

Operating Manual



touchMATRIX Indicator DX350

HTL-frequency counter, -tachometer and -speed indicator with touchscreen and graphic display

Product features:

- Multifunctional unit with several operating modes, e. g. speed or position indicator, process meter, counter, timer or stopwatch
- Universal HTL inputs for encoders / sensors with NPN / PNP / NAMUR characteristic
- Bright and high-contrast display with event controlled color variations
- Emulation of a 7-segment display inclusively icons and units
- Intuitive and easy parameterization by plain text and touchscreen
- 24 V auxiliary output for encoder supply
- Input frequencies up to 250 kHz
- Linearization with 24 interpolation points
- Numerous features, e. g. scaling, filtering, start-up suppression
- 96 x 48 mm (3.78 x 1.89 inch) norm panel housing and IP65 protection

Available options:

- **DX350:** Basic unit with HTL inputs (A, B), 3 control inputs
- **Option AC350:** Power supply 115 ... 230 VAC
- **Option AO350:** 16 bit analog output, 4 control outputs, serial RS232 interface
- **Option CO350:** 4 control outputs, serial RS232 interface
- **Option RL350:** 2 relay outputs

All options can be combined

Version:	Description
DX350_01a_oi/sn- tg /Feb-17	First Version
DX350_01d_oi/cn/Okt-16	Revised first Version
DX350_02a_oi/cn/Nov-16	Second Version
DX350_02c_oi/cn/Jan-17	revised Version

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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 reserves 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 have 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.

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 and reparation (if necessary). Unauthorized opening and repairing can have negative effects or failures to the protection-measures of the unit.

2. Introduction

This series of display unit is suitable for HTL impulse signals and panel mounting. It is very versatile in use, due to the intuitive handling and the extensive range of functions and options.

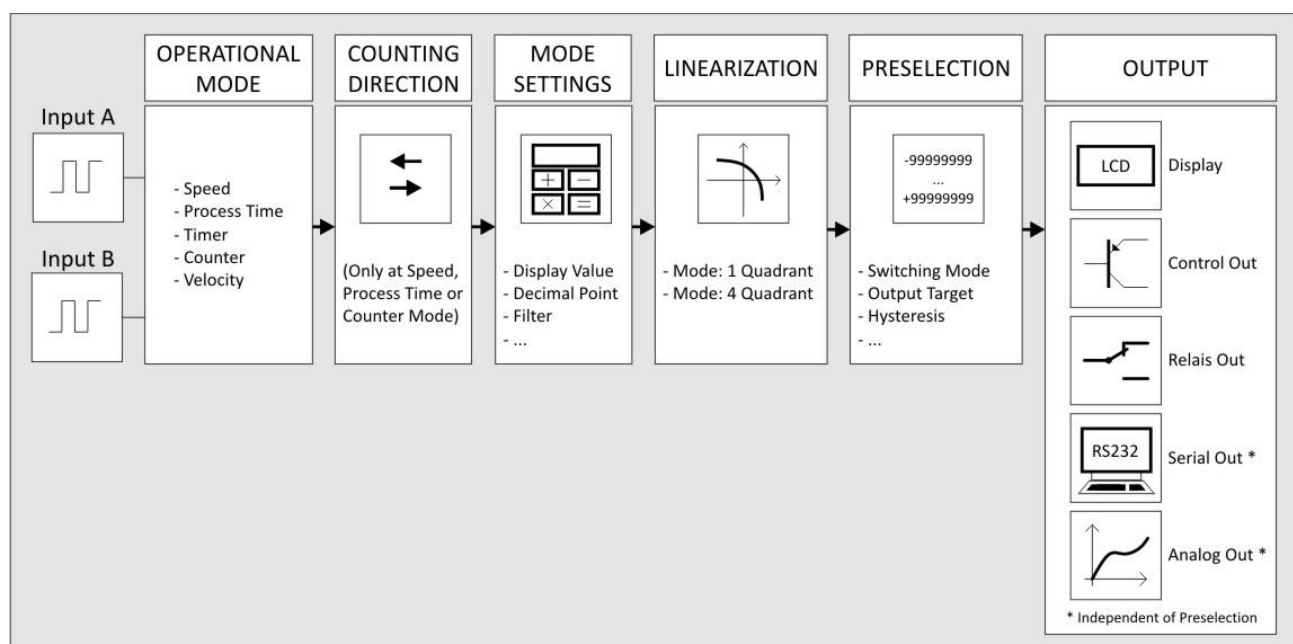
2.1. Operation mode

All functions are can be configured in the parameter menu.

The device can be set to one of the following operation modes:

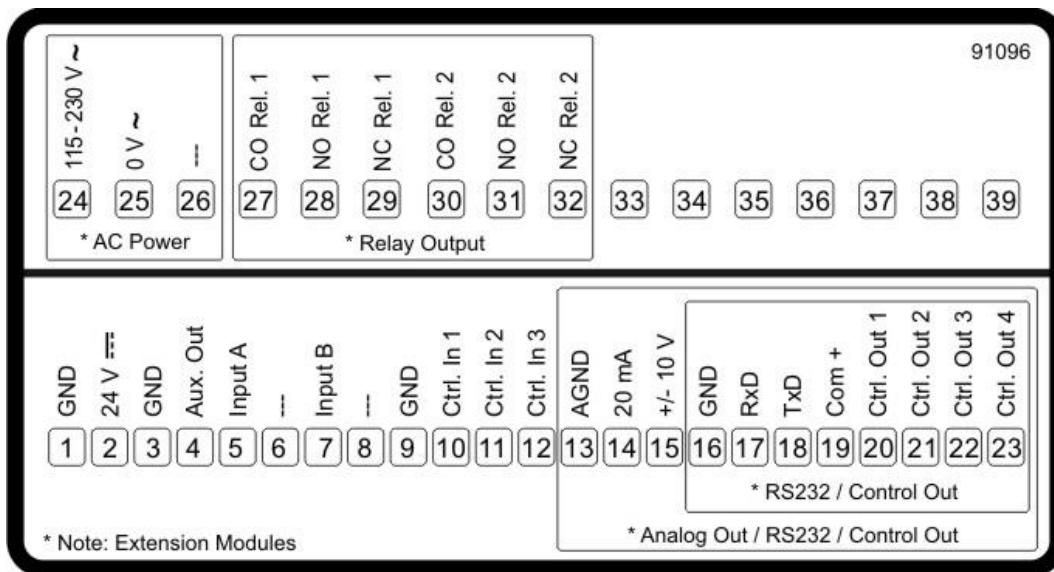
- Speed:
Speed indicator (RPM), operation as tachometer or frequency meter.
Only input A is used.
- Process Time:
Operation as baking time or processing time indicator (reciprocal speed)
Only input A is used.
- Timer:
Operation as stopwatch. Start- / Stop function can be freely parameterized.
Depending on the parameter setting, only Input A or Input B are used.
- Counter:
Operation as position indicator, event-, sum-, differential- or up-down counter.
Input A and B are used.
- Velocity:
Runtime measurement as speed indicator.
Input A operates as a start input and input B operates as a stop input.

2.2. Function diagram



3. Electrical Connections

The terminal screws should be tightened with a slotted screwdriver (blade width 2mm).



3.1. DC Power Supply

The unit accepts DC supply from 18 to 30 V at the terminals 1 and 2. The power consumption depends on the level of the supply voltage with approx. 100 mA and the additional current required at the Auxiliary Voltage Output.

All GND terminals are internally interconnected.

3.2. Auxiliary Voltage Output

Terminal 3 and 4 provide an auxiliary output for supply of sensors and encoders. The output voltage depends on the power supply.

DC version	AC version
The encoder voltage is approx. 1 V lower than the power supply voltage at terminal 1 and 2 and should be loaded with max. 250 mA.	The encoder voltage is 24 VDC ($\pm 15\%$) and should be loaded with max. 150 mA up to 45 degrees Celsius. At higher temperature the maximum output current is reduced to 80 mA.

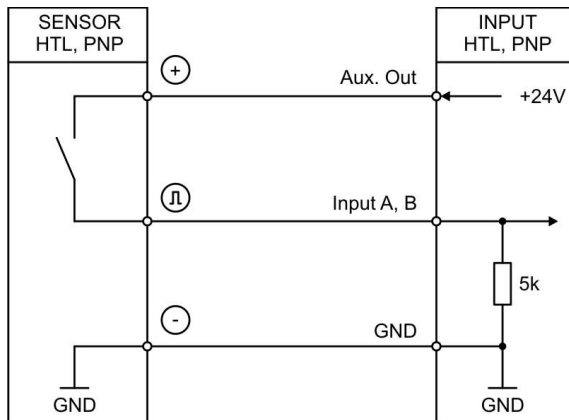
3.3. Incremental Input A, B

The unit provides two inputs at terminal 5 and 7 for HTL signals.

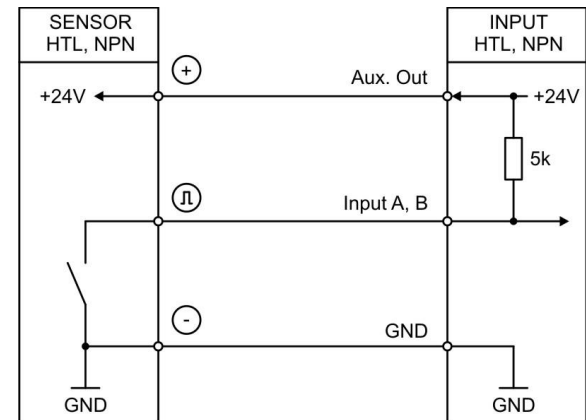
The characteristics of the incremental input (PNP, NPN, Namur or Tri-State) can be set in the GENERAL MENU.

Wiring of the incremental inputs:

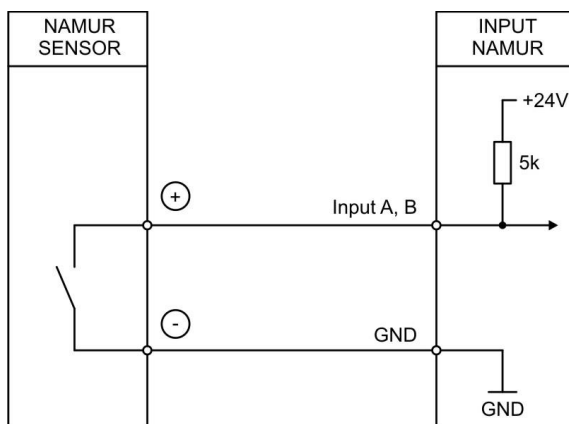
PNP



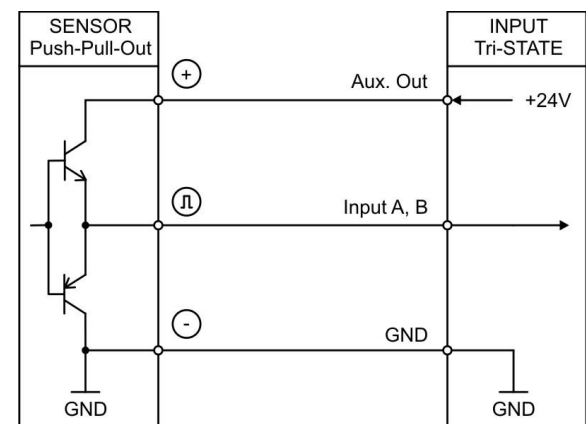
NPN



Namur



Tri-State



Unconnected PNP inputs are always "LOW" and unconnected NPN inputs are always "HIGH". All inputs are designed to receive impulses from electrical impulse sources.

Notice for mechanical switching contacts:

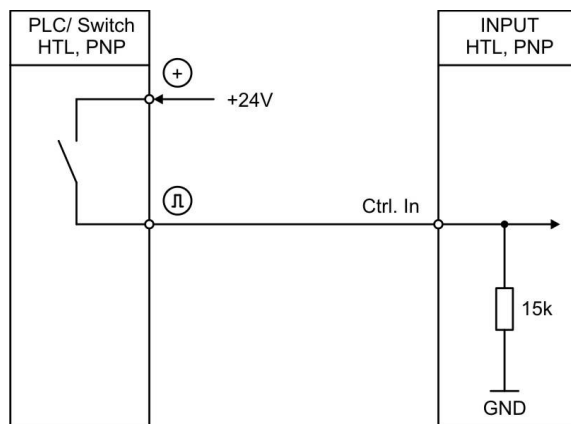
When exceptionally mechanical contacts are used, please connect an external capacitor between GND (-) and the corresponding input (+). A capacity of 10 µF will reduce the input frequency to 20 Hz and miscounting due to contact bouncing will be eliminated.

3.4. Control Inputs

The three control inputs at terminal 10, 11 and 12 have HTL PNP characteristics.

In the COMMAND MENU the programmable functions for the control inputs can be assigned. Available functions are: reset the display value, display switching, locking the touch screen or release the lock function of the control or relay outputs.

Wiring of the control inputs:



Unconnected control inputs are always "LOW".

All inputs are designed to receive impulses from an electronic impulse source.

Notice for mechanical switching contacts:

When exceptionally mechanical contacts are used, please connect an external capacitor between GND (-) and the corresponding input (+). A capacity of 10 μF will reduce the input frequency to 20 Hz and miscounting due to contact bouncing will be eliminated.

3.5. Analog Output (Option A0350)

A 16 bit analog output is available at terminal 13 and 14 / 15

This output can be configured and scaled in the ANALOG MENU.

The following configuration is possible:

- Voltage output: -10 ... +10 V
- Current output: 0 ... 20 mA
- Current output: 4 ... 20 mA

The analog output is proportional to the display value and is referenced to potential AGND.

AGND and GND are internally interconnected.



Important:

A parallel operation with voltage and current output at the analog output is not allowed.

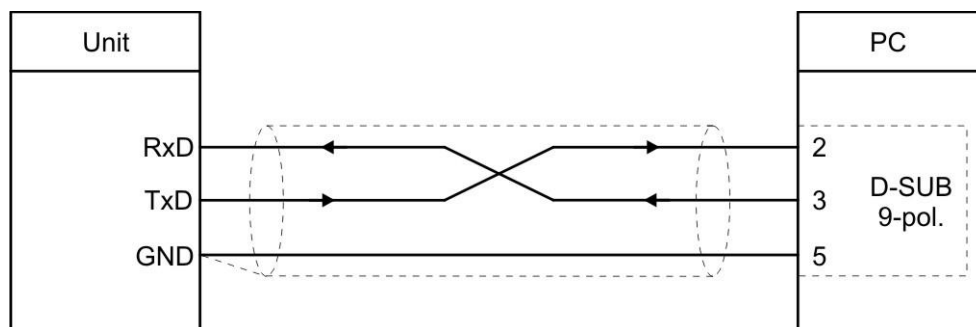
3.6. Serial interface (Option A0350 / C0350)

A serial interface (RS232) is available at terminal 16, 17 und 18. This interface can be configured in the SERIAL MENU.

The serial interface RS232 can be used:

- for easy setup and commissioning of the units
- to modify settings and parameters during operation
- to read out internal states and actual measuring values by PC or PLC

The following drawing shows the connection to a PC by using a standard Sub-D-9 connector:



3.7. Control-Output (Option A0350 / C0350)

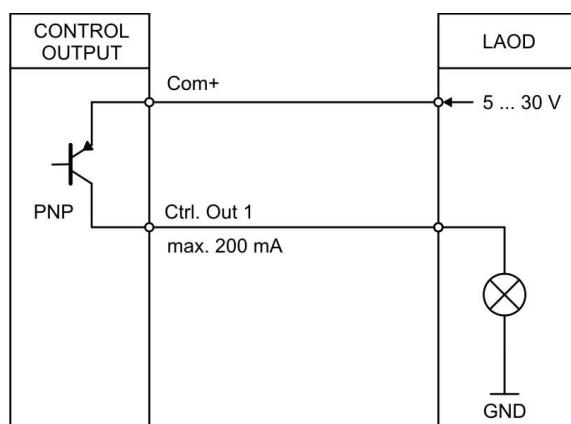
Four control outputs are available at terminal 20, 21, 22 and 23.

Switching conditions can be set in the PRESELECTION MENU. The output Ctrl. Out1 – 4 are fast PNP outputs with a switching capability of 5 – 30 Volt / 200 mA per channel. The switching states is displayed (display with unit and status bar) as C1 ... C4.

The switching voltage of the outputs must be applied to input terminal 19 (COM+).

In case of switching inductive loads it is advisable to use external filtering of the coils.

Wiring of the control-outputs:



3.8. AC Power supply (Option AC350)

The unit accepts AC supply from 115 to 230 V at the terminals 24 and 25. The power consumption depends on the level of the supply voltage with approx. 3VA and the additional current required at the Auxiliary Voltage Output.

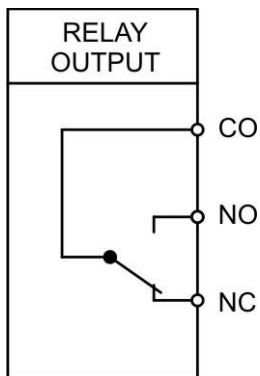
3.9. Relay-Output (Option RL350)

Two relay outputs with potential-free changeover contacts are available at terminal 27, 28, 28, 30, 31, 32. Switching conditions can be set in the PRESELECTION MENU. The switching states is displayed (display with unit and status bar) as K1 and K4.

AC-switching capacity max 250 VAC/ max 3 A / 750 VA

DC-switching capacity max 150 VAC/ max 2 A / 50 W

Wiring of the relay outputs



4. Display and touch screen

4.1. Screen structure for parametrization

The parameter menus and the parameters are described in chapter 5.



Start setup procedure:

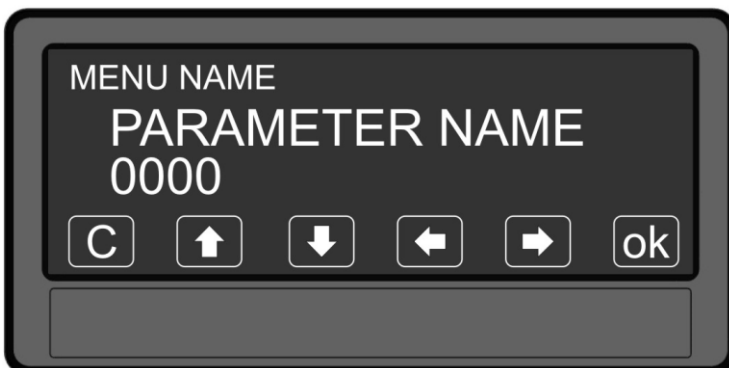
To edit the parameters, press the touchscreen for 3 seconds.



Menu selection:

Select the parameter menu via arrow buttons and confirm with "OK".

The menu selection can be terminated with „C“.



Parameter selection:

Select the parameter via arrow buttons and confirm with „OK“.

The parameter selection can be terminated with „C“.



Parameter editing:

Edit the parameter via arrow button up and down, shift cursor via left and right and save with „OK“.

The parameter editing can be terminated with „C“.

Parameter changes becomes active only after closing the menu selection

4.2. Screen structure in operation

The following screens are available during operation. Depending on the device version and the selected operation mode, not all displays will be shown.



Display with unit and status bar

To switch to the next display, press the touch screen.

Control - or Relay status are only shown with Option A0350, C0350, RL350.



Display with command keys

To switch to the next display, press the top of the screen.

This is only possible in operation mode TIMER or COUNTER.



Display for quick start for enter preselection values (PRESELECT VALUES)

To switch to the next display, press the top of the screen or the "skip" button.

This is only possible with Option A0350, C0350, RL350



Display with minimum and maximum value

To switch to the next display, press the top of the screen or the "skip" button.

5. Parameter / Overview-Menu Structure

This section provides an overview of the menus and their parameters. The menu names are printed bold and the associated parameters are listed under the menu name. Depending on the device version and the selected operation mode, only the necessary menus / parameters are shown.

Menu / Parameter
GENERAL MENU
OPERATIONAL MODE
ENCODER PROPERTIES
COUNTING DIRECTION
SCALE UNITS
LINEARIZATION MODE
PIN PRESELECTION
PIN PARAMETER
BACK UP MEMORY
FACTORY SETTINGS

Menu / Parameter
MODE SPEED
DISPLAY VALUE
BASE FREQUENCY
DECIMAL POINT
SAMPLING TIME
WAIT TIME
STANDSTILL TIME
AVERAGE FILTER
MODE PROCESS TIME
DISPLAY FORMAT
DISPLAY VALUE
BASE FREQUENCY
SAMPLING TIME
WAIT TIME
STANDSTILL TIME
AVERAGE FILTER
MODE TIMER
TIME BASE
START / STOP
AUTO RESET
LATCH FUNCTION
MODE COUNTER
COUNT MODE
FACTOR
SET VALUE
DECIMALPOINT
MODE VELOCITY
DISPLAY VALUE
BASE TIME
DECIMALPOINT
WAIT TIME
STANDSTILL TIME

Menu / Parameter
PRESELECTION VALUES
PRESELECTION 1 PRESELECTION 2 PRESELECTION 3 PRESELECTION 4
PRESELECTION 1 MENU
MODE 1 HYSTERESIS 1 PULSE TIME 1 OUTPUT TARGET 1 OUTPUT POLARITY 1 OUTPUT LOCK 1 START UP DELAY 1 EVENT COLOR 1
PRESELECTION 2 MENU
MODE 2 HYSTERESIS 2 PULSE TIME 2 OUTPUT TARGET 2 OUTPUT POLARITY 2 OUTPUT LOCK 2 START UP DELAY 2 EVENT COLOR 2
PRESELECTION 3 MENU
MODE 3 HYSTERESIS 3 PULSE TIME 3 OUTPUT TARGET 3 OUTPUT POLARITY 3 OUTPUT LOCK 3 START UP DELAY 3 EVENT COLOR 3
PRESELECTION 4 MENU
MODE 4 HYSTERESIS 4 PULSE TIME 4 OUTPUT TARGET 4 OUTPUT POLARITY 4 OUTPUT LOCK 4 START UP DELAY 4 EVENT COLOR 4

Menu / Parameter
SERIAL MENU
UNIT NUMBER SERIAL BAUD RATE SERIAL FORMAT SERIAL INIT SERIAL PROTOCOL SERIAL TIMER SERIAL VALUE
ANALOG MENU
ANALOG FORMAT ANALOG START ANALOG END ANALOG GAIN ANALOG OFFSET
COMMAND MENU
INPUT 1 ACTION INPUT 1 CONFIG INPUT 2 ACTION INPUT 2 CONFIG INPUT 3 ACTION INPUT 3 CONFIG
DISPLAY MENU
COLOR BRIGHTNESS CONTRAST SCREEN SAVER UP-DATE-TIME FONT
LINEARISATION MENU
P1(X) P1(Y) P2(X) P2(Y) P23(X) P23(Y) P24(X) P24(Y)

5.1. General Menu

OPERATIONAL MODE

This parameter specifies the selected measuring function.

0	SPEED	Speed indicator (RPM), tachometer or frequency counter
1	PROCESS TIME	Operation as baking time or processing time indicator (reciprocal speed)
2	TIMER	Operation as stopwatch
3	COUNTER	Operation as position indicator, event-, sum-, differential- or up-down counter
4	VELOCITY	Runtime measurement as speed indicator

ENCODER PROPERTIES

This parameter determines the characteristics of the pulse input.

0	PNP	PNP (switch to +)
1	NPN	NPN (switch to -)
2	NAMUR	Connect sensor (-) to GND and sensor (+) to input (A or B)
3	TRI-STATE	Tri-State

COUNTING DIRECTION

This parameter determines the direction of counting. (Only in mode COUNTER)

0	FORWARD	forward
1	REVERSE	reverse

SCALE UNITS

This parameter defines the required engineering unit. This parameter does not affect the calculation of the display value. The number of decimal places must be defined with the parameter DECIMAL POINT.

0	HZ	Default
1	KHZ	
2	M/S	
3	M/MIN	
4	KM/H	
5	MPH	
6	MIN-1	
7	RPM	
8	SEK-1	
9	RPS	
10	STK/H	
11	PCS/H	
12	MM	
13	M	
14	INCH	

Continuation „General Menu“:

15	FEET	
16	STUECK	
17	PCS	
18	SEC	
19	MIN	
20	MIN:SEC	
21	H:M:S	
22	%	
23	LPM	
24	GPM	
25	ML/MIN	
26	GR/MIN	
27		no unit

LINEARIZATION MODE

This parameter defines the linearization function. See chapter 6.1.

0	OFF	No linearization
1	1 QUADRANT	Linearization in the 1. quadrant
2	4 QUADRANT	Linearization in all 4 quadrants

PIN PRESELECTION

This parameter defines the PIN-code to lock the quick start of the menu PRESELECTION VALUE for entering the preselection values_ (master PIN 6079).

This Lock function is only useful in conjunction with active lock function in PIN PARAMETER.

	0000	No lock
	...	
	9999	Access after entering PIN-Code 9999

PIN PARAMETER

This parameter defines the PIN-code for lock function of all parameters (master PIN 6079).

	0000	No lock
	...	
	9999	Parameterization of the unit after entering PIN-code 9999

BACK UP MEMORY

0	NO	No back memory –up by power failure
1	YES	Backup memory by power failure, actual value will be saved

FACTORY SETTINGS

0	No	No default values are loaded
1	Yes	Load default values of all parameters (grey marked default values)

5.2. Mode Speed

This menu defines the operation as speed indicator (RPM), tachometer or frequency meter. In this operation mode only input A is used. This menu is only displayed when the appropriate OPERATIONAL MODE in GENERAL MENU is selected.

DISPLAY VALUE		
Desired value, which should be displayed at the setting of BASE FREQUENCY.		
	1	Smallest value
	1000	Default value
	99999999	Highest value

BASE FREQUENCY (HZ)		
Reference frequency for the desired DISPLAY VALUE.		
	1	Smallest value
	100	Default value
	500000	Highest value

DECIMAL POINT		
This value defines the position of the decimal point.		
0	NO	No decimal point
1	0000000.0	Decimal point at the specified position
2	000000.00	Decimal point at the specified position
3	00000.000	Decimal point at the specified position
4	0000.0000	Decimal point at the specified position
5	000.00000	Decimal point at the specified position
6	00.000000	Decimal point at the specified position
7	0.0000000	Decimal point at the specified position

SAMPLING TIME (S)		
The configured value corresponds to the minimum measurement time. The Parameter is used as a filter in case of irregular frequencies. This parameter directly affects the response time of the unit.		
	0.005	Shortest Sampling time
	0.1	Default value
	9.999	Longest Sampling time

Continuation „Mode Speed“:

WAIT TIME (S)
 This parameter defines the period time of the lowest frequency, accordingly the time between two rising signal edges detecting frequency 0 Hz. Frequencies with a period time higher than the set "WAIT TIME" will be detected as frequency = 0 Hz.

0.01	Frequency = 0 Hz, for frequencies below 100 Hz
1.00	Default value
99.99	Frequency = 0 Hz, for frequencies below 0,1 Hz

STANDSTILL TIME (S)
 This parameter defines the time setting for standstill definition. A time of xx.xx seconds after detection " frequency = 0 Hz " the unit signals "standstill" and reactivates the start-up-delays.
 Stand still detection can be set in PRESELECT MENU.

0.00	Shortest time
...	
99.99	Largest time

AVERAGE FILTER
 Selectable average or filter function to avoid measuring fluctuations by unstable frequencies. At setting 1 to 4 a floating average calculation is performed. At settings 5 to 8, the device uses an exponential filter. The time constant T (63%) corresponds to the sampling cycles.

For example: If SAMPLING TIME = 0,1 s and AVERAGE FILTER = Exponential filter, T (63 %) = 2x SAMPLING TIME, after 0,2 seconds, 63% of the step size are reached

0	No average value will be created
1	2 numbers of floating average cycles
2	4 numbers of floating average cycles
3	8 numbers of floating average cycles
4	16 numbers of floating average cycles
5	Exponential filter, T (63 %) = 2x SAMPLING TIME
6	Exponential filter, T (63 %) = 4x SAMPLING TIME
7	Exponential filter, T (63 %) = 8x SAMPLING TIME
8	Exponential filter, T (63 %) = 16x SAMPLING TIME

5.3. Mode Process Time

In this menu the operation is defined as baking time or processing time indicator (reciprocal speed) Only input A is used. This menu is only displayed when the appropriate OPERATIONAL MODE in the GENERAL MENU is selected.

DISPLAY FORMAT		
This parameter selects the Display Format. The corresponding decimal point will be set automatically.		
0	SECONDS	Display in seconds
1	MINUTES	Display in minutes
2	MIN:SEC	Display in minutes : seconds
3	MIN.00	Display in minutes and 1/100 minutes

DISPLAY VALUE		
Desired value, which should be displayed at the setting of BASE FREQUENCY.		
1		Smallest value
1000		Default value
99999999		Highest value

BASE FREQUENCY (HZ)		
Reference frequency for the desired DISPLAY VALUE.		
1		Smallest value
100		Default value
500000		Highest value

SAMPLING TIME (S)		
The configured value corresponds to the minimum measurement time. The Parameter is used as a filter in case of irregular frequencies. This parameter directly affects the response time of the unit.		
0.005		Shortest sampling time
0.1		Default value
9.999		Longest sampling time

$f = \frac{6}{T}$

Continuation „Mode Process Time“:

WAIT TIME (S)
 This parameter defines the period time of the lowest frequency, accordingly the time between two rising signal edges detecting frequency 0 Hz. Frequencies with a period time higher than the set "WAIT TIME" will be detected as frequency = 0 Hz.

0.01	Frequency = 0 Hz, for frequencies below 100 Hz
1.00	Default value
99.99	Frequency = 0 Hz, for frequencies below 0,1 Hz

STANDSTILL TIME (S)
 This parameter defines the time setting for standstill definition.
 A time of xx.xx seconds after detection " frequency = 0 Hz " the unit signals "standstill" and reactivates the start-up-delays. Stand still detection can be set in PRESELECT MENU.

0.00	Shortest time
...	
99.99	Longest time

AVERAGE FILTER
 Selectable average or filter function to avoid measuring fluctuations by unstable frequencies. At setting 1 to 4 a floating average calculation is performed. At settings 5 to 8, the device uses an exponential filter. The time constant T (63%) corresponds to the sampling cycles.

For example: If SAMPLING TIME = 0,1 s and AVERAGE FILTER = Exponential filter, T (63 %) = 2x SAMPLING TIME, after 0,2 seconds, 63% of the step size are reached

0	No average value will be created
1	2 numbers of floating average cycles
2	4 numbers of floating average cycles
3	8 numbers of floating average cycles
4	16 numbers of floating average cycles
5	Exponential filter, T (63 %) = 2x SAMPLING TIME
6	Exponential filter, T (63 %) = 4x SAMPLING TIME
7	Exponential filter, T (63 %) = 8x SAMPLING TIME
8	Exponential filter, T (63 %) = 16x SAMPLING TIME

5.4. Mode Timer

In this menu the operation of timer or stopwatch is defined.

Depending on the parameterization only input A or both are used. This menu is only displayed when the appropriate OPERATIONAL MODE in the GENERAL MENU is selected.

TIME BASE		
This parameter defines the time base or resolution of the measurement.		
0	1/1000 SEC	Milliseconds
1	1/100 SEC	1/100 seconds
2	1/10 SEC	1/10 seconds
3	SECONDS	Full seconds
4	MIN.00	Minutes and 1/100 minutes
5	MIN.0	Minutes and 1/10 minutes
6	H:M:S	Hour : Minutes : Seconds (9999:59:59)

START / STOP		
This parameter defines the start/stop condition of the time measurement.		
0	COUNT AT A HIGH	Time measurement active at Input A is „HIGH“
1	COUNT AT A LOW	Time measurement active at Input A is „LOW“
2	START A / STOP B	A rising edge at Input A starts the time measurement, a rising edge at Input B stops the time measurement.
3	PERIODE AT A	Period time measurement: displays the time between two rising signal edges at Input A

AUTO RESET		
0	NO	Time count cumulates with every new start. To clear the time counter a reset command must be performed.
1	YES	Every start initializes a new counting from zero.

LATCH-FUNCTION		
0	NO	Real time display, counting value is visible.
1	YES	Display shows the result of the last measurement. The time counts in the background.

5.5. Mode Counter

In this menu the operation as position indicator, impulse counting, sum of 2 inputs, difference of 2 inputs or up-down counter is defined. Input A and Input B are used. This menu is only displayed when the appropriate OPERATIONAL MODE in GENERAL MENU is selected.

COUNT MODE		
This parameter defines the counter operation.		
0	A SINGLE	Input A is a counting input. Input B defines the counting direction: „LOW“ = forward „HIGH“ = reverse
1	A+B	Sum counter: Impulses at A + Impulses at B
2	A-B	Differential counter: Impulses at A – impulses at B
3	A/B 90 x1	Quadrature counter: Impulses A, B with edge counting x1
4	A/B 90 x2	Quadrature counter: Impulses A, B with edge counting x2
5	A/B 90 x4	Quadrature counter: Impulses A, B with edge counting x4

FACTOR		
Scaling factor. With the summing mode (A+B) and the differential mode (A-B) please note that the impulse scaling factor will only affect input A		
For example: A setting of factor 1.23456 and 100000 input pulses will result in a value of 123456.		
	0.00001	Smallest value
	1	Default value
	99.99999	Highest value

SET VALUE		
Upon a reset command (via keys, Control-Inputs or PC-user interface), the counter is set to the value entered here.		
	-99999999	Smallest value
	0	Default value
	+99999999	Highest value

DECIMAL POINT		
This value defines the position of the decimal point.		
0	NO	No decimal point
1	0000000.0	Decimal point at the specified position
2	000000.00	Decimal point at the specified position
3	00000.000	Decimal point at the specified position
4	0000.0000	Decimal point at the specified position
5	000.00000	Decimal point at the specified position
6	00.000000	Decimal point at the specified position
7	0.0000000	Decimal point at the specified position

5.6. Mode Velocity

In this menu the operation as a runtime measurement for speed is defined.

Input A is the start input and Input B is the stop input. This menu is only displayed when the appropriate OPERATIONAL MODE in GENERAL MENU is selected.

DISPLAY VALUE		
Desired value, which should be displayed at the setting of BASE TIME (S).		
	1	Smallest value
	1000	Default value
	999999	Highest value

BASE TIME (S)		
Reference time for the desired DISPLAY VALUE.		
	0.001	Smallest value
	1	Default value
	999.999	Highest value

DECIMAL POINT		
This value defines the position of the decimal point.		
0	NO	No decimal point
1	0000000.0	Decimal point at the specified position
2	000000.00	Decimal point at the specified position
3	00000.000	Decimal point at the specified position
4	0000.0000	Decimal point at the specified position
5	000.00000	Decimal point at the specified position
6	00.000000	Decimal point at the specified position
7	0.0000000	Decimal point at the specified position

Continuation „Mode Velocity“:

WAIT TIME (S)	
This parameter defines the period time of the lowest frequency, accordingly the time between two rising signal edges detecting frequency 0 Hz. Frequencies with a period time higher than the set "WAIT TIME" will be detected as frequency = 0 Hz.	
0,00	The display value is retained until a new value is determined.
0,01	Frequency = 0 Hz, for frequencies below 100 Hz
...	
99,99	Frequency = 0 Hz, for frequencies below 100 Hz

STANDSTILL TIME	
This parameter defines the time setting for standstill definition. A time of xx.xx seconds after detection " frequency = 0 Hz " the unit signals "standstill" and reactivates the start-up-delays. Stand still detection can be set in PRESELECT MENU. This STANDSTILL TIME is suitable at WAIT TIME unequal 0.000 only.	
0.00	Shortest time
...	
99.99	Longest time

5.7. Preselection Values

This menu is used to set the preselection values or the switching points.

The preselection values / switching points are always referred to the display value.

This menu is only available for devices with option C0350, A0350 or RL350.

PRESELECTION 1		
Preselection / switching point 1		
	-99999999	Smallest value
	10000	Default value
	+99999999	Highest value

PRESELECTION 2		
Preselection / switching point 2		
	-99999999	Smallest value
	20000	Default value
	+99999999	Highest value

PRESELECTION 3		
Preselection / switching point 3		
	-99999999	Smallest value
	30000	Default value
	+99999999	Highest value

PRESELECTION 4		
Preselection / switching point 4		
	-99999999	Smallest value
	40000	Default value
	+99999999	Highest value

5.8. Preselection 1 Menu

This function is only available for devices with option CO350, AO350 or RL350.

MODE 1		
Switching conditions for preselection 1. Output/ relay/ display switches under the following conditions:		
0	$ \text{RESULT} \geq \text{PRES} $	Absolute value of the display value is greater or equal absolute value of PRESELECTION 1 With HYSTERESIS 1 not equal 0 the following switching condition is applied: Display value \geq PRESELECTION 1 \rightarrow ON, Display value $<$ PRESELECTION 1 – HYSTERESIS 1 \rightarrow OFF
1	$ \text{RESULT} \leq \text{PRES} $	Absolute value of the display value is less or equal absolute value of PRESELECTION 1 (start-up suppression (START UP DELAY) is advisable) With HYSTERESIS 1 not equal 0 the following switching condition is applied: Display value \leq PRESELECTION 1 \rightarrow ON, Display value $>$ PRESELECTION 1 + HYSTERESIS 1 \rightarrow OFF
2	$ \text{RESULT} = \text{PRES} $	Absolute value of the display value is equal absolute value of PRESELECTION 1 A range (Preselection +/- ½ Hysteresis) can be defined and monitored in conjunction with the hysteresis. With HYSTERESIS 1 not equal 0 the following switching condition is applied: Display value $>$ PRESELECTION 1 + ½ HYSTERESIS 1 \rightarrow OFF, Display value $<$ PRESELECTION 1 - ½ HYSTERESIS 1 \rightarrow OFF
3	$\text{RESULT} \geq \text{PRES}$	Display value is greater or equal PRESELECTION 1, e.g. overspeed With HYSTERESIS 1 not equal 0 the following switching condition is applied: Display value \geq PRESELECTION 1 \rightarrow ON, Display value $<$ PRESELECTION 1 – HYSTERESIS 1 \rightarrow OFF
4	$\text{RESULT} \leq \text{PRES}$	Display value is less or equal PRESELECTION 1, e.g. underspeed (start-up suppression (START UP DELAY) is advisable) With HYSTERESIS 1 not equal 0 the following switching condition is applied: Display value \leq PRESELECTION 1 \rightarrow ON, Display value $>$ PRESELECTION 1 + HYSTERESIS 1 \rightarrow OFF
5	$\text{RESULT} = \text{PRES}$	Display value is equal PRESELECTION 1. A range (Preselection +/- ½ Hysteresis) can be defined and monitored in conjunction with the hysteresis. With HYSTERESIS 1 not equal 0 the following switching condition is applied: Display value $>$ PRESELECTION 1 + ½ HYSTERESIS 1 \rightarrow OFF, Display value $<$ PRESELECTION 1 - ½ HYSTERESIS 1 \rightarrow OFF
6	$\text{RESULT} = 0$	Display value is zero (Standstill after STANDSTILL TIME(s)), e.g. standstill monitoring, (only in mode SPEED and PROCESS TIME).
7	$\text{RESULT} \geq \text{PRES} - > 0$	Auto reset at PRESELECTION 1: Display value is greater or equal PRESELECTION 1, the display value is set to zero (only in mode mode TIMER or COUNTER).
8	$\text{RESULT} \leq 0 \rightarrow \text{SET}$	Auto set to PRESELECTION 1: Display value is less or equal zero, the display value is set to PRESELECTION 1 (only in mode COUNTER)
9	$\text{RES} \geq \text{PRES} - \text{TRAIL}$	Trailing PRESELECTION 1: Display value is greater or equal PRESELECTION 2 – PRESELECTION 1 \rightarrow ON, PRESELECTION 1 is the trailing value from PRESELECTION 2

Continuation „PRESELECTION 1 MENU“:

HYSTERESIS 1		
This parameter defines the switching hysteresis of the switch-off point for preselection 1		
	0	No switching hysteresis
	...	
	9999	Switching hysteresis of 99999

PULSE TIME 1 (S)		
Duration of output pulse for the switching condition of preselection 1		
	0.000	No output pulse (static signal)
	...	
	60.000	Pulse duration of 60 seconds

OUTPUT TARGET 1		
Assignment of an output or relay for the switching condition of preselection 1. If more than one switching condition is assigned to one output / relay, the output is set when at least one switching condition is true		
	0 NO	No assignment
	1 CTRL OUT 1	Switching condition assigned to "Ctrl. Out 1"
	2 CTRL OUT 2	Switching condition assigned to "Ctrl. Out 2"
	3 CTRL OUT 3	Switching condition assigned to "Ctrl. Out 3"
	4 CTRL OUT 4	Switching condition assigned to "Ctrl. Out 4"
	5 RELAY 1	Switching condition assigned to "Rel. 1"
	6 RELAY 2	Switching condition assigned to "Rel. 2"

OUTPUT POLARITY 1		
Polarity for the switching condition of preselection 1		
	0 ACTIVE HIGH	Switching condition is true → Active „HIGH“
	1 ACTIVE LOW	Switching condition is true → Active „LOW“

OUTPUT LOCK 1		
Latch for the switching condition of preselection 1		
	0 NO	No latch for preselection
	1 YES	Latch for preselection (command LOCK RELEASE will clear latch)

Continuation „PRESELECTION 1 MENU“:

START UP DELAY 1 (S)		
Start-up suppression for the switching condition of preselection 1.		
This adjustment is only valid for the switching condition $ RESULT \leq PRES $ or $RESULT \leq PRES$ and mode SPPED and PROCESS TIME.		
(Start Up Delay 3 and 4 have an automatic start up suppression).		
	00.000	No start-up suppression
	...	
	60.000	Start-up suppression in seconds

EVENT COLOR 1		
Event-depending change of the display color for the switching condition of preselection 1.		
EVENT COLOR 1 has the lowest priority. EVENT COLOR 2 ... 4 are allowed to overwrite this color change.		
0	NO CHANGE	No color change.
1	CHANGE TO RED	Color change to red
2	CHANGE TO GREEN	Color change to green
3	CHANGE TO YELLOW	Color change to yellow

5.9. Preselection 2 Menu

MODE 2

Switching conditions for preselection 2. Output/ relay/ display switches under the following conditions:

		See chapter PRESELECTION 1 MENU
9	RES \geq PRES-TRAIL	Trailing preselection 2: Display value is greater or equal to PRESELECTION 1 – PRESELECTION 2 → ON, PRESELECTION 2 is the trailing preselection from PRESELECTION 1.

HYSTERESIS 2

This parameter defines the switching hysteresis of the switch-off point for preselection 2.

See chapter PRESELECTION 1 MENU.

PULSE TIME 2 (S)

Duration of output pulse for the switching condition of preselection 2.

See chapter PRESELECTION 1 MENU.

OUTPUT TARGET 2

Assignment of an output or relay for the switching condition of preselection 2.

See chapter PRESELECTION 1 MENU.

OUTPUT POLARITY 2

Polarity for the switching condition of preselection 2.

See chapter PRESELECTION 1 MENU.

OUTPUT LOCK 2

Latch for the switching condition of preselection 2.

See chapter PRESELECTION 1 MENU.

START UP DELAY 2 (S)

Start-up suppression for the switching condition of preselection 2.

See chapter PRESELECTION 1 MENU.

(Start Up Delay 3 and 4 have an automatic start up suppression).

EVENT COLOR 2

Event-depending change of the display color for the switching condition of preselection 2.

See chapter PRESELECTION 1 MENU.

5.10. Preselection 3 Menu

MODE 3

Switching conditions for preselection 3. Output/ relay/ display switches under the following conditions:

		See chapter PRESELECTION 1 MENU
9	RES>=PRES-TRAIL	Trailing preselection 3: Display value is greater or equal to PRESELECTION 4 – PRESELECTION 3 → ON, PRESELECTION 3 is the trailing preselection from PRESELECTION 4.

HYSTERESIS 3

This parameter defines the switching hysteresis of the switch-off point for preselection 3.

See chapter PRESELECTION 1 MENU.

PULSE TIME 3 (S)

Duration of output pulse for the switching condition of preselection 3.

See chapter PRESELECTION 1 MENU.

OUTPUT TARGET 3

Assignment of an output or relay for the switching condition of preselection 3.

See chapter PRESELECTION 1 MENU.

OUTPUT POLARITY 3

Polarity for the switching condition of preselection 3.

See chapter PRESELECTION 1 MENU.

OUTPUT LOCK 3

Latch for the switching condition of preselection 3.

See chapter PRESELECTION 1 MENU.

START UP DELAY 3

Start-up suppression for the switching condition of preselection 3.

This adjustment is only valid for the switching condition $|\text{RESULT}| \leq |\text{PRES}|$ or $\text{RESULT} \leq \text{PRES}$ and mode SPPED and PROCESS TIME. (Start Up Delay 1 and 2 have a time-dependent start up suppression).

0	OFF	No start-up suppression
1	AUTO	Automatic start up suppression, until the preselection value / switching point is exceeded for the first time.

EVENT COLOR 3

Event-depending change of the display color for the switching condition of preselection 3.

See chapter PRESELECTION 1 MENU.

5.11. Preselection 4 Menu

MODE 4

Switching conditions for preselection 4. Output/ relay/ display switches under the following conditions:

		See chapter PRESELECTION 1 MENU
9	RES \geq PRES-TRAIL	Trailing preselection 4: Display value is greater or equal to PRESELECTION 3 – PRESELECTION 4 → ON, PRESELECTION 4 is the trailing preselection from PRESELECTION 3.

HYSTERESIS 4

This parameter defines the switching hysteresis of the switch-off point for preselection 4.

See chapter PRESELECTION 1 MENU.

PULSE TIME 4 (S)

Duration of output pulse for the switching condition of preselection 3.

See chapter PRESELECTION 1 MENU.

OUTPUT TARGET 4

Assignment of an output or relay for the switching condition of preselection 4.

See chapter PRESELECTION 1 MENU.

OUTPUT POLARITY 4

Polarity for the switching condition of preselection 4.

See chapter PRESELECTION 1 MENU.

OUTPUT LOCK 4

Latch for the switching condition of preselection 4.

See chapter PRESELECTION 1 MENU.

START UP DELAY 4

Start-up suppression for the switching condition of preselection 4.

This adjustment is only valid for the switching condition $|\text{RESULT}| \leq |\text{PRES}|$ or $\text{RESULT} \leq \text{PRES}$ and mode SPPED and PROCESS TIME. (Start Up Delay 1 and 2 have a time-dependent start up suppression).

0	OFF	No start-up suppression
1	AUTO	Automatic start up suppression, until the preselection value / switching point is exceeded for the first time.

EVENT COLOR 4

Event-depending change of the display color for the switching condition of preselection 4.

See chapter PRESELECTION 1 MENU.

5.12. Serial Menu

This menu defines the basic settings of serial interface.

This function is only available for devices with option C0350 or A0350.

UNIT NUMMER		
This parameter defines serial device addresses. The addresses between 11 and 99 can be assigned to the devices. Addresses with zero are not allowed, there are used as broadcast addresses.		
	11	Smallest address
	...	
	99	Highest address

SERIAL BAUD RATE		
This parameter defines the serial baud rate		
0	9600	9600 baud
1	19200	19200 baud
2	38400	38400 baud

SERIAL FORMAT				
This parameter defines the bit data format.				
0	7-EVEN-1	7 data	Parity even	1 Stop
1	7-EVEN-2	7 data	Parity even	2 Stops
2	7-ODD-1	7 data	Parity odd	1 Stop
3	7-ODD-2	7 data	Parity odd	2 Stops
4	7-NONE-1	7 data	no Parity	1 Stop
5	7-NONE-2	7 data	no Parity	2 Stops
6	8-EVEN-1	8 data	Parity even	1 Stop
7	8-ODD-1	8 data	Parity odd	1 Stop
8	8-NONE-1	8 data	no Parity	1 Stop
9	8-NONE-2	8 data	no Parity	2 Stops

SERIAL INIT		
This parameter defines the baud rate for the initialization to the user interface OS6.0. With settings larger than 9600 the initialization time can be reduced.		
0	NO	Initialization with 9600 baud. Then the device operates with the value selected by the user.
1	YES	Initialization with the baud rate set by SERIAL BAUD RATE. Then the device operates with the value selected by the user.

Continuation „Serial Menu“:

SERIAL PROTOCOL													
<p>Determines the sequence of characters send, when using the serial output for cyclic data transmission under time control (xxxxxx = value SERIAL VALUE). Setting „1“ removes the unit address from the string which allows a slight faster transmission cycle.</p>													
0	Transmission report = Unit Nr., +/-, data, LF, CR <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>1</td><td>1</td><td>+/-</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>LF</td><td>CR</td> </tr> </table>	1	1	+/-	X	X	X	X	X	X	X	LF	CR
1	1	+/-	X	X	X	X	X	X	X	LF	CR		
1	Transmission report = +/-, data, LF, CR <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>+/-</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>LF</td><td>CR</td> </tr> </table>	+/-	X	X	X	X	X	X	X	LF	CR		
+/-	X	X	X	X	X	X	X	LF	CR				

SERIAL TIMER (S)	
<p>This register determines the cycle time in seconds for cycling transmission of SERIAL VALUE when using the serial output. (On a serial request, the cycling transmission is stopped for 20 s)</p>	
0.000	All cyclic transmission is switched off. The unit will send data upon a serial request or with command SERIAL PRINT.
...	
60.000	Cycle time in seconds.

SERIAL VALUE			
This parameter defines the value to be transmitted.			
Setting	Code	Register contents	
1	:1	Display value	
2	:2	Minimum value	
3	:3	Maximum value	

5.13. Analog Menu

This menu defines the basic settings of the analog output.

This function is only available for devices with option A0350.

ANALOG FORMAT		
This parameter defines the output characteristics. The analogue output is proportional to the display value. With setting ANALOG FORMAT (-10 ... +10 V) in MODE COUNTER the polarity of the analog output depends on the polarity of the display value.		
0	-10...10V	-10 ... +10 V
1	0...20M	0 ... 20 mA
2	4...20MA	4 ... 20 mA

ANALOG START		
This parameter defines the start value of the analog conversion. This start value is corresponding to the display value for an analog output of 0 V or 0/4 mA.		
	-99999999	Smallest start value
	0	Default value
	+99999999	Highest start value

ANALOG END		
This parameter defines the end value of the analog conversion. This end value is corresponding to the display value for an analog output of (+/-) 10 V or 20mA.		
	-99999999	Smallest end value
	10000	Default Wert
	+99999999	Highest end value

ANALOG GAIN (%)		
This parameter specifies the maximum conversion of the analog output in %.		
e. g. 102.00 corresponds to a conversion of 10.2 V or 20.4 mA, when the ANALOG END value is reached.		
e. g. 95.00 corresponds to a conversion of 9.5 V or 18 mA, when the ANALOG END value is reached.		
	0	Smallest gain
	100	Default value
	110	Highest gain

ANALOG OFFSETT (%)		
This parameter defines the zero offset of the analog output.		
z. B. 0.20 result in an offset of 0.2 V or 0.4 mA at ANALOG START value		
	-99.99	Smallest offset
	0	Default value
	+99.00	Highest offset

5.14. Command Menu

INPUT 1 ACTION

This parameter defines the function of the input "Ctrl. In 1".

0	NO	No function
1	RESET VALUE	Mode Timer: Reset to zero Mode Counter: Set to SET VALUE
2	SCROLL DISPLAY	Switch to next screen during operation
3	FREEZE	Freeze actual display value
4	RESET MIN/MAX	Reset of the min. / max. values
5	KEY LOCK	disable touch screen
6	LOCK RELEASE	Release all latched switching conditions
7	SERIAL PRINT	Sending of serial data, see parameter SERIAL VALUE

INPUT 1 CONFIG

This parameter defines the switching characteristics of the input "Ctrl. In 1".

0	ACTIVE LOW	Active at „LOW“ (static)
1	ACTIVE HIGH	Active at „HIGH“ (static)
2	RISING EDGE	Activate at rising edge
3	FALLING EDGE	Activate at falling edge

INPUT 2 ACTION

This parameter defines the function of the input "Ctrl. In 2".
See parameter INPUT 1 ACTION.

INPUT 2 CONFIG

This parameter defines the switching characteristics of the input "Ctrl. In 2".
See parameter INPUT 1 CONFIG.

INPUT 3 ACTION

This parameter defines the function of the input "Ctrl. In 3".
See parameter INPUT 1 ACTION.

INPUT 3 CONFIG

This parameter defines the switching characteristics of the input "Ctrl. In 3".
See parameter INPUT 1 CONFIG.

5.15. Display Menu

Parameter changes become active only after closing the menu selection.

COLOR			
This parameter defines the display color.			
Event-dependending change of the display color by a switching condition is possible (see PRESELECTION 1...4 MENU)			
Event-dependending changes are only available for devices with option CO350, A0350 or RL350.			
	0	RED	Red display
	1	GREEN	Green display
	2	YELLOW	Yellow display

BRIGHTNESS (%)		
This parameter defines the brightness of the display in percent		
	10	Min. brightness
	90	Default value
	100	Max. brightness

CONTRAST		
This parameter defines the viewing angle.		
	0	Viewing angle from top
	1	Viewing angle from center
	2	Viewing angle from bottom

SCREEN SAVER (S)		
This parameter defines the time in seconds until the display is switched off, after the last touch action. A new touch action will activate the display again.		
	0	No switch off
	...	
	99.99	Longest time to switch off

UP-DATE-TIME (S)		
This parameter defines the update time in seconds of the display only.		
	0.005	Shortest update time
	0.1	Default value
	9.999	Longest update time

FONT		
This parameter defines the setting of the font style.		
	0	Standard
	1	Font 1

5.16. Linearization Menu

The linearization function is defined in this menu. The linearization points are only used in operation mode SPEED, PROCESS TIME or COUNTER. This menu will only be showed, if the LINEARIZATION MODE in GENERAL MENU is selected.

Linearization description and examples are shown in the appendix.

P1(X) - P24(X)	
X-coordinate of the linearization point. This value representing the display value which the unit show in the display without linearization.	
-99999999	Smallest X-coordinate
0	Default value
+99999999	Largest X-coordinate

P1(Y) - P24(Y)	
Y-coordinate of the linearization point This is the display value, which the unit should show in the display with linearization. E.g. P2(X) is replaced by P2(Y).	
-99999999	Smallest Y-coordinate
0	Default value
+99999999	Largest Y-coordinate

6. Appendix

6.1. Data readout via serial interface

All codes shown in the parameter SERIAL VALUE are available for serial readout by PC or PLC. For communication the monitors use the Drivecom Protocol according to ISO 1745. All protocol details can be found in our manual SERPRO_2a.doc which is available for download from our homepage www.motrona.com.

To request for a data transmission you must send the following request string to the converter:

EOT	AD1	AD2	C1	C2	ENQ
-----	-----	-----	----	----	-----

EOT = control character (Hex 04)

AD1 = unit address, High Byte

AD2 = unit address, Low Byte

C1 = register code, High Byte

C2 = register code, Low Byte

ENQ = control character (Hex 05)

The following example shows the request string for readout of the actual input frequency of a monitor (Code :1) from a unit with unit address 11:

ASCII-Code:	EOT	1	1	:	1	ENQ
Hex-Code:	04	31	31	3A	31	05
Binary-Code:	0000 0100	0011 0001	0011 0001	0011 1010	0011 0001	0000 0101

After a correct request, the unit will respond:

STX	C1	C2	xxxxx	ETX	BCC
-----	----	----	-------	-----	-----

STX = control character (Hex 02)

C1 = register code, High Byte

C2 = register code, Low Byte

xxxxx = readout data

ETX = control character (Hex 03)

BCC = block check character

6.2. Linearization

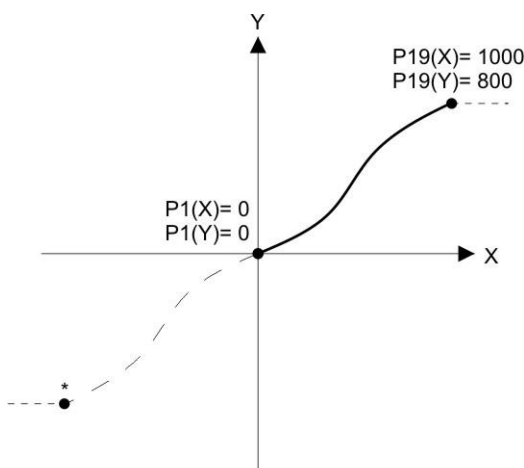
The linearization function of this unit allows converting a linear input signal into a non-linear developing (or vice versa). There are 24 programmable x/y coordinates available, which can be set in any desired distance over the full conversion range. Between two coordinates, the unit uses linear interpolation. Therefore it is advisable to use more coordinates in a range with strong curves and only a few coordinates where the curvature is less.

To specify an individual linearization curve, the parameter LINEARISAZATION MODE must be set to either 1 QUADRANT or 4 QUADRANT (see following diagram).

The parameters P1(X) to P24(X) are used to specify the coordinates on the x-axis. These are the measuring values that the unit normally would generate according to the actual input signal.

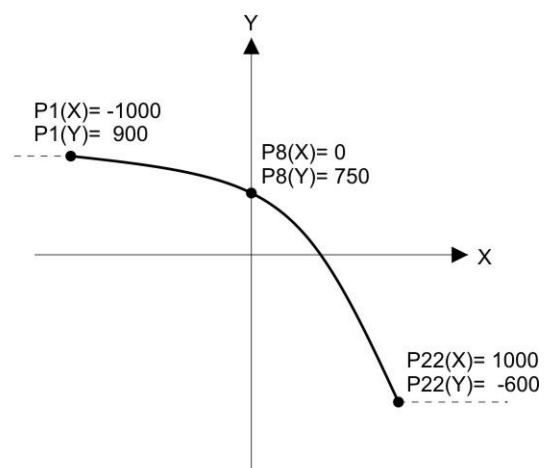
Now enter the attached values to parameter P1(Y) to P24(Y). These are the values that the unit will generate instead of the x- values, i.e. P5(Y) replaces P5(X) etc.

The X-Coordinates must use continuously increasing settings, i.e. P1(X) must have the lowest and P24(X) must have the highest setting. If the measured value is bigger than the last defined X-value, the corresponding Y-value is displayed.



Example: Linearization Mode: 1 Quadrant

* Linearization is point symmetric to 1. Quadrant



Example: Linearization Mode: 4 Quadrant

Mode: 1 Quadrant:

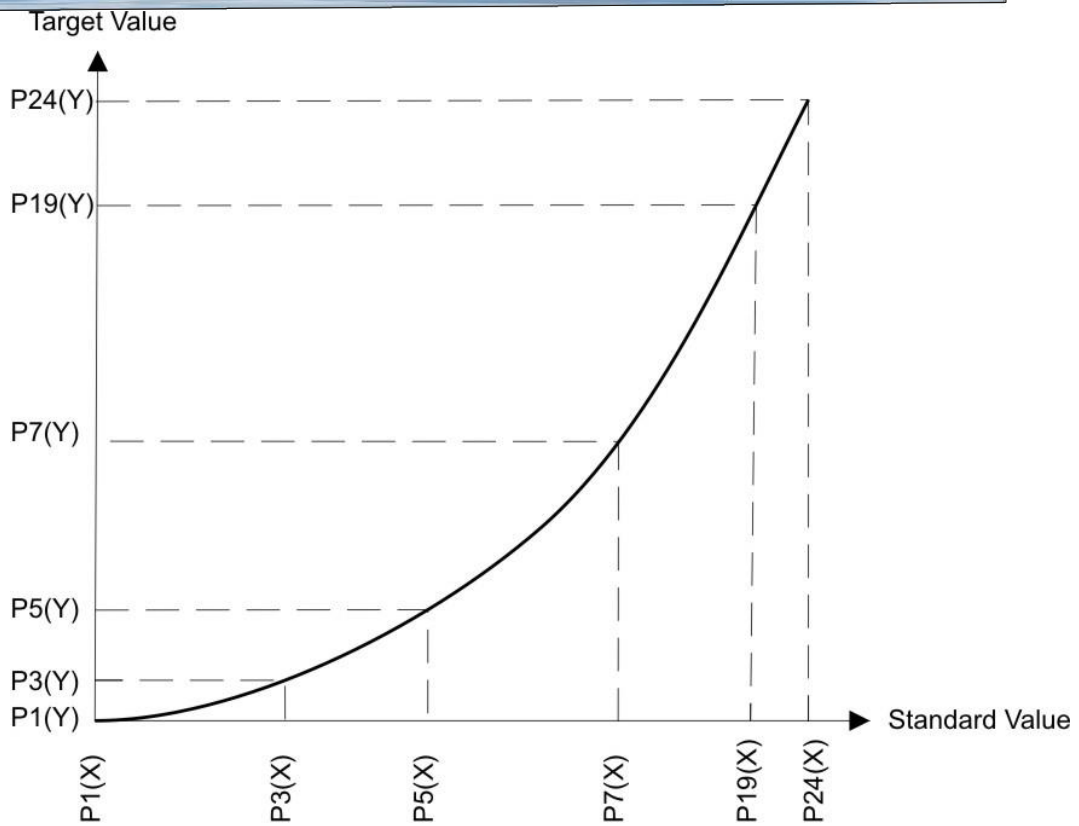
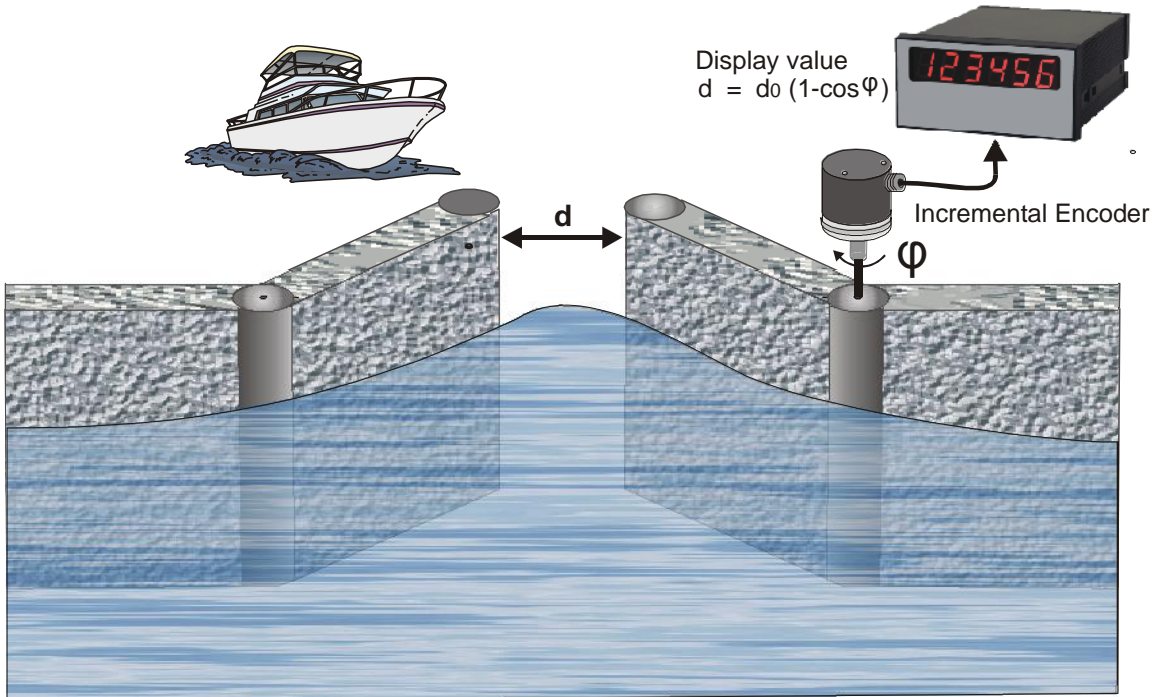
P1(X) must be set to zero. Linearization is only defined in the positive range and the negative range will be mirrored symmetric to central point.

Mode: 4 Quadrant:

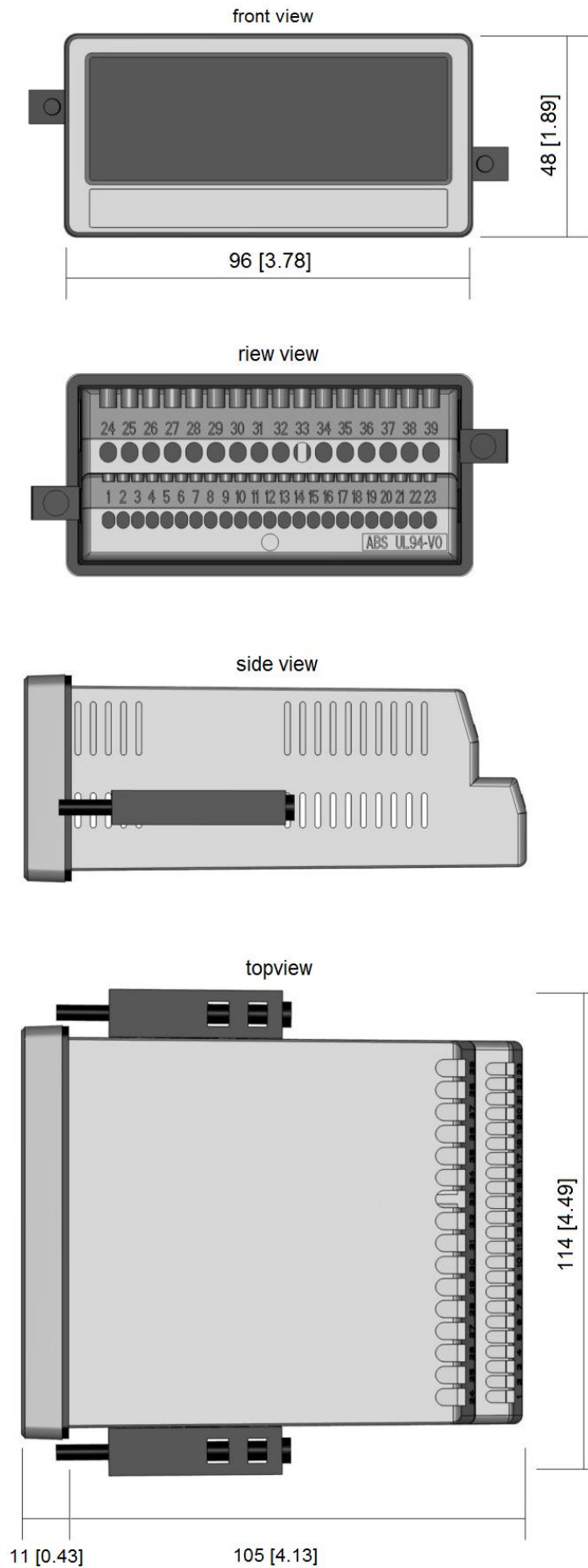
P1(X) can also be set to a negative value. If the measured value is smaller than P1(X), P1(Y) is displayed.

Application Example:

The picture below shows a watergate where the opening is picked up by means of an incremental encoder. We would like to display the clearance of the gate "d", but the existing encoder information is proportional to the angular information φ .



6.3. Dimensions



6.4. Technical specifications

Technical Specifications:		
Connections:	Connector type:	screw terminal, 1.5 mm ² / AWG 16
Power supply (DC):	Input voltage:	18 ... 30 VDC
	Protection circuit:	reverse polarity protection
	Consumption:	approx. 100 mA (unloaded)
Power supply (AC): (Option AC350)	Input voltage:	115 ... 230 VAC (50 ... 60 Hz)
	Power consumption:	approx. 3 VA (unloaded)
Encoder supply:	DC version:	approx. 1 V lower than the power supply voltage
	Output current:	max. 250 mA
	AC version:	approx. 24 VDC (± 15%)
	Output current:	150 mA to 45°C / 80 mA above 45°C
Incremental inputs:	Number of inputs:	2
	Configuration:	PNP, NPN, Namur or Tri-State
	Channels:	A, B
	Format:	HTL (Low 0 ... 3 V, High 9 ... 30 V)
	Frequency:	max. 250 kHz
	Load:	max. 6 mA / Ri > 5 kOhm / 470 pF
Control inputs:	Number of inputs:	3
	Format:	HTL, PNP (Low 0 ... 3 V, High 9 ... 30 V)
	Frequency:	max. 10 kHz
	Load:	max. 2 mA / Ri > 15 kOhm / 470 pF
Analog output: (Option A0350)	Configuration:	current or voltage operation
	Voltage output:	-10...+10 V (max. 2 mA)
	Current output:	0/4 ... 20 mA (burden: max. 270 Ohm)
	Resolution:	16 Bit
	Accuracy:	± 0,1 %
Control outputs: (Option C0350)	Number of outputs:	4
	Format / level:	5 ... 30 V (depend on COM+ voltage), PNP
	Output current:	max. 200 mA
	Reaction time:	< 1 ms
Relay outputs: (Option RL350)	Number of outputs:	2
	Configuration:	potential free changeovers
	AC-Switching capacity:	max. 250 VAC / 3 A / 750 VA
	DC-Switching capacity:	max. 150 VDC / 2 A / 50 W
	Reaction time:	< 5 ms
Serial interface: (Option C0350)	Format:	RS232
	Baud rate:	9600, 19200 or 38400 baud
Display:	Type:	Graphic LCD with backlight
	Display range:	8 digits plus sign (-99999999 ... 99999999)
	Digit height:	13 mm height
	Color:	red / green / yellow (selectable)
	Operation:	resistive touchscreen
Housing:	Material:	ABS, UL 94 V-0
	Mounting:	panel
	Dimensions (w x h x d):	96 x 48 x 116 mm / 3.78 x 1.89 x 4.56 inch
	Cut out (w x h):	91 x 43 mm / 3.58 x 1.69 inch
	Protection class:	IP65 (front), IP20 (rear)
	Weight:	approx. 200 g
Ambient temperature:	Operation:	-20°C ... +60°C / -4 ... 140°F
	Storage:	-25°C ... +70°C / -13 ... 158°F
Conformity and standards:	EMC 2004/108/EC:	EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
	LV 2006/95/EC:	EN 61010-1
	RoHS 2011/65/EU:	EN 50581