TC-LCDC-8A-24VDC, TC-LCDC-8A-230VAC

Pulse Counter, Tachometer, and Rotational Speed Measuring Instrument with Touch Screen and Graphic Display

Manual

Your automation, our passion.

PEPPERL+FUCHS

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Worldwide

Pepperl+Fuchs Group

Lilienthalstr. 200

68307 Mannheim

Germany

Phone: +49 621 776 - 0

E-mail: info@de.pepperl-fuchs.com

North American Headquarters

Pepperl+Fuchs Inc.

1600 Enterprise Parkway

Twinsburg, Ohio 44087

USA

Phone: +1 330 425-3555

E-mail: sales@us.pepperl-fuchs.com

Asia Headquarters

Pepperl+Fuchs Pte. Ltd.

P+F Building

18 Ayer Rajah Crescent

Singapore 139942

Phone: +65 6779-9091

E-mail: sales@sg.pepperl-fuchs.com

https://www.pepperl-fuchs.com

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1 Introduction

1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

Note

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

1.2 Manufacturer

Pepperl+Fuchs Group Lilienthalstraße 200, 68307 Mannheim, Germany
Internet: www.pepperl-fuchs.com

1.3 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.4 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:

Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.

Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.

Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols

Note

This symbol brings important information to your attention.

Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

2 Product Description

2.1 Product Characteristics

The device is designed for panel mounting as a display device for HTL pulses. The intuitive operation and extensive range of functions make it suitable for universal use.

- Multifunction device with operating modes such as rev counter, other counters, throughput time display, position display, timer for runtimes, stopwatch, and process display
- Universal inputs (HTL/RS422) for encoders/sensors with NPN/PNP/NAMUR characteristics
- Bright, high-contrast display with event-dependent color versions
- Emulation of a seven-segment display with symbols and units
- Intuitive and simple parameterization using plain text and touch screen
- Auxiliary voltage output 5/24 V DC for encoder supply
- Input frequency up to 1 MHz
- Linearization with 24 interpolation points
- Numerous functions such as scaling, filters, and start-up override
- Standard installation housing with dimensions of 96 mm x 48 mm and IP65 degree of protection

2.2 Operating Modes

You can configure all functions in the Parameter menu.

You can use the device in the following operating modes:

- **SPEED** (input A or input A and B active, depends on the parameter)
  - Tachometer / velocity display
  - Frequency measurement / speed display (e.g., RPM)
  - Monitoring of speed rotational speed and downtime
- **PROCESS TIME** (only input A is active)
  - Process time display (reciprocal speed)
  - Baking time display
  - Runtime display
- **TIMER** (input A or input A and B active, depends on the parameter)
  - Stopwatch (start/stop functions can be freely parameterized)
  - Operating hours counter
  - Measurement of cycle duration
- **COUNTER** (inputs A and B are active)
  - Pulse counter / cumulative counter or differential counter
  - Incrementing or decrementing counter
  - Position display
  - Angle sensor
  - Quadrature counter
  - Quantity counter (batch counter)
- **VELOCITY** (input A used as the start input and input B as the stop input)
  - Velocity display from runtime measurement.

2.3 Functional Diagram

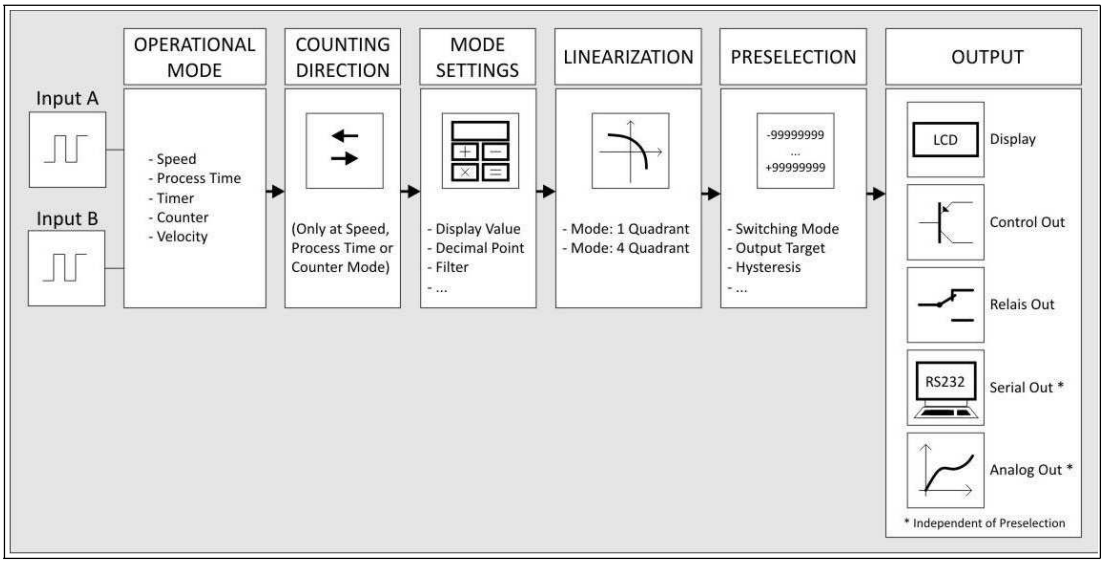

Figure 2.1

3 Installation

3.1 Power Source

Tighten the terminals with a slotted screwdriver (blade width: 2 mm).

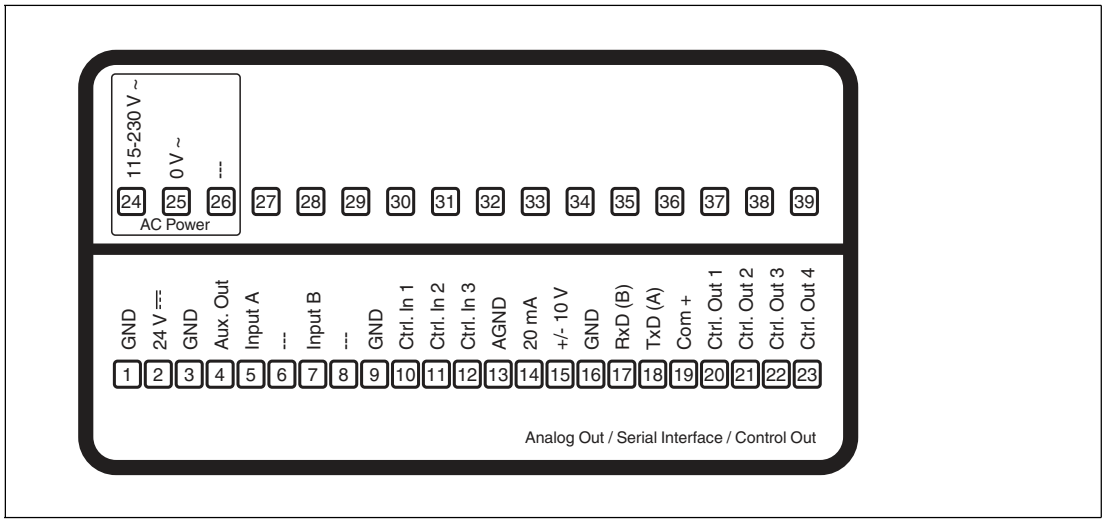

Figure 3.1

Note

AC Power only applies to a device with AC voltage supply.

AC Voltage Supply

You can supply the device with an alternating-current voltage between 115 V AC and 230 V AC via terminals 24 and 25. The power consumption depends on factors such as the level of supply voltage and the settings and is approx. 3 VA, plus the encoder current drawn at the auxiliary voltage output.

Devices with AC voltage supply can be supplied with a direct-current voltage between 18 V DC and 30 V DC via terminals 1 and 2.

DC Voltage Supply

You can supply the device with a direct-current voltage between 18 V DC and 30 V DC via terminals 1 and 2. The current consumption depends on factors such as the level of supply voltage and the settings and is approx. 100 mA, plus the encoder current drawn at the auxiliary voltage output.

All GND connections are internally interconnected.

Auxiliary Voltage Output

An auxiliary voltage is available as an encoder/sensor supply at terminals 3 and 4.

The output voltage depends on the device supply.

DC device supply	AC device supply
The output voltage is approx. 1 V less than the supply voltage supplied at terminals 1 and 2 and may be loaded with a maximum of 250 mA.	The output voltage is 24 V DC (±15%) and may be loaded up to 45°C with a maximum of 150 mA. At higher temperatures, the maximum output current is reduced to 80 mA.

3.2 Inputs

Incremental Inputs A, B

Two pulse inputs for HTL signals are available at terminals 5 and 7. The characteristic (PNP, NPN, Namur, or Tri-State) of the incremental inputs can be set in the GENERAL MENU.

Connection of incremental inputs:

PNP

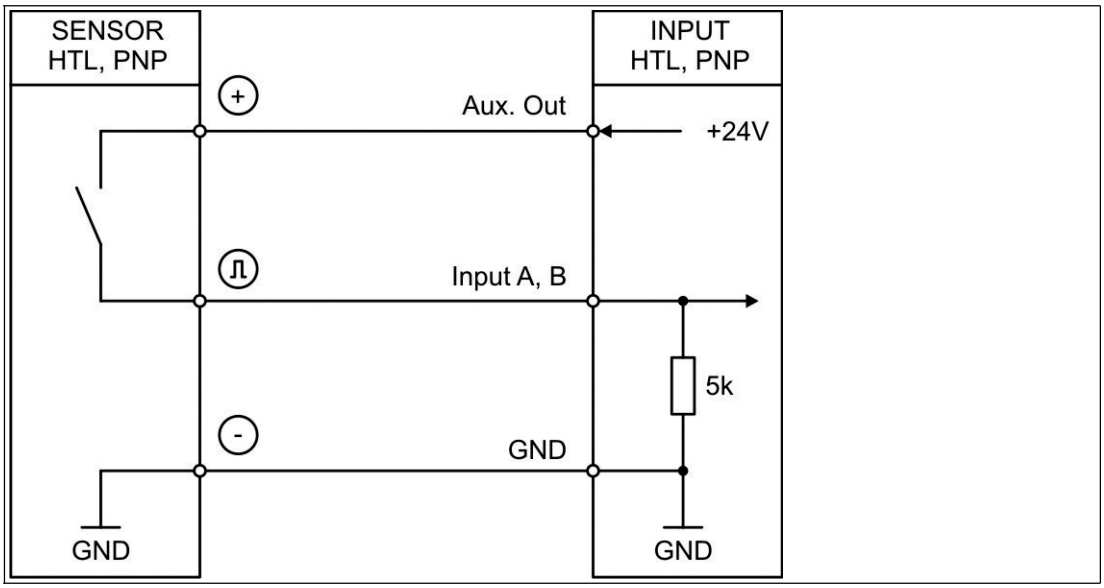

Figure 3.2

NPN

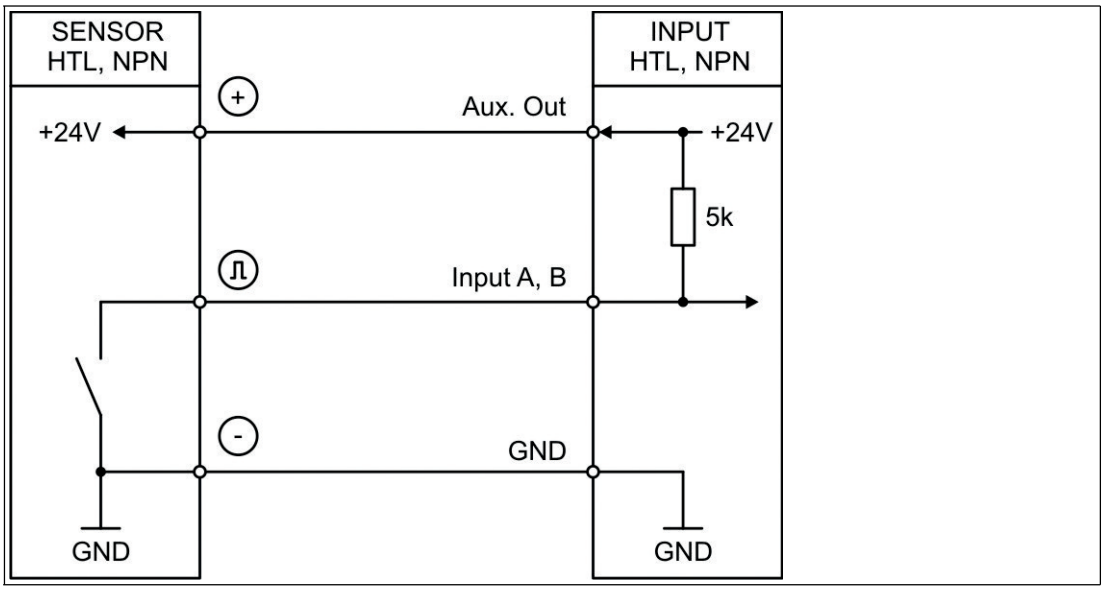

Figure 3.3

NAMUR

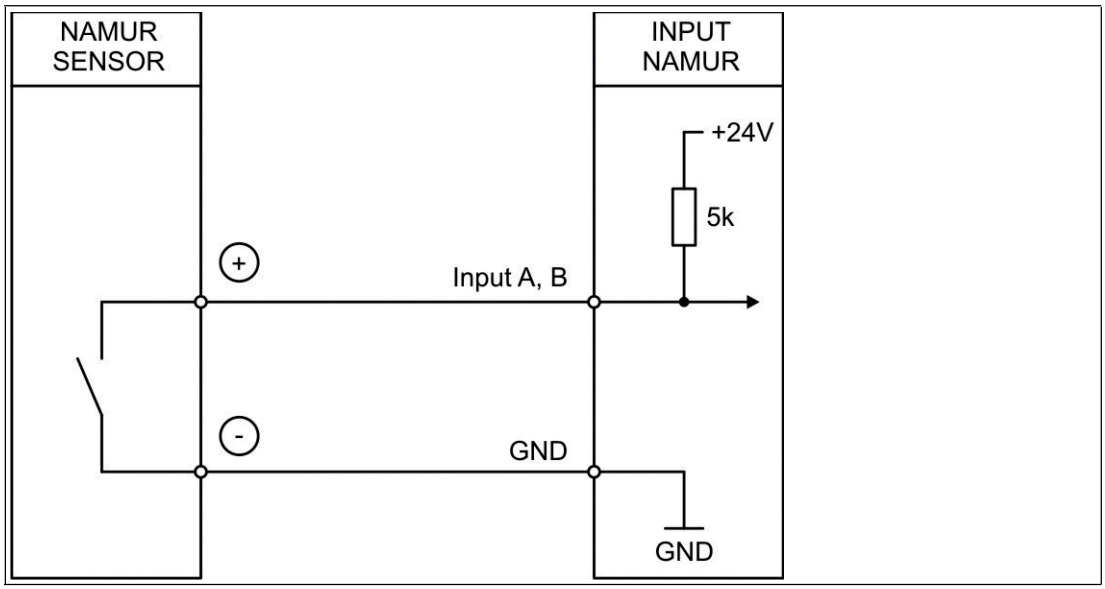

Figure 3.4

Tri-State

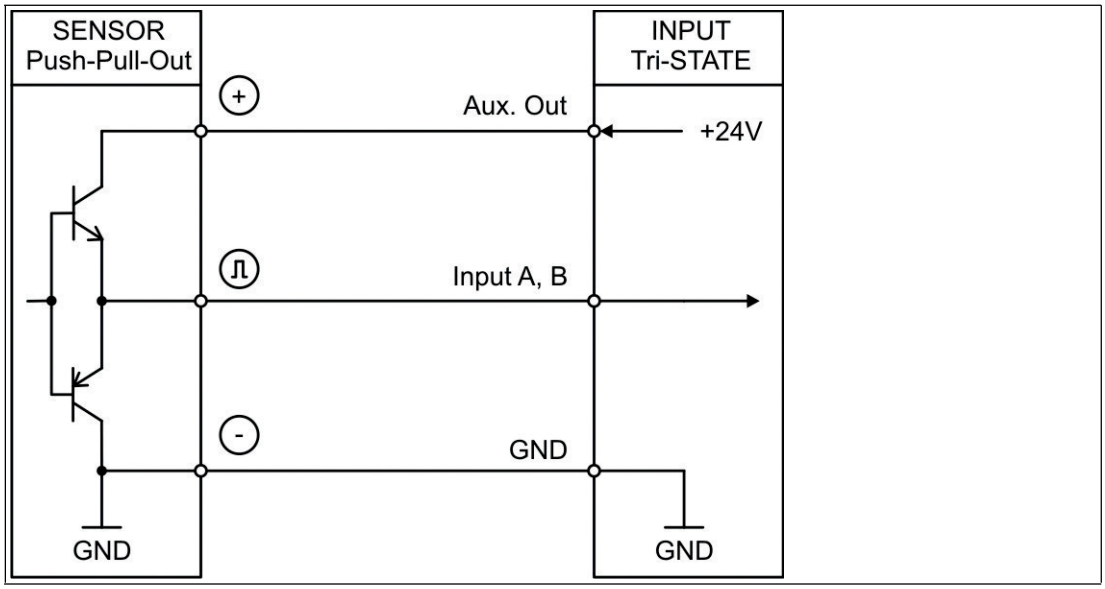

Figure 3.5

In principle, open PNP inputs are LOW and open NPN inputs are HIGH. The input stages are designed for electronic pulse sensors.

Note

Mechanical switching contacts

If, in exceptional cases, mechanical contacts are used as a pulse source, you must attach a conventional external capacitor of approx. 10 µF to the terminals between GND (-) and the corresponding input (+). This attenuates the maximum input frequency to approx. 20 Hz and suppresses bounce.

Control Inputs

Three control inputs with HTL PNP characteristics are available at terminals 10, 11, and 12. You can configure these inputs in the COMMAND MENU and use them for externally triggered functions, e.g., resetting the display value, changing the display, locking the touch screen, or releasing the self-lock of control and relay outputs.

Connection of control inputs:

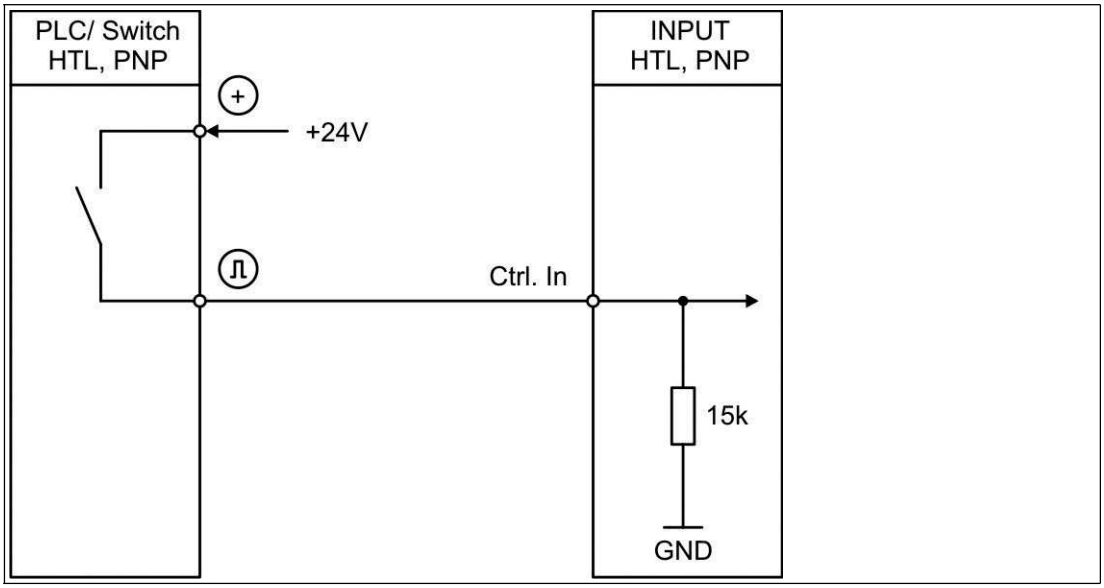

Figure 3.6

In principle, open control inputs are LOW. The input stages are designed for electronic control signals.

Note

Mechanical switching contacts

If, in exceptional cases, mechanical contacts are used as a pulse source, you must attach a conventional external capacitor of approx. 10 µF to the terminals between GND (-) and the corresponding input (+). This attenuates the maximum input frequency to approx. 20 Hz and suppresses bounce.

3.3 Outputs

Analog Output

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

The analog output is proportional to the value displayed and refers to AGND potential. AGND and GND devices are internally interconnected.

Warning!

Important:

Parallel operation of voltage and current outputs is not permitted!

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Serial Interface

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

The RS232 interface can be used as follows:

- To parameterize the device during commissioning
- To change parameters during operation
- To read out actual values via the PLC or PC

The diagram below shows the connection to a PC with a standard plug (D-SUB 9-pin):

Connection of the RS232 interface

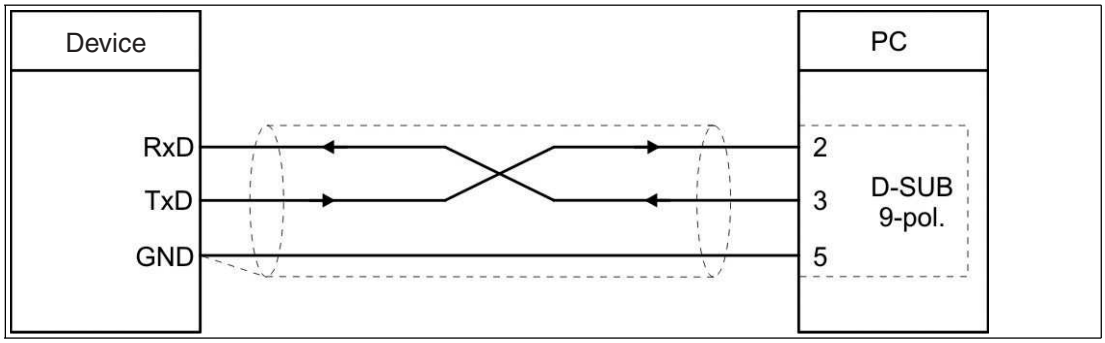

Figure 3.7

Control Outputs

Four control outputs are available at terminals 20, 21, 22, and 23. The switching conditions can be set in the PRESELECTION MENU. The Ctrl. Out 1 – 4 outputs are quick PNP outputs with a switching capacity of 5 V … 30 V and 200 mA per channel. The switch state is shown in the display (unit and status bar display) as C1 … C4.

The switching voltage is determined by the voltage supplied at terminal 19 (COM+).

External damping measures are recommended for switching inductive loads.

Connection of control outputs

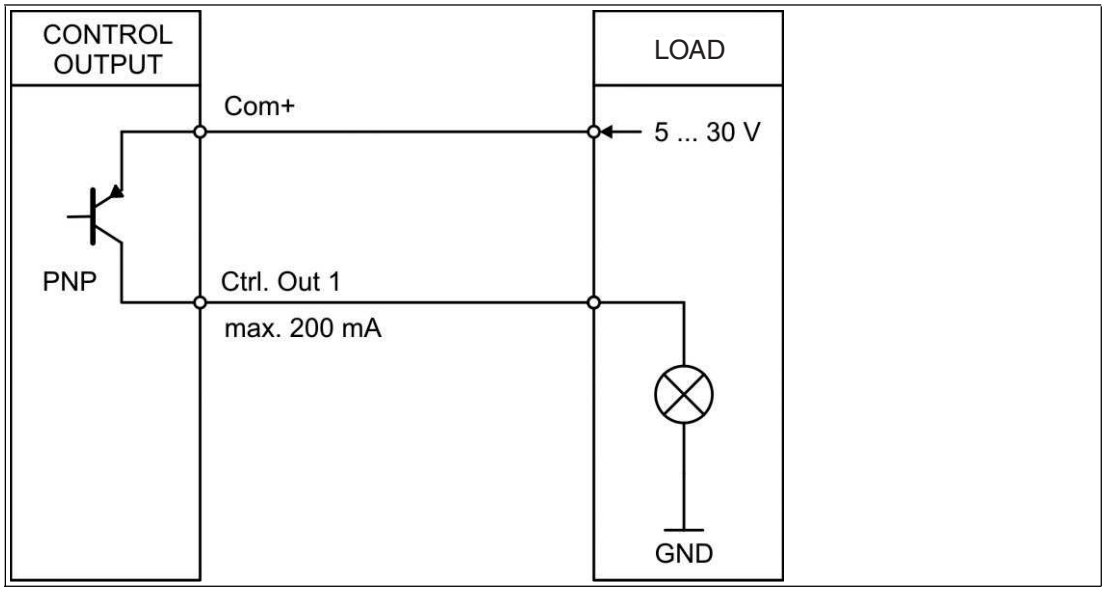

Figure 3.8

4 Operation

4.1 Touch Screen

4.1.1 Parameterization

The individual parameter menus and their parameters are described in the "Operating Software" section.

Note

To set device parameters, press the touch screen for three seconds.

Parameterizing the device

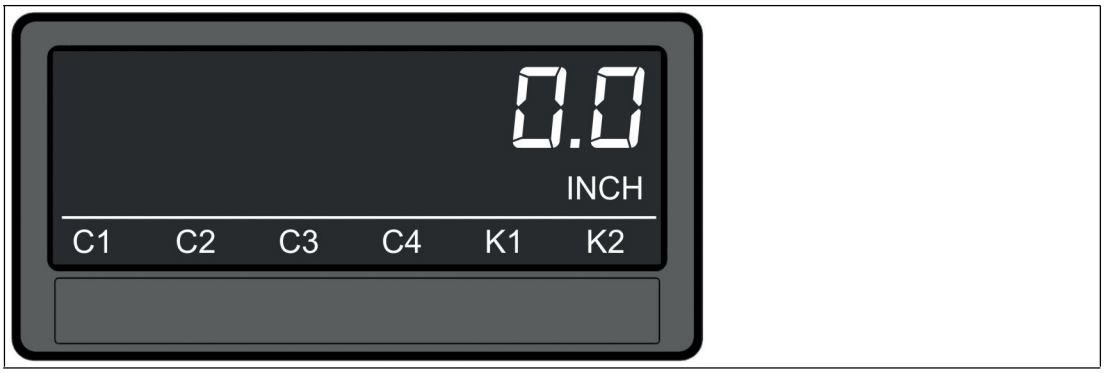

Figure 4.1

Selecting a menu

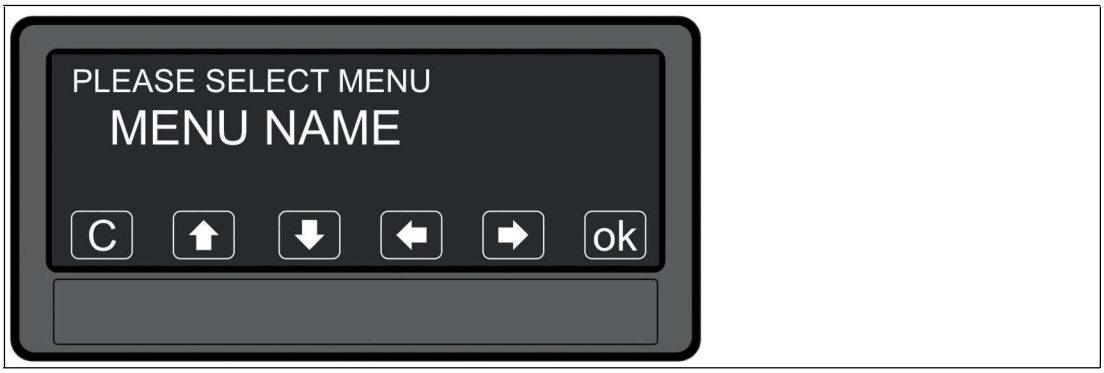

Figure 4.2 Use the arrow keys to select the required parameter menu and confirm by pressing "OK."

Pressing "C" exits the menu selection.

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Selecting parameters

Figure 4.3 Use the arrow keys to select the required parameter and confirm by pressing "OK." Pressing "C" exits the parameter selection.

Editing parameters

Figure 4.4 Use the arrow keys to edit the selected parameter and save by pressing "OK." Pressing "C" exits the editing screen.

Note

Parameter changes only become active after exiting the menu selection.

4.1.2 Display Layout During Operation

The following displays are available during operation. Only certain displays are shown depending on the device version and the selected operating mode.

Unit and status bar display

Figure 4.5 Tap the touch screen to change to the next display.

Counter and batch counter display (quantity counter)

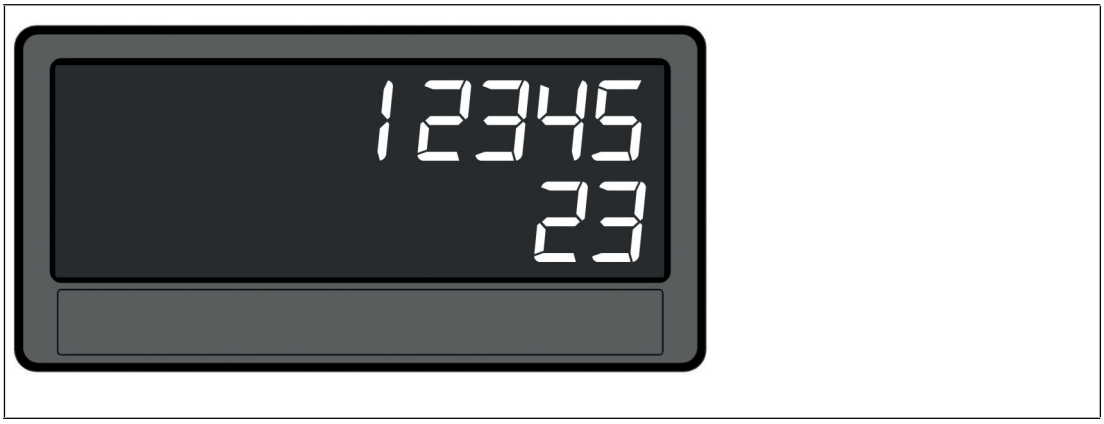

Figure 4.6 Tap the top of the touch screen to change to the next display.
Only enabled in COUNTER - BATCH MODE.

Keyboard command display

Figure 4.7 Tap the top of the touch screen to change to the next display.
Only enabled in TIMER or COUNTER mode.

Display with quick-start function to enter the preselection values (PRESELECT VALUES)

Figure 4.8 Tap the top of the touch screen or tap Skip to change to the next display.

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Min/max value display

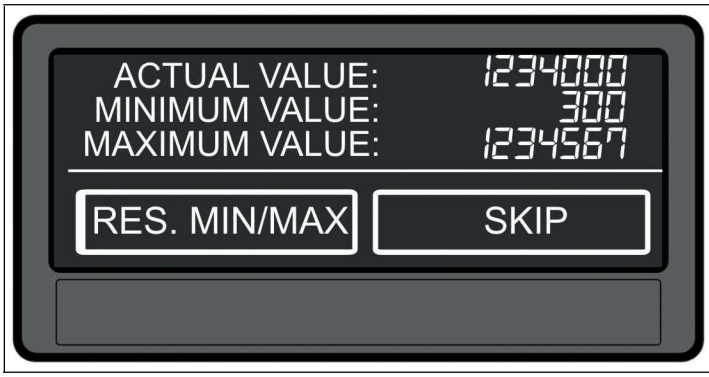

Figure 4.9 Tap the top of the touch screen or press Skip to change to the next display.

4.1.3 Error Messages

Note

The error messages are reset **automatically** once the relevant display value has returned to the displayable range.

ERROR: MAXIMUM DISPLAY VALUE

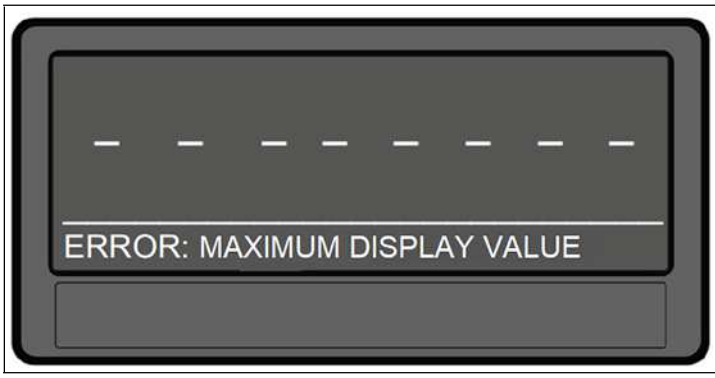

Figure 4.10 Value displayed in the one-line display is greater than +99999999.

ERROR: MINIMUM DISPLAY VALUE

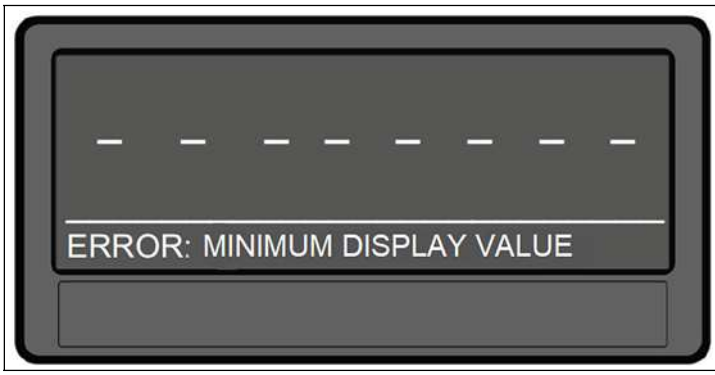

Figure 4.11 Value displayed in the one-line display is less than -99999999.

ERROR: MAX. TOP DISPLAY VALUE

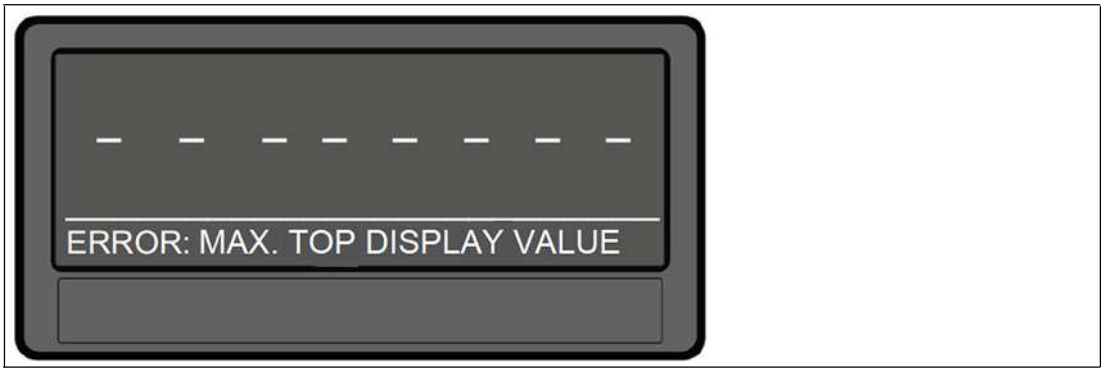

Figure 4.12 Upper value displayed in the two-line display is greater than +99999999.

ERROR: MIN. TOP DISPLAY VALUE

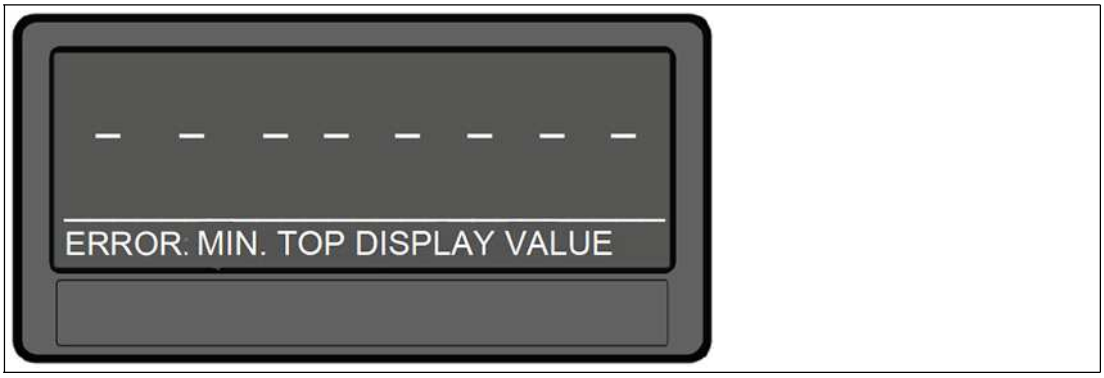

Figure 4.13 Upper value displayed in the two-line display is less than -99999999.

ERROR: MAX. DOWN DISPLAY VALUE

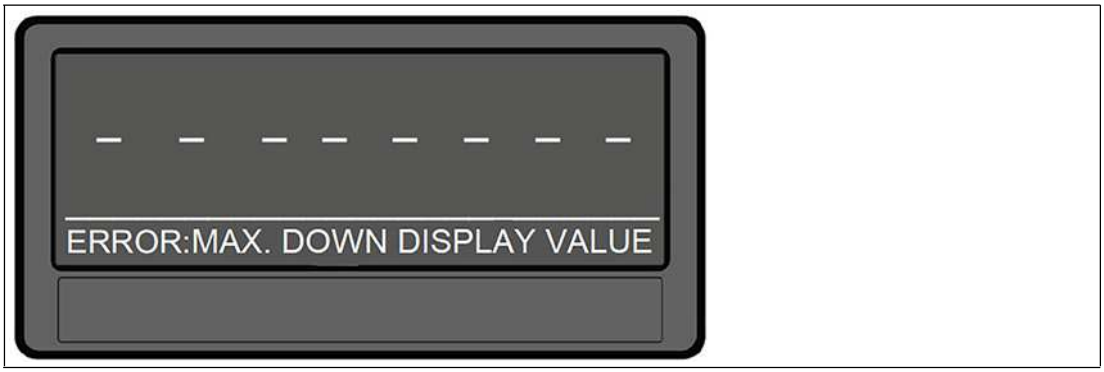

Figure 4.14 Lower value displayed in the two-line display is greater than +99999999.

ERROR: MIN. DOWN DISPLAY VALUE

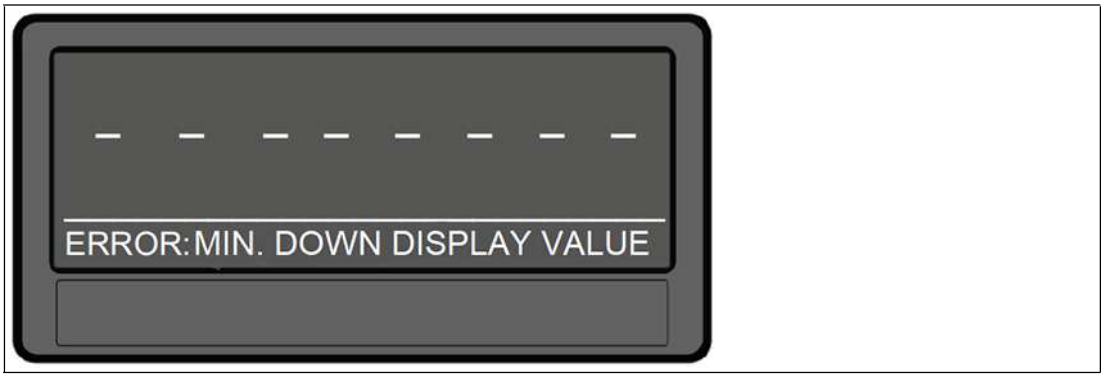

Figure 4.15 Lower value displayed in the two-line display is less than -99999999.

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ERROR: MAX. LARGE DISPLAY VALUE

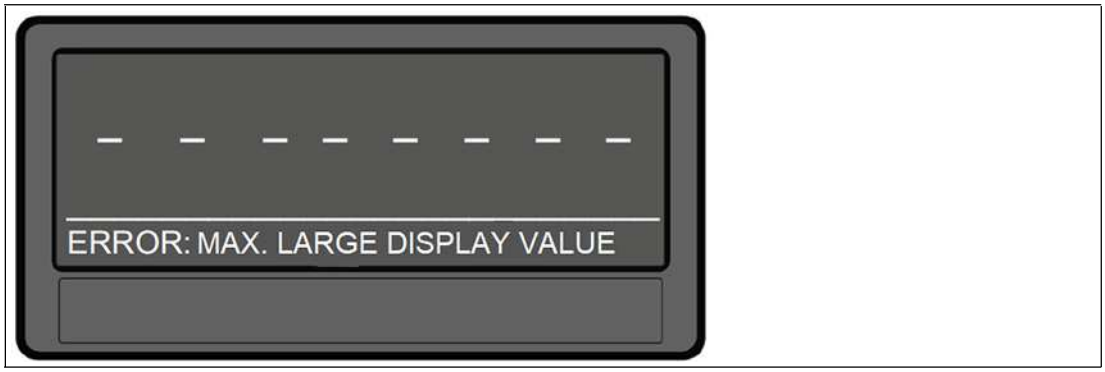

Figure 4.16 Value displayed in the large display is greater than +9999.

ERROR: MIN. LARGE DISPLAY VALUE

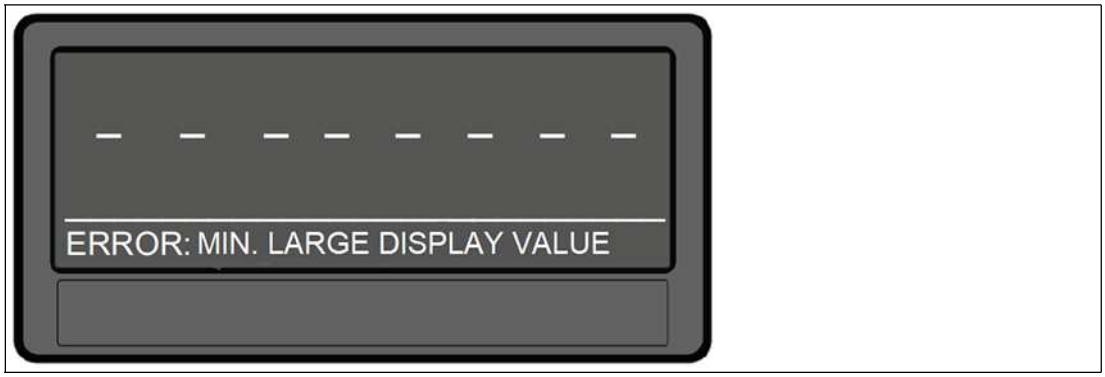

Figure 4.17 Value displayed in the large display is less than -999.

4.2 Operating Software

The device is parameterized via the serial interface using a PC and OS6.0 or OS10.0 operating software. OS6.0 and OS10.0 operating software is free and can be found at www.pepperl-fuchs.de.

This section shows an overview of the individual menus and their parameters. The menu names are always in bold. The associated parameters are arranged directly below the menu name. Only certain menus are displayed depending on the device version (options) and the selected operating mode.

4.2.1 Main Menu (GENERAL MENU)

Default values are formatted in bold.

OPERATIONAL MODE

This parameter defines which measuring function (operating mode) the device is to use.

0	**SPEED**	Speed display (RPM), operates as a tachometer or as a frequency gauge
1	PROCESS TIME	Operates as a baking time or runtime display (reciprocal speed)
2	TIMER	Stopwatch/timer
3	COUNTER	Operates as a position display, pulse counter, cumulative counter, differential counter, incrementing counter, or decrementing counter
4	VELOCITY	Velocity display from runtime measurement

ENCODER PROPERTIES

This parameter determines the characteristics of the pulse inputs.

0	**PNP**	PNP (switching to +)
1	NPN	NPN (switching to –)
2	NAMUR	Connect sensor (–) to GND and sensor (+) to input (A, B)
3	TRI-STATE	Tri-state for push-pull encoders / sensors

COUNTING DIRECTION

You can use this parameter to reverse the direction of rotation of the pulse input (COUNTER mode only).

0	**FORWARD**	Forward
1	REVERSE	Reverse

SCALE UNITS

This parameter determines which unit is shown on the display. The parameter does not affect the value displayed. You can set the decimal point for decimal places in the DECIMAL POINT parameter.

0	**Hz**	Default
1	kHz	
2	m/s	
3	m/min	
4	km/h	
5	mph	
6	rpm	
7	RPM	
8	rps	
9	RPS	
10	piece/h	
11	pcs/h	
12	mm	
13	m	
14	inch	
15	feet	
16	piece	
17	pcs	
18	sec	
19	min	
20	min:sec	
21	H:M:S	
22	%	
23	l/min	
24	gal/min	
25	ml/min	

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26	gr/min	
27	inch/min	
28	H:M	
29	Edit Unit	This parameter allows you to edit a customer-specific unit with a maximum of 16 digits. Press "OK" to open the Edit Unit menu. Use the arrow keys to create a unit. (Pressing and holding the arrow keys allows you to scroll through the characters in quick succession). Press "OK" to save the Edit Unit menu. Press "C" to exit the Edit Unit menu. Keyboard layout: ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\ ] ^ _ ` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~

LINEARIZATION MODE

This parameter defines the linearization function. Observe the information in section 6.1.

0	**OFF**	No linearization
1	1 QUADRANT	Linearization in the first quadrant
2	4 QUADRANT	Linearization in all four quadrants

PIN PRESELECTION

This parameter determines the PIN code for the access lock for the quick-start function to enter the preselect values in the PRESELECTION VALUES menu (emergency pin is 6079).

An access lock for the quick-start function is only useful if combined with an access lock for all parameters.

0000	No access lock
....	
9999	Access after entering the pin code 9999

PIN PARAMETER

This parameter sets the access lock pin code for all parameters (emergency pin is 6079).

0000	No access lock
....	
9999	The device can only be parameterized once the pin code 9999 has been entered

BACK UP MEMORY

0	NO	No back-up memory
1	**YES**	Back-up memory enabled, stores the actual value if a power failure occurs

FACTORY SETTINGS

0	**NO**	The factory settings are not loaded
1	YES	The factory settings are loaded

4.2.2 Speed Mode

Use this menu to define operation as a speed display (RPM), tachometer, or frequency gauge. In this operating mode, only input A is active or input A and input B are active with a 90° phase offset for up/down rotation detection monitoring. This menu is only displayed if you have selected the appropriate OPERATIONAL MODE in the GENERAL MENU.

DISPLAY VALUE

Sets the desired display value to be shown at the following reference frequency.

1	Smallest value
1000	Default value
99999999	Largest value

BASE FREQUENCY (HZ)

Sets the reference frequency in Hz for the value displayed above.

1	Smallest value
100	Default value
500000	Largest value

DECIMAL POINT

This setting determines the position of the decimal point.

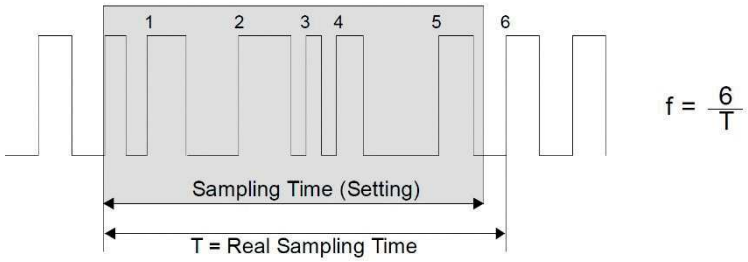
0	NO	No decimal point
1	**0000000.0**	Decimal point at the specified position
2	000000.00	Decimal point at the specified position
3	00000.000	Decimal point at the specified position
4	0000.0000	Decimal point at the specified position
5	000.00000	Decimal point at the specified position
6	00.000000	Decimal point at the specified position
7	0.0000000	Decimal point at the specified position

SAMPLING TIME (S)

The set value corresponds to the minimum measuring time in seconds. The sampling time acts as a filter at irregular frequencies. This parameter directly affects the device reaction time.

0.005	Minimum measuring time in seconds
0.1	Default value

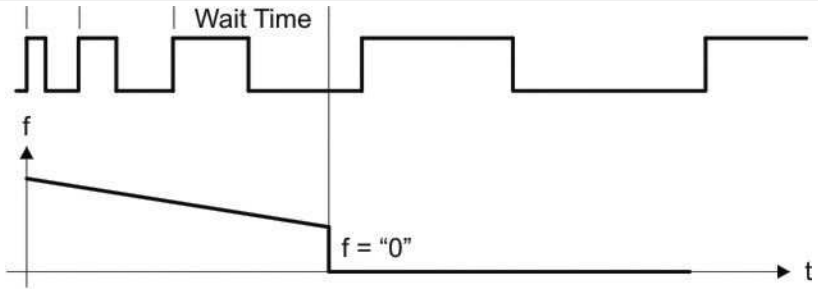
9.999	Maximum measuring time in seconds



WAIT TIME (S)

The set value corresponds to the zero setting time. This parameter defines the period of the lowest frequency, or the waiting time between two rising edges, at which the device detects the 0 Hz frequency. Frequencies of which the period is greater than the set WAIT TIME are evaluated as frequency = 0 Hz

0.01	Frequency = 0 Hz for frequencies less than 100 Hz
1.0	Default value
99.99	Frequency = 0 Hz for frequencies less than 0.01 Hz



STANDSTILL TIME (S)

This parameter defines the downtime. If the frequency = 0 Hz is determined, a downtime is signaled after xx.xx seconds and the start-up override is reactivated.

You can set downtime monitoring in the PRESLECT MENU.

0.00	Shortest delay in seconds
...	
99.99	Longest delay in seconds

AVERAGE FILTER

Switchable average determination or filter function to prevent display fluctuations at unstable frequencies. If the filter is set to 5 … 8, the device uses an exponential function.

The time constant T (63%) corresponds to the number of sampling cycles.

Example

SAMPLING TIME = 0.1 s and AVERAGE FILTER = exponential filter, T (63%) = 2 x sampling time.

This means that after 0.2 seconds, 63% of the leap height is reached.

0	No average determination
1	Fluid average determination with two cycles

2	Fluid average determination with four cycles
3	Fluid average determination with eight cycles
4	Fluid average determination with 16 cycles
5	Exponential filter, T (63%) = 2 x SAMPLING TIME
6	Exponential filter, T (63%) = 4 x SAMPLING TIME
7	Exponential filter, T (63%) = 8 x SAMPLING TIME
8	Exponential filter, T (63%) = 16 x SAMPLING TIME

FOR/REV DETECTION

This parameter enables the detection of the direction of rotation (input A, input B at 90°).

0	**OFF**	Direction of rotation detection off
1	ON	Direction of rotation detection on

4.2.3 Process Time Mode

Use this menu to define the operation as baking time or runtime display (reciprocal speed). Only input A is active. This menu is only displayed if you have selected the appropriate OPERATIONAL MODE in the GENERAL MENU.

DISPLAY FORMAT

This parameter allows you to select the desired display format. The decimal point is automatically set by the format selection.

0	**SECONDS**	Display in seconds
1	MINUTES	Display in minutes
2	MIN:SEC	Display in minutes:seconds
3	MIN.00	Displayed in minutes and 1/100 minutes
4	H:M:S	Display in hours:minutes:seconds

DISPLAY VALUE

Sets the desired display value to be shown at the following reference frequency.

1	Smallest value
1000	Default value
99999999	Largest value

BASE FREQUENCY (HZ)

Sets the reference frequency (in Hz) for the value displayed above.

1	Smallest value
1000	Default value
500000	Largest value

SAMPLING TIME (S)

The set value corresponds to the minimum measuring time in seconds. The sampling time acts as a filter at irregular frequencies. This parameter directly affects the device reaction time.

0.005	Minimum measuring time in seconds
0.1	Default value

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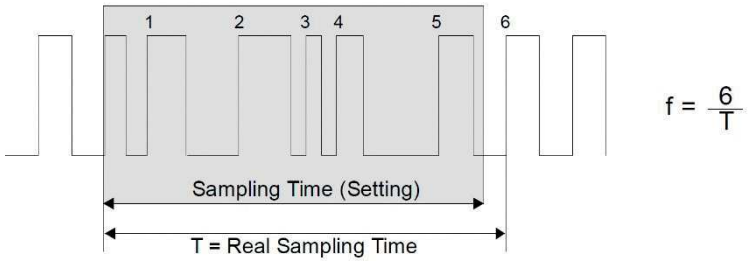
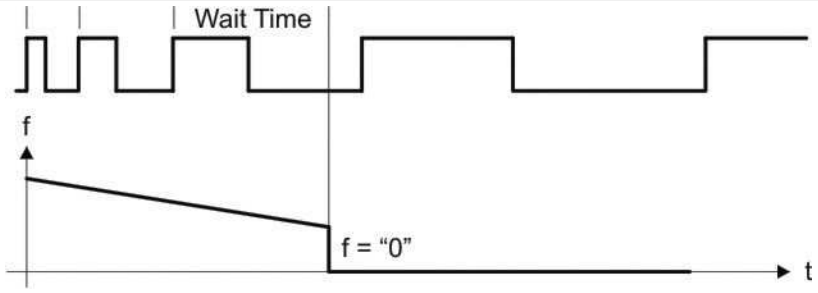
9.999	Maximum measuring time in seconds



WAIT TIME (S)

The set value corresponds to the zero setting time. This parameter defines the period of the lowest frequency, or the waiting time between two rising edges, at which the device detects the 0 Hz frequency. Frequencies of which the period is greater than the set WAIT TIME are evaluated as frequency = 0 Hz

0.01	Frequency = 0 Hz for frequencies less than 100 Hz
1.0	Default value
99.99	Frequency = 0 Hz for frequencies less than 0.01 Hz



STANDSTILL TIME (S)

This parameter defines the downtime. If the frequency = 0 Hz is determined, a downtime is signaled after xx.xx seconds and the start-up override is reactivated.

You can set downtime monitoring in the PRESLECT MENU.

0.00	Shortest delay in seconds
...	
99.99	Longest delay in seconds

AVERAGE FILTER

Switchable average determination or filter function to prevent display fluctuations at unstable frequencies. If the filter is set to 5 … 8, the device uses an exponential function.

The time constant T (63%) corresponds to the number of sampling cycles.

Example

SAMPLING TIME = 0.1 s and AVERAGE FILTER = exponential filter, T (63%) = 2 x sampling time.

This means that after 0.2 seconds, 63% of the leap height is reached.

0	No average determination
1	Fluid average determination with 2 cycles

2	Fluid average determination with 4 cycles
3	Fluid average determination with 8 cycles
4	Fluid average determination with 16 cycles
5	Exponential filter, T (63%) = 2 x SAMPLING TIME
6	Exponential filter, T (63%) = 4 x SAMPLING TIME
7	Exponential filter, T (63%) = 8 x SAMPLING TIME
8	Exponential filter, T (63%) = 16 x SAMPLING TIME

4.2.4 Timer Mode

Use this menu to set operation as a timer/stopwatch. Only input A or input A and B are active depending on the parameterization. This menu is only displayed if you have selected the appropriate OPERATIONAL MODE in the GENERAL MENU.

TIME BASE

Selection of the time base or resolution required for 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	MIN:SEC	Minutes:seconds (999999:59)
7	MIN:SEC:00	Minutes:seconds:1/100 seconds (9999:59:99)
8	H:M:S	Hours:minutes:seconds (9999:59:59)
9	H:M	Hours:minutes (999999:59)

START / STOP

Determining the type of start/stop of the time measurement

0	COUNT AT A HIGH	Time is counted as long as input A is HIGH
1	COUNT AT A LOW	Time is counted as long as input A is LOW
2	**START A / STOP B**	Rising edge at input A starts the time being measured, rising edge at input B stops the time being measured.
3	PERIODE AT A	Duration of period measurement: cyclically displays the time period between two rising edges at input A.

AUTO SET / RESET

0	**NO**	Time is counted by adding or subtracting; no automatic set/reset at next start. Set/Reset to perform the start setting
1	YES	With each start, the new time count starts automatically at the value set in the SET VALUE parameter.

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LATCH-FUNCTION

0	**NO**	The timing is visible in the display.
1	YES	The display shows the end result of the last time measurement, while the new measurement runs in the background.

SET VALUE

With a set / reset command (via keyboard command, control input, or PC user interface), the timer is set to the value set here.

0	Smallest value (reset)
…	
99999999	Largest value

INC / DEC MODE

The time is always counted by adding when the period duration measurement is set as START / STOP:

0	**INCREMENT MODE**	Time is counted by adding
1	DECREMENT MODE	Time is counted by subtracting

TOTAL TIME MODE

Enabling the total timer (total time measurement)

When TOTAL TIME MODE is enabled, the total time measurement can be assigned to each PRESELECTION value using a selectable reference source.

Example

TOTAL TIME MODE must be set to YES for total time measurement. The total time measurement runs in parallel with the normal time measurement. If the total time upon reaching 1:30 (H:M) is to be automatically reset to 0, the reference source, e.g., SOURCE 1 from the corresponding preselection menu must be set to TOTAL TIMER, the corresponding preselection value, e.g., PRESELECTION 1, must be set to "1:30", and the corresponding switching condition MODE 1 must be set to RESULT>=PRES->0.

0	**NO**	Total time measurement disabled
1	YES	Total time measurement enabled

TOTAL TIME SET VALUE

The set / reset command (SET TOTAL TIME command via the control input) sets the total timer (total time measurement) to the value set here.

Parameters are only visible when TOTAL TIME MODE is enabled.

0	Smallest value (reset)
...	
99999999	Largest value

4.2.5 Counter Mode

Use this menu to define the operation as position display, pulse counter, cumulative counter, difference counter, incrementing counter, or decrementing counter. Input A and B are active. This menu is only displayed when the appropriate OPERATIONAL MODE is selected in the GENERAL MENU.

COUNT MODE

Selection of the counter configuration.

0	A SINGLE	Input A is the counter input. Input B determines the counting direction: LOW = incrementing, HIGH = decrementing
1	A+B	Cumulative: counts A pulses + B pulses
2	A-B	Difference: counts A pulses – B pulses
3	**A/B 90 x1**	Incrementing / decrementing counter for pulses with 2 x 90° offset (single edge evaluation x1)
4	A/B 90 x2	Incrementing / decrementing counter for pulses with 2 x 90° offset (double edge evaluation x2)
5	A/B 90 x4	Incrementing / decrementing counter for pulses with 2 x 90° offset (quadruple edge evaluation x4)

FACTOR

Pulse evaluation factor. For cumulative counting (A+B) and difference counting (A-B), the pulse evaluation factor affects only channel A.

Example

If set to 1.23456, the device displays 123456 after 100,000 input pulses.

0.00001	Smallest value
1	Default value
99.99999	Largest value

SET VALUE

With a reset command (via keyboard command, control input, or PC user interface), the counter is set to the value set here.

-99999999	Smallest value
0	Default value
+99999999	Largest value

DECIMAL POINT

This setting determines 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

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BATCH / TOTAL MODE

Setting the Batch Counter (quantity counter) / Total Counter.

The quantity counting function based on a preselection value is only possible in conjunction with the automatic zero switching condition (RESULT>=PRES->0), automatically setting to the set value (RESULT>=PRES->VALUE), or setting the counter value (RESULT<=0->SET).

When BATCH / TOTAL MODE is active, a reference source can be selected (SOURCE 1 ... 4) and used to assign the BATCH COUNTER or the TOTAL COUNTER to each PRESELECTION VALUE.

Example

Quantity counter

If the quantity counter is to be increased by 1 every 1000 pulses, a preselection value, e.g., PRESELECTION 1 must be set to 1000, the associated reference source SOURCE 1 must be set to MEASUREM. RESULT, the corresponding switching condition MODE 1 must be set to RESULT>=PRES->0, and BATCH / TOTAL MODE must be set to INCREMENT BATCH. If an output is to be switched after a quantity of 33, PRESELECTION 2, e.g., must be set to the value 33, the associated reference source SOURCE 2 must be set to BATCH COUNTER, and the corresponding switching condition MODE 2 must be set greater than or equal to the value displayed (RESULT >=PRES).

Example

Total counter

For the total counter, BATCH / TOTAL MODE must be set to TOTAL COUNTER. In this case, the total counter counts in parallel with the main counter. If the total counter is to be automatically reset to 0 when 4000 is reached, a preselection value must be set, e.g., PRESELECTION 3 to "4000", the associated reference source SOURCE 3 must be set to TOTAL COUNTER, and the corresponding switching condition MODE 3 must be set to RESULT>=PRES->0.

0	**OFF**	No batch counter (quantity counter) and no total counter
1	INCREMENT BATCH	Quantity counter active and incrementing
2	DECREMENT BATCH	Quantity counter active and decrementing
3	USE INPUTS ONLY	Quantity counter active and works only via external control commands (see Command Menu)
4	TOTAL COUNTER	Total counter active

BATCH / TOTAL SET VALUE

The reset / set command (SET BATCH / TOTAL command via control input) sets the batch counter / total counter to the value set here.

Parameters are only visible when BATCH / TOTAL MODE is active.

0	Smallest value
...	
99999999	Largest value

ROUND LOOP VALUE

Defines the number of steps if a round loop function is required.

(Round loop function only for COUNT MODE: A SINGLE or A/B 90 xX.)

0	Normal display, round loop is switched off
...	
99999999	Number of steps for the round loop function

4.2.6 Velocity Mode

Use this menu to define a velocity display from a runtime measurement.

Input A is used as the start input and input B as the stop input. This menu is only displayed if you have selected the appropriate OPERATIONAL MODE in the GENERAL MENU.

START / STOP

Setting the start and stop function.

RISE TO RISE	Start = rising edge at input A Stop = rising edge at input B
FALL TO FALL	Start = falling edge at input A Stop = falling edge at input B
RISE TO FALL	Start = rising edge at input A Stop = falling edge at input B
FALL TO RISE	Start = falling edge at input A Stop = rising edge at input B

DISPLAY VALUE

Sets the desired display value to be shown at the following reference frequency.

1	Smallest value
1000	Default value
99999999	Largest value

BASE TIME (S)

Setting the reference runtime (in seconds) for the value displayed above.

0.001	Smallest value
1	Default value
999.999	Largest value

DECIMAL POINT

This setting determines 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

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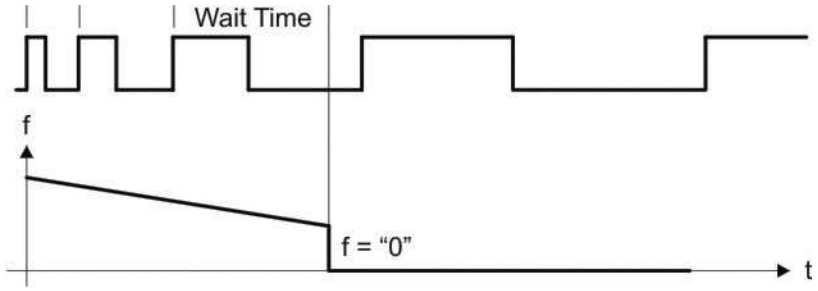
WAIT TIME (S)

The set value corresponds to the zero setting time. This parameter defines the period of the lowest frequency, or the waiting time between two rising edges, at which the device detects the 0 Hz frequency. Frequencies of which the period is greater than the set WAIT TIME are evaluated as frequency = 0 Hz

0.00	No zero setting time: The display value remains until a new display value has been determined
0.01	Frequency = 0 Hz for frequencies less than 100 Hz
...	
99.99	Frequency = 0 Hz for frequencies less than 0.01 Hz



STANDSTILL TIME (S)

This parameter defines the downtime. If the frequency = 0 Hz is determined, a downtime is signaled after xx.xx seconds and the start-up override is reactivated.

You can set downtime monitoring in the PRESLECT MENU.

STANDSTILL TIME is only appropriate if WAIT TIME is not equal to 0.000.

0.00	Shortest delay in seconds
...	
99.99	Longest delay in seconds

4.2.7 Preselection 1 Menu

MODE 1

Switching condition for preselection 1. Switch output / relay / display according to the following condition:

0	**|RESULT|≥|PRES|**	Value displayed greater than or equal to PRESELECTION 1 When HYSTERESIS 1 is not equal to 0, the result is the following switching condition: Display value ≥ PRESELECTION 1 -> ON Display value < PRESELECTION 1 – HYSTERESIS 1 -> OFF
1	|RESULT|≤|PRES|	Value displayed smaller than or equal to PRESELECTION 1 (Start-up override of START UP DELAY recommended) When HYSTERESIS 1 is not equal to 0, the result is the following switching condition: Display value ≤ PRESELECTION 1 -> ON Display value > PRESELECTION 1 + HYSTERESIS 1 -> OFF

2	|RESULT|=|PRES|	Value displayed is equal to PRESELECTION 1. In conjunction with hysteresis, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. When HYSTERESIS 1 is not equal to 0, the result is the following switching condition: Display value > PRESELECTION 1 + ½ HYSTERESIS 1 -> OFF, Display value < PRESELECTION 1 – ½ HYSTERESIS 1 -> OFF
3	RESULT≥PRES	Value displayed greater than or equal to PRESELECTION 1, e.g., overspeed When HYSTERESIS 1 is not equal to 0, the result is the following switching condition: Display value ≥ PRESELECTION 1 -> ON Display value < PRESELECTION 1 – HYSTERESIS 1 -> OFF
4	RESULT≤PRES	Value displayed smaller than or equal to PRESELECTION 1, e.g., underspeed (Start-up override of START UP DELAY recommended) When HYSTERESIS 1 is not equal to 0, the result is the following switching condition: Display value ≤ PRESELECTION 1 -> ON Display value > PRESELECTION 1 + HYSTERESIS 1 -> OFF
5	RESULT=PRES	Value displayed is equal to PRESELECTION 1. In conjunction with HYSTERESIS 1, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. When HYSTERESIS 1 is not equal to 0, the result is the following switching condition: Display value > PRESELECTION 1 + ½ HYSTERESIS 1 -> OFF Display value < PRESELECTION 1 – ½ HYSTERESIS 1 -> OFF
6	RESULT=0	Value displayed equal to 0 (downtime after downtime STANDSTILL TIME (s)), e.g., downtime monitoring. (Only in SPEED and PROCESS TIME operating modes).
7	RESULT≥PRES->0	Set display to zero: (Only for TIMER or COUNTER modes) If the value displayed is greater than or equal to PRESELECTION 1, the display value is set to zero. If BATCH MODE is active, the batch counter is incremented or decremented each time it is reset to zero.
8	RESULT≤0->SET	Set display to PRESELECTION 1: (only for TIMER or COUNTER modes) If the value displayed is smaller than or equal to zero, the display value is set to PRESELECTION 1. If BATCH MODE is active, the batch counter is incremented or decremented each time it is set to PRESELECTION 1.
9	RES≥PRES TRAIL	Trailing preselection 2: Value displayed is greater than or equal to PRESELECTION 2 – PRESELECTION 1 PRESELECTION 1 is the trailing preselection of PRESELECTION 2

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HYSTERESIS 1

Hysteresis for defining the switch-off point for the preselection 1 switching condition.

0	No switching hysteresis
...	
9999	Switching hysteresis of 99999

PULSE TIME 1 (S)

Duration of the one-shot pulse for the preselection 1 switching condition.

0.000	No one-shot pulse (static signal)
...	
60.000	Pulse duration of 60 seconds

OUTPUT TARGET 1

Assignment of an output or relay for the preselection 1 switching condition.

If multiple switching conditions are assigned to a single output/relay, this is active as soon as one of the switching conditions is met.

0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switching condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switching condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switching condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switching condition to Ctrl. Out 4
5	RELAY 1	Assignment of the switching condition to relay 1
6	RELAY 2	Assignment of the switching condition to relay 2

OUTPUT POLARITY 1

Switch state for the preselection 1 switching condition.

0	**ACTIVE HIGH**	HIGH active
1	ACTIVE LOW	LOW active

OUTPUT LOCK 1

Self-lock for the preselection 21 switching condition

0	**NO**	No self-locking
1	YES	Self-locking

START UP DELAY 1 (S)

Start-up override for the preselection 12 switching condition.

Time frame until the monitoring function is activated. This setting is only valid for switching conditions |RESULT|≤|PRES| or RESULT≤PRES and only for the SPEED and PROCESS TIME modes.

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

0.000	No start-up override
...	
60.000	Start–up override in seconds

EVENT COLOR 1

Event-related change in display color for the preselection 1 switching condition.

EVENT COLOR 1 has the lowest priority. EVENT COLOR 2 … 4 can override this change in color.

0	**NO CHANGE**	No change in color
1	CHANGE TO RED	Color changes to red
2	CHANGE TO GREEN	Color changes to green
3	CHANGE TO YELLOW	Color changes to yellow

4.2.8 Preselection 2 Menu

MODE 2

Switching condition for preselection 2. Switch output / relay / display according to the following condition:

0	**|RESULT|≥|PRES|**	Value displayed greater than or equal to PRESELECTION 2 When HYSTERESIS 2 is not equal to 0, the result is the following switching condition: Display value ≥ PRESELECTION 2 -> ON Display value < PRESELECTION 2 – HYSTERESIS 2 -> OFF
1	|RESULT|≤|PRES|	Value displayed smaller than or equal to PRESELECTION 2 (Start-up override of START UP DELAY recommended) When HYSTERESIS 2 is not equal to 0, the result is the following switching condition: Display value ≤ PRESELECTION 2 -> ON Display value > PRESELECTION 2 + HYSTERESIS 2 -> OFF
2	|RESULT|=|PRES|	Value displayed is equal to PRESELECTION 2. In conjunction with hysteresis, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. When HYSTERESIS 2 is not equal to 0, the result is the following switching condition: Display value > PRESELECTION 2 + ½ HYSTERESIS 2 -> OFF, Display value < PRESELECTION 2 – ½ HYSTERESIS 2 -> OFF
3	RESULT≥PRES	Value displayed greater than or equal to PRESELECTION 2, e.g., overspeed When HYSTERESIS 2 is not equal to 0, the result is the following switching condition: Display value ≥ PRESELECTION 2 -> ON Display value < PRESELECTION 2 – HYSTERESIS 2 -> OFF
4	RESULT≤PRES	Value displayed smaller than or equal to PRESELECTION 2, e.g., underspeed (Start-up override of START UP DELAY recommended) When HYSTERESIS 2 is not equal to 0, the result is the following switching condition: Display value ≤ PRESELECTION 2 -> ON Display value > PRESELECTION 2 + HYSTERESIS 2 -> OFF

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5	RESULT=PRES	Value displayed is equal to PRESELECTION 2. In conjunction with HYSTERESIS 1, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. When HYSTERESIS 2 is not equal to 0, the result is the following switching condition: Display value > PRESELECTION 2 + ½ HYSTERESIS 2 -> OFF Display value < PRESELECTION 2 – ½ HYSTERESIS 2 -> OFF
6	RESULT=0	Value displayed equal to 0 (downtime after downtime STANDSTILL TIME (s)), e.g., downtime monitoring. (Only in SPEED and PROCESS TIME operating modes).
7	RESULT≥PRES->0	Set display to zero: (Only for TIMER or COUNTER modes) If the value displayed is greater than or equal to PRESELECTION 2, the display value is set to zero. If BATCH MODE is active, the batch counter is incremented or decremented each time it is reset to zero.
8	RESULT≤0->SET	Set display to PRESELECTION 2: (only for TIMER or COUNTER modes) If the value displayed is smaller than or equal to zero, the display value is set to PRESELECTION 2. If BATCH MODE is active, the batch counter is incremented or decremented each time it is set to PRESELECTION 2.
9	RES≥PRES TRAIL	Trailing preselection 2: Value displayed is greater than or equal to PRESELECTION 1 – PRESELECTION 2 PRESELECTION 2 is the trailing preselection of PRESELECTION 1

HYSTERESIS 2

Hysteresis for defining the switch-off point for the preselection 2 switching condition.

0	No switching hysteresis
...	
9999	Switching hysteresis of 99999

PULSE TIME 2 (S)

Duration of the one-shot pulse for the preselection 2 switching condition.

0.000	No one-shot pulse (static signal)
...	
60.000	Pulse duration of 60 seconds

OUTPUT TARGET 2

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

If multiple switching conditions are assigned to a single output/relay, this is active as soon as one of the switching conditions is met.

0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switching condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switching condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switching condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switching condition to Ctrl. Out 4

5	RELAY 1	Assignment of the switching condition to relay 1
6	RELAY 2	Assignment of the switching condition to relay 2

OUTPUT POLARITY 2

Switch state for the preselection 2 switching condition.

0	**ACTIVE HIGH**	HIGH active
1	ACTIVE LOW	LOW active

OUTPUT LOCK 2

Self-lock for the preselection 2 switching condition.

0	**NO**	No self-locking
1	YES	Self-locking

START UP DELAY 2 (S)

Start-up override for the preselection 2 switching condition.

Time frame until the monitoring function is activated. This setting is only valid for switching conditions |RESULT|≤|PRES| or RESULT≤PRES and only for the SPEED and PROCESS TIME modes.

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

0.000	No start-up override
...	
60.000	Start–up override in seconds

EVENT COLOR 2

Event-related change in display color for the preselection 2 switching condition.

0	**NO CHANGE**	No change in color
1	CHANGE TO RED	Color changes to red
2	CHANGE TO GREEN	Color changes to green
3	CHANGE TO YELLOW	Color changes to yellow

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4.2.9 Preselection 3 Menu

MODE 3

Switching condition for preselection 3. Switch output / relay / display according to the following condition:

0	**|RESULT|≥|PRES|**	Value displayed greater than or equal to PRESELECTION 3 When HYSTERESIS 3 is not equal to 0, the result is the following switching condition: Display value ≥ PRESELECTION 3 -> ON Display value < PRESELECTION 3 – HYSTERESIS 3 -> OFF
1	|RESULT|≤|PRES|	Value displayed smaller than or equal to PRESELECTION 3 (Start-up override of START UP DELAY recommended) When HYSTERESIS 3 is not equal to 0, the result is the following switching condition: Display value ≤ PRESELECTION 3 -> ON Display value > PRESELECTION 3 + HYSTERESIS 3 -> OFF
2	|RESULT|=|PRES|	Value displayed is equal to PRESELECTION 3. In conjunction with hysteresis, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. When HYSTERESIS 3 is not equal to 0, the result is the following switching condition: Display value > PRESELECTION 3 + ½ HYSTERESIS 3 -> OFF, Display value < PRESELECTION 3 – ½ HYSTERESIS 3 -> OFF
3	RESULT≥PRES	Value displayed greater than or equal to PRESELECTION 3, e.g., overspeed When HYSTERESIS 3 is not equal to 0, the result is the following switching condition: Display value ≥ PRESELECTION 3 -> ON Display value < PRESELECTION 3 – HYSTERESIS 3 -> OFF
4	RESULT≤PRES	Value displayed smaller than or equal to PRESELECTION 3, e.g., underspeed (Start-up override of START UP DELAY recommended) When HYSTERESIS 3 is not equal to 0, the result is the following switching condition: Display value ≤ PRESELECTION 3 -> ON Display value > PRESELECTION 3 + HYSTERESIS 3 -> OFF
5	RESULT=PRES	Value displayed is equal to PRESELECTION 3. In conjunction with HYSTERESIS 1, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. When HYSTERESIS 3 is not equal to 0, the result is the following switching condition: Display value > PRESELECTION 3 + ½ HYSTERESIS 3 -> OFF Display value < PRESELECTION 3 – ½ HYSTERESIS 3 -> OFF
6	RESULT=0	Value displayed equal to 0 (downtime after downtime STANDSTILL TIME (s)), e.g., downtime monitoring. (Only in SPEED and PROCESS TIME operating modes).

7	RESULT≥PRES->0	Set display to zero: (Only for TIMER or COUNTER modes) If the value displayed is greater than or equal to PRESELECTION 3, the display value is set to zero. If BATCH MODE is active, the batch counter is incremented or decremented each time it is reset to zero.
8	RESULT≤0->SET	Set display to PRESELECTION 3: (only for TIMER or COUNTER modes) If the value displayed is smaller than or equal to zero, the display value is set to PRESELECTION 3. If BATCH MODE is active, the batch counter is incremented or decremented each time it is set to PRESELECTION 3.
9	RES≥PRES TRAIL	Trailing preselection 3: Value displayed is greater than or equal to PRESELECTION 4 – PRESELECTION 3 PRESELECTION 3 is the trailing preselection of PRESELECTION 4

HYSTERESIS 3

Hysteresis for defining the switch-off point for the preselection 3 switching condition.

0	No switching hysteresis
...	
9999	Switching hysteresis of 99999

PULSE TIME 3 (S)

Duration of the one-shot pulse for the preselection 3 switching condition.

0.000	No one-shot pulse (static signal)
...	
60.000	Pulse duration of 60 seconds

OUTPUT TARGET 3

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

If multiple switching conditions are assigned to a single output/relay, this is active as soon as one of the switching conditions is met.

0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switching condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switching condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switching condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switching condition to Ctrl. Out 4
5	RELAY 1	Assignment of the switching condition to relay 1
6	RELAY 2	Assignment of the switching condition to relay 2

OUTPUT POLARITY 3

Switch state for the preselection 3 switching condition.

0	**ACTIVE HIGH**	HIGH active
1	ACTIVE LOW	LOW active

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OUTPUT LOCK 3

Self-lock for the preselection 3 switching condition.

0	**NO**	No self-locking
1	YES	Self-locking

START UP DELAY 3

Start-up override for the preselection 3 switching condition.

Time frame until the monitoring function is activated. This setting is only valid for switching conditions |RESULT|≤|PRES| or RESULT≤PRES and only for the SPEED and PROCESS TIME modes.

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

EVENT COLOR 3

Event-related change in display color for the preselection 3 switching condition.

0	**NO CHANGE**	No change in color
1	CHANGE TO RED	Color changes to red
3	CHANGE TO GREEN	Color changes to green
3	CHANGE TO YELLOW	Color changes to yellow

4.2.10 Preselection 4 Menu

MODE 4

Switching condition for preselection 4. Switch output / relay / display according to the following condition:

0	**|RESULT|≥|PRES|**	Value displayed greater than or equal to PRESELECTION 4 When HYSTERESIS 4 is not equal to 0, the result is the following switching condition: Display value ≥ PRESELECTION 4 -> ON Display value < PRESELECTION 4 – HYSTERESIS 4 -> OFF
1	|RESULT|≤|PRES|	Value displayed smaller than or equal to PRESELECTION 4 (Start-up override of START UP DELAY recommended) When HYSTERESIS 4 is not equal to 0, the result is the following switching condition: Display value ≤ PRESELECTION 4 -> ON Display value > PRESELECTION 4 + HYSTERESIS 4 -> OFF
2	|RESULT|=|PRES|	Value displayed is equal to PRESELECTION 4. In conjunction with hysteresis, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. When HYSTERESIS 4 is not equal to 0, the result is the following switching condition: Display value > PRESELECTION 4 + ½ HYSTERESIS 4 -> OFF, Display value < PRESELECTION 4 – ½ HYSTERESIS 4 -> OFF

3	RESULT≥PRES	Value displayed greater than or equal to PRESELECTION 4, e.g., overspeed When HYSTERESIS 4 is not equal to 0, the result is the following switching condition: Display value ≥ PRESELECTION 4 -> ON Display value < PRESELECTION 4 – HYSTERESIS 4 -> OFF
4	RESULT≤PRES	Value displayed smaller than or equal to PRESELECTION 4, e.g., underspeed (Start-up override of START UP DELAY recommended) When HYSTERESIS 4 is not equal to 0, the result is the following switching condition: Display value ≤ PRESELECTION 4 -> ON Display value > PRESELECTION 4 + HYSTERESIS 4 -> OFF
5	RESULT=PRES	Value displayed is equal to PRESELECTION 4. In conjunction with HYSTERESIS 1, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. When HYSTERESIS 4 is not equal to 0, the result is the following switching condition: Display value > PRESELECTION 4 + ½ HYSTERESIS 4 -> OFF Display value < PRESELECTION 4 – ½ HYSTERESIS 4 -> OFF
6	RESULT=0	Value displayed equal to 0 (downtime after downtime STANDSTILL TIME (s)), e.g., downtime monitoring. (Only in SPEED and PROCESS TIME operating modes).
7	RESULT≥PRES->0	Set display to zero: (Only for TIMER or COUNTER modes) If the value displayed is greater than or equal to PRESELECTION 4, the display value is set to zero. If BATCH MODE is active, the batch counter is incremented or decremented each time it is reset to zero.
8	RESULT≤0->SET	Set display to PRESELECTION 4: (only for TIMER or COUNTER modes) If the value displayed is smaller than or equal to zero, the display value is set to PRESELECTION 4. If BATCH MODE is active, the batch counter is incremented or decremented each time it is set to PRESELECTION 4.
9	RES≥PRES TRAIL	Trailing preselection 4: Value displayed is greater than or equal to PRESELECTION 3 – PRESELECTION 4 PRESELECTION 4 is the trailing preselection of PRESELECTION 3

HYSTERESIS 4

Hysteresis for defining the switch-off point for the preselection 4 switching condition.

0	No switching hysteresis
...	
9999	Switching hysteresis of 99999

PULSE TIME 4 (S)

Duration of the one-shot pulse for the preselection 4 switching condition.

0.000	No one-shot pulse (static signal)
...	
60.000	Pulse duration of 60 seconds

OUTPUT TARGET 4

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

If multiple switching conditions are assigned to a single output/relay, this is active as soon as one of the switching conditions is met.

0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switching condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switching condition to Ctrl. Out 2
4	CTRL OUT 3	Assignment of the switching condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switching condition to Ctrl. Out 4
5	RELAY 1	Assignment of the switching condition to relay 1
6	RELAY 2	Assignment of the switching condition to relay 2

OUTPUT POLARITY 4

Switch state for the preselection 4 switching condition.

0	**ACTIVE HIGH**	HIGH active
1	ACTIVE LOW	LOW active

OUTPUT LOCK 4

Self-lock for the preselection 4 switching condition.

0	**NO**	No self-locking
1	YES	Self-locking

START UP DELAY 4

Start-up override for the preselection 4 switching condition.

Time frame until the monitoring function is activated. This setting is only valid for switching conditions |RESULT|≤|PRES| or RESULT≤PRES and only for the SPEED and PROCESS TIME modes.

(Start Up Delay 2 has a time-related start-up override).

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

EVENT COLOR 4

Event-related change in display color for the preselection 4 switching condition.

0	**NO CHANGE**	No change in color
1	CHANGE TO RED	Color changes to red

4	CHANGE TO GREEN	Color changes to green
4	CHANGE TO YELLOW	Color changes to yellow

4.2.11 Serial Menu

Use this menu to define the default settings for the serial interface.

UNIT NUMBER

This parameter allows you to set serial device addresses. The devices can be assigned addresses between 11 and 99. Addresses that contain a 0 are not permitted, since these are used as group addresses or collective addresses.

11	Smallest address without zero
...	
99	Largest address without zero

SERIAL BAUD RATE

Use this parameter to set the serial baud rate.

0	**9600**	9600 baud
1	19200	19200 baud
2	38400	38400 baud

SERIAL FORMAT

Use this parameter to set 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

Use this parameter to determine the baud rate at which the initialization values are transferred to the PC user interface. Settings greater than 9600 baud can shorten the duration of the initialization.

0	**NO**	The initialization values are transferred at 9600 baud. The device works again at the value set by the user
1	YES	The initialization values are transferred at the baud rate set by the user in the SERIAL BAUD RATE parameter. The device works again at the value set by the user

SERIAL PROTOCOL

Determines the character string for a command transfer or timed transfer

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(xxxxxxx = SERIAL VALUE).

If 1 is specified, the unit no. is omitted and the transfer starts directly with the measured value. This enables a quicker transfer cycle.

0	Transmission protocol = unit no., +/-, data, LF, CR 1 | 1 | +/- | X | X | X | X | X | X | X | LF | CR
1	Transmission protocol = +/-, data, LF, CR +/- | X | X | X | X | X | X | X | LF | CR

SERIAL TIMER (S)

Adjustable timed cycle in seconds for automatic (cyclical) transfer of the SERIAL VALUE via the serial interface.

If a query is issued via the query protocol, the cyclic transfer is interrupted for 20 seconds.

0.000	Cyclical transfer is switched off and the device only sends SERIAL PRINT on command via a control input or a request via the request protocol
...	
60	Timed cycle in seconds

SERIAL VALUE

This parameter determines which value is transferred

Setting	Code	Meaning
0	:0	Measurement_Result
1	:1	Speed_Value
2	:2	Time_Result
3	:3	Counter
4	:4	Velocity_Speed
5	:5	Batch_Counter
6	:6	Minimum_Value
7	:7	Maximum_Value
8	:8	Counter_Total
9	:9	Time_Result_Total

MODBUS

This parameter allows you to enable the MODBUS protocol and set the MODBUS address.

0	Serial interface uses the Lecom protocol (Motrona standard)
1 ... 247	Serial interface uses the MODBUS RTU protocol The set value is the device MODBUS address.

4.2.12 Analog Menu

The default settings for the analog output are defined in this menu.

ANALOG SOURCE

This parameter defines the reference source for the analog output.

0	**MEASUREM. RESULT**	The reference source is the measurement result of the selected operating mode.
1	COUNTER A	The reference source is the channel A counter reading. (only visible in COUNTER mode → COUNT MODE: A+B or A-B)
2	COUNTER B	The reference source is the channel B counter reading. (only visible in COUNTER mode → COUNT MODE: A+B or A-B)
3	BATCH COUNTER	The reference source is the batch counter (quantity counter) (only visible in COUNTER mode → BATCH / TOTAL MODE: INCREMENT BATCH, DECREMENT BATCH, or USE INPUTS ONLY)
4	TOTAL COUNTER	The reference source is the total counter. (only visible in COUNTER mode → BATCH / TOTAL MODE: TOTAL COUNTER)
5	TOTAL TIMER	The reference source is the total timer (total time measurement) (only visible in TIMER mode → TOTAL TIME MODE: YES)

ANALOG FORMAT

This parameter defines the output characteristic. In the output format (-10 V… +10 V), the polarity of the output follows the sign in the display (only in COUNTER mode)

The analog output is proportional to the display value.

0	**-10…10V**	-10 V … +10 V
1	0…20MA	0 mA … 20 mA
2	4…20 MA	4 mA … 20 mA

ANALOG START

Use this parameter to set the start value of the analog modulation. The start value specifies the display value at which the analog output modulates 0 V or 0/4 mA

-99999999	Smallest start value
0	Default value
+99999999	Largest start value

ANALOG END

Use this parameter to set the end value of the analog modulation. The end value specifies the display value at which the analog output modulates its max. value (+/-) 10 V or 20 mA.

-99999999	Smallest start value
10000	Default value
+99999999	Largest start value

ANALOG GAIN (%)

Use this parameter to set the maximum modulation. The ANALOG GAIN indicates the maximum modulation of the analog output in % relative to (+/-) 10 V or 20 mA.

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Example

102.00 corresponds to a modulation of 10.2 V / 20.4 mA when the ANALOG END value is reached.

95.00 corresponds to a modulation of 9.5 V / 18 mA when the ANALOG END value is reached.

0.00	Smallest modulation
100.00	Default value
110.00	Largest modulation

ANALOG OFFSET (%)

Use this parameter to set the zero point shift of the output.

Example

0.20 corresponds to a modulation of 0.02 V / 0.04 mA when the ANALOG START value is reached.

-99.99	Smallest zero point shift
0	Default value
+99.00	Largest zero point shift

4.2.13 Command Menu

INPUT 1 ACTION

(Input 1 function)

This parameter determines the control function of the Ctrl. In 1 input

0	**NO**	No function.	
1	RESET/SET VALUE	Timer mode: resets/sets the value to SET VALUE. Counter mode: resets/sets the value to SET VALUE. Velocity mode: resets the value to 0.	(d) (s)
2	FREEZE	Freezes the display value	(s)
3	KEY LOCK	Keylock: touch screen	(s)
4	LOCK RELEASE	Releases the self-lock of all outputs/relays	(d)
5	RESET MIN/MAX	Resets the min/max values	(d) (s)
6	SERIAL PRINT	Sends serial data, see SERIAL VALUE	(d)
7	TEACH PRESEL. 1	The current display value is stored as PRESELECTION 1	(d)
8	TEACH PRESEL. 2	The current display value is stored as PRESELECTION 2	(d)
9	TEACH PRESEL. 3	The current display value is stored as PRESELECTION 3	(d)
10	TEACH PRESEL. 4	The current display value is stored as PRESELECTION 4	(d)
11	SCROLL DISPLAY	Switches display (see Display Layout During Operation)	(d)
12	CLEAR LOOP TIME	All specified switching conditions are enabled	
13	START PRESELECT	N.A.	

14	ACTIVATE	N.A.	
15	STORE DATA	N.A.	
16	TESTPROGRAM	N.A.	
17	SET RED COLOR	Display lights up red. The color can be changed by the event-related change in color in the PRESELECTION 1 … 4 MENU	(d)
18	SET GREEN COLOR	Display lights up green. The color can be changed by the event-related change in color in the PRESELECTION 1 … 4 MENU	(d)
19	SET YELLOW COLOR	Display lights up yellow. The color can be changed by the event-related change in color in the PRESELECTION 1 … 4 MENU	(d)
20	INCREMENT BATCH	Increases the quantity counter (see Counter mode)	(d)
21	DECREMENT BATCH	Reduces the quantity counter (see Counter mode)	(d)
22	RESET/SET BATCH / TOTAL	Resets / sets the quantity counter / total counter (see Counter mode)	(d) (s)
23	INC. BRIGHTNESS	Display brightness is increased	(d) (s)
24	DEC. BRIGHTNESS	Display brightness is reduced	(d) (s)
25	SET TOTAL TIME	Resets / sets the total time measurement (see TIMER mode)	(d) (s)
26	SET COUNTER A	Resets / sets the counter value of channel A to the set value in SET VALUE—only in COUNTER mode	(d) (s)
27	SET COUNTER B	Resets / sets the counter value of channel B to the set value in SET VALUE—only in COUNTER mode	(d) (s)
28	LOCK COUNTER A	Counter mode: counter (channel A) is disabled and no more pulses are counted as long as this command is present.	(s)
29	LOCK COUNTER B	Counter mode: counter (channel B) is disabled and no more pulses are counted as long as this command is present.	(s)

Table 4.1

(s) Static switching characteristics (level evaluation)
INPUT CONFIG must be set to ACTIVE LOW/HIGH

(d) Dynamic switching characteristics (edge evaluation)
INPUT CONFIG must be set to RISING/FALLING EDGE

INPUT 1 CONFIG

This parameter determines the switching characteristics for Ctrl. In 1.

0	ACTIVE LOW	Enabled at LOW (static)
1	ACTIVE HIGH	Enabled at HIGH (static)
2	**RISING EDGE**	Enabled at rising edge
3	FALLING EDGE	Enabled at falling edge

INPUT 2 ACTION

This parameter determines the control function of the Ctrl. In 2 input

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See functional assignment parameter INPUT 1 ACTION

INPUT 2 CONFIG

This parameter determines the switching characteristics for Ctrl. In 2.

See enabling assignment parameter INPUT 1 CONFIG

INPUT 3 ACTION

This parameter determines the control function of the Ctrl. In 3 input

See functional assignment parameter INPUT 1 ACTION

INPUT 3 CONFIG

This parameter determines the switching characteristics for Ctrl. In 3.

See enabling assignment parameter INPUT 1 CONFIG

4.2.14 Display Menu

Parameter changes only become active after exiting the menu selection.

SOURCE DUAL TOP

(Reference source for two-line display, first line)

0	MEASUREM. RESULT	The reference source is the measurement result of the selected operating mode.
1	**COUNTER A**	The reference source is the channel A counter reading. (only visible in COUNTER mode → COUNT MODE: A+B or A-B)
2	COUNTER B	The reference source is the channel B counter reading. (only visible in COUNTER mode → COUNT MODE: A+B or A-B)
3	BATCH COUNTER	The reference source is the batch counter (quantity counter) (only visible in COUNTER mode → BATCH / TOTAL MODE: INCREMENT BATCH, DECREMENT BATCH, or USE INPUTS ONLY)
4	TOTAL COUNTER	The reference source is the total counter. (only visible in COUNTER mode → BATCH / TOTAL MODE: TOTAL COUNTER)
5	TOTAL TIMER	The reference source is the total timer (total time measurement) (only visible in TIMER mode → TOTAL TIME MODE: YES)

SOURCE DUAL DOWN

(Reference source for two-line display, second line)

0	MEASUREM. RESULT	The reference source is the measurement result of the selected operating mode.
1	COUNTER A	The reference source is the channel A counter reading. (only visible in COUNTER mode → COUNT MODE: A+B or A-B)
2	**COUNTER B**	The reference source is the channel B counter reading. (only visible in COUNTER mode → COUNT MODE: A+B or A-B)

3	BATCH COUNTER	The reference source is the batch counter (quantity counter) (only visible in COUNTER mode → BATCH / TOTAL MODE: INCREMENT BATCH, DECREMENT BATCH, or USE INPUTS ONLY)
4	TOTAL COUNTER	The reference source is the total counter. (only visible in COUNTER mode → BATCH / TOTAL MODE: TOTAL COUNTER)
5	TOTAL TIMER	The reference source is the total timer (total time measurement) (only visible in TIMER mode → TOTAL TIME MODE: YES)

COLOR

This parameter determines the color of the display.

0	**RED**	The display lights up red
1	GREEN	The display lights up green
2	YELLOW	The display lights up yellow

BRIGHTNESS (%)

This parameter determines the display brightness as a percentage.

10	Minimum display brightness
90	Default value
100	Maximum display brightness

CONTRAST

This parameter defines the angle at which to view the display.

0	Viewing angle from above
1	Viewing angle from the front
2	Viewing angle from below

SCREEN SAVER (S)

This parameter determines the time in seconds after which the display goes dark.

0	Display does not go dark
...	
9999	Longest time taken for the display to go dark

UP-DATE-TIME (S)

This parameter determines the update time of the display.

0.005	Shortest update time in seconds
0.1	Default value: 0.1 seconds
9.999	Longest update time in seconds

FONT

This parameter is used to select the font of the plain text.

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0	Default
1	Font 1

START DISPLAY

This parameter sets the starting display after the device is switched on.

0	**DEFAULT**	Unit and status bar display
1	DOUBLE	Dual display without units (only with an active parameter BATCH TOTAL MODE or TOTAL TIME MODE or COUNT MODE A+B or A-B)
2	DOUBLE WITH UNITS	Dual display with units (only with an active parameter BATCH TOTAL MODE or TOTAL TIME MODE or COUNT MODE A+B or A-B)
3	LARGE	Large display (only when the LARGE DISPLAY parameter is active)
4	COMMAND	Keyboard command display (only in TIMER or COUNTER mode)
5	QUICKSTART	Quick-start display for entering the preselect values
6	MINIMUM / MAXIMUM	Displays the minimum / maximum values

LARGE DISPLAY

This parameter is used to switch the large display on or off. A divider ratio divides the display value can be divided accordingly for the large display.

(applies to all 99999999 number formats!)

0	**NO**	Large display switched off.
1	1:1	Large display with 1:1 divider ratio
2	1:10	Large display with 1:10 divider ratio
3	1:100	Large display with 1:100 divider ratio
4	1:1000	Large display with 1:1000 divider ratio
5	1:10000	Large display with 1:10000 divider ratio

4.2.15 Linearization Menu

Use this menu to define the linearization points. Linearization is only possible in SPEED, PROCESS TIME, or COUNTER modes. This menu is only displayed when the appropriate LINEARIZATION MODE is selected in the GENERAL MENU.

Refer to the appendix for a description and examples of the linearization function.

P1(X) ... P24(X)

X coordinate of the linearization point.

This is the display value generated by the device without linearization, based on the input signal.

-99999999	Smallest value
0	Default value
+99999999	Largest value

P1(Y) ... P24(Y)

Y coordinate of the linearization point.

This is the display value to be generated by the device instead of the X coordinate.

Example

P2(X) is replaced by P2(Y).

-99999999	Smallest value
0	Default value
+99999999	Largest value

5 Appendix

5.1 Reading out Data via Serial Interface

You can read out the code positions in series (SERIAL VALUE) defined in the SERIAL MENU at any time via a PC or a PLC. Motrona device communication is based on the Drivecom protocol according to ISO 1745 or the MODBUS RTU protocol. Further details can be found in the "MODBUS RTU Interface" section.

The query string to read out data is:

EOT	AD1	AD2	C1	C2	ENQ

For a current display value to be read out from a device with device address 11 (code=1), the detailed query string is:

ASCII code:	EOT	1	1	:	1	ENQ
Hexadeci-mal:	04	31	31	3A	31	05
Binary:	0000 0100	0011 0001	0011 0001	0011 1010	0011 0001	0000 0101

If the query is correct, the device response is:

STX	C1	C2	xxxxx	ETX	BCC

STX Control character (Hex 02)

C1 Code position to be read out, high byte

C2 Code position to be read out, low byte

xxxxx Data to be read out

ETX Control character (Hex 03)

BCC Block check character

5.2 MODBUS RTU Interface

The MODBUS interface of the touchMATRIX series is a standard MODBUS RTU slave and offers the following MODBUS functions:

- Read coils
- Write single coil
- Read holding registers
- Write multiple registers
- Diagnostics

Basic knowledge of MODBUS RTU communication is required for operating the interface module and for understanding this manual.

5.2.1 Parameter Settings

Required parameter settings in the Serial Menu:

UNIT NUMBER

Not valid for MODBUS communication

(For setting the MODBUS address, refer to "MODBUS" parameter)

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SERIAL BAUD RATE

This parameter is used to set the serial baud rate.

0	**9600**	9600 baud
1	19200	19200 baud
2	38400	38400 baud

SERIAL FORMAT

This parameter sets the bit data format.

0	**7-EVEN-1**	Cannot be used with the MODBUS protocol.		
1	7-EVEN-2			
2	7-ODD-1			
3	7-ODD-2			
4	7-NONE-1			
5	7-NONE-2			
6	8-EVEN-1	8 data	Parity even	1 stop
7	8-ODD-1	8 data	Parity odd	1 stop
8	8-NONE-1	Cannot be used with the MODBUS protocol.		
9	8-NONE-2	8 data	No parity	2 stops

SERIAL INIT

Not valid for MODBUS communication

SERIAL PROTOCOL

Not valid for MODBUS communication

SERIAL TIMER (S)

Not valid for MODBUS communication

SERIAL VALUE

Not valid for MODBUS communication

MODBUS

This parameter enables the MODBUS protocol and determines the MODBUS address.

0	Do not use with MODBUS protocol (MODBUS is disabled)
1...247	MODBUS enabled: The serial interface uses the MODBUS RTU protocol. The number set here determines the MODBUS node address.

5.2.2 MODBUS Communication

The following MODBUS functions are available:

Read Holding Registers and Write Multiple Registers

The Read Holding Registers and Write Multiple Registers functions can be used to access all device registers. All variables (actual values) and status registers are assigned to MODBUS holding registers.

Since all device registers are 32-bit registers, but MODBUS holding registers are only 16-bit registers, each device register requires two holding registers. (It is therefore not possible to use the Write Single Register MODBUS function.)

For each read or write operation, it is only possible to access a single touchMATRIX® device register. Therefore, the "quantity (or number) of registers" in the MODBUS request must always be two.

Access to Parameters

Holding register 0x0000 / 0x0001 hex and the subsequent holding registers allow access to the device parameters.

The holding register numbers for a particular parameter can be calculated using the # parameter. This can be found in the parameter table in the relevant touchMATRIX® device manual:

- Holding register low = (# parameter) x 2
- Holding register high = (# parameter) x 2 + 1

Example:

Access to parameter # 51 PRESELECTION 1 through holding register 0x0066 and 0x0067 hex.

Access to Actual Values

Holding register 0x1000 / 0x1001 hex and the subsequent holding registers allow access to the device variables (actual value register):

- Holding register 0x1000 / 0x1001 hex → actual values with serial code ":0" (displayed value)
- Holding register 0x1002 / 0x1003 hex → actual values with serial code ":1"
- Holding register 0x1004 / 0x1005 hex → actual values with serial code ":2"
- Holding register 0x1006 / 0x1007 hex → actual values with serial code ":3"
- etc.

Access from Status Register

Holding register 0x2000 / 0x2001 hex and the following holding registers allow access to the device status registers:

- Holding register 0x2000 / 0x2001 hex → output status (Ctrl. Out status, read-only)
- Holding register 0x2002 / 0x2003 hex → serial commands
- Holding register 0x2004 / 0x2005 hex → external commands (Ctrl. In status, read-only)
- Holding register 0x2006 / 0x2007 hex → all commands (read-only)

Read Coils and Write Single Coil

The Read Coils and Write Single Coil functions can be used to read and set / reset individual commands:

Coil number	Command serial code	Command	Description
0	54	Reset / Set	Resets / sets the value
1	55	Freeze Display	Freezes the displayed value
2	56	Touch Disable	Keylock: touch screen
3	57	Clear Lock	Removes the lock
4	58	Clear Min/Max	Resets the min. / max. values

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Coil number	Command serial code	Command	Description
5	59	Serial Print (do not use with Modbus)	Sends serial data
6	60	Teach Preset 1	The current display value is stored as PRESELECTION 1
7	61	Teach Preset 2	The current display value is stored as PRESELECTION 2
8	62	Teach Preset 3	The current display value is stored as PRESELECTION 3
9	63	Teach Preset 4	The current display value is stored as PRESELECTION 4
10	64	Scroll Display	Switches display (see Display Layout During Operation)
11	65	Clear Loop Time	All determined switching conditions are enabled
12	66	Start Preselection	Starts the preselection
13	67	Activate Data (not required with MODBUS)	Activates data (not required with MODBUS)
14	68	Store to EEPROM	Saves to EEPROM
15	69	Test program (do not use with MODBUS)	Test program (do not use with MODBUS)

5.2.3 Diagnostics

The device supports the diagnostic sub-function 00 "Return Query Data."

Other diagnostic functions are not available.

5.3 Parameter List / Serial Codes

GENERAL MENU

#	Menu	Name	Serial Code	Min	Max	Default
0	GENERAL MENU	OPERATIONAL MODE	0	0	4	0
1	GENERAL MENU	ENCODER PROPERTIES	1	0	3	0
2	GENERAL MENU	ENCODER SUPPLY	2	0	1	0
3	GENERAL MENU	COUNTING DIRECTION	3	0	1	0
4	GENERAL MENU	SCALE UNITS	4	0	28	0
5	GENERAL MENU	LINIARIZATION MODE	5	0	2	0
6	GENERAL MENU	PIN PRESELECTION	6	0	9999	0
7	GENERAL MENU	PIN PARAMETER	7	0	9999	0

#	Menu	Name	Serial Code	Min	Max	Default
8	GENERAL MENU	BACK UP MEMORY	8	0	1	1
9	GENERAL MENU	FACTORY SETTINGS	9	0	1	0
10	GENERAL MENU	-	10	0	0	0
11	GENERAL MENU	-	11	0	0	0

MODE SPEED

#	Menu	Name	Serial Code	Min	Max	Default
12	MODE SPEED	DISPLAY VALUE	12	1	999999 99	1000
13	MODE SPEED	BASE FREQUENCY (HZ)	13	1	500000	100
14	MODE SPEED	DECIMAL POINT	14	0	7	1
15	MODE SPEED	SAMPLING TIME (S)	15	5	9999	100
16	MODE SPEED	WAIT TIME (S)	16	1	9999	100
17	MODE SPEED	STANDSTILL TIME (S)	17	0	9999	0
18	MODE SPEED	AVERAGE FILTER	18	0	8	0
19	MODE SPEED	-	19	0	0	0
20	MODE SPEED	-	20	0	0	0
21	MODE SPEED	-	21	0	0	0

MODE PROCESS TIME

#	Menu	Name	Serial Code	Min	Max	Default
22	MODE PROCESS TIME	DISPLAY FORMAT	22	0	3	0
23	MODE PROCESS TIME	DISPLAY VALUE	23	1	999999 99	1000
24	MODE PROCESS TIME	BASE FREQUENCY (HZ)	24	1	500000	100
25	MODE PROCESS TIME	SAMPLING TIME (S)	25	5	9999	100
26	MODE PROCESS TIME	WAIT TIME (S)	26	1	9999	100
27	MODE PROCESS TIME	STANDSTILL TIME (S)	27	0	9999	0
28	MODE PROCESS TIME	AVERAGE FILTER	28	0	8	0
29	MODE PROCESS TIME	-	29	0	0	0
30	MODE PROCESS TIME	-	30	0	0	0

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MODE TIMER

#	Menu	Name	Serial Code	Min	Max	Default
31	MODE TIMER	TIME BASE	31	0	7	0
32	MODE TIMER	START / STOP	32	0	3	2
33	MODE TIMER	AUTO RESET	33	0	1	0
34	MODE TIMER	LATCH FUNCTION	34	0	1	0
35	MODE TIMER	SET VALUE	35	0	99999999	0
36	MODE TIMER	INC / DEC MODE	36	0	1	0
37	MODE TIMER	TOTAL TIME MODE	37	0	1	0
38	MODE TIMER	TOTAL TIME SET VALUE	38	0	99999999	0
39	MODE TIMER	-	39	0	0	0

MODE COUNTER

#	Menu	Name	Serial Code	Min	Max	Default
40	MODE COUNTER	COUNT MODE	40	0	5	3
41	MODE COUNTER	FACTOR	41	1	9999999	100000
42	MODE COUNTER	SET VALUE	42	-99999999	99999999	0
43	MODE COUNTER	DECIMALPOINT	43	0	7	0
44	MODE COUNTER	BATCH / TOTAL MODE	44	0	3	0
45	MODE COUNTER	BATCH / TOTAL SET VALUE	45	0	99999999	0
46	MODE COUNTER	ROUND LOOP VALUE	46	0	99999999	0
47	MODE COUNTER	-	47	0	0	0
48	MODE COUNTER	-	48	0	0	0

MODE VELOCITY

#	Menu	Name	Serial Code	Min	Max	Default
49	MODE VELOCITY	START / STOP	A0	0	3	0
50	MODE VELOCITY	DISPLAY VALUE	A1	1	99999999	1000
51	MODE VELOCITY	BASE TIME (S)	A2	1	999999	1000
52	MODE VELOCITY	DECIMALPOINT	A3	0	7	0
53	MODE VELOCITY	WAIT TIME (S)	A4	0	9999	0
54	MODE VELOCITY	STANDSTILL TIME (S)	A5	0	9999	0
55	MODE VELOCITY	-	A6	0	0	0
56	MODE VELOCITY	-	A7	0	0	0
57	MODE VELOCITY	-	A8	0	0	0

PRESELECTION VALUES

#	Menu	Name	Serial Code	Min	Max	Default
58	PRESELECTION VALUES	PRESELECTION 1	A9	-999999999	999999999	1000
59	PRESELECTION VALUES	PRESELECTION 2	B0	-999999999	999999999	2000
60	PRESELECTION VALUES	PRESELECTION 3	B1	-999999999	999999999	3000
61	PRESELECTION VALUES	PRESELECTION 4	B2	-999999999	999999999	4000

PRESELECTION 1 MENU

#	Menu	Name	Serial Code	Min	Max	Default
62	PRESELECTION 1 MENU	SOURCE 1	B3	0	5	0
63	PRESELECTION 1 MENU	MODE 1	B4	0	11	0
64	PRESELECTION 1 MENU	HYSTERESIS 1	B5	0	99999	0
65	PRESELECTION 1 MENU	PULSE TIME 1 (S)	B6	0	60000	0
66	PRESELECTION 1 MENU	OUTPUT TARGET 1	B7	0	6	1
67	PRESELECTION 1 MENU	OUTPUT POLARITY 1	B8	0	1	0
68	PRESELECTION 1 MENU	OUTPUT LOCK 1	B9	0	1	0
69	PRESELECTION 1 MENU	START UP DELAY 1 (S)	C0	0	60000	0
70	PRESELECTION 1 MENU	EVENT COLOR 1	C1	0	3	0
71	PRESELECTION 1 MENU	-	C2	0	0	0

PRESELECTION 2 MENU

#	Menu	Name	Serial Code	Min	Max	Default
72	PRESELECTION 2 MENU	SOURCE 2	C3	0	5	0
73	PRESELECTION 2 MENU	MODE 2	C4	0	11	0
74	PRESELECTION 2 MENU	HYSTERESIS 2	C5	0	99,999	0
75	PRESELECTION 2 MENU	PULSE TIME 2 (S)	C6	0	60000	0

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#	Menu	Name	Serial Code	Min	Max	Default
76	PRESELECTION 2 MENU	OUTPUT TARGET 2	C7	0	6	2
77	PRESELECTION 2 MENU	OUTPUT POLARITY 2	C8	0	1	0
78	PRESELECTION 2 MENU	OUTPUT LOCK 2	C9	0	1	0
79	PRESELECTION 2 MENU	START UP DELAY 2 (S)	D0	0	60000	0
80	PRESELECTION 2 MENU	EVENT COLOR 2	D1	0	3	0
81	PRESELECTION 2 MENU	-	D2	0	0	0

PRESELECTION 3 MENU

#	Menu	Name	Serial Code	Min	Max	Default
82	PRESELECTION 3 MENU	SOURCE 3	D3	0	5	0
83	PRESELECTION 3 MENU	MODE 3	D4	0	11	0
84	PRESELECTION 3 MENU	HYSTERESIS 3	D5	0	99,999	0
85	PRESELECTION 3 MENU	PULSE TIME 3 (S)	D6	0	60000	0
86	PRESELECTION 3 MENU	OUTPUT TARGET 3	D7	0	6	3
87	PRESELECTION 3 MENU	OUTPUT POLARITY 3	D8	0	1	0
88	PRESELECTION 3 MENU	OUTPUT LOCK 3	D9	0	1	0
89	PRESELECTION 3 MENU	START UP DELAY 3	E0	0	1	0
90	PRESELECTION 3 MENU	EVENT COLOR 3	E1	0	3	0
91	PRESELECTION 3 MENU	-	E2	0	0	0

PRESELECTION 4 MENU

#	Menu	Name	Serial Code	Min	Max	Default
92	PRESELECTION 4 MENU	SOURCE 4	E3	0	5	0
93	PRESELECTION 4 MENU	MODE 4	E4	0	11	0
94	PRESELECTION 4 MENU	HYSTERESIS 4	E5	0	99,999	0
95	PRESELECTION 4 MENU	PULSE TIME 4 (S)	E6	0	60000	0

#	Menu	Name	Serial Code	Min	Max	Default
96	PRESELECTION 4 MENU	OUTPUT TARGET 4	E7	0	6	4
97	PRESELECTION 4 MENU	OUTPUT POLARITY 4	E8	0	1	0
98	PRESELECTION 4 MENU	OUTPUT LOCK 4	E9	0	1	0
99	PRESELECTION 4 MENU	START UP DELAY 4	F0	0	1	0
100	PRESELECTION 4 MENU	EVENT COLOR 4	F1	0	3	0
101	PRESELECTION 4 MENU	-	F2	0	0	0

SERIAL MENU

#	Menu	Name	Serial Code	Min	Max	Default
102	SERIAL MENU	UNIT NUMBER	90	11	99	11
103	SERIAL MENU	SERIAL BAUD RATE	91	0	2	0
104	SERIAL MENU	SERIAL FORMAT	92	0	9	0
105	SERIAL MENU	SERIAL INIT	9~	0	1	0
106	SERIAL MENU	SERIAL PROTOCOL	F3	0	1	0
107	SERIAL MENU	SERIAL TIMER (S)	F4	0	60000	0
108	SERIAL MENU	SERIAL VALUE	F5	0	9	0
109	SERIAL MENU	MODBUS	F6	0	247	0
110	SERIAL MENU	-	F7	0	0	0
111	SERIAL MENU	-	F8	0	0	0

ANALOG MENU

#	Menu	Name	Serial Code	Min	Max	Default
112	ANALOG MENU	ANALOG SOURCE	F9	0	5	0
113	ANALOG MENU	ANALOG FORMAT	G0	0	2	0
114	ANALOG MENU	ANALOG START	G1	-99999999	99999999	0
115	ANALOG MENU	ANALOG END	G2	-99999999	99999999	10000
116	ANALOG MENU	ANALOG GAIN %	G3	0	11000	10000
117	ANALOG MENU	ANALOG OFFSET %	G4	-9999	9999	0
118	ANALOG MENU	-	G5	0	0	0

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COMMAND MENU

#	Menu	Name	Serial Code	Min	Max	Default
119	COMMAND MENU	INPUT 1 ACTION	G6	0	29	0
120	COMMAND MENU	INPUT 1 CONFIG.	G7	0	3	2
121	COMMAND MENU	INPUT 2 ACTION	G8	0	29	0
122	COMMAND MENU	INPUT 2 CONFIG.	G9	0	3	2
123	COMMAND MENU	INPUT 3 ACTION	H0	0	29	0
124	COMMAND MENU	INPUT 3 CONFIG.	H1	0	3	2
125	COMMAND MENU	-	H2	0	0	0
126	COMMAND MENU	-	H3	0	0	0
127	COMMAND MENU	-	H4	0	0	0
128	COMMAND MENU	-	H5	0	0	0
129	COMMAND MENU	-	H6	0	0	0

DISPLAY MENU

#	Menu	Name	Serial Code	Min	Max	Default
130	DISPLAY MENU	SOURCE DUAL TOP	H7	0	5	1
131	DISPLAY MENU	SOURCE DUAL DOWN	H8		5	2
132	DISPLAY MENU	COLOR	H9	0	2	0
133	DISPLAY MENU	BRIGHTNESS %	I0	10	100	90
134	DISPLAY MENU	CONTRAST	I1	0	2	1
135	DISPLAY MENU	SCREEN SAVER (S)	I2	0	9999	0
136	DISPLAY MENU	UP-DATE-TIME (S)	I3	5	9999	100
137	DISPLAY MENU	FONT	I4	0	1	0
138	DISPLAY MENU	START DISPLAY	I5	0	6	0
139	DISPLAY MENU	LARGE DISPLAY	I6	0	5	0

LINEARIZATION MENU

#	Menu	Name	Serial Code	Min	Max	Default
140	LINEARIZATION MENU	P1(X)	I7	-99999999	99999999	0
141	LINEARIZATION MENU	P1(Y)	I8	-99999999	99999999	0
142	LINEARIZATION MENU	P2(X)	I9	-99999999	99999999	0
143	LINEARIZATION MENU	P2(Y)	J0	-99999999	99999999	0
144	LINEARIZATION MENU	P3(X)	J1	-99999999	99999999	0

#	Menu	Name	Serial Code	Min	Max	Default
145	LINEARIZATION MENU	P3(Y)	J2	-999999999	999999999	0
146	LINEARIZATION MENU	P4(X)	J3	-999999999	999999999	0
147	LINEARIZATION MENU	P4(Y)	J4	-999999999	999999999	0
148	LINEARIZATION MENU	P5(X)	J5	-999999999	999999999	0
149	LINEARIZATION MENU	P5(Y)	J6	-999999999	999999999	0
150	LINEARIZATION MENU	P6(X)	J7	-999999999	999999999	0
151	LINEARIZATION MENU	P6(Y)	J8	-999999999	999999999	0
152	LINEARIZATION MENU	P7(X)	J9	-999999999	999999999	0
153	LINEARIZATION MENU	P7(Y)	K0	-999999999	999999999	0
154	LINEARIZATION MENU	P8(X)	K1	-999999999	999999999	0
155	LINEARIZATION MENU	P8(Y)	K2	-999999999	999999999	0
156	LINEARIZATION MENU	P9(X)	K3	-999999999	999999999	0
157	LINEARIZATION MENU	P9(Y)	K4	-999999999	999999999	0
158	LINEARIZATION MENU	P10(X)	K5	-999999999	999999999	0
159	LINEARIZATION MENU	P10(Y)	K6	-999999999	999999999	0
160	LINEARIZATION MENU	P11(X)	K7	-999999999	999999999	0
161	LINEARIZATION MENU	P11(Y)	K8	-999999999	999999999	0
162	LINEARIZATION MENU	P12(X)	K9	-999999999	999999999	0

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#	Menu	Name	Serial Code	Min	Max	Default
163	LINEARIZATION MENU	P12(Y)	L0	-999999999	99999999	0
164	LINEARIZATION MENU	P13(X)	L1	-999999999	99999999	0
165	LINEARIZATION MENU	P13(Y)	L2	-999999999	99999999	0
166	LINEARIZATION MENU	P14(X)	L3	-999999999	99999999	0
167	LINEARIZATION MENU	P14(Y)	L4	-999999999	99999999	0
168	LINEARIZATION MENU	P15(X)	L5	-999999999	99999999	0
169	LINEARIZATION MENU	P15(Y)	L6	-999999999	99999999	0
170	LINEARIZATION MENU	P16(X)	L7	-999999999	99999999	0
171	LINEARIZATION MENU	P16(Y)	L8	-999999999	99999999	0
172	LINEARIZATION MENU	P17(X)	L9	-999999999	99999999	0
173	LINEARIZATION MENU	P17(Y)	M0	-999999999	99999999	0
174	LINEARIZATION MENU	P18(X)	M1	-999999999	99999999	0
175	LINEARIZATION MENU	P18(Y)	M2	-999999999	99999999	0
176	LINEARIZATION MENU	P19(X)	M3	-999999999	99999999	0
177	LINEARIZATION MENU	P19(Y)	M4	-999999999	99999999	0
178	LINEARIZATION MENU	P20(X)	M5	-999999999	99999999	0
179	LINEARIZATION MENU	P20(Y)	M6	-999999999	99999999	0
180	LINEARIZATION MENU	P21(X)	M7	-999999999	99999999	0

#	Menu	Name	Serial Code	Min	Max	Default
181	LINEARIZATION MENU	P21(Y)	M8	-99999999	99999999	0
182	LINEARIZATION MENU	P22(X)	M9	-99999999	99999999	0
183	LINEARIZATION MENU	P22(Y)	N0	-99999999	99999999	0
184	LINEARIZATION MENU	P23(X)	N1	-99999999	99999999	0
185	LINEARIZATION MENU	P23(Y)	N2	-99999999	99999999	0
186	LINEARIZATION MENU	P24(X)	N3	-99999999	99999999	0
187	LINEARIZATION MENU	P24(Y)	N4	-99999999	99999999	0

Serial codes for the commands:

Serial Code	Command
54	RESET/SET
55	FREEZE DISPLAY
56	TOUCH DISABLE
57	CLR LOCK
58	CLR MIN MAX
59	SERIAL PRINT
60	TEACH PRES 1
61	TEACH PRES 2
62	TEACH PRES 3
63	TEACH PRES 4
64	SCROLL_DISPLAY
65	CLEAR LOOP TIME
66	START PRESELECTION
67	ACTIVATE DATA
68	STORE EEPROM
69	TESTPROGRAM

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5.4 Linearization

This function allows you to convert a linear input signal into a non-linear display (or vice versa). A maximum of 24 linearization points are available. These can be distributed over the entire conversion range at any desired intervals. Linear interpolation takes place automatically between two set coordinates.

We recommend that you place as many points as possible in places with strong curvature, whereas in places with weak curvature only a few points are sufficient. To specify a linearization curve, you must set the LINEARIZATION MODE parameter to 1 QUADRANT or 4 QUADRANT (see diagram below).

Parameters P1(X) to P24(X) can be used to specify up to 24 X coordinates. These correspond to the display values without linearization.

Parameters P1(Y) to P24(Y) are used to enter the values that the display will adopt instead of the X values.

Example

Value P5(X) is replaced by value P5(Y).

You must assign continuously increasing values to the X coordinates.

P1(X) is the smallest value and each of the following must be greater. For measured values greater than the last defined X value, the corresponding Y value is displayed constantly.

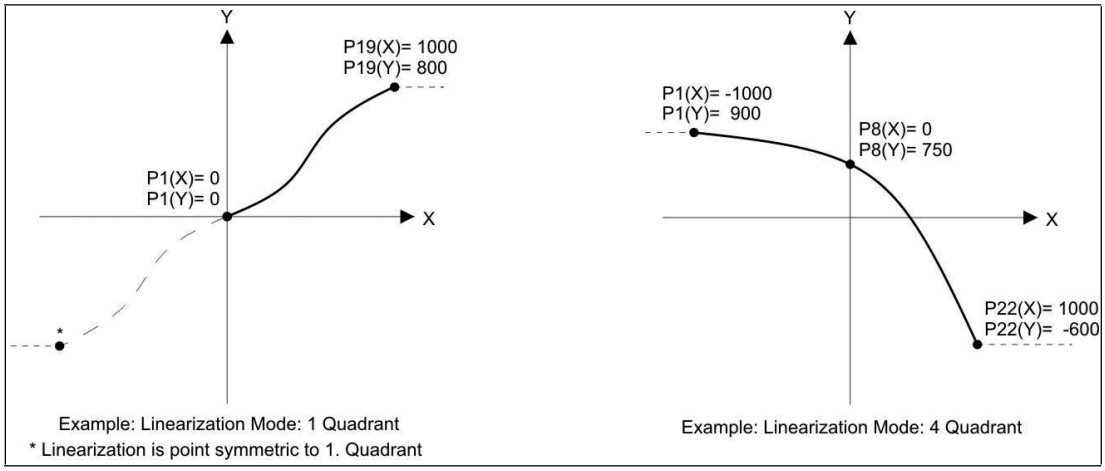

Figure 5.1

Mode: 1 Quadrant:

P1(X) must be set to 0. The linearization is only defined in the positive value range.

With negative measured values, the curve is mirrored point-symmetrically.

Mode: 4 Quadrant:

P1(X) can also be set to negative values. For measured values less than P1(X), the P1(Y) value is displayed constantly.

Example

The image below shows a water sluice, in which an incremental rotary encoder will detect the opening width, which will be displayed. In this arrangement, the encoder generates a signal proportional to the angle of rotation φ; however, direct indication of the opening width "d" is required

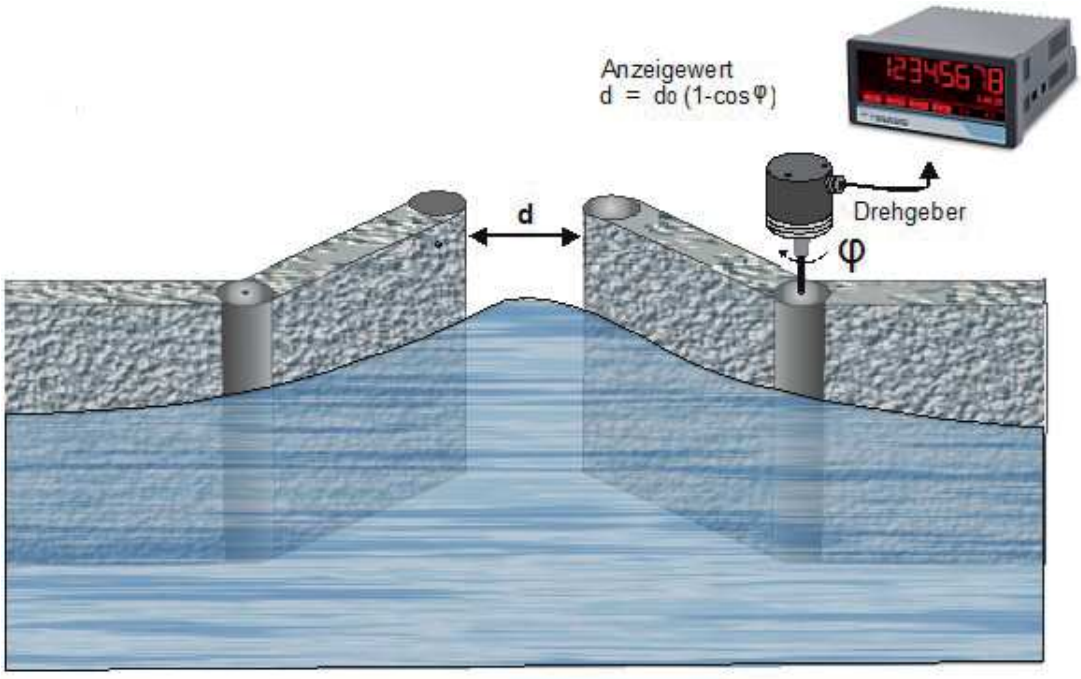

Figure 5.2

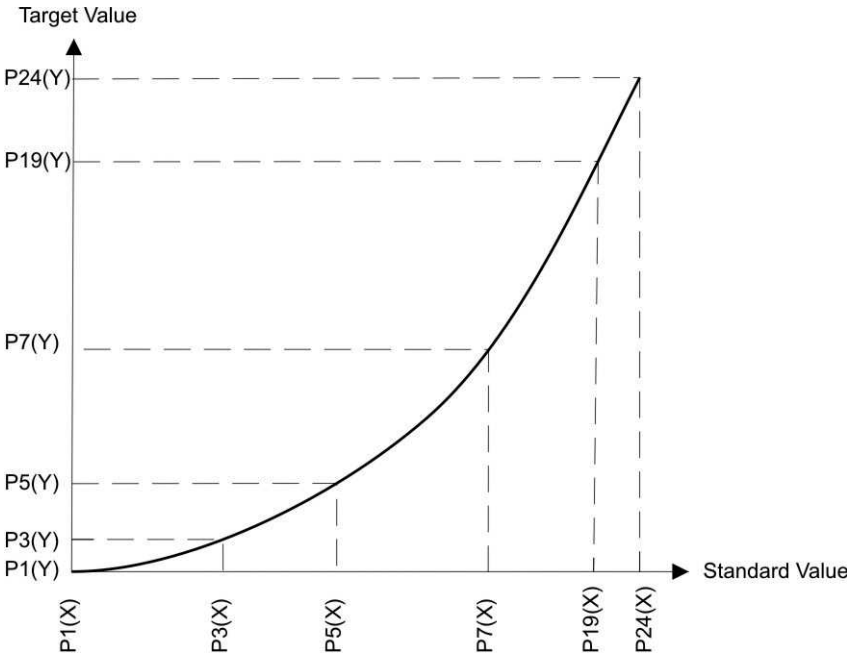

Figure 5.3

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