4 are protected with individual passwords (3, resp. 4).



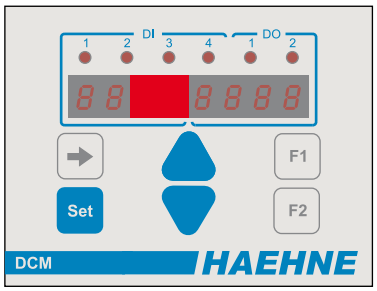
2. Password input

Additional protection regarding faulty input



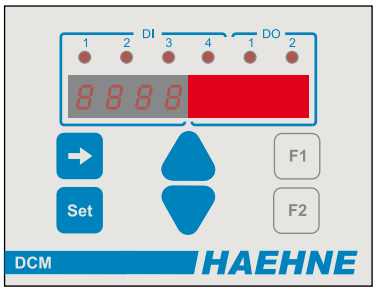
3. Block selection

The blocks I, A, Y, C, F, O, r and d are displayed as letters in the first field of the left display.



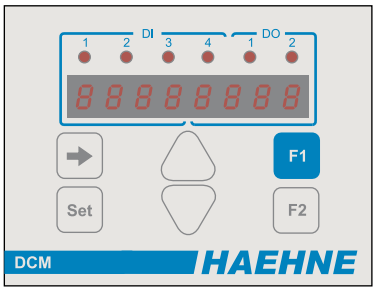
4. Parameter menu selection

As explained in the description of the individual blocks.



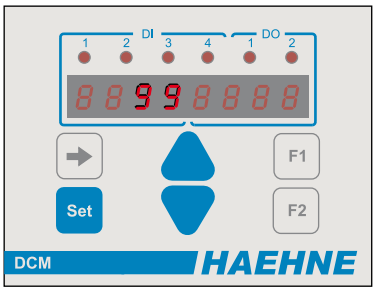
5. Parameter value changes

The value changes are done in real time. This results in a adjustment procedure which is similar to conventional potentiometers



Leaving the mode without storing. The F1-key makes it possible to leave the menu step-by-step at any position

Storing in the Long-term Memory



Changed values have been stored in the intermediate storage by pressing the corresponding SET-key. If these values are now to be moved to the long term memory then in each block the parameter number 99 has to be selected and confirmed twice with the SET-key. Afterwards exit from the menu step-by-step with the F1-key.

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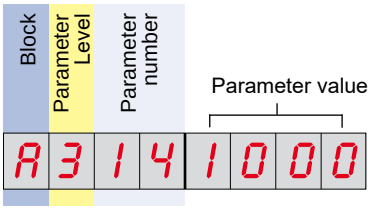
Adjustment Example

Block: A
Level: 3
Amplifier: 1
Manual amplifier adjustment: 4
Amplification factor: 1000

Display



Adjustment step	Modus	Display
	Operting mode	As adjusted in the display menu, e. g. actual force value
Keep SET-key pressed after 5 seconds press ⇨-key in addition	Level adjustment	L100. 0
2x press the ▲-key		L300. 0
confirm by pressing the SET-key	Password input	L300. 0
3x press the ▲-key		L300. 3
confirm by pressing the SET-key	Block selection	I300. 0
1x press the ▲-key		A300. 0
confirm by pressing the SET-key	Parameter menu-selection	A311. 0.0
3x press the ▲-key		A314.666.7
confirm by pressing the SET-key	Parameter value changes	A314.666.7
4x press the ▲-key		A314.1067.
1x press the ⇨-key		A314.1067.
6x press the ▼-key		A314.1007.
1x press the ⇨-key		A314.1067.
7x press the ▼-key		A314.1000.
The F1-key makes it possible to leave the parameter value change without storing		
confirm by pressing the SET-key	Parameter menu-selection	A314.1000.
With pressing the F1-key 3x it is possible to quit the adjustment mode		
To store the settings permanent, the following steps are neccessary		
6x press the ▲-key		A399. 1
confirm by pressing the SET-key	Parameter value changes	A399. 1
confirm by pressing the SET-key		A399. 0
1x press the F1-key		A300. 0
1x press the F1-key		L300. 0
1x press the F1-key	Operating mode	As adjusted in the display menu, e. g. the current force value

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5. Adjustment Instruction

5.1. Sensor Adjustment

As a rule the *HAEHNE* measuring systems do not need calibration. The measuring amplifier is factory calibrated to the specific sensitivity of the *HAEHNE* sensors. If the actually used maximum sensor force is less then the nominal force of the sensor, then it is possible to adjust the amplification with A314 respectively A324.

$$A3x4 = \frac{10000\ [mV]}{\text{Nominal rating of sensor } \left[\frac{mV}{V}\right] * 10\ [V]} * \frac{\text{Sensor nominal force [N]}}{\text{Maximum used sensor force [N]}}$$

In case the actually used maximum sensor force is not known, then it is possible to calculate the amplification automatically with parameters A 313 respectively A323. A reference weight is necessary for this task. In case of web tension measurement an additional rope or cable is necessary to simulate the web geometry.

1. Wire the system according to the application under consideration.
2. Apply power and wait until operating temperature has been reached.
3. Adjust parameters which deviate from the standard adjustment.
4. If the sensor signal is very volatile then it is possible to use filter adjustment I311 respectively I321 to filter the signal.
5. Ensure that the sensor is free of any additional load such as production material webs of foil, paper etc. Only the initial pre-load consisting of the measuring roll including bearings and possibly other accessories should be acting on the sensors.
6. Zero adjust with parameters A311 respectively A312. In most cases the standard value 0.0 should be the correct adjustment. After this adjustment the voltage at the amplifier output is 0 V based on the initial preload.

Approach of Zero adjust with parameter A311	**Mode**	**Display**
	Operating mode	
Keep SET-key pressed after 5 sec. press ⇨-key in addition	Level adjustment	L100. 0
2x press ▲ -key		L300. 0
confirm by pressing the SET-key	Password input	L300. 0
3x press ▲ -key		L300. 3
confirm by pressing the SET-key	Block selection	I300. 0
1x press ▲ -key		A300. 0
confirm by pressing the SET-key	Parameter menu selection	A311. 0.0
confirm by pressing the SET-key	Parameter value changes	A311. 0.0
Press SET-key to activate the zero adjust	Parameter menu selection	A311. 0.0
To store the settings permanently, the following steps are necessary:		
1x press ▼ -key		A399. 1
confirm by pressing the SET-key	Parameter value changes	A399. 1
Press SET-key to store the zero adjust permanently		A399. 0
1x press F1-key		A300. 0
1x press F1-key		L300. 0
1x press F1-key	Operating mode	

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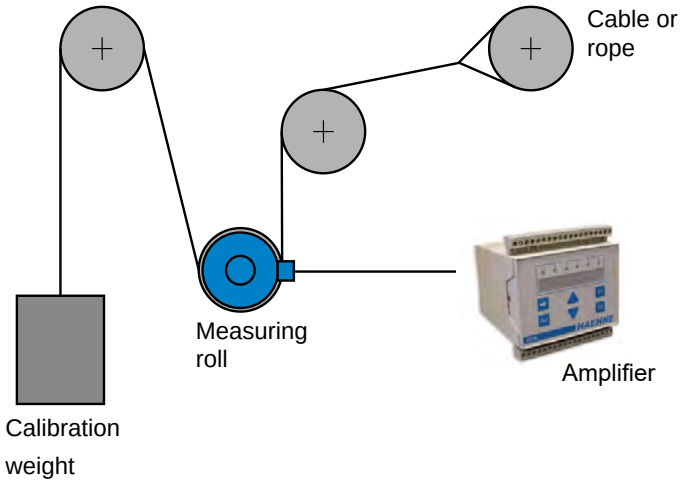
The following adjustments are necessary only if the amplification cannot be calculated:

7. Model the web geometry with a belt or rope in the middle of the measuring roll.
   Please ensure that the Web geometry in front and back of the measuring roll is identical to the operating conditions. The wrapped rolls must turn easily (e.g. not driven rolls).
   Please pay attention so as to not touch any machinery components.

8. Connect one end of the rope to a fixed point. Apply a precisely determined reference weight at the other end of the roll. The weight force should be 70 to 100% of the nominal force.

9. Under parameters A313 respectively A323 the percent value of the reference weight in relation to the maximum force. After adjustment a voltage is available at the amplifier output which is proportional to the percent value. In case of 100 % of the utilized maximum force the voltage is 10 V.



Alternatively to positions 7. to 9.:
Is the amplification factor known then this value can be entered under parameters A314 and A324.

Example 1

Sensor data: Nominal rating mV/V
Bridge supply voltage: 10 V
(the output signal is therefore 15 mV = 0.015 V at nominal force)

Amplifier output: 10 V at nominal web tension
0 V at zero web tension

$$\text{Gain} = \frac{10\text{V}}{0{,}015\ \text{V}} = 666{,}6\bar{6} \approx 666{,}7$$

If the sensor is operating below its nominal force then the amplification must be increased.

Example 2

The maximum sensor load is only 75% of nominal force. The output signal is therefore only:

$$15\ \text{mV} \cdot \frac{75\ \%}{100\ \%} = 11{,}25\ \text{mV}$$

This leads to:

$$\text{Gain} = \frac{10\text{V}}{0{,}01125\ \text{V}} = 888{,}8\bar{8} \approx 888{,}9$$

10. With parameters of the output Block O the signal of downstream systems, e.g. a PLC or a display can be adjusted.

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5.2. Controller Adjustment

In order to achieve an optimal control situation it is necessary to adjust the control parameters to the application under consideration .

1. Take the necessary steps for proper sensor alignment.
2. Use parameters C301 and C302 to adjust desired control range of the controller.

   In case of control applications with a reference input variable, the control range is typically smaller compared to control situations where the controller is required to use the complete scope of the control range. Basic adjustments for the downstream inputs should best be made with parameters in Block O.

   Examples:
   If a motor should turn only in the positive direction then the adjustment 0.00 should be made with parameter O343. If the input section of the downstream PLC does not control values larger than 10 V then the parameter O3x2 should be adjusted to 10.00.
3. In case of control situations with an existing reference input variable the controller lockout should be activated and the motors synchronized. The parameter C343 must be set to 0.0 (standard). Afterwards the controller lockout should be deactivated.
4. Introduce the production material and increase the equipment speed to its nominal velocity. In case of very fast and critical processes it may be necessary to begin operations with less than nominal line velocity.
5. Adjust the set point to the desired value.
6. Increase the proportional portion of the controller with C331 up to the point where the control system begins to oscillate slightly. Afterwards reduce C331 slowly until the closed loop control system achieves stability.
7. Similar as above the integral portion of the controller is decreased with C332 up to the point where the control system begins to oscillate slightly. Afterwards C332 is increased until the closed loop control system achieves ability.
8. In control applications with a present actual line velocity, parameter C335 and C336 are used to adjust the desired behavior with the various existing velocities. In order to ensure that the control system exerts a stronger influence at higher velocities, parameter C335 is used to modify the amplitude of the control system. Parameter C336 is used to adjust the basic value of the control system. This means, that this amplitude results in a minimum of control.
9. If a constant voltage should be issued during controller lockout then parameter in C343 has to be adjusted to this value. This is necessary if a certain holding web tension is desired when braking at standstill.

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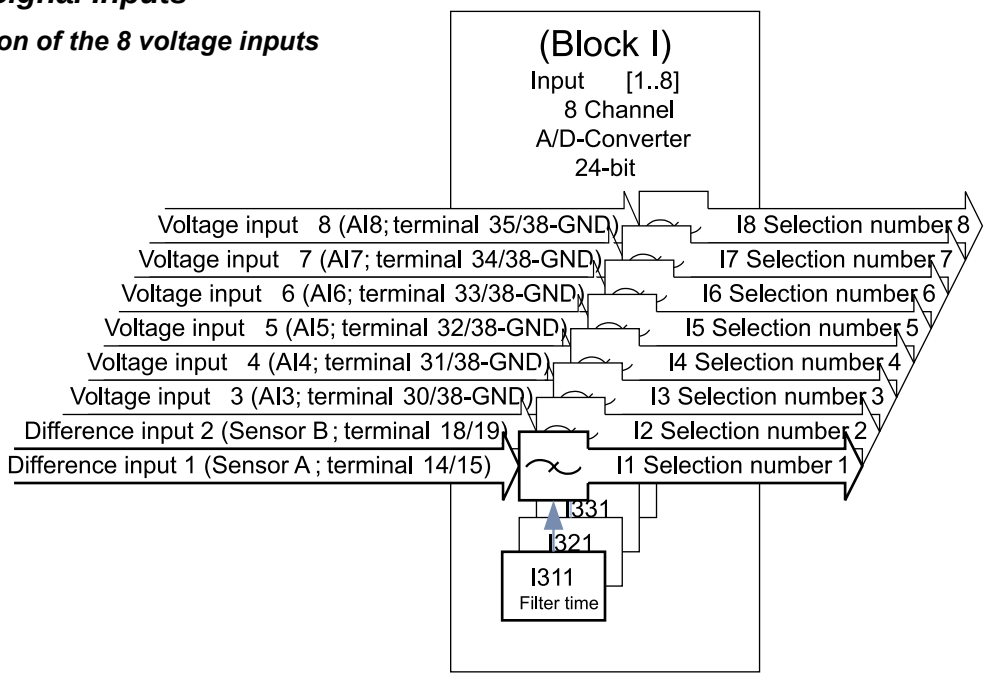
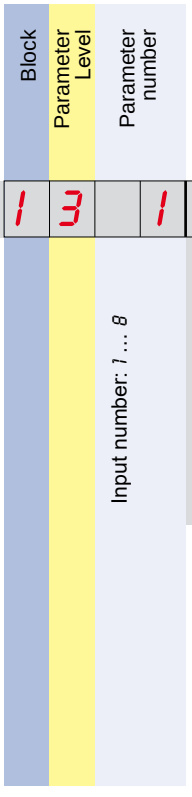
5.3. Explanation of the Individual Blocks

General Consideration "Standardization"
In the following description values are often designated by %. They apply to a virtual nominal value, similar to the 10 V voltage in the analog system. In the digital system of the DCM values above 100% are also possible.

Block I - Signal Inputs

Configuration of the 8 voltage inputs





Filter behavior

1 3 1

Range: 1 …9999
Window of moving averages in msec

1: Filter function not in operation
From the value 52 onwards an additional peak suppression function is activated. However, local peaks do not enter into the calculation of averages. In the following blocks the individual channels can be selected under the selection number 1 ... 8 .

Within the DCM it is possible in the individual blocks to select, in addition to the input filters, also other filter functions. The connection of these functions result in a total filter function.

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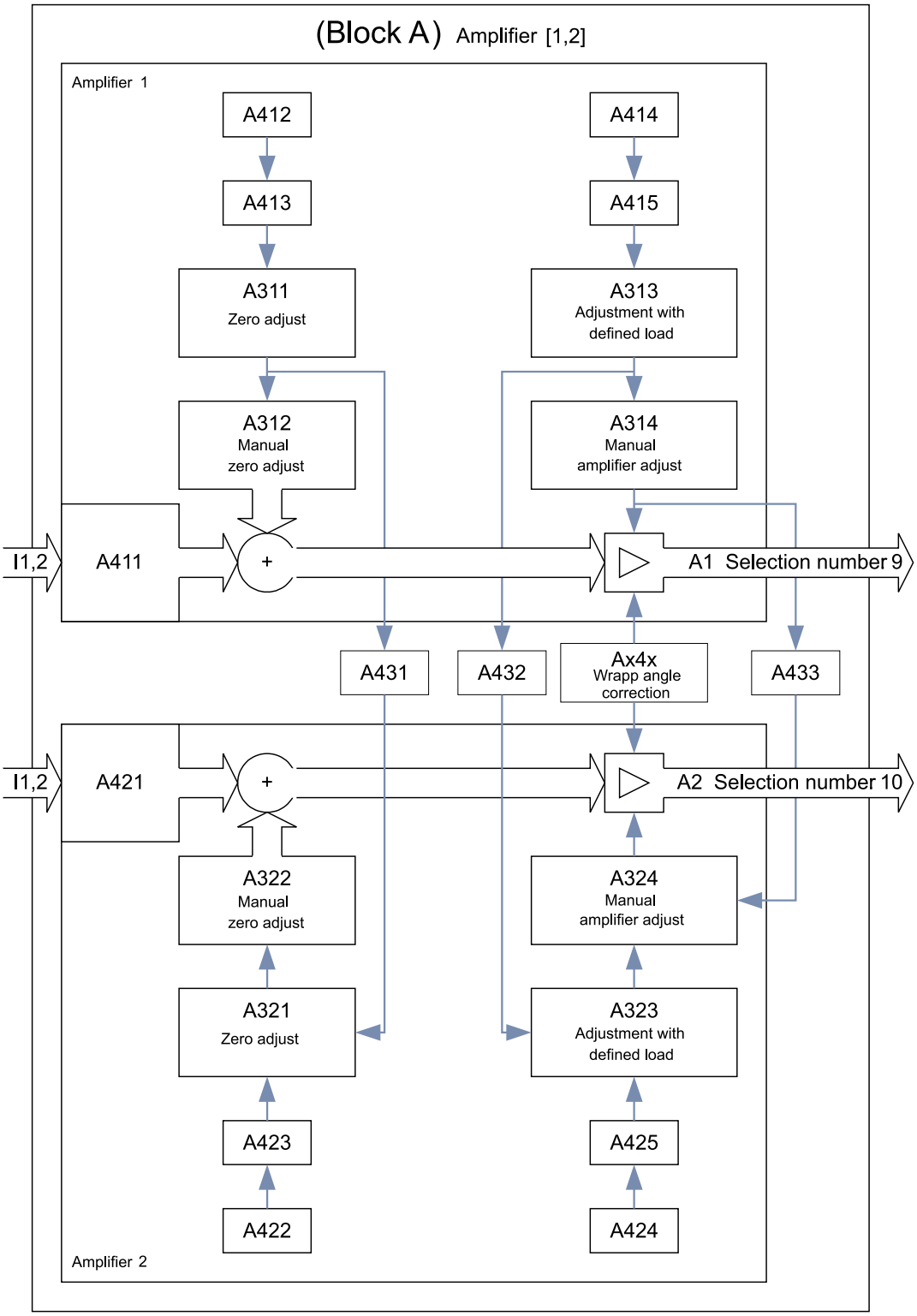
Block A - Amplifier

Configuration of two independent amplifiers



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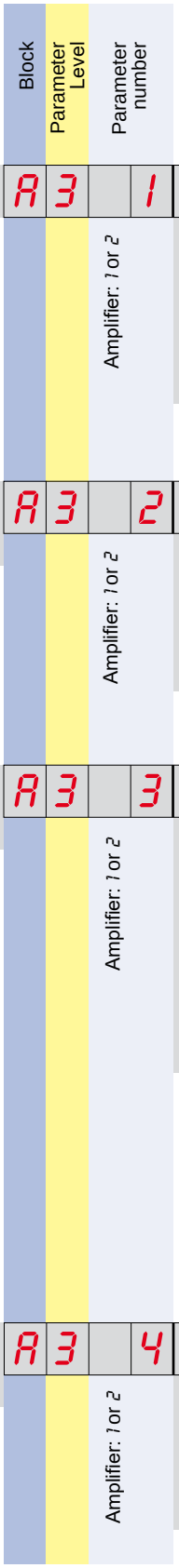

Zero adjust function *)

Range: -10.0 …100.0
Standard: 0.0
Designation in %
In case of the adjustment 0% the output with the actually present input value is set to 0. In case of values other than 0% the output is modified by the adjusted value.

Manual zero adjust function

Range: -200.0 …200.0
Designation in % (100 % is equal 20 mV)
This parameter is used for the input but also for monitoring of the value affected by A3□1, A3□3 or A3□4. This parameter designates the zero adjust displacement of the input signal.

Amplifier adjustment with defined load*)

Range: 10.0 …110.0
Designation in %
Standard: 100.0
The input of the load in % of the standardized signal. The value should be as close as possible to the nominal value. Recommended is a value between 70 and 110 %. The smallest possible value is additionally dependent of parameter A3□1 and must be 10% larger than the smallest value.

Fault conditions

"GainH": calculated amplification is too high
"GainL": calculated amplification is too low
"Zero": actual calibration weight to low

Manual amplification-adjustment (Gain)

Range: 100.0 …30.00 (k)
Amplification factor in V/V
Standard: 666.7
This parameter is used for the input of the amplification factor or for the display of the value calculated by A3□3.

***)** The zero adjust function respectively amplifier adjustment is activated by pressing the SET-key. In order to find the optimal adjustment, value calculation of averages is activated for 200 msec. Input signal should not be changed during this time..

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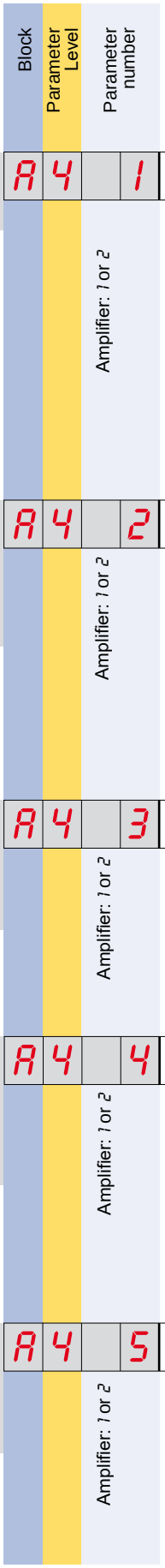

Input designation
(signal source)

Range: 0 …4

0: Amplifier OFF (Standard amplifier 2)
At the output of the amplifier "0" is always supplied
1: I1 (Standard amplifier 1)
2: I2
3: (I1 + I2)/2
4: I1 + I2

External triggering of zero adjust

Selection of control source (desired control input)

Range: 0 …4

0: No triggering (Standard)
1: Control of input D1
2: " D2
3: " D3
4: " D4

External triggering of zero adjust

Logik designation

Range: 0 or 1
Standard: 1

0: Active if 0 V voltage is present at digital input
1: Active if 24 V voltage is present at digital input

External triggering amplifier adjustment

Selection of control source (desired control input)

Range: 0 …4

0: No triggering (Standard)
1: Control of input D1
2: " D2
3: " D3
4: " D4

External triggering amplifier adjustment

Logik designation

Range: 0 or 1
Standard: 1

0: Active if 0 V voltage is present at digital input
1: Active if 24 V voltage is present at digital input

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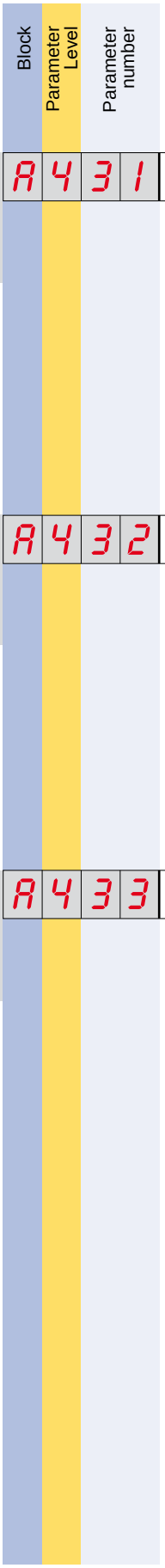

Coupling of zero adjust

From amplifier 2 to 1

A 4 3 1

Range: 0 or 1
Standard: 0

0: OFF Zero adjust of amplifier 1 and amplifier 2 function independently

1: ON Zero adjustment for amplifier 1 made by A311 is automatically active for amplifier 2

Coupling of amplifier adjustment

From amplifier 2 to 1

A 4 3 2

Range: 0 or 1
Standard: 0

0: OFF Amplifier adjustment of amplifier 1 and amplifier 2 function independently

1: ON Amplifier adjustment for amplifier 1 made by A313 is automatically active for amplifier 2

Coupling of manual amplifier adjustment

From amplifier 2 to 1

A 4 3 3

Range: 0 or 1
Standard: 0

0: OFF The amplifcation factor of amplifier 1 and amplifier 2 are independently

1: ON The amplification factors of amplifier 1 and 2 are simultaneously adjusted with A314

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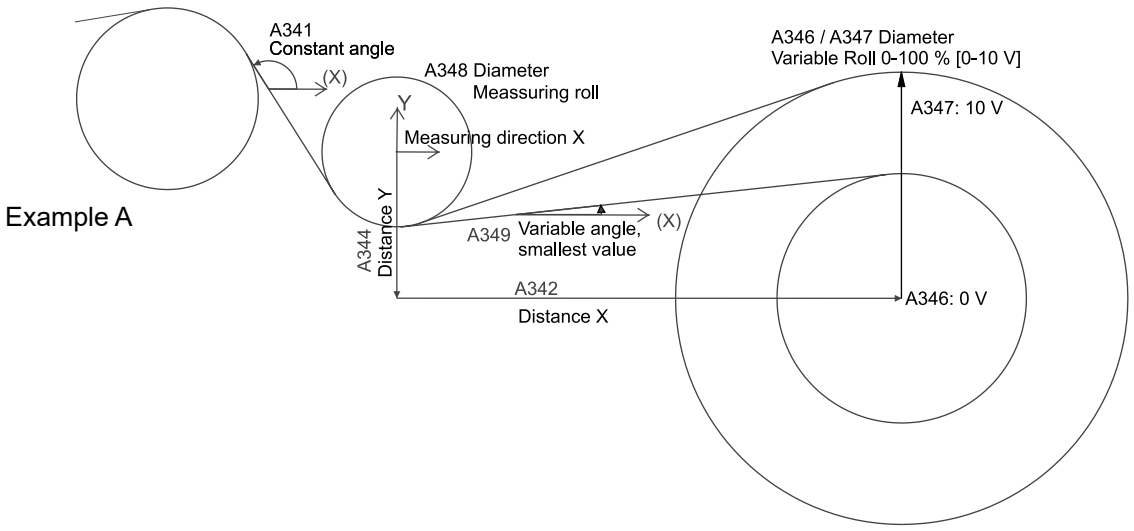
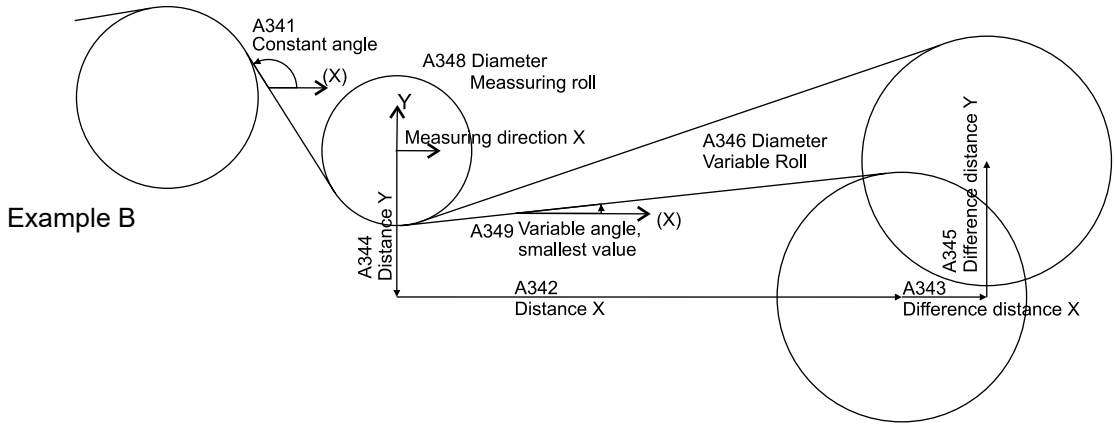
Wrap Angle Correction

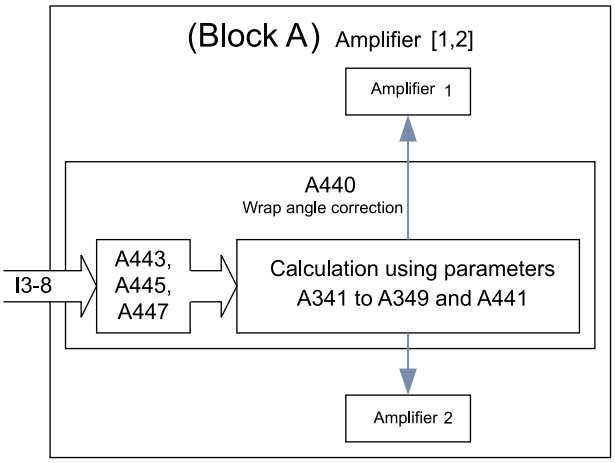
Web tension measurement in running webs by measuring the forces acting on the roll bearings is normally only possible, if the intake and runout angles are known and remain constant. With geometric functions and the knowledge of the web geometry the tension forces acting in the measuring directions can be calculated. However, in rewinding and unwinding stations with constantly changing wrap angles this results in continuously changing forces acting in the measuring direction. In order to ensure that the DCM issue the correct force signal it is necessary to adjust the signal with wrap angle correction calculations in the DCM.
In block A the DCM can compensate for two different sources of single-sided changing geometries. For one there is the change of the roll diameter (Example A) and on the other hand there is the change of the roll position (Example B). The correction factor is determined by the DCM with an additional signal which in Example A is proportional to the roll diameter and in Example B to the change of distance of the rolls. The optimal location of the sensors attached to the measurement roll is one that results in the lowest correction factor. The *HAEHNE* company can provide this information if the details of the application are known.

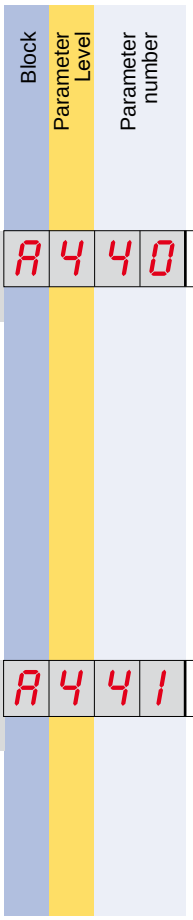




Select the coordinate system in such a way, that the X-axis points in the force measurement direction and the Y-axis measures at the 90° angle to that direction. The parameters which are required are shown in the examples. The angle information refers on the selected coordinate system. All dimensions have to be in the same dimensional units (millimeter, centimeter, inch, etc.). The mathematical signs used (plus or minus) should conform to the selected coordinate system.

20 Block A





Sphere of influence
Wrap angle correction

A440

Range: 0 … 3
Standard: 0

Designation which amplifier is influenced by a wrap angle correction calculations:

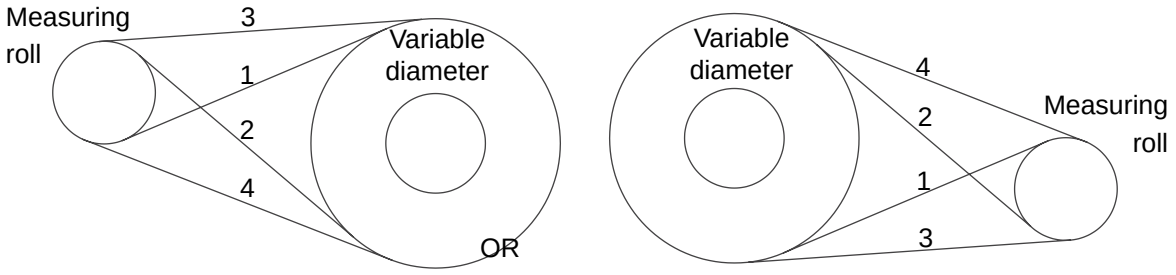
0: Wrap angle correction OFF
1: Amplifier 1
2 Amplifier 2
3: Both amplifiers

Wrap path geometry
Principle characteristics

A441

Range: 1 …4
Standard: 1

Allocation as per diagram below.



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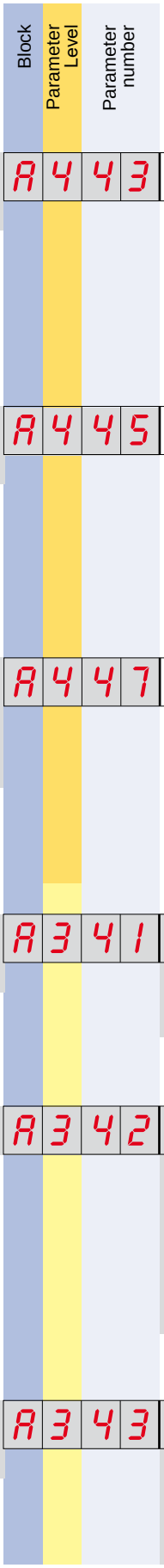

Source
Distance signal X

A 4 4 3

Range: 0; 3 … 8
Standard: 0
Is being used to select the source for the difference distance X.
0: OFF (Distance X is not variabel)
3-8: I3 – I8

Source
Distance signal Y

A 4 4 5

Range: 0; 3 … 8
Standard: 0
Is being used to select the source for the difference distance Y.
0: OFF (Distance Y is not variabel)
3-8: I3 – I8

Source
Diameter signal

Variable diameter roll

A 4 4 7

Range: 0; 3 … 8
Standard: 6
Designation to which input the diameter signal of the corresponding roll is connected.
0: OFF (Diameter of variable roll is not variabel)
3-8: I3 – I8

Constant angle

A 3 4 1

Range: -180.0 …180.0
Standard: 135.0
Angle of the web geometry in relation to the selected coordinate system (X-axis=0°) in degrees.

Distance X

A 3 4 2

Range: -2999 …9999
Standard: 500
X-component of the distance between the variable roll and the measurement roll.
If A443 is ON then the input voltage is 0 V (0 %) based on the source at the distance under consideration.

Scaling
Difference distance X

A 3 4 3

Range: -2999 …9999
Standard: 0
Change of the X-component of the distance if at A443 designated source an input voltage of 10 V (100 %) is present.

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Block | Parameter Level | Parameter number

Distance Y — A344

Range: -2999 …9999
Standard: -100
Y-Component of the distance between the variable roll and the measurement roll.
If A445 is ON then the input voltage is 0 V (0 %) based on the source at the distance under consideration.

Scaling Difference distance Y — A345

Range: -2999 …9999
Standard: 0
Change of the Y-component of the distance if at A445 designated source an input voltage of 10 V (100 %) is present.

Diameter of the variable roll — A346

Range: 0 …9999
Standard: 0
Diameter of the variable roll.
If A447 is ON then the input voltage is 0 V (0 %) based on the source at the distance under consideration.
This can be the minimal diameter or as shown in example A the core of the roll.

Scaling diameter Variable roll — A347

Range: 0 …9999
Standard: 200
Change of the diameter of the variable roll if at A447 designated source an input voltage of 10 V (100 %) is present.

Diameter Measurement roll — A348

Range: 0 …9999
Standard: 100
Diameter of the measurement roll.

Web geometry Variable angle

Minimal value — A349

Range: -180.0 …180.0
Standard: 0.0
Smallest value which the variable angle can assume.

Make the amplifcation adjustment with the smallest angle value in A313; A314; A323; A324!

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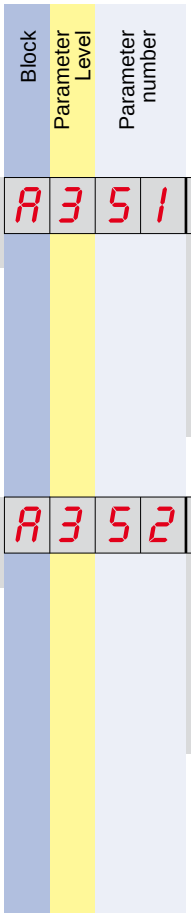

Correction factor Amplifier 1 (PX_Y)

A 3 5 1

Range: -29.99 …99.99
Standard: 0.00
Designation in %

For an attached two axis sensor the dependence of the signal is indicated in X-direction by the load in Y-direction.

Correction factor Amplifier 2 (PY_X)

A 3 5 2

Range: -29.99 …99.99
Standard: 0.00
Designation in %

For an attached two axis sensor the dependence of the signal is indicated in Y-direction by the load in X-direction.

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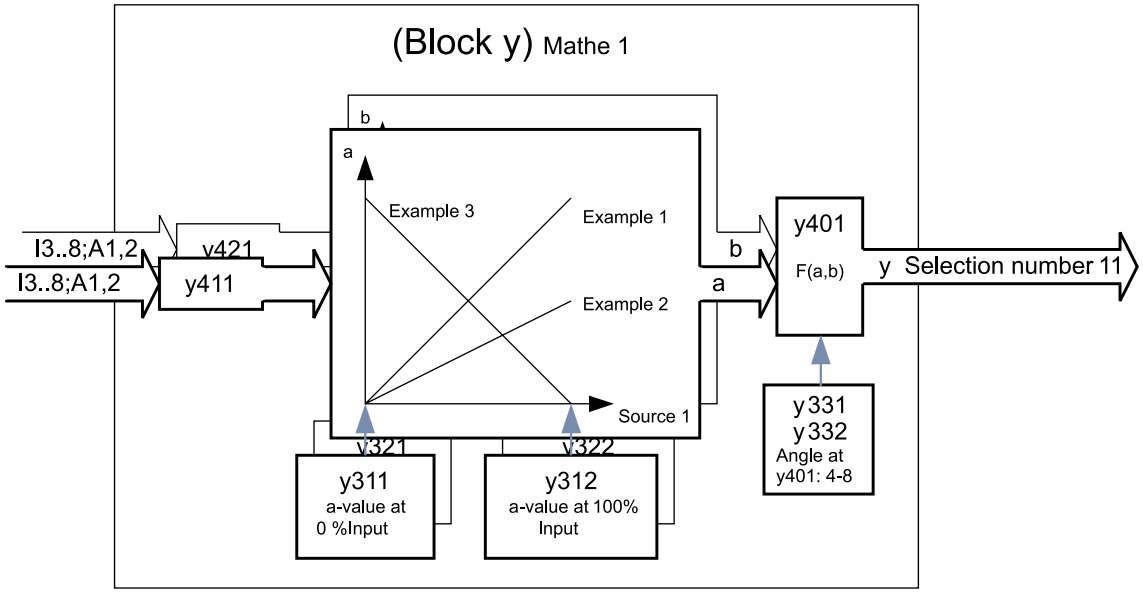
Block Y - Mathe 1

Execution of Special Calculations



	Block	Parameter Level	Parameter number					
Function selection	Y	4	0	1				

Range: 0 …8

0: Mathe 1 OFF (Standard)
"0" is always present at the output of the block

1: Summary function (a+b)

2: Multiplier function (a*b)

3: Divider function (a/b) [1)]

The functions 4-8 analyze the Haehne dual axis sensor. The coordinate system should be selected in such a way that the X-axis points in the X-force direction and the Y-axis is perpendicular in the Y-force direction.

The opening angle cannot exceed 160°

4: Output off the web tension in case of single-sided changing web geometry. The constant intake or runout angles are designated in Y331.

5: Outputs of the web tension in case of changing intake and runout angle and constant enlacement. Fixed opening angle is designated under Y331.

The functions 6-8 of are valid for constant geometries that changing forces as they occur at the driven or a breaked rolls the constant intake angle is designated under Y331 and the constant runout angle is designated under 332.

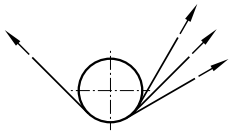
Output as:

6: Intake force

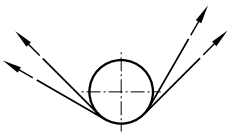
7: Runout force

8: Average between intake force and runout force.

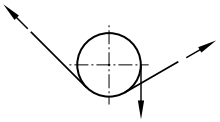
4:



5:



6-8::



[1)] Divide function

If b = 0, then the output values are:

200 % at a > 0

-200 % at a < 0

10 % [1 V] at a = 0

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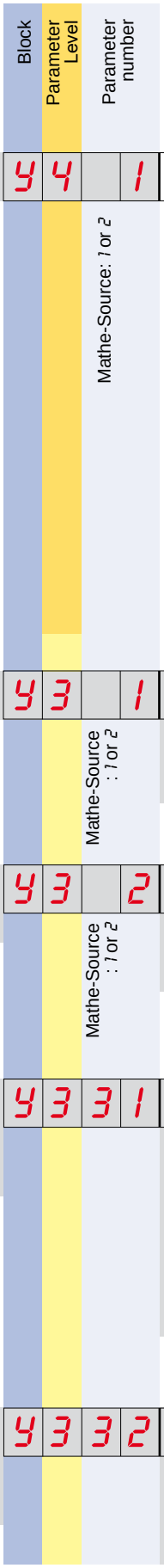

Signal source selection

Range: 3 …10

3 = I3 7 = I7
4 = I4 8 = I8
5 = I5 9 = A1 (Standard for y411)
6 = I6 10 = A2 (Standard for y421)

The input values of both signal sources can be scaled separately. They must be scaled in such a way that the results are still within the permissible range. If one assumes the DCM as an analog system, then e. g. the multiplier function would result in 10 V (100 %) * 10 V (100 %) = 100 V (1000 % !) The results are standardized to 1 V * 1 V= 1 V and 1 V / 1 V = 1 V.
The results are actually limited to ± 200 %.

Scaling at 0-signal

Range: -100.0 …100.0
Standard: 0.0
Designation in %

Output value with 0 % input

Scaling at nominal signal (100 %)

Range: -100.0 …100.0
Standard: 50.0
Designation in %

Output value with 100 % input

Analysis of the dual axis sensor

Constant angle 1

Range: -180.0° …180.0°
Standard: 0°
Designates the first constant angle of the web geometry when analyzing a dual axis sensor.
Functional operation as:
Intake and runout angle at y401: 4
Opening angle at y401: 5
Intake angle at y401: 6-8

Analysis of the dual axis sensor

Constant angle 2

Range: -180.0° …180.0°
Standard: 0°
Max. permissible opening angle at y401: 4
Constant runout angle of web geometry at y401: 6-8

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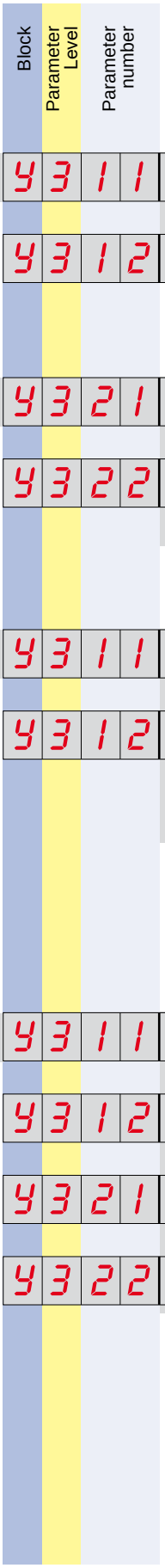
Calculation Examples



Example 1

y311 0.0

y3121 100.0

The values of the Mathe 1 source are passed on unchanged

Example 2

y321 0.0

y322 50.0

All values of the Mathe 2 source are passed on with 50 % of their value. If under y401 the summarizing function was selected, then averages are calculated based on 2 sources.

Example 3

y311 100.0

y312 0.0

The values of Mathe 1 source are inverted. 0 - 10 V results therefore in 10 - 0 V. If the input signal decreases e.g. due to strong influence, even though it should get larger for the calculation, then this adjustment is necessary.

Example 4

y311 0.0

y3121 100.0

y321 0.0

y322 -100.0

The values of the Mathe 1 source are passed on unchanged. The values of the Mathe 2 source are passed on negatively. This summary function (y401) enables the calculation of differences.
For example, differences in the forces acting at the entry of a measuring roll can be determined.

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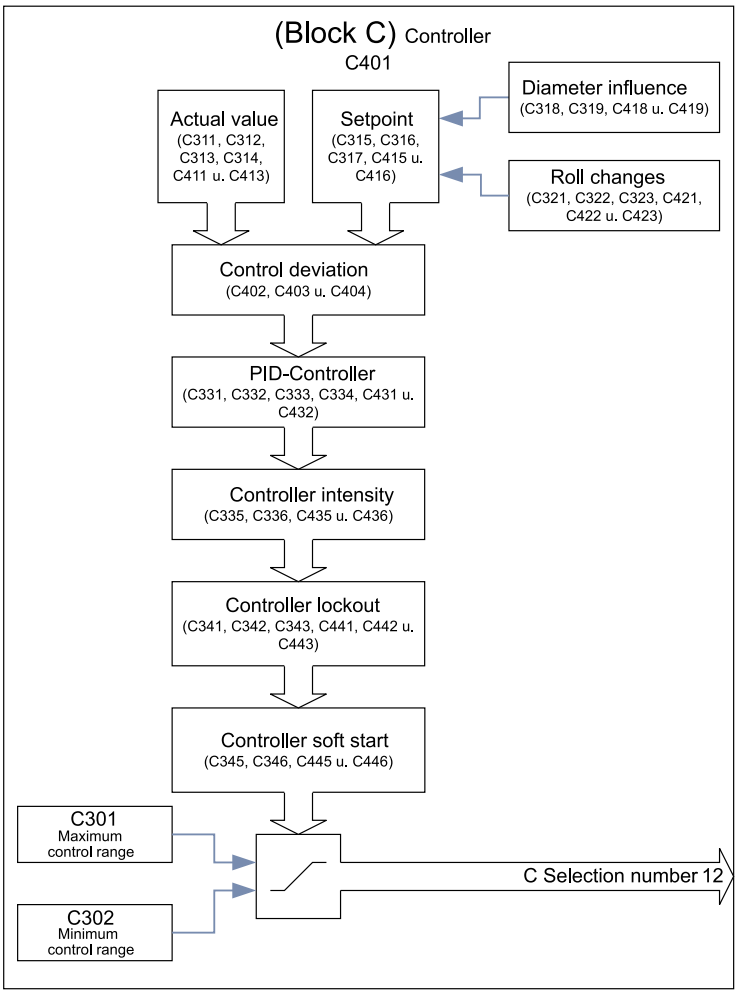
Block C - Controller

Configuration of the Controller



*) C401:2
Selection number 13

Block F (Mathe [2]) not available

Fixed assignment:
Actual value/setpoint 1 for 1st controller
Actual value/setpoint 2 for 2nd controller

The actual and set values are not added. Remaining parameter settings are valid for the first and the second controller at the same time.

	Block	Parameter Level	Parameter number	
Operation control ON / OFF	C	4	01	Range: 0; 1 Standard: 0 0: Controller is OFF, output is 0 1: Controller is operating 2: Additionally second controller in operation *)
Positive control range	C	3	01	Range: 0.0…200.0 Standard: 120.0 Designation in % Maximum output signal of the controller. This is the equivalent to the desired maximum positive influence.
Negative control range	C	3	02	Range: -200.0…0.0 Standard: -120.0 Designation in % Minimum output signal of the controller. This is the equivalent to the desired minimum negative influence.

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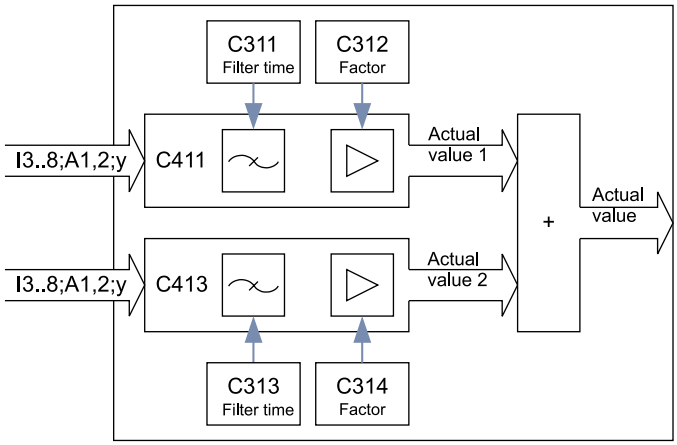
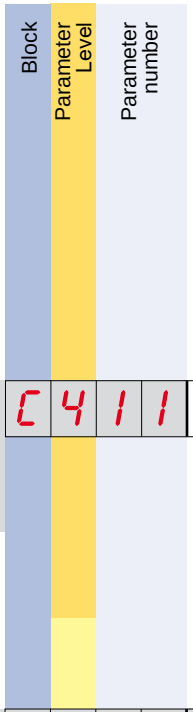
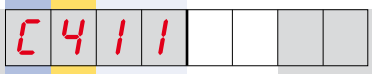
Actual Value





Input designaion Signalsource

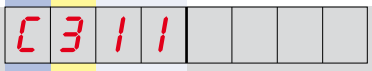
Actual value 1



Range: 0; 3 …11
Standard: 9
0: OFF (Actual value 1=0)
3 …8: I3 …I8
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)

Filter behavior

Actual value 1



Range: 1 …9999 msec
Standard: 1 (Filter OFF)
Value of the moving average in msec.
Starting with the value of 52 an additional peak suppression function is active. However, local peaks do not enter into the average calculation.

Weighting factor

Actual value 1

Range: 0.0 …100.0
Standard: 100.0
Designation in %
This denotes how strong the actual value 1 is weighted. If only one actual value is available then 100.0 % is appropriate. However, if in case of a measurement roll with two separate amplified sensor signals two actual values are available then the actual value here and under C314 are reduced to 50 %. Thereby the two actual values are processed as average.

Input designation Signalsource

Actual value 2

Range: 0; 3 …11
Standard: 0
0: OFF (Actual value 2=0)
3 …8: I3 …I8
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)

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Block | Parameter Level | Parameter number

Filter behavior

Actual value 2

C313

Range: 1 …9999 msec
Standard: 1 (Filter OFF)
Value of the moving average in msec.
Starting with the value of 52 an additional peak suppression function is active. However, local peaks do not enter into the average calculation.

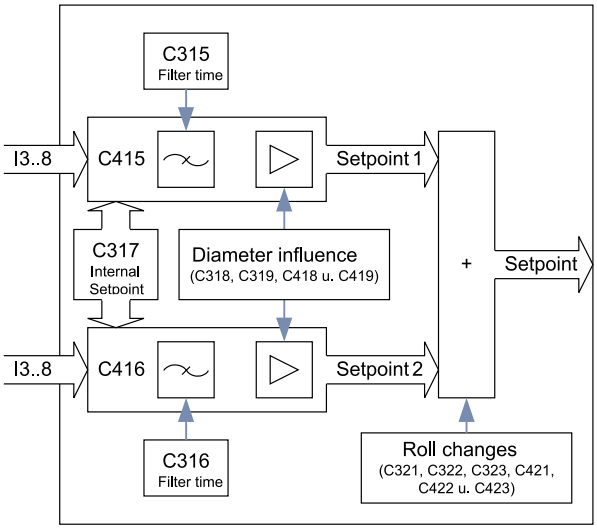
Weighting factor

Actual value 2

C314

Range: 0.0 …100.0
Standard: 100.0
Designation in %
This denotes how strong the actual value 2 is weighted. However, if in case of a measurement roll with two separate amplified sensor signals two actual values are available then the actual values here and under C312 are reduced to 50 %. Thereby the two actual values are processed as average.

Setpoint



Input designation Signalsource

Setpoint 1

C415

Range: 0; 2 …8
Standard: 5

0: OFF (Setpoint 1=0)
2: Internal setpoint, presribed with C317
3 …8: I3 …I8

Filterbehavior

Setpoint 1

C315

Range: 1 …9999
Standard: 1 (Filter OFF)
Value of the moving average in msec.
Starting with the value of 52 an additional peak suppression function is active. However, local peaks do not enter into the average calculation.

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Block | Parameter Level | Parameter number

Input designation Signalsource

Setpoint 2

C 4 1 6

Range: 0; 2 …8

0: OFF (Setpoint 2=0) (Standard)
2: Internal setpoint, presribed with C317
3 …8: I3 …I8

Filter behavior

Setpoint 2

C 3 1 6

Range: 1 …9999
Standard: 1 (Filter OFF)

Value of the moving average in msec.
Starting with the value of 52 an additional peak suppression function is active. However, local peaks do not enter into the average calculation.

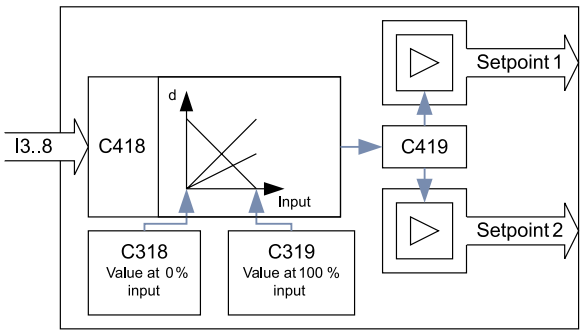
Internal setpoint

C 3 1 7

Range: -100.0…100.0
Standard: 0.0

Internal setpoint instead of an external setpoint.
Designation with C415 or C416.

Diameter influence



Web tension control requirement:
Control web tension depending on the diameter (taper tension). This is accomplished by coupling the setpoint with the diameter signal.

Input designation Signalsource

Diameter influence

C 4 1 8

Range: 0; 3 …8

0 : Diameter influence OFF (Standard)
3 …8: I3 …I8

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Block | Parameter Level | Parameter number

Control
Diameter influence

Selection of setpoint

C 4 1 9

Range: 0 …2
Standard: 0
0 : Setpoint 1
1 : Setpoint 2
2 : Setpoint 1 and setpoint 2 (Standard)

Diameter influence

Value at 0 % Input signal

C 3 1 8

Range: -100.0…100
Standard: 100
(Which means as a standard no diameter influence)
Information regarding of the value of diameter influence with an input value of 0%

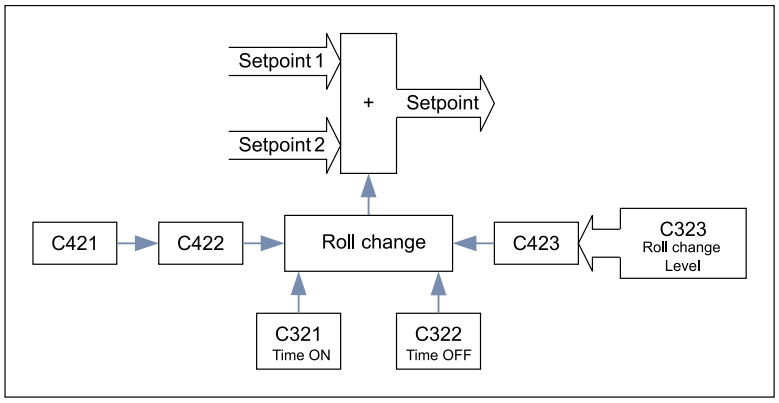
Diameter influence

Value at 100 % Input signal

C 3 1 9

Range: -100.0…100
Standard: 100
Information regarding of the value of diameter influence with an input value of 100%

Roll change



In case of specific operations a change to another setpoint within a defined time span is required, e.g. to support the roll change during web tension measurement.

Control signal selection

Roll changes

C 4 2 1

Range: 0 …4
0: No roll change can be activated (Standard)
1 …4: D1 …D4

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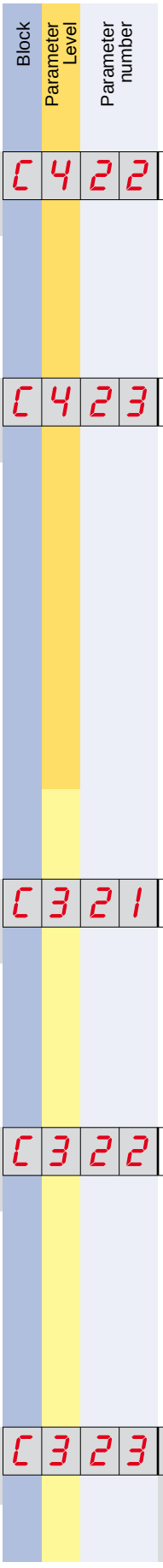

Logic designation

Roll changes

C 4 2 2

Range: 0 und 1

0: Active at voltage 0 V at the digital input

1: Active at 24 V at digital input (Standard)

Operation

Roll changes

C 4 2 3

Range: 0 …3

Standard: 0

Activating the roll change function results in:

0: The standard setpoint is increased with the in C323 determined %-portion [+ relative]

1: The standard setpoint is increased with the in C323 determined constant value [+ absolute]

2: The setpoint is set equal to the value of C323 [constant]

3: Setpoint 1 is exchanged with setpoint 2. With deactivated role change function only setpoint 1 is active, or setpoint 2 for the 2nd controller.

Switching time

Roll change ON

C 3 2 1

Range: 0.0 …20.0

Standard 0.0 sec

The switching time from standard setpoint to the changed setpoint is determined here.

Switching time

Roll change OFF

C 3 2 2

Range: 0.0 …20.0

Standard 8.0 sec

The switching time from changed setpoint to the standard setpoint is determined here.

Base value
Changed setpoint

C 3 2 3

Range: -100.0 …100.

The amount of the base value is determined here. The influence on the standard setpoint is determined with C423.

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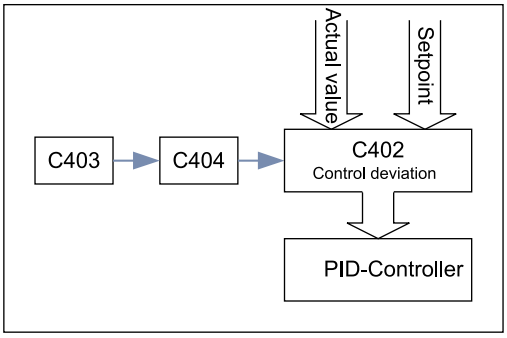
Control Deviation

Block | Parameter Level | Parameter number



The standard definition for the control deviation is setpoint minus actual value. This applies to many applications, e.g. such as rewinding. However, if e.g. unwinding is to be accomplished, then the control deviation is defined as actual value minus setpoint.

Controller polarity

Determination of the control direction

C402

Range: 0; 1
Standard: 0

Control deviation =
0: Setpoint - actual value (standard)
1: Actual value - setpoint

Controller polarity

Reversal

C403

Range: 0 …10

Inverting of the value adjusted with C402
0: OFF (Standard)
1 …4: Control with D1 …D4
5: Control with I3 negative
6: Control with I4 negative
7: Control with I5 negative
8: Control with I6 negative
9: Control with I7 negative
10: Control with I8 negative

With the use of an external control signal rewinding and unwinding can be accomplished without rewiring.

Logic designation

Reversal

C404

Range: 0; 1
Standard: 1

0: Active if 0 V voltage is present at digital input
1: Active if 24 V voltage is present at digital input

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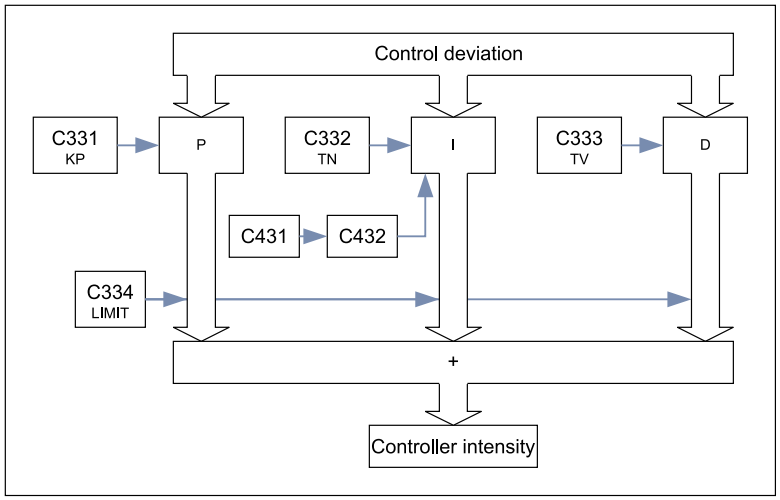
PID-Controller

Block | Parameter Level | Parameter number



Control signal selection

I-lockout

C431

Range: 0 …5

The activated lockout switches the I-portion OFF
0: No I-lockout can be activated
1: D1 (Standard)
2: D2
3: D3
4: D4
5: I-portion is permanently switched OFF

Logic designation

I-lockout

C432

Range: 0 und 1
Standard: 0

0: Active if 0 V voltage is present at digital input
1: Active if 24 V voltage is present at digital input

Controller P-fraction

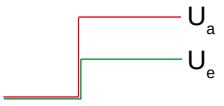
Proportional coefficient Kp

C331

Range: 0.0 …99.99
Standard: 1.0

Amplification factor of such proportional fraction.

$$KP = \frac{U_a}{U_e}$$



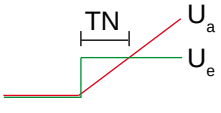
Controller I-fraction

Reset time TN

C332

Range: 2 …9999
Standard: 2000
Designation in msec

TN in msec is the parameter of the I-portion. This parameter defines the time, which the output voltage requires, after a step of the input signal, to reach the level of the input voltage.



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Block | Parameter Level | Parameter number

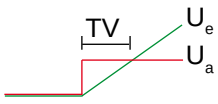
Regler D-portion

Derivative time TV

C 3 3 3

Range: 0 …1800
Standard: 0
Designation in msec

TV can be depicted very clearly by a continuous voltage change at the input. This time designates the input voltage increase up to the level of the output voltage generated by this continuous change.



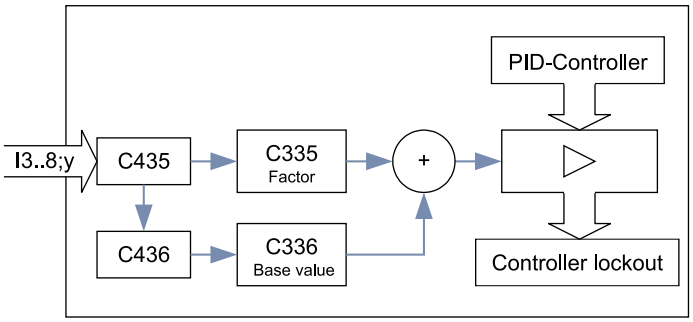
Limitation of controller portions

Amount of the maximum value

C 3 3 4

Range: 0.0 …200.0
Standard: 100.0
Designation in %
This limits the output value of the controller portions to the designated amount. This is especially important for the I-and D-fractions. Otherwise the values could be too large and could prevent a reasonable control function.

Controller Intensity



Input designation Signal source

Multiplier system

C 4 3 5

Range: 0; 3 …8;11
Standard: 7
0: OFF, dynamic portion
Multiplier system = 0
3 …8: I3 …I8
11: Y (Mathe)
The source for the dynamic portion of the multiplier system will be selected here. The controller intensity can be influenced by an external voltage. This is mainly necessary by velocity dependent control functions.

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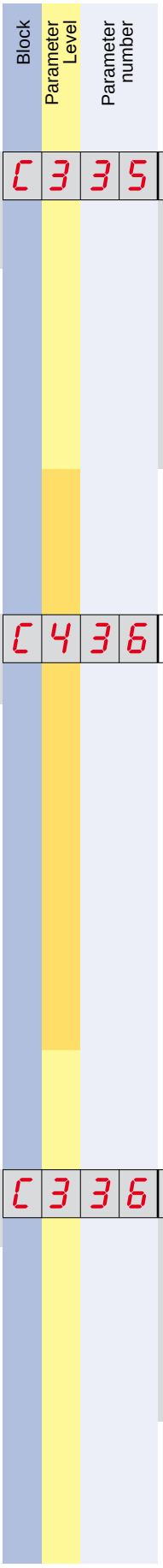

Influence of multiplier input

Weighting factor

C335

Range: 0 …100.0
Standard: 100.0
Designation in %
This determines how much the controller output is dependent on the voltage at the multiplier input. For example, with the value of 100.0 % and an input voltage level of 10 V at the multiplier input the control signal is active to 100 %. In case of 0 V at the multiplier input control signal is blocked.

Polarity control

Controller base value

C436

Range: 0 and 1

The tendency of the polarity of the controller base value from the dynamic multiplier input. The amount of the base value is determined with C336.
0: OFF, Base value remains unchanged (standard)
1: ON, the base value has to polarity of the dynamic multiplier input (C435). With a negative input to base value C336 will be inverted.
This makes sense in processing lines where the processing direction can be reversed and thereby the velocity can be processed as negative voltage.

Determination of the controller base value

C336

Range: 0 …100.0
Standard: 0.0
Designation in %
This determines how large the base value of the controller signal remains active, independent of the multiplier input. At the value of 100 % the controller signal is to 100 % active, and 0 % it is blocked.

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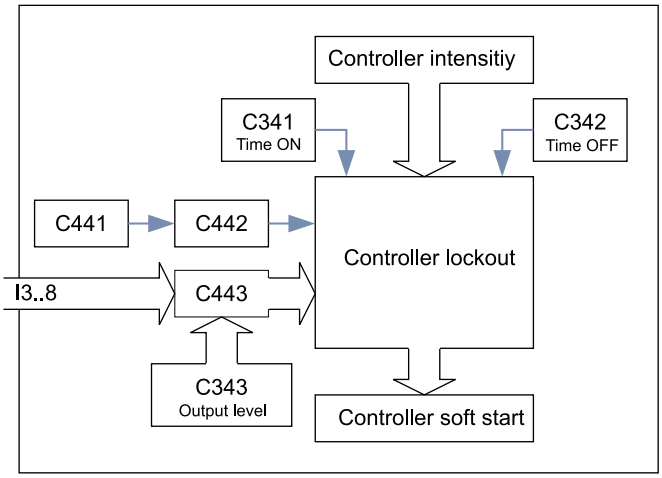
Controller Lockout



Block | Parameter Level | Parameter number

Control signal selction

Controller lockout

C 4 4 1

Range: 0 …4
Standard: 3
0: Controller lockout cannot be activated
1 …4: D1 …D4

Logic designation

Controller lockout signal

C 4 4 2

Range: 0 and 1
Standard: 0
0: Active with voltage 0V at the digital input
1: Active with 24 V at digital input

Input designation signal source

Output level with controller lockout

C 4 4 3

Range: 2 …8
2: Internal value, determined with C343 (Standard)
3 …8: I3 …I8

Switching time Controller lockout ON

C 3 4 1

Range: 0.0 …20.0
Standard: 0.0
Designation in sec
Determination how quickly the controller lockout is activated. In this time the standard controller value is crossfaded to the given value (C443) for the control lockout.

Switching time Controller lockout OFF

C 3 4 2

Range: 0.0 …20.0
Standard: 0.0
Designation in sec
Determination how quickly the controller lockout is deactivated. In this time the given value (C443) for the control lockout is crodssfaded to the standard controller value.

Level controller lockout

C 3 4 3

Range: -100.0 …+100.0
Standard: 0.0
Designation in %
The amount of the output level with activated controller lockout is determined here.

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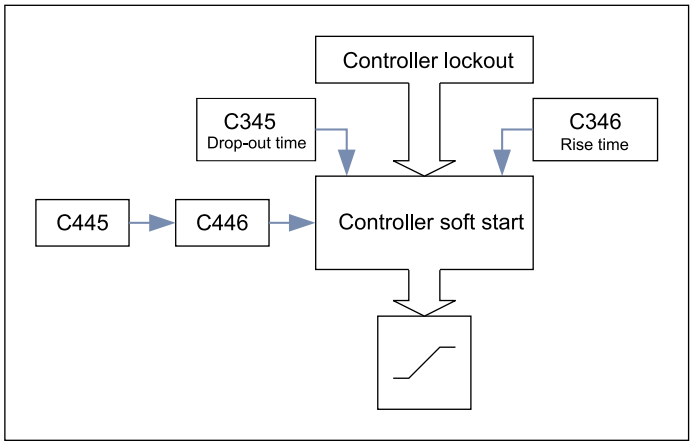
Controller Soft Start

Block | Parameter Level | Parameter number



Control signal selection

Soft start signal

C 4 4 5

Range: 0 …4
Standard: 2
0: Controller soft start cannot be activated
1 …4: D1 …D4

Logic determination

Soft start signal

C 4 4 6

Range: 0 and 1
0: Active with voltage 0V at the digital input
1: Active with 24 V at digital input

Controller soft start

Drop-out time

C 3 4 5

Range: 0.00 …20.00
Standard: 1.00
Designation in sec
Determination how quickly the standard controller value is crossfaded to 0 % (0 V)

Controller soft start

Rise time

C 3 4 6

Range: 0.00 …20.00
Standard: 1.00
Designation in sec
Determination about the time for crossfading from 0 % (0 V) to standard controller value.

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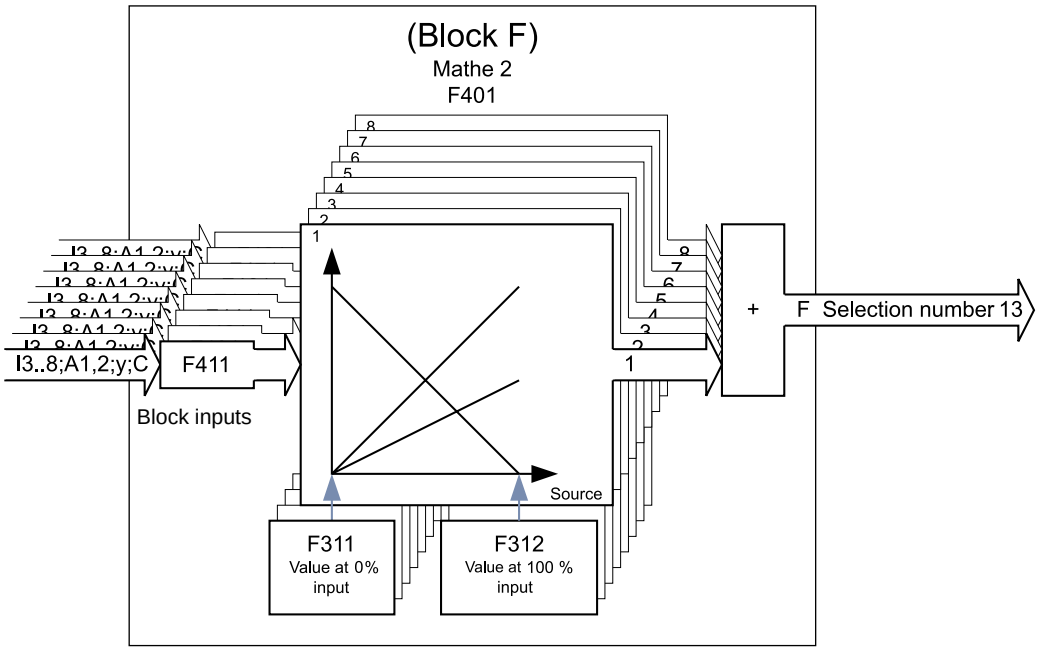
Block F - Mathe

Addition of up to 8 Signals



The following parameter sets scale the values before they are added.
The determination block inputs - signal source is made with F4□1
All output values are limited to ± 200 % .
Examples refer to Block Y

	Block	Parameter Level	Parameter number	Block input no. 1 … 8								
Scaling with zero signal	F	3		1								
Scaling with nominal-signal (100 %)	F	3		2								

Scaling with zero signal

Range: -100.0 …100.0
Standard: 0.0
Designation in %

Output value with 0 % input

Scaling with nominal-signal (100 %)

Range: -100.0 …100.0
Standard: 100
Designation in %

Output value with 100 % input

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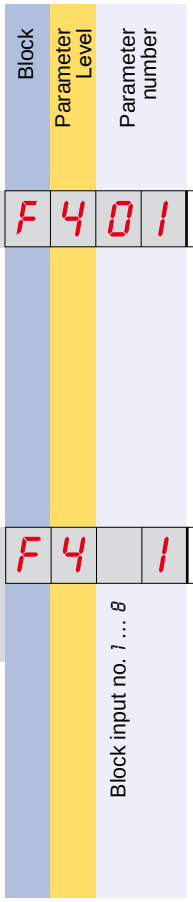

Function selection

Range: 0; 1

0: Mathe 2 OFF (standard)
At the output of this Block "0" is always present.
1: Adder function

Signal source selection

Designation of signal-source - Block input

Range: 0; 3; …12

Standard: F411 : 8
F421 : 12
F431 …F481: 0

0: OFF
3 …8: 3 …I8
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)

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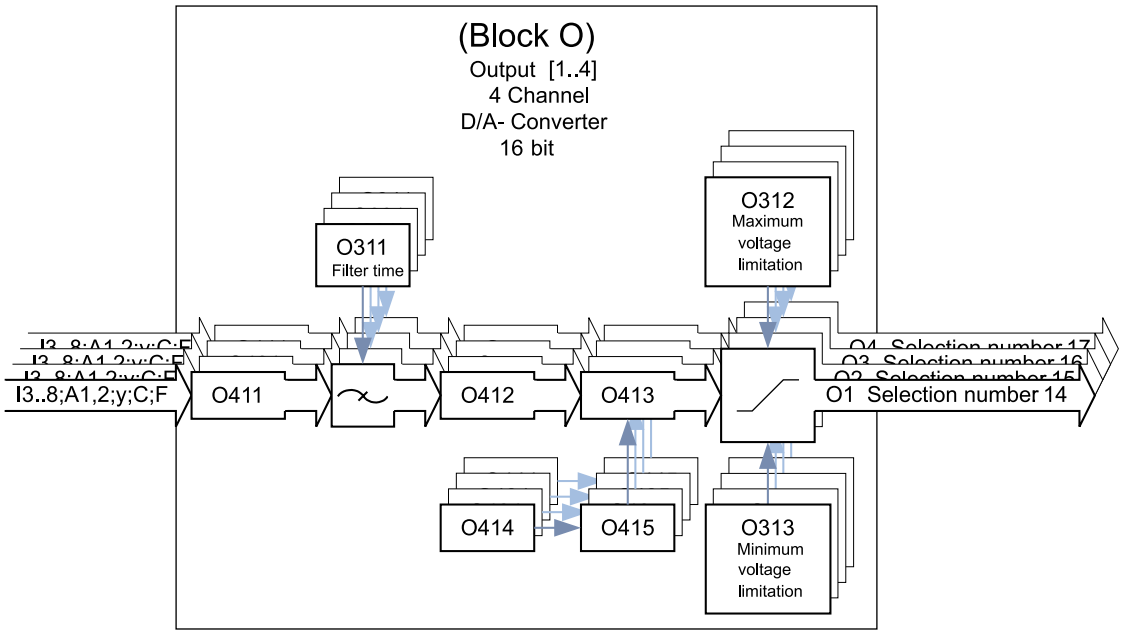
Block O - Analog Outputs

Configuration of voltage outputs



Block outputs O1…O4 ≙ voltage outputs A01 …A04 (see terminal diagram)
100 % ≙ 10 V, $U_{max.}$ = 12 V, based on GND

	Block	Parameter Level	Parameter number					
Filter behavior	0	3		1				

Block output 1…4

Range: 1 …9999
Designation in msec
Standard: O311: 1
O321: 4800
O331: 1
O341: 1

Window width of the moving average in msec
1: Filter function not in operation
Starting with value 52 an additional peak suppression function is activated. Thereby local peaks do not enter into the calculation of averages.
Example: High value for displays, low value for PLC inputs.

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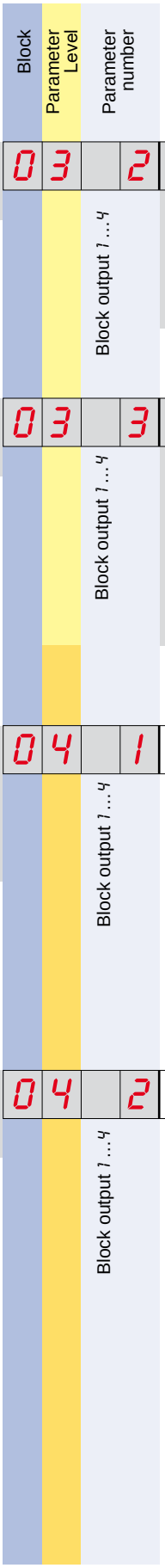

Upper voltage limitation

Range: 0.00 …12
Standard: 12.00
Maximum output voltage in V
Example: Limitation to 10 V if the downstream input cannot accept a higher voltage.

Lower voltage limitation

Range: -12.00 …0.00
Standard: -12.00
Minimum output voltage in V
Example: Limitation to 0 V
- If the connected input is not suitable for negative voltages
- If by definition as controller output, the connected motor should not turn in reverse

Signal source selection

Designation:
Signal source - Analog output

Range: 0; 3 …13
Standard: O411: 9
O421: 9
O431: 0
O441: 13

0: OFF, 0 V at the selected output
3 …8: I3 …I8
9 : A1 (Amplifier 1)
10 : A2 (Amplifier 2)
11 : Y (Mathe 1)
12 : C (Controller)
13 : F (Mathe 2)

Operation mode

Range: 0 …2
0: Bipolar
-100…0…100 % represents -10…0…10 V and 0…100 % represents 4(0)…20 mA (standard)
1: Unipolar
-100…0…100 % represents 0…5…10 V, bzw. 4(0)…12…20 mA
This makes sense, if positive and negative signals are processed further, but only one current output or one 0 …10 V input is available.
2: Amount/signal rectification
-100…0…100 % represents 10…0…10 V resp. 20…4(0)…20 mA
Example: This is important if only the absolute amount of the difference of Block Y Example 4 are to be processed further.

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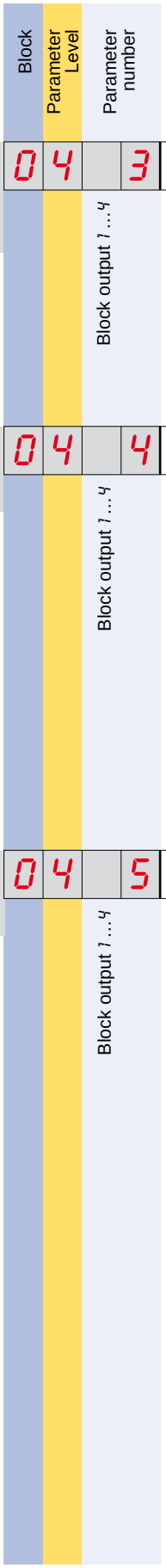

Peak value storage Activation

Functional control

Range: 0; 1

0: OFF (Standard)
1: The voltage of the selected output has the highest value which has been reached since resetting by O4□4.

Control signal

Reset peak value storage

Range: 1 …4
Standard O414: 1
O424: 2
O434: 3
O444: 4

Selection of the desired control input to be used to reset peak value storage.
1: Control from input D1
2: " D2
3: " D3
4: " D4

Logic designation

Reset peak value storage

Range: 0 or 1

0: Activating, when no signal at the selected control input is present (standard).
1: Activating, when the control signal is present.

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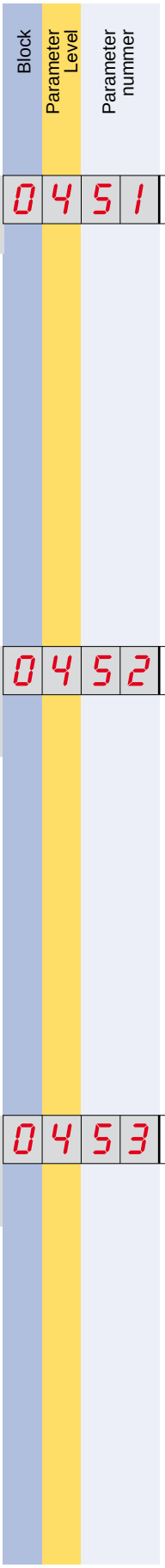

Switching function Output 1

0 4 5 1

Range: 0 ...3
Standard: 0
0: OFF;
1: Alternativ
2: Addition
3: Subtraction

The switching function of the output O1 is determined here.

Switching function Output 1

Signal source

0 4 5 2

Range: 3 …13
Standard: 12
Signal source

3 …8:	I3 …I8	11 : Y (Mathe 1)
9 :	A1 (Amplifier 1)	12 : C (Controller)
10 :	A2 (Amplifier 2)	13 : F (Mathe 2)

The signal source of the switching funktion will be selected here.

Switching function Output 1

Control signal selection

0 4 5 3

Range: 1 …8
Standard: 5
Control signal selection

1 ...4:	DI1 ...D4	Open
5 ...8:	DI1 ...D4	Closed

Selection of the desired control signal and the logic designation for the switching function.

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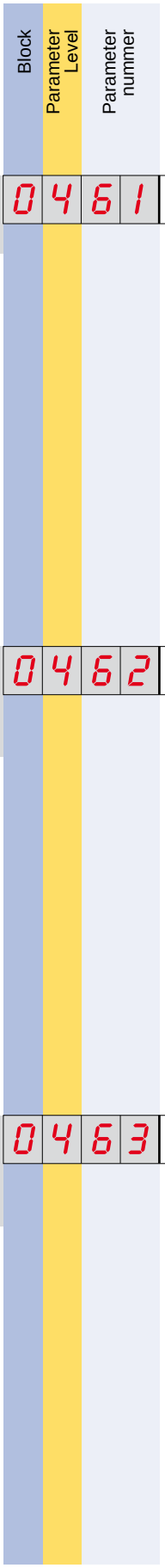


Switching function Output 2

0 4 6 1

Range: 0 ...3
Standard: 0
0: OFF;
1: Alternativ
2: Addition
3: Subtraction

The switching function of the output O2 is determined here.

Switching function Output 2

Signal source

0 4 6 2

Range: 3 …13
Standard: 12
Signal source

3 …8:	I3 …I8	11 : Y (Mathe 1)
9 :	A1 (Amplifier 1)	12 : C (Controller)
10 :	A2 (Amplifier 2)	13 : F (Mathe 2)

The signal source of the switching funktion will be selected here.

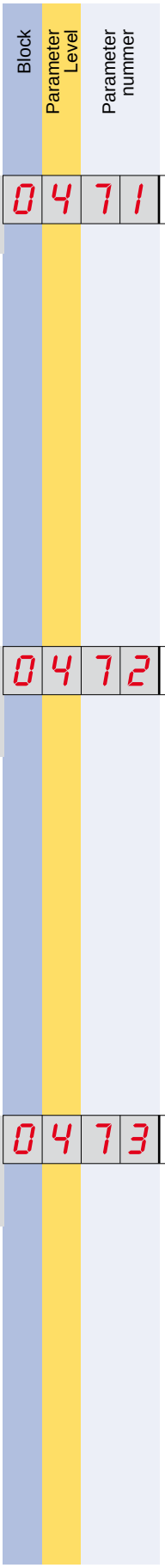
Switching function Output 2

Control signal selection

0 4 6 3

Range: 1 …8
Standard: 5
Control signal selection
1 ...4: DI1 ...D4 Open
5 ...8: DI1 ...D4 Closed

Selection of the desired control signal and the logic designation for the switching function.



Switching function Output 3

0 4 7 1

Range: 0 ...3
Standard: 0
0: OFF;
1: Alternativ
2: Addition
3: Subtraction

The switching function of the output O3 is determined here.

Switching function Output 3

Signal source

0 4 7 2

Range: 3 …13
Standard: 12
Signal source

3 …8:	I3 …I8	11 : Y (Mathe 1)
9 :	A1 (Amplifier 1)	12 : C (Controller)
10 :	A2 (Amplifier 2)	13 : F (Mathe 2)

The signal source of the switching funktion will be selected here.

Switching function Output 3

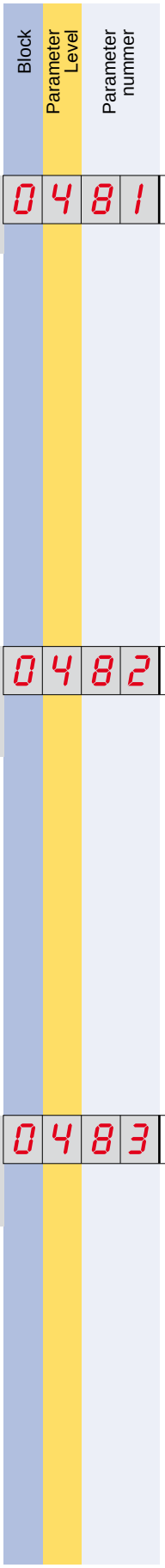
Control signal selection

0 4 7 3

Range: 1 …8
Standard: 5
Control signal selection

1 ...4:	DI1 ...D4	Open
5 ...8:	DI1 ...D4	Closed

Selection of the desired control signal and the logic designation for the switching function.



Switching function Output 4

0 4 8 1

Range: 0 ...3
Standard: 0
0: OFF;
1: Alternativ
2: Addition
3: Subtraction

The switching function of the output O4 is determined here.

Switching function Output 4

Signal source

0 4 8 2

Range: 3 …13
Standard: 12
Signal source
3 …8: I3 …I8
9 : A1 (Amplifier 1)
10 : A2 (Amplifier 2)
11 : Y (Mathe 1)
12 : C (Controller)
13 : F (Mathe 2)

The signal source of the switching funktion will be selected here.

Switching function Output 4

Control signal selection

0 4 8 3

Range: 1 …8
Standard: 5
Control signal selection
1 ...4: DI1 ...D4 Open
5 ...8: DI1 ...D4 Closed

Selection of the desired control signal and the logic designation for the switching function.

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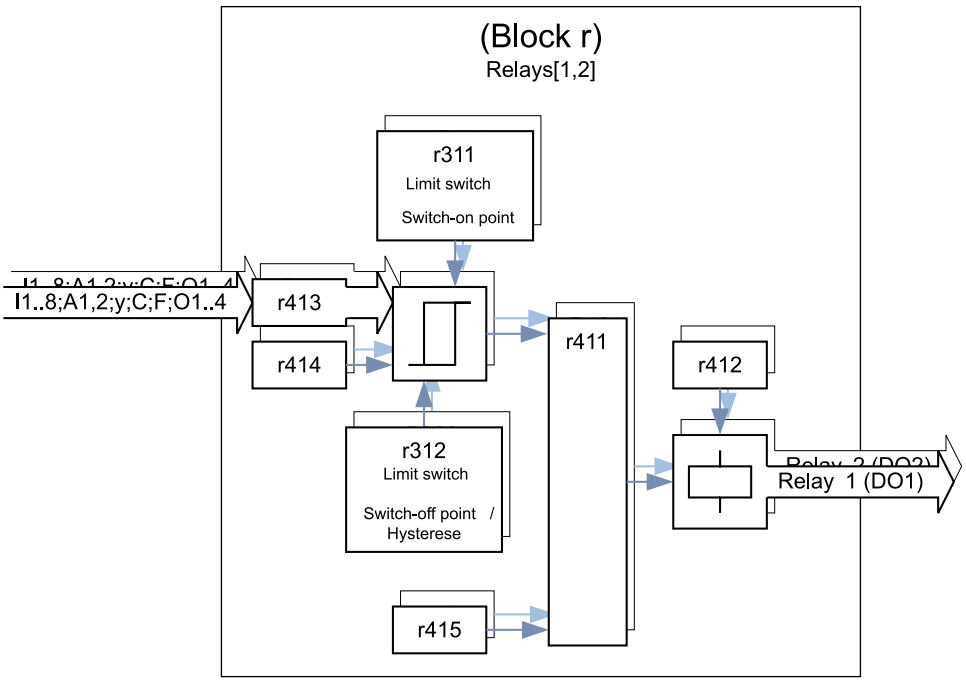
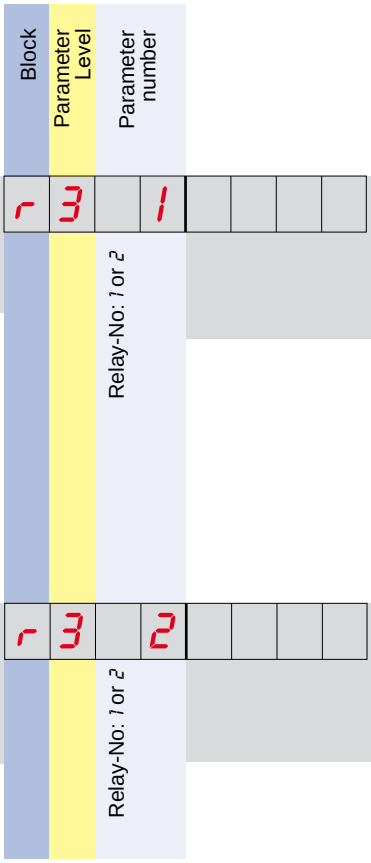
Block r - Relay Outputs

Configuration of the relays



The relay contacts signal, depending on the adjustment, either the status of the limit switches or of the voltage limitation. These are matched to the signals which are to be monitored.



Switching point for the operational mode

Limit switch signal

Range: -120.0 …120.0
Standard: 100.0
Switching point in %

The exact function is determined in r4□4.

Switch off point or hysteresis for the operational mode

Limit switch signal

Range: -120.0 …120.0
Standard: 0.0
Switch off point / hysteresis in %

The exact function is determined in r4□4.

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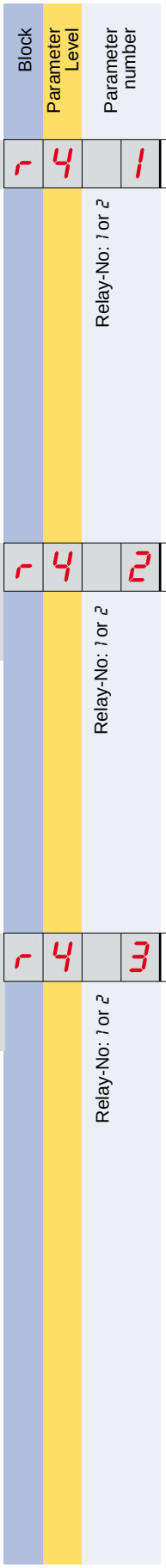

Function selection

Range: 0; 1; 2
Standard: 0

0: Relay OFF
1: Operational mode limit switch, depending on the adjustments r3□1; r3□2; r4□3; r4□4
2: Operational mode status signal, adjustment with r4□5

Logic designation Relay output

Designation

Range: 0 or 1
Standard: 1

0: Opener, contact open with activated relay output.
1: Closer, contact closed with activated relay output

Contact normally open (NO)

Input designation Signal source

Limit switch

Range: 1 …17
Standard: 9

Selection of the signals to be monitored
1 …8: I1 …I8 (Inputs)
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)
13: F (Mathe 2)
14: O1 (Output 1)
15: O2 (Output 2)
16: O3 (Output 3)
17: O4 (Output 4)

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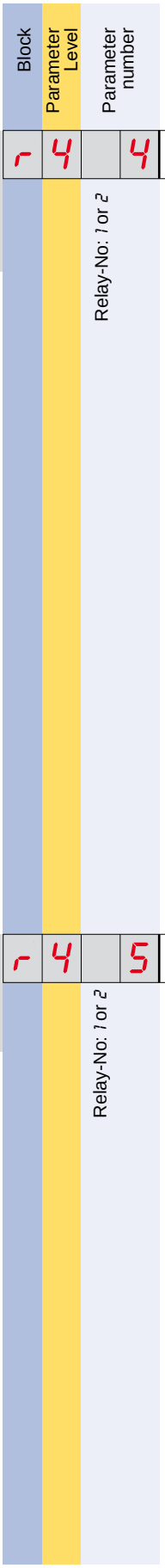


Limit switch
Switching characteristics

Switching point determination

Range: 0; 1; 2
Standard: 0

0: The switching point is determined by r3□1, the switch off point by r3□2. The switching hysteresis is the difference between r3□2 and r3□1.

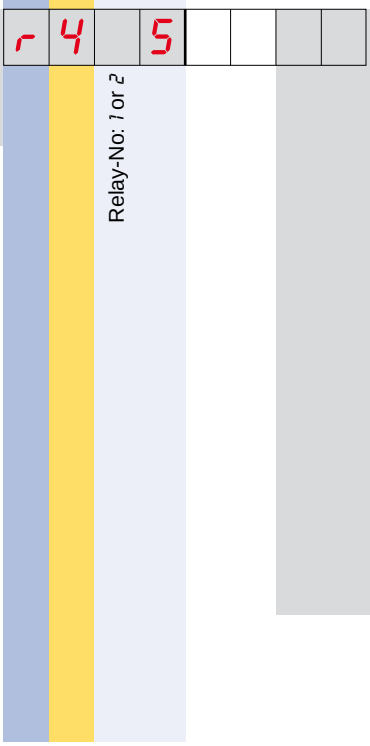
1: The switching point is determined by r3□1, the hysteresis by r3□2. The switch off point, whereby the relay is deactivated is determined by the switching point (r3□1) minus hysteresis (r3□2).

2: The nominal switching point- switch off point is prescribed as average value witht r3□1, the hysteresis with r3□2. The result is:

Switching point: $r3\square1 + \frac{r3\square1}{2}$

Switch off point: $r3\square1 - \frac{r3\square1}{2}$

This operational mode is meaningful, if a theoretical switching point is known but the signal noise cannot yet be determined.



Input designation
Status monitoring

Signal source

Range: 0 oder 17
Standard: 0

0: Relay ON, if the adjustment function at the amplifier inputs are active

1 …17: Relay ON, if the voltage limitation activates the selected input or output signals.

1 …8: I1 …I8 (Inputs)
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)
13: F (Mathe 2)
14: O1 (Output 1)
15: O2 (Output 2)
16: O3 (Output 3)
17: O4 (Ouput 4)

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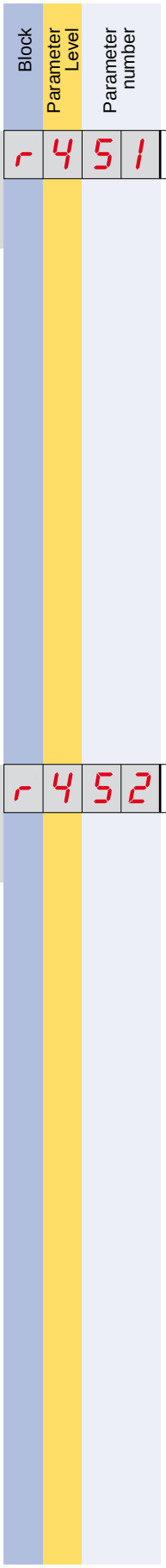

Limit switch
Switch-on point relais 1

Signal source

r 4 5 1

Range: 0 ...17
Standard 0
0: Internal switch-on point is preset with r311
1 …17: External switch-on point

1 …8: I1 …I8 (Inputs)
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)
13: F (Mathe 2)
14: O1 (Output 1)
15: O2 (Output 2)
16: O3 (Output 3)
17: O4 (Output 4)

Limit switch
Switch off point relais 1

Signal source

r 4 5 2

Range: 0 or 17
Standard: 0
0: Internal switch off point is preset with r312
1 …17: External switch off point

1 …8: I1 …I8 (Inputs)
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)
13: F (Mathe 2)
14: O1 (Output 1)
15: O2 (Output 2)
16: O3 (Output 3)
17: O4 (Output 4)

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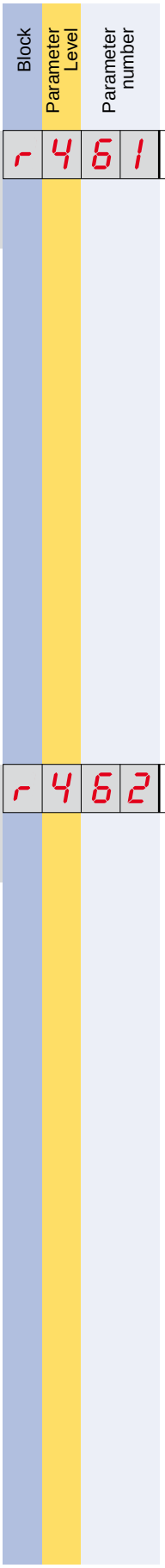

Limit switch
Switch-on point relais 2

Signal source

r 4 6 1

Range: 0 ...17
Standard 0
0: Internal switch-on point is preset with r321
1 …17: External switch-on point

1 …8: I1 …I8 (Inputs)
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)
13: F (Mathe 2)
14: O1 (Output 1)
15: O2 (Output 2)
16: O3 (Output 3)
17: O4 (Output 4)

Limit switch
Switch off point relais 2

Signal source

r 4 6 2

Range: 0 or 17
Standard: 0
0: Internal switch off point is preset with r322
1 …17: External switch off point

1 …8: I1 …I8 (Inputs)
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)
13: F (Mathe 2)
14: O1 (Output 1)
15: O2 (Output 2)
16: O3 (Output 3)
17: O4 (Output 4)

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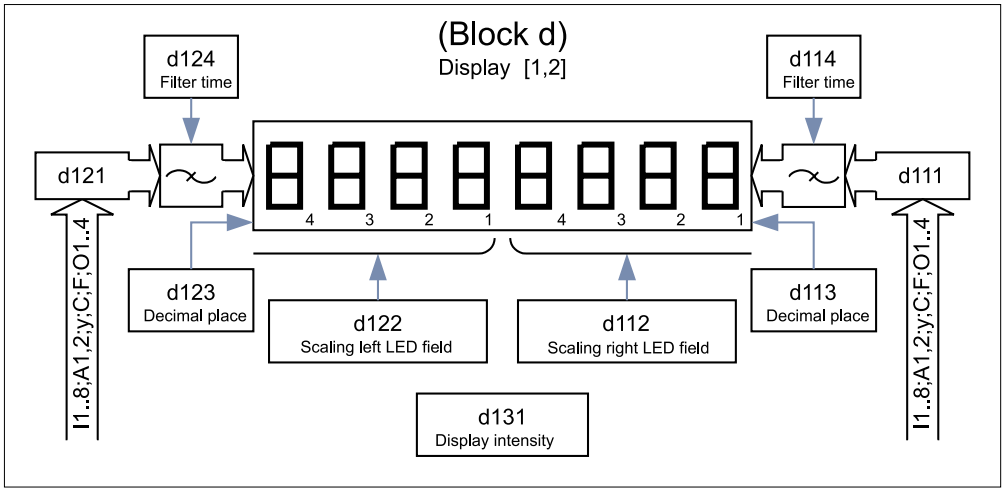
Block d - Display



The display indicates, depending on the adjustment with d121, either a 8-digit value or two independent signals, each 4-digits.

Form of 4-digit display:

≥ 10000:	OFL
- 999…-9999:	Standard
-1000… - 1999:	first digit: -
-2000…-2999:	first digit: L
≤ -3000:	-OFL

If signals should exceed internal limits, then OFL is displayed also, resp. - OFL

Block | Parameter Level | Parameter number

Right display range

Signal source

Right display range

d 1 1 1

Range: 1 …17
Standard: 14

1 …8: I1 …I8 (Inputs)
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)
13: F (Mathe 2)
14: O1 (Output 1)
15: O2 (Output 2)
16: O3 (Output 3)
17: O4 (Output 4)

Scaling real-time value

Right display range

d 1 1 2

Range: 10 …9999
Standard: 100 (Display shows %)

Displayed value in case of 100% signal of the selected signal source, other values correspondingly proportional.

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Block | Parameter Level | Parameter number

Decimal point

Right display range

d 1 1 3

Range: 0…4

Decimal position
0: No decimal point display (Standard)
1 …4: Pos. 1 …pos. 4

Filter behavior

Right display range

d 1 1 4

Range: 0 …9999
Standard: 50

Window width of the moving average in msec
1: Filter function not in operation
Starting with value 52 an additional peak suppression function is activated. Thereby local peaks do not enter into the calculation of averages.

Left display range

8 8 8 8

Signal source

Left display range

d 1 2 1

Range: 1 …17
Standard: 0

0: Left range OFF
1 …8: I1 …I8 (Inputs)
9: A1 (Amplifier 1)
10: A2 (Amplifier 2)
11: Y (Mathe 1)
12: C (Controller)
13: F (Mathe 2)
14: O1 (Output 1)
15: O2 (Output 2)
16: O3 (Output 3)
17: O4 (Output 4)

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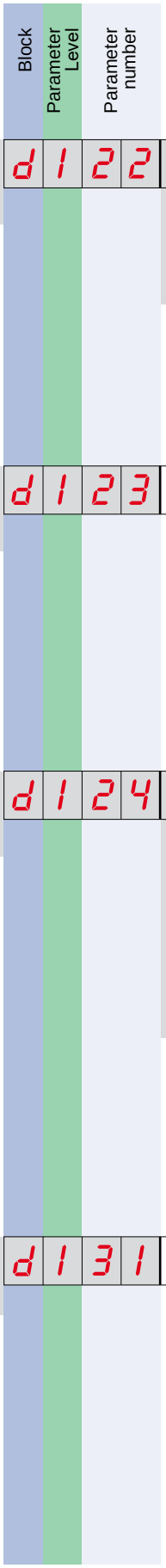

Scaling real-time value

Left display range

d 1 2 2

Range: 10 …9999
Standard: 100 (Display shows %)

Displayed value in case of 100% signal of the selected signal source, other values correspondingly proportional.

Decimal point

Left display range

d 1 2 3

Range: 0 …4

Decimal position
0: No decimal point display (standard)
1 …4: Pos. 1 …pos. 4

Filter behavior

Left display range

d 1 2 4

Range: 0 …9999
Standard: 50

Window width of the moving average in msec
1: Filter function not in operation
Starting with value 52 an additional peak suppression function is activated. Thereby local peaks do not enter into the calculation of averages.

Intensity of the total display

d 1 3 1

Brightness in steps from 0 ... 15
Standard: 0

0: Lowest brightness
15: Maximum brightness

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6. Parameter Table

Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
Block I (Input [1..8] /Input) / 1…8							
I311	Difference input AI1 Filter adjustment	1	1	9999	msec	1=OFF	
I321	Difference input AI2 Filter adjustment	1	1	9999	msec	1=OFF	
I331	Voltage input AI3 Filter adjustment	1	1	9999	msec	1=OFF	
I341	Voltage input AI4 Filter adjustment	1	1	9999	msec	1=OFF	
I351	Voltage input AI5 Filter adjustment	1	1	9999	msec	1=OFF	
I361	Voltage input AI6 Filter adjustment	1	1	9999	msec	1=OFF	
I371	Voltage input AI7 Filter adjustment	1	1	9999	msec	1=OFF	
I381	Voltage input AI8 Filter adjustment	1	1	9999	msec	1=OFF	
I399	Block 0 Level 3 store to EEPROM (!= 0 changed values)	0				auto. entry	
Block A (Amplifier[1,2] / Amplifier) / 9,10							
A311	Amplifier 1 Zero adjust	0.0	-10.0	100.0	%		
A312	Amplifier 1 Manual zero adjustment (auto. entry)	auto	-200.0	200.0	%	100.0 %=20 mV rounded	
A313	Amplifier 1 Adjustment with defined load	100.0	10.0	110.0	%	with error message	
A314	Amplifier 1 Manual amplifier adjustment	666.7	100.0	30.00k			
A321	Amplifier 2 Zero adjust	0.0	-10.0	100.0	%		
A322	Amplifier 2 Manual zero adjustment (auto. entry)	auto	-200.0	200.0	%	100.0 %=20 mV rounded	
A323	Amplifier 2 Adjustment with defined load	100.0	10.0	110.0	%	with error message	
A324	Amplifier 2 Manual amplifier adjustment	666.7	100.0	30.00k			
A341	Wrap angle correction Constant angle	135.0	-180.0	180.0	°		
A342	Wrap angle correction Distance x 0 %	500	-2999	9999	=		
A343	Wrap angle correction Difference distance x 100 %	0	-2999	9999	=		
A344	Wrap angle correction Distance y 0 %	-100	-2999	9999	=		
A345	Wrap angle correction Difference distance y 100 %	0	-2999	9999	=		
A346	Wrap angle correction Diameter variable roll 0 %	0	0	9999	=		
A347	Wrap angle correction Difference diameter variable roll 100 %	200	-2999	9999	=		

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Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
A348	Wrap angle correction Diameter measuring roll	100	0	9999	=		
A349	Wrap angle correction Angle variabel minimum	0.0	-180.0	180.0	°		
A351	Correction factor Amplifier 1 (PX_Y)	0.00	-29.99	99.99	%	valid from version 1.05	
A352	Correction factor Amplifier 2 (PY_x)	0.00	-29.99	99.99	%	valid from version 1.05	
A399	Block 1 Level 3 store to EEPROM (!= 0 changed values)	0				auto. entry	
A411	Amplifier 1 Source (OFF; I1; I2; (I1+I2) / 2; I1+I2)	1	0	4			
A412	Zero adjust 1 External triggering Source (OFF; D1..4)	0	0	4			
A413	Zero adjust 1 External triggering (open, closed)	1	0	1			
A414	Amplifier adjustment 1 External triggering source (OFF; D1..4)	0	0	4			
A415	Amplifier adjustment 1 External triggering (open, closed)	1	0	1			
A421	Amplifier 2 Source (OFF; I1; I2; (I1+I2) / 2; I1+I2)	0	0	4			
A422	Zero adjust 2 External triggering source (OFF; D1..4)	0	0	4			
A423	Zero adjust 2 External triggering (open, closed)	1	0	1			
A424	Amplifier adjust 2 External triggering source (aus; D1..4)	0	0	4			
A425	Amplifier adjust 2 External triggering (open, closed)	1	0	1			
A431	Coupling of zero adjust from amplifier 2 to 1 (OFF; ON)	0	0	1			
A432	Coupling of amplifier adjustment from V.2 to 1 (OFF; ON)	0	0	1			
A433	Coupling of manual amplifier adjustment from V. 2 to 1 (OFF; ON)	0	0	1			
A440	Wrap angle correction influence (OFF; V1; V2; V1+V2)	0	0	3			
A441	Wrap path correction Web path geometry (1..4 sketch)	1	1	4			
A443	Wrap angle correction source Difference distance x (OFF; I3..I8)	0	0;3	8			
A445	Wrap angle correcton source Difference distance y (OFF; I3..I8)	0	0;3	8			
A447	Wrap angle correction source Difference diameter of variable roll (OFF; I3..I8)	6	0;3	8			
A499	Block 1 Level 4 store to EEPROM (!= 0 changed values)	0				auto. entry	

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Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
Block Y (Mathe[1]) / 11							
y311	Source 1 Output with 0% input 0 V	0.0	-100.0	100.0	%		
y312	Source 1 Output value with 100 % input 10 V	50.0	-100.0	100.0	%		
y321	Source 2 Output value with 0 % input 0 V	0.0	-100.0	100.0	%		
y322	Source 2 Output value with 100 % input 10 V	50.0	-100.0	100.0	%		
y331	XY Constant intake, runout or opening angle	0.0	-180.0	180.0	°		
y332	XY Max. opening angle or constant runout angle	0.0	-180.0	180.0	°		
y399	Block 2 Level 3 store to EEPROM (!= 0 changed values)	0				auto. entry	
y401	Function selection: OFF; 1: Summary function; 2: Multiplier function (norminal 1 V * 1 V = 1 V); 3: Divider function (norminal 1 V / 1 V = 1 V); 4: XY Constant intake or runout angle; 5: XY Constant opening anlge 6: XY Driven rolls, intake force; 7: XY Driven rolls, runout force 8: XY Average between intake and runout force	0	0	8			
y411	Source 1 (I3..8; A1,2)	9	3	10			
y421	Source 2 (I3..8; A1,2)	10	3	10			
y499	Block 2 Level 4 store to EEPROM (!= 0 changed values)	0				auto. entry	
Block C (Controller) / 12							
C301	Admissible control range positive (maximum desired positive influence)	120.0	0.0	200.0	%		
C302	Admissible control range negative (maximum desired negative influence)	-120.0	-200.0	0.0	%		
C311	Actual value 1 Filter adjust	1	1	9999	msec	1=OFF	
C312	Actual value 1 Factor	100.0	0.0	100.0	%		
C313	Actual value 2 Filter adjust	1	1	9999	msec	1=OFF	
C314	Actual value 2 Factor	100.0	0.0	100.0	%		
C315	Setpoint 1 Filter adjust	1	1	9999	msec	1=OFF	
C316	Setpoint 2 Filter adjust	1	1	9999	msec	1=OFF	
C317	Internal setpoint	0.0	-100.0	100.0	%		
C318	Setpoint diameter influence value with 0 % input	100.0	0.0	100.0	%		
C319	Setpoint diameter influence value with 100 % input	100.0	0.0	100.0	%		
C321	Roll change (time ON)	0.00	0.00	20.00	s		

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Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
C322	Roll change (time OFF)	8.00	0.00	20.00	s		
C323	Roll change (level setpoint preset)	100.0	-100.0	100.0	%		
C331	KP (proportional coefficient) P	0.40	0.00	99.99			
C332	TN (reset time) I	2000	2	9999	msec		
C333	TV (derivative time) D	0	0	1800	msec		
C334	Limit (P,I,D) (amount)	100.0	0	200.0	%		
C335	Factor controller - dynamic signal with multiplier input	100.0	0.0	100.0	%		
C336	Factor controller - constant signal (base value)	0.0	0.0	100.0	%		
C341	Controller lockout (time ON)	0.00	0.00	20.00	s		
C342	Controller lockout (time OFF)	0.00	0.00	20.00	s		
C343	Controller lockout Output level	0.0	-100.0	100.0	%		
C345	Controller soft start (time ON)	1.00	0.00	20.00	s		
C346	Controller soft start (time OFF)	1.00	0.00	20.00	s		
C399	Block 3 Level 3 store to EEPROM (!= 0 changed values)	0				auto. entry	
C401	Controller (OFF; ON; 2nd Controller)	0	0	2		Value 2: valid from version 1.11	
C402	Controller polarity (setpoint - actual value; actual value-setpoint)	0	0	1			
C403	Reversal (OFF; D1..4; automatic to I3..8)	0	0	10			
C404	Reversal D1-D4 Activate condition (open; closed)	1	0	1			
C411	Actual value 1 source (OFF; I3..8; A1,2; y)	9	0;3	11			
C413	Actual value 2 source (OFF; I3..8; A1,2;y)	0	0;3	11			
C415	Setpoint 1 source (OFF; internal; I3..8)	5	0;2	8			
C416	Setpoint 2 source (OFF; internal; I3..8)	0	0;2	8			
C418	Diameter influence source (OFF; I3..8)	0	0;3	8			
C419	Diameter influence (setpoint 1; setpoint 2; both)	2	0	2			
C421	Roll change source (OFF; D1..4)	0	0	4			
C422	Roll change activate condition (open; closed)	1	0	1			
C423	Roll change influence setpoint (+relative; +absolute; constant; setpoint <-> setpoint 2)	0	0	3			
C431	I-lockout source (OFF; D1..4; I-lockout permanently)	1	0	5			
C432	I-lockout activate condition (open; closed)	0	0	1			

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Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
C435	Dynamic multiplier input source (OFF; I3..8; y)	7	0;3	8;11			
C436	Base value multiplier inputs, sign dependend (OFF; ON)	0	0	1			
C441	Controller lockout source (OFF; D1..4)	3	0	4			
C442	Controller lockout activate condition (open; closed)	0	0	1			
C443	Controller lockout output level source (internal; I3..8)	2	2	8			
C445	Controller soft start source (OFF; D1..4)	2	0	4			
C446	Controller soft start activate condition (open; closed)	0	0	1			
C499	Block 3 Level 4 store to EEPROM (!= 0 changed values)	0				auto. entry	
Block F (Mathe[2]) / 13							
F311	Source 1 Factor with 0 V	0.0	-100.0	100.0	%		
F312	Source 1 Factor with 10 V	100	-100.0	100.0	%		
F321	Source 2 Factor with 0 V	0.0	-100.0	100.0	%		
F322	Source 2 Factor with 10 V	100	-100.0	100.0	%		
F331	Source 3 Factor with 0 V	0.0	-100.0	100.0	%		
F332	Source 3 Factor with 10 V	100	-100.0	100.0	%		
F341	Source 4 Factor with 0 V	0.0	-100.0	100.0	%		
F342	Source 4 Factor with 10 V	100	-100.0	100.0	%		
F351	Source 5 Factor with 0 V	0.0	-100.0	100.0	%		
F352	Source 5 Factor with 10 V	100	-100.0	100.0	%		
F361	Source 6 Factor with 0 V	0.0	-100.0	100.0	%		
F362	Source 6 Faktor with 10 V	100	-100.0	100.0	%		
F371	Source 7 Factor with 0 V	0.0	-100.0	100.0	%		
F372	Source 7 Factor with 10 V	100	-100.0	100.0	%		
F381	Source 8 Factor with 0 V	0.0	-100.0	100.0	%		
F382	Source 8 Factor with 10 V	100	-100.0	100.0	%		
F399	Block 4 Level 3 store to EEPROM (!= 0 changed values)	0				auto. entry	
F401	OFF; Adder function	0	0	0;1			
F411	Source 1 (OFF; I3..8; A1,2; y; C)	8	0;3	12			
F421	Source 2 (OFF; I3..8; A1,2; y; C)	12	0;3	12			
F431	Source 3 (OFF; I3..8; A1,2; y; C)	0	0;3	12			
F441	Source 4 (OFF; I3..8; A1,2; y; C)	0	0;3	12			
F451	Source 5 (OFF; I3..8; A1,2; y; C)	0	0;3	12			
F461	Source 6 (OFF; I3..8; A1,2; y; C)	0	0;3	12			
F471	Source 7 (OFF; I3..8; A1,2; y; C)	0	0;3	12			
F481	Source 8 (OFF; I3..8; A1,2; y; C)	0	0;3	12			
F499	Block 4 Level 4 store to EEPROM (!= 0 changed values)	0				auto. entry	

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Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
Block O (Output [1..4] / Output) / 14…17							
O311	Output 1 Filter adjustment	1	1	9999	msec	1=OFF	
O312	Output 1 Voltage limitation maximum	12.00	0.00	12.00	V		
O313	Output 1 Voltage limitation minimum	-12.0	-12.00	0.00	V		
O321	Output 2 Filter adjustment	4800	1	9999	msec	1=OFF	
O322	Output 2 Voltage limitation maximum	12.00	0.00	12.00	V		
O323	Output 2 Voltage limitation minimum	-12.0	-12.00	0.00	V		
O331	Output 3 Filter adjustment	1	1	9999	msec	1=OFF	
O332	Output 3 Voltage limitation maximum	12.00	0.00	12.00	V		
O333	Output 3 Voltage limitation minimum	-12.0	-12.00	0.00	V		
O341	Output 4 Filter adjustment	1	1	9999	msec	1=OFF	
O342	Output 4 Voltage limitation maximum	12.00	0.00	12.00	V		
O343	Output 4 Voltage limitation minimum	-12.0	-12.00	0.00	V		
O399	Block 5 Level 3 store to EEPROM (!= 0 changed values)	0				auto. entry	
O411	Output 1 Source (OFF; I3..8; A1,2; y; C; F)	9	0;3	13			
O412	Output 1 Modus (bi;uni; amount) -100…100; 0…100; | -100…100|	0	0	2			
O413	Output 1 peak value storage (OFF; ON)	0	0	1			
O414	Output 1 Peak value storage reset source (DI1..4)	1	1	4			
O415	Output 1 Peak value storage reset (open; closed)	1	0	1			
O421	Output 2 Source (OFF; I3..8; A1,2; y; C; F)	9	0;3	13			
O422	Output 2 Modus (bi;uni; amount) -100…100;0…100; | -100…100|	0	0	2			
O423	Output 2 Peak value storage (OFF; ON)	0	0	1			
O424	Output 2 Peak value storage reset source (DI1..4)	2	1	4			
O425	Output 2 Peak value storage reset (open; closed)	1	0	1			
O431	Output 3 Source (OFF; I3..8; A1,2; y; C; F)	0	0;3	13			
O432	Output 3 Modus (bi; uni; amount) -100…100; 0…100; | -100…100|	0	0	2			
O433	Output 3 Peak value storage (OFF; ON)	0	0	1			

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Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
O434	Output 3 Peak value storage reset source (DI1..4)	3	1	4			
O435	Output 3 Peak value storage reset (open; closed)	1	0	1			
O441	Output 4 Source (OFF; I3..8; A1,2; y; C; F)	13	0;3	13			
O442	Output 4 Modus (bi; uni; amount) -100…100; 0…100; | -100…100|	0	0	2			
O443	Output 4 Peak value storage (OFF; ON)	0	0	1			
O444	Output 4 Peak value storage reset source (DI1..4)	4	1	4			
O445	Output 4 Peak value storage reset (open; closed)	1	0	1			
O451	Output 1 Switching function (Off; alternativ; addition; subtraction)	0	0	3		valid from version 1.06	
O452	Output 1 Switching function Signal source (I3..8;A1,2;y;C;F)	12	3	13		valid from version 1.06	
O453	Output 1 Switching function (DI1..4 (open); DI1..4(closed))	5	1	8		valid from version 1.06	
O461	Output 2 Switching function (Off; alternativ; addition; subtraction)	0	0	3		valid from version 1.06	
O462	Output 2 Switching function Signal source (I3..8;A1,2;y;C;F)	12	3	13		valid from version 1.06	
O463	Output 2 Switching function (DI1..4 (open); DI1..4(closed))	5	1	8		valid from version 1.06	
O471	Output 3 Switching function (Off; alternativ; addition; subtraction)	0	0	3		valid from version 1.06	
O472	Output 3 Switching function Signal source (I3..8;A1,2;y;C;F)	12	3	13		valid from version 1.06	
O473	Output 3 Switching function (DI1..4 (open); DI1..4(closed))	5	1	8		valid from version 1.06	
O481	Output 4 Switching function (Off; alternativ; addition; subtraction)	0	0	3		valid from version 1.06	
O482	Output 4 Switching function Signal source (I3..8;A1,2;y;C;F)	12	3	13		valid from version 1.06	
O483	Output 4 Switching function (DI1..4 (open); DI1..4(closed))	5	1	8		valid from version 1.06	
O499	Block 5 Level 4 store to EEPROM (!= 0 changed values)	0				auto. entry	
Block r (Relays [1,2])							
r311	Relais 1 Limit switch switching point	100.0	-120.0	120.0	%		
r312	Relais 1 Limit switch switching point / hysteresis	0.0	-120.0	120.0	%		
r321	Relais 2 Limit switch switching point	100.0	-120.0	120.0	%		
r322	Relais 2 Limit switch switching point / hysteresis	0.0	-120.0	120.0	%		
r399	Block 6 Level 3 store to EEPROM (!= 0 changed values)	0				auto. entry	

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Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
r411	Relay 1 (OFF; limit switch; status message)	0	0	2			
r412	Relay 1 Activate condition (open; closed)	1	0	1			
r413	Relay 1 Limit switch source (I1..8; A1,2; y; C; F; O1..4)	9	1	17			
r414	Relay 1 Limit switch functional principal (switch off point [AEM]; hyseresis; hysteresis average)	0	0	2			
r415	Relay 1 Status message source (adjustment function activated, voltage limiter ON (I1..8; A1,2; y; C; F; O1..4) activ)	0	0	17			
r421	Relay 2 (OFF; limit switch; status message)	0	0	2			
r422	Relay 2 Activated condition (open; closed)	1	0	1			
r423	Relay 2 Limit switch source (I1.. 8; A1,2; y; C; F; O1..4)	9	1	17			
r424	Relay 2 Limit switch functional principle (switch off point [AEM]; hysteresis; hysteresis average)	0	0	2			
r425	Relay 2 Status message source (adjustment function activated, voltage limiter ON (I1..8; A1,2; y; C; F; O1..4) activ)	0	0	17			
r451	Relay 1 Limit switch Switch-on point source (fixed internal (r311), I1..8; A1,2; y; C; F; O1..4)	0	0	17		valid from version 1.06	
r452	Relay 1 Limit switch Switch off point / hysteresis source (fixed internal (r312), I1..8; A1,2; y; C; F; O1..4)	0	0	17		valid from version 1.06	
r461	Relay 2 Limit switch Switch-on point source (fixed internal (r321), I1..8; A1,2; y; C; F; O1..4)	0	0	17		valid from version 1.06	
r462	Relay 2 Limit switch Switch off point / hysteresis source (fixed internal (r322), I1..8; A1,2; y; C; F; O1..4)	0	0	17		valid from version 1.06	
r499	Block 6 Level 4 store to EEPROM (!= 0 changed values)	0				auto. entry	
Block d (Display [1,2] /display)							

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Parameter number	Function	Standard	Range		Unit	Notes	Actual Adjustment
			min.	max.			
d111	Right range source (I1..8; A1,2; y; C; F; O1..4)	14	1	17			
d112	Right range scaling 100 %=	100	10	9999		-1=-| / -2=L / -OFL // OFL	
d113	Right range decimal point	0	0	4		right 1	
d114	Right range filter adjustment	50	1	9999	msec	1=aus	
d121	Left range source (OFF; I1..8; A1,2; y; C; F; O1..4)	0	0	17			
d122	Left range scaling 100 %=	100	10	9999		-1=-| / -2=L / -OFL // OFL	
d123	Left range decimal point	0	0	4		right 1	
d124	Left range filter adjustment	50	1	9999	msecec	1=OFF	
d131	Intensity of display (all segments)	0	0	15			
d199	Block 7 Level 1 store to EEPROM (!= 0 changed values)	0				auto. entry	
	Active voltage limitation is also displayed with (-)OFL, except at the output						

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6. Tabulation of Signal Source Selection Numbers

Block		Signal		Selection number	Limit +-[%]
Input [1..8]	I	Input 1	I1	1	200
		Input 2	I2	2	200
		Input 3	I3	3	135
		Input 4	I4	4	135
		Input 5	I5	5	135
		Input 6	I6	6	135
		Input 7	I7	7	135
		Input 8	I8	8	135
Amplifier [1,2]	A	Amplifier 1	A1	9	200
		Amplifier 2	A2	10	200
Mathe [1]	y	Mathe1	y	11	200
Controller [1]	C	Controller 1	C	12 (or 13: 2nd controller)	200
Mathe [2]	F	Mathe 2	F	13	200
Output [1..4]	O	Output 1	O1	14	120
		Output 2	O2	15	120
		Output 3	O3	16	120
		Output 4	O4	17	120

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