Operating Manual

BG230

Display and programming unit for motrona safety units

Product features:

- Touchscreen with intuitive navigation
- 1.54“ OLED Display (128 x 64 pixel)
- Simple parameterization of motrona safety units
- Editing, saving and loading of parameters
- Dual channel frequency indicator
- Individual scalable process and speed monitors

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Version:	Description:
Bg230_01a_oi/ag/10/14	First edition pre series
Bg230_02a_oi/Jun-15/sn-ag	First edition series
Bg230_02b_oi/Jul-15/sn-ag/	Diverse modifications and extensions
Bg230_02c_oi/Nov-15/sn-ag/	Table modification in chapter 8
Bg230_03a_oi/Jan-16/sn	Change address, modification of scaled input, chapter 5.1, 7, 7.1, 8, 9.1

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1. Safety Instructions and Responsibility

1.1. General Safety Instructions

This operation manual is a significant component of the unit and includes important rules and hints about the installation, function and usage. Non-observance can result in damage and/or impairment of the functions to the unit or the machine or even in injury to persons using the equipment!

Please read the following instructions carefully before operating the device and observe all safety and warning instructions! Keep the manual for later use.

A pertinent qualification of the respective staff is a fundamental requirement in order to use these manual. The unit must be installed, connected and put into operation by a qualified electrician.

Liability exclusion: The manufacturer is not liable for personal injury and/or damage to property and for consequential damage, due to incorrect handling, installation and operation. Further claims, due to errors in the operation manual as well as misinterpretations are excluded from liability.

In addition the manufacturer reserve the right to modify the hardware, software or operation manual at any time and without prior notice. Therefore, there might be minor differences between the unit and the descriptions in operation manual.

The raiser respectively positioner is exclusively responsible for the safety of the system and equipment where the unit will be integrated.

During installation or maintenance all general and also all country- and application-specific safety rules and standards must be observed.

If the device is used in processes, where a failure or faulty operation could damage the system or injure persons, appropriate precautions to avoid such consequences must be taken.

1.2. Use according to the intended purpose

The unit is intended exclusively for use in industrial machines, constructions and systems. Non-conforming usage does not correspond to the provisions and lies within the sole responsibility of the user. The manufacturer is not liable for damages which has arisen through unsuitable and improper use. Please note that device may only be installed in proper form and used in a technically perfect condition - in accordance to the "Technical Specifications"). The device is not suitable for operation in explosion-proof areas or areas which are excluded by the EN 61010-1 standard.

1.3. Installation

The device is only allowed to be installed and operated within the permissible temperature range. Please ensure an adequate ventilation and avoid all direct contact between the device and hot or aggressive gases and liquids.

Before installation or maintenance, the unit must be disconnected from all voltage-sources. Further it must be ensured that no danger can arise by touching the disconnected voltage-sources.

Devices which are supplied by AC-voltages, must be connected exclusively by switches, respectively circuit-breakers with the low voltage network. The switch or circuit-breaker must be placed as near as possible to the device and further indicated as separator.

Incoming as well as outgoing wires and wires for extra low voltages (ELV) must be separated from dangerous electrical cables (SELV circuits) by using a double resp. increased isolation.

All selected wires and isolations must be conform to the provided voltage- and temperature-ranges. Further all country- and application-specific standards, which are relevant for structure, form and quality of the wires, must be ensured. Indications about the permissible wire cross-sections for wiring are described in the "Technical Specifications" chapter.

Before first start-up it must be ensured that all connections and wires are firmly seated and secured in the screw terminals. All (inclusively unused) terminals must be fastened by turning the relevant screws clockwise up to the stop.

Overvoltages at the connections must be limited to values in accordance to the overvoltage category II.

For placement, wiring, environmental conditions as well as shielding and earthing/grounding of the supply lines the general standards of industrial automation industry and the specific shielding instructions of the manufacturer are valid. Please find all respective hints and rules on „ www.motrona.com/download.html --> [General EMC Rules for Wiring, Screening and Earthing]".

1.4. Cleaning, Maintenance and Service Notes

To clean the front of the unit please use only a slightly damp (not wet!), soft cloth. For the rear no cleaning is necessary. For an unscheduled, individual cleaning of the rear the maintenance staff or assembler is self-responsible.

During normal operation no maintenance is necessary. In case of unexpected problems, failures or malfunctions the device must be shipped for back to the manufacturer for checking, adjustment or reparation. Unauthorized opening and repairing can have negative effects or failures to the protection-measures of the unit.

2. Functional Description

The optional BG230 unit serves as display- and programming-unit for motrona safety-relevant devices. With its intuitive operation, the BG230 is quick, easy and flexible to handle.

The unit can be used via PC or directly connected with the safety unit. The BG230 offers a wide range of functions and features.

Applications with the safety unit:

- Edit and save BG230 parameters
- Edit and save parameters of safety units
- Copy parameters of safety units
- Dual channel frequency indicator
- Individual scalable indication of e. g. speed, production rates, …
- Visual error message

Applications via PC *(in preparation)*

- Edit and save BG230 parameters

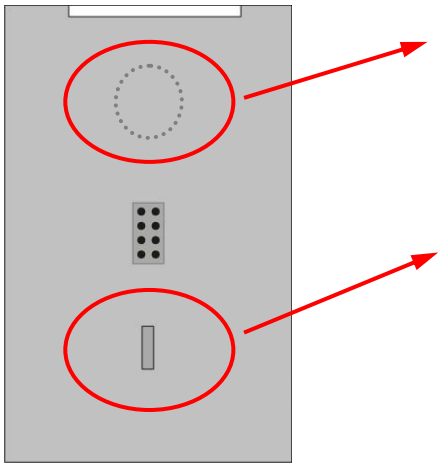
In connection with a motrona safety unit, the functionality of the BG230 depends on the DIL-switch setting of the safety unit. There are three different operation modes available:

- „Normal Operation“ (see chapter 5.1)
- „Factory Settings“(see chapter 5.2)
- „Programming Mode“ (see chapter 5.3)

3. Mounting On Safety Unit

The mounting of the programming unit BG230 can be done by simply plugging the programming unit at the safety device. Via the 8-position pin strip, both units will be connected. A mechanical polarity protection ensures that the device cannot be plugged wrong. Neodymium magnets ensure a safe connection.

Rear view



Neodymium magnet:

Neodymium magnet for safety mounting.

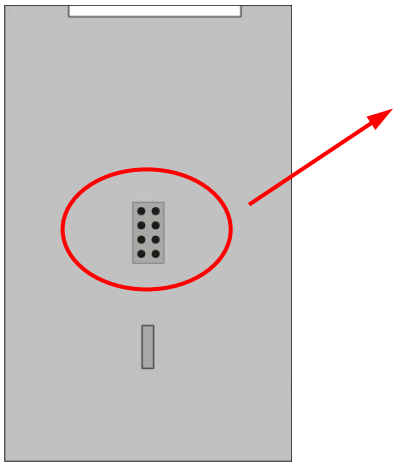
Polarity protection:

Mechanical polarity protection.

4. Electrical Connections

4.1. 8-pin (male) connector

Rear view



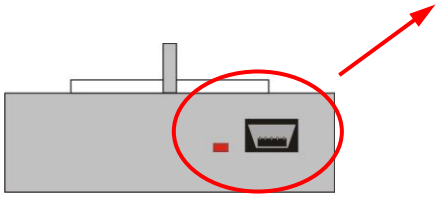
8-pin (male) connector:

This interface connects
the BG230 to the safety unit.

After initialization parameters
can be loaded, edited and saved.

4.2. USB 2.0 Interface

Bottom view



USB 2.0 Interface: *(in preparation)*

Allows the connection of the
BG230 unit to a PC or notebook

A red status LED indicates, that
the USB power supply is on.

After initialization, parameters
can be edited by using the PC
operator software OS 6.x.

Please note: Only one of both interfaces may be connected at the same time!

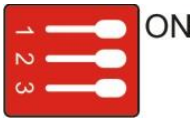
5. Parameterizing by Safety Unit

The BG230 is operated by using the 6 buttons of the touchscreen key panel.

	The button OK is used to confirm entries
	The „Cancel“ resp. „ESC“ button is used to leave the menu or go back one menu-level.
	The UP button is used to jump to the next menu item or increases the numeric value (number flashes).
	The DOWN button is used to jump to the previous menu item or decreases the numeric value (number flashes).
	The LEFT button switches to the previous menu item or selects the previous position of the value to be edited (number flashes).
	The RIGHT button switches to the next menu item or selects the next position of the value to be edited (number flashes).

For touchscreen operation, an existing connection between the BG230 and a safety unit is necessary.

5.1. Unit Mode „NORMAL OPERATION“

The DIL-switch positions of the safety unit are:	

By using the arrow buttons, this mode allows to change the displays of the BG230 as follows:

5.1.1. Display 1: Frequencies (Hz)

Both input frequencies of sensor1 and sensor2 are indicated with one decimal place (see “Operational Mode” of the safety unit).

The indication is independent from the safety device scaling.

5.1.2. Display 2: Divergence (%)

Indicates the divergence of both input frequencies in percent (see “Div. Calculation” of the safety unit).

The indication depends on parameters of the Sensor Menus and divergence parameters settings of the safety device.

5.1.3. Display 3: Scaled Input 1

In this display, the respective input frequency of sensor1 is converted according to its adjusted parameters („OPU-Menu” in safety device) and shown in the display. *) See chapter 7.1

5.1.4. Display 4: Scaled Input 2

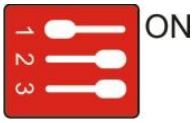
In this display, the respective input frequency of sensor2 is converted according to its adjusted parameters („OPU-Menu” in safety device) and shown in the display. *) See chapter 7.1

Examples about the indication of speed, rotational speed, production rates, … see chapter 8.

For information’s about error messages in the status-line see chapter 9.

*) If the version of the safety device is lower 04A, these parameters are in BG230.
The maximum display value is +/- 999 999 999.

5.2. Modus „FACTORY SETTINGS“

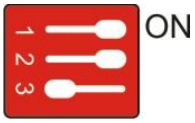
The DIL-switch positions of the safety unit are:	

This mode is used to reset the safety unit back to its default values with the next power-up. No data entry at the BG230 is possible here!

The programming unit BG230 cannot be set to default values!

In order to keep the actual parameter settings safety, these can be stored in the flash memory of the BG230 unit. At first the parameters must be transmitted from the safety unit into the BG230 (see chapter 5.4). Then the parameters can be stored (see chapter 5.6).

5.3. „PROGRAMMING MODE“

The DIL-switch positions of the safety unit are:	

In this mode the parameters of the programming unit BG230 or the parameters of the safety unit can be editing by the touch panel.

5.3.1. BG230 Menu Structure

Please find the BG230 Parameter List in the chapter 7

The first menu level serves for selection of the parameters to be edited (BG230 or Safety Unit)
To edit the BG230, please select “Display Unit”

To edit parameters, please select „Edit Data“ press OK to confirm.

See chapter 5.5

To save the parameters of the BG230, please select „Save Data To Display Unit“ and press OK to confirm.

See chapter 5.6

For orientation, the actual menu from the first menu-level appears in the top left corner.

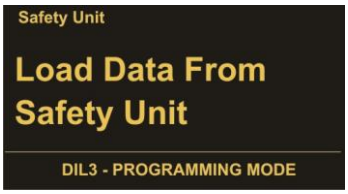
5.3.2. Menu Structure of the Safety Unit

Please find the relevant parameter list of the safety units in the respective operation manual!

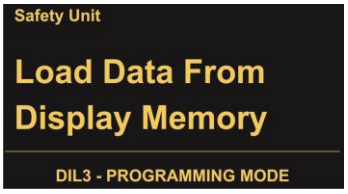
The first menu level serves for selection of the parameters to be edited (BG230 or Safety Unit).
To edit the safety unit, please select "Safety Unit".

To edit already loaded parameters, please select „Use Loaded Data" and press OK to confirm.

See chapter 5.4



To load actual parameters from the safety unit, please select „Load Data From Safety Unit" and press OK to confirm.



To load parameters for a safety unit from the BG230 flash memory, please select „Load Data From Display Memory" and press OK to confirm.

Please select „Edit Data" and press OK to confirm.

See chapter 5.5

To save the parameter-set in the safety unit, please select „Save Data To Safety Unit" and press OK to confirm..

See chapter 5.6

To save the parameter-set of the safety unit in the BG230 flash memory, please select „Save Data To Display Memory" and press OK to confirm.

For orientation, the actual menu from the first menu level appears in the top left corner.

5.4. Load Parameter

5.4.1. Parameters of the Safety Unit

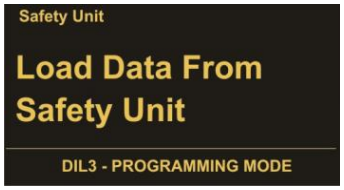
The „Load Data From…"- menu can be found as follows:

Safety Unit	→	Load Data From …

After selection of „Safety Unit" in the first menu level, the parameter-sets to be loaded are available.

This menu option is only selectable, when data has already been loaded from the safety unit or flash memory.

To edit already loaded parameters, please select „Use Loaded Data" and press OK to confirm.



To load actual parameters from the safety unit, please select „Load Data From Safety Unit" and press OK to confirm.

To load parameters for a safety unit from the BG230 flash memory, please select „Load Data From Display Memory" and press OK to confirm.

If „Load Data From Display Memory" is selected, but no data has been saved in the flash memory, the following hint appears: „ATTENTION! No Data In Flash"

5.4.2. BG230 Parameters

The „Load Data From …" menu is only for safety unit parameters available. The parameters for the BG230 unit are loaded directly after „Display Unit" was selected in the first menu level.

5.5. Edit Parameter

The „Edit Data"- menu can be found as follows:

Safety Unit	→	Load Data From …	→	Edit Data …
Display Unit	→	Edit Data …		

After choosing the device to be edited in the first menu level, which is followed by the selection of „Edit Data", the selectable parameter-groups are shown. All respective parameters are listed here (see chapter 7).

The selection menu of the parameter-group can be reached in the menu option „Edit Data". After confirmation by pressing OK, the respective parameter-groups are shown in the display.

Please select the parameter to edit by using the arrow buttons. The actual value of the parameter is also shown display. After pressing OK, the parameter can be edited.

By using the arrow buttons left/right, the cursor can be skipped to another position (the relevant number flashes). By using the arrow buttons up/down, the value can be changed. Press OK to confirm or C to leave the entry.

After changing parameters these must be saved.
This is important to ensure, that the changes took effect also after power-off or when the BG230 has been removed from the safety unit (see chapter 5.6).

Parameter changes of the safety unit are only effective after saving (see 5.6.1).

5.6. Save Parameter

The „Save Data To…"- menu can be found as follows:

Safety Unit	→	Load Data From …	→	Edit Data / Save Data …
Display Unit	→	Edit Data / Save Data …		

5.6.1. Save Parameter to Safety Unit

The following storage locations are selectable for the safety unit parameters:

Select „Save Data To Safety Unit" to save the respective parameters in that unit. Then press OK to confirm.

Select „Save Data To Flash Memory" to save parameters of the safety unit into the flash memory of the BG230. Then press OK to confirm.

5.6.2. Save Parameter to Display Unit

To save parameters in the BG230, please select „Save Data To Display Unit" and press OK to confirm.

5.6.3. Storage Hints

To ensure a correct storage, the procedure must be confirmed with OK. The respective storage location is shown in the info line of the display.

If the menu (after changing parameters) should be left without saving, the procedure „Exit Without Save Press OK" must be confirmed with OK. Press button C to jump back to the storage menu.

If the menu has been left without saving, the data are not lost. They are still available in the menu „Use Loaded Data" (see chapter 5.4).

5.7. PIN Value

Normally the BG230 is delivered without a PIN, respectively with PIN Value = 0000. In this case the PIN Value request after initialization is skipped.

If needed, the unit can be protected from unauthorized access when creating an individual PIN by stepping through the following menu items:

Display Unit	→	Edit Data	→	Unit Settings	→	PIN Value

Please enter an individual 4 digit PIN and press OK to confirm the entrees. After OK, the changed PIN must be saved in order to protect the BG230 unit with the new PIN after the next power-on (see chapter 5.6).

The PIN request is also usable as keypad interlock function.

To enable the BG230 keypad, the PIN must be entered and confirmed with OK.

If the PIN is lost, you can enter the emergency pin 6079.

6. Parameterization via PC by using OS-6

(in preparation)

7. BG230 Parameter List

The parameter list of the safety units can be found in the respective operation manual.

If the BG230 is connected to a PC which is equipped with the OS6.x operator surface, the parameters (see below) are listed on the left side of the program.

If the BG230 is connected to a safety unit (please observe the DIL-switch settings), the parameters (see below) are listed in the following menu:

Display Unit	→	Edit Data …

Parameter Group	Parameter	Min	Max	Default
Input Scaling *)	X Factor 1	1	999999	1
	/ Divisor 1	1	999999	1
	+/- Value 1	-999999	999999	0
	Units 1	0	12	0
	Decimal Point 1	0	5	0
	X Factor 2	1	999999	1
	/ Divisor 2	1	999999	1
	+/- Value 2	-999999	999999	0
	Units 2	0	12	0
	Decimal Point 2	0	5	0
Unit Settings	Display Mode	1	3	1
	Screen Light	0	99	0
	Screen Saver	0	999	1
	PIN Value	0	9999	0
	Touch Tones	0	1	1
Serial Settings	Unit Number	11	99	11
	Serial Baud Rate	0	10	0
	Serial Format	0	9	0

*) If the version of the safety device is lower 04A, scaling parameters are in BG230. When safety device version is higher DS23004A scaling parameters are in the “OPU Menu” of the safety device.

7.1. Input Scaling for Display 3 and 4

This Menu is in safety device as OPU Menu, when safety device version is higher DS23004A!

Parameter		Min	Max	Default
X Factor 1: By this value, the input frequency 1 is multiplied and visualized in the display mode 3.		-999999	+999999	1
/ Divisor 1: By this value, the input frequency 1 is divided and visualized in the display mode 3.		1	999999	1
+/- Value 1: By this value, the input frequency 1 is added / subtracted and visualized in the display mode 3.		-999999	999999	0
Units 1: By this value, the unit is adjusted and visualized in the display mode 3.		0	12	0
Decimal Point 1: By this value, the number of decimal places is defined and visualized in the display mode 3.		0	5	0
X Factor 2:	see „X Factor 1“	-999999	+999999	1
/ Divisor 2:	see „/ Divisor 1“	1	999999	1
+/- Value 2:	see „+/- Value 1“	-999999	999999	0
Units 2:	see „Units 1“	0	12	0
Decimal Point 2:	see „Decimal Point 1“	0	5	0

0	Hz
1	kHz
2	m/s
3	km/h
4	mph
5	min-1
6	rpm
7	sek-1
8	rps
9	Stk/h
10	pcs/h
11	%
12	

Examples for the visualization of frequencies, speed or production rates, … can be found in the chapter 8.

7.2. Unit Settings

<table>
<tr><th>Parameter</th><th>Min</th><th>Max</th><th>Default</th></tr>
<tr><td><u>Display Mode:</u>

Defines which of the four display variants serves as start-display (see chapter 5.2)

<table>
<tr><td>1</td><td><u>5.2.1 Display 1: Frequency (Hz)</u></td></tr>
<tr><td>2</td><td><u>5.2.2 Display 2: Divergence (%)</u></td></tr>
<tr><td>3</td><td><u>5.2.3 Display 3: Scaled input for Speed, Rotating Speed, …</u></td></tr>
<tr><td>4</td><td><u>5.2.4 Display 4: Scaled input for Speed, Rotating Speed, …</u></td></tr>
</table>
</td><td>1</td><td>4</td><td>1</td></tr>
<tr><td><u>Screen Light:</u>

Defines the brightness of the OLED-Displays.*

<table>
<tr><td>0</td><td>Display brightness minimal</td></tr>
<tr><td>…</td><td></td></tr>
<tr><td>99</td><td>Display brightness maximal</td></tr>
</table>
</td><td>0</td><td>99</td><td>0</td></tr>
<tr><td><u>Screen Saver:</u>

This value is used to set the time for the screensaver.*

<table>
<tr><td>0</td><td>screen saver OFF</td></tr>
<tr><td>1</td><td>screen saver active after 1 minute</td></tr>
<tr><td>…</td><td></td></tr>
<tr><td>999</td><td>screen saver active after 999 minutes</td></tr>
</table>
</td><td>0</td><td>999</td><td>1</td></tr>
<tr><td><u>PIN Value:</u>

Defines a PIN code for access. With setting “0000“ the PIN request is not active. Any other value will be overtaken as PIN code with the next power-on of the BG230.</td><td>0</td><td>9999</td><td>0</td></tr>
<tr><td><u>Touch Tones:</u>

This value is used to set keypad tones active / inactive.

<table>
<tr><td>0</td><td>keypad tones OFF</td></tr>
<tr><td>1</td><td>keypad tones ON</td></tr>
</table>
</td><td>0</td><td>1</td><td>1</td></tr>
</table>

*) Display Unit changes like „Screen Light“ or „Screen Saver“ are effective immediately, <u>but will go lost without saving</u> (see chapter <u>5.6</u>)!

7.3. Serial Settings

Parameter	Min	Max	Default
Unit Number: Unit numbers between 11 … 99 can be assigned to the devices (default setting = 11). Unit numbers with "0" are forbidden because these are used for group- or bulk-addressing.	11	99	11
Serial Baud Rate:	0	10	0

0	9 600 Baud
1	4 800 Baud
2	2 400 Baud
3	1 200 Baud
4	600 Baud
5	19 200 Baud
6	38 400 Baud
7	56 000 Baud
8	57 200 Baud
9	76 800 Baud
10	115 200 Baud

Serial Format:	0	9	0

0	7 data bit	parity	even	1	stop bit
1	7 data bit	parity	even	2	stop bit
2	7 data bit	parity	odd	1	stop bit
3	7 data bit	parity	odd	2	stop bit
4	7 data bit	parity	---	1	stop bit
5	7 data bit	parity	---	2	stop bit
6	8 data bit	parity	even	1	stop bit
7	8 data bit	parity	odd	1	stop bit
8	8 data bit	parity	---	1	stop bit
9	8 data bit	parity	---	2	stop bit

Serial Init This parameter determines the baud rate for the transmission of the initialization values to the operator surface OS6.0 respectively to the BG230 programming- and display unit. **0:** The initialization values will be transmitted with 9600 baud. After initialization the unit works with the user settings again. **1:** The initialization values will be transmitted with the user defined baud rate. After initialization the unit works with the user settings again. With settings higher than 9600 baud, the duration of the initialization procedure can be shortened.	0	1	0

8. Example of an individual scalable Display

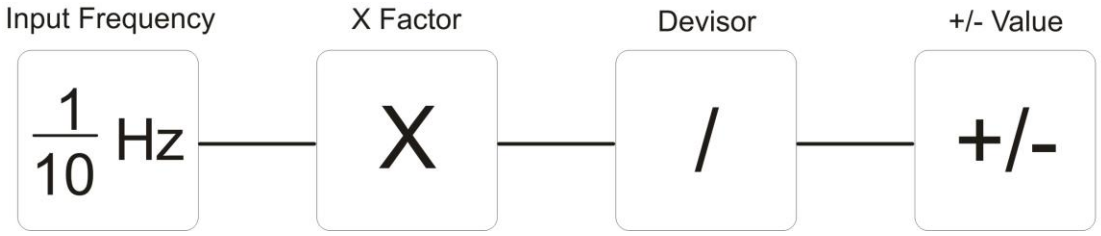
By using the arrow buttons, the unit mode of the safety device can be selected.

The programming unit works directly with the frequencies measured by the safety unit. Which inputs are used by the safety unit, must be specified in the "Operational Mode" of the safety unit.

*) If the version of the safety device is lower 04A, scaling parameters are in BG230. When safety device version is higher DS23004A scaling parameters are in the "OPU Menu" of the safety device.

Changes will be only effective after saving! See chapter 5.5

The calculation of an individual scalable display is built-up as follows:



The unit („Units") as well as the number of decimal places are freely selectable and have no influence to the accuracy of the calculation.

Examples for an input frequency of 1 kHz:

If 1000.0 [Hz] is shown in display 1 „Frequency", the parameter group „Input Scaling" can be used to adjust the following scaling's, which are then indicated in display 3.

Display 1: „Frequency"	X Factor	Divisor	+/- Value	Units	Decimal Point	Display 3/4 „Scaled Input"
1000.0 [Hz]	1	10	0	12	0	1000
1000.0 [Hz]	1	1	0	0	1	1000.0 [Hz]
1000.0 [Hz]	1	1000	0	1	1	1.0 [kHz]
1000.0 [Hz]	1	1	0	1	4	1.0000 [kHz]
1000.0 [Hz]	60	2048*	0	6	2	29.29 [rpm]

*) Number of pulses per encoder revolution

Parameters of the group „Input Scaling" see chapter 7.1
Display 1 „Frequency" resp. display 3/4 „Scaled Input" see chapter 5.1

9. Error Messages

9.1. Error Messages from the Safety Unit

Error- resp. status-messages will be shown below the diving line of the BG230 display.

Runtime Error / Initial Error:

Error messages from the safety device are indicated as a hexadecimal number (H) given in the status line of the display. A listing of all available numbers and the associated errors can be found in the manual of the safety device.

Example:

The hexadecimal number of the error message is build-up of individual errors:

Runtime Error: H 0000 0386
H 0000 0200
H 0000 0100
H 0000 0080
H 0000 0004
H 0000 0002

9.2. Status Messages from the BG230

Error- resp. status-messages will be shown below the diving line of the BG230 display.

Communication Offline:

In case of a status message „Communication Offline“
- the serial settings must be checked resp. adjusted
- or the safety unit must be switched off and on again (in order to re-initialize the safety and display unit)

CRC Error:

The "CRC Error" is released in case of damaged data, when storing in resp. loading from the flash memory. The damaged data from the flash cannot be loaded or used and need to be saved again.

Readback Error:

The "Readback Error“ is released if the data which were transmitted to the safety device do not correspond with the read back data.

Serial Error:

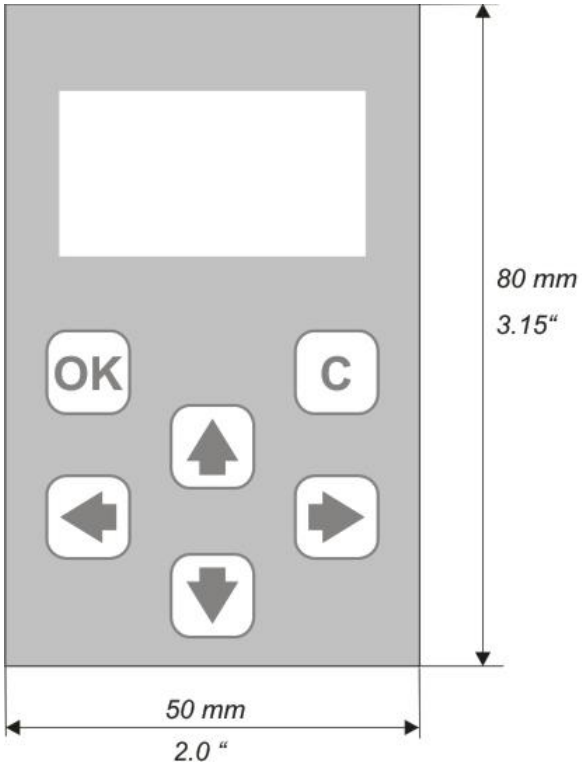
In case of errors during the serial transmission (e. g. parity errors or transmission errors), the „Serial Error“ message is released. Then the BG230 must be removed and connected again for a re-initialization of the serial interface.

10. Technical Specifications

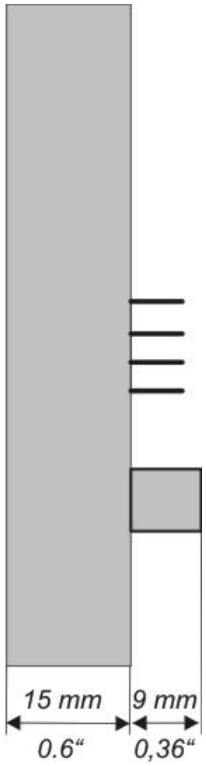
Power supply:	Input voltage:	directly via a motrona safety unit or via USB
	Protection:	mechanical polarity protection
	Power consumption:	approx. 100 mA (by safety device), approx. 50 mA (by USB port)
	Connection:	8 position pin strip (safety unit) or USB connector
Display elements:	Display:	1.54" OLED display
	Resolution:	128 x 64 pixels
	Brightness:	digitally adjustable (99 steps)
	LEDs:	1 red status LED for „USB power"
Operating elements:	Keypad:	touchscreen (6 capacitive touch-fields)
	Miscellaneous:	key tones (switchable mute)
Data memory:	Storage medium:	Flash EEPROM
	Data retention:	1,000,000 cycles
USB port:	Type/version:	USB 2.0
	Connection:	Mini B connector (female)
Housing:	Material:	front: polycarbonate, black/yellow/clear rear: polystyrene, black
	Mounting:	plug-on motrona safety unit
	Dimensions:	50 x 80 x 15 mm / 1.969 x 3.150 x 0.591 " (plugged on safety device)
	Protection class:	IP20
	Weight:	approx. 50 g
Temperature range:	Operation:	-20 … +55 °C / -4 °F … 131 °F
	Storage:	-25 … +70 °C / -13 °F … 158 °F
Conformity & standards:	EMC 2004/108/EC:	EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
	Guideline 2011/65/EU:	RoHs-conform

10.1. Dimensions

Front view



Side view



11. Installation Form

Date:	Unit: BG230
Operator:	
Software:	
Serial No.:	

Input Scaling	X Factor 1	
	/ Divisor 1	
	+/- Value 1	
	Units 1	
	Decimal Point 1	
	X Factor 2	
	/ Divisor 2	
	+/- Value 2	
	Units 2	
	Decimal Point 2	

Unit Settings	Display Mode	
	Screen Light	
	Screen Saver	
	PIN Value	
	Touch Tones	

Serial Settings	Unit Number	
	Serial Baud Rate	
	Serial Format	