HAEHNE

General Application Examples

and Functional Diagramms

Digital Controller Module DCM

DCM AW 11_14 E

Technical modifications reserved

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Overview

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Overview

Controller DCM

Depending on customer requirements several systems combinations are possible, which result in a different type of programming of parameters in comparison to the standard adjustment. The following pages show examples with the corresponding parameter changes.
The parameters to be changed are shown in **bold letters** in the example descriptions.

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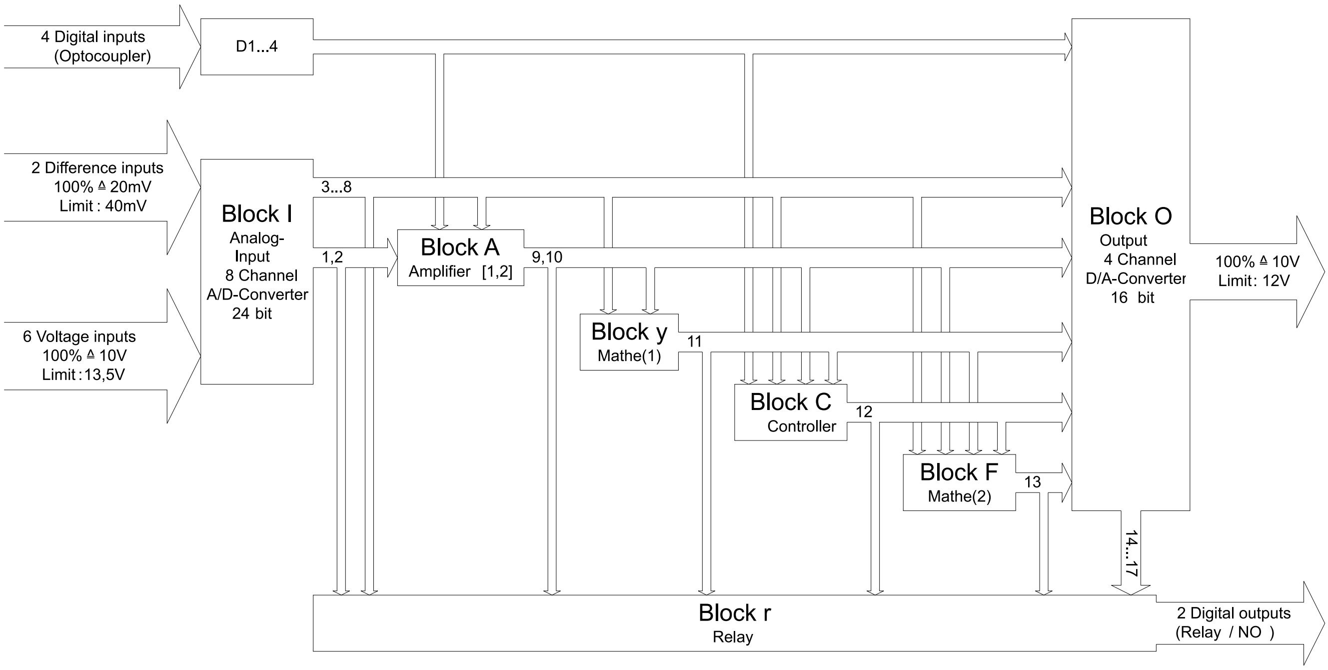
DCM Functional Blocks



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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DCM Functional Blocks

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.

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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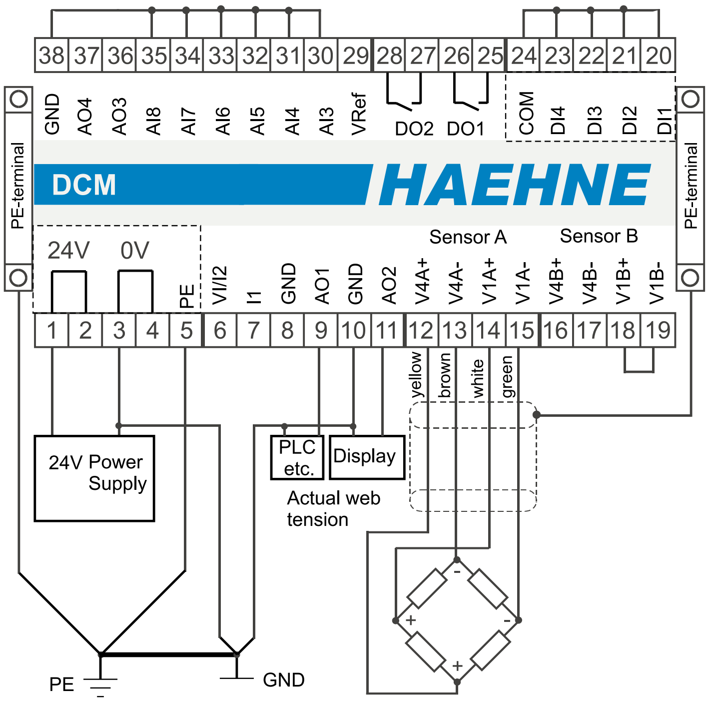
1. Amplifier / 1 Channel / 1 Sensor (Standard Adjustment)

DCM as 1 channel amplifier with 1 connected sensor

Zero adjust made with parameter A311
The amplification is done either automatically with A313 or with A314 to a specific value.
The analog output 1 (A01) is not filtered. The analog output 2 (AO2) is filtered with 4.8 seconds.
The filter times of the analog outputs can be adjusted with the following parameters:
Parameter for O311 for A01 and parameter O321 for AO2.

The left display range is OFF. The right display range shows the output signal in %.
The scaling can be adjusted as required with d112.



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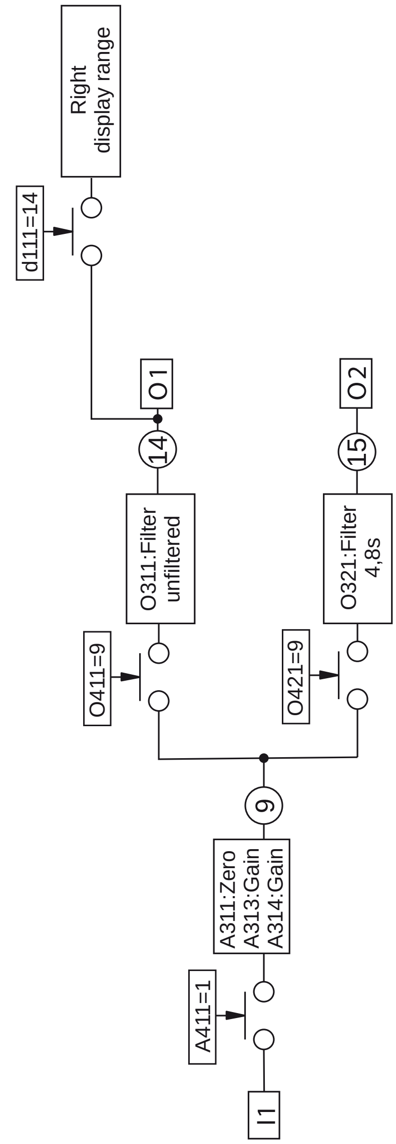
Functional Diagram 1



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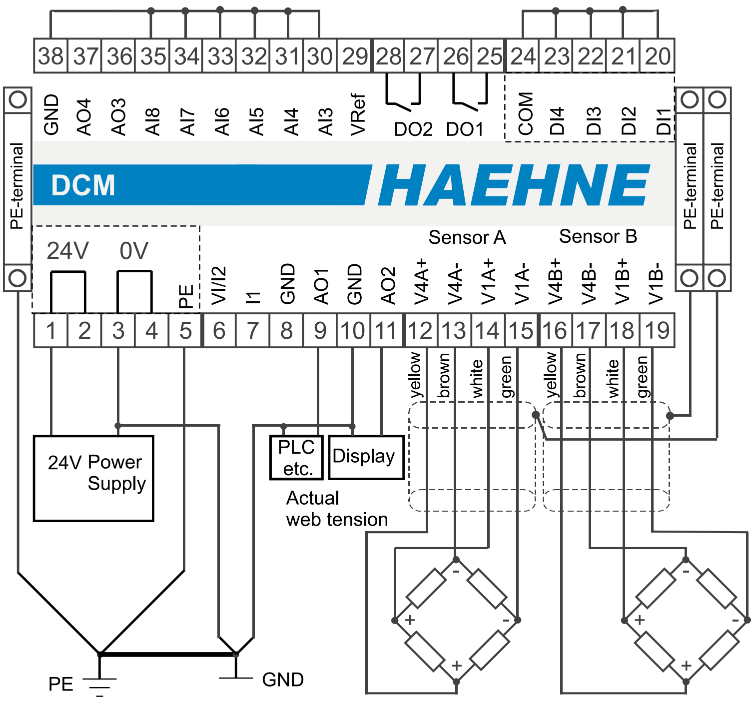
2. Amplifier / 1 Channel / 2 Sensors

DCM as 1 channel amplifier with 2 connected sensors

A411: 3 / Signal sources are averaged.

Zero adjust made with parameter A311
The amplification is done either automatically with A313 or with A314 to a specific value.
The analog output 1 (A01) is not filtered. The analog output 2 (AO2) is filtered with 4.8 seconds.
The filter times of the analog outputs can be adjusted with the following parameters:
Parameter for O311 for AO1 and parameter O321 for AO2.

The left display range is OFF. The right display a range shows the output signal in %.
The scaling can be adjusted as required with d112.



Alternatively, both sensors can be connected in parallel to terminals 12 to 15.
In this case use example 1.

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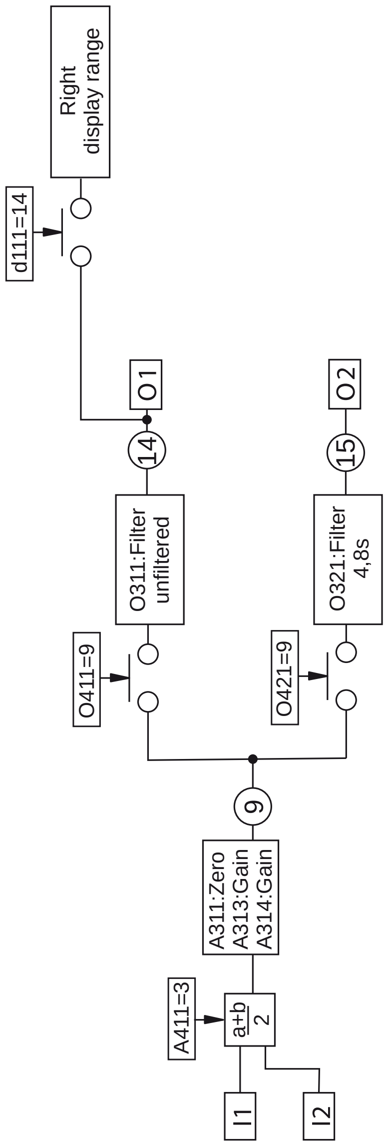
Functional Diagram 2



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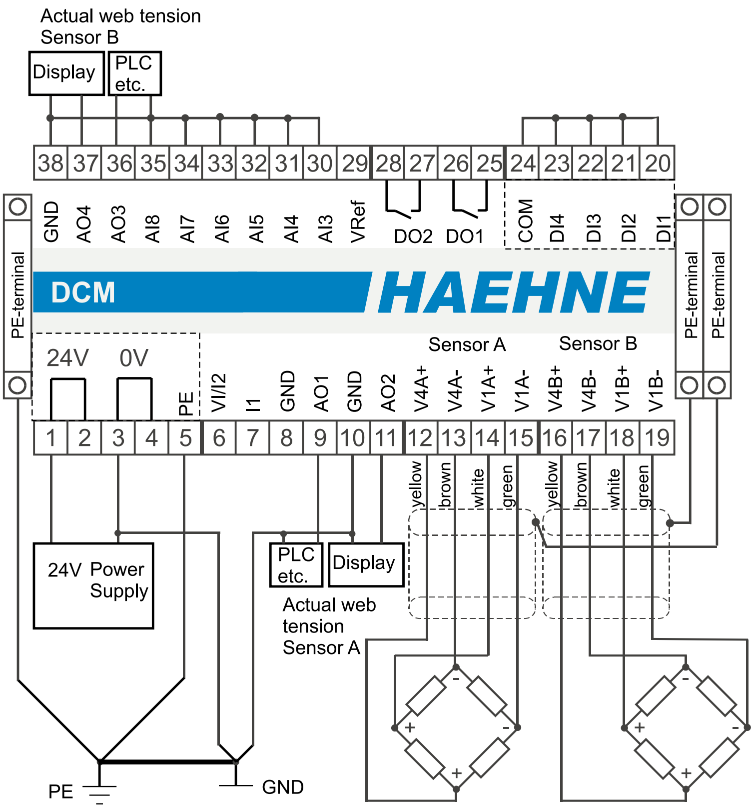
3a. Amplifiers / 2 Channels / 2 Sensors

DCM as 2 channel amplifier

A421: 2 / Sensor B connected to second amplifier.

Zero adjust of channel 1 is done with A311 and zero adjust of channel 2 is done with A321.
The amplification for Channel 1 is done automatically with A313 or adjusted to a specific value with A314.
The amplification for Channel 2 is done automatically with A323 or adjusted to a specific value with A324.

Parameter	Value	Designation		Filter	Filter time adjustment depending on requirements
O411	9	Analog output 1 (AO1)	Channel 1	unfiltered	O311
O421	9	Analog output 2 (AO2)	Channel 1	filtered with 4,8 s	O321
O431	**10**	Analog output 3 (AO3)	Channel 2	unfiltered	O331
O441 **O341**	**10 and** **4800**	Analog output 4 (AO4)	Channel 2	filtered with 4,8 s	O341
d111	**16**	The output signal of the second channel is shown in the right display range in %.		d112	Adjustment of scaling at will
d121	**14**	The output signal of the first channel is shown in the left display range in %.		d122	Adjustment of scaling at will



At the sensor inputs several sensors can be connected in parallel to the terminals. In this case the average is determined in analog fashion. The maximum supply current must not be exceeded.

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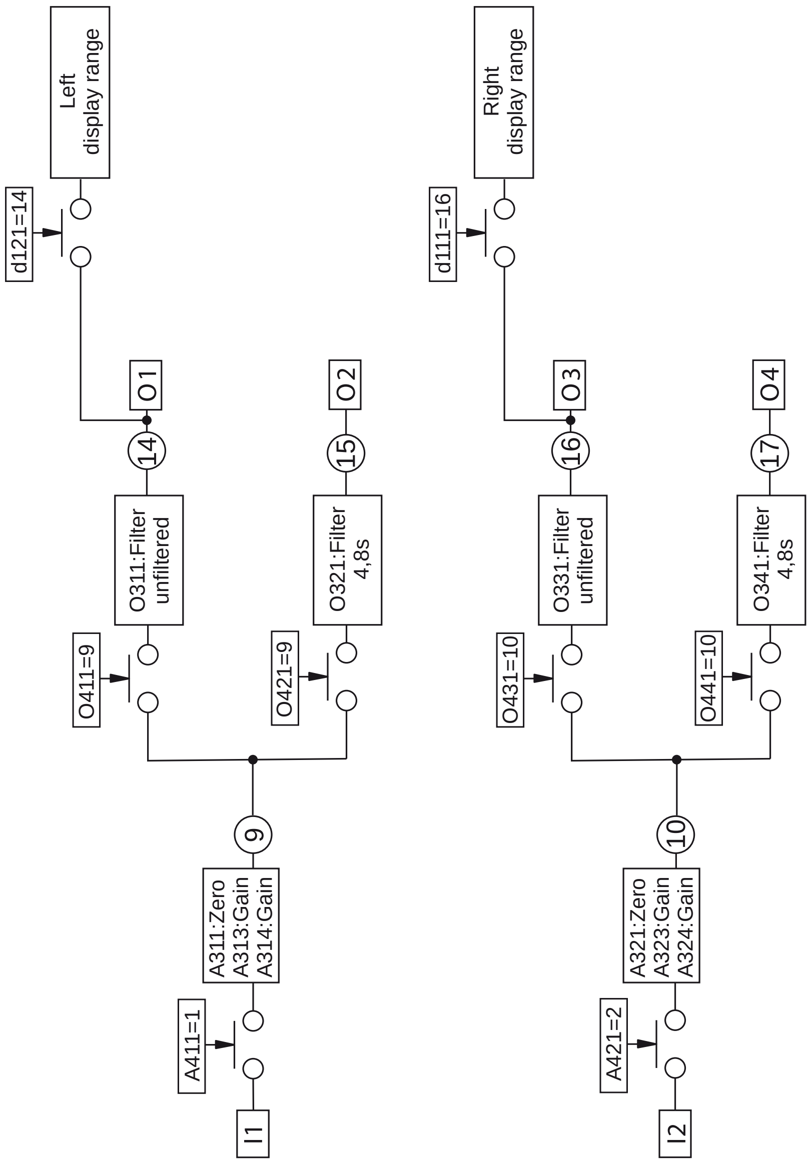
Functional Diagram 3a



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3b. Amplifiers / 2 Channels / 2 Sensors With Calculation Of Summation (Average)

DCM as 2 channel amplifier

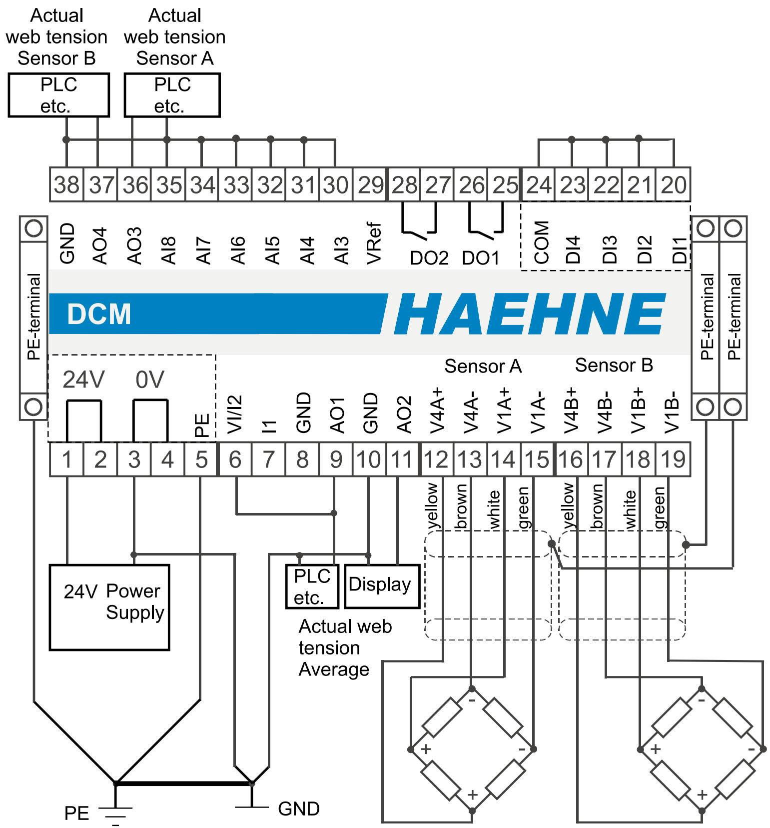
A421: 2 / Sensor B connected to second amplifier.

Zero adjust of channel 1 is done with A311 and zero adjust of channel 2 is done with A321.
The amplification for Channel 1 is done automatically with A313 or adjusted to a specific value with A314.
The amplification for Channel 2 is done automatically with A323 or adjusted to a specific value with A324.

y401: 1 / The average value of both amplifiers is available at the Block output of Block y.

If a calculation of sum is desired, set the parameters y321 and y312 to 100.

Parameter	Value	Designation		Filter	Filter time adjustment depending on require-ments
O411	**11**	Analog output 1 (AO1)	Average	unfiltered	O311
O421	**11**	Analog output 2 (AO2)	Average	filtered with 4,8 s	O321
O431	**9**	Analog output 3 (AO3)	Channel 1	unfiltered	O331
O441	**10**	Analog output 4 (AO4)	Channel 2	unfiltered	O341
d111	**17**	The output signal of the second channel is shown in the right display range in %.		d112	Adjustment of scaling at will
d121	**16**	The output signal of the first channel is shown in the left display range in %.		d122	Adjustment of scaling at will



At the sensor inputs several sensors can be connected in parallel to the terminals. In this case the average is determined in analog fashion. The maximum supply current must not be exceeded.
With option C the average is supplied as a current signal to terminal 7/8.

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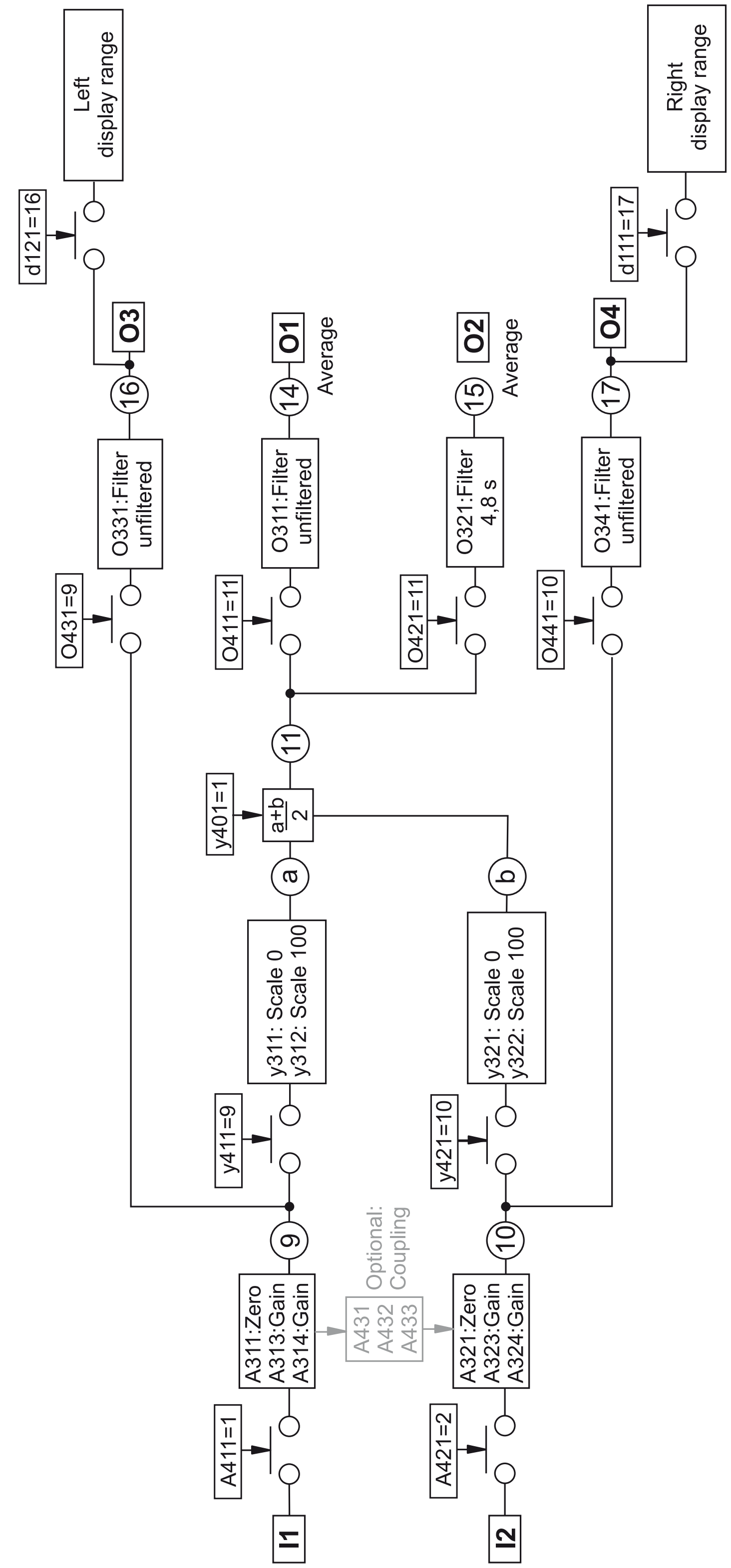
Functional Diagram 3b



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3c. Amplifiers / 2 Channels / 2 Sensors / 2 Current Outputs

DCM as 2 channel amplifier

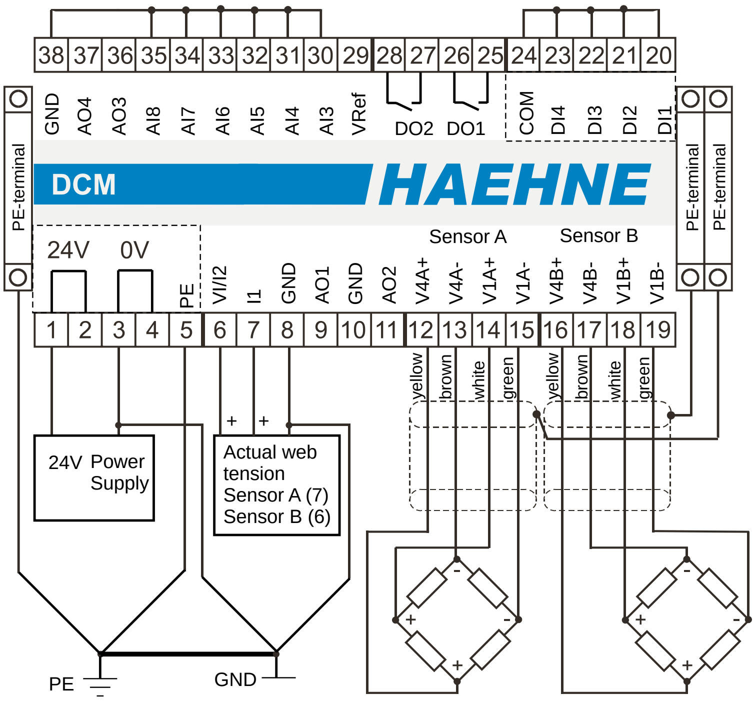
This signals of the individual sensors are issued separately. Using two voltage / current converters the voltage outputs AO1 and AO2 can be internally converted to 4-20 mA signals.

The current output I1 corresponding to the voltage output AO1 is available on terminal 7/8.
The current output I2 corresponding to the voltage output AO2 is available on terminal 6/8.

A421: 2 / Sensor B connected to second amplifier.

Zero adjust of channel 1 is done with A311 and zero adjust of channel 2 is done with A321.
The amplification for Channel 1 is done automatically with A313 or adjusted to a specific value with A314.
The amplification for Channel 2 is done automatically with A323 or adjusted to a specific value with A324.

Parameter	Value	Designation		Filter	Filter time adjustment depending on requirements
O411	9	Analog output 1 (AO1)	Channel 1	unfiltered	O311
O421 O321	**10 and 1**	Analog output 2 (AO2)	Channel 2	unfiltered	O321
d111	**15**	The output signal of the second channel is shown in the right display range in %.		d112	Adjustment of scaling at will
d121	**14**	The output signal of the first channel is shown in the left display range in %.		d122	Adjustment of scaling at will



At the sensor inputs several sensors can be connected in parallel to the terminals. In this case the average is determined in analog fashion. The maximum supply current must not be exceeded.
With option C the average is supplied as a current signal to terminal 7/8.

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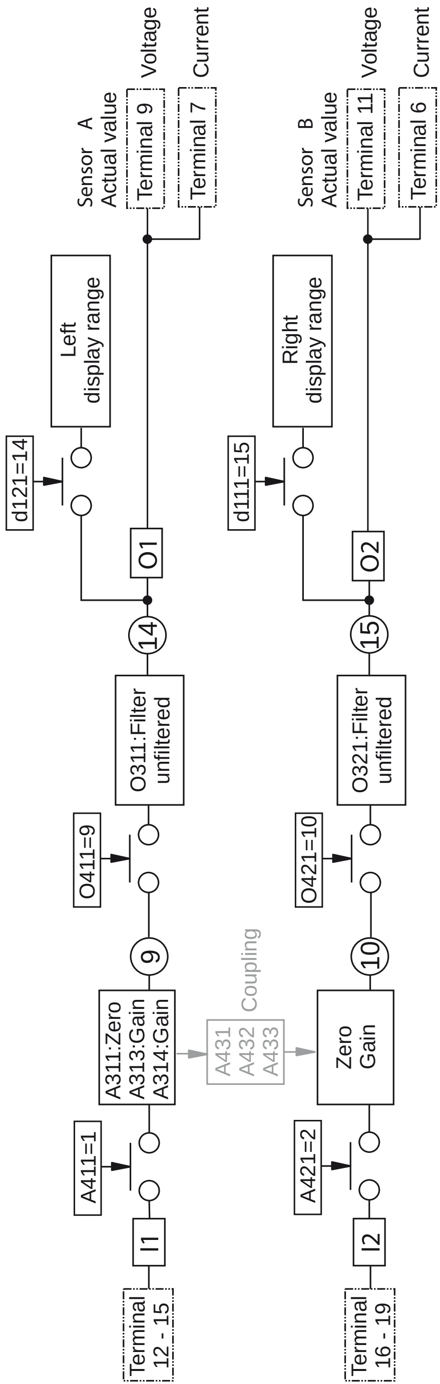
Functional Diagram 3c



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4a. Amplifier / 2 Channels / 1 Roll With 2 Sensors

DCM as 2 channel amplifier

This signals of the individual sensors are issued separately. For external control purposes an averaged actual value is available. For plausibility monitoring or recognition of uneven loads on the roll, the difference between the two sensor signals is available as absolute value.

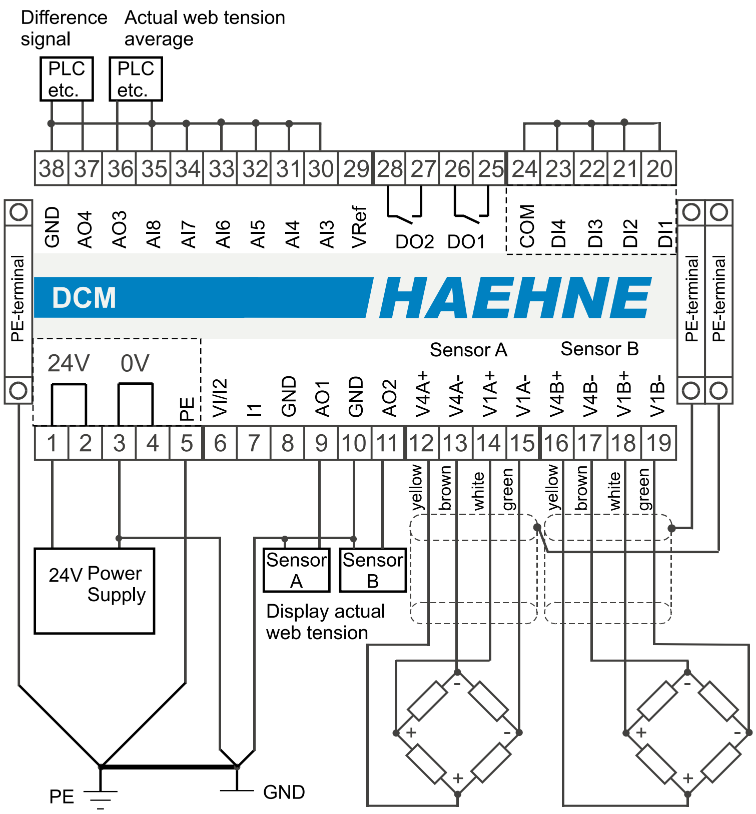
A421: 2 / Sensor B connected to second amplifier.
A431, A432 and A433 to 1 / Coupling of the two amplifiers.
Zero adjust of channel 1 and channel 2 are done with A311.

The amplification of both channels is done automatically with A313 or adjusted to a specific value with A314. In case of the automatic amplifier adjustment it is important to ensure that the force is acting in the middle of the roll.

y401: 1 / The average value of both amplifiers is available at the Block output of Block y.

F401: 1, F411: 9, F421: 10 and F322: -100 / The difference between the two amplifiers is available at the Block output of Block F.

Parameter	Value	Designation			Filter	Filter time adjustment
O311	**4800**	Analog output 1 (AO1)	Channel 1	Sensor A	filtered with 4,8s	O311
O421	**10**	Analog output 2 (AO2)	Channel 2	Sensor B	filtered with 4,8s	O321
O431	**11**	Analog output 3 (AO3)	Block y	Average	unfiltered	O331
O441	**13**	Analog output 4 (AO4) Amount function on	Block F	Difference	unfiltered	O341
O442	**2**					
d111	**15**	The output signal of the second channel is shown in the right display range in %.			d112	Adjustment of scaling at will
d121	**14**	The output signal of the first channel is shown in the left display range in %.			d122	Adjustment of scaling at will



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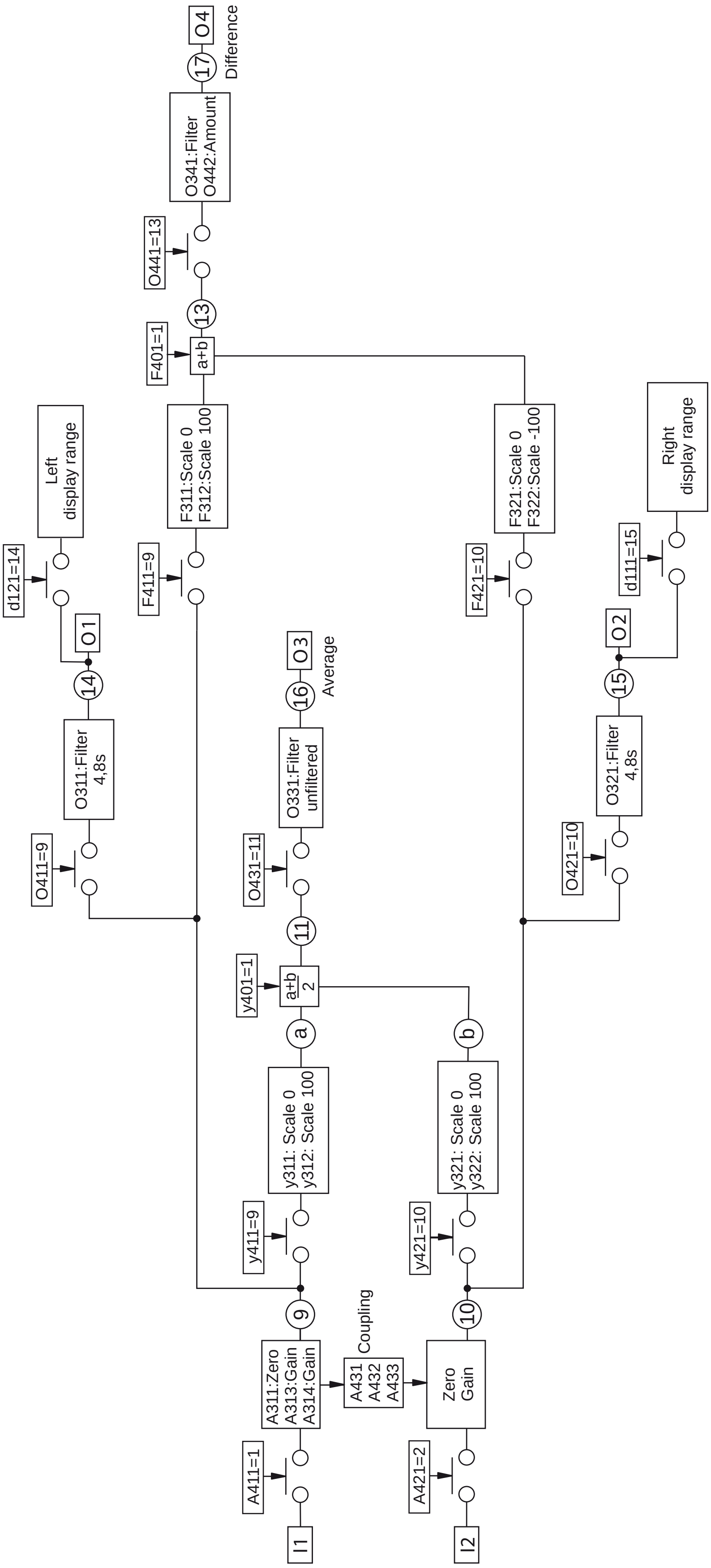
Functional Diagram 4a



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4b. Amplifier / 2 Channels / 1 Roll With 2 Sensors, 2 Current Outputs And Diagnostic Report

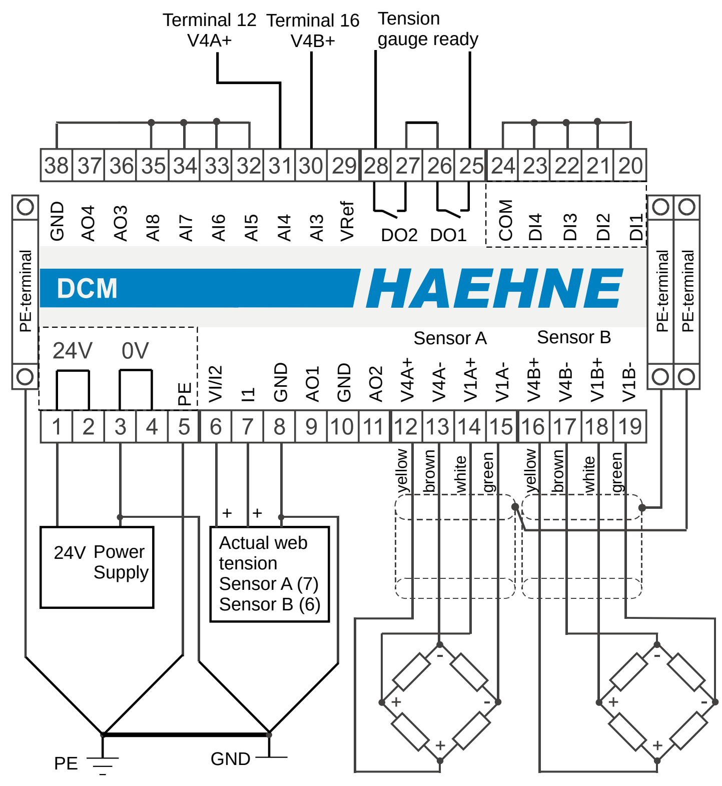
This signals of the individual sensors are issued separately. Using two voltage / current converters the voltage outputs AO1 and AO2 can be internally converted to 4-20 mA signals.

The current output I1 corresponding to the voltage output AO1 is available on terminal 7/8.
The current output I2 corresponding to the voltage output AO2 is available on terminal 6/8.

A421: 2 / Sensor B connected to second amplifier.
A431, A432 and A433 to 1 / Coupling of the two amplifiers.
Zero adjust of channel 1 and channel 2 are done with A311.

The amplification of both channels is done automatically with A313 or adjusted to a specific value with A314. In case of the automatic amplifier adjustment it is important to ensure that the force is acting in the middle of the roll.

Parameter	Value	Designation		Filter	Filter time adjustment depending on requirements
O411	9	Analog output 1 (AO1)	Channel 1	unfiltered	O311
O421 O321	**10 and 1**	Analog output 2 (AO2)	Channel 2	unfiltered	O321
r411	**1**	The digital output DO1 (relay) functions as limit switch.			
r413	**3**	AI3 signal is set to be monitored			
r311	**20.0**	Switch-on point of the limit monitor			
r312	**10.0**	Switch-off point of the limit monitor			
r421	**1**	The digital output DO2 (relay) functions as limit switch.			
r423	**4**	AI4 signal is set to be monitored			
r321	**20.0**	Switch-on point of the limit monitor			
r322	**10.0**	Switch-off point of the limit monitor			
d111	**15**	The output signal of the second channel is shown in the right display range in %.		d112	Adjustment of scaling at will
d121	**14**	The output signal of the first channel is shown in the left display range in %.		d122	Adjustment of scaling at will



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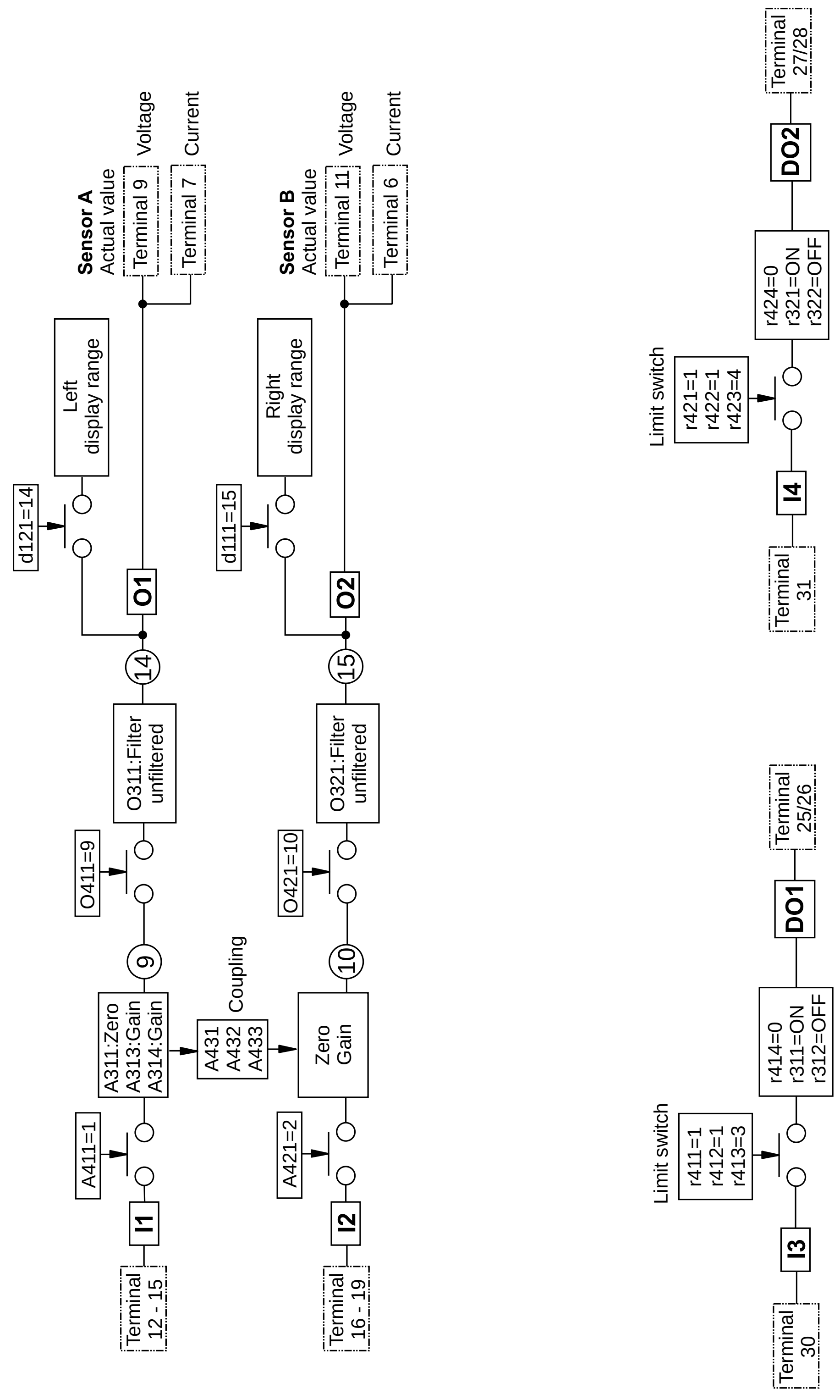
Functional Diagram 4b



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5. Amplifier / External Zero Adjust

Zero adjust is initiated externally by using the digital input DI1. This simplifies zero adjustment in case of frequently changing zero points. In addition, the status of zero adjust is displayed at a digital output.

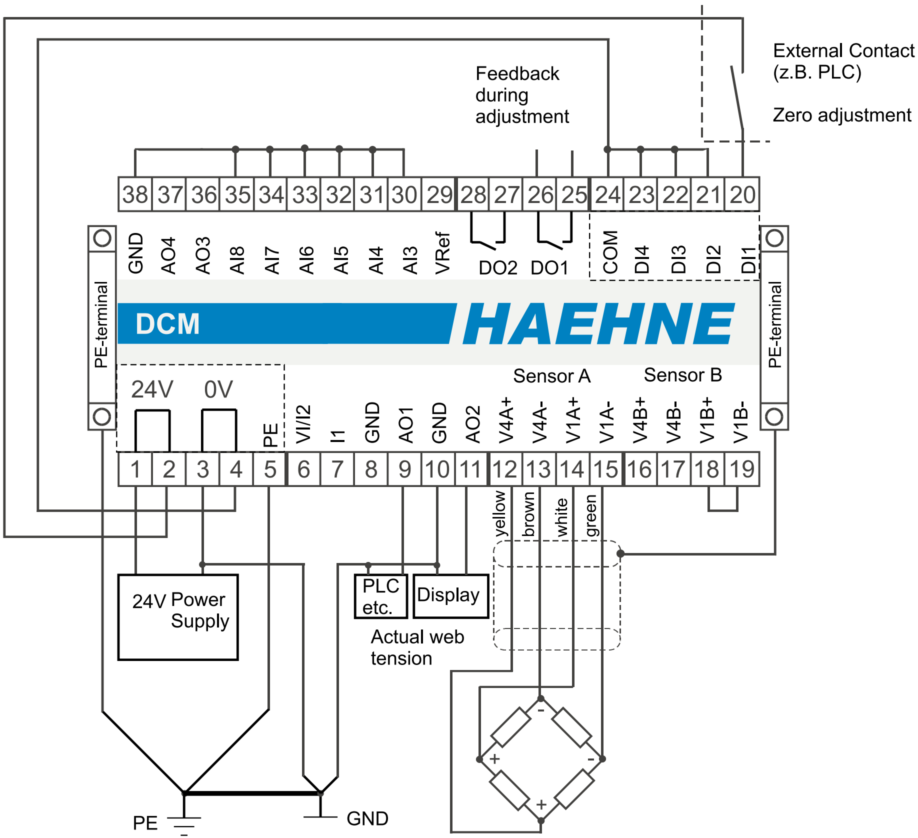
Attention! This zero adjust it is only temporary. In case of power outage a new zero adjust is necessary.

The basic sensor and amplifier adjustments have to be made similar to the examples above. The example refers to the single channel amplifier but can also be used for coupled zero adjustment. In case of the two channel amplifier, the second channel is adjusted accordingly.

A412: 1 / Zero adjust of the first amplifier is initiated externally by using the digital input DI1.

r411: 2 / The digital output DO1 (relay) is closed by activated adjustment function.

r415 is adjusted to 0 (standard adjustment).



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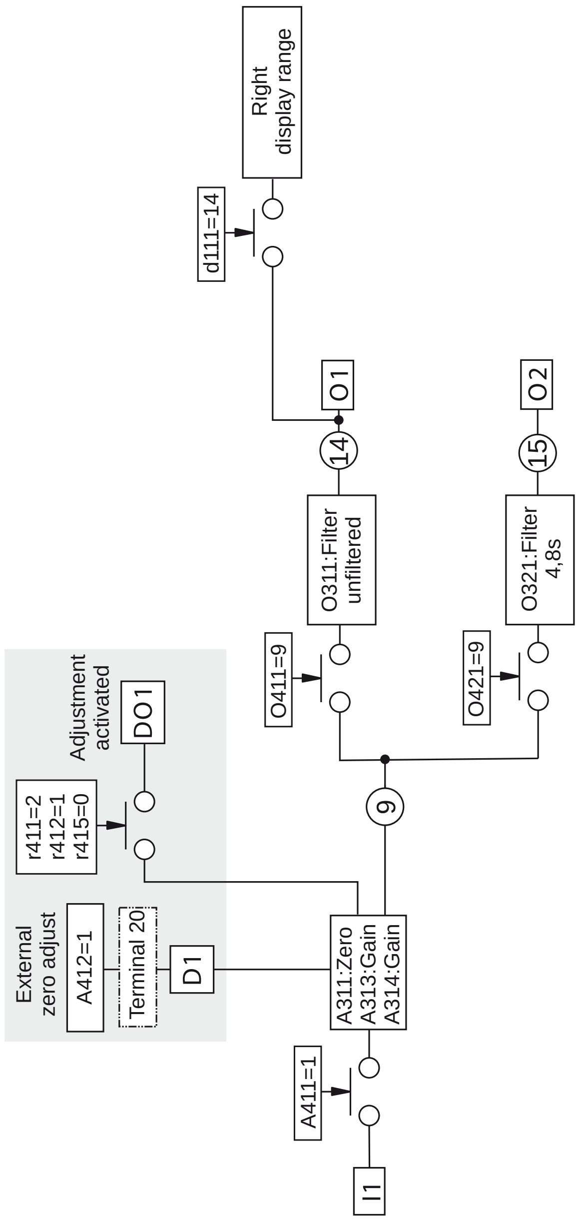
Functional Diagram 5



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6. Amplifier / Limiting Force Control / Limit Values

In this case the limit force of one channel is monitored. The relay is being closed by exceeding the pre-adjusted value and opened again by falling below the second pre-adjusted limit.

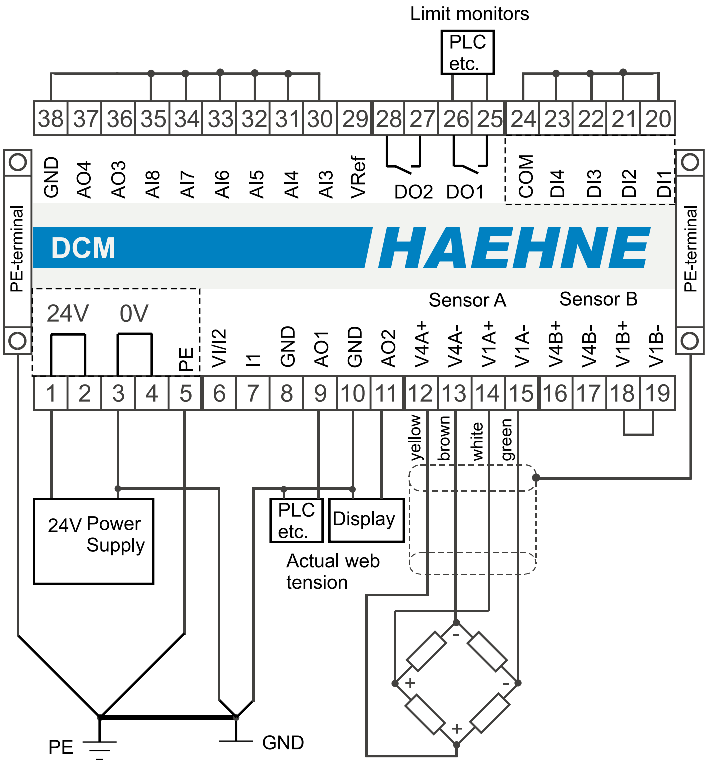
The basic sensor and amplifier adjustments have to be made according to the examples above. The example refers to the single channel amplifier but can also be used for coupled zero adjustment. In case of the two channel amplifier the second channel is adjusted accordingly.

r411: 1 / The digital output DO1 (relay) functions as limit switch.

Parameter r412 can be used to change the response characteristics.

Parameter r413 is used to select the signal to be monitored. The first amplifier output is adjusted here as a standard.

Parameters r311 and r312 can be used to adjust the switch and switch off points.



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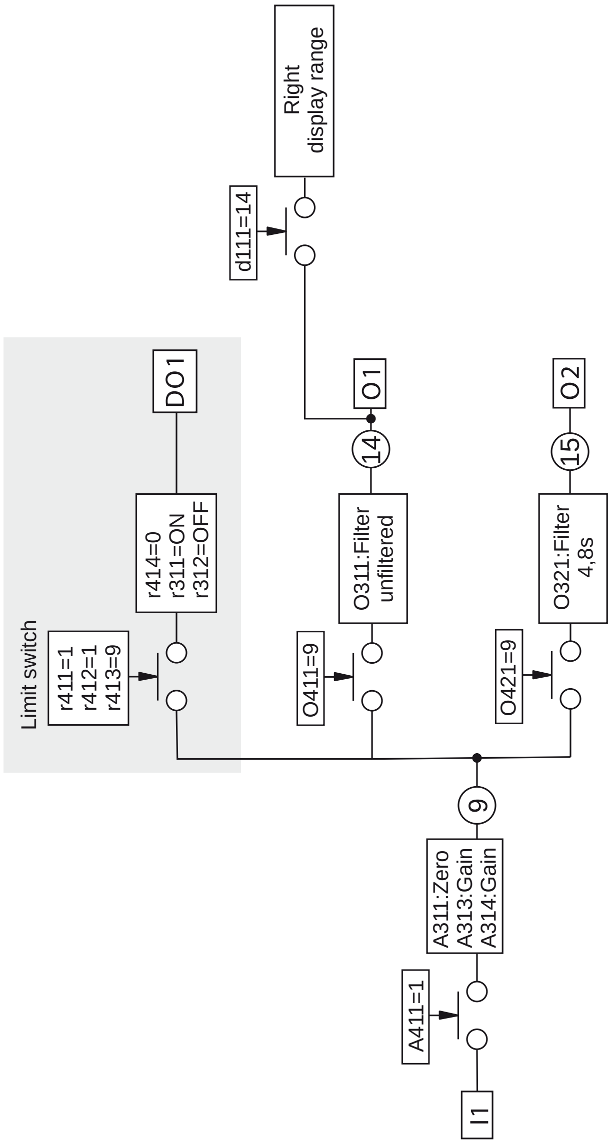
Functional Diagram 6



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7. Amplifier / Compression Force Control

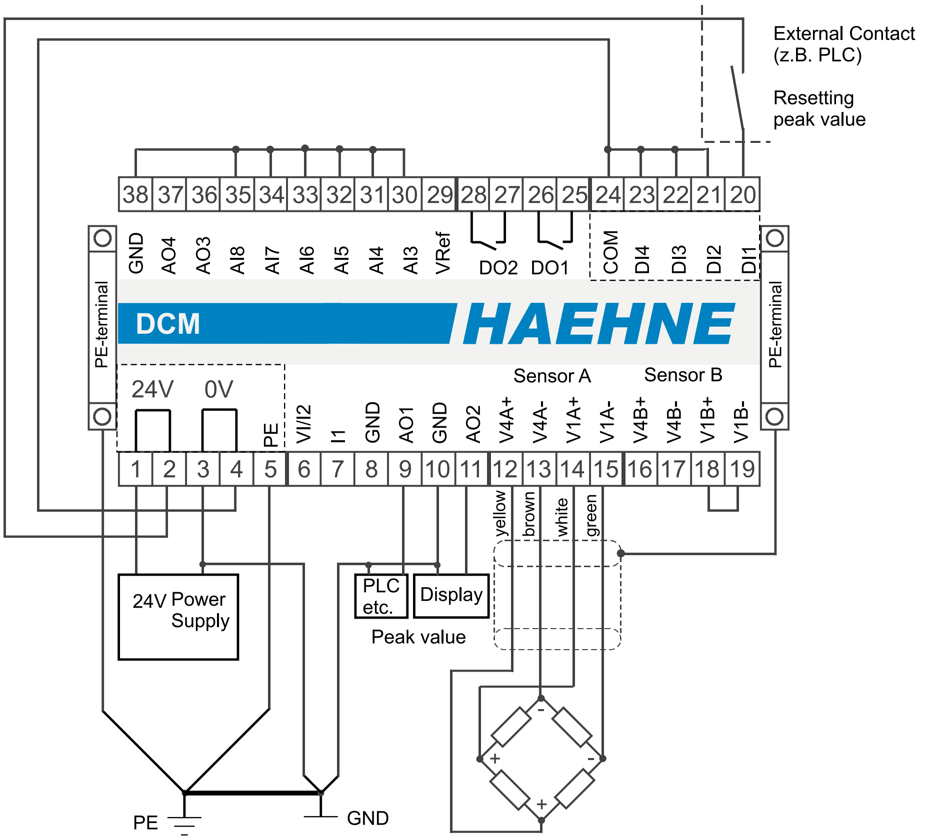
The peak value of a channel is issued with the analog output AO1 and externally reset with the digital input DI1. Based on the fast cycle time it is possible to recognize peak values in a time pattern of 520 µs.

The basic sensor and amplifier adjustments have to be made according to the examples above.
The example refers to the single channel amplifier. In case of the two channel amplifier the second channel is adjusted accordingly.

O413: 1 / The analog peak value storage is activated.

Parameter O414 is used to change the reset source.

If the force display should be enabled to display also the peak value then O423 has to be set to 1.



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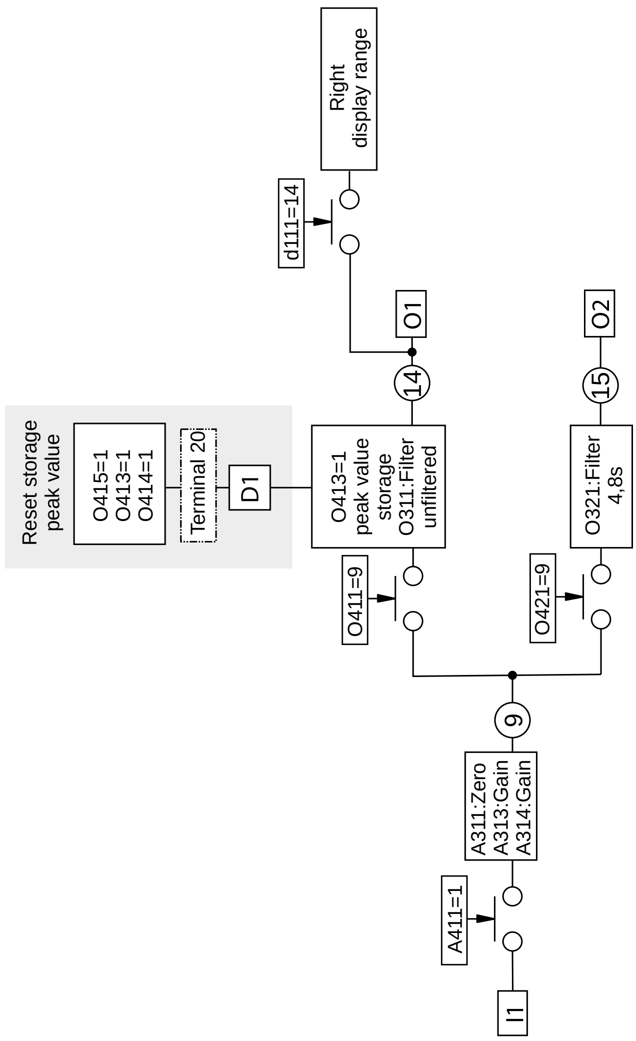
Functional Diagram 7



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8. Amplifier / Wrap Angle Correction with Variable Diameter

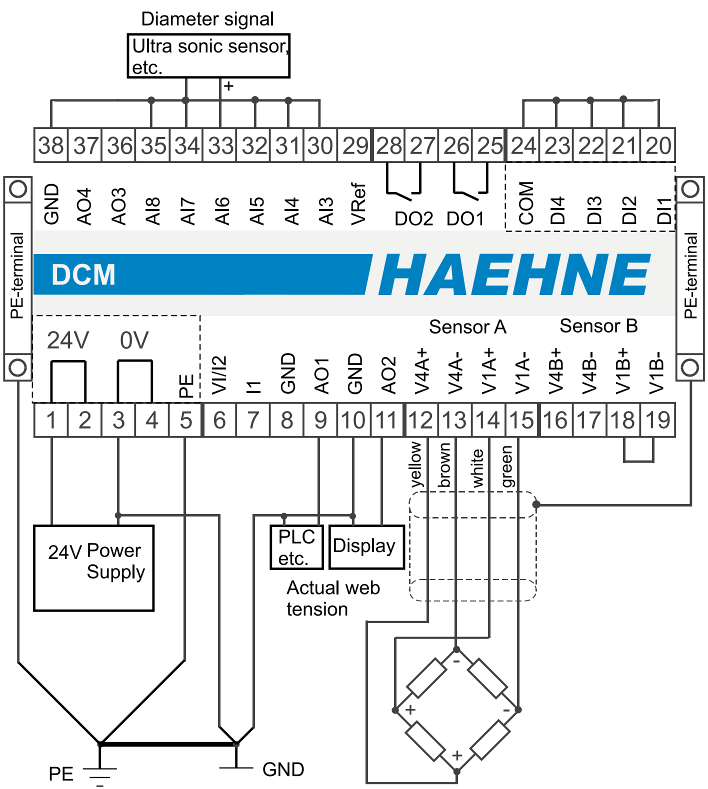
Accurate determination of web tension despite force variation caused by rewinding and unwinding. The winding diameter is required for the correction. The basic sensor and amplifier adjustments have to be made according to the examples above. The example refers to single channel amplifier.
A440: 1 / Wrap angle correction is activated.
As a standard adjustment the diameter signal is connected to AI6. This can, however, be changed with parameter A447.
The parameters **A341** to **A349** and **A441** have to be adjusted according to the geometry data.
The value data of the parameter A346 and capital A347 are dependent on the available signal sources:
1. The diameter signal is delivered by the PLC, which was calculated there and does not include a zero point deviation: **A346 : 0** and **A347**: **"Diameter of the variable roll at the 10 V signal"**.

2. An ultra sonic sensor is used. This enables the teaching of 0 V and 10 V output signals:
A346: "diameter at 0 V signal" and **A347: "diameter increase at 10 V signal"**.

By using the MKB software and the angle entered with A341 and A349 the maximum force is calculated acting on the connected sensor. The roll weight is not necessary for calculating the required amplification. The measurement direction to be selected is horizontal pointing in the X-axis direction.
The amplification A314 is calculated according to the following formula:

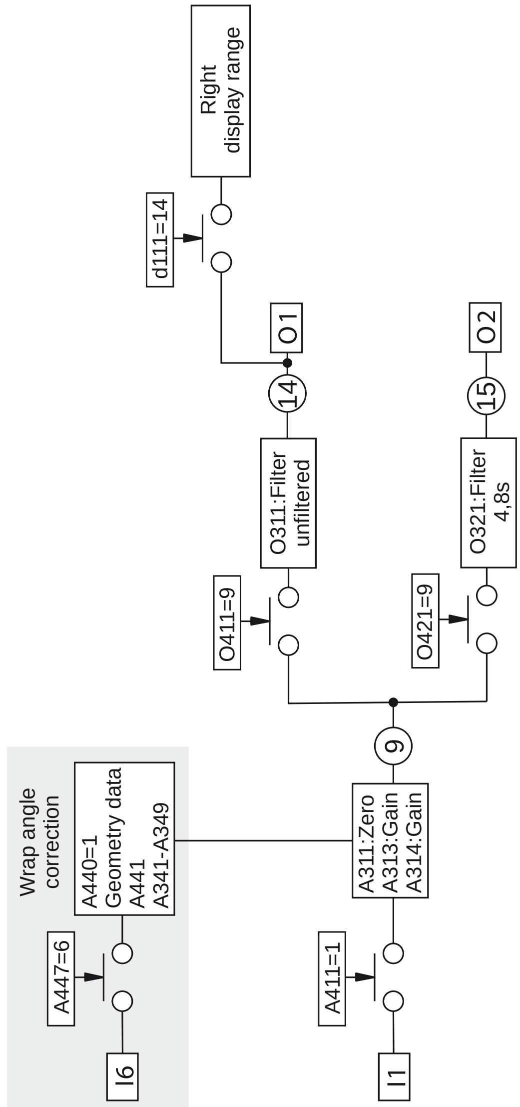
$$A314 = \frac{10000\,[mV] \ast \text{Sensor nominal force [N]}}{\text{Nominal rating of sensor} \left[\frac{mV}{V}\right] \ast 10\,[V] \ast \text{Web tension portion [N]}}$$

Alternatively, the amplification can be automatically determined with parameter A313 and a calibration weight. Thereby it is necessary that the minimum angle entered with parameter A349 which the variable web geometry can assume is actually present.



The two channel amplifier can be used for wrap angle correction on the second channel if the identical web geometry is present. For all practical purposes this is the case with a measuring roll with two sensors and separate amplification. In this case the parameter A440 is adjusted to 3.

Functional Diagram 8



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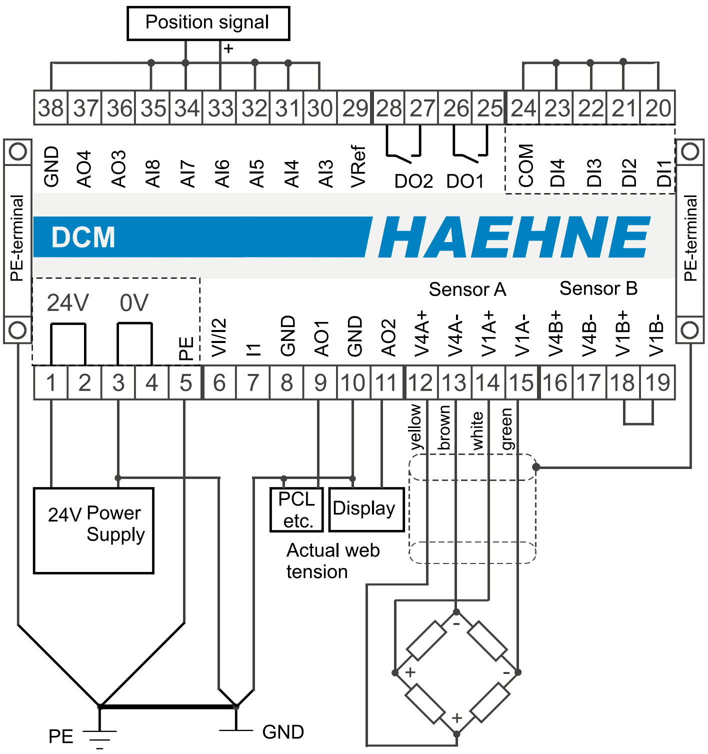
9. Amplifier / Wrap Angle Correction With Variable Position

Determination of the correct web tension despite variable forces acting due to rewinding and unwinding. The position change of the variable roll is required for the correction. The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier.
A440: 1 / Wrap angle correction activated.
A443: 6 and A445: 6 / The signal source for the variation of the distance in X-and Y-direction is connected to AI6.
A447: 0 / The diameter is constant.
The parameter A341 to A349 and A441 have to be adjusted according to the geometries, e.g.:
A342: "Distance in the X-direction at 0 V signal"
A343: "Distance change in the X-direction at 10 V signal"
A344: "Distance in the Y-direction at 0 V signal"
A345: "Distance change in the Y-direction at 10 V signal"
A346: "Diameter of the variable roll" (Because the diameter is constant the parameter A347 is not considered)
The maximum force acting on the connected sensor is calculated with the MKB software and the angles entered under A341 and A349. The roll weight is not necessary for calculating the necessary amplification.
As measuring direction the horizontal X-direction should be selected. The amplification A314 is calculated according to the following formula.

$$A314 = \frac{10000\ [\text{mV}] \ast \text{Sensor nominal force [N]}}{\text{Nominal rating of sensor} \left[\frac{\text{mV}}{\text{V}}\right] \ast 10\ [\text{V}] \ast \text{Web tension portion [N]}}$$

Alternatively the amplification can be determined automatically with parameter A313 and a calibration weight.
The minimum angle which the variable geometry can assume must be stored under the parameter A349.



The two channel amplifier can be used for wrap angle correction on the second channel if the identical web geometry is present. For practical purposes this is the case with a measuring roll with two sensors and separate amplification. In this case the parameter A440 is adjusted to 3.

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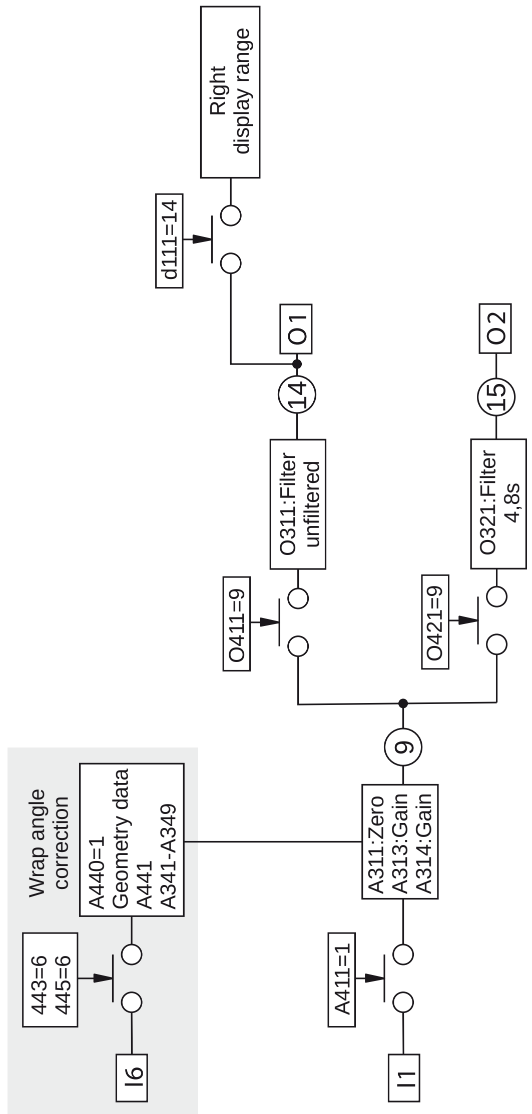
Functional Diagram 9



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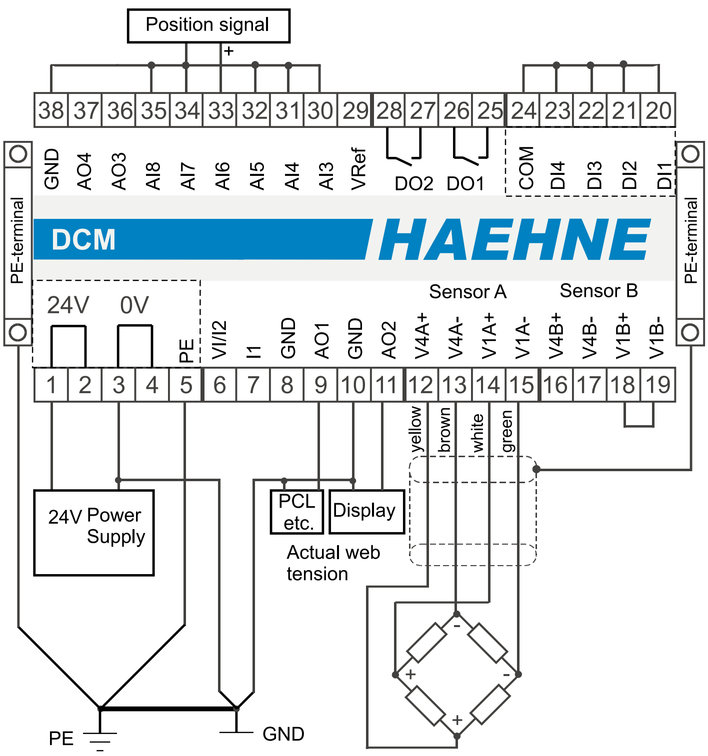
10. Amplifier / Wrap Angle Correction With Symmetrical Position Change

Despite variable force application the correct web tension is determined by moving the measuring roll. Required is the position change of the measuring roll for calculating the correction.
The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier.
A440: 1 / Wrap angle correction is ON
A443: 6 / The signal source for the change of the distance in X-direction is connected to AI6.
A447: 0 / Diameter is constant.
The parameters A342 to A349 and A441 have to be adjusted according to the web geometry of **one** side. A345 and A347 are not required. The fixed angle is assumed to be 90° and has therefore no influence: **A341: 90**

The maximum force acting on the connected sensor is calculated with the MKB software and the angles entered under A349. The roll weight is not necessary for calculating the necessary amplification. As measuring direction the horizontal X-direction should be selected. Because intake and runout angles have equal value the minimal variable angle A349 are considered twice. Once as an original value and again as a negative value. The amplification A314 calculated according to the following formula:

$$A314 = \frac{10000\ [mV] \quad * \quad \text{Sensor nominal force [N]}}{\text{Nominal rating of sensor } \left[\frac{mV}{V}\right] \quad * \quad 10\ [V] * \text{Web tension portion [N]}}$$

Alternatively the amplification can be determined automatically with parameter A313 and a calibration weight. The minimum angle which the variable geometry can assume must be stored under the parameter A349.



The two channel amplifier can be used for wrap angle correction on the second channel if the identical web geometry is present. For all practical purposes this is the case with a measuring the roll with two sensors and separate amplification. In this case the parameter A440 is adjusted to 3.

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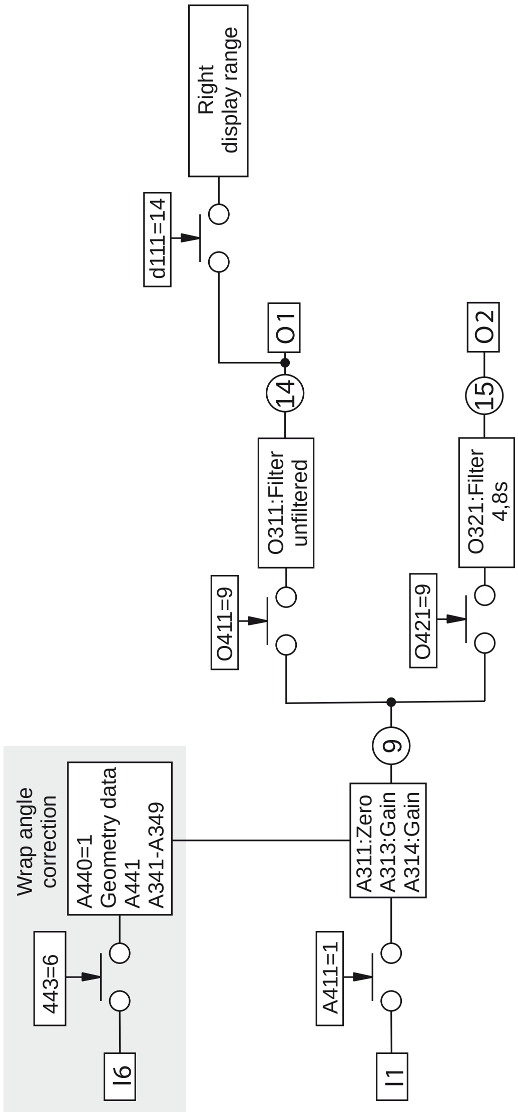
Functional Diagram 10



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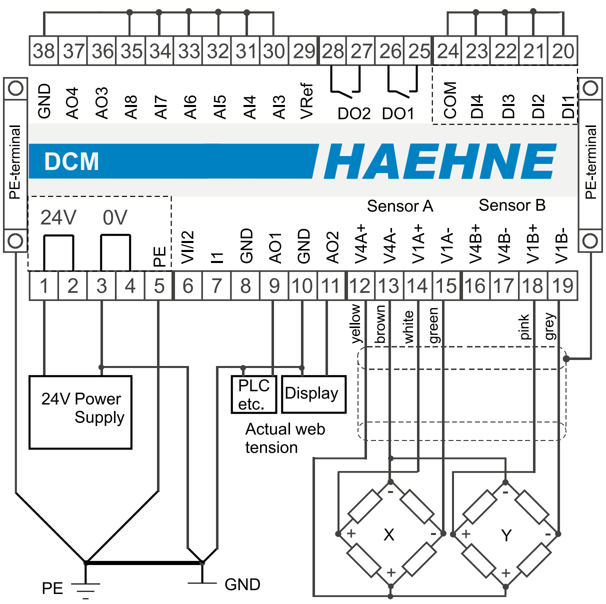
11a. Amplifier / XY-Sensor Analysis

In this case the *HAEHNE* XYR dual axis sensor is analyzed and the resulting web tension force is calculated and issued. Despite the variable application of force the correct web tension is determined. In contrast to the wrap angle correction no additional hardware is required.
A421: 2 / Y-Output of the sensor onto the second amplifier.
A431, A432 and A433 to 1 / Coupling of both amplifiers.
Zero adjust with A311 of channel 1 and of channel 2.
The amplification of both channels is adjusted with A314 to the following value:

$$A314 = \frac{10000\,[mV] \quad * \quad \text{Sensor nominal force [N]}}{\text{Nominal rating of sensor}\left[\frac{mV}{V}\right] \quad * \quad 10\,[V] * \text{Maximum web tension [N]}}$$

The XY-sensor is intended for measuring rolls with sensors on both roll ends, thereby halving the web tension force acting on each sensor. On the other hand given the necessary enlacement the maximum force acting at the roll can be twice as high as the web tension force. With the formula above the amplification can be adjusted in such a way that in case of maximum web tension the maximum force per channel is limited to 100%.
The XY-Analysis calculates the web tension in such a fashion that the maximum web tension at the output results in a voltage of 10 V.

Parameter	Value	Designation		Filter	Filter time adjustment depending on requirements
O411	**11**	Analog output 1 (AO1)	Mathe1	unfiltered	O311
O421	**11**	Analog output 2 (AO2)	Mathe1	filtered with 4,8s	O321
		The output signal is shown in the right display range in %.		d112	Adjustment of scaling at will
		The left display range is OFF			
y401	**4**	The analysis is adjusted to "Single-sided varying geometry". Alternativ value 5: Single-sided varying geometry, constant intake/runout angle (see parameter explanation Block Y401)			
y312	**100**	The X-signal is processed unchanged.			
y322	**100**	The Y-signal is processed unchanged.			
y331		The constant intake or runout angle must be indicated here.			
y332	150	The constant max. opening angle must be indicated here.			



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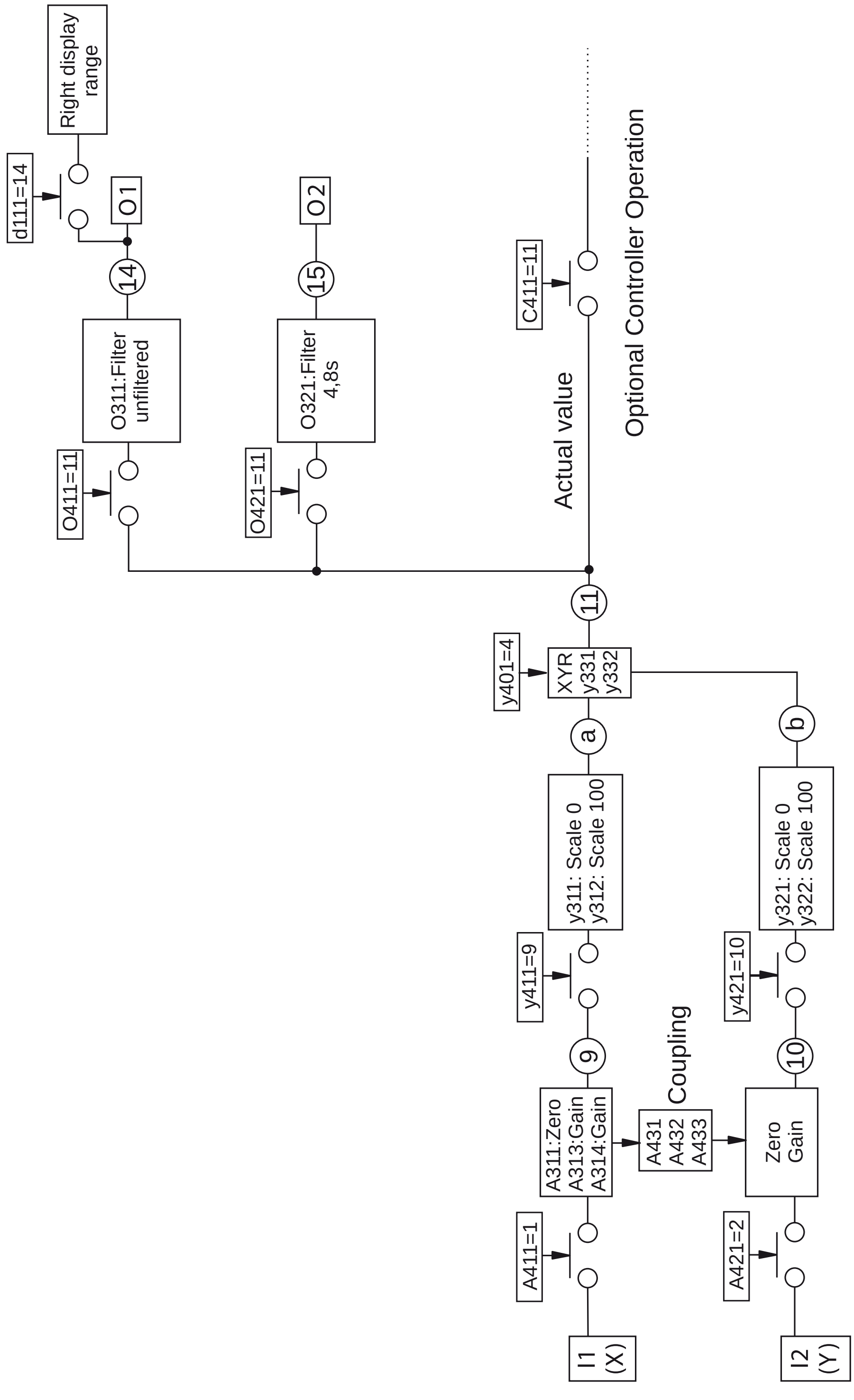
Functional Diagram 11a



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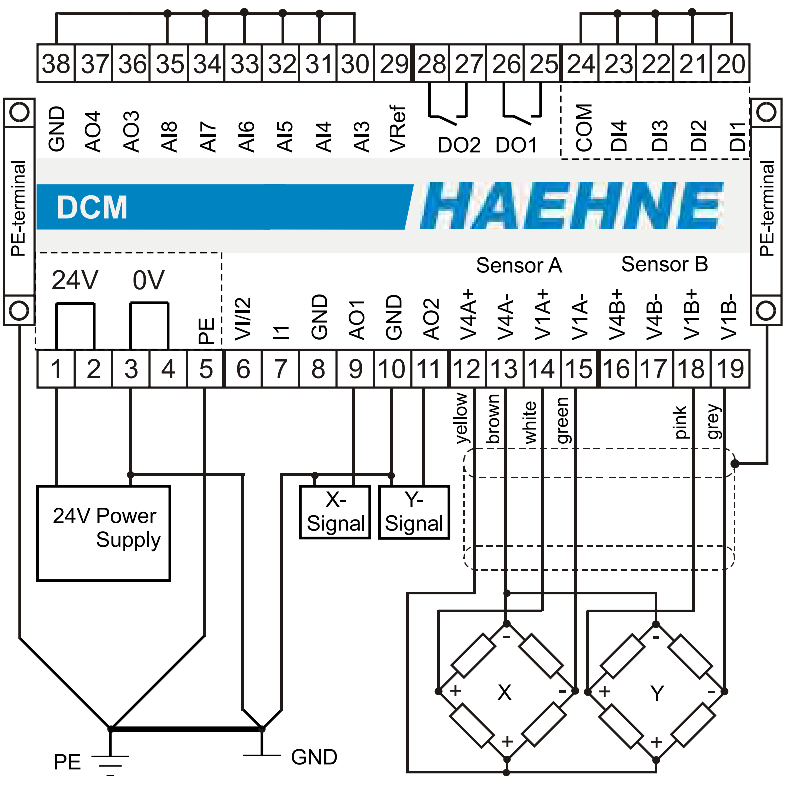
11c. Amplifier / XY-Sensor Evaluation (Compensation only)

The *HAEHNE* two-axis sensor is evaluated and the crosstalk between the channels is compensated..

A421: 2 / Y-Output of the sensor onto the second amplifier.
A431, A432 and A433 to 1 / Coupling of both amplifiers.
Zero adjust with A311 of channel 1 and of channel 2.
The amplification of both channels is adjusted with A314 to the following value:

$$A314 = \frac{10000\ [mV]}{\text{Nominal rating of sensor} \left[\frac{mV}{V}\right] * 10\ [V]}$$

Parameter	Value	Designation		Filter	Filter time adjustment depending on requirements
A351	**PX_Y**	Correction factor amplifier depending on the sensor			
A352	**PY_X**	Correction factor amplifier depending on the sensor			
O411	9	Analog output 1 (AO1)	Channel 1	unfiltered	O311
O421 **O321**	**10 and** **1**	Analog output 2 (AO2)	Channel 2	unfiltered	O321
d111	**15**	The right display shows the Y signal in %		d112	Adjustment of scaling at will
d121	**14**	The right display shows the X signal in %		d122	Adjustment of scaling at will



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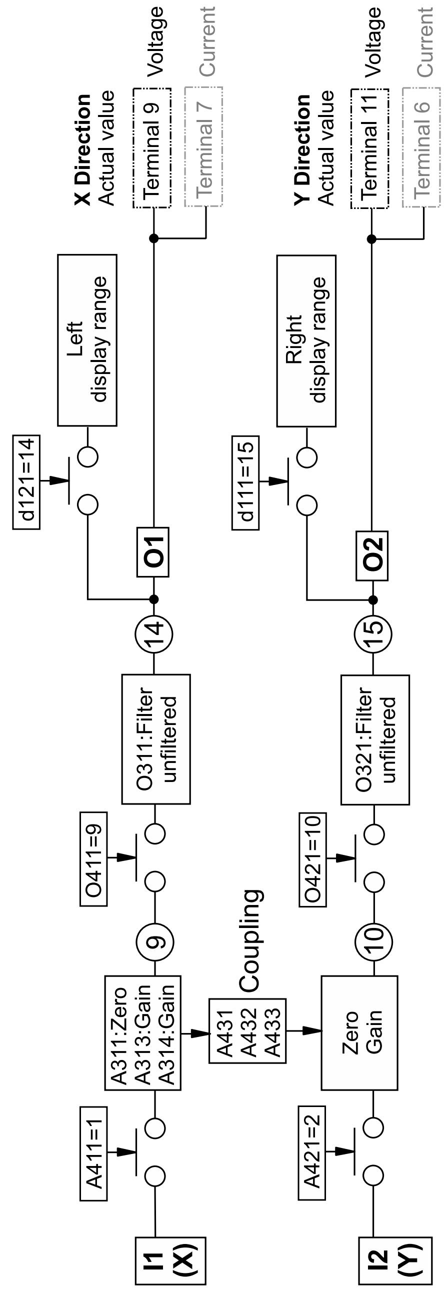
Functional Diagram 11c



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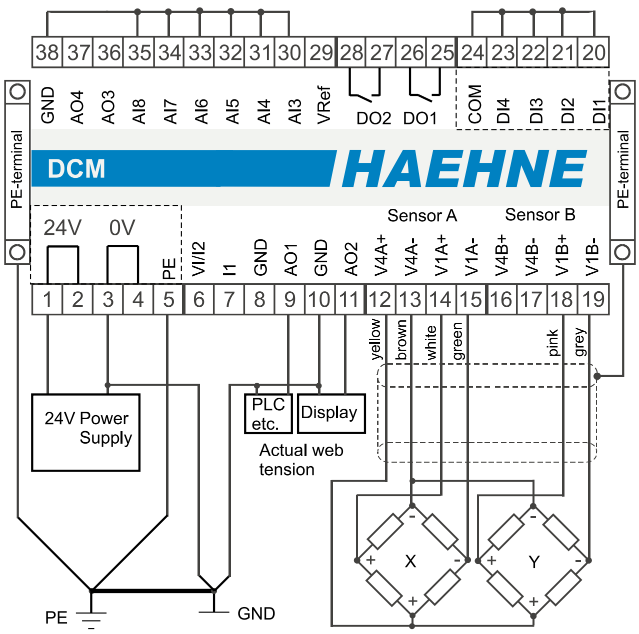
11b. Amplifier / XY-Sensor Analysis

In this case the *HAEHNE* XYR dual axis sensor is analyzed and the resulting web tension force is calculated and issued. The correct web tension is determined despite changing forces, which occur with driven or braked rolls.
A421: 2 / Y-Output of the sensor onto the second amplifier.
A431, A432 and A433 to 1 / Coupling of both amplifiers.
Zero adjust with A311 of channel 1 and of channel 2.
The amplification of both channels is adjusted with A314 to the following value:

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

The XY-sensor is intended for measuring rolls with sensors on both roll ends, thereby halving the web tension force acting on each sensor. On the other hand given the necessary enlacement the maximum force acting at the roll can be twice as high as the web tension force. With the formula above the amplification can be adjusted in such a way that in case of maximum web tension the maximum force per channel is limited to 100%.
The XY-Analysis calculates the web tension in such a fashion that the maximum web tension at the output results in a voltage of 10 V.

Parameter	Value	Designation		Filter	Filter time adjustment depending on requirements
O411	**11**	Analog output 1 (AO1)	Mathe1	unfiltered	O311
O421	**11**	Analog output 2 (AO2)	Mathe1	filtered with 4,8s	O321
		The output signal is shown in the right display range in %.		d112	Adjustment of scaling at will
		The left display range is OFF			
y401	**6**	The analysis is adjusted to "Intake force". Alternativ value 7 : Runout force, value 8: Average (see parameter explanation Block Y401)			
y312	**100**	The X-signal is processed unchanged.			
y322	**100**	The Y-signal is processed unchanged.			
y331	The constant intake angle must be indicated here.				
y332	The constant runout angle must be indicated here.				



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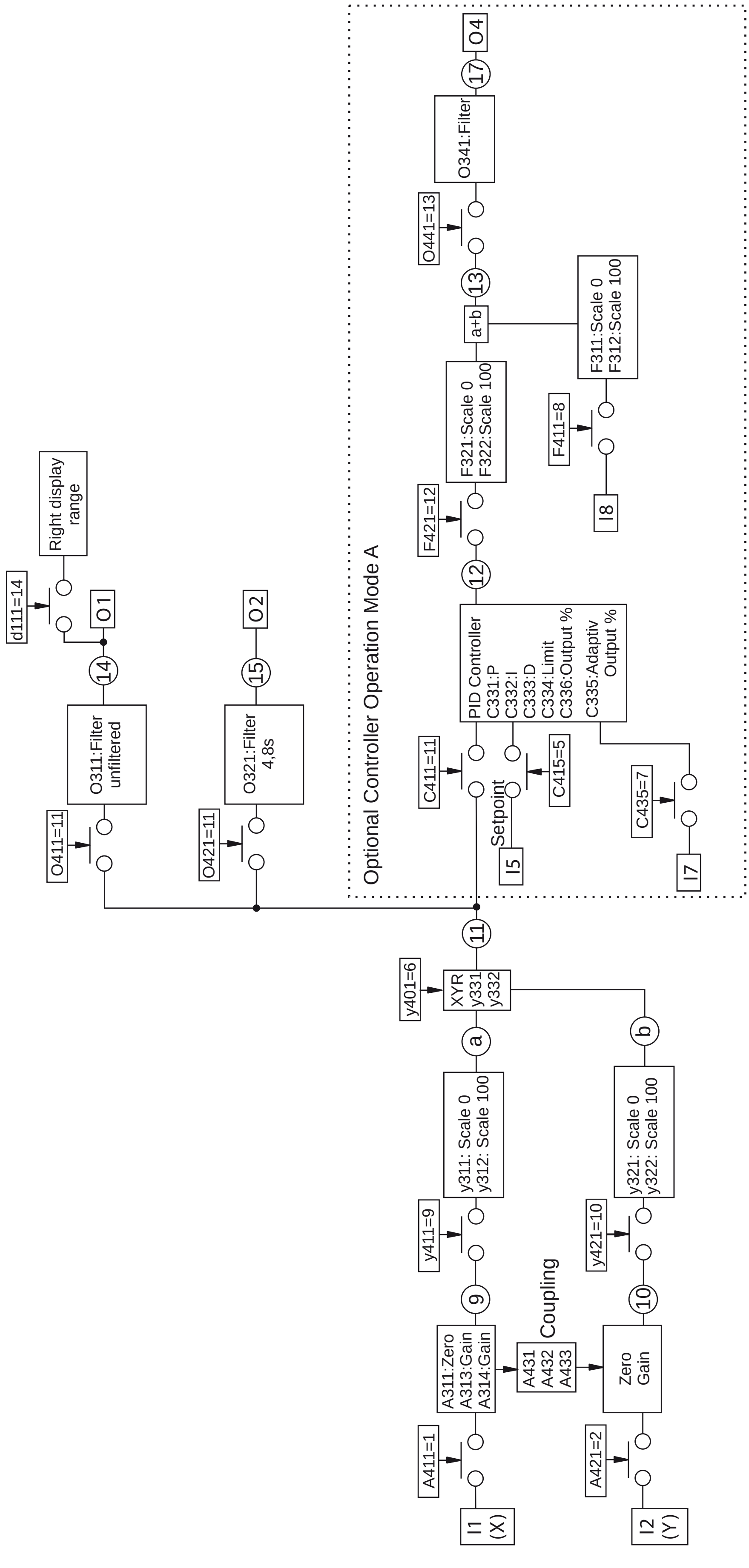
Functional Diagram 11b



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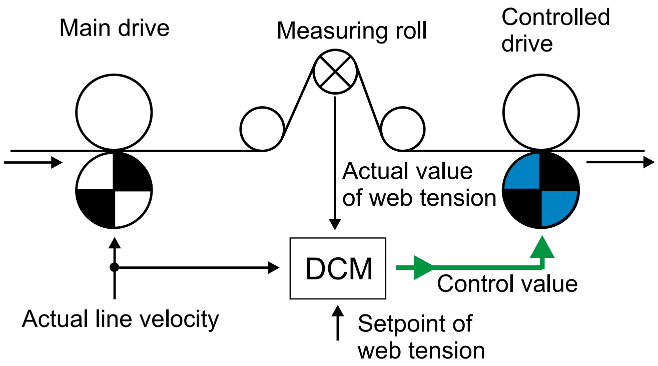
12. Controller Operation Mode A

Web tension control via correction of the existing line velocity

- Material treatment
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- In the process the measurement roll is physically located **before** the controlled drive

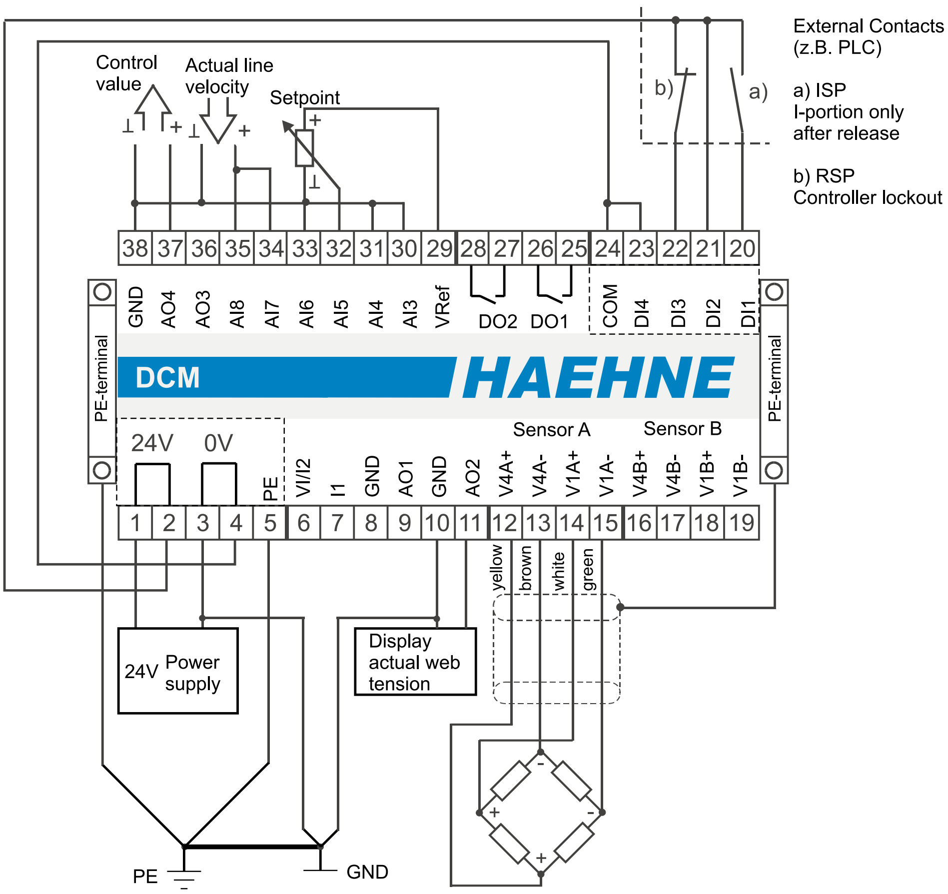


The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier.

If the DCM is used as a two channel amplifier then the following values have to be adjusted:

C413: 10, C312 and C314: 50.0

Parameter	Value	
C401	**1**	Controller is activated
F401	**1**	Controller signal is added to the actual line velocity
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.5, C332: 800 ms, C335: 20.0 and C336: 2.0



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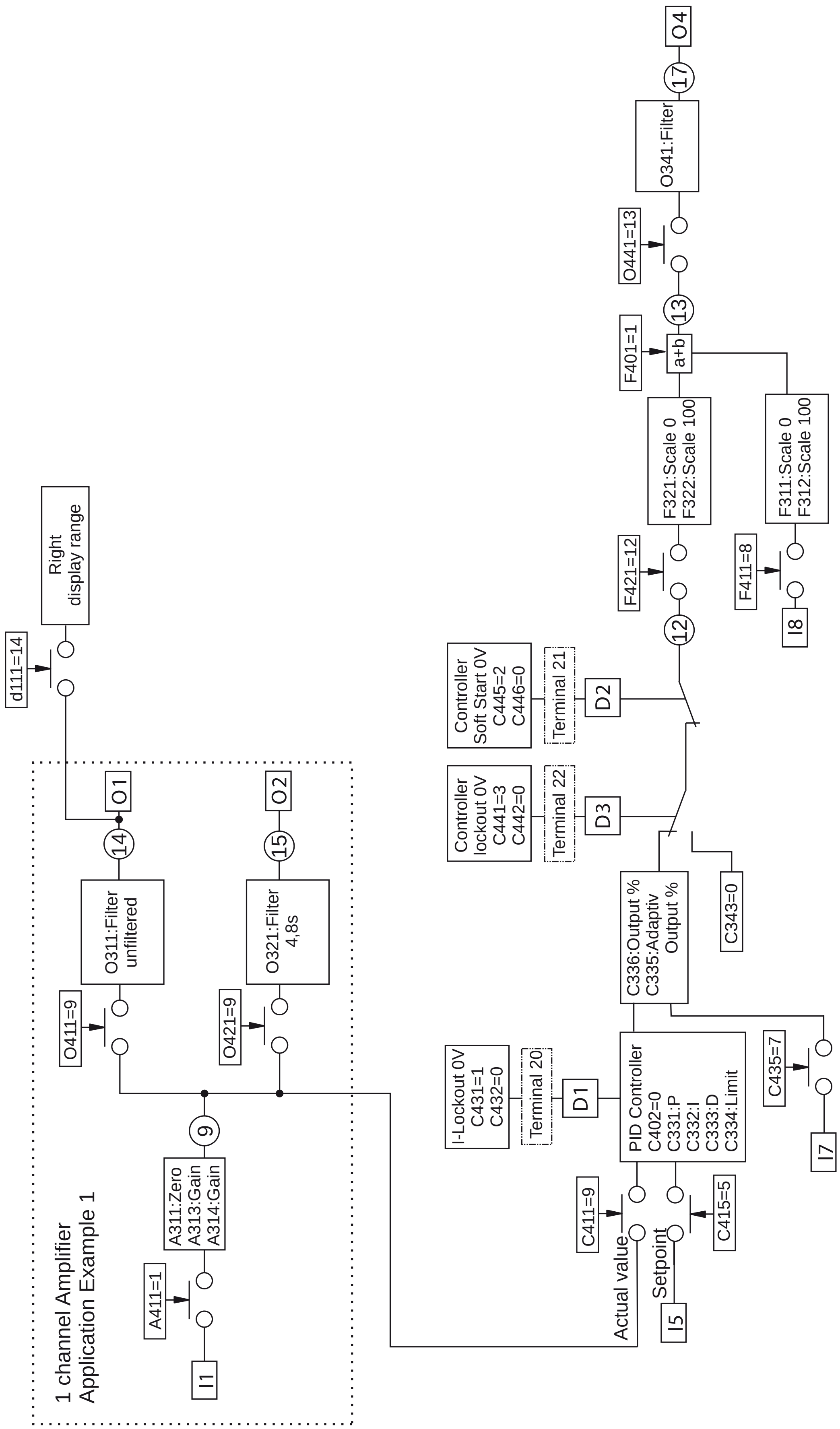
Functional Diagram 12



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12a. Controller Operation Mode A.1

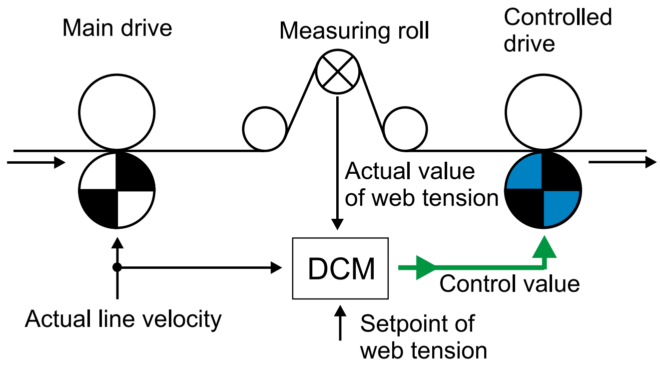
Web tension control via correction of the existing line velocity

- Material treatment
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- In the process the measurement roll is physically located **before** the controlled drive

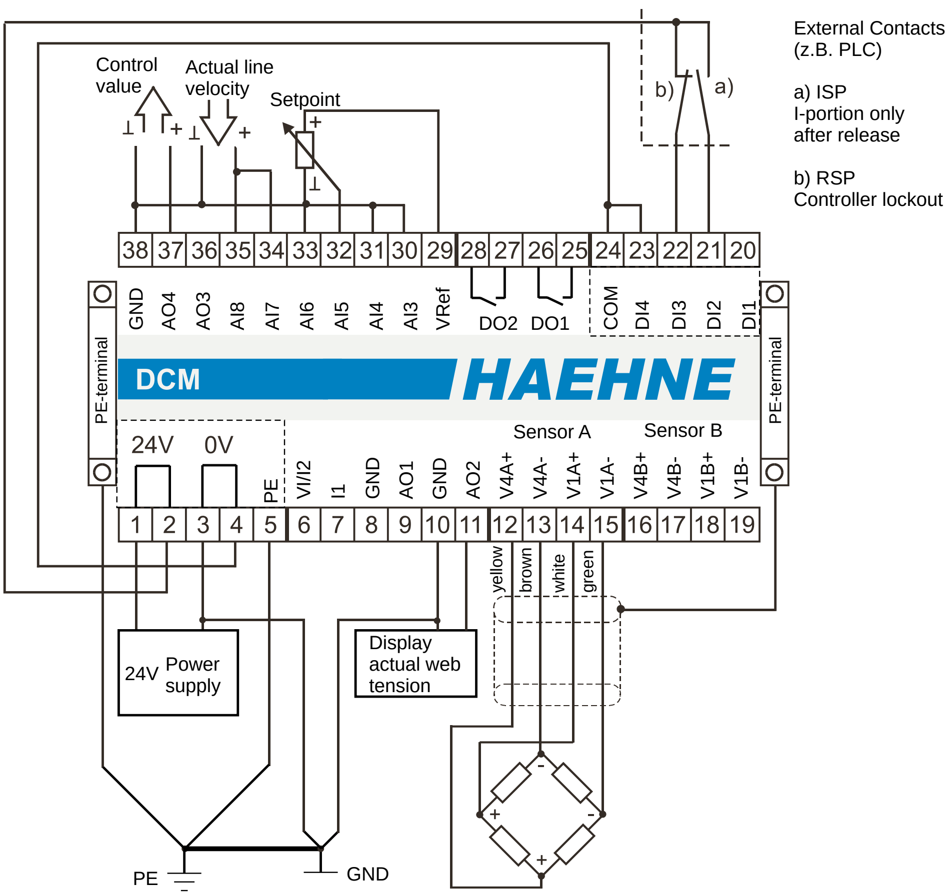
The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier.

If the DCM is used as a two channel amplifier then the following values have to be adjusted:

C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
C431	**2**	I-lockout can be activated via D2 (terminal 21)
C445	**0**	Controller soft start cannot be activated
F401	**1**	Controller signal is added to the actual line velocity
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.5, C332: 800 ms, C335: 20.0 and C336: 2.0



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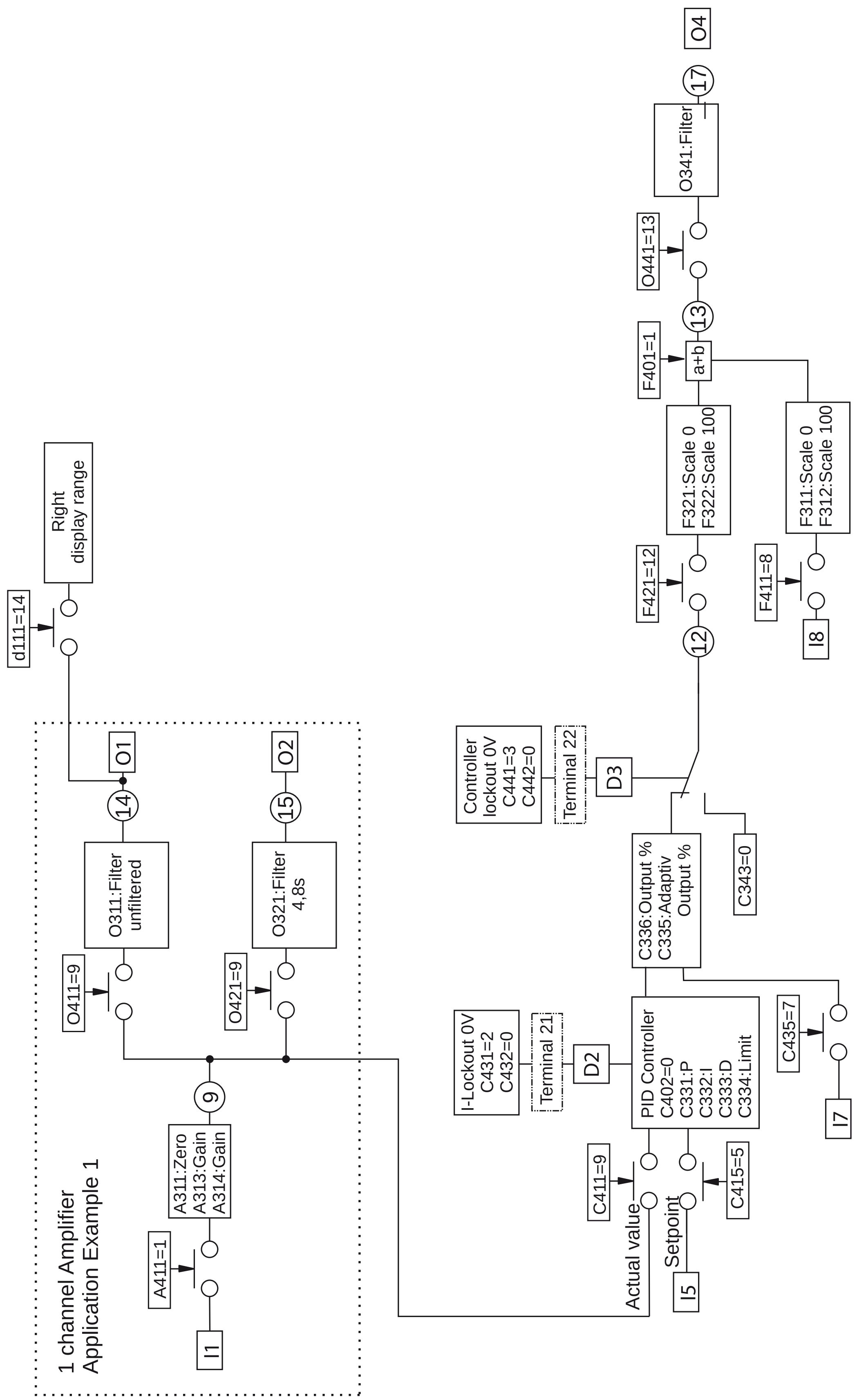
Functional Diagram 12a



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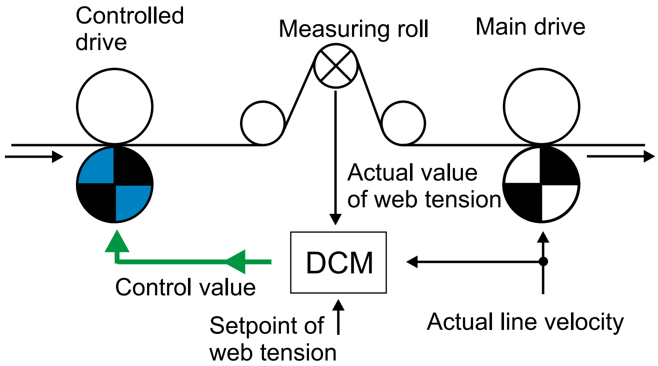
13. Controller Operation Mode B

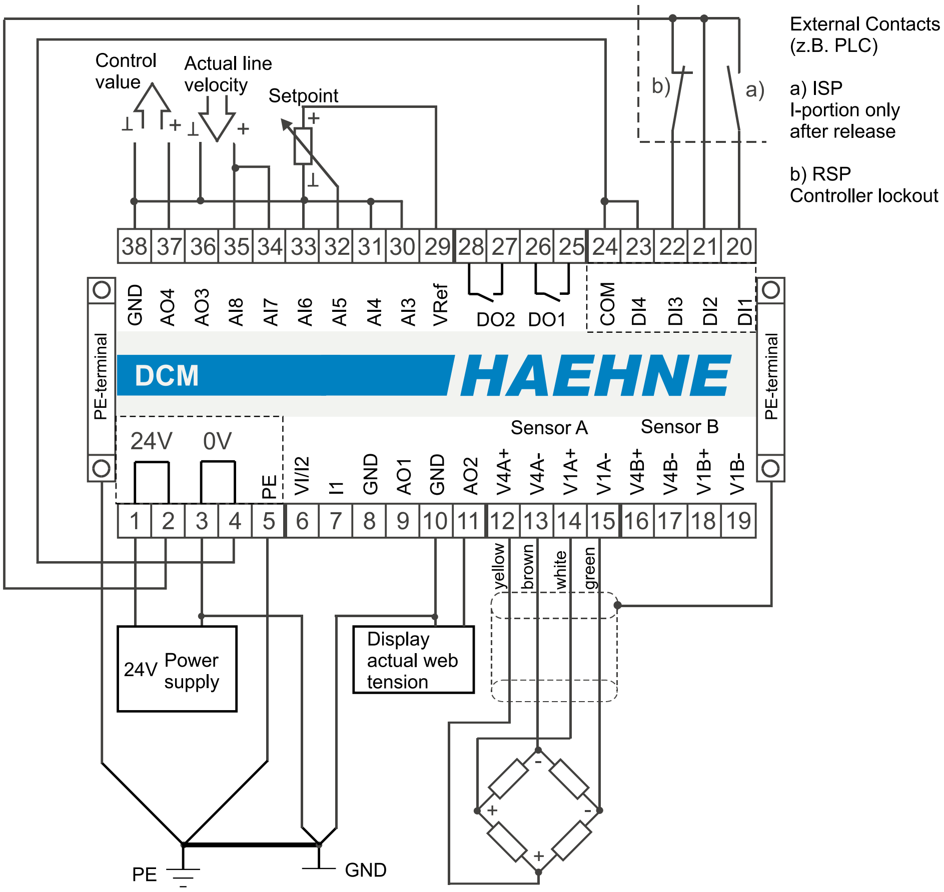
Web tension control via correction of the existing line velocity

- Material treatment
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- In the process the measurement roll is physically located **after** the controlled drive.



The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier.
If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0

Parameter	Value	
C401	**1**	Controller is activated
C402	**1**	Control direction changed into actual value-setpoint
F401	**1**	Controller signal is added to the actual line velocity
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.5, C332: 800 ms, C335: 20.0 and C336: 2.0



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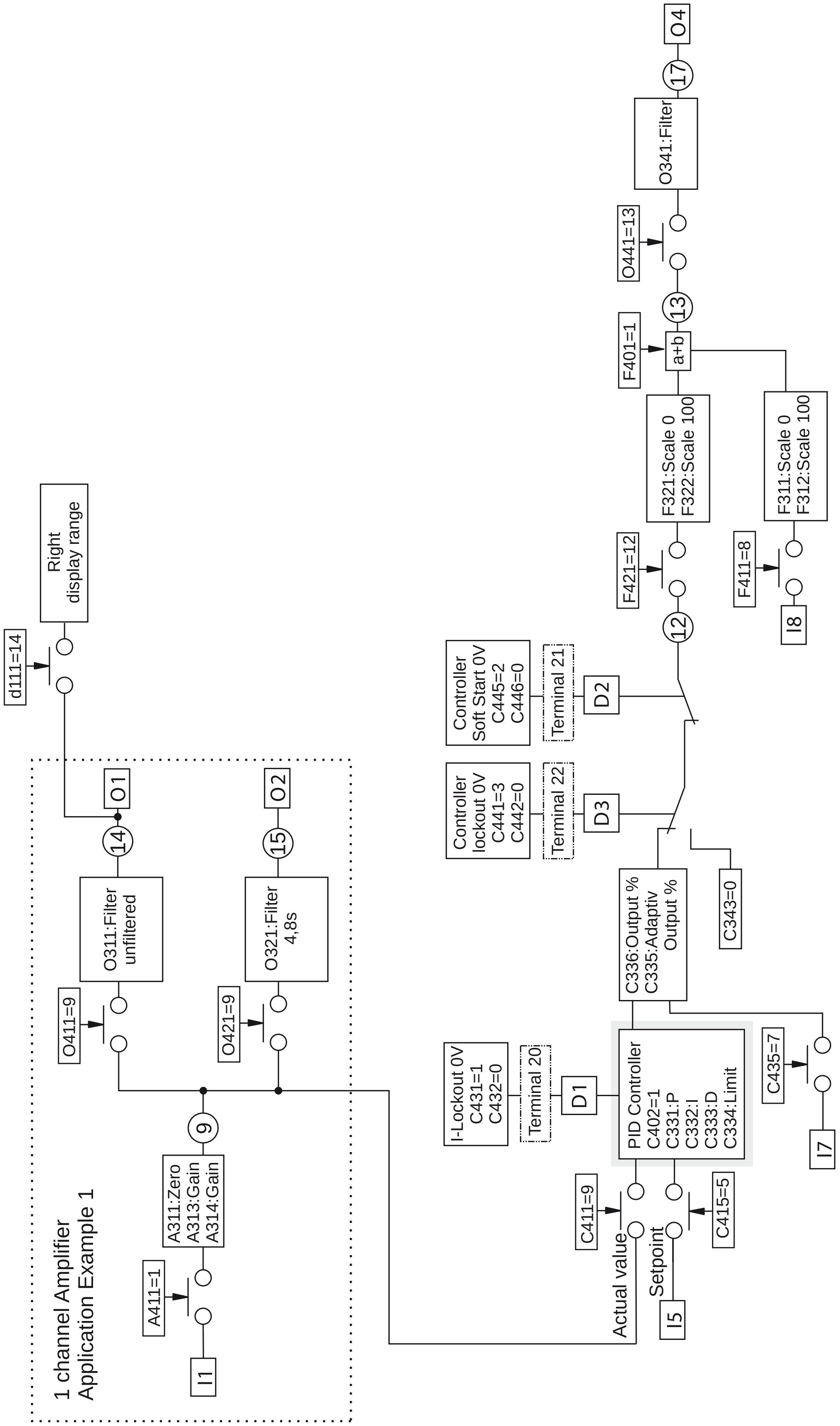
Functional Diagram 13



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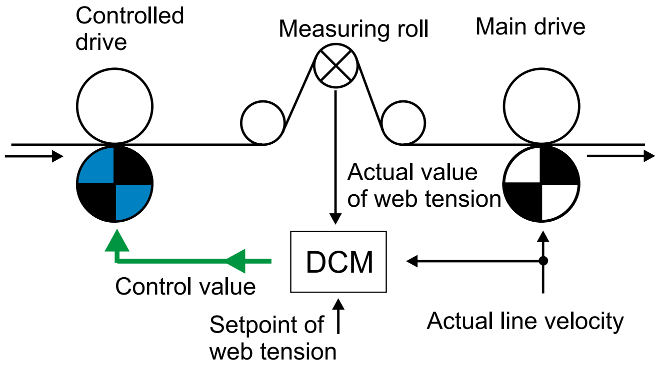
13a. Controller Operation Mode B.1

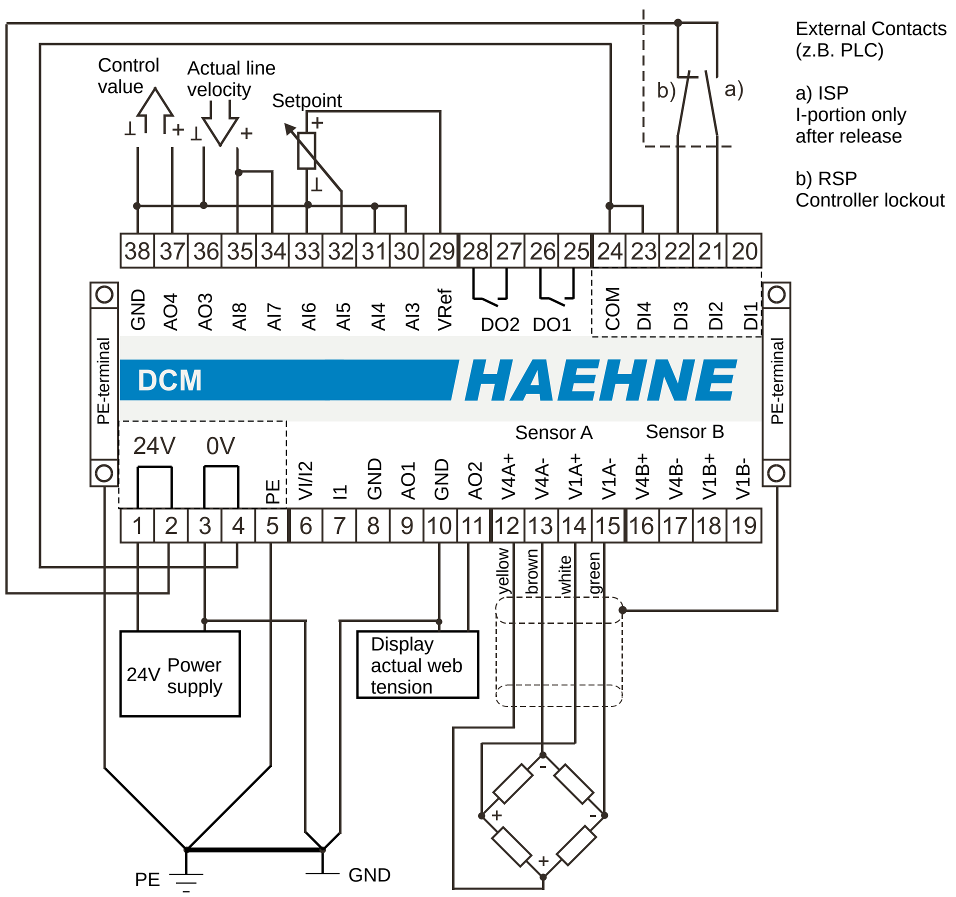
Web tension control via correction of the existing line velocity

- Material treatment
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- In the process the measurement roll is physically located **after** the controlled drive.

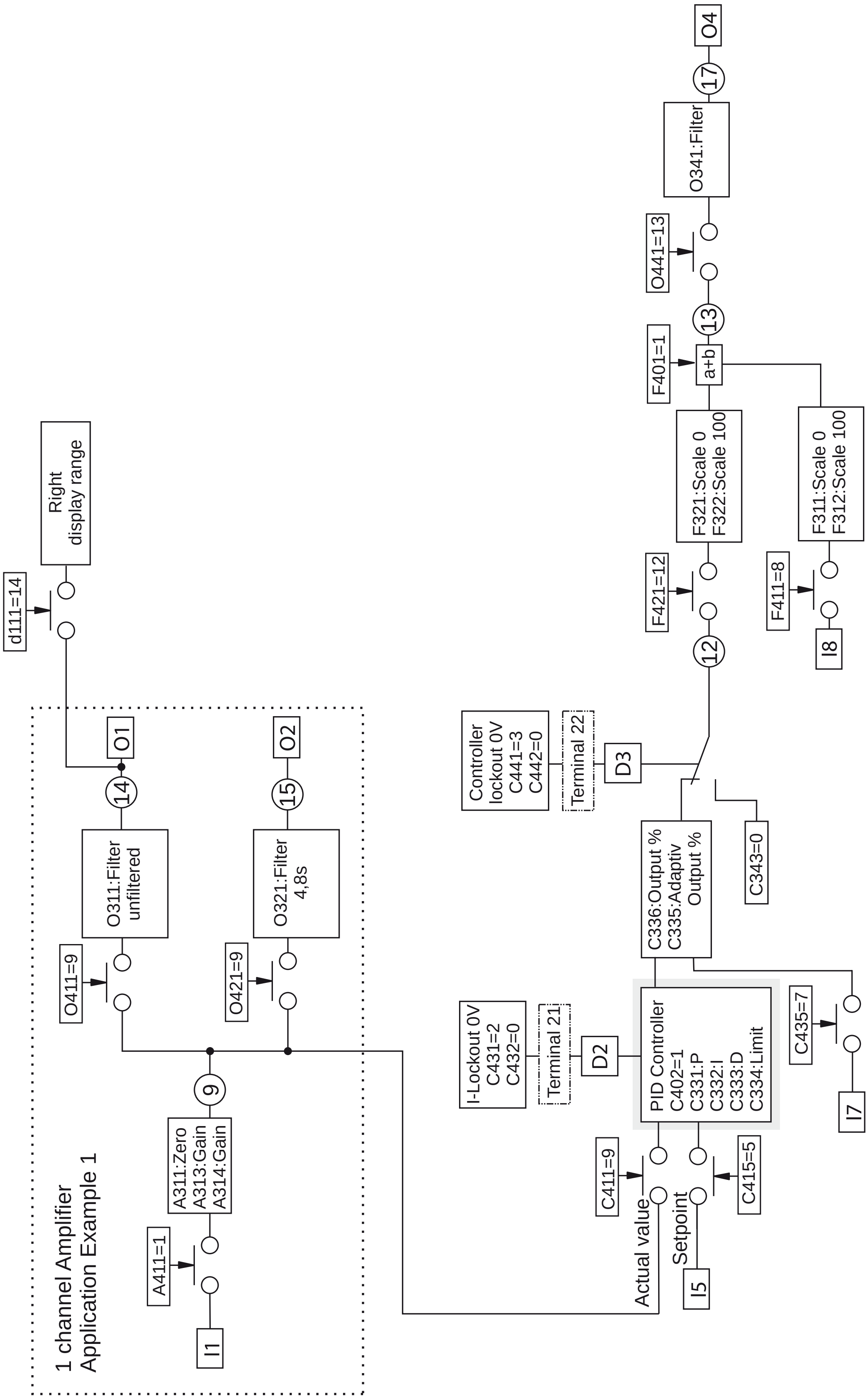
The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier.
If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
C402	**1**	Control direction changed into actual value-setpoint
C431	**2**	I-lockout can be activated via D2 (terminal 21)
C445	**0**	Controller soft start cannot be activated
F401	**1**	Controller signal is added to the actual line velocity
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.5, C332: 800 ms, C335: 20.0 and C336: 2.0



Functional Diagram 13a



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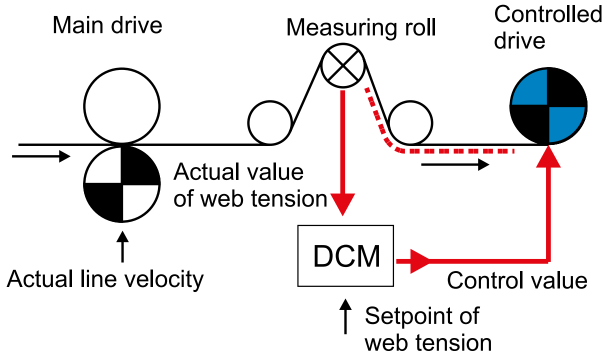
14. Controller Operation Mode C

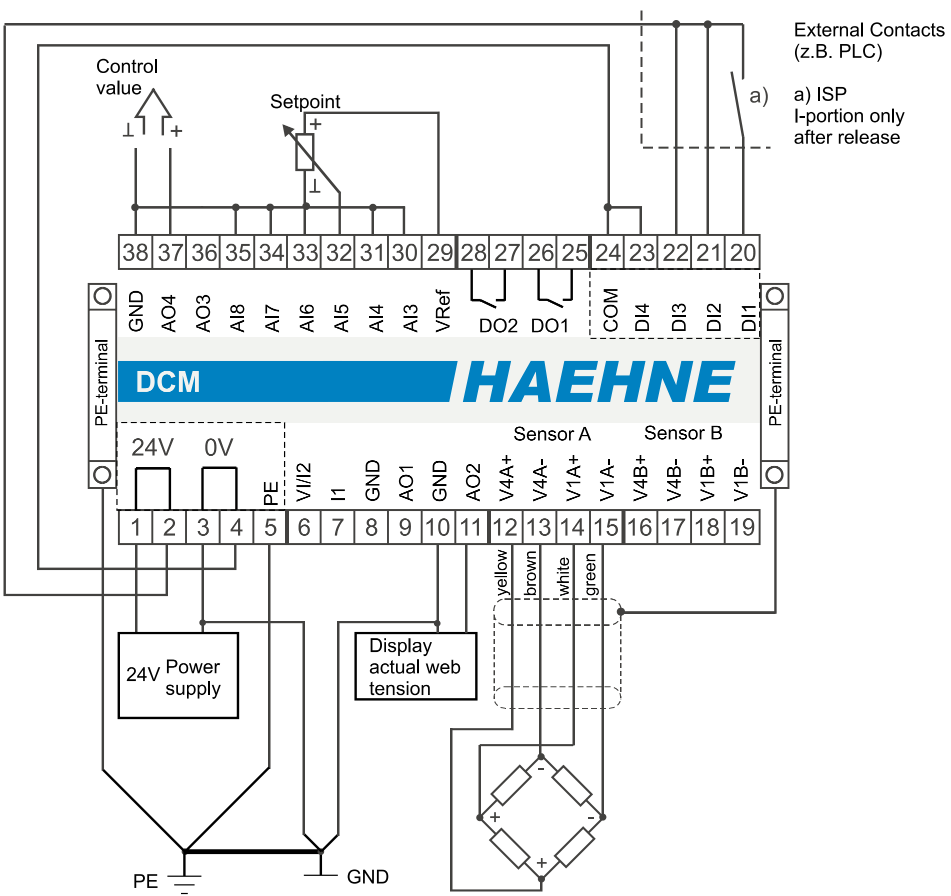
Web tension control in one independent control loop

- Rewinding
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- The measurement roll is physically located **before** the controlled drive

The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted: C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
C435	**0**	No line velocity available. Dynamic multiplier input not possible
C302	**0.00**	The controller section issues positive signals only
O343	**0.00**	The DCM issues positive signals only (the motor does not turn backwards)
O441	**12**	The controller signal is issued at the analog output 4 (AO4)
C331, C332, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, **C335: 0.0** and **C336: 100.0**



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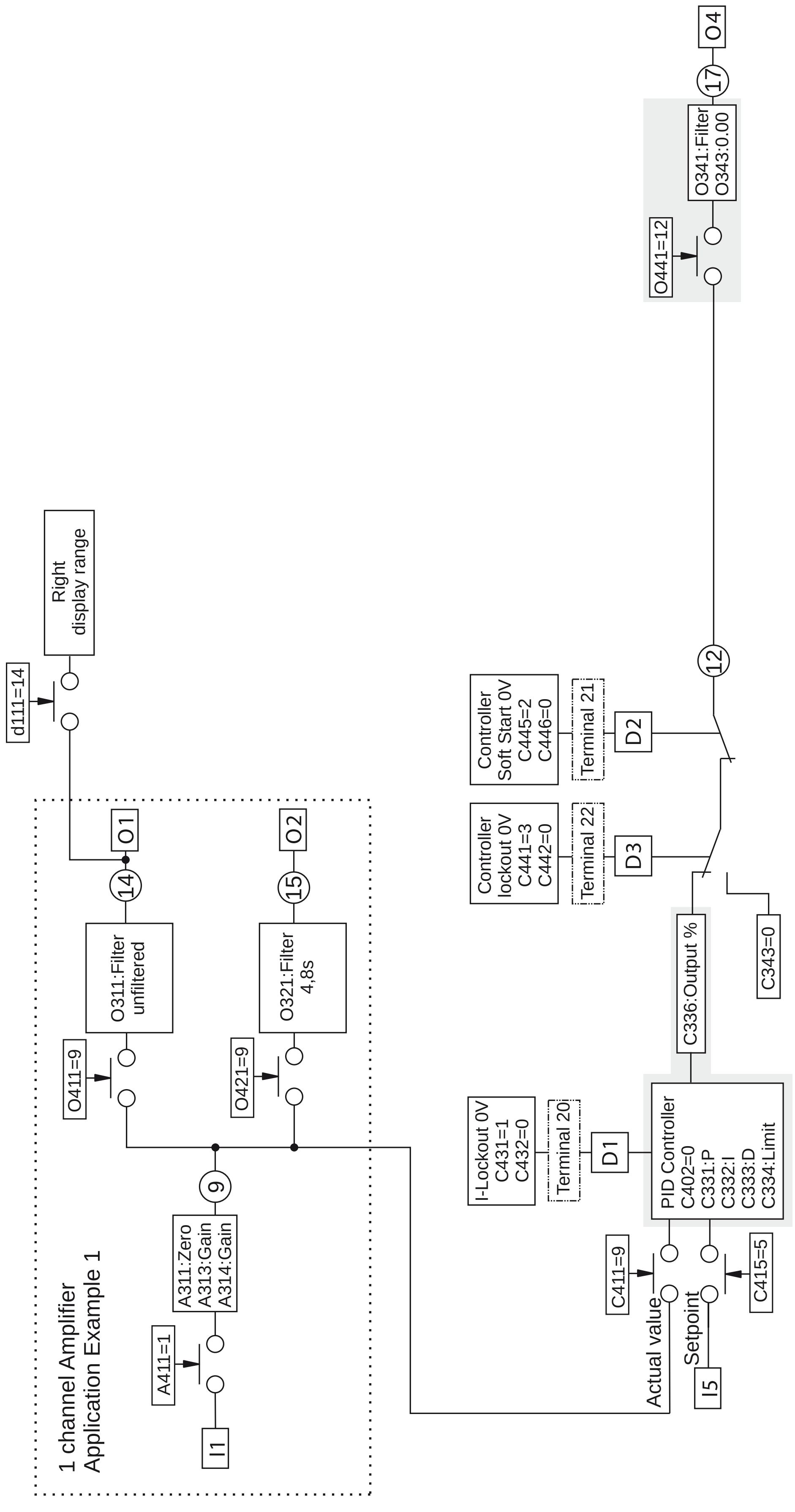
Functional Diagram 14

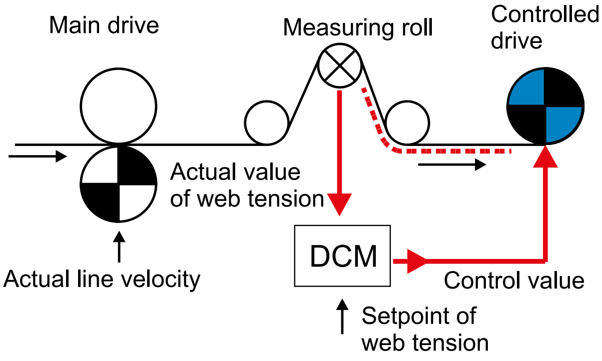


14a. Controller Operation Mode C.1

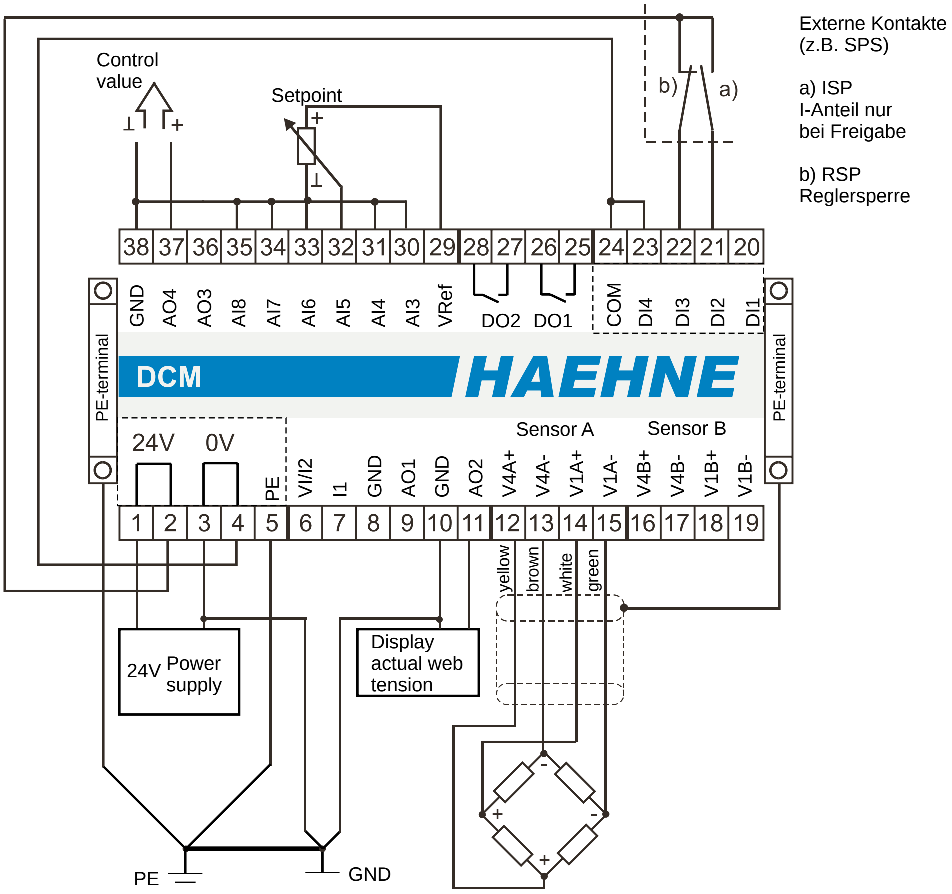
Web tension control in one independent control loop

- Rewinding
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- The measurement roll is physically located **before** the controlled drive

The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted: C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
C431	**2**	I-lockout can be activated via D2 (terminal 21)
C435	**0**	No line velocity available. Dynamic multiplier input not possible
C445	**0**	Controller soft start cannot be activated
C302	**0.00**	The controller section issues positive signals only
O343	**0.00**	The DCM issues positive signals only (the motor does not turn backwards)
O441	**12**	The controller signal is issued at the analog output 4 (AO4)
C331, C332, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, **C335: 0.0** and **C336: 100.0**



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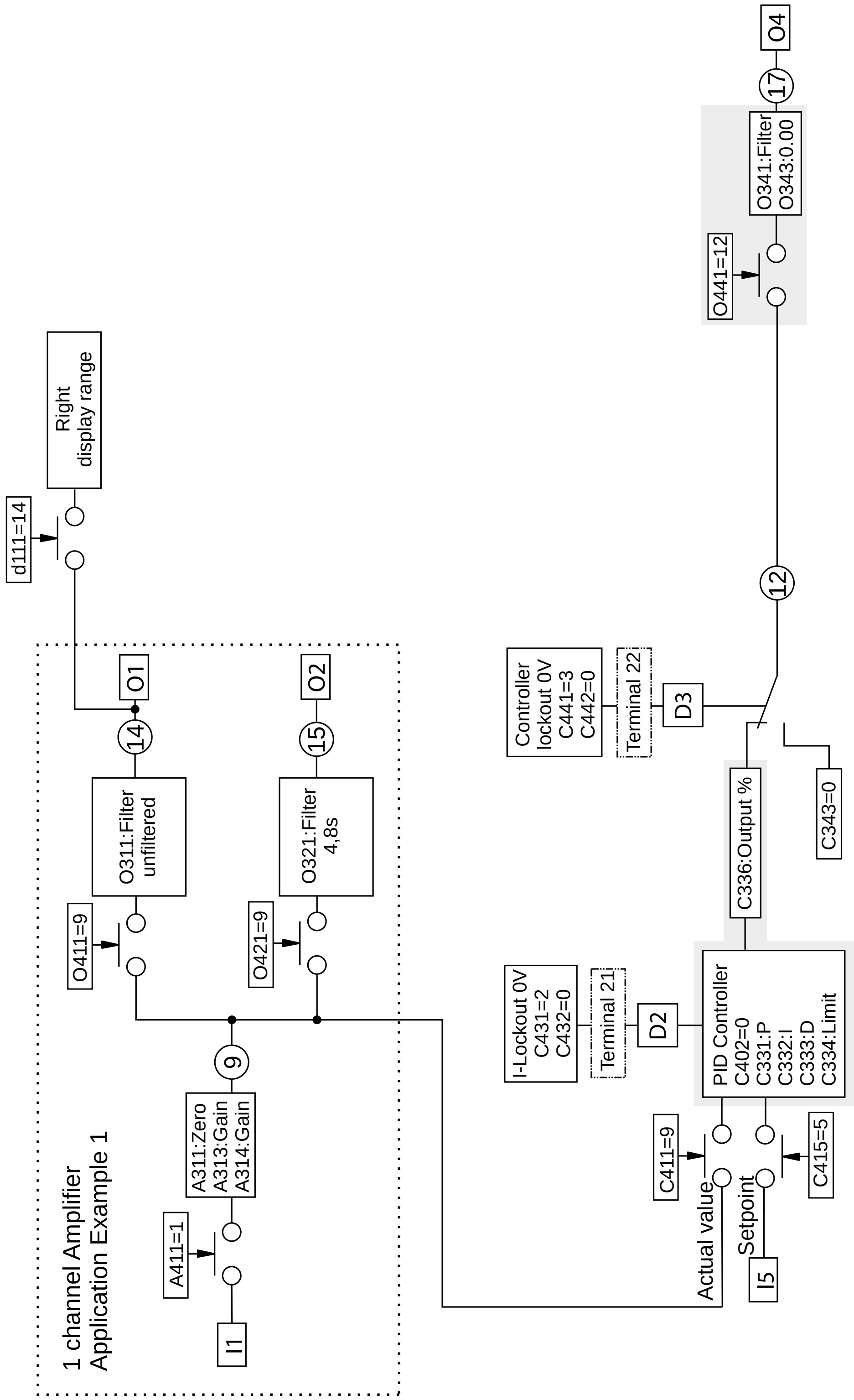
Functional Diagram 14a



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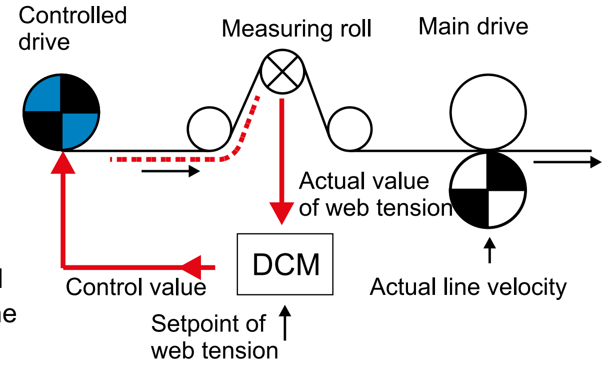
15. Controller Operation Mode D

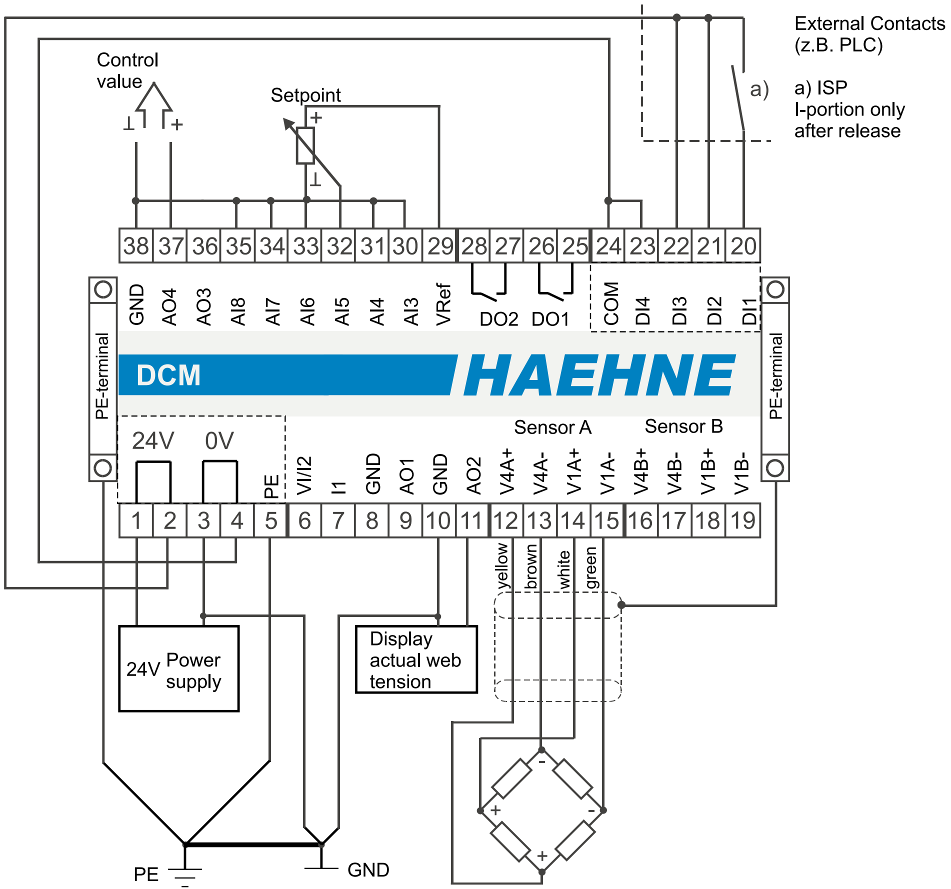
Web tension control by an independent control loop

- Unwinding
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- In the process the measurement roll is physically located **after** the controlled drive.

The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
C402	**1**	Control direction is changed into actual value-setpoint
C435	**0**	No line velocity available. Dynamic multiplier input not possible
C302	**0.00**	The controller section issues positive signals only
O343	**0.00**	The DCM issues positive signals only (The motor does not turn backwards)
O441	**12**	The controller signal is issued at the analog output 4 (AO4)
C331, C332, C335 C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, **C335: 0.0** and **C336: 100.0**



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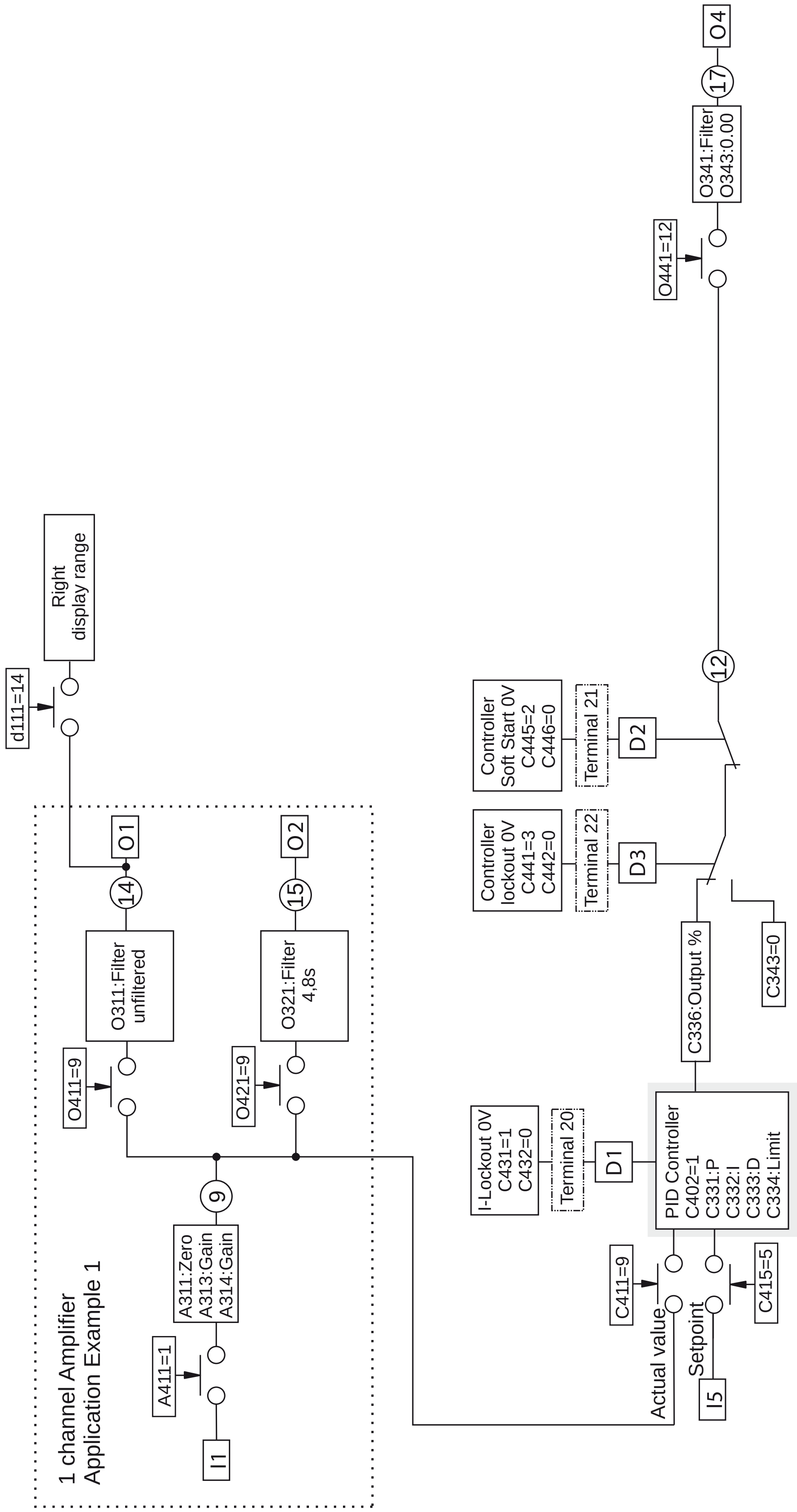
Functional Diagram 15



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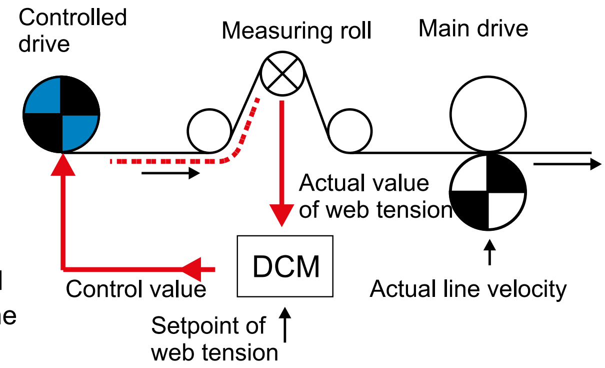
15a. Controller Operation Mode D.1

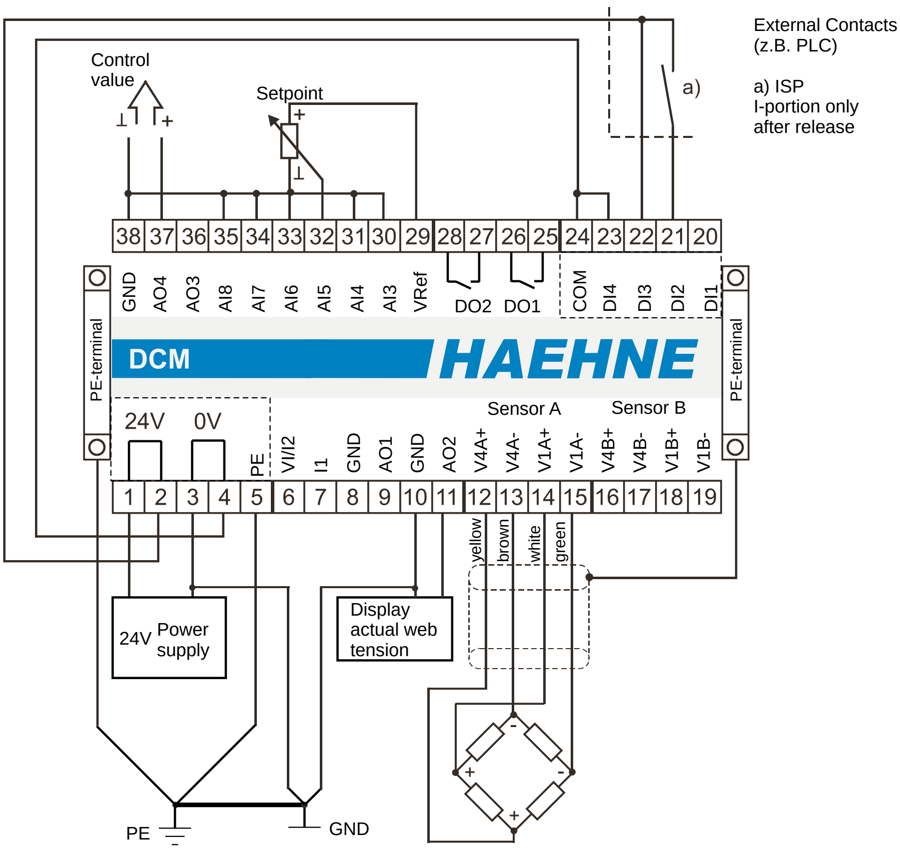
Web tension control by an independent control loop

- Unwinding
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- In the process the measurement roll is physically located **after** the controlled drive.



The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0

Parameter	Value	
C401	**1**	Controller is activated
C402	**1**	Control direction is changed into actual value-setpoint
C431	**2**	I-lockout can be activated via D2 (terminal 21)
C445	**0**	Controller soft start cannot be activated
C435	**0**	No line velocity available. Dynamic multiplier input not possible
C302	**0.00**	The controller section issues positive signals only
O343	**0.00**	The DCM issues positive signals only (The motor does not turn backwards)
O441	**12**	The controller signal is issued at the analog output 4 (AO4)
C331, C332, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, **C335: 0.0** and **C336: 100.0**



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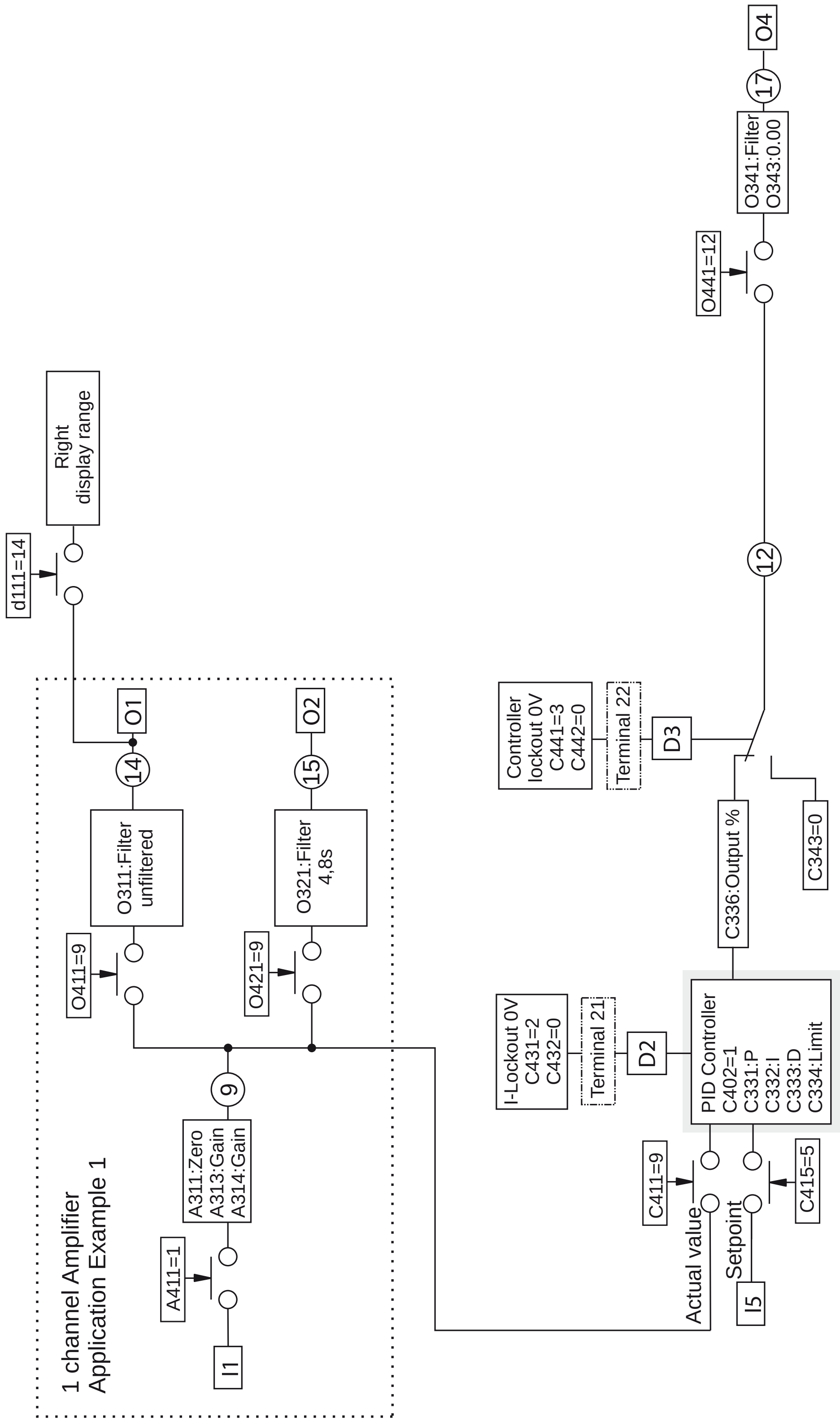
Functional Diagram 15a



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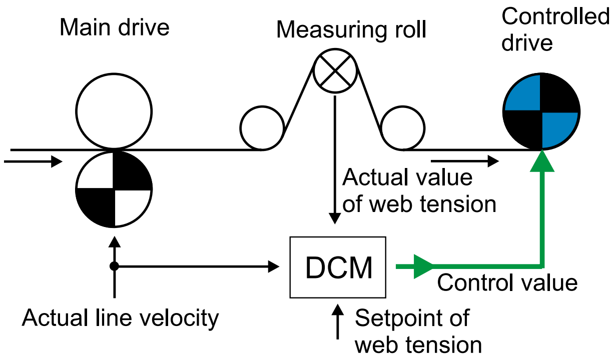
16. Controller Operation Mode E

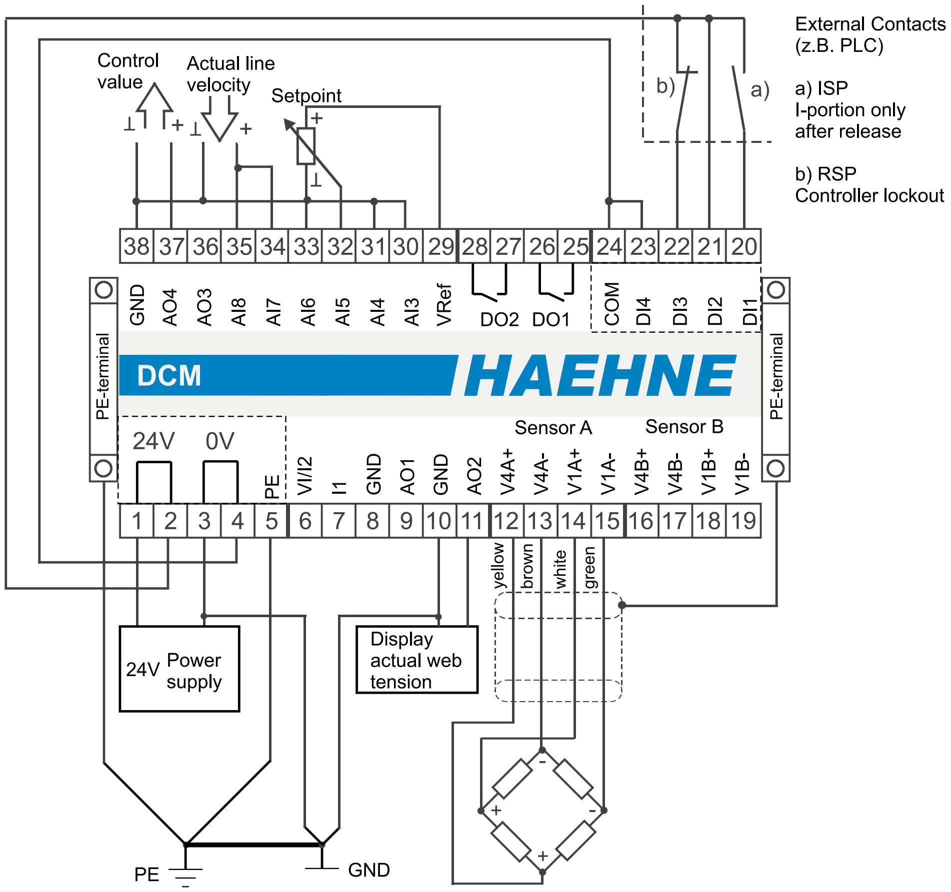
Web tension control via correction of the existing line velocity

- Rewinding
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- The measurement roll is physically located **before** the controlled drive

The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
F401	**1**	Controller signal is added to the line velocity
O343	**0.00**	Only positive signals are available at the output (The motor does not turn backwards)
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, C335: 30.0 and C336: 60.0



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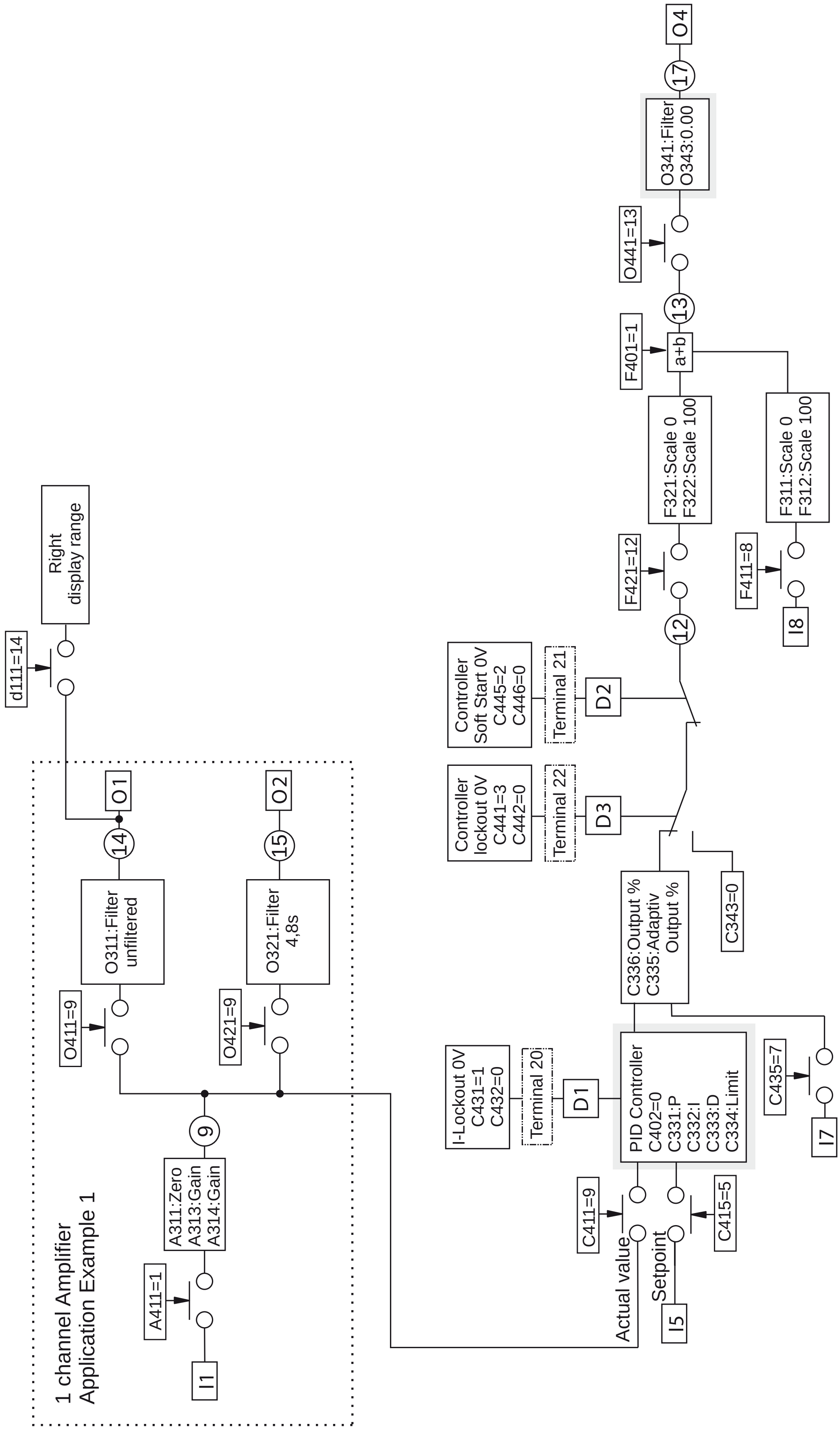
Functional Diagram 16



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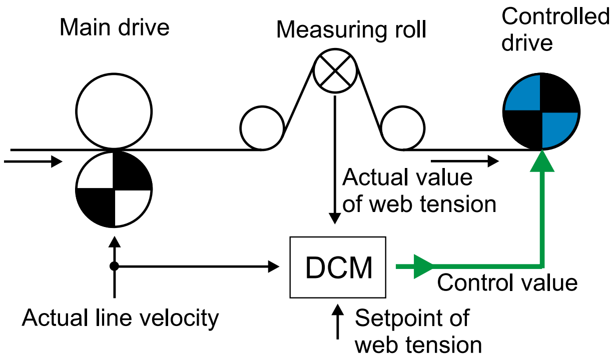
16a. Controller Operation Mode E.1

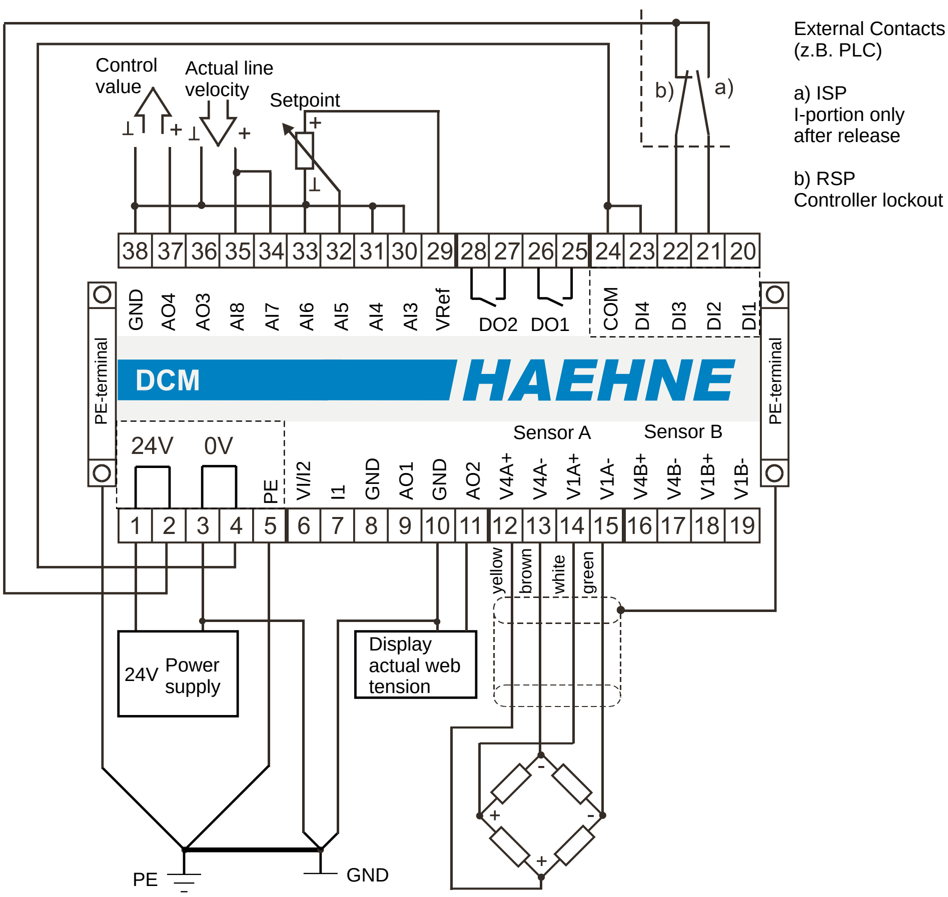
Web tension control via correction of the existing line velocity

- Rewinding
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- The measurement roll is physically located **before** the controlled drive

The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
C431	**2**	I-lockout can be activated via D2 (terminal 21)
C445	**0**	Controller soft start cannot be activated
F401	**1**	Controller signal is added to the line velocity
O343	**0.00**	Only positive signals are available at the output (The motor does not turn backwards)
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, C335: 30.0 and C336: 60.0



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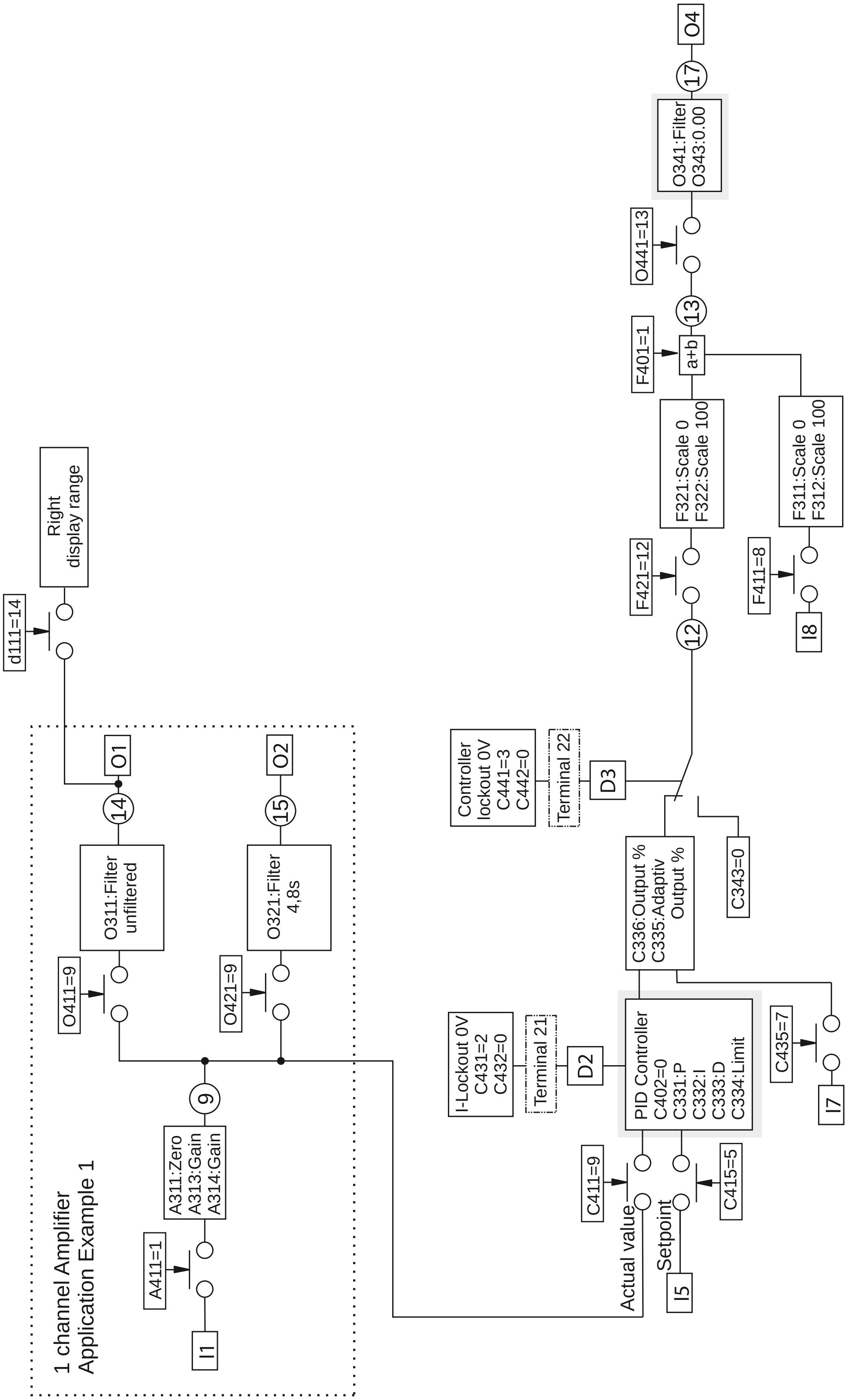
Functional Diagram 16a



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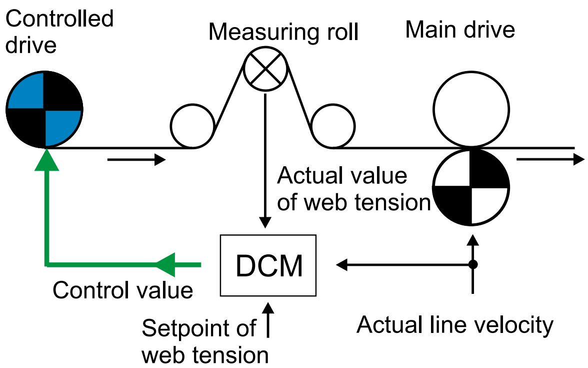
17. Controller Operation Mode F

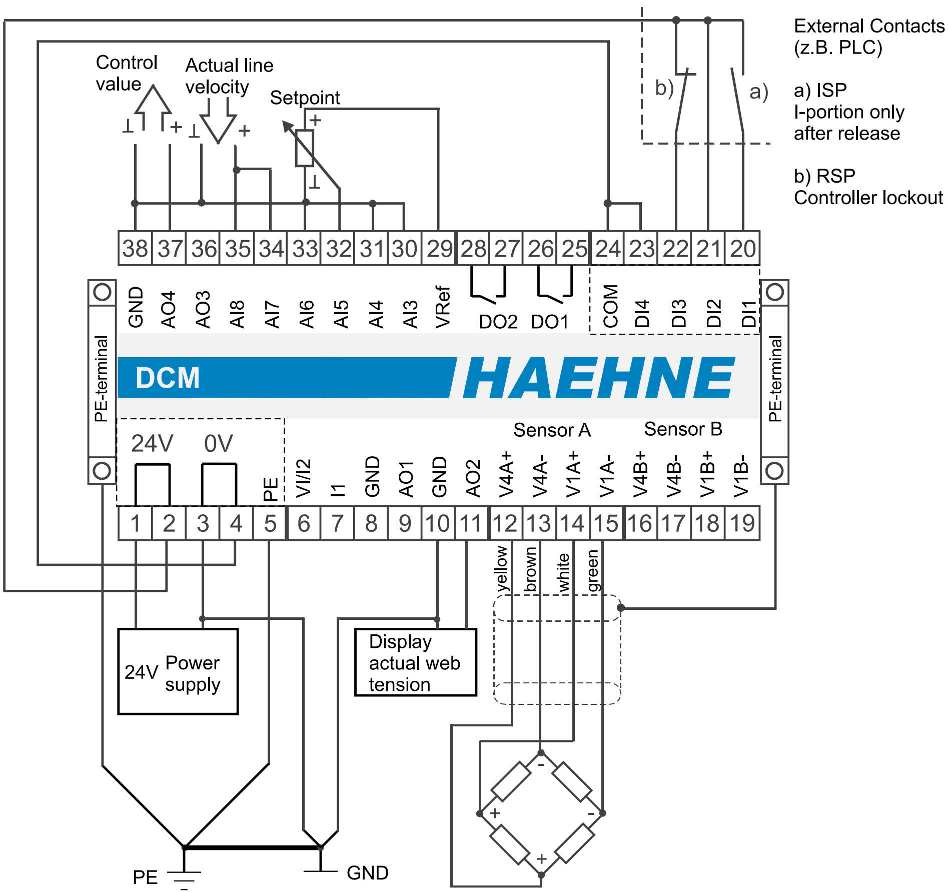
Web tension control via correction of the existing line velocity

- Unwinding
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- In the process the measurement roll is physically located **after** the controlled drive.

The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted: C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
C402	**1**	Control direction changed into actual value-setpoint
F401	**1**	The controller signal is added to the line velocity
O343	**0.00**	Only positive signals are available at the output (The motor does not turn backwards)
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, C335: 30.0 and C336: 60.0



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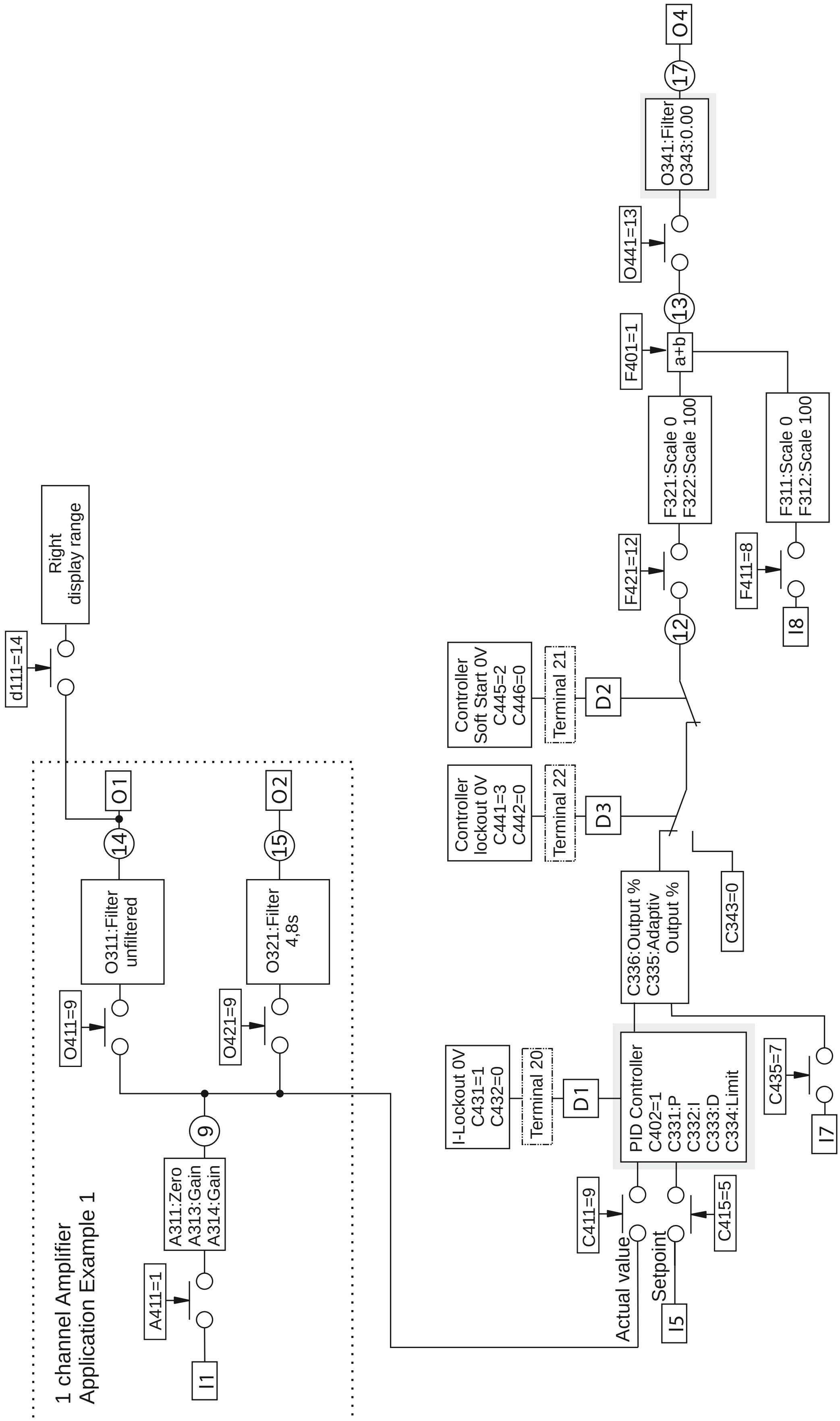
Functional Diagram 17



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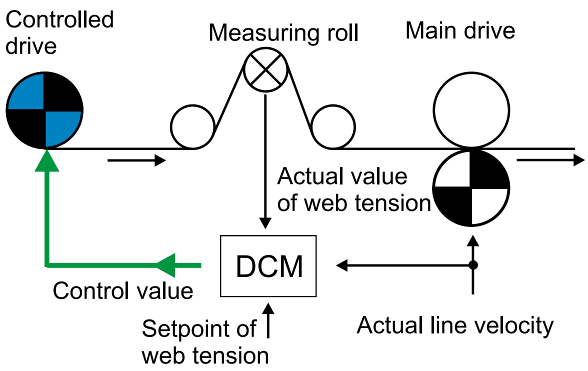
17a. Controller Operation Mode F.1

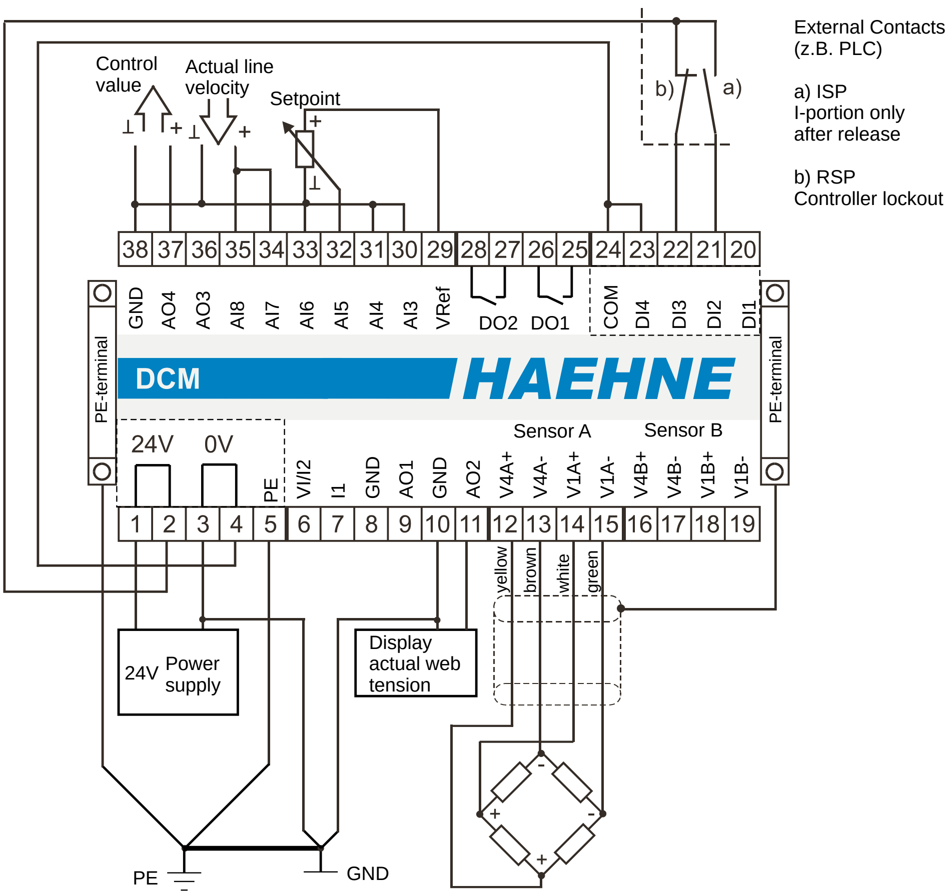
Web tension control via correction of the existing line velocity

- Unwinding
- Control value for a drive
- The main drive is determined by the process and is independent of the web tension
- In the process the measurement roll is physically located **after** the controlled drive.



The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted: C413: 10, C312 and C314: 50.0

Parameter	Value	
C401	**1**	Controller is activated
C402	**1**	Control direction changed into actual value-setpoint
C431	**2**	I-lockout can be activated via D2 (terminal 21)
C445	**0**	Controller soft start cannot be activated
F401	**1**	The controller signal is added to the line velocity
O343	**0.00**	Only positive signals are available at the output (The motor does not turn backwards)
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, C335: 30.0 and C336: 60.0



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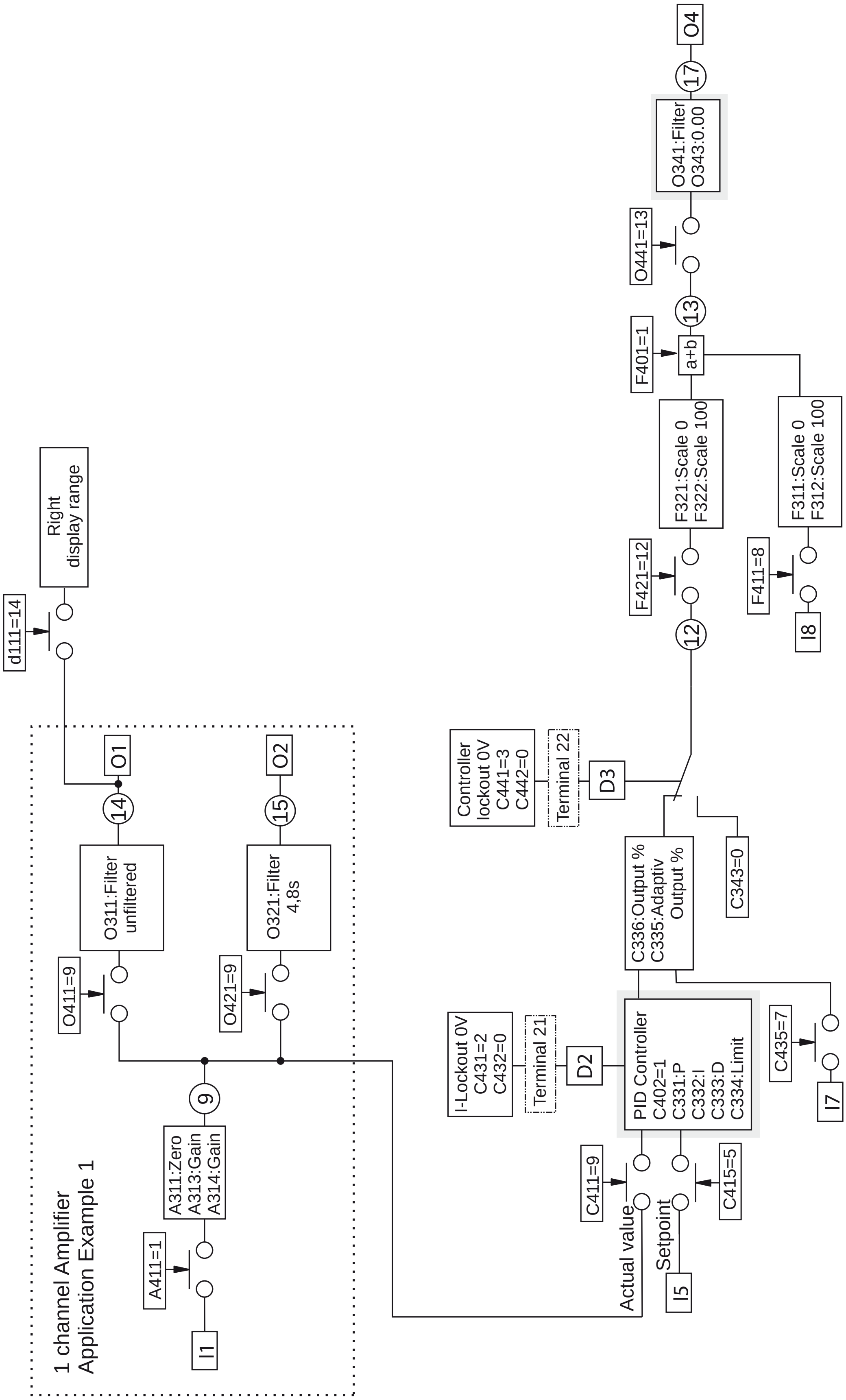
Functional Diagram 17a



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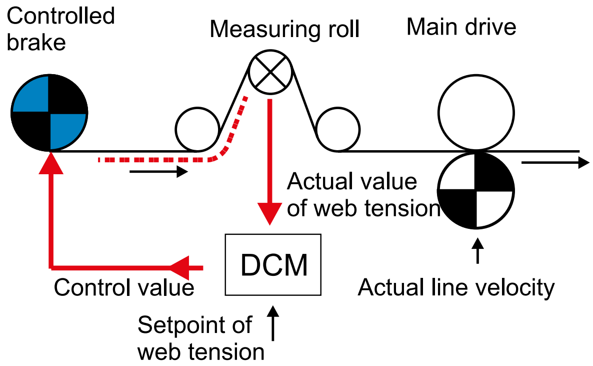
18. Controller Operation Mode G

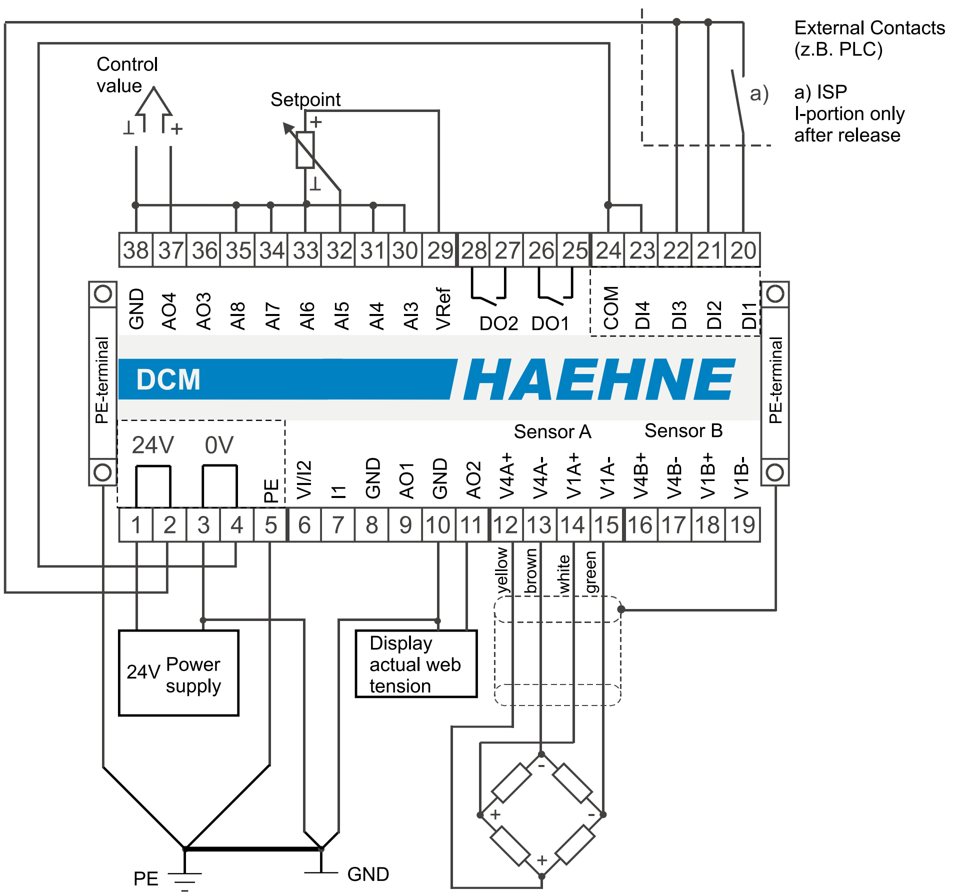
Web tension control by an independent control loop

- Unwinding
- Control value for a brake **(10 V: closed; 0 V: open)**
- The main drive determined by the process and is independent of the web tension
- The measurement roll is physically located **after** the controlled brake

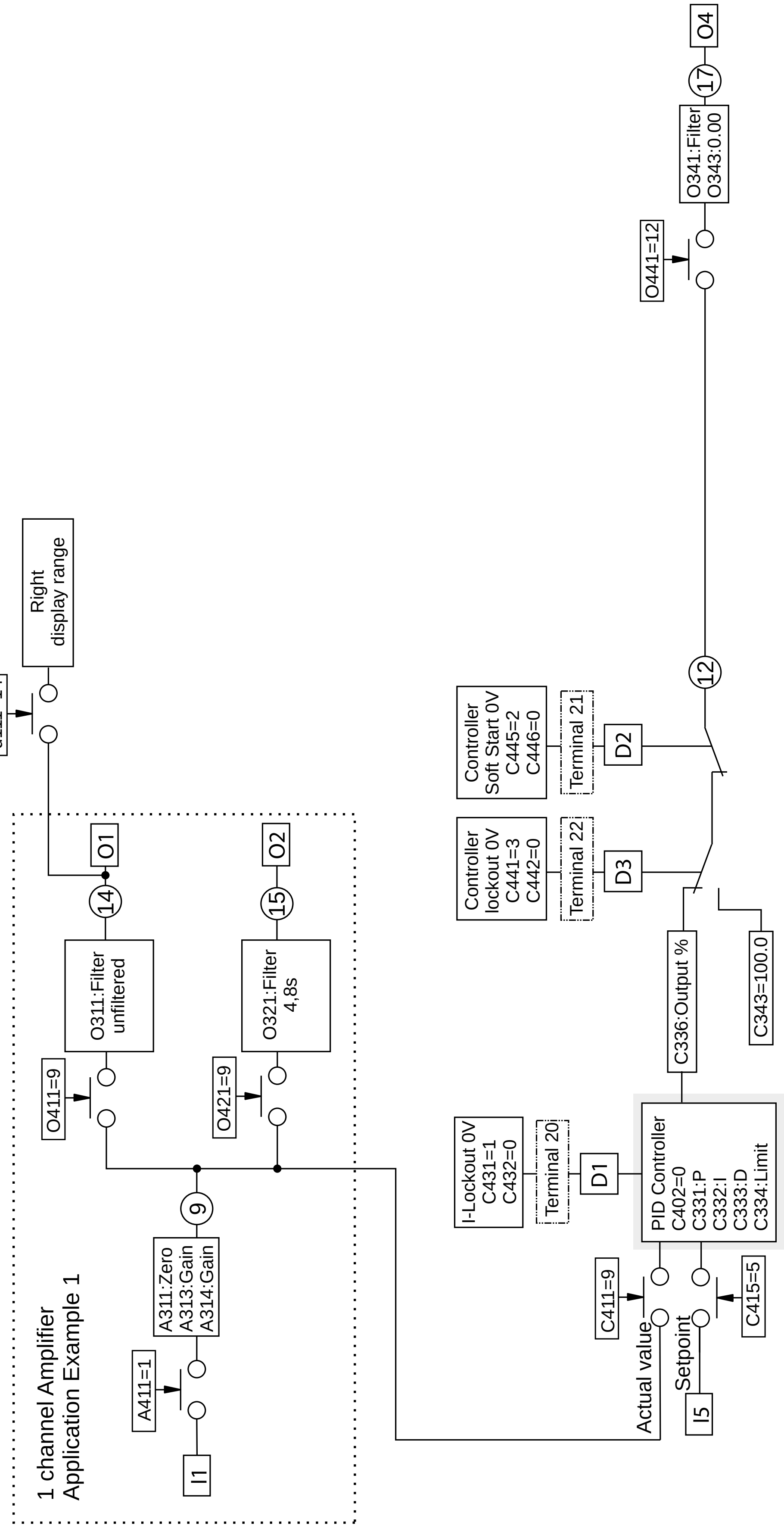
The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0



Parameter	Value	
C401	**1**	Controller is activated
C402	0	Keep the control direction setpoint minus actual value (The brake is with 10 V: closed and with 0 V: open)
C435	**0**	No line velocity available. Dynamic multiplier input not possible
C302	**0.00**	The controller section issues positive signals only
C343	**100.0**	In case of controller lockout full braking effect
O343	**0.00**	The DCM issues positive signals only
O441	**12**	The controller signal is issued at the analog output 4 (AO4)
C331, C332, C335, C336 adjust depending on controlled system		Tested start settings are: C331: 0.4, C332: 2000 ms, **C335: 0.0** and **C336: 100.0** (depends on the max. required braking force)



Functional Diagram 18



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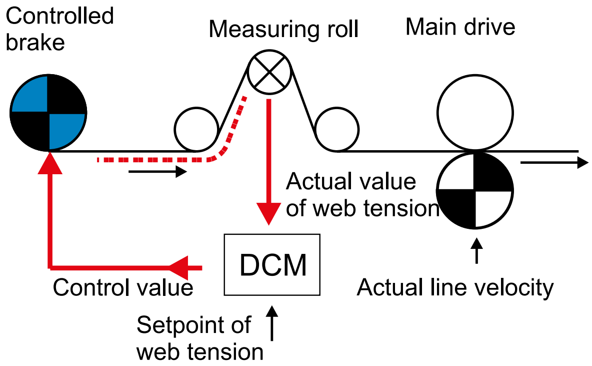
18a. Controller Operation Mode G.1

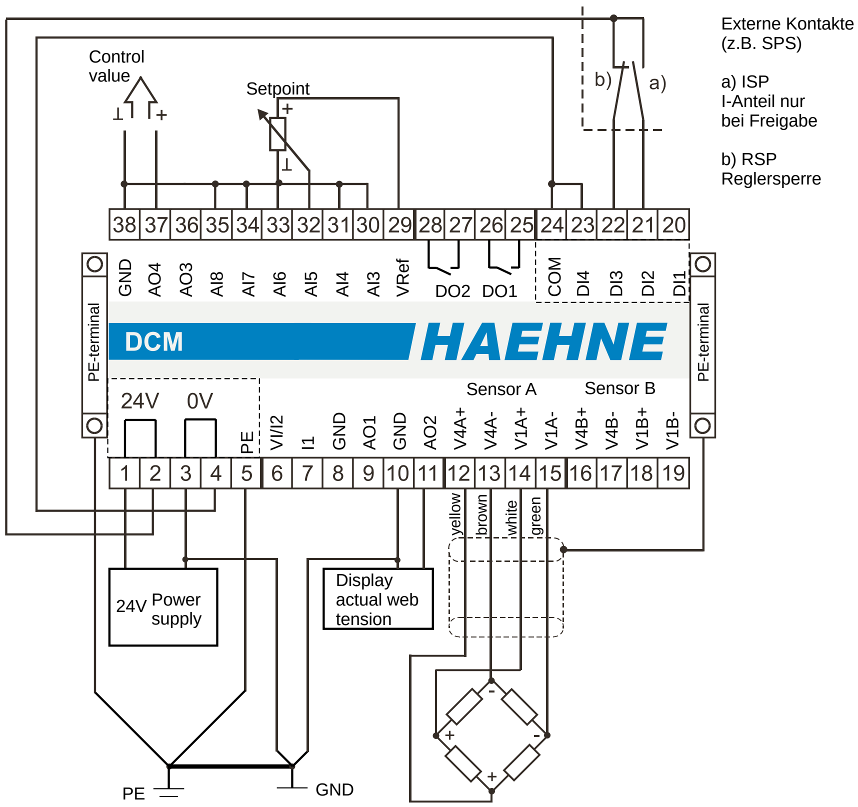
Web tension control by an independent control loop

- Unwinding
- Control value for a brake **(10 V: closed; 0 V: open)**
- The main drive determined by the process and is independent of the web tension
- The measurement roll is physically located **after** the controlled brake

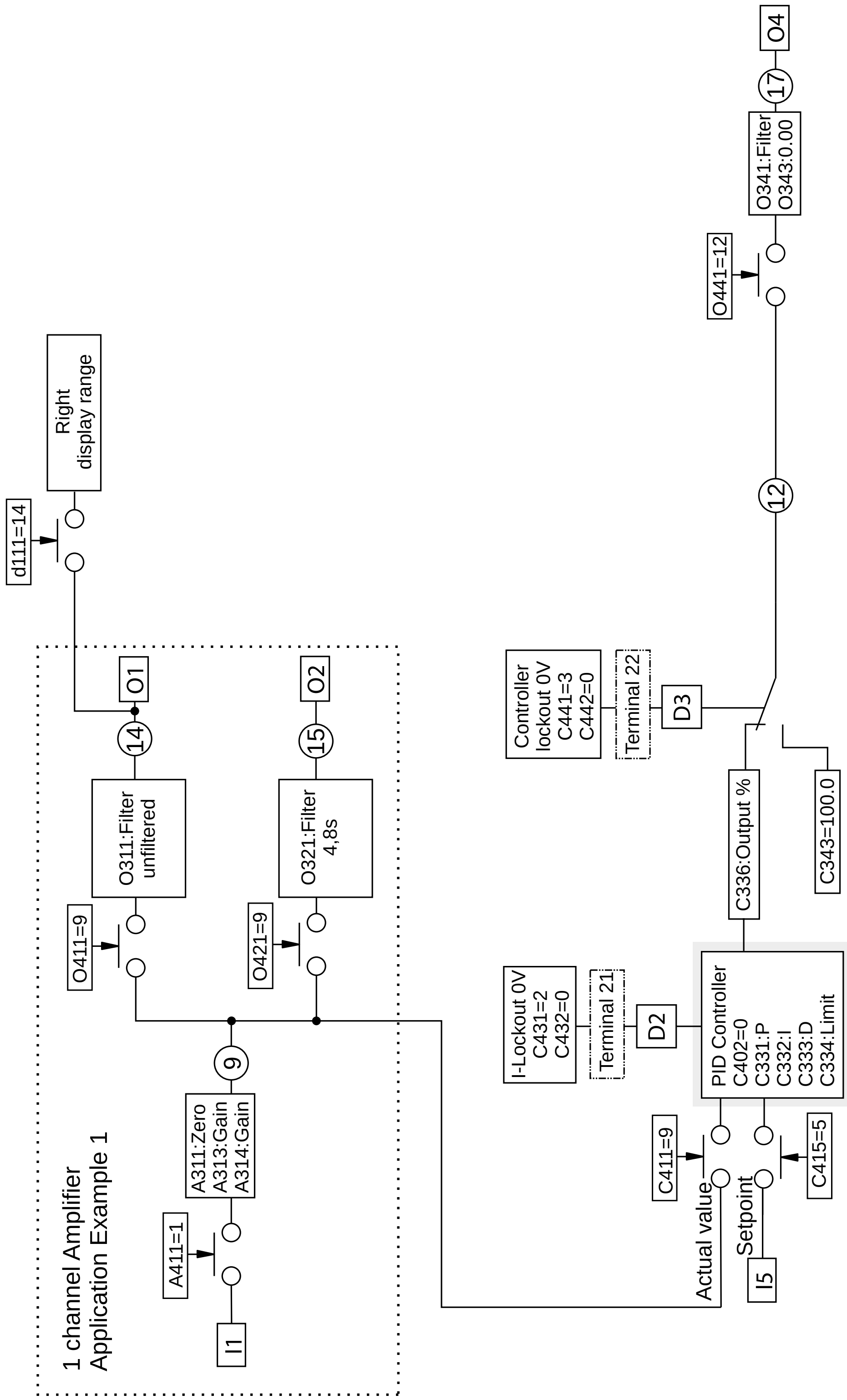


The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0

Parameter	Value	
C401	**1**	Controller is activated
C402	0	Keep the control direction setpoint minus actual value (The brake is with 10 V: closed and with 0 V: open)
C431	**2**	I-lockout can be activated via D2 (terminal 21)
C435	**0**	No line velocity available. Dynamic multiplier input not possible
C445	**0**	Controller soft start cannot be activated
C302	**0.00**	The controller section issues positive signals only
C343	**100.0**	In case of controller lockout full braking effect
O343	**0.00**	The DCM issues positive signals only
O441	**12**	The controller signal is issued at the analog output 4 (AO4)
C331, C332, C335, C336 adjust depending on controlled system		Tested start settings are: C331: 0.4, C332: 2000 ms, **C335: 0.0** and **C336: 100.0** (depends on the max. required braking force)



Functional Diagram 18a



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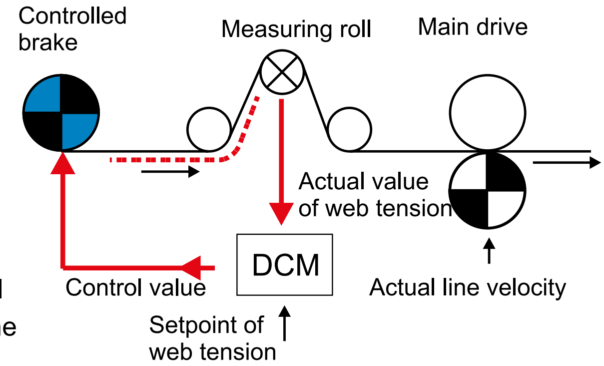
19. Controller Operation Mode H

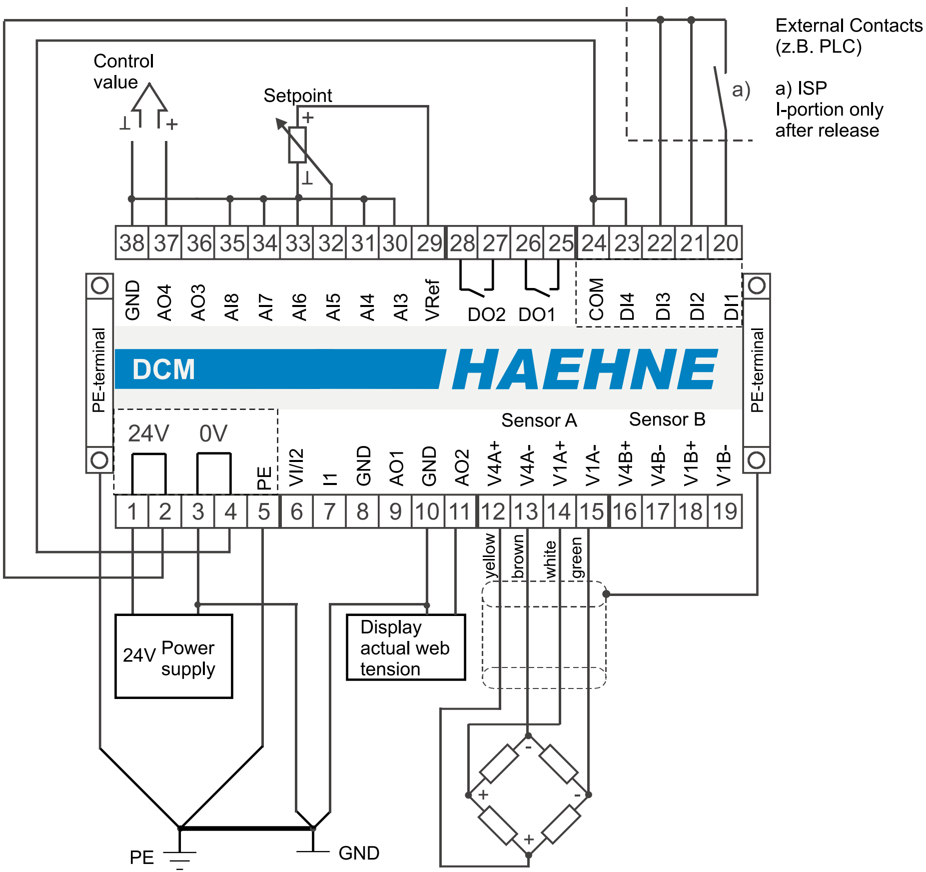
Web tension control by an independent control loop

- Unwinding
- Control value for a brake **(0 V: closed; 10 V: open)**
- The main drive is determined by the process and is independent of the web tension
- The measurement roll is physically located **after** the controlled brake



The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0

Parameter	Value	
C401	**1**	Controller is activated
C402	**1**	Change the control direction in setpoint minus actual value (The brake is with 0 V: closed and with 10 V: open)
C435	**0**	No line velocity available. Dynamic multiplier input not possible
C302	**0.00**	The controller section issues positive signals only
C343	0.0	In case of controller lockout full braking effect
O343	**0.00**	The DCM issues positive signals only
O441	**12**	The controller signal is issued at the analog output 4 (AO4)
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, **C335: 0.0** and **C336: 100.0**



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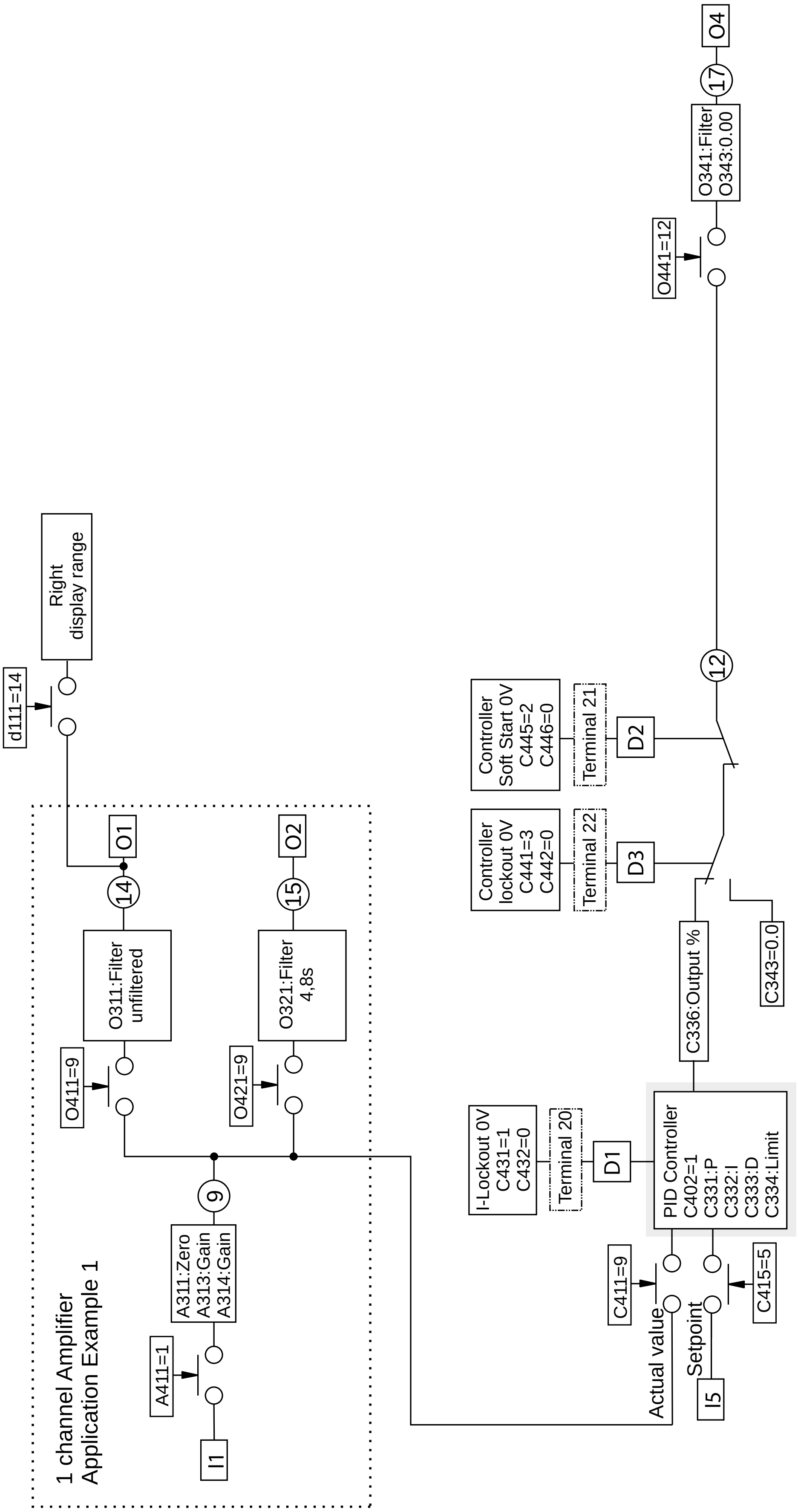
Functional Diagram 19



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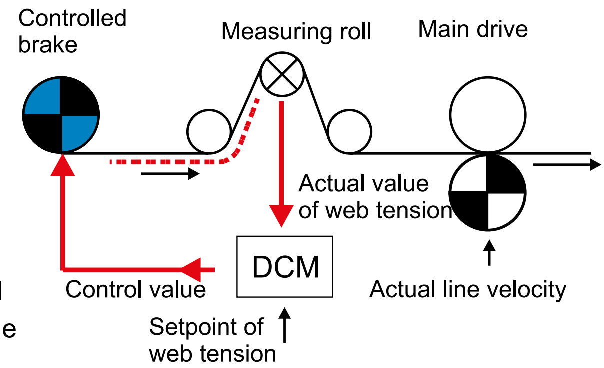
19a. Controller Operation Mode H.1

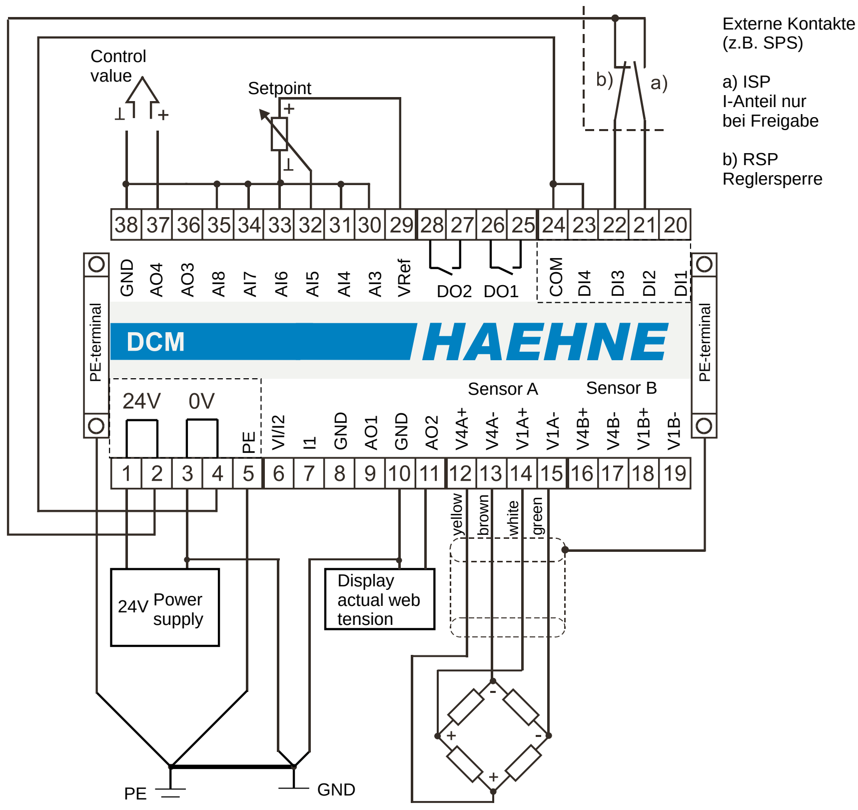
Web tension control by an independent control loop

- Unwinding
- Control value for a brake **(0 V: closed; 10 V: open)**
- The main drive is determined by the process and is independent of the web tension
- The measurement roll is physically located **after** the controlled brake



The basic sensor and amplifier adjustments are contained in the examples above. This example refers to the single channel amplifier. If the DCM is used as a two channel amplifier then the following values have to be adjusted:
C413: 10, C312 and C314: 50.0

Parameter	Value	
C401	**1**	Controller is activated
C402	**1**	Change the control direction in setpoint minus actual value (The brake is with 0 V: closed and with 10 V: open)
C431	**2**	I-lockout can be activated via D2 (terminal 21)
C435	**0**	No line velocity available. Dynamic multiplier input not possible
C445	**0**	Controller soft start cannot be activated
C302	**0.00**	The controller section issues positive signals only
C343	0.0	In case of controller lockout full braking effect
O343	**0.00**	The DCM issues positive signals only
O441	**12**	The controller signal is issued at the analog output 4 (AO4)
C331, C332, C335, C336 adjust depending on control system		Tested start settings are: C331: 0.4, C332: 2000 ms, **C335: 0.0** and **C336: 100.0**



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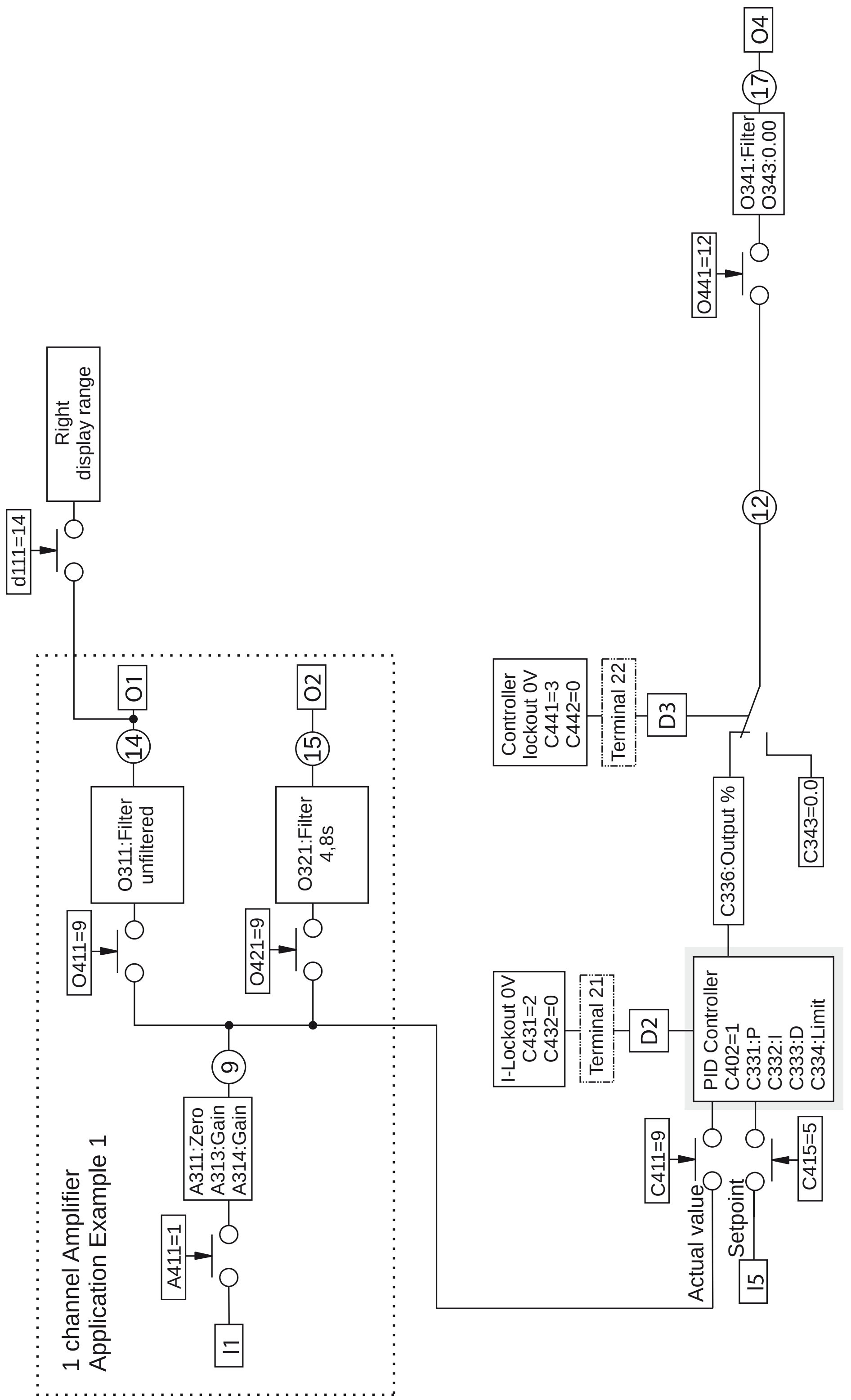
Functional Diagram 19a



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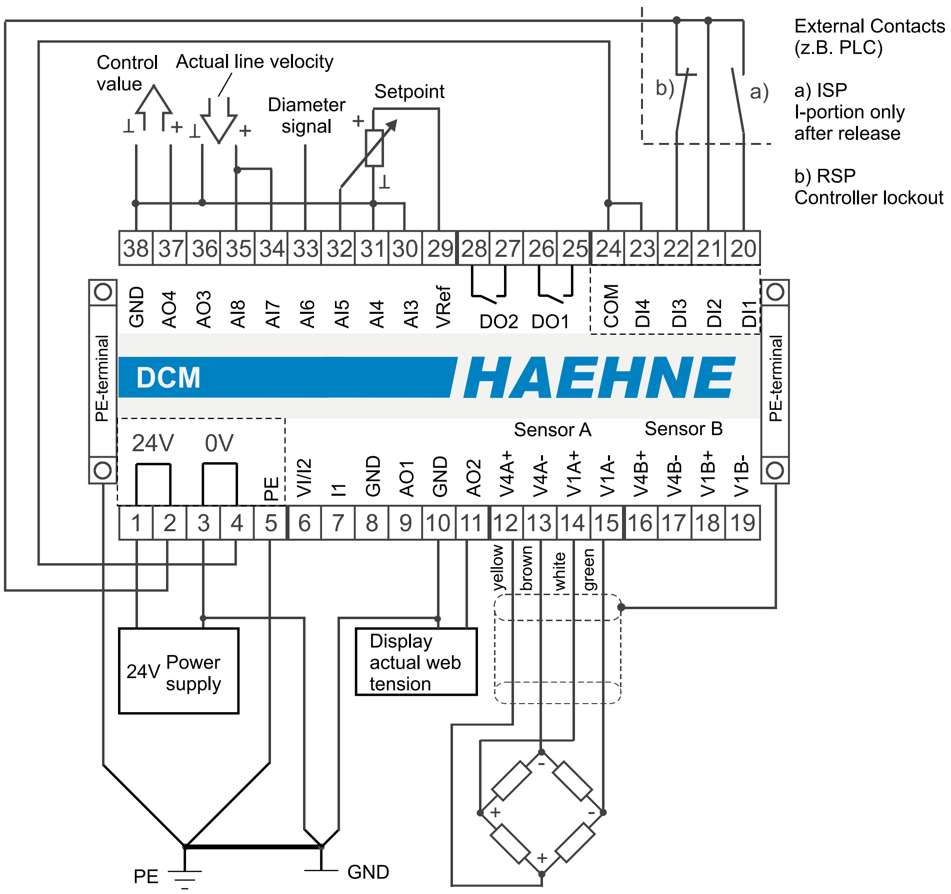
20. Controller Operation Mode Diameter Dependent Web Tension

The basic controller adjustments have to be made according to the examples above..

C418: 6 / The diameter signal is issued to the analog input.

Parameters C318 and C319 are used to adjust the desired influence.

The wiring diagram refers to Example A
Other examples to be modified accordingly:



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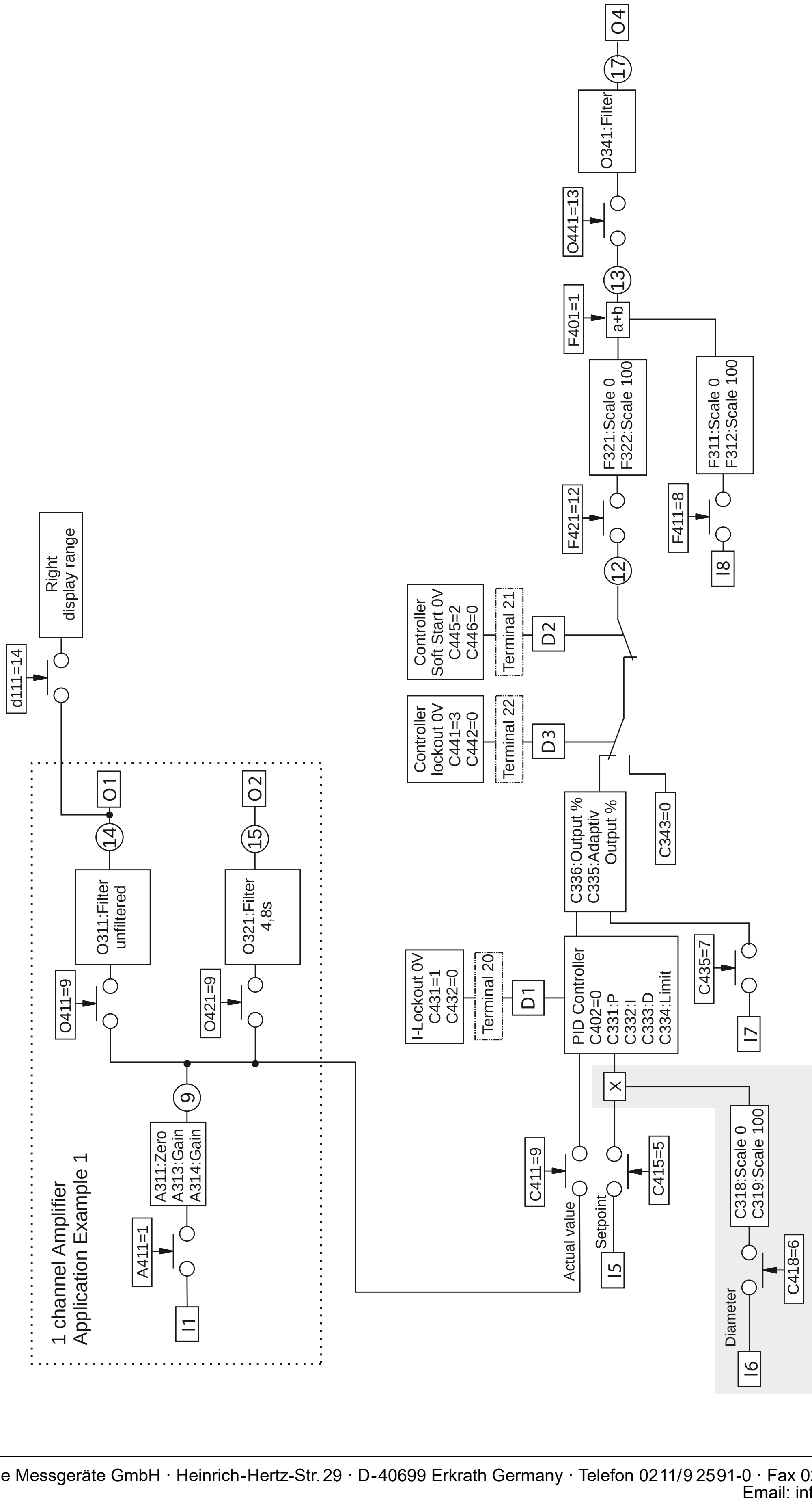

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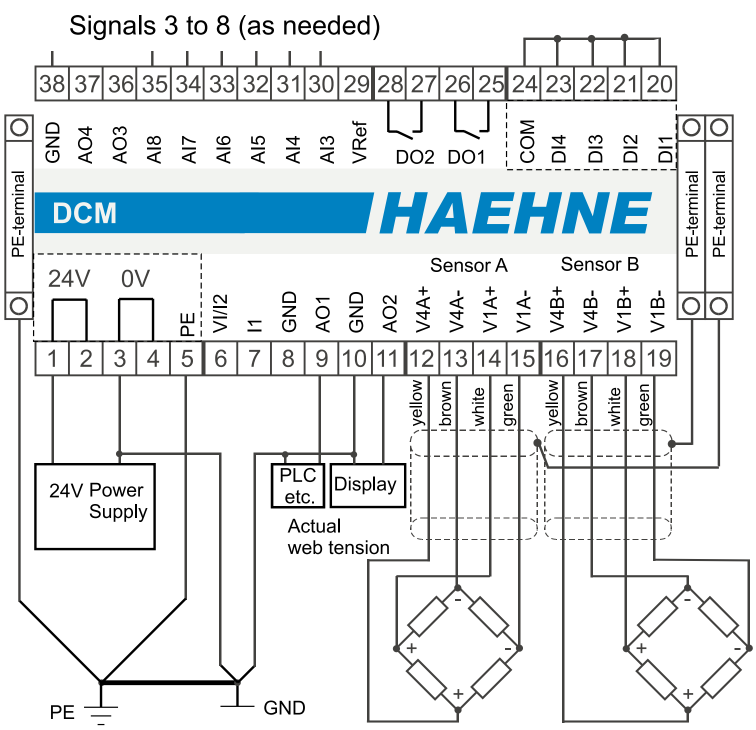
21. Adder for Several Voltage Values

Thereby several channels are added. Up to eight sensor force values can be added together.
For that purpose six sensors are to be connected to external amplifiers.
Inputs which are not used should be connected to GND.
The basic sensor and amplifier adjustments of the two internal channels should be made according to the corresponding examples. The analog outputs are to be used as described below.

Parameter	Value	
F401	**1**	The adder function is activated.
F411: 9, F412: 10, F413: 3, F414: 4 ...		Depending on the number of channels.
F311 bis F382		Values are changeable depending on weighting of individaul channels.
O411	**12**	The analog output 1 AO1 is assigned to the sum signal and is unfiltered, filter time adjustment with O311.
O421	**12**	The analog output 2 AO2 is assigned to the sum signal and filtered with 4,8 s, filter time adjustment with O321.



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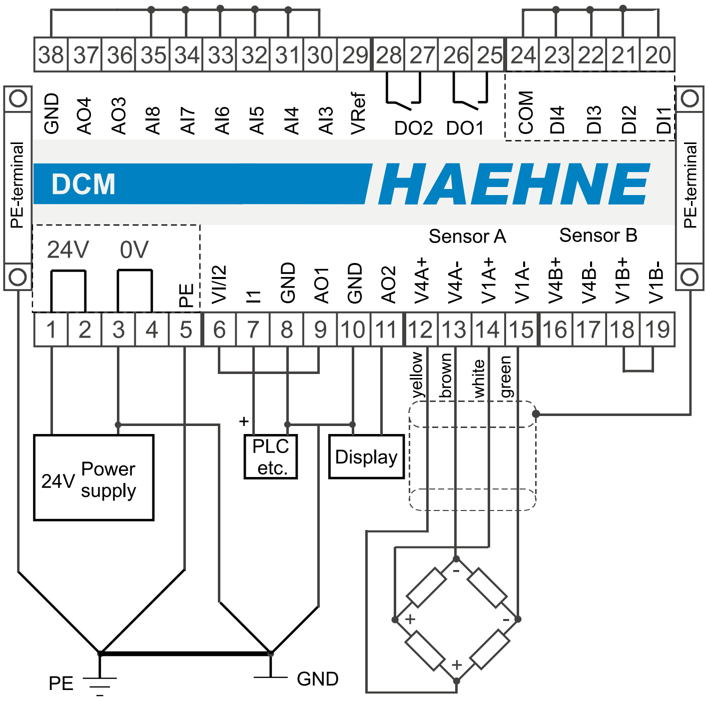
22. Option C

Each available 0 - 10 V signal can be changed into an 4-20 mA signal with the voltage/current converter.
For this purpose terminals 6 and 8 must be connected with the desired voltage source.
For the internal voltage outputs AO1 and AO4 is a connection to terminal 6 sufficient because GND is already internally connected.

Downstream units with an mA-input are connected to terminals 7/8.

The basic sensor and amplifier adjustments are contained in the examples above.
This example refers to the single channel amplifier.



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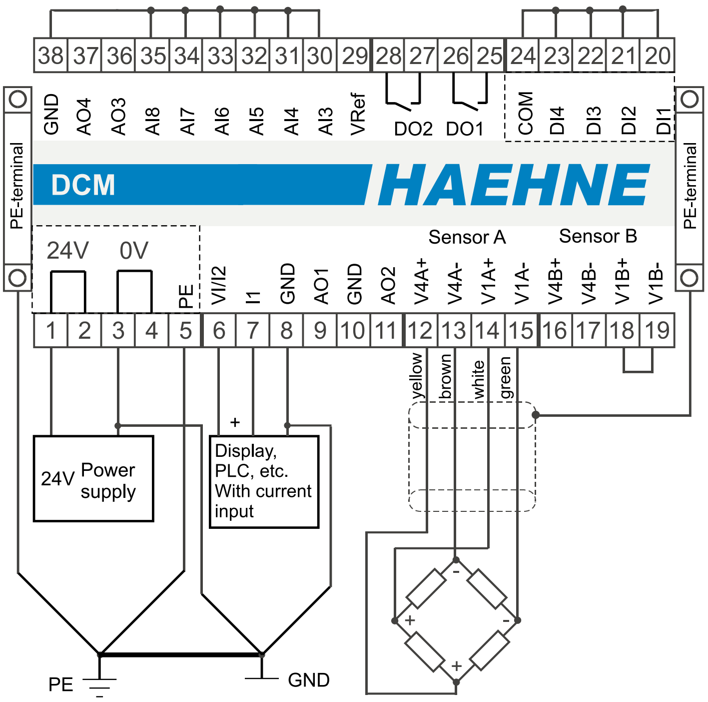
23. Option CC

Using two voltage / current converters the voltage outputs AO1 and AO2 can be internally converted to 4-20 mA signals. If the signals are to be used downstream as current signals, then they must be assigned to the voltage outputs AO1 and AO2.
The current output I1 corresponding to the voltage output AO1 is available on terminal 7/8.
The current output I2 corresponding to the voltage output AO2 is available on terminal 6/8.

The basic sensor and amplifier adjustments are contained in the examples above.
This example refers to the single channel amplifier.



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