control – motion – interface

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AX 346

Process Indicator with Two Analogue Inputs, Calculations and Programmable Analogue Output

Available models of this series:

AX 345	Process Indicator, Display only
AX 346:	Process Indicator with Analogue Outputs 0 - 10 V und 0/4 – 20 mA
AX 347:	Process Indicator with 2 Presets and Optocoupler Outputs
AX 348:	Process Indicator with Serial Interface RS232 / RS485

- Two analogue inputs with independent scaling, each +/- 10V or 0/4 – 20 mA
- Operating modes for display of input A, input B as well as combinations [A + B], [A - B], [A x B] and [A : B]
- Fully programmable scaling and zero definitions
- Useful supplementary functions like Tare function, programmable averaging functions, programmable linearization etc.
- Power supply 115/230 VAC and 17-30 VDC in the same unit
- Aux. output 24 VDC / 100 mA for sensor supply

Operating Instructions

for Model AX 346

Safety Instructions

- This manual is an essential part of the unit and contains important hints about function, correct handling and commissioning. Non-observance can result in damage to the unit or the machine or even in injury to persons using the equipment!
- The unit must only be installed, connected and activated by a qualified electrician
- It is a must to observe all general and also all country-specific and application-specific safety standards
- When this unit is used with applications where failure or maloperation could cause damage to a machine or hazard to the operating staff, it is indispensable to meet effective precautions in order to avoid such consequences
- Regarding installation, wiring, environmental conditions, screening of cables and earthing, you must follow the general standards of industrial automation industry
- - Errors and omissions excepted –

Version:	Description:
AX34607a_hk/kk/04/2007	First edition
AX34607b_hk/kk/10/2007	Add new key CMD commands
AX34509a/hk/kk/10/2010	Tare Function for combined modes, assignment of analogue output, overflow control

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1. Introduction

Some of the general demands to an up-to-date process controller for automation industry are always high flexibility, combined with easy and simple operability.

Many applications require two separate analogue inputs for use with single or combined operation.

Also it may be important to display and evaluate both, linear and non-linear analogue inputs at an acceptable accuracy, which requires programmable linearization functions.

Process controllers of series AX345 to AX348 have been designed for this kind of requirements.

AX 345 provides **display** function only.

AX 346 provides additional **analogue outputs** proportional to the measuring result

AX347 provides two additional **Preselections** with optocoupler outputs

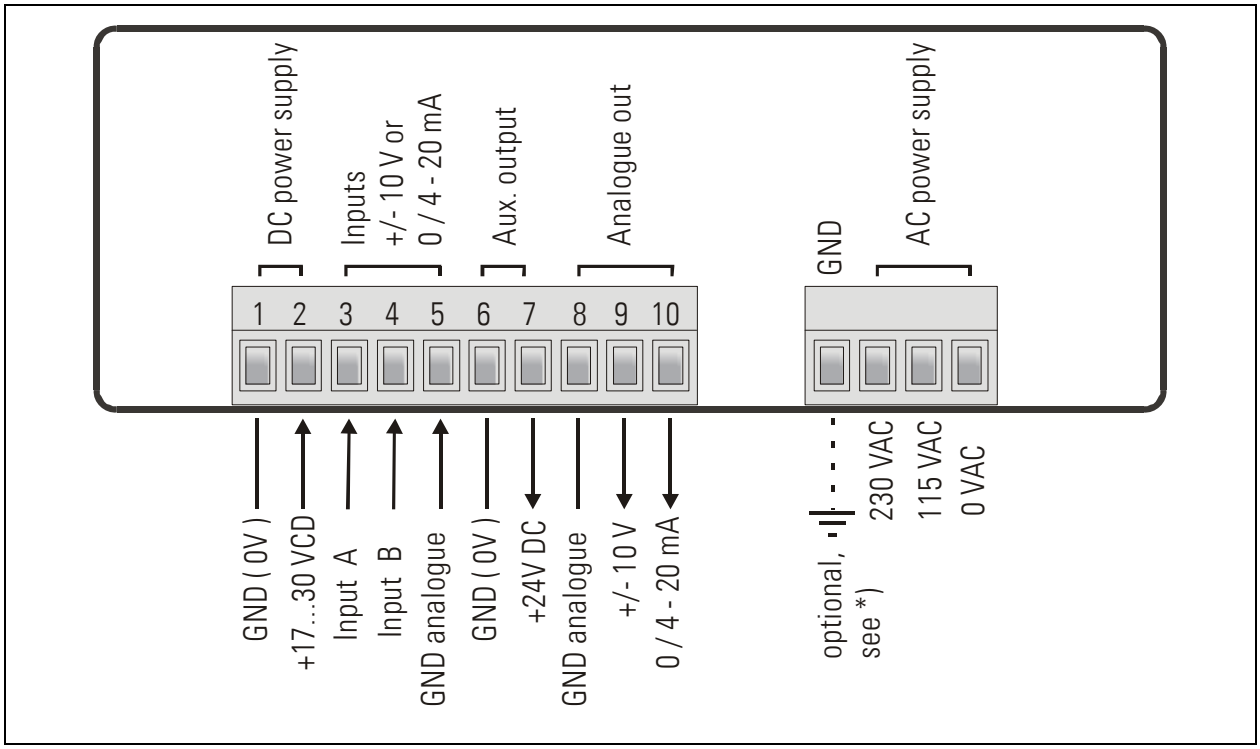
AX348 provides additional communication via **RS232 / RS485** serial link

All other functions within this controller family are fully similar.

The present operating instructions are valid for model AX 346 only.

Separate manuals are available for all other models

2. Terminal Assignments



*) The connection of PE is optional and not necessary for safety or for EMC.
However, with some applications, it can be useful to ground the common potential of all signal lines

- When using this earthing option, please be aware that all terminals marked GND or AGND will be earthed.
- Multiple earthing on different positions of an installation may cause problems, especially with poor overall performance of the whole earthing and screening system!
- The minus potential of analogue inputs is internally connected to the minus of the DC supply. When you like to use current loops through several units, it is therefore necessary to supply the units from either AC power or from several, potential-separated DC sources.

2.1. Power Supply

The unit accepts DC supply from 17 V to 30 V with use of terminals 1 and 2. The DC current consumption depends on the level of the supply voltage (typical 80 mA at 30V or 130mA at 17V, plus current taken from the aux. output).

For AC supply, terminals 0 VAC and 115 VAC or 230 VAC can be used.
The total AC power is approximately 7.5 VA.

2.2. Aux. Voltage Output

Terminal 7 provides an auxiliary output of 24 VDC / 100 mA max. for supply of sensors and encoders. This is valid for AC supply and DC supply of the unit as well.

2.3. Analogue Measuring Inputs

There are two analogue inputs with common minus potential available (Input A and Input B). Both refer to the AGND potential of terminal 5 which is internally connected to terminal 1, terminal 6 and GND.

The analogue inputs can be configured for voltage input (+/- 10 V) or current input (0/4 – 20 mA), by means of internal jumpers

Ex factory, both inputs are always configured for current input.
(see section 3 for jumper settings)

2.4. Adjustable Analogue Output

The outputs provides a voltage output (0 … +10V or -10 … +10V) and a current output 0/4 – 20 mA proportional to the measuring result. It is possible to attach the analogue output to either input A or input B or to the calculated result [A,B]

Both analogue outputs refer to GND potential. The polarity of the output signal depends on the sign shown in the display.

The output resolution is 14 bits and the minimum response time to changes on the input site is about 58 msec.*)

The voltage output accepts output currents of 2 mA
The current output accepts load resistors from 0 to 270 ohms.

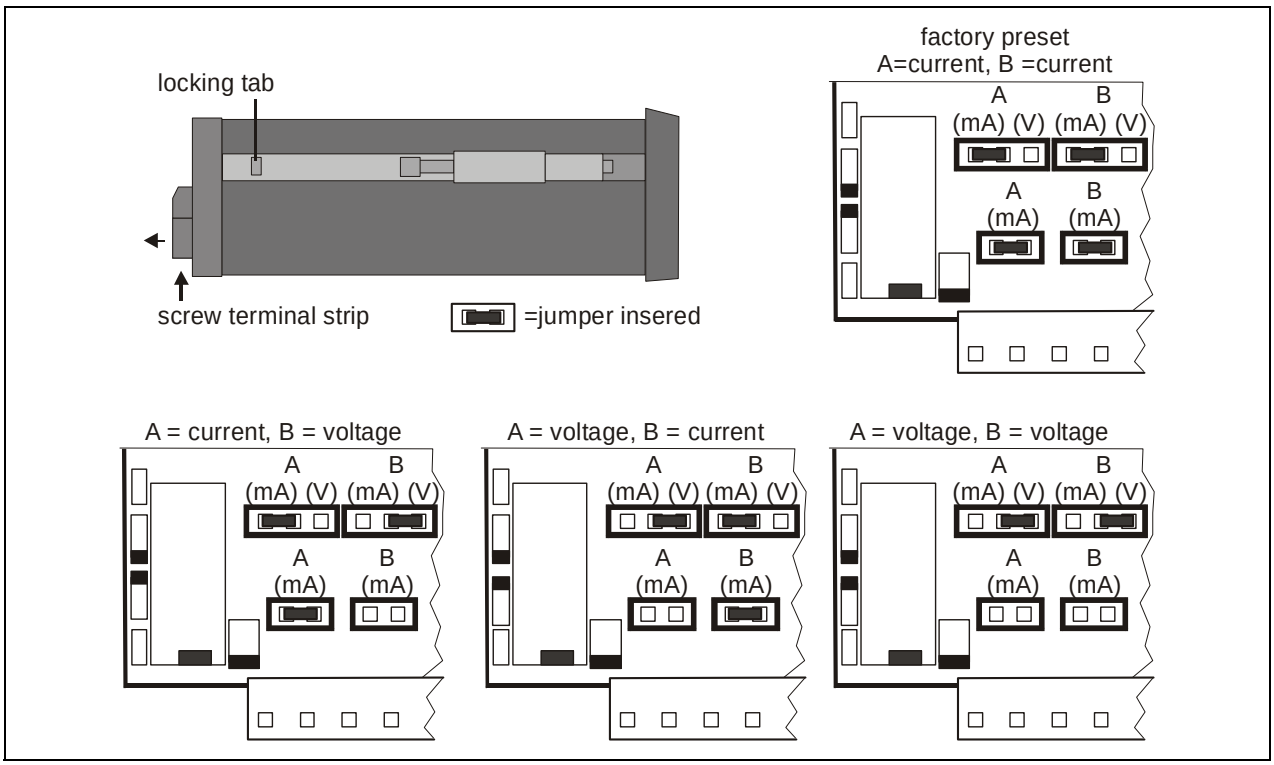
*) For more details please refer to chapter 8.4

3. Jumper settings

When your input signal is a current of 0-20 mA or 4-20 mA, there is no need to change jumper settings and you can skip this section.

Where however you intend to use one or both inputs for voltage signals, you must change the internal jumper settings correspondingly.

To access the jumpers, you have to disconnect the rear screw terminal strips, remove the back plane from the unit and pull the PCB out of the housing



Wrong jumper settings may cause serious damage to the unit!

After setting the jumpers, please shift the print carefully back to the housing, in order not to damage the front pins for connection to the keypad plate.

Current inputs are automatically scaled to an input range of 0/4 – 20 mA.

Voltage inputs use the standard range of +/- 10V.

You are free to measure voltages up to 120 volts DC by use of a remote resistance in series to the input line (please observe applicable safety standards!). You can calculate the value from the formula

$$Rx\,[\,k\Omega\,] = 3 \times Vx\,[\,V\,] - 30$$

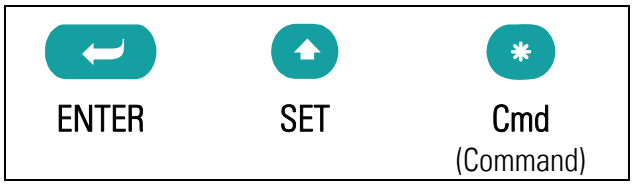
R = resistance value
V = input voltage

Example: Desired input = 100 volts:
R = [3 x 100] – 30 (kΩ) = 270 kΩ

With regard to the scaling procedure described later, the new maximum input with resistance will work like a 10 volts signal with no resistance

4. How to Operate the Keys

The unit uses 3 front keys for all setup operations. Subsequently, the key functions will be named as shown in the table below.



The functions of the keys are depending on the actual operating state of the unit.

The following three operating states apply:

- Normal display state
- Setup state
  a.) Basic setup
  b.) Operational parameter setup
- Teach operation

4.1. Normal display state

You can change over to the other states while the unit is in the normal display state only.

Change over to	Key operation
Basic setup	Keep ENTER and SET down simultaneously for 3 seconds
Operational parameter setup	Keep ENTER down for 3 seconds.
Teach operation	Keep SET down for 3 seconds

The Cmd key is only used for execution of the Tare function, the Reset function and for Teaching the interpolation points for linearization (see section 8).

4.2. Parameter settings

4.2.1. How to select a parameter

The ENTER key will scroll through the menu. The SET key allows to select the corresponding item and to change the setting or the numeric value. After this, the selection can be stored by ENTER again, which automatically changes over to the next menu item.

4.2.2. How to change parameter settings

With numerical entries, at first the lowest digit will blink. When keeping the SET key down, the highlighted digit will scroll in a continuous loop from 0 … 9 … 0 … 9. When you release the SET key, the actual digit will remain and the next digit will be highlighted (blink).
This procedure allows setting all digits to the desired values. After the most significant digit has been set, the low order digit will blink again and you can do corrections if necessary.
With signed parameters, the high order digit will only scroll between the values "0" (positive) and "-" (negative)

4.2.3. How to store settings

To store the actual setting, press the ENTER key, which will also automatically scroll forward the menu.

The unit changes from programming mode to normal operation when you keep down the ENTER key again for at least 3 seconds.

4.2.4. Time-out function

The "time-out" function will automatically conclude every menu level, when for a break period of 10 seconds no key has been touched. In this case, any entry which has not been confirmed by ENTER yet would remain unconsidered.

4.3. Teach Operation

The Time-out function will be switched off during all Teach operations

Key	Function
	ENTER will conclude or abort any Teach operation in progress
	SET function is fully similar to normal set-up operation
	Cmd will store the display value to the register and will change over to the next interpolation point.

For details of the Teach procedure see section 8.3.

4.4. Set all parameters to "Default"

At any time you can return all settings to the factory default values.
The factory default settings are shown in the parameter listings in section 6.

When you decide to set all parameters to „default", please be aware that all previous settings will be lost and you will need to do the whole set-up procedure once more

To execute the „Default" setting function:

- Power the unit down.
- Press the ENTER key.
- Power the unit up again while the ENTER key is kept down

4.5. Code Locking of the Keypad

When the code locking of the keypad has been switched on, any key access first results in display of

To access the menu you must press the key sequence

within 10 seconds, otherwise the unit will automatically return to the normal display mode.

5. The Parameter Menu

The menu provides one section with “basic parameters” and another section with “operational parameters”. On the display you will only find those parameters which have been enabled by the basic settings. E.g. when the Linearization Functions have been disabled in the basic set-up, the associated linearization parameters will also not appear in the parameter menu.

All parameters, as good as possible, are designated by text fragments. Even though the possibilities of forming texts are very limited with a 7-segment display, this method has proved to be most suitable for simplification of the programming procedure.

The subsequent table is to show the general structure of the whole menu only.
Detailed descriptions of all parameters will follow in section 6.

Menu overview:

Basic Parameters
"modE "
"briGht"
"UPdAt”
"CodE "
"LinEAr"
"A-Src "
"A-CHAr"
"GAin "
"OFFSEt"
“Crnd”

Operational Parameters		
Single Mode	Dual Mode	Combined Modes
„inPutA"	„inPutA"	„inPutA"
„StArtA"	„StArtA"	„StArtA"
„End A"	„End A"	„End A"
„dPoi A"	„dPoi A"	„dPoi A"
„FiLt A"	„FiLt A"	„FiLt A"
"OFFS A" *)	"OFFS A" *)	
	„inPutb"	„inPutb"
	„StArtb"	„StArtb"
	„End b"	„End b"
	„dPoi b"	„dPoi b"
	„FiLt b"	„FiLt b"
	"OFFS b" *)	
		„n) FAc"
		„d FAc"
		„P FAc"
		„dPoint"
"An-bEG"		
"An-End"		
"P01_H " **) "P01_Y " **) ---> "P16_H " **) "P16_Y " **)		

*) Appears only when the Tare function has been enabled
**) Appears only when the Linearization function has been enabled

6. Setup Procedure

6.1. Basic Parameters

In general, the parameters described subsequently must be set with the very first commissioning of the unit only.

Menu Text			Default
mode	Mode of operation		SinGLE
	SinGLE	Single input operation (input A only)	
	dUAL	Dual input operation (input A and input B separately)	
	A u b	Sum operation (input A + input B)	
	A - b	Differential operation (input A – input B)	
	A d b	Dividing operation (ratio A : B)	
	A m b	Multiplying operation (product A x B)	
brIGht	Brightness of the display		„100“
	„ 100“	100% of maximum brightness	
	„ 80“	80% of maximum brightness	
	„ 60“	60% of maximum brightness	
	„ 40“	60% of maximum brightness	
	„ 20“	20% of maximum brightness	
UPdAt	Update time of the display		„0.300“
	Updates the display every x.xxx seconds. Setting range from 0.050 to 9.999 seconds.		
CodE	Keypad interlock code		no
	no	Keypad enabled continuously	
	YES	Keypad locked for any access, see 6.3	
LinEAr	Mode of linearization		no
	no	No linearization. The corresponding parameters will not appear in the menu.	
	1-9UA	Linearization for the numeric range 0 – 99999. Interpolation points to be set in the positive range only (negative values will appear as a mirror).	
	4-9UA	Linearization over the full range –99999 to +99999	

Menu Text			Default
A-Src	**Source for the Analogue Output** The analogue output refers to input channel A The analogue output refers to input channel B *) The analogue output refers to the result of the combination [A,B] **)	In A In b In A_b	In A
A-CHAr	**Analogue output characteristics** - 10_ 10 Full range from -10V to +10V 0 _ 10 Positive range only 0 – 10V 0_20 Current range 0 – 20 mA 4_20 Current range 4 – 20 mA		- 10_ 10
GA in	**Analogue output swing** Setting 1000: results in a full-scale output of 10 V respectively 20 mA Setting 200: reduces the full scale output to 2 V respectively 4mA	0 … 1000	1000
OFFSEt	**Analogue zero definition** Setting 0: Output generates 0 V respectively 0 mA with zero in display. Setting 5.000: Output generates already 5 V respectively 10 mA with zero in display.	-9999 … 9999	0
Cmd	**Command key enable** oFF The Command key is switched off and no Offset values will appear in the menu oFFSEt The Cmd key will execute the Tare/Offset function tEACH The Cmd key will execute the Teach function both The Cmd key will execute both, the Tare and the Teach function		oFF

*) Requires Analogue input B to be activated (i.e. operating mode must be set to "Dual" or "Combined")

**) Requires operating mode setting "Combined"

6.2. Operational parameters

After the basic setup, you can access the operational parameters by pressing ENTER for at least 3 seconds. You will only find those parameter texts that are relevant for your mode of operation.

The parameters for scaling of the analogue output will appear at the end of each menu. Since they are absolutely the same with all operating modes, these parameters will be described separately in section 6.3.4.

To exit the menu, keep again ENTER down for at least 3 seconds, or just wait for the automatic Time-Out function.

6.3. Modes of operation

6.3.1. Single mode (input A only)

Menu Text		Setting Range	Default
inPut A	**Input A range** Set the desired range for input A in U Voltage +/-10V in 0 Current 0-20 mA in 4 Current 4-20 mA		in 0
StArtA	**Start value** Value which the unit will display with a zero input signal of 0 volts or 0/4 mA	-99999 … 99999	0
End A	**End value** Value which the unit will display with a full scale input of 10 volts or 20 mA	-99999 … 99999	1000
dPoi A	**Decimal point for signal A** Select the desired position of the decimal point 000000 No decimal point 00000.0 one decimal position ----> 0.00000 five decimal positions		00000.0
FiLt A	**Average filter input A** Adjustable floating average filter for smoothing the display with unsteady input signals oFF No filtering 2, 4, 8, 16 Number of floating averaging cycles		oFF
OFFSA	**Offset value for input A *)** Offset value for the zero displacement of input A signals	-99999 … 99999	0
*) When Tare function is switched on only			

6.3.2. Dual Mode (Inputs A and B separately)

With this mode, the SET key selects between display of channel A and display of channel B.

A bar on the high order LED indicates which of the two channels is actually in display.

Menu Text		Input Range	Default
inPut b	**Input B range** Set the desired range for input B in U Voltage +/-10V in 0 Current 0-20 mA in 4 Current 4-20 mA		in 0
StArt b	**Start value B** Value which the unit will display with a zero input signal of 0 volts or 0/4 mA	-99999 … 99999	0
End b	**End value B** Value which the unit will display with a full scale input of 10 volts or 20 mA	-99999 … 99999	1000
dPoi b	**Decimal point for signal B** Select the desired position of the decimal point 000000 No decimal point 00000.0 one decimal position ----> 0.00000 five decimal positions		000000
FiLt b	**Average filter input B** Adjustable floating average filter for smoothing the display with unsteady input signals oFF No filtering 2, 4, 8, 16 Number of floating averaging cycles		oFF
OFFS b	**Offset value for input B *)** Offset value for the zero displacement of input A signals	-99999 … 99999	0
*) When Tare function is switched on only			

6.3.3. Combined Modes [A + B], [A - B], [A : B], [A x B]

These modes allow displaying either the single channels A and B or the calculated result according to the selected combination. The SET key allows scrolling between the three displays.

A →

The upper bar of the high order digit indicates that you display channel A.

B →

The lower bar of the high order digit indicates channel B.

[A,B]

When no bar is lit, the display shows the result of the calculation [A,B], according to setting.

When you use one of the combined modes, you will first have to do the same settings as with the "Dual" mode for individual display of inputs A and B.
The combined display will then be the result calculated from both single values.
The following additional parameters provide a final scaling facility, so you can read out the result of your combination in proper engineering units:

Menu Text		Setting Range	Default
nn FAc	**Proportional Scaling Factor** Multiplies the result by this setting	-10000 … 10000	1000
d FAc	**Reciprocal Factor** Divides the result by this setting	1 … 99999	1000
P FAc	**Additive Constant** Adds or subtracts this setting	-99999 … 99999	0
dPoint	**Decimal Point** Sets the decimal point for the combined display value 000000 No decimal point 00000.0 one decimal position ----> 0.00000 five decimal positions		000000

Calculation Formula:

$$\text{Final display value} = \text{value calculated from <AB>} \times \frac{\text{m\_Fac}}{\text{d\_Fac}} \pm \text{P\_Fac}$$

6.3.4. Parameters for scaling of the analogue output

The analogue output operates at any time under control of the display value and the scaling parameters explained below. This means that the analogue signal also will contain the same calculations, combinations and linearization as shown in display.

Output swing and zero definition have already been set with the basic parameters under 6.1. The operating range of the output can be set by means of the following parameters:

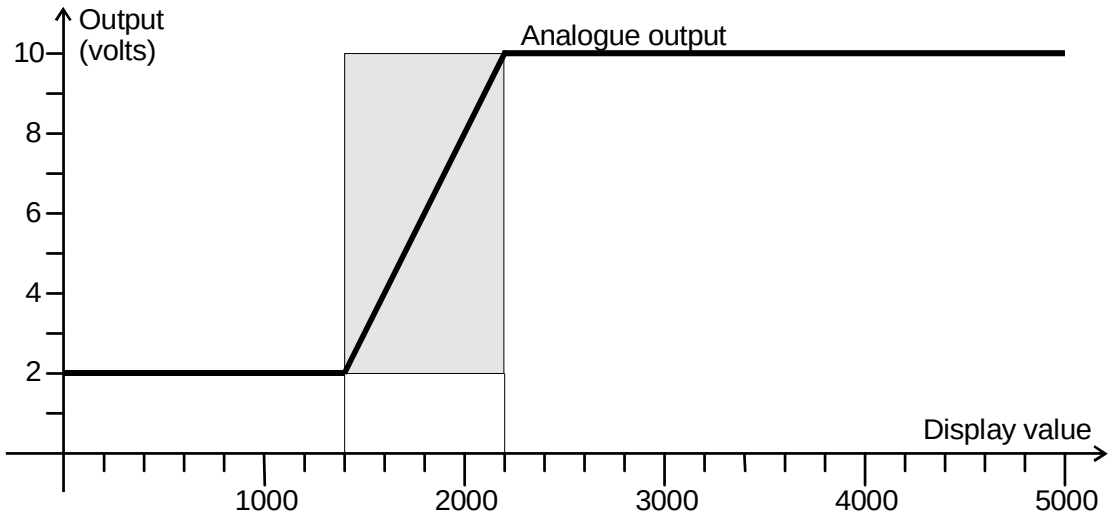
Menu Text		Setting Range	Default
AnAbEG	Analogue Begin: Start value of the operating range	-99999 … 99999	0
AnAEnd	Analogue End: End value of the operating range	-99999 … 99999	1000

It is easy to understand that these settings allow to either converting the full range or only a selected window of the full range to analogue.

The subsequent example of settings explains

a. how to convert an input signal of 0 to 10 volts to a display range of 0 to 10.000

b. how to convert the range from 1.400 to 2.200 into an analogue output of 2 - 10 volts



Basic Settings

Parameter	Text	Setting	Remarks
Mode	Mode of operation	Single	Only input A is used
A-Src	Source for analogue output	In A	Input A is converted to analogue
A-CHAr	Output characteristics	0_10	Format 0 ... +10 V
GAin	Total span of the output	800	Span = 8,00 Volt (from 2 to 10 V)
OFFSEt	Zero position of the output	2000	Output starts at 2,00 volts

Operational Settings

Parameter	Text	Setting	Remarks
inPut A	Input range A	in U	Voltage input
StArt A	Start value for input A	0	Display to start at 0
End A	End value for input A	10000	Display to end at 10000
dPoi A	Decimal point of display	3	Display format x.xxx
AnAbEG	Start value for analogue output	1400	Conversion starts with display 1400
AnAEnd	End value for analogue output	2200	Conversion ends with display 2200

7. Commissioning

Commissioning of this unit is easy and uncomplicated when following the subsequent steps:

	Step	Action	See section
1	Analogue inputs	• Set jumpers	3.
2	Basic settings	• Select Operation mode • Keep linearization and Tare function off firstly	6.1 6.1
3	Parameter settings	• Configuration of the analogue inputs, scaling of the display • If applicable, select combination and final scaling	6.3.1 and 6.3.2 6.3.3
4	Supplementary functions	• Set Tare function and Linearization, if applicable	6.1 and 8.
5	Analogue Output	• Scaling of the analogue output signal	6.1 and 6.3.4

A Set-Up Form is available in the appendix of this manual, which may be used for a most convenient and clearly arranged setup procedure.

It is advisable to do settings for Tare and linearization functions quite at the end, after all other functions have already proved to work fine.

8. Special Functions

8.1. Tare / Offset function

This function will become active after the "Cmd" parameter has been set to "Offset" or to "both"(see 6.1). With the Tare function activated, the Cmd key will trigger the following functions:

Single Mode, Dual-Mode:	Activating the Cmd key will overwrite the current setting of parameter "Offset" by the actual display value of the unit. As a result the display value will become zero at the actual state of the input signal
Combined Modes:	Activating the Cmd key will overwrite the current setting of parameter "P-Fac" by the actual display value of the unit. As a result the display value will become zero at the actual states of the two input signals

8.2. Linearization

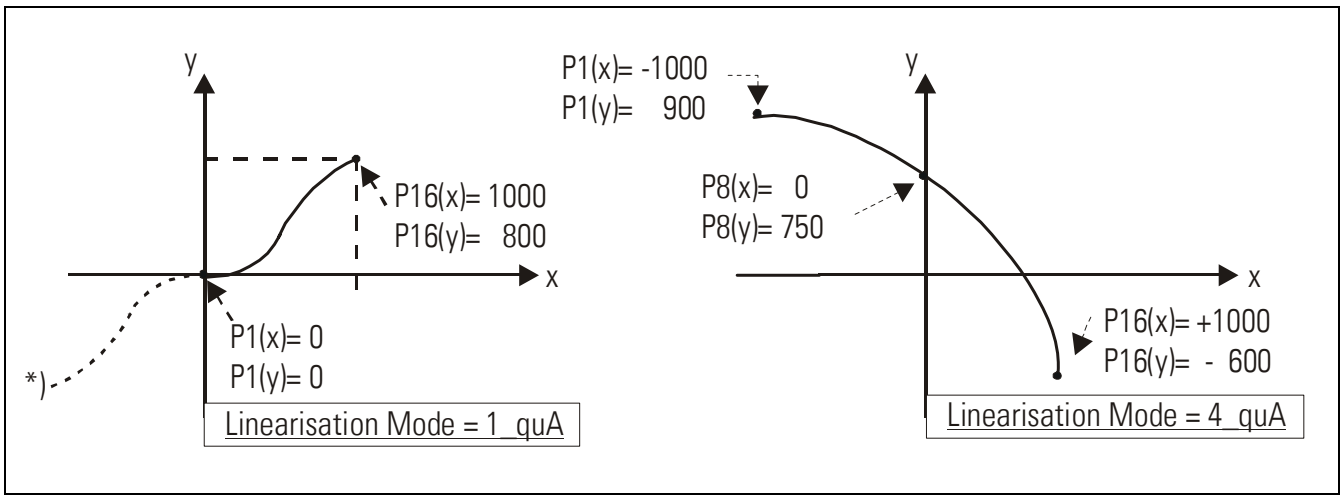
This function allows converting non-linear input signals into a linear presentation or vice-versa. There are 16 interpolation points available, which can be freely arranged over the whole measuring range in any distance. Between two points the unit automatically will interpolate straight lines.

For this reason it is advisable to set many points into areas with strong bending, and to use only a few points in areas with little bending. „Linearization Mode" has to be set to either **„1-quA"** or **„4-quA"** to enable the linearization function (see subsequent drawing). This will change the linear measuring results into a non-linear display.

Parameters **P01_x to P16_x** select 16 x- coordinates, representing the display values which the unit would normally show in the display. With parameters **P01_y to P16_y** you can specify now, which values you would like to display instead of the corresponding _x values.

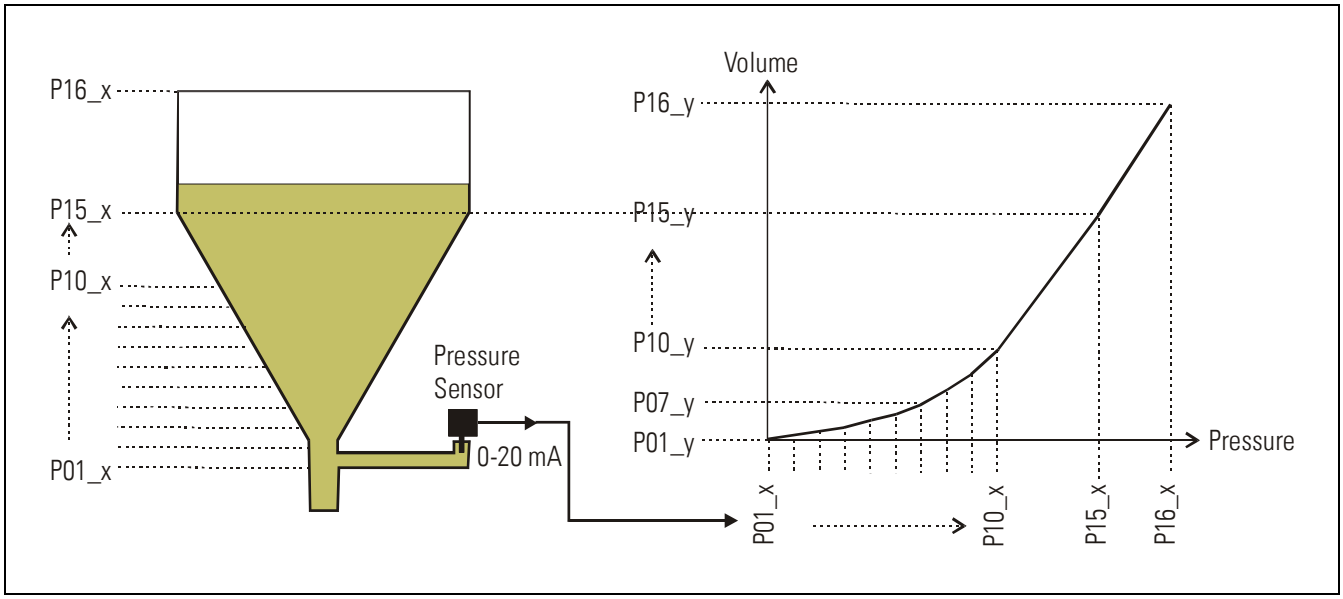
This means e.g. that the unit will replace the previous P02_x value by the new P02_y value.

- With respect to the consistency of the linearization, the x- registers have to use continuously increasing values, e.g. the x- registers must conform to the constraint P01_X < P02_X < … < P15_X < P16_X.
- Independent of the selected linearization mode, the possible setting range of all registers P01_x, P01_y,…, P16_x, P16_y is always -99999 … 99999.
- For measuring values lower than P01_x, the linearization result will always be P01_y.
- For measuring values higher than P16_x, the linearization result will always be P16_y.
- With operation modes "Single" and Dual", all linearization refers to input channel A only.
- With all combined operation modes, linearization refers to the calculated final result of the selected combination.



Application Example:

We like to display the filling quantity (volume) of a tank as shown below, with use of a pressure sensor mounted to the bottom of the tank. With this application the analogue pressure signal is proportional to the filling level, but not to the filling quantity.



To solve the problem, we divide the non-linear part of the tank into 14 parts. We enter the expected display values of the pressure sensor to registers P01_x to P15 _x.
For the linear part of the tank it is sufficient to store the final pressure value to register P16_x.
Now we can easily calculate the appropriate filling quantities and enter these values to the registers P01_y to P16_y.

8.3. Manual input or „Teaching“ of the interpolation points

Interpolation points to form the linearization curve can be entered one after another, using the same procedure as for all other numeric parameters. This means you will enter all parameters P01_x to P16_x and P01_y to P16_y manually by keypad.

During manual input of interpolation points the unit will not examine the settings P01_x to P16_x. Therefore the operator is responsible to observe the constraint

P01_X < P02_X < … < P15_X < P16_X.

In many cases it should however be more convenient to use the Teach function. Here you have to sequentially apply all the x-values to the analogue input, and just add the corresponding y-values by keypad.

Preparation for teaching:

- Please select the desired range of linearization (see section 6.1).
- Please set the basic parameter “Cmd” to “tEACH” or “both” (see section 6.1).
  After this, the teach function is ready to start.

How to use the Teach Function:

- Hold down the “Cmd” key for 3 seconds, until the display shows “tEACh”. Now you are in the Teach mode.

  To exit the teach mode again, you have the following two possibilities:

  1. Press the enter key for 2 seconds. On the display you will read “StOP” for a short time, and then the unit will switch back to the normal mode.
  2. Just do nothing. After 10 seconds the unit will switch back to the normal mode automatically.

  In both cases the parameters of linearization P01_X to P16_Y will not change.
- To start the teach procedure please press “Cmd” again within the next 10 seconds. The display will show “P01_X”.

With respect to the consistency of the linearization, all parameters from P01_X to P16_Y will be overwritten by suitable initial values.

Initial values for „P01_X“ and „P01_Y“ are -99999, all other values will start with 99999

- Press once more “Cmd” to display the actual analogue input signal. Now arrange for the desired analogue input signal of the first interpolation point (with combined modes please arrange for both analogue signals)

- When you read the x-value of your first interpolation point in the display, press “Cmd” again. This will automatically store the actual display value to the P01_x register, and for about 1 second you will read “P01_y “ on the display, followed again by the same reading stored previously.
- This display value now can be edited to the desired P01_y value, like a regular parameter
- When you read the desired P01_y value in your display, store it by pressing “Cmd” again. This will automatically cycle the display to the next interpolation point P02_x.

The unit will examine the constraint valid for the x-values of interpolation points. Every interpolation point must be higher than its preceding point.

Where this constraint is breached, all 6 decimal points will blink automatically as a warning. Pressing the CMD key will not store the illegal value, but result in an error text "E.r.r.-.L.O." as a warning.

- Once you have reached and stored the last interpolation points P16_x/y, the routine will restart with P01_x again, and you are free to double-check your settings once more.
- To conclude the Teach procedure, press the ENTER key. As a result you will read “StOP” for about 2 seconds, before the unit returns to the normal operation. All linearization points will at the same time be finally stored.

8.4. Update Times of the Display and the Analogue Output

Parameter “UPdAt” allows setting a variable update time for the display (see section 6.1). This parameter at the same time also affects the update cycle of the analogue output. The total response of the analogue output to changes of input signals result from the update time setting plus a constant propagation delay of 8 milliseconds

The shortest possible update time of the analogue output with changes of the input signal is 50 msec + 8 msec = 58 msec.

8.5. Overflow and Underflow Control

The unit continuously monitors both input channels for possible overflow or underflow situations (input signal out of specified range)

Overflow: the analogue input signal is greater than +10.2 V or +20.4 mA

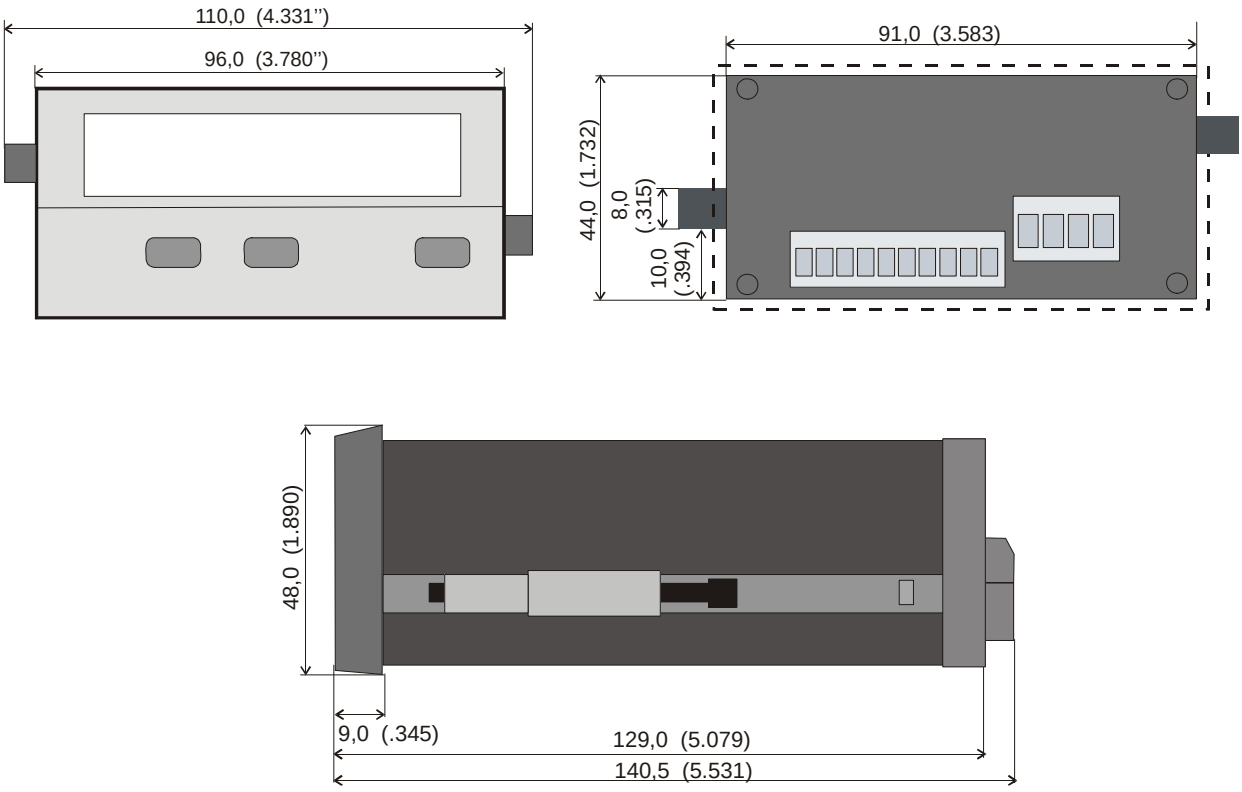
Underflow: the analogue input signal is lower than -10.2 V or -0.4 mA

Any out-of-range situation will cause a message according the table below:

Display	Input A	Input B
1Lo	Underflow	o.k
1Hi	Overflow	o.k
2Lo	o.k	Underflow
2Hi	o.k	Overflow
1Lo 2Lo	Underflow	Underflow
1Hi 2Lo	Overflow	Underflow
1Lo 2Hi	Underflow	Overflow
1Hi 2Hi	Overflow	Overflow

9. Technical Specifications

9.1. Dimensions



Panel cut out: 91 x 44 mm (3.583 x 1.732")

9.2. Technical Specifications

Power supply AC	:	115/230 V (+/- 12,5 %), 7,5 VA
Power supply DC	:	24 V (17 – 30 V), approx. 100 mA (without aux. sensor supply)
Total AC power	:	7,5 VA
DC current consumption (without sensors)	:	18 V : 110 mA, 24 V : 90 mA, 30 V : 80 mA
Aux. output for sensors	:	24 V DC, +/- 15%, 100 mA (with AC and DC power input)
Inputs	:	2 analogue inputs (+/-10 V, 0 ... 20 mA, 4 ... 20 mA)
Input impedance	:	Current: Ri = 100 Ohms, Voltage: Ri = 30 kOhms
Resolution	:	14 bits (13 bits + sign)
Accuracy	:	+/- 0.1%, +/- 1 digit
Analogue outputs		0/4 – 20 mA (max. 270 ohms) 0 … +/-10 V (max. 2 mA) Resolution 14 bits
Response times		Display min. 50 msec. Analogue outputs min. 58 msec.
Ambient temperature	:	Operation: 0° - 45° (32 – 113°F) Storage: -25° - +70° (-13 – 158°F)
Housing	:	Norly UL94 – V-0
Display	:	6 decades LED, high-efficiency orange, 15 mm (0.590'')
Protection class	:	IP65 (front), IP20 (rear)
Screw terminals	:	Signal lines max. 1.5 mm² (.0023 sq.in.) AC lines max. 2.5 mm² (.0039 sq.in.)
Conformity and standards	:	EMC 2004/108/EC: EN 61000-6-2 EN 61000-6-3 LV2005/95/EC: EN 61010-1

9.3. Commissioning Form

Date:	Software:
Operator:	Serial No.:

Basic Settings	Operation Mode:	Code:
	Brightness:	Linearization:
	Update Time:	
	A Src:	GAin:
	A-CHAr:	OFFSEt:
	CmD:	

Analogue Inputs	Input A	Input B
Input Range:		
Start Value::		
End Value::		
Decimal Point:		
Average Filter:		
Offset:		

Combined Modes (A+B, A-B, A:B, AxB)	
Proportional Factor:	
Reciprocal Factor:	
Additive Constant:	
Decimal Point:	

Analogue Output	
AnAbEG:	
AnAEnd:	

Linearization			
P01_X:	P01_Y:	P09_X:	P09_Y:
P02_X:	P02_Y:	P10_X:	P10_Y:
P03_X:	P03_Y:	P11_X:	P11_Y:
P04_X:	P04_Y:	P12_X:	P12_Y:
P05_X:	P05_Y:	P13_X:	P13_Y:
P06_X:	P06_Y:	P14_X:	P14_Y:
P07_X:	P07_Y:	P15_X:	P15_Y:
P08_X:	P08_Y:	P16_X:	P16_Y:

(*) Parameters appear only when the Linearization has been enabled.