



ifm electronic



Geräte-Handbuch
Device manual
Notice pour utilisateurs

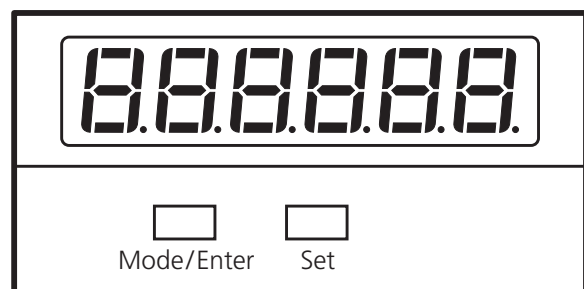
ecomat²⁰⁰

Multifunktionsanzeige
und Auswertesystem

Multifunction display
and evaluation system

Afficheur multifonctions
et système d'évaluation

AX360



Sachnr. 7390351/04 08/2010

ENGLISH

Safety instructions



These instructions are part of the unit. They contain information and illustrations about the correct handling of the unit and must be read before installation or use.

Follow the operating instructions. Non-observance of the instructions, operation which is not in accordance with use as prescribed below, incorrect installation or handling can affect the safety of people and equipment.

The unit must be installed, connected and put into operation by a qualified electrician.

Disconnect the unit externally before handling it. Also disconnect any independently supplied output load circuits.

The external 24 V DC supply must be generated and supplied according to the requirements for safe extra-low voltage (SELV) since this voltage is supplied without further measures near the operating elements and at the terminals for the supply of connected sensors.

The wiring of all signals concerning the SELV circuit of the unit must also meet the SELV criteria (safe extra-low voltage, safe galvanic separation from other circuits).

If 24 V DC is switched with the potential-free outputs, they only correspond to the ELV criteria.

In case of malfunction of the unit or uncertainties please contact the manufacturer.

Contents

1. Function and features	page 3
2. Technical data	page 4
3. Dimensions and mounting	page 4
4. Electrical connection	
Terminal connection	page 5
Optocoupler transistor outputs (only DX2012)	page 5
Input selection (jumper)	page 6
5. Function of the programming buttons	page 6
Numerical entries and signs	page 7
Storing of entries	page 7
Display of the switching status of the outputs	page 8
Default to the factory settings	page 8
Time-out function	page 8
Locking of the buttons	page 8
6. Basic settings	page 9
Operating mode, display brightness, locking of the buttons	page 9
Switching function and hysteresis of the outputs (only DX2012)	page 10
7. Operating parameters	
Single mode (one-channel operation, only A)	page 12
Dual mode (two-channel operation, A and B)	page 13
Combined modes	page 15
A u B summation mode (A + B)	
A – B differential operation (A – B)	
A d B dividing mode (A ÷ B)	
A m B multiplying mode (A x B)	
8. Setting example	page 16
9. Factory default settings	page 17
10. Maintenance, repair, and disposal	page 18

1. Function and features

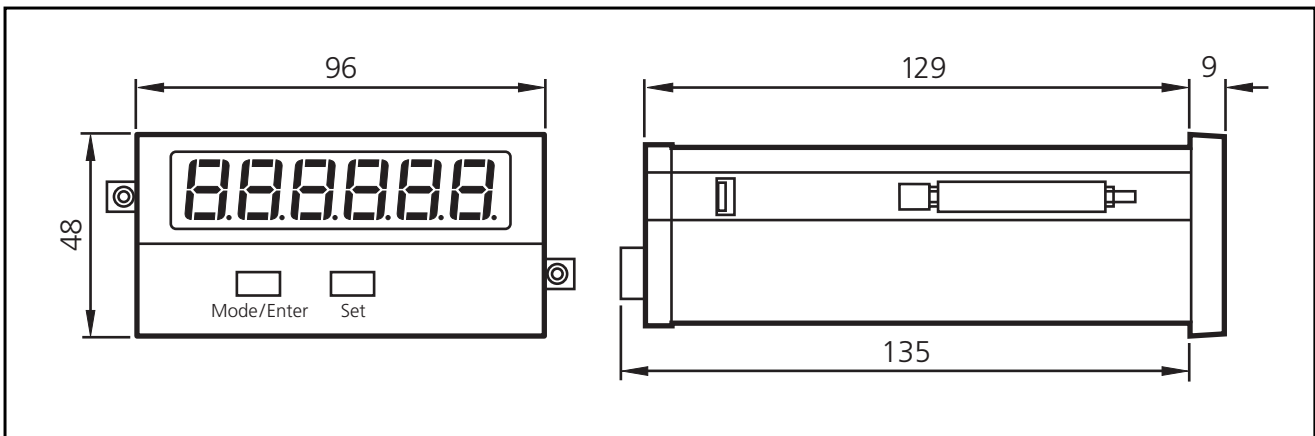
The multifunction display AX 360 is a universal device for the display and evaluation of physical quantities derived from analogue standard signals. The function of the unit is variable within a great value range due to the setting of different parameters and can thus be adapted to the individual application.

The analogue current and/or voltage signals of the two inputs can be scaled independently of each other and displayed individually or combined. This for example enables the configuration as a differential pressure display or percentage display (see the setting example on page 16).

2. Technical data

Order no.	DX2011	DX2012
Operating voltage AC	115/230 V AC ($\pm 12.5\%$)	
Operating voltage DC	24 V DC (17...30 V)	
Current consumption (without pulse pick-up)	110 mA (18 V); 90 mA (24 V); 80 mA (30 V)	
Power consumption	7.5 VA	
Auxiliary energy for sensors	24 V DC; $\pm 15\%$; 150 mA	
Analogue inputs Factory preset	2 (0/4...20 mA or 0...10 V) for both inputs 0/4...20 mA each input selectable via jumper	
Load (current/voltage input)	100 Ω / 30 k Ω	
Resolution	13 bits (+ sign)	
Accuracy	$\pm 0.1\%$ / ± 1 digit	
Switching output	–	2 optocouplers, pnp
Voltage range		5...35 V DC
Max. current load per output		max. 150 mA
Display	7-segment LEDs, high efficiency orange, 15 mm, 6-digit	
Operating temperature	0...+45°C	
Storage temperature	-25...+70°C	
Protection housing / terminals	IP 65 (front panel) / IP 20	
EMC	radiation: EN 50081-1 / immunity: EN 50082-2	
Housing material	Noryl UL94-V-0	
Weight	410 g	
Connection	10 screw terminals up to 1.5 mm ² (DC supply and signals) 4 screw terminals up to 2.5 mm ² (AC supply)	
CE conformity	in accordance with the directives EMC 89/336/CEE and LV	

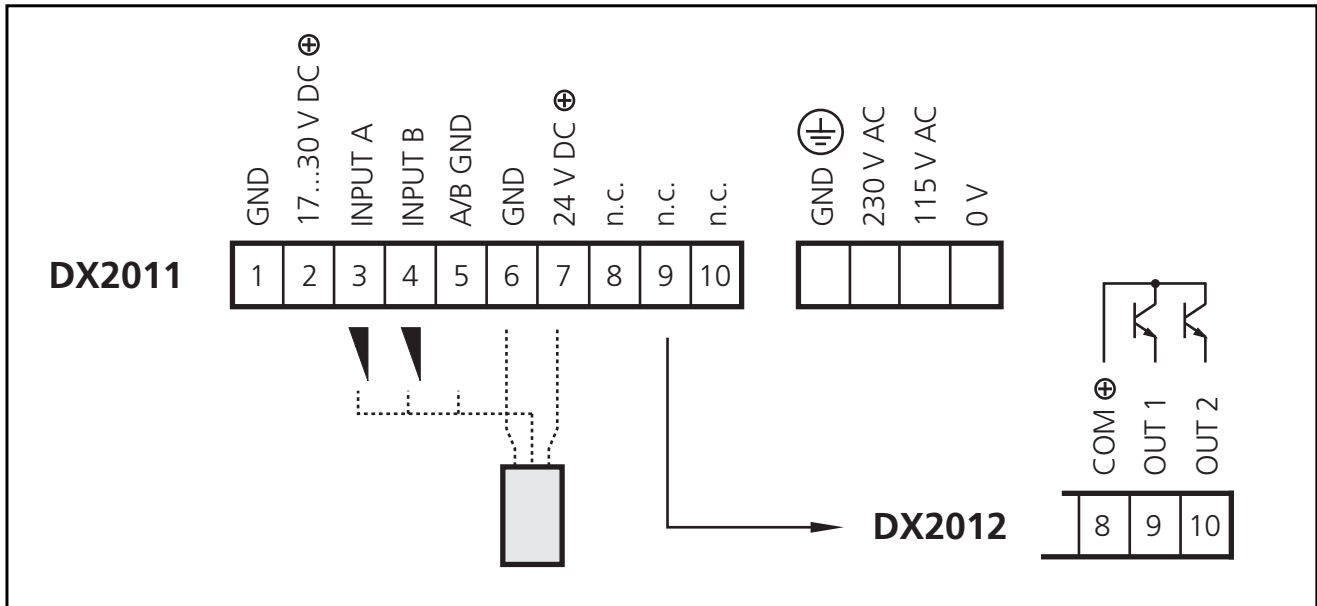
3. Dimensions and mounting



Mount the unit with 2 screws in the control panel cutout (91 x 44 mm).

4. Electrical connection

Terminal connection



Disconnect the installation before connecting the unit.

Note when earthing GND:

In this case all digital and analogue reference potentials are earthed.

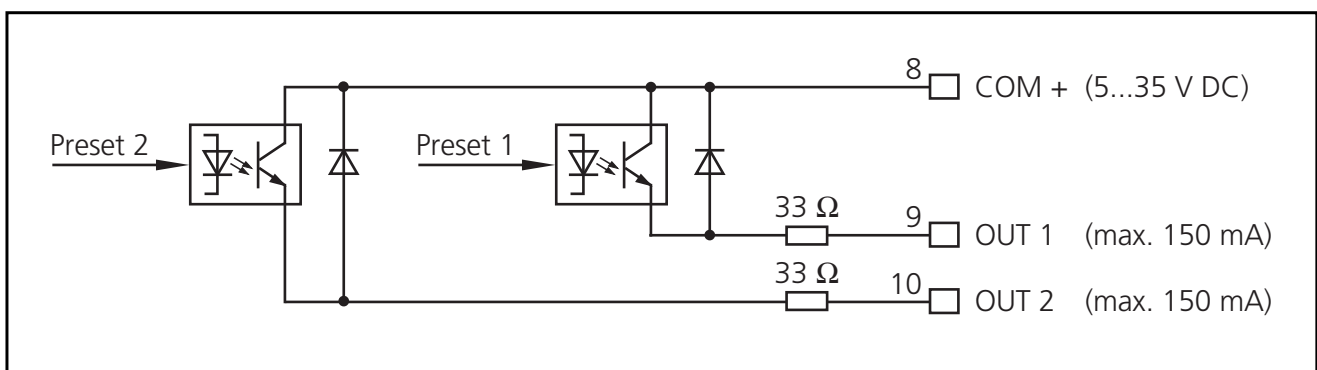
Double earthing in case of DC supply must be avoided (e.g. if the negative pole of the supply voltage has already been earthed externally).

The PE connection is internally connected to the ground of the unit. It is however not necessary for safety or EMC.

Passing through current signals:

GND of the analogue inputs A/B (terminal 5) is electrically connected to GND of the DC supply. Therefore passing current signals through several units is only possible with an AC supply or when separate DC supplies are used.

Optocoupler transistor outputs (only DX2012)

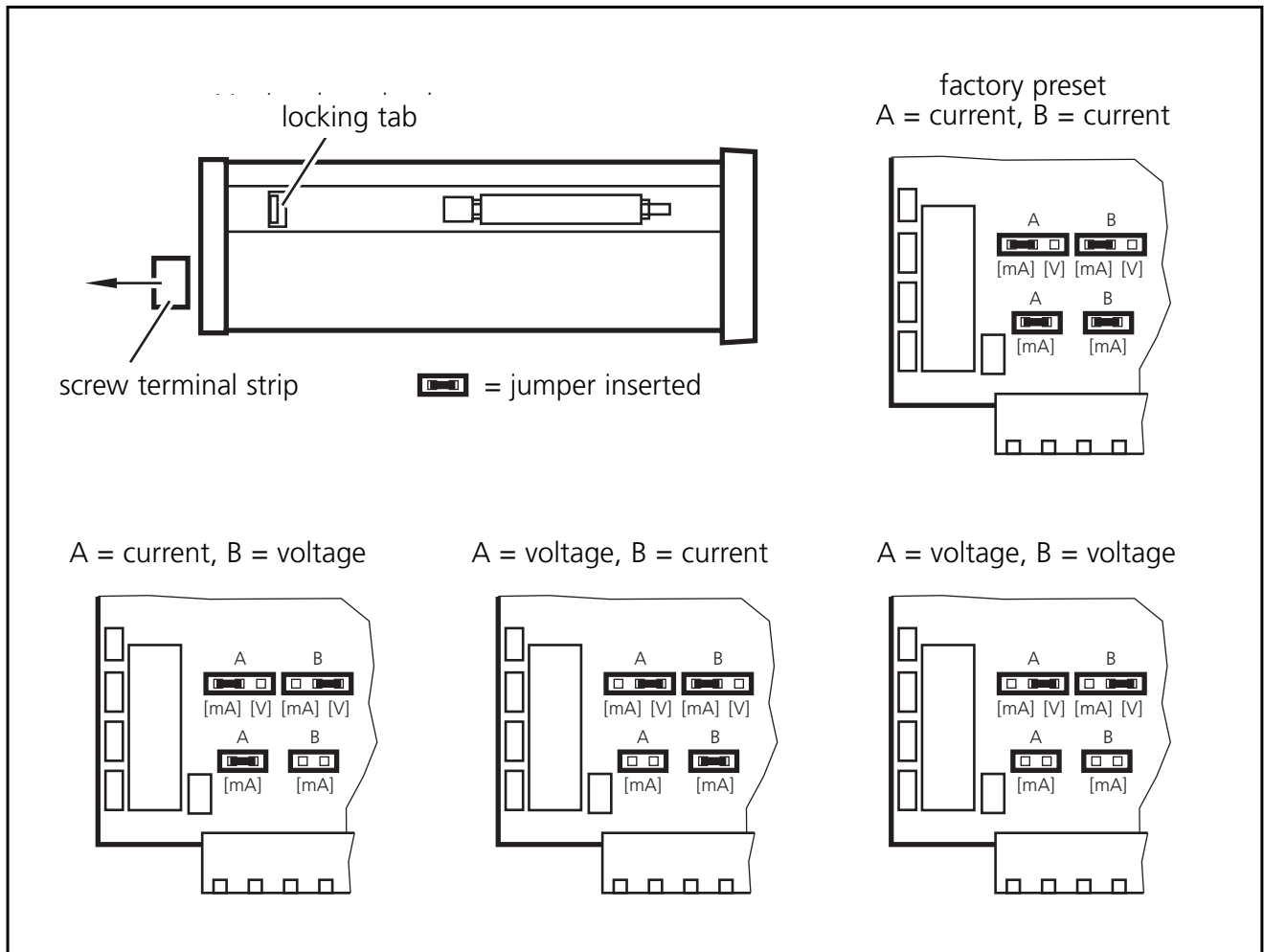


When inductive loads are switched, an additional external damping of the coil by means of a diode is recommended.

Input selection (jumper)

Both inputs are configured as current inputs at the factory (0/4 ... 20 mA). To be able to use one or both inputs as voltage input the internal jumpers must be repositioned.

- To do so, remove the screw terminal strips from the rear of the unit.
- Press one of the two locking tabs to the inside using a screwdriver and remove the rear of the unit.
- Remove the PCB from the housing.



After repositioning the jumpers carefully insert the PCB into the housing. Care must be taken not to apply too much force and damage the bolts that snap into the front panel.

5. Function of the programming buttons

The unit is operated and parameters are set via 2 front buttons.

- The Mode/Enter button scrolls the individual menu points and serves to store a selection or a numerical value.
- With the Set button a menu point is selected, the respective selection is made or a numerical value is entered.

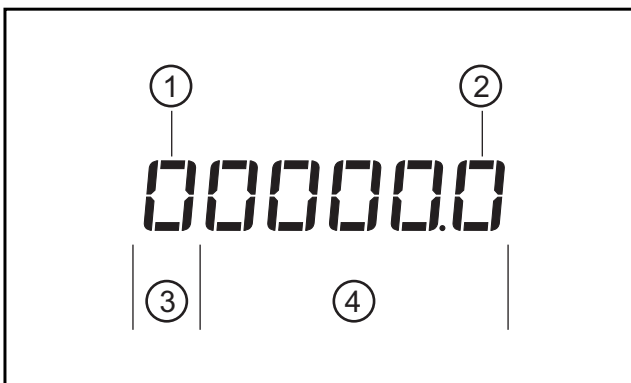
Numerical entries and signs

For numerical entries the lowest decade flashes first.

Press the Set button briefly to change to the next decade.

By continuously pressing the Set button the numerical value of the flashing decade changes (cyclical scrolling 0, 1, 2, ... 9, 0, 1, 2, etc.).

When the Set button is released the last displayed numerical value is maintained and the next higher decade flashes.



1. Highest decade
2. Lowest decade
3. Sign
Display "0" corresponds to positive (+).
4. Numerical values

When the highest decade has been set, the lowest decade flashes again.

The highest decade for the sign only changes between "0" (positive) and "-" (negative). "0" for positive values is not displayed during operation.

Storing of entries

To store a numerical value or a selection the Mode/Enter button is pressed, at the same time the unit switches to the next menu point.

If the unit is to switch from the programming routine back to the operating mode, the Mode/Enter button has to be pressed for min. 3 s.

Display of the switching status of the outputs (only DX2012)

Press the button during operation.

One of the following messages is displayed for approx. 2 s:

<input type="text" value="1.2OFF"/>	Switching output 1 and 2 blocked
<input type="text" value="1.2 On"/>	Switching output 1 and 2 switched
<input type="text" value="1 On"/>	Switching output 1 switched (switching output 2 blocked)
<input type="text" value="2 On"/>	Switching output 2 switched (switching output 1 blocked)

Note: A set decimal point continues to be displayed and is not significant.

Default to the factory settings

Press the button and switch on the supply of the unit at the same time (see factory default settings on page 17).

Time-out function

If during programming no button is pressed for more than 10 s, the unit switches one menu level higher or back into the operating mode. Entries which have not been confirmed with the button are not taken into account.

Locking of the buttons

The programming buttons are unlocked or locked in the basic menu with the menu point "Code". If access has been denied, the display indicates each time a button is pressed. Entries can be made if the button sequence ————— is pressed within 10 s. Otherwise the unit automatically switches back to the normal display.

6. Basic settings

The basic menu includes

- selection of the operating mode (single mode, dual mode, combined modes)
- setting of the display brightness
- locking of the programming buttons
- switching function and hysteresis of the outputs (only DX2012).

Activating the basic menu

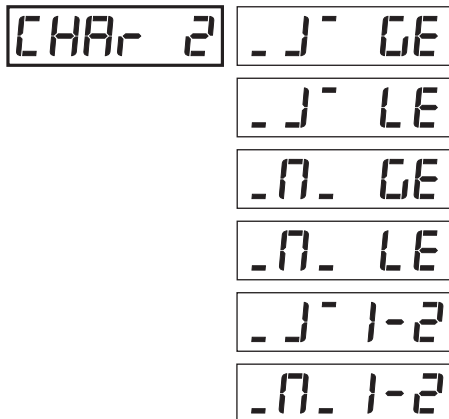
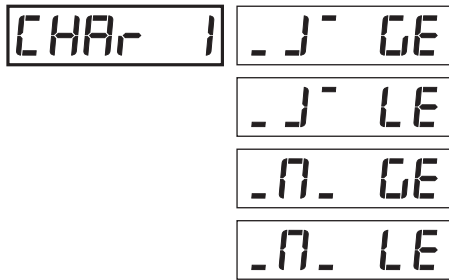
Press the **Mode/Enter** and **Set** buttons at the same time for approx. 3 s.

■ Basic menu

Menu point	Selection	
mode	Single	Mode Operating mode <hr/> Single One-channel operation ❖ (only input A) Dual Two-channel operation (input A and B separately) A u B Summation mode (input A + input B) A - B Differential mode (input A - input B) A d B: Dividing mode (relation A : B) A m B: Multiplicating mode (product A x B)
	duAL	
	A u b	
	A - b	
	A d b	
	A m b	
br ight	100	Bright Display brightness [%] <hr/> 100 ❖ 20, 40, 60, 80 or 100
	80	
Code	no	Code Locking of the buttons <hr/> no ❖ Buttons always unlocked ALL Buttons locked for all functions PFrEE Buttons locked for all functions except the preset values Pres1 and Pres2 (only DX2012)
	ALL	
	PFrEE	
		Additional basic settings (see the following page) <hr/> Switching function and hysteresis of the outputs (only DX2012)

❖ = default

■ Switching function of the outputs (only DX2012)



Connection between displayed value and switching status of the outputs

- **Single mode**
Displayed value A is effective for outputs 1 and 2.
- **Dual mode**
Displayed value A is effective for output 1, displayed value B is effective for output 2.
- **Combined modes (A+B, ...)**
Combined displayed value is effective for outputs 1 and 2.

The preset values (switch points) of the outputs are set at the beginning of the operating parameters (see next pages).

Char 1 Characteristics output 1

- ┌ GE ❖ Greater/Equal
Output 1 becomes statically HIGH if the displayed value ≥ preset value 1
- ┌ LE Lower/Equal
Output 1 becomes statically HIGH if the displayed value ≤ preset value 1
⚠ For min/max monitoring:
Output 1 only becomes statically HIGH if the previously displayed value > preset value 1
- ┐ GE Greater/Equal (fleeting pulse, 300 ms)
Output 1 becomes dynamically HIGH if the displayed value ≥ preset value 1
- ┐ LE Lower/Equal (fleeting pulse, 300 ms)
Output 1 becomes dynamically HIGH if the displayed value ≤ preset value 1
⚠ For min/max monitoring:
Output 1 only becomes dynamically HIGH if the previously displayed value > preset value 1

Char 2 Characteristics output 2

- ┌ GE ❖ Greater/Equal
Output 2 becomes statically HIGH if the displayed value ≥ preset value 2
- ┌ LE Lower/Equal
Output 2 immediately becomes statically HIGH if the displayed value ≤ preset value 2
- ┐ GE Greater/Equal (fleeting pulse, 300 ms)
Output 2 becomes dynamically HIGH if the displayed value ≥ preset value 2
- ┐ LE Lower/Equal (fleeting pulse, 300 ms)
Output 2 immediately becomes dynamically HIGH if the displayed value ≤ preset value 2
- ┌ 1-2 Output switches statically if the displayed value ≥ preset 1 - preset 2 *)
- ┐ 1-2 Output switches dynamically if the displayed value ≥ preset 1 - preset 2 *)

*) Serves to generate a "presignal" at constant intervals to a main signal. The switch point of output 2 automatically changes each time preset 1 is changed.

❖ = default

■ Hysteresis of the outputs (only DX2012)

Menüpunkt

Auswahl

HYST 1

0 ... 99999

HYST 1

Hysteresis output 1

Determines the switching hysteresis to the set switch point output 1.

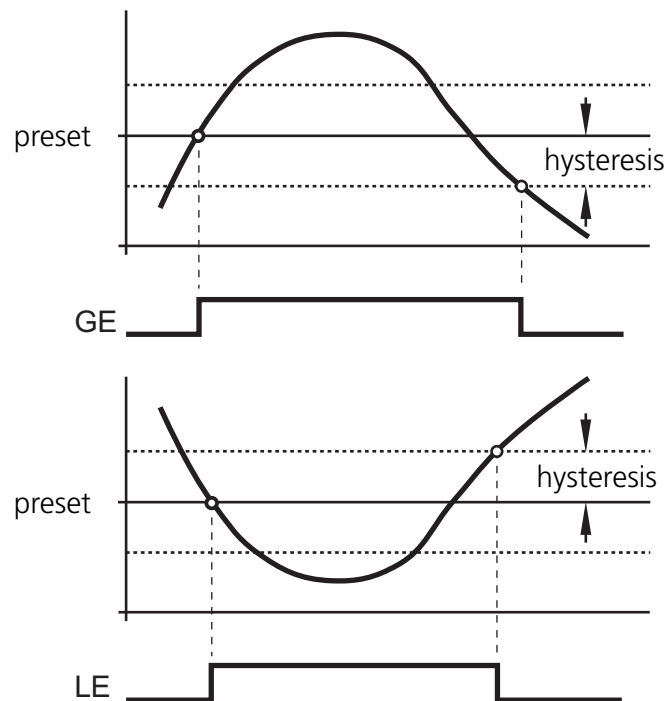
⚠ The hysteresis is only effective in connection with the switching characteristics „ \square GE“ and „ \square LE“.

The operating direction of the hysteresis depends on the switching characteristics.

GE = preset – hysteresis

LE = preset + hysteresis

Principle:



The decimal point settings are maintained.

Preset = 0

HYST 2

0 ... 99999

HYST 2

Hysteresis output 2

like above, for output 2.

7. Operating parameters

The operating parameters are selected by pressing the **Mode/Enter** button for 3 s. The display only shows parameters which are relevant to the previously selected operating mode (single mode, dual mode, combined modes A...B) are indicated.

■ Single mode (evaluation and display of input A)

PrES 1	-99999...99999	PreSelection Preset values 1/2 (only DX2012) Default switch point 1 = 10000 Default switch point 2 = 5000
PrES 2	-99999...99999	
inPut A	in U in i0 in i4	Input A Configuration of the input A in U Voltage ±10 V in i0 ❖ Current 0...20 mA in i4 Current 4...20 mA
StAr t A	-99999...99999	Start A Reference displayed values A "Start" Numerical value which is to be indicated for an input signal of 0 V, 0 mA or 4 mA (without considering the decimal point) Default = 1000
End A	-99999...99999	End A Reference displayed value A "End" Numerical value which is to be indicated for an input signal of 10 V or 20 mA (without considering the decimal point) Default = 1000
dPoi A	000000 : 000000	Dpoint A Decimal point A Sets the decimal point to the displayed position for the displayed value A Default = 00000.0
FiLt A	OFF : 16	Filter A Number of the mean value cycles To avoid display fluctuations for unstable input signals A Default = OFF (filter OFF)

❖ = default

■ **Dual mode** (evaluation and display of inputs A and B)

In this operating mode the Set button is used to change between the displayed values A and B. If input A is displayed, the upper horizontal line is shown for the highest decade. If input B is displayed, the lower horizontal line is shown (e.g. 10000 = A, 8600 = B).

The menu sequence is the same as in the single mode. After the parameters for input A the same menu points are shown for input B.

<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">PrES 1</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">-99999...99999</div>	<p>PreSelection Preset values 1/2 (only DX2012)</p> <hr/> <p>Default switch point 1 = 10000 Default switch point 2 = 5000</p>
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">PrES 2</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">-99999...99999</div>	
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">InPUtA</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px; margin-bottom: 5px;">in U</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px; margin-bottom: 5px;">in i0</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">in i4</div>	<p>Input A Configuration of the input A</p> <hr/> <p>in U Voltage ±10 V in i0 ❖ Current 0...20 mA in i4 Current 4...20 mA</p>
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">StArTA</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">-99999...99999</div>	<p>Start A Reference displayed values A "Start"</p> <hr/> <p>Numerical value which is to be indicated for an input signal of 0 V, 0 mA or 4 mA (without considering the decimal point) Default = 1000</p>
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">End A</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">-99999...99999</div>	<p>End A Reference displayed value A "End"</p> <hr/> <p>Numerical value which is to be indicated for an input signal of 10 V or 20 mA (without considering the decimal point) Default = 1000</p>
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">dPo1 A</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px; margin-bottom: 5px;">000000</div> <div style="text-align: center; margin: 5px 0;">⋮</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">0.000000</div>	<p>Dpoint A Decimal point A</p> <hr/> <p>Sets the decimal point to the displayed position for the displayed value A Default = 00000.0</p>
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-bottom: 5px;">Filt A</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px; margin-bottom: 5px;">OFF</div> <div style="text-align: center; margin: 5px 0;">⋮</div> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;">16</div>	<p>Filter A Number of the mean value cycles</p> <hr/> <p>To avoid display fluctuations for unstable input signals A Default = OFF (filter OFF)</p>
<p>↓</p> <p>For parameters B see the following page.</p>	
❖ = default	

■ Dual Mode (Fortsetzung)

Input b	in U
	in 10
	in 14

Input B Configuration of the input B

in U Voltage ± 10 V
 in i0 \blacklozenge Current 0...20 mA
 in i4 Current 4...20 mA

Start b	-99999...99999
---------	----------------

Start B Reference displayed values B "Start"

Numerical value which is to be indicated for an input signal of 0 V, 0 mA or 4 mA (without considering the decimal point)
 Default = 1000

End b	-99999...99999
-------	----------------

End B Reference displayed value B "End"

Numerical value which is to be indicated for an input signal of 10 V or 20 mA (without considering the decimal point)
 Default = 1000

dPoi b	000000
	⋮
	0.000000

Dpoint B Decimal point B

Sets the decimal point to the displayed position for the displayed value B
 Default = 000000 (without decimal point)

Filter b	OFF
	⋮
	16

Filter B Number of the mean value cycles

To avoid display fluctuations for unstable input signals B
 Default = OFF (filter OFF)

\blacklozenge = default

■ Combined modes A+B, A-B, A:B and AxB

For these operating modes the Set button can be used to change between the individual values A and B as well as the combined value AB.

If input A is displayed, the upper horizontal line is shown for the highest decade. If input B is indicated, the lower horizontal line is shown. The combined value «AB» is shown without horizontal line.

Example: - 10000 = input A, _ 8600 = input B, 18600 = combination (A+B).

To set the parameters the same menu and selection points as for the "dual mode" are available. Four additional parameters at the end of the menu sequence enable rescaling and conversion into user-friendly units.

The combined display value «AB» is as follows:

$$\begin{array}{|c|} \hline \text{combination of the values} \\ \text{(A+B), (A-B), (A:B) or (AxB)} \\ \hline \text{- 10000} \quad \text{- 8600} \\ \hline \end{array} \times \frac{\text{m_Fac}}{\text{d_Fac}} \pm \text{P_Fac} = \begin{array}{|c|} \hline \text{combined} \\ \text{displayed value} \\ \hline \text{18600} \\ \hline \end{array}$$

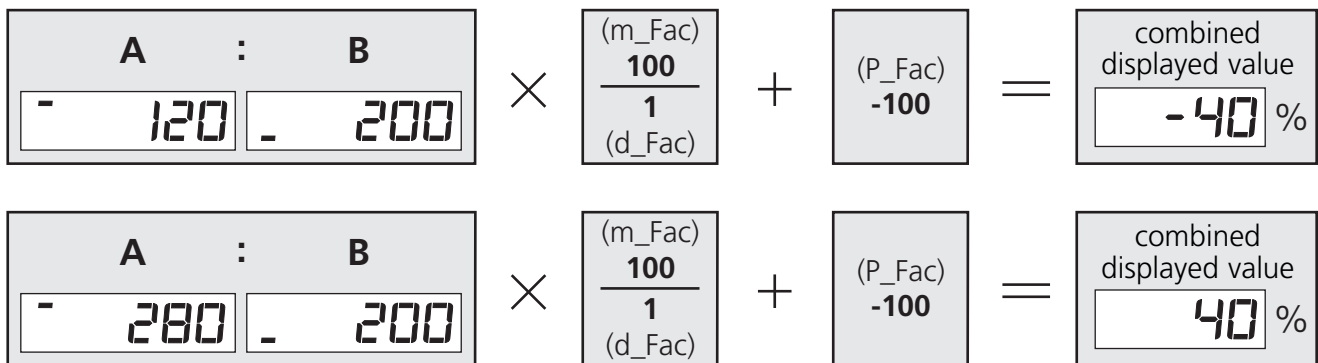
PrES 1	-99999...99999	PreSelection Preset values 1/2 (only DX2012)
PrES 2	-99999...99999	Default switch point 1 = 10000 Default switch point 2 = 5000
InPut A	in U	Input A Configuration of the input A
	in i0	in U Voltage ±10 V
	in i4	in i0 ♦ Current 0...20 mA
		in i4 Current 4...20 mA
⋮		Further parameter sequence as with the "dual mode" and the following parameters for rescaling/conversion
m Fac	-10000...10000	m_Fac Proportional factor
		The combination result «AB» is multiplied with this factor. Default = 1000
d Fac	1...9999	d_Fac Reciprocal factor
		The combination result «AB» is divided by this factor. Default = 1000
P Fac	-99999...99999	P_Fac Additive constant
		This value is added to or subtracted from the combination result «AB». Default = 0
dPoint	000000	Dpoint Decimal point
	⋮	Sets the decimal point for the combination result «AB». Default = 000000 (without decimal point)
	000000	

ENGLISH

8. Setting example

Task			
In a system the percentage deviation between a measured value and a reference value is to be determined and indicated. For a percentage deviation $\leq -20\%$ output 1 is to switch (static HIGH). For a percentage deviation $\geq 40\%$ output 2 is to switch (static HIGH).			
Application			
Analogue value A	Variable quantity	(e.g. pressure, temperature, etc.)	
Analogue value B (both 4...20 mA)	Reference quantity	(e.g. pressure, temperature, etc.)	
Basic settings		Selection or value	
Mode	operating mode	A dB	(relation A : B)
Char1	characteristics output 1	\neg LE	(static HIGH if combined displayed value \leq preset value 1)
Char2	characteristics output 2	\neg GE	(static HIGH if combined displayed value \geq preset value 2)
Operating parameters		Selection or value	
PreS1	preset value output 1	-20	(switch point for a combined displayed value)
PreS2	preset value output 2	40	(switch point for a combined displayed value)
inPutA	configuration input A	in i4	(current 4...20 mA)
inPutB	configuration input B	in i4	(current 4...20 mA)
m_Fac	proportional factor	100	(conversion factor "%")
d_Fac	reciprocal factor	1	(division factor)
P_Fac	additive constant	-100	(conversion factor for percentage display)

The above parameters result in the following displayed values:



Note on the "additive constant" P_Fac:
 If the displayed values A and B are "0" in the example, the combined displayed value is -100.

9. Factory default settings

	Designation	Display text	Min. value	Max. value	Default
Basic menu plus...	Operating mode	<code>n mode</code>	0	5	0 (single)
	Brightness	<code>br ight</code>	0	4	0 (100%)
	Locking of the buttons	<code>Code</code>	0	2	0 (NO)
Output DX2012	Characteristics 1	<code>CHAR 1</code>	0	3	0 (┘ GE)
	Characteristics 2	<code>CHAR 2</code>	0	5	0 (┘ GE)
	Hysteresis 1	<code>HYS 1</code>	0	99999	0
	Hysteresis 2	<code>HYS 2</code>	0	99999	0
Parameters input A	Input mode A	<code>inputA</code>	0	2	1 (0...20 mA)
	Start point A	<code>StartA</code>	-99999	99999	0
	End point A	<code>End A</code>	-99999	99999	1000
	Decimal point A	<code>dPoi A</code>	0	5	1 (00000.0)
	Mean value A	<code>Filt A</code>	0	4	1 (2 cycles)
Parameters input B	Input mode B	<code>inputb</code>	0	2	1 (0...20 mA)
	Start point B	<code>Startb</code>	-99999	99999	0
	End point B	<code>End b</code>	-99999	99999	1000
	Decimal point B	<code>dPoi b</code>	0	5	0 (none)
	Mean value B	<code>Filt b</code>	0	4	0 (OFF)
Combined modes (A+B, etc.)	Proportional factor	<code>n FAC</code>	-10000	10000	1000
	Reciprocal factor	<code>d FAC</code>	1	9999	1000
	Additive constant	<code>P FAC</code>	-99999	99999	0
	Decimal point	<code>dPoi nt</code>	0	5	0 (none)
Switch point DX2012	Preset value 1	<code>PrES 1</code>	-99999	99999	10000
	Preset value 2	<code>PrES 2</code>	-99999	99999	5000

10. Maintenance, repair and disposal

The digital display is maintenance-free and may only be repaired by the manufacturer.

The unit must be disposed of in accordance with the national environmental regulations.