

## Modularer Digital Controller DCX

### Quick Start Guide





This quick reference guide covers primarily the function of the DCX as an amplifier. The digital inputs and outputs as well as the other parameters and settings are explained in more detail in the Reference Manual.

## Content

1. System Description . . . . .	3
2. Hardware Design . . . . .	4
3. Terminal Assignment . . . . .	6
4. Software Design . . . . .	8
4.1. Function Blocks . . . . .	9
4.2. DCX Operation . . . . .	11
4.2.1. Modification of Displayed Values . . . . .	11
4.2.2. Peak Value Mode . . . . .	13
4.2.3. Quick Function . . . . .	14
4.2.4. Adjustment Mode . . . . .	16
5. Operating Instruction	
5.1. Sensor Adjustment . . . . .	19
5.2. Controller Adjustment . . . . .	20
5.3. Fieldbus and Master Adjustment . . . . .	21
6. Description of Parameters	
6.1. Parameters Displayed Values . . . . .	23
6.2. Parameters Level 1 . . . . .	25
6.2.1. General Display Adjustment (Function Block 0) . . . . .	25
6.3. Parameters Level 3 and 4 . . . . .	26
6.3.2. Anybus Inputs (Block 1) . . . . .	26
6.3.3. Analog Inputs (Block 4) . . . . .	28
6.3.4. Amplifier (Block 5) . . . . .	31
6.3.5. Mathematical functions (Block 6) . . . . .	34
6.3.8. Analog Outputs (Block 9) . . . . .	36
6.3.9. Anybus Outputs (Block A) . . . . .	38
6.4. Parameters Level 7 . . . . .	39
6.4.1. Anybus (Function Block 1) . . . . .	39
7. Parameter Table . . . . .	40
8. Tabular Overview of Signal Sources . . . . .	43

## 2 Content

## 1. System Description

The DCX is a multi-functional amplifier system that can be configured through its modular design to customized industrial application. The individual modules, options and specifications can be individually tailored to fit the specific applications.

Up to eight force measurement channels can be operate with the amplifier inputs and can be processed with additional process variables.

Averaging, difference calculation or wrap angle correction can be assigned separately to each channel. The signal processor of the DCX also calculates complex functions in a very short time, eg. the evaluation of the X-Y signals. The DCX can also be used as a multi-channel web tension controller. Various controller models can be configured and the control behavior can be modified by winding diameter or the strip speed.

There are analog and digital interfaces available for the signal outputs. On the analog side there are up to eight voltage outputs available and in addition eight current outputs. On the digital side this is either a fieldbus interface, such as Profibus or either an Ethernet interface, such as Profinet.

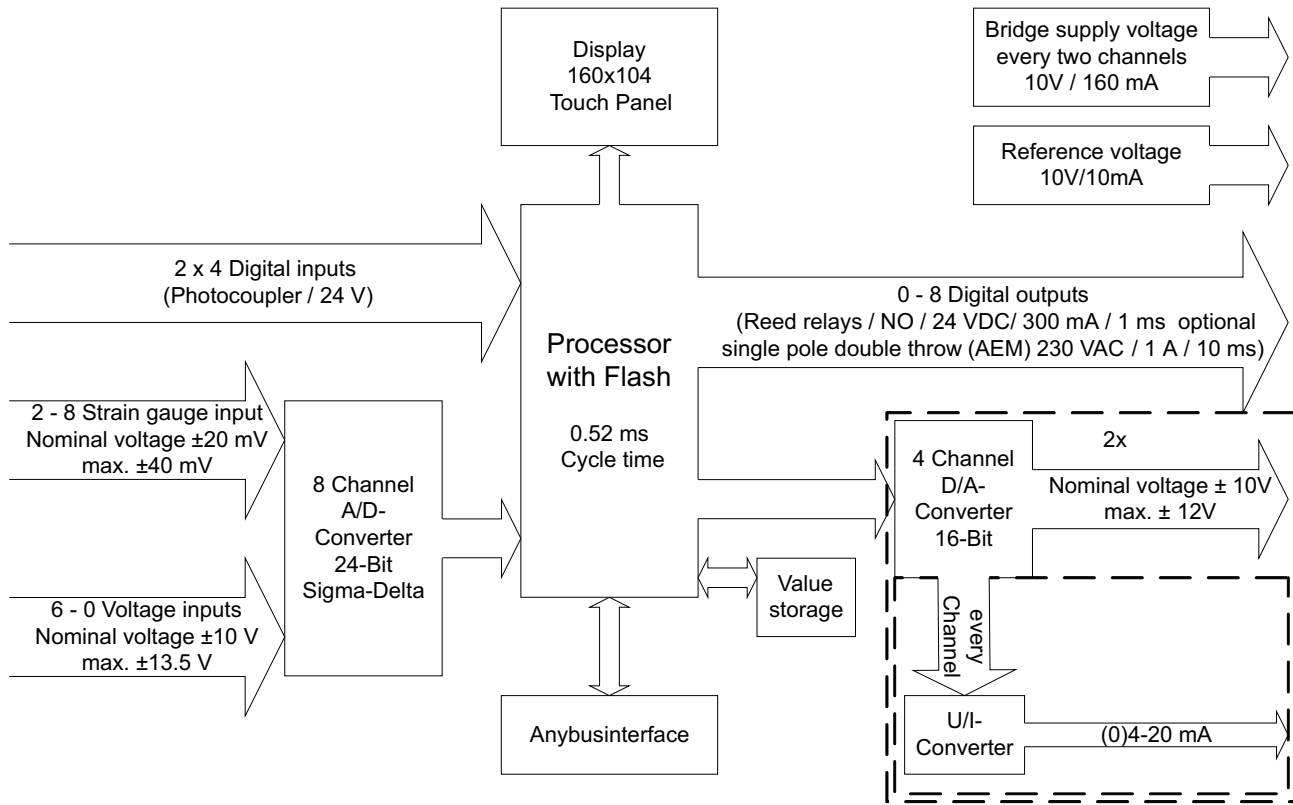
With digital control inputs and outputs, the controller settings can be changed or limit switches can be set.

With the menu-driven touch-panel display, the set up and the use of the DCX is very user friendly.

### Several Applications of Web Tension Measurement



## 2. Hardware Design



The DCX is a user-oriented combination of functional units which are arranged around the core: the Digital Signal Processor. This runs synchronously to the A / D converter with a cycle time of 0.52 ms. In one clock cycle every eight converter signals, present in the A / D, are read, processed and issued again with 16 bit resolution.

Parallel to this, in the same clock cycle, occurs the conversion of the eight analog input signals into digital signals in the 24 bit sigma-delta converter. These are available in the next clock cycle for further processing.

### Analog Inputs

The eight inputs are designed either as a measuring amplifier differential inputs to connect to strain gauge sensors or at the option of the customer as  $\pm 10$  V signal input voltages. The differential inputs are normalized to  $\pm 20$  mV.

Signals up to max.  $\pm 40$  mV can be analyzed. The normalized  $\pm 10$  V analog inputs can process signals up to 13.5 V.

### Analog Outputs

The eight optional analog outputs are normalized to  $\pm 10$  V. The maximum voltage is  $\pm 12$  V. They are fully configurable in terms of operating range and assignment. To each voltage output a current output can be optionally assigned. The current range 4-20 mA corresponds to the standard signal 0-10 V.

## 4 Hardware Design

## **Bridge Power Supply And Reference Voltage**

For the supply of the strain gauge sensors a bridge supply of 10 V / 160 mA is available. Optional up to 4 x 160 mA are possible. One output with 10 V / 10 mA is provided as a reference voltage. This output can also be used for external potentiometers.

## **Digital Inputs**

For control functions there are eight galvanically isolated 24 V inputs.

## **Digital outputs**

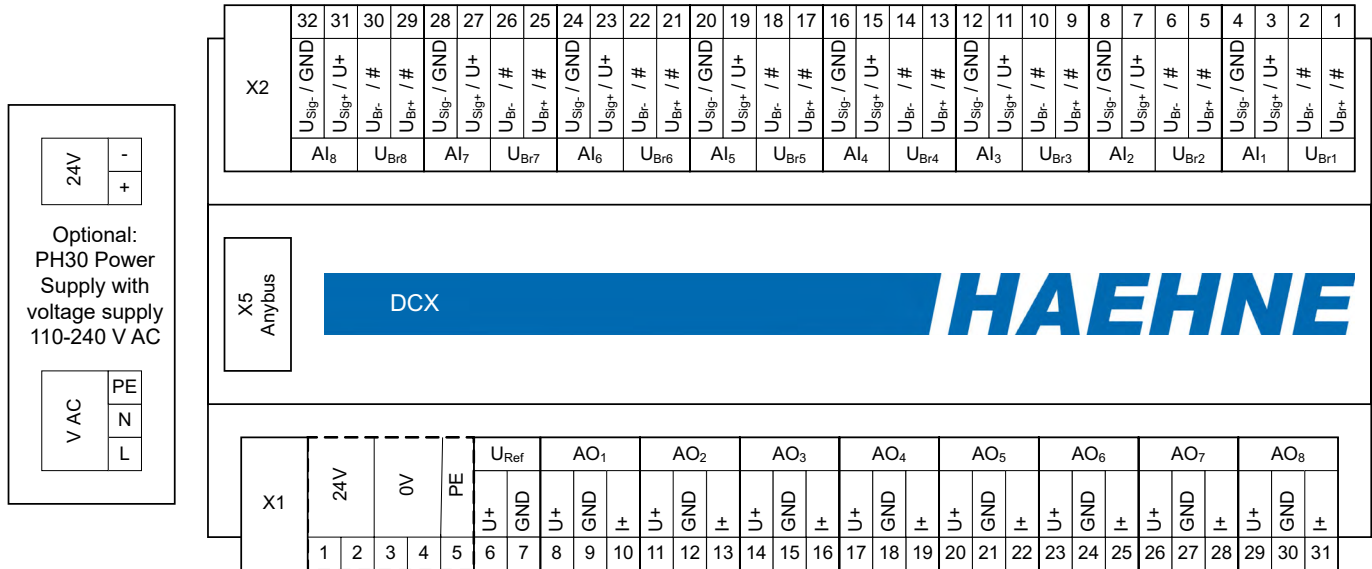
As digital outputs up to eight Reed type relays are available as normally open contacts (SPNO) or as PCB relays double throw contacts (SPDT) are available. DC voltage up to 24 V / 300 mA with a response time of max. 1 ms can be switched with the normally open relay. With the double throw relay an AC voltage to 230 V / 1 mA with a response time of 10 ms can be switched.

## **Anybus Interface**

At the Anybus interface the following fieldbus versions can be connected: BACNet MS/TP, CANopen, CC-Link, ControlNet, Modbus RTU and Profibus. With Ethernet modules, the versions BACNet/IP, EtherCAT, Ethernet/IP, Modbus TCP, Profinet and SERCOS III can be connected.

### 3. Terminal Assignment

The terminal assignments shown here are for use of DCX without digital inputs and outputs. The terminal assignment for the DCX with digital inputs and outputs is described in the Reference Manual.



With the optional power supply of 110-240 V AC and the housings G1 to G4, the 24 V supply is pre-wired for the power supply PH30 (X1: terminal 1 and 3).

The power supply voltage must be grounded. In the power supply loop the current of the supply voltage should not be exceed 500 mA.

## 6 Terminal Assignment

## Terminal Block X1

Terminal No.	Description
1 and 2	24 V Supply voltage +
3 and 4	0 V Supply voltage -
5	PE-connection
6	Reference voltage 10 V
7	GND
8	Voltage output AO <sub>1</sub>
9	GND
10	Current output AO <sub>1</sub>
11	Voltage output AO <sub>2</sub>
12	GND
13	Current output AO <sub>2</sub>
14	Voltage output AO <sub>3</sub>
15	GND
16	Current output AO <sub>3</sub>
17	Voltage output AO <sub>4</sub>
18	GND
19	Current output AO <sub>4</sub>
20	Current output AO <sub>5</sub>
21	GND
22	Current output AO <sub>5</sub>
23	Voltage output AO <sub>6</sub>
24	GND
25	Current output AO <sub>6</sub>
26	Voltage output AO <sub>7</sub>
27	GND
28	Current output AO <sub>7</sub>
29	Voltage output AO <sub>8</sub>
30	GND
31	Current output AO <sub>8</sub>

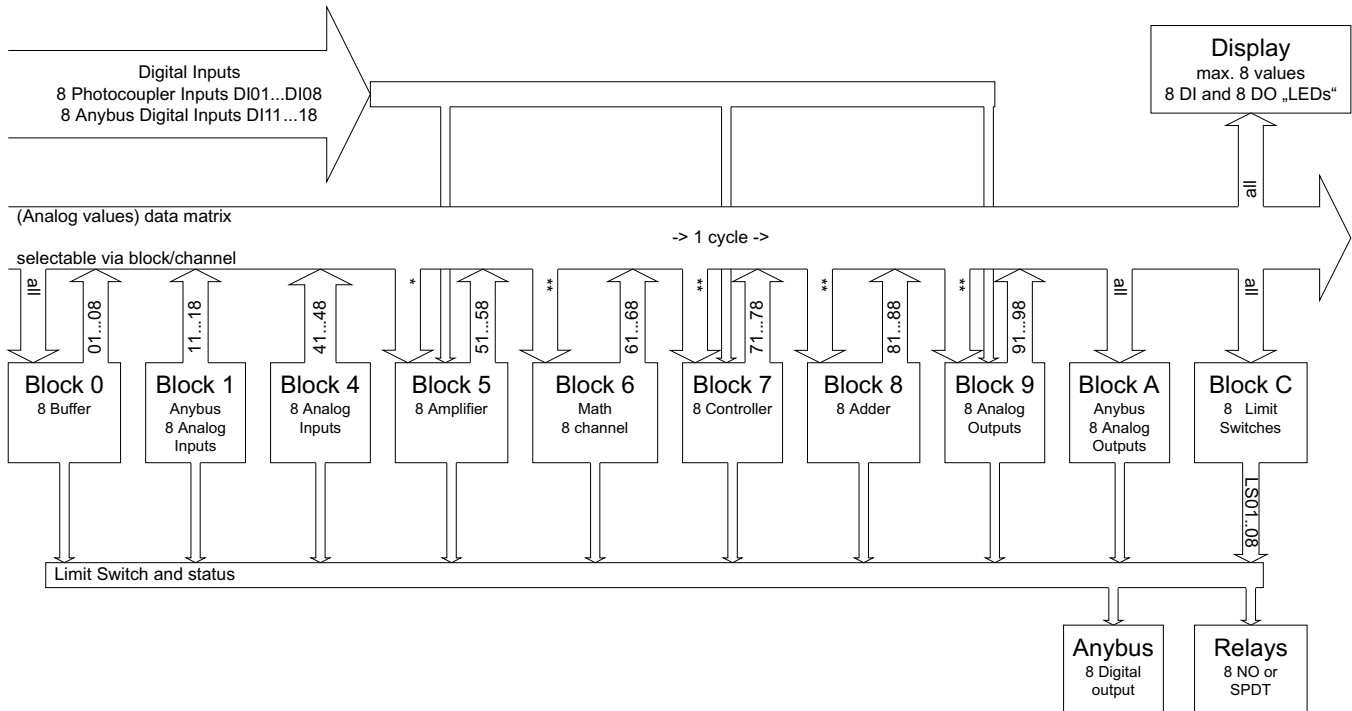
## Terminal Block X2

Terminal No.	Description
1	Bridge supply voltage U <sub>BR1</sub> +
2	Bridge supply voltage U <sub>BR1</sub> -
3	Signal voltage AI <sub>1</sub> +
3	Signal voltage AI <sub>1</sub> - / GND
5	Bridge supply voltage U <sub>BR2</sub> +
6	Bridge supply voltage U <sub>BR2</sub> -
7	Signal voltage AI <sub>2</sub> +
8	Signal voltage AI <sub>2</sub> - / GND
9	Bridge supply voltage U <sub>BR3</sub> +
10	Bridge supply voltage U <sub>BR3</sub> -
11	Signal voltage AI <sub>3</sub> +
12	Signal voltage AI <sub>3</sub> - / GND
13	Bridge supply voltage U <sub>BR4</sub> +
14	Bridge supply voltage U <sub>BR4</sub> -
15	Signal voltage AI <sub>4</sub> +
16	Signal voltage AI <sub>4</sub> - / GND
17	Bridge supply voltage U <sub>BR5</sub> +
18	Bridge supply voltage U <sub>BR5</sub> -
19	Signal voltage AI <sub>5</sub> +
20	Signal voltage AI <sub>5</sub> - / GND
21	Bridge supply voltage U <sub>BR6</sub> +
22	Bridge supply voltage U <sub>BR6</sub> -
23	Signal voltage AI <sub>6</sub> +
24	Signal voltage AI <sub>6</sub> - / GND
25	Bridge supply voltage U <sub>BR7</sub> +
26	Bridge supply voltage U <sub>BR7</sub> -
27	Signal voltage AI <sub>7</sub> +
28	Signal voltage AI <sub>7</sub> - / GND
29	Bridge supply voltage U <sub>BR8</sub> +
30	Bridge supply voltage U <sub>BR8</sub> -
31	Signal voltage AI <sub>8</sub> +
32	Signal voltage AI <sub>8</sub> - / GND

The terminal assignments shown here represent the complete version of the DCX. In a partial version only the required terminals are connected. Corresponding inputs are defined as strain gauge sensor inputs. Also in this case the signal inputs are designed as differential inputs.

## 4. Software Design

The software of the DCX is divided into blocks. These blocks are independently operating functional units can therefore be independently configured.



Up to 8 analog values from the data matrix can be displayed. All block outputs are scheduled as a source. This simplifies troubleshooting in customer systems, eg. the raw data of the sensor signals can be checked without a measuring device. Depending on the application, the inputs of the blocks can be selected flexibly from the data matrix.

The matrix is supplied from the outputs of the blocks 0-9.

In the blocks 0, A and C all values from the data matrix can be processed.

For block 5 (\*) applies the following: the amplifier input can process values only from the strain gauge sensor inputs. The inputs of the wrap angle correction can be linked only with values from the blocks 0 ... 4.

Blocks 6, 7, 8 and 9 (\*\*) can be linked only with values from the "smaller" blocks. This guarantees the processing of data in a cycle of 0,52 ms.

Blocks 2,3 and B are not shown because they are currently not used, but are reserved for further use.

## 8 Software Design



## 4.1. Function Blocks

Each block consists of 8 channels with identical parameters. Blocks that are not necessary for the specific application can be disabled. Therefore the operation need not be considered in more detail at this point.

### Block 0 - Temporary Storage

the selected signals of the data matrix from the previous cycle are scaled and filtered here.

This allows, for example, the use of the analog output values again as inputs for the controller block.

### Block 1 - Anybus Analog Inputs

The incoming "analog data" via the Anybus module are scaled here and can optionally also be filtered.

### Block 4 - Analog Inputs

The filter behavior and the scaling of each analog input is adjustable independently.

This way very noisy signals can be better processed. The correction factors for multi-axis sensors are also entered here.

### Block 5 - Amplifiers

In this block, the virtual amplifier inputs are adapted to the different sensors. Each amplifier is associated with one or more sensor outputs. In the latter case it is possible choose between an average or a summation. The usual settings, such as zero point and gain are made here. A correction of the wrap angle can be activated here for each channel and can be individually configured. To simplify configuration, a coupling of the amplifiers is possible. The calibration functions can be triggered by external signals.

### Block 6 - Mathematical Functions

In this block, special calculations can be performed.

The block can be used for various calculations. These are for example the averaging of separately evaluated sensor signals, the difference calculation for detecting a defective sensor or the winding diameter projection for the control function. The signal analysis of the multi-axis sensors is also done in this block.

### Block 7 - Controller

This block describes the PID controller with additional functions.

For more details see the Reference Manual.

### Block 8 - Adder

The sum of up to 8 signals is calculates here. Due to the separate adjustment of the scaling, which also allows an inversion, a separate evaluation of the signals is possible.

## **Block 9 - Analog Outputs**

Here the analog voltage outputs are configured independently.

The outputs are flexibly allocatable. The signals are filtered differently depending on the use.

The output voltage range is also set in this block. The signal can be limited to positive values only. For devices that may cause problems during further processing, the value can be set to a certain maximum voltage.

It is possible to activate an analog peak value storage per channel. This can be reset via the digital interfaces.

The output range of -10 V to 10 V can be compressed to the range of 0 to 10 V. This is useful when positive and negative signals are to be processed, but only one current input or one 0 to 10 V input is available.

In addition, a switching function is integrated. This enables switching the output to an alternative signal by using a digital input.

## **Block A - Anybus Analog Outputs**

The "analog data" sent to the Anybus module, are scaled and filtered here on request.

## **Block C - Limit Switch**

The selectable assignment to external or internal signals enables the a monitoring of a limit switch with adjustable characteristics.

## **Digital Inputs**

The digital inputs DI01 to DI18 are control inputs intended for activatable special functions (eg external zeroing, controller lockout, peak level reset, output signal switching)

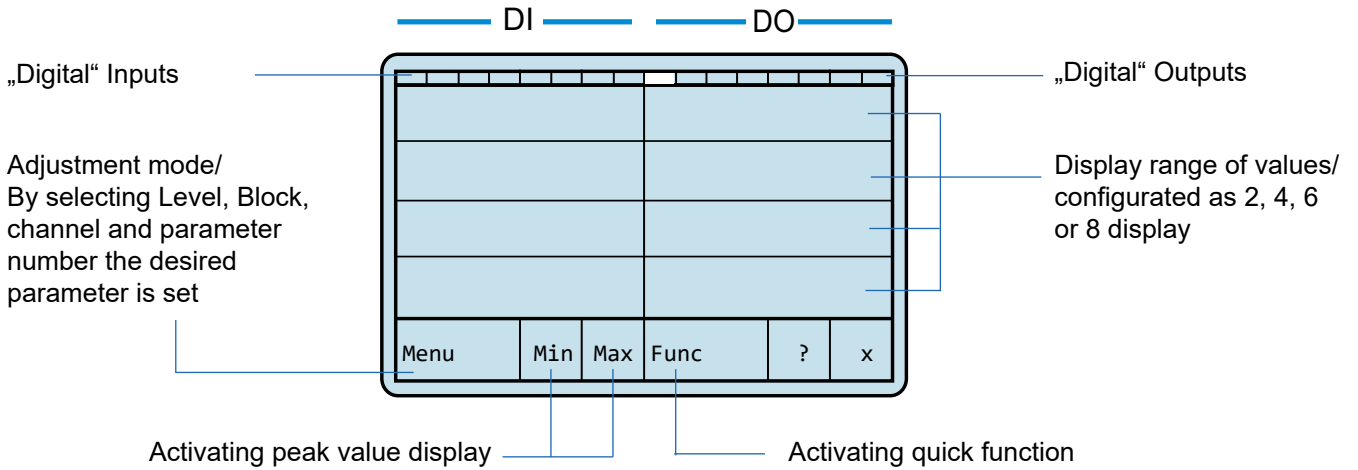
## **Digital Outputs**

Through the digital outputs, the switching states of the limit switches or their status messages, such as adjustment function or voltage limitation, are issued. The signals are routed either to the Anybus as 8bit value or they switch the relays.

## **10 Software Design**

## 4.2. DCX Operation

After applying power on the DCX starts with the start screen.



### 4.2.1. Modification of Displayed Values

The displayed values are changed by directly pressing the corresponding field

51: xxxxxxxx	55: xxxxxxxx				
52: xxxxxx	56: xxxxxxxx				
53: xxxxxxxx	57: xxxxxxxx				
54: xxxxxxxx	58: xxxxxxxx				
Menu	Min	Max	Func	?	x

By pressing the first display position, as an example, the following parameter selection screen can appear:

Position 1 (001..)	
Actual Value: xxxxxxx	
Source: 51	Filter: xxxx
Scale: xxxxx	Unit: xx
	y


The values for the data source, the filter setting, scaling and unit are presented here.

The field "y" displays the number of changed parameters. If no parameter is changed, then this value is 0.

By pressing the start screen always appears.

By pressing a parameter field, the page for the change of values is displayed, in which the respective parameter values can be set. (All parameter are described in chapter 6.1. „Parameter of displayed Values“ )

For the data source, for example this is the following page:

Position 1 Source (00101)						
Actual Value: xxxxxxxx						
XX						
	<	>	Esc	^	v	OK


With "<" resp. ">" the position in the value field is selected.

With "^" resp. "v" the corresponding digit is increased or decreased.

To exit the page without change, use „Esc“


In case of modified values "OK" appears. By pressing it, the modified values are saved.

This values are not saved permanently. This is especially useful in cases in which different parameter values should be tried only. With restart the old parameter values are restored without resetting each parameter.

Position 1 (001..)						
Actual Value: xxxxxxxx						
Source: 51			Filter: xxxx			
Scale: xxxxx			Unit: xx			
					y	

Thus, the modified values even after a restart are still present, the field designated here as "y", must be pressed in the parameter selection page.

The following page appears:

Position 1 (001..)						
Save						
		Esc			y	


By pressing "Save", the modified values are transferred to the long-term storage.


In contrast, the page is exited by pressing "Esc" without saving any changes.

## 12 Operation


## 4.2.2. Peak Value Mode

By pressing „Min“- resp. „Max“ on the start screen the peak value mode is activated.

51: xxxxxxxx	55: xxxxxxxx
52: xxxxxxxx	56: xxxxxxxx
53: xxxxxxxx	57: xxxxxxxx
54: xxxxxxxx	58: xxxxxxxx
 Min	Clear x


51: xxxxxxxx	55: xxxxxxxx
52: xxxxxxxx	56: xxxxxxxx
53: xxxxxxxx	57: xxxxxxxx
54: xxxxxxxx	58: xxxxxxxx
 Max	Clear x

To reset all values, "Clear" must be pressed. Following page appears:


Minimum values	
Clear	
 Esc	x

All peak values reset to the actual value with "Clear".  
"Esc" to exit the page without resetting.

If only individual peak values are to be reset, the corresponding field must be pressed directly.

51: xxxxxxxx	55: xxxxxxxx
52: xxxxxx	56: xxxxxxxx
53: xxxxxxxx	57: xxxxxxxx
54: xxxxxxxx	58: xxxxxxxx
 Min	Clear x

Following page appears:

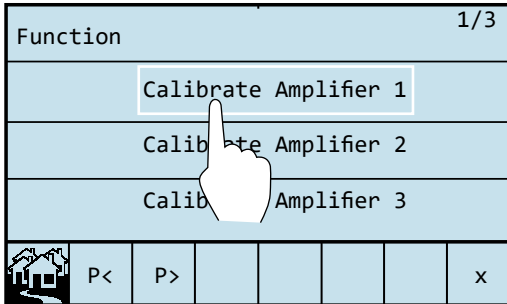
Minimum Position: 1	
51: xxxxxxxx	
 Esc	Clear x

By pressing "Clear" the peak values are reset to the current value.

Leave this page with "Esc".

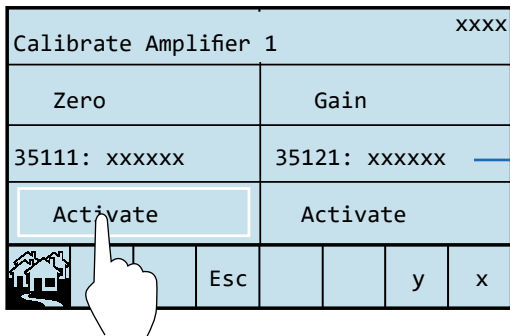
**4.2.3. Quick Function**

Press "Func." on the initial screen, quick functions are called. These are the calibration functions for the zero point (tare) and the gain for each amplifier separately selectable.



Page numbering (current page / number of pages "1/3")  
 "P <" and "P >" switches between the sides.

By selecting an amplifier the following page is displayed:



Actual value

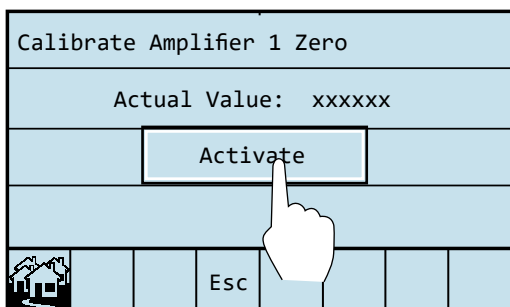
Values of Level 3 are "Zero" (zero adjustment value) and "Gain" (adjustment value for a defined load)

Here, too, shows the as "y" designated field the number of changed parameters.

If no adjustments were made, this value is 0.

With "Activate" the appropriate activation page is called.

(This additional step is used to avoid incorrect entries.)



Actual value

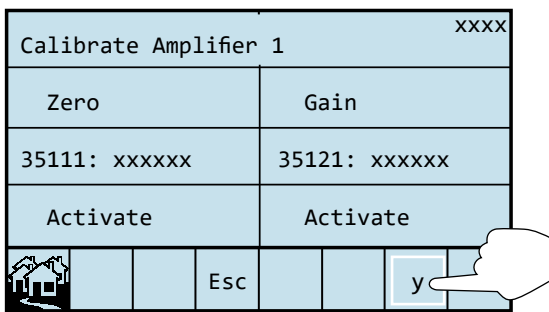
With "Activate", the corresponding adjustment process is started.

"Esc" to exit the page without adjustment.

**14 Operation**

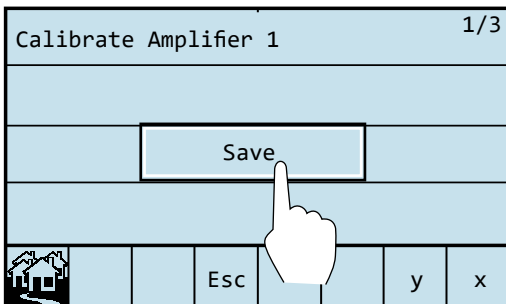
**O** \*) The zero adjust function respectively the amplifier adjustment is activated by pressing "Activate".  
**I** In order to find the optimal adjustment value, the calculation of averages is activated for 200 msec.  
 The input signal should not be changed at this time.  
 At the amplifier adjustment 3 fault conditions are possible:  
 "GainH": calculated amplification is too high  
 "GainL": calculated amplification is too low  
 "Zero": actual calibration weight is too low

To assure that the modified values even after a restart are still present, the field labeled "y" must be pressed in the amplifier overview page.



In this concrete example "y" is the number 1

Following page appears:



By pressing "Save" the changed parameter values are transferred to the long-term memory. In contrast, the page is exited by pressing "Esc" without saving the entries.





### 3. Block Selection

Level 3 (3...)		1/2	
Buffer			
Anybus Inputs		Analog Inputs	
USB Inputs		Amplifier	
	P<	P>	Esc
			0 x

Page numbering (current page / number of pages "1/2")

"P<" and "P>" switches between the pages.

### 4. Channel Selection

Amplifier (35...)		1/2	
Channel 1	Channel 4		
Channel 2	Channel 5		
Channel 3	Channel 6		
	P<	P>	Esc
			0 x

Page numbering (current page / number of pages "1/2")

To access more channels, with the "P<" and "P>" switch between the pages.

### 5. Parameter Selection

Amplifier Channel 1 (351..)		1/3	
11: xxxxxxxX	22: xxxxxxx		
12: xxxxxxx	31: xxxxxxx		
21: xxxxxxx	32: xxxxxxx		
	P<	P>	Esc
			0 x

Page numbering (current page / number of pages "1/3")

In order to access additional parameters, "P<" and "P>" switches between the pages.

### 6. Parameter Value Mode

Amplifier Channel 1 (35122)			
1000			
	<	>	Esc
	^	v	OK x

Here in parentheses is the complete parameter number, as listed in the parameter table (chapter 7. Level / block / channel / 2-digit number)

The fields "<" or ">" the digit position is selected within the value.

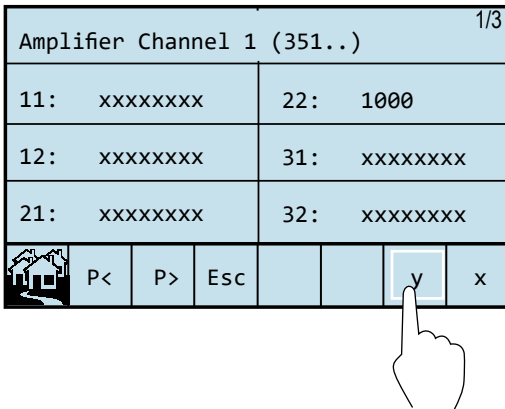
The fields "^" or "v" each digit is increased or decreased.

With "Esc" exit the page without a change.

The "OK" field appears only, when a value has been modified. If the page is left on the field, the modified value is adopted.

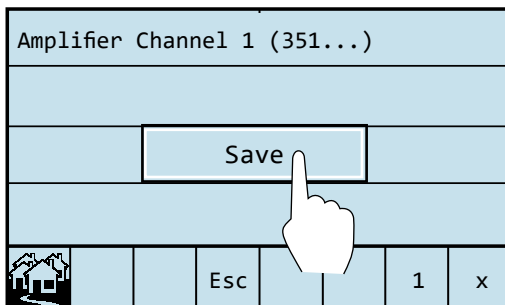
## 7. Storing in the Long Term Memory

In order maintain changed values after a new start, it is necessary to press the field "y" in the parameter selection page. This field shows the number of modified parameters.



In this example one parameter has been changed.

The following page appears:



By pressing the "Save" field the changed parameter values of the amplifier channel (Level / Block / Channel) are stored in the long term memory. But pressing the field "Esc" results in leaving this page without storing the changed value.

As a general rule, pressing the "Esc" field in leaving the present position

Pressing the field, results in leaving all previous steps with the immediate return to the start screen.

## 18 Operation

## 5. Operating 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 than the nominal force of the sensor, then it is possible to adjust the amplification with parameter 35x22. (Level 3 / Block 5 (amplifier) / channel x / 22 (manual amplifier adjustment))

$$35x22 = \frac{10000 \text{ [mV]} \cdot \text{Sensor nominal force [N]}}{\text{Nominal rating of sensor} \left[ \frac{\text{mV}}{\text{V}} \right] \cdot 10 \text{ [V]} \cdot \text{Maximum used sensor force [N]}}$$

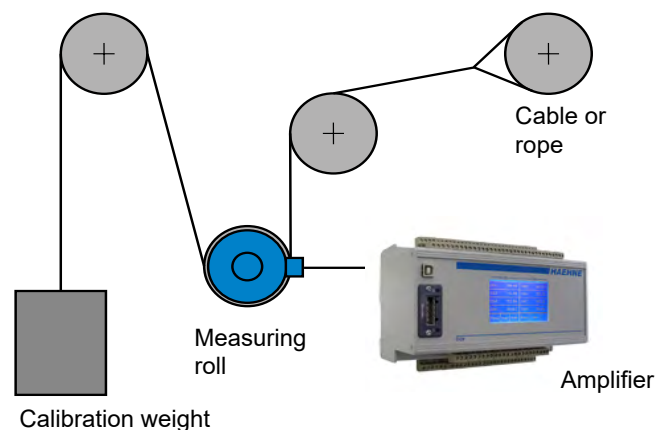
In case the actually used maximum sensor force is not known, then it is possible to calculate the amplification automatically with parameters 35x21. A reference weight is necessary for this task. In case of web tension measurement an additional rope or cable is necessary to simulate the web geometry.

#### Step by step instruction:

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 34x11 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. Use the "Quick Function" for adjusting the zero point (s. chapter 4.2.3 Quick Function). After the adjustment the present pre-load, the amplifier output shows a voltage of 0 V. If a different voltage is necessary, then it must be adjusted in advance in the menu with parameter 35x11.

#### 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 parameter 35x21 (s. chapter 4.2.4. Adjustment Mode) the percent value of the reference weight in relation to the maximum force. Use the "Quick Function for adjusting the amplification" (refer to 4.2.3 Quick Functions). 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.

If the amplification factor known then this value can be entered under parameter 35x22.

## 5.1. Sensor adjustment

### Example 1

Sensor data:                      Nominal rating 1,5 mV/V  
Bridge supply voltage: 10 V  
(therefore the output signal is 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 Block 9 (analog outputs) or Block A (Anybus analog outputs) the signal of downstream systems, e.g. a PLC or a display, can be adjusted.

## 5.2. Controller Adjustment

*The settings for the controller are described in the Reference Manual..*

## 5.3. Fieldbus and Ethernet Master Adjustment

The required device description file (eg GSD file in the Profibus) is supplied by HAEHNE and must be read in the configuration tool of the PLC.

As a result, for example, the Profibus slave will be listed in the "Hardware Catalog" (only in the catalog Profile "Standard") under "Profibus DP \ Additional Field Devices" and is there available for the configuration.

The slave "Anybus CompactCom" must be added in the configuration software to the project. (For EtherNet / IP, this is the Catalog Number in the Catalog: ABCC; Description: CompactCom EtherNet/IP(TM) 2P; HMS Industrial Networks AB).

Because the DCX has a modular configuration, the output and input modules have to be added afterwards in the slave configuration.

The entry "Output" in the master software has to be equated with the DCX Anybus inputs as the data are sent from the master to the DCX.

The entry "Input" in the master software, however, has to be equated with the DCX Anybus outputs as the data are sent from the DCX to the master.

The "analog" data is represented as a two's complement in the 16-bit register. In the configuration software, this is the "Word" entry.


In contrast to this, the "digital" data will be combined in 8-bit number.

In the configuration software, this is the "byte" entry.


The order in which the modules have to be inserted into the software is as follows:

1. Max. 8 times "Output 1 Word" (The number depends on the activated **analog Anybus inputs** (41x00 parameters) and can range from 0 to 8. In the standard set up no Anybus inputs are switched ON. Thus there are no modules "Output 1 Word" to be inserted.)
2. Max. 1 time "Output 1 byte" (This module is inserted only if the **digital Anybus inputs** are switched on (parameter 71011 **Bit 0** to 1). By default, these inputs are switched off. Thus, this module is not required in the standard.)
3. Max. 8 times "Input 1 Word" (The number depends on the activated **analog Anybus outputs** (Parameter 4Ax01) and can range from 0 to 8. These are the really important Data which are usually always present. The number corresponds always to the number of the desired signals to be processed.
4. Max. 1 time „Input 1 Byte“ (This module will only be inserted, if the **digital Anybus outputs** are turned on (Parameter 71011 **Bit 1** on 1). By default this outputs are turned off. Thus this module is not necessary in the standard configuration.

51:	xxxxxxx	55:	xxxxxxx
52:	xxxxxxx	56:	xxxxxxx
53:	xxxxxxx	57:	xxxxxxx
54:	xxxxxxx	58:	xxxxxxx
Menu		Min	Max
		Func	
			?



The overview of the inserted output and input modules is displayed as follows:

Block Diagram	Busmodules
Version	
Reset	
Bargraph	
	

Master Anybus Modules	
Output 1 Word	: 0
Output 1 Byte	: 0
Input 1 Word	: 4
Input 1 Byte	: 0

If the parameters 41x00, 4Ax01 or 71011 are changed, the device must be restarted for the changed number of modules in the network to take effect.

Leave the display by pressing any button



By default, only the "Input 1 Word" modules, the number of processing "analog" Anybus outputs (of the DCX), are allowed to be inserted.

The data is scaled by parameter 3Ax12.

In the standard 100% corresponds to the value 20480dez. This corresponds to the hexadecimal value of 0x5000.

The negative numbers are scaled accordingly.

Only the special representation in two's complements has to be kept in mind.

In the standard -100 % corresponds to

- the decimal description with the sign to the value of -20480,
- as value without sign to 45056 ( $65536 \{2^{16}\} - 20480$ ) and
- in the hexadecimal representation to the value 0xB000 (0x10000 - 0x5000)).

In fieldbus systems in which the field devices have to be assigned to a slave address, this setting is selected by parameter 71001 in Level 7 (see chapter 6.4.). By default, the address is 111. An assignment of the slave address is also possible via the master. For this purpose the parameter value in the DCX must be set to 126.

For Ethernet-based network systems, the IP address is assigned through the DHCP server (DHCP mode).



The above examples refer mainly to the Profibus. With other fieldbus or Ethernet types one should proceed equivalently.

## 22 Operating Instruction

## 6. Description of Parameters

### ○ General Consideration "Standardization"



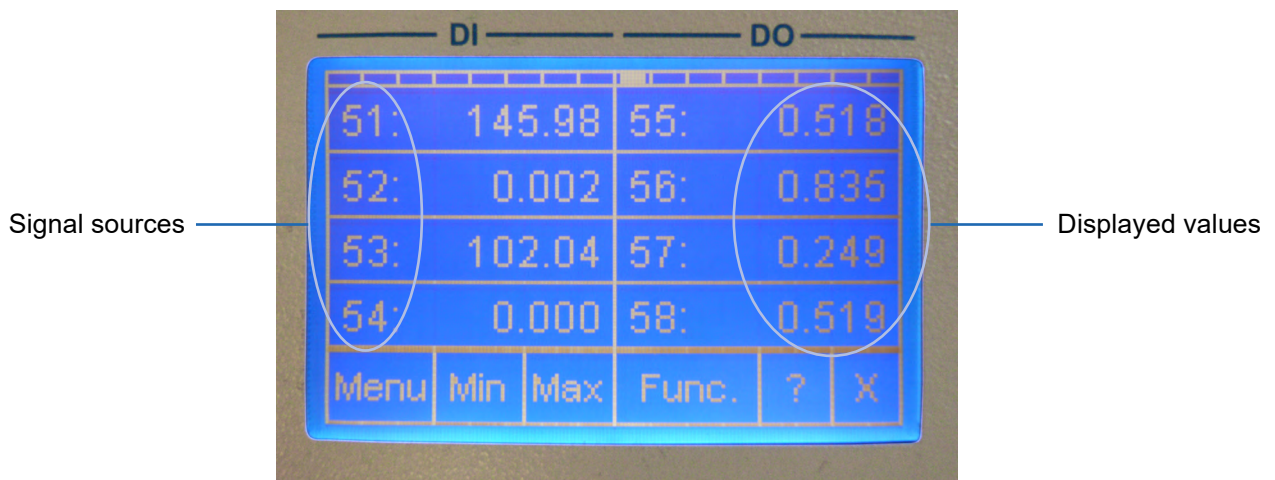
In the following description values are often designated by %. They apply to a virtual nominal value, similar to the 10 V voltage in the analog system. In the digital system of the DCM values above 100% are also possible.

The parameters of the DCX have always the format "level/block/channel/2 digit number.

When changing parameter values then this is also correspondingly indicated in the display caption.

This procedure simplifies the communication and documentation about the changed adjustments significantly. In the parameter table in chapter 7 a quick overview regarding the various functions is available.

### 6.1. Parameters of Displayed Values



### ○ Parameter values



The parameters of the displayed values are changed by pressing the appropriate field directly (s. 4.2.1.) and they carry no specification for level and block. For a uniform representation the corresponding positions simply filled with 0. If signals exceed internal limits, then OFL or -OFL are displayed.

The division as 2, 4, 6 or 8 display is a basic setting and takes place in Level 1


## 6.1. Parameters of Displayed Values

		Position 1...8	Number	
Signal source	00	X	01	Range: 01 ...98 Standard: 5x (x: as position) 1. Digit: block 2. Digit: channel <b>Tabular overview of signal sources in chapter 8</b> Signal source for this display position.
Scaling	00	X	02	Range: 10 ...100000 Standard: 100 (display shows %) Displayed value in case of 100 % signal of the selected signal source, other values correspondingly proportional.
Decimal point	00	X	03	Range: 0 ...6 Standard: 0 (no decimal point display) Point position starts right with 1 Is set on the same side as the scale with direct selection of the point position.
Filter time	00	X	04	Range: 1 ...9999 Designation in ms Standard: 50 Value of the moving average 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 average calculation.
Unit	00	X	05	Selection: NO (no unit / standard) % N kN MN lbs kg Direct unit selection for actual item

## 24 Parameter Description



## 6.2. Parameter Level 1


 The parameters in level 1 are not assigned to the blocks 0 to C. For a uniform presentation of the appropriate position for each functional unit is counted starting from zero.

### 6.2.1. General Display Adjustment (Function Unit 0)

	Level	Function unit	Number	
Display partitioning	1	0	0	0


Range: 2, 4, 6 or 8  
Standard: 8

The display of the values is configured as 2, 4, 6 or 8 display on the start screen.

 Generally display adjustment has no specification for the channel. For a uniform presentation the corresponding position is simply filled with "0".

The parameters in chapter 6.2.2. Anybus Digital outputs (Function unit 1), 6.2.3 Relays (Function unit 3) and the parameters [Source DI „LEDs“ (10002)] and [Source DI „LEDs“ (10003)] are described in the Reference Manual.

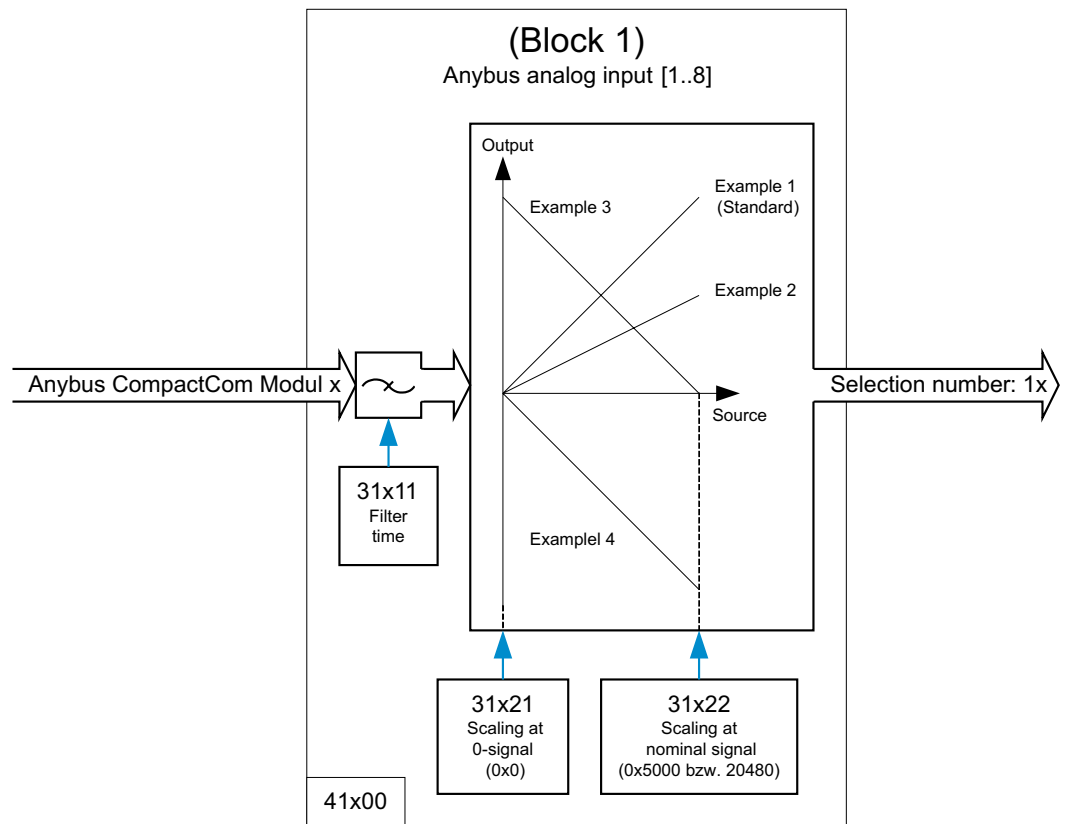
## 6.3. Parameter Level 3 and 4 (Blocks 0 to C)

 Each block has 8 channels. The settings are the same for all channels, so only one channel is displayed.


The parameters of the chapter 6.3.1. is described in the Reference Manual.

6.3.2. Anybus Inputs (Block 1)


Configuration of 8 Anybus Analog Inputs



	Level	Block	Channel 1...8	Number	
ON / OFF	4	1	X	00	Range: 0; 1 0: Channel x of Anybus inputs OFF (Standard) At the output of channel x of this block "0" is always present 1: Channel x of Anybus inputs on
Filter time	3	1	X	11	Range: 1 ....9999 Designation in ms Standard: 1 Value of the moving average 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 average calculation.

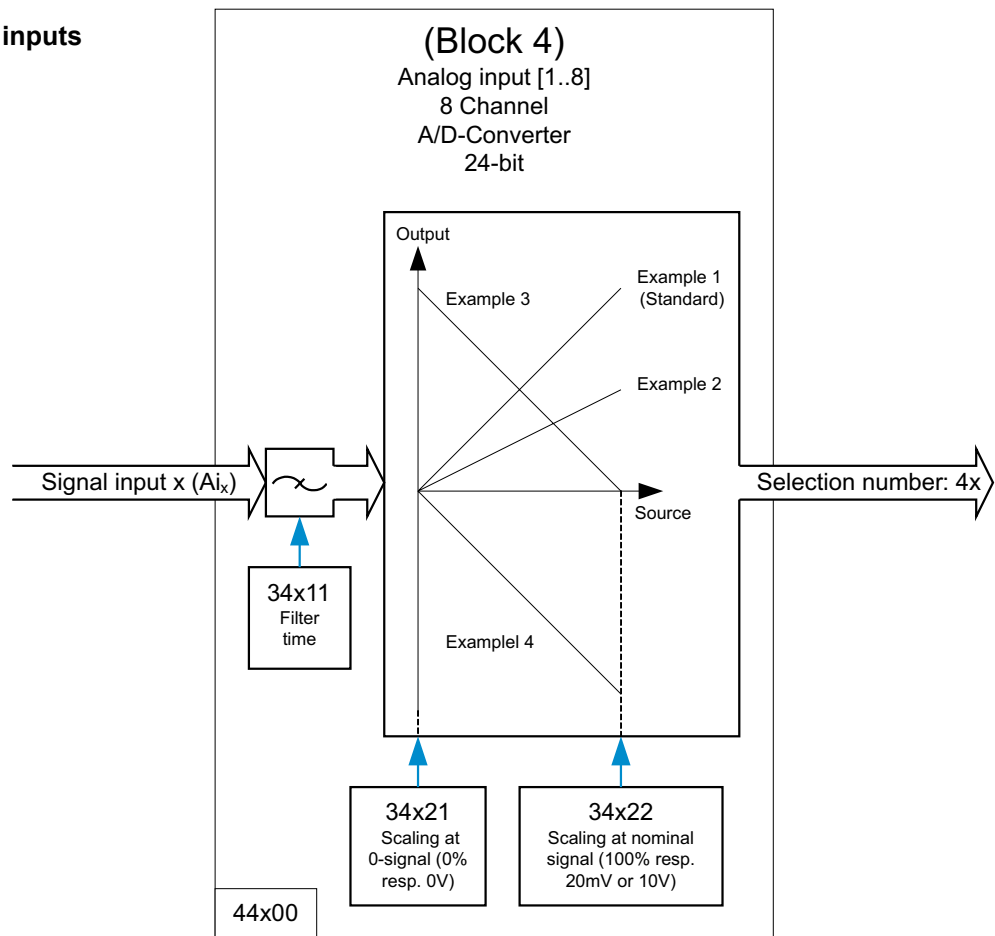
 Within the individual blocks of the DCX more filter functions are selectable, in addition to the input filters. The combination of these functions results in a total filter effect.

	Level	Block	Channel 1...8	Number		
<b>Scaling with zero signal (0x0)</b>	3	1	X	2	1	Range: -200.0...200.0 Designation in % Standard: 0.0 Output value of the channel "x" at input value of 0x0 hex or 0 dez
<b>Scaling with zero signal (0x5000 / 20480)</b>	3	1	X	2	2	Range: -200.0...200.0 Designation in % Standard: 100.0 Output value of the channel "x" at input value of 0x5000 hex or 20480 dez.

 The input values of the signal sources can be scaled separately. When scaling the result must still be within the permitted range. The result will be limited to  $\pm 200\%$ . Sample calculations for scaling can be found in chapter 6.3.3.

6.3.3. Analog Inputs (Block 4)


Configuration of 8 voltage inputs



Level	Block	Channel 1...8	Number
ON / OFF	44	X00	
Filter time	34	X11	

Range: 0; 1  
 0: Channel x of analog inputs OFF  
 At the output of channel x of this block "0" is always present  
 1: Channel x of analog inputs on (Standard)

Range: 1 ....9999  
 Designation in ms  
 Standard: 20  
 Value of the moving average  
 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 average calculation.


 Within the individual blocks of the DCX more filter functions are selectable, in addition to the input filters. The combination of these functions results in a total filter effect.

	Level	Block	Channel 1...8	Number	
<b>Scaling with zero signal</b> (0 % resp. 0 V)	3	4	X	2 1	Range: -200.0...200.0 Designation in % Standard: 0.0 Output value of the channel "x" at 0 % input. This value should not be changed at strain gauge sensor inputs, In this case, the settings are made in the amplifier block.
<b>Scaling with zero signal</b> (100 % resp. 20 mV or 10 V)	3	4	X	2 2	Range: -200.0...200.0 Designation in % Standard: 100.0 Output value of the channel "x" at 100 % input. This value should not be changed at strain gauge sensor inputs, In this case, the settings are made in the amplifier block.

*The parameters for source correction in multi-axis calculation (34x31 and 34x32 44x31;; 44x32) are described in the Reference Manual.*

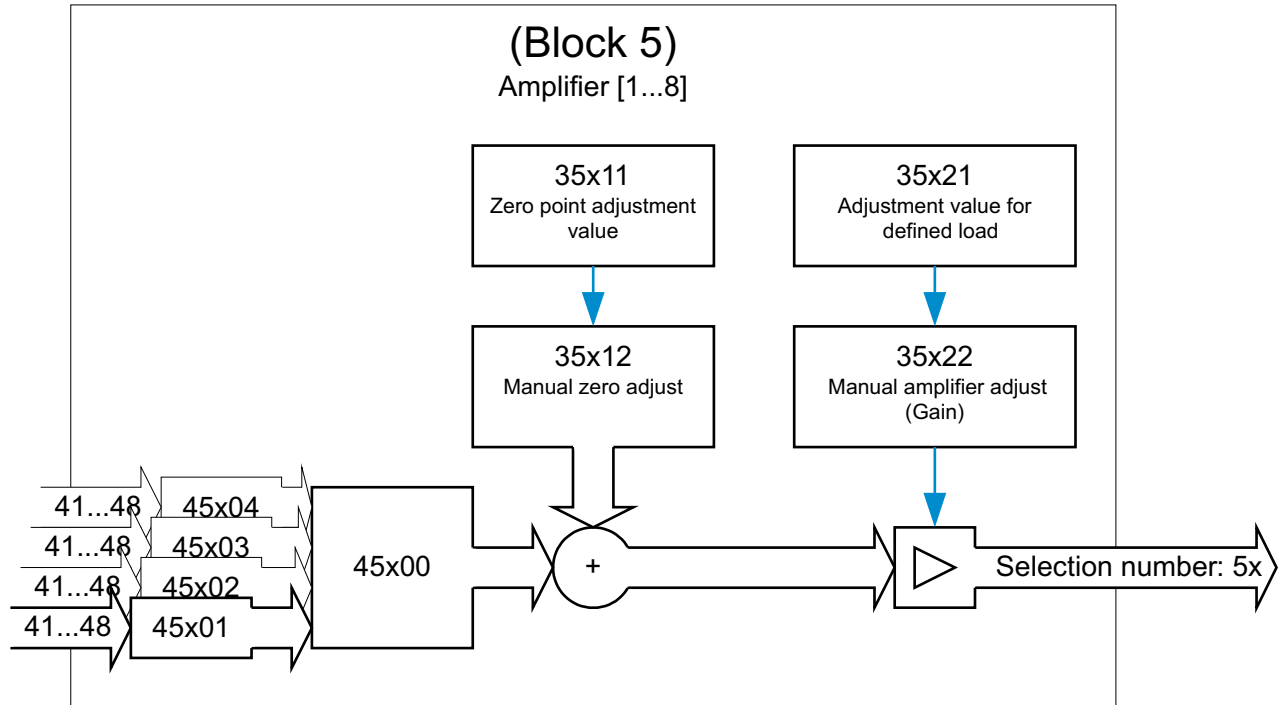
Calculation Examples for Scaling

	Level	Block	Channel 1...8	Number			
<b>Example 1</b>	3	4	X	2	1	= 0.0 %	All values are passed on unchanged
	3	4	X	2	2	= 100 %	
<b>Example 2</b>	3	4	X	2	1	= 0.0 %	All values are passed on with 50 % of their value
	3	4	X	2	2	= 50.0 %	
<b>Example 3</b>	3	4	X	2	1	= 100 %	The input values are passed on 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.
	3	4	X	2	2	= 0.0 %	
<b>Example 4</b>	3	4	X	2	1	= 0.0 %	All values are passed on negated.
	3	4	X	2	2	= -100 %	

 This examples are shown graphically on page 26 (Block 4).

## 6.3.4. Amplifier (Block 5)

### Configuration of 8 amplifiers



	Level	Block	Channel 1...8	Number		
Function selection ON / OFF		4	5	X	00	Range: 0 ...2 0: Amplifier x OFF At the output of the amplifier „0“ is always supplied 1: Amplifier x ON (Standard) The input values from the signal sources 1 to 4 are averaged 2: Amplifier x ON The input values from the signal sources 1 to 4 are summed. The amplifier can only calculate values from the strain gauge sensor inputs

	Level	Block	Channel 1...8	Number		
1. Signal source	4	5	X	0	1	Range: 41...48 Standard: 4x (x: as channel) First signal source for amplifier x Only the 2nd digit is changeable: channel of analog input
2. Signal source	4	5	X	0	2	Range: 0, 41...48 Standard: 0 (OFF) Second signal source for amplifier x Only the 2nd digit is changeable: channel of analog input
3. Signal source	4	5	X	0	3	Range: 0, 41...48 Standard: 0 (OFF) Third signal source for amplifier x Only the 2nd digit is changeable: channel of analog input
4. Signal source	4	5	X	0	4	Range: 0, 41...48 Standard: 0 (OFF) Forth signal source for amplifier x Only the 2nd digit is changeable: channel of analog input

## 32 Block 5



Level	Block	Channel 1...8	Number
3	5	X	1
3	5	X	1
3	5	X	2
3	5	X	2



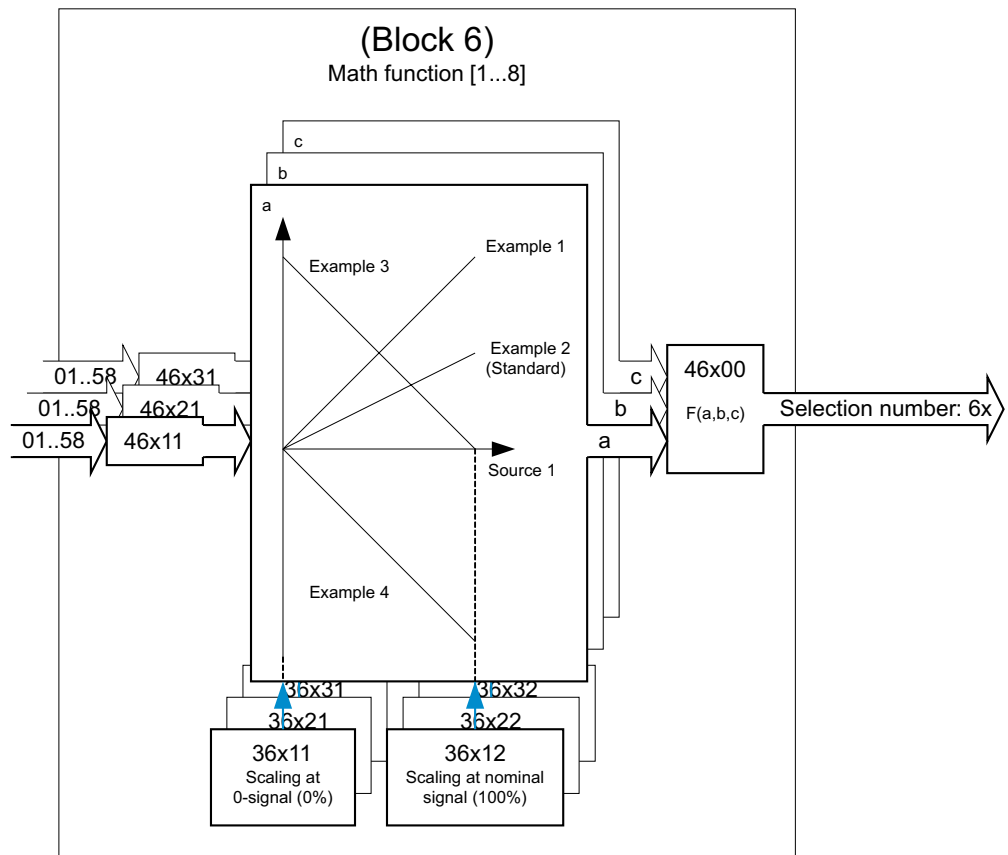
\*) In Level 3 only the zero point adjustment value, resp. the adjustment value for the defined load is adjusted. The actual zero and gain adjustment is activated in the quick functions (4.2.3.).

<b>Zero point adjustment value *)</b>	Range: -100.0...100.0 Designation in % Standard: 0.0  In case of the adjustment 0.0 % the output of the actual present input value is set to 0 during zero adjust (taring). In case of values other than 0.0 % the output is modified by the adjusted value. First point of two-point adjustment
<b>Manual zero adjustment</b>	Range: -200.0...200.0 Designation in % (100 % is equal to an input signal movement of +20 mV) Standard: automatic entry of the adjustments  This parameter is optional to enter or to control of the 35x11, 35x21 and 35x22 influenced value. It shows the zero offset of the input signal
<b>Setting for defined load*)</b>	Range: 10.0...110.0 Designation in % Standard: 100.0  Entry of the load in % of the nominal value. Recommended values are between 70 and 110 %. The smallest possible value also depends on parameters 35x11 and has 10 % larger than his. Second point of the two-point adjustment
<b>Manual amplification adjustment (Gain)</b>	Range: 100.0...30000.0 Amplification factor in V/V Standard: 666.7  This parameter is optional for the input of the gain or to display the calculated value by 35x21

The parameters for external triggering of the adjustment (45x12, 45x13, 45x22 and 45x23), for coupling of amplifiers (45x11; 45x21 and 45x24) and the wrap angle correction (45x30 to 45x39 and 35x31 to 35x39) are described in the Reference Manual.

**6.3.5. Math Function (Block 6)**

Configuration of 8 special calculation




	Level	Block	Channel 1...8	Number
Function selection OFF / ON		46	X01	
1. Signal source (a)		46	X11	
2. Signal source (b)		46	X21	

Range: 0...8  
 0: Math function channel x OFF (Standard)  
 At the output of channel x of this block "0" is always present  
 1: Sum function (a+b+c)  
*More parameter values 2 to 8 are described in the Reference Manual*

Range: 01...58  
 Standard: 51  
 1. Digit: block  
 2. Digit: channel  
 First signal source (a) for the Math function x

Range: 01...58  
 Standard: 52  
 1. Digit: block  
 2. Digit: channel  
 Second signal source (b) for the Math function x

 The input values of the signal sources can be scaled separately. When scaling the result must still be within the permitted range. The result will be limited to ± 200% . A Tabular overview of signal sources is given in chapter 8

**34 Block 6**

	Level	Block	Channel 1...8	Number		
<b>3. Signal source (c)</b>	4	6	X	3	1	Range: 0; 01...58 Standard: 0 (OFF) / c = 0 1. Digit: block 2. Digit: channel Third signal source (c) for the Math function x
<b>Scaling at zero signal (0%) Source 1</b>	3	6	X	1	1	Range: -200.0...200.0 Designation in % Standard: 0.0 Output value <b>a</b> at 0 % input
<b>Scaling at nominal signal (100%) Source 1</b>	3	6	X	1	2	Range: -200.0...200.0 Designation in % Standard: 50.0 Output value <b>a</b> at 100 % input
<b>Scaling at zero signal (0%) Source 2</b>	3	6	X	2	1	Range: -200.0...200.0 Designation in % Standard: 0.0 Output value <b>b</b> at 0 % input
<b>Scaling at nominal signal (100%) Source 2</b>	3	6	X	2	2	Range: -200.0...200.0 Designation in % Standard: 0.0 Output value <b>c</b> at 0 % input
<b>Scaling at zero signal (0%) Source 3</b>	3	6	X	3	1	Range: -200.0...200.0 Designation in % Standard: 50.0 Output value <b>b</b> at 100 % input
<b>Scaling at nominal signal (100%) Source 3</b>	3	6	X	3	2	Range: -200.0...200.0 Designation in % Standard: 33.4 Output value <b>c</b> at 100 % input

○ Sample calculations for scaling can be found in chapter 6.3.3. The first and second source are prepared for the averaging of two sources.

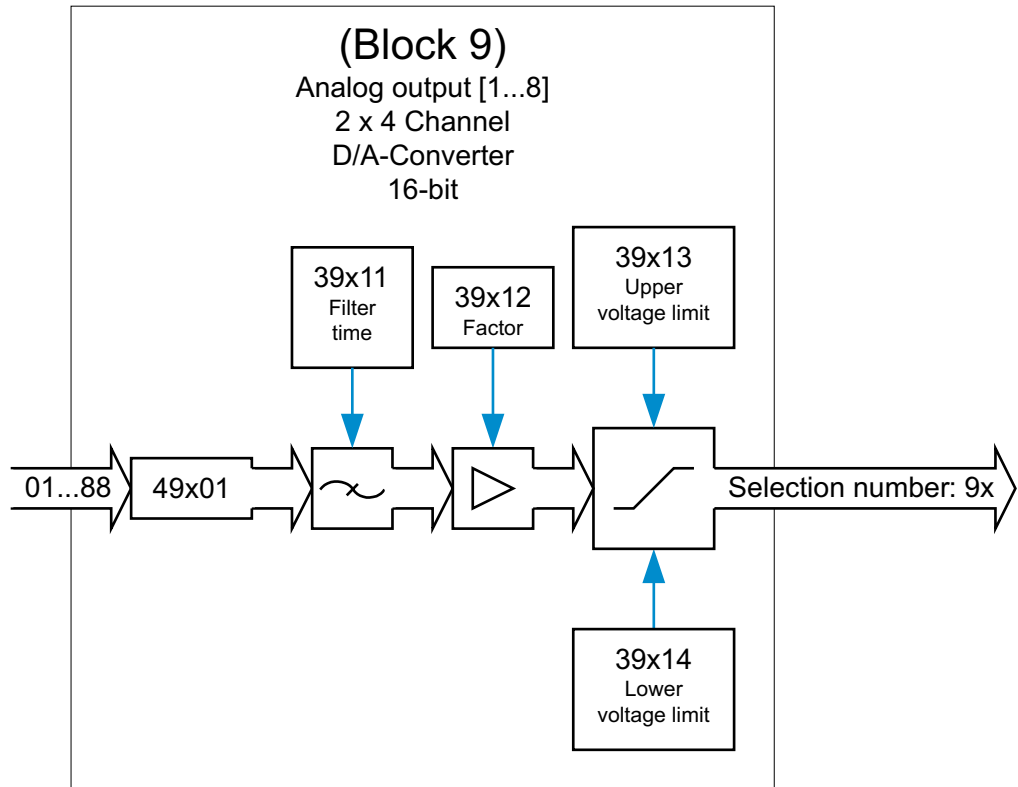
I A difference calculation is possible when Example 1 is applied to source 1 and Example 4 is applied to source 2. As an example, it can be found differences in the application of the force on a roller. The third source is prepared for the averaging of three sources. The sources 1 and 2 must still be adjusted.

The parameters for multi-axis calculation (36x51 and 36x52) are described in the Reference Manual

The parameters of chapter 6.3.6. Controller (Block 7) and 6.3.7. Summer (Block 8) are described in the Reference Manual.

6.3.8. Analog Outputs (Block 9)

Configuration of 8 voltage outputs



	Level	Block	Channel 1...8	Number
Signal source selection		4	9	X01
Filter time		3	9	X11

Signal source selection

Range: 0; 01...88  
 Standard: 5x (x: as channel)  
 0: Analog output x OFF  
 At the Analog output x 0 V resp. 4 mA are always present

1. Digit: block  
 2. Digit: channel  
**Tabular overview of signal sources in chapter 8**  
 Signal source for analog output x

Filter time

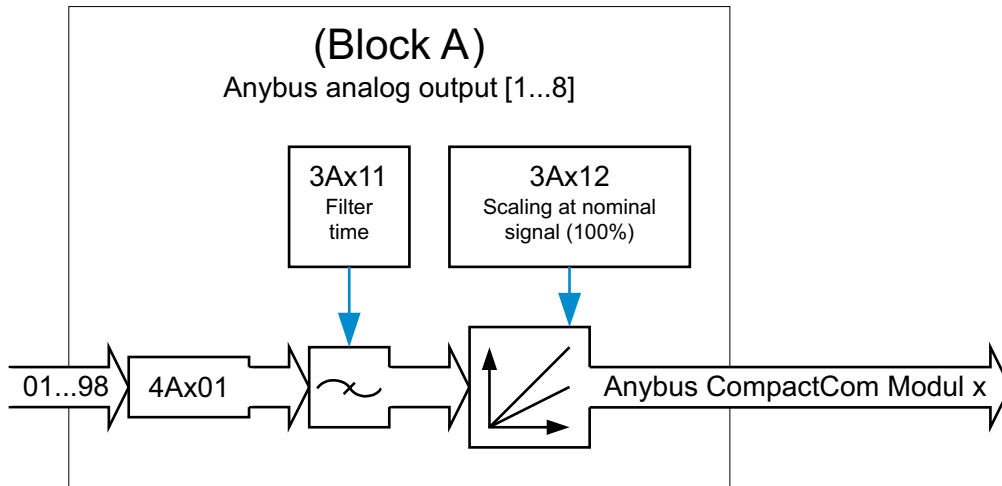
Range: 1...9999  
 Designation in ms  
 Standard: 1 (Filter function not in operation)  
 Value of the moving average in msec.  
 From the value 52 onwards an additional peak suppression function is activated. However, local peaks do not enter into the average calculation. Example: High value for displays, lower value for PLC inputs.

	Level	Block	Channel 1...8	Number	
<b>Factor</b>	3	9	X	1 2	Range: 0.000...2.000 Standard: 1.000 The values of the signal source are multiplied by the factor
<b>Upper voltage limitation</b>	3	9	X	1 3	Range: 0.00...12.00 Designation in V Standard: 10.00 Maximum output voltage The corresponding current output is equivalent (10 V corresponds to 20 mA) Example: Limitation to 10 V when the downstream input cannot accept a higher voltage.
<b>Lower voltage limitation</b>	3	9	X	1 4	Range: -12.00...0.00 Designation in V Standard: -10.00 Minimal output voltage The corresponding current output is unaffected from this and limited to 4 (0) mA. Example: Limitation to 0 V - if the connected input is not suitable for negative voltage - if by definition as controller output, the connected motor should not turn in reverse.

*The parameters of output mode (49x11), the peak value storage (49x21 to 49x23) and the switching function (49x31 to 49x34) are described in the Reference Manual*

### 6.3.9. Anybus Outputs (Block A)

#### Configuration of 8 Anybus analog outputs




	Level	Block	Channel 1...8	Number		
<b>Signal source selection</b>	4	A	X	0	1	Range: 0; 01...98 Standard: 5x (x: as channel) 0: Anybus Analog output x OFF This "Input 1 word" module in the configuration is not applied (chapter 5.3.) 1. Digit: block 2. Digit: channel <b>Tabular overview of signal sources in chapter 8</b> Signal source for Anybus analog outputs x
<b>Filter time</b>	3	A	X	1	1	Range: 1...9999 Designation in ms Standard: 100 Value of the moving average in msec. From the value 52 onwards an additional peak suppression function is activated. However, local peaks do not enter into the average calculation.
<b>Scaling at nominal signal (100%)</b>	3	A	X	1	2	Range: 2048...32768 Standard: 20480 Output value of channels x at 100% input signal

The parameters of chapter 6.3.10. Limit switch (Block C) are described in the Reference Manual

## 38 Block A

## 6.4. Parameter Level 7

 The parameters in Level 7 are not assigned the blocks 0 to C. For a uniform presentation of the appropriate position for each functional unit is counted starting from 1. The parameters have no specification for the channel. For a uniform presentation the corresponding position is filled with 0

### 6.4.1. Anybus (function unit 1)

	Level	Function unit	Number							
<b>Slave adress</b>	7	1	001	Range: 1...126 Standard: 111 Slave address of Anybus module Influence only, if the module supports this setting e.g. Profibus						
<b>Baud Rate</b>	7	1	002	Range: 0...3 Standard: 3 Baud rate of Anybus module Influence only, if the module supports this setting e.g. DeviceNet						
<b>Configuration</b>	7	1	0151	Range: 0...3 Standard: 0 Configuration of digital Anybus signal Binary coded <div style="margin-top: 10px;"> <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Bit</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">0</td> </tr> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px; text-align: center;">0</td> <td style="padding: 2px; text-align: center;">0</td> </tr> </table> <div style="margin-left: 20px;"> <p>Digital input 0: OFF 1: ON</p> <p>Digital output 0: OFF 1: ON</p> </div> </div>	Bit	1	0		0	0
Bit	1	0								
	0	0								

## 7. Parameter Table

○ It will be shown the parameters in Chapter 6 only. The additional parameters are listed in the Reference Manual. The parameters of Level 4 are listed before the values of Level 3, because first the basic settings and combinations of the blocks has to be set and then the continuous parameter values.

Parameter number	Function	Standard	Value range		Unit	Remarks
			min.	max.		

### Parameter of displayed value

Position x									
0	0	x	01	Source (01-98)	5x	01	98		
0	0	x	02	Scaling 100 % =	100	10	100000		
0	0	x	03	Decimal place	0	0	6		right 1
0	0	x	04	Filter adjustment	50	1	9999	ms	1=off
0	0	x	05	Unit (no,%, N, kN, lbs, kg)	0	0	6		

### Level 1

#### General display adjustment (function unit 0)

1	0	0	01	Display partitioning (2, 4, 6 or 8 display)	8	2	8		2, 4, 6 or 8
---	---	---	----	--	---	---	---	--	--------------

### Level 3 and 4

#### Anybus Analog inputs (Block 1) / 11...18

Anybus Analog input x:									
4	1	x	00	OFF; ON	0	0	1		
3	1	x	11	Filter adjustment	1	1	9999	ms	1=off
3	1	x	21	Scaling at zero signal (0 % resp.. 0 V)	0.0	-200.0	200.0	%	
3	1	x	22	Scaling at nominal signal (100 % resp. 20 mV or 10 V)	100	-200.0	200.0	%	

#### Analog inputs (Block 4) / 41...48

Voltage input Alx:									
4	4	x	00	OFF; ON	1	0	1		
3	4	x	11	Filter adjustment	20	1	9999	ms	1=off
3	4	x	21	Scaling at zero signal (0 % resp. 0 V)	0.0	-200.0	200.0	%	
3	4	x	22	Scaling at nominal signal (100 % resp. 20 mV or 10 V)	100.0	-200.0	200.0	%	

## 40 Parameter Table



## Amplifier (Block 5) / 51...58

				Amplifier x					
4	5	x	00	OFF; ON (average); ON (sum)	1	0	2		
4	5	x	01	1. Source (41-48)	4x	41	48		DMS-inputs only
4	5	x	02	2. Source (OFF; 41-48)	0	0;41	48		DMS-inputs only
4	5	x	03	3. Source (OFF; 41-48)	0	0;41	48		DMS-inputs only
4	5	x	04	4. Source (OFF; 41-48)	0	0;41	48		DMS-inputs only
3	5	x	11	Value of zero adjustment	0.0	-100.0	100.0	%	
3	5	x	12	Manual zero adjustment (auto. entry)	auto	-200.0	200.0	%	100.0 % = 20 mV rounded
3	5	x	21	Setting for defined load	100.0	10.0	110.0	%	
3	5	x	22	Manual amplifier adjustment	666.7	100.0	30000.0		

## Math functions (Block 6) / 61...68

				Mathematical channel x					
4	6	x	01	Function selection: OFF; 1: sum function (parameter value 2 to 8 see Reference Manual)	0	0	8		
4	6	x	11	Source 1 (01 - 58)	51	01	58		
4	6	x	21	Source 2 (01 - 58)	52	01	58		
4	6	x	31	Source 3 (OFF, 01 - 58)	0	0	58		only sum
3	6	x	11	Source 1 scaling at zero signal (0 %)	0.0	-200.0	200.0	%	
3	6	x	12	Source 1 scaling at nominal signal (100 %)	50.0	-200.0	200.0	%	
3	6	x	21	Source 2 scaling at zero signal (0 %)	0.0	-200.0	200.0	%	
3	6	x	22	Source 2 scaling at nominal signal (100 %)	50.0	-200.0	200.0	%	
3	6	x	31	Source 3 scaling at zero signal (0 %)	0.0	-200.0	200.0	%	only sum
3	6	x	32	Source 3 scaling at nominal signal (100 %)	33,4	-200.0	200.0	%	only sum

## Analog outputs (Block 9) / 91...98

				Analog output x					
4	9	x	01	Source (OFF; 01-88)	5x	0	88		
3	9	x	11	Filter adjustment	1	1	9999	ms	1=off
3	9	x	12	Factor	1.000	0.000	2.000		
3	9	x	13	Upper voltage limitation	10.00	0.00	12.00	V	
3	9	x	14	Lower voltage limitation	-10.00	-12.00	0.00	V	

**Anybus analog outputs (Block A)**

Anybus analog output x									
4	A	x	01	Source (OFF; 01-98)	5x	0	98		
3	A	x	11	Filter adjustment	100	1	9999	ms	1=off
3	A	x	12	Scaling 100 % =	20480	2048	32768		

**Level 7****Anybus (function unit 1)**

7	1	0	01	Anybus slave adress	111	1	126		
7	1	0	02	Baud rate (3: auto baud)	3	0	3		
7	1	0	11	Configuration (00, 01, 10, 11 // digital outputs, digital inputs // binary encoded)	0	0	3		

**42 Signal Sources**

## Tabular Overview of Signal Sources

Block	Limit value block input   +/-				Selection number		Limit value block output   +/-	
	Nr.			[%]	[Block]	[Channel]	[%]	limited by
Cache [1..8]	0			200	01...08			
Anybus inputs [1..8]	1	Decimal (signed) design	+32767 -32768		11...18		200	
Analog inputs [1..8]	4	Strain gauge input voltage input	40 mV 13,5 V	200 135	41...48		200	
Amplifier [1..8]	5			200	51...58		200	
Mathe function [1..8]	6			200	61...68		200	
Controller [1..8]	7			200	71...78		200	control range
Adder [1..8]	8			200	81...88		200	
Analog outputs [1..8]	9			200	91...98		120	voltage limitation

DCX

**HAEHNE**