



Signal converter FU210 / IV210 / PV210 / ZU210

| | | |
|----------------------------|---|----------------------------|
| Frequency (FU210) | → | Analog (current / voltage) |
| SSI absolute value (IV210) | | Serial (RS232 / RS485) |
| Start-Stop (PV210) | | |
| Pulse counter (ZU210) | | |

Product features:

- Multifunctional unit with several operating modes for incremental encoders or SSI absolute encoders
- For incremental encoders:
 - Operating modes as frequency converter or position transducer (pulse counter)
 - Universal incremental inputs (HTL/TTL/RS422) for NPN/PNP/NAMUR encoders and sensors
 - Functions such as linkages (eg. A+B), scaling, filters, start-up bridging, ...
 - Input frequencies up to 1 MHz
- For SSI absolute encoders:
 - Master or Slave operation with clock frequencies up to 1 MHz
 - For single turn and multi turn encoders with SSI formats from 10 ... 32 Bit
 - Functions such as bit suppression, round-loop function, scaling, ...
- For absolute and magnetostrictive position encoder with Start-Stop-Interface:
 - Operating modes for master or slave, for position, angle and speed measurement
- 16 bit analog output, configurable for voltage or current operation
- USB interface and RS232/RS485-interface for configuration and serial readout
- Extremely short conversion times
- Linearization with 24 control points
- Auxiliary voltage output 5 and 24VDC for encoder supply
- Numerous connection options via 6 control inputs and 6 control outputs
- Compact rail housing to EN60715
- Easy parameterization via user interface OS (Freeware)

Die deutsche Beschreibung ist verfügbar unter:

https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Zu210_d.pdf



The English description is available at:

https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Zu210_e.pdf



La description en français est disponible sur:

https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Zu210_f.pdf



The operator software OS (freeware) is available at:

<https://www.motrona.com/en/support/software.html>



| Version: | Description: |
|--------------------------------|---|
| ZU210_01a_oi/tgo/April 19 | First Version |
| Zu210_01b/mbo/August 19 | New added: chapter "Compatibility Hint" |
| ZU210_02a_oi/tgo/November 19 | Extension of QR-code and of new filter functions at Mode Frequency |
| ZU210_02b_oi/mbo/December 19 | Revised Version |
| ZU210_03a_oi/mbo/tgo/Januar 20 | Extension by start-stop-interface |
| ZU210_03b_oi/mbo/April 2020 | New connection diagram in chapter 4, failure rate added |
| ZU210_04a_oi/mbo/August 2020 | New USB interface at X7 |
| ZU210_05a_oi/tgo/mbo/June 2024 | New parameter structure, Analog Gain adapted, serial parameters for USB |

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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.

1.4. EMC Guidelines

All motrona devices are designed to provide high protection against electromagnetic interference. Nevertheless you must minimize the influence of electromagnetic noise to the device and all connected cables.

Therefore the following measures are mandatory for a successful installation and operation:

- **Use shielded cables for all signal and control input and output lines.**
- **Cables for digital controls (digital I/O, relay outputs) must not exceed a length of 30 m and are allowed for in building operation only**
- Use shield connection clamps to connect the cable shields properly to earth
- The wiring of the common ground lines must be star-shaped and common ground must be connected to earth at only one single point
- The device should be mounted in a metal enclosure with sufficient distance to sources of electromagnetic noise.
- Run signal and control cables apart from power lines and other cables emitting electromagnetic noise.

Please also refer to motrona manual "General Rules for Cabling, Grounding, Cabinet Assembly". You can download that manual by the link

<https://www.motrona.com/en/support/general-certificates.html>

1.5. 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. Compatibility Hint

This product is a successor model of the thousand fold proven converter type ZU252 / FU252 / IV251.

This converter is able to replace functionally the previous model; however some minor differences have to be observed with regard to the parameter settings.

The main differences between this product and the respective predecessor model are listed below.

Differences of the ZU210 / FU210 / IV210 compared to the previous models are:

| | ZU210 / FU210 / IV210 | ZU252 / FU252 / IV251 |
|-----------------------------------|--|---|
| Incremental Input: (ZU/FU) | <p><u>Possible configurations:</u></p> <p>RS422 (TTL), HTL Differential, HTL PNP, HTL NPN or TTL PNP (asymmetrical)</p> <p>The setting made in the corresponding parameter then applies to both inputs (A <u>and</u> B).</p> | <p><u>Possible configurations:</u></p> <p>RS422 (TTL), HTL Differential, HTL PNP, HTL NPN or TTL (asymmetrical)</p> <p>The desired setting can be made separately for each channel (A <u>and</u> B) using the corresponding DIL switches.</p> |
| Control Inputs: | <p>Number of inputs: 6</p> <p>Format: HTL</p> | <p>Number of inputs 1</p> <p>Format: HTL</p> |
| Control Outputs: | <p>Number of outputs: 6</p> <p>Format / Level: 5...30 V, PNP</p> <p>Output current: max. 200 mA</p> <p>Reaction time: < 1ms</p> | No switching outputs |
| Encoder Supply: | <p>Output voltage: 5VDC u. 24VDC</p> <p>Output current: max. 250 mA</p> | <p>Output voltage: 5VDC</p> <p>Output current: max. 250 mA</p> |
| Serial Interface: | <p>RS232/RS485 via screw terminals</p> <p>Baud rate: 9600, 19200 or 38400 Baud</p> | <p>RS232/RS485 via 9-position SUB-D connector (female)</p> <p>Baud rate: 600, 1200, 2400, 4800, 9600, 19200, or 38400 Baud</p> |
| Housing: | <p>Dimensions (w x h x d): 23 x 102 x 102 mm</p> <p>Weight: approx. 100 g</p> | <p>Dimensions (w x h x d): 40 x 79 x 91 mm</p> <p>Weight: approx. 190 g</p> |
| Device parameterization: | Only by operator software OS. | By operator software OS and partially via DIL switches |
| Operating modes for FU: | <p>Only channel A</p> <p>Ratio B/A</p> <p>Percentage deviation from channel B to A</p> <p>Sum A+B</p> <p>Difference A-B</p> <p>A/Bx90</p> | <p>Only channel A</p> <p>Ratio A/B</p> <p>Sum A+B</p> <p>A/Bx90</p> <p>Only channel B</p> <p>Product AxB</p> <p>Difference A-B</p> <p>A= Impulse, B = Direction</p> |

3. Introduction

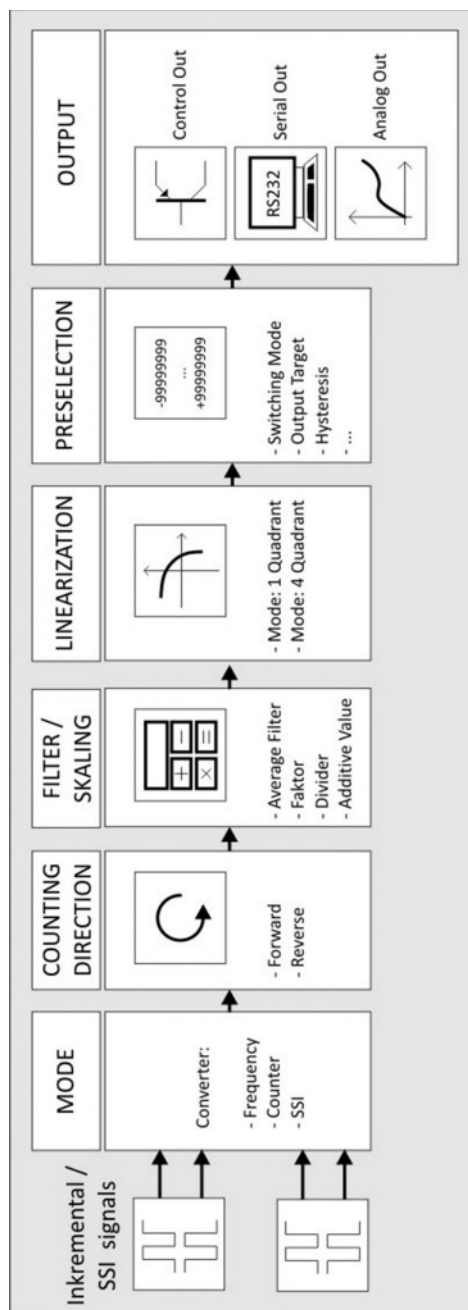
The device is designed as a signal converter with control inputs and outputs. Its extensive functions make it universally applicable.

3.1. Operating Mode

Basically all functions have to be configured in the parameter menu. The device can be used in the following operating modes:

- Operation as frequency converter for incremental input signals (replaces FU252)
- Operation as position transducer / counter for incremental input signals (replaces ZU252)
- Operation as absolute value converter for signals of a start-stop interface
- Operation as absolute value converter for SSI signals (replaces IV251)

3.2. Function diagram



3.3. Power – LED / Error messages

The device has a green LED on its front foil. This lights up permanently as soon as the supply voltage of the device has been applied. If an error occurs, the LED flashes at 1 Hz.

The analog output is also controlled with 0 V resp. 0 mA (0..20 mA) or 2 mA (4..20 mA). If the error no longer exists, the LED automatically lights up again permanently and the analogue output responds to the current result.

In addition, a "collective fault message" can be issued via one of the control outputs if required. To do this, the "MODE x" parameter of the respective switching output must be set to "ERROR SET".

The exact error can be read out via the serial interface via the user interface (OS).

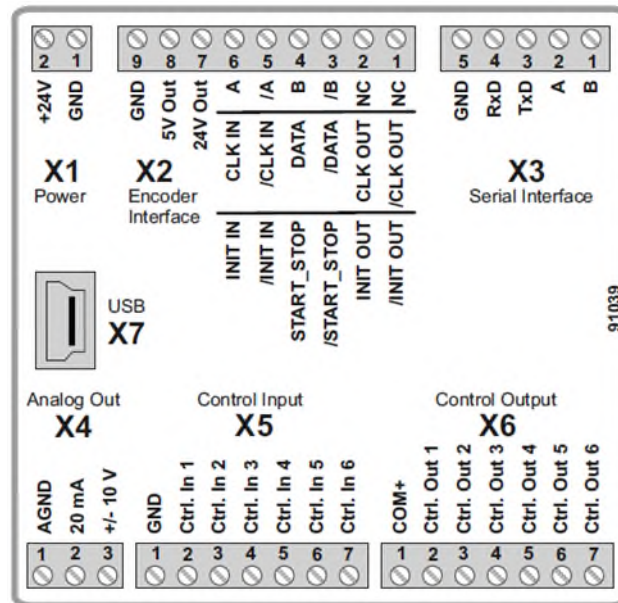
(→ Variable: Error_Status, Code: "; 3")

The individual error codes are explained below:

| Errorcode: (Error_Status) | Error identification: | Error description: |
|------------------------------|------------------------------------|--|
| 0x00000001 | Maximum Value | Measured value is greater than 99999999 |
| 0x00000002 | Minimum Value | Measured value is less than -99999999 |
| 0x00000004 | SSI Encoder Error | SSI error bit set |
| 0x00000008 | Encoder Fault | Wire break detection is active. |
| 0x00000010 | Frequency (Input A) out of range | Maximum or minimum permissible input frequency at input A has been exceeded or fallen below with the exponential filter setting used. |
| 0x00000020 | Frequency (Input B) out of range | Maximum or minimum permissible input frequency at input B has been exceeded or fallen below with the exponential filter setting used. |
| 0x00000040 | Start/Stop Encoder Error | No "start" and no "stop" pulse detected between two "init" pulses. (only for PV210) Check sensor connections! |
| 0x00000080 | Position Encoder Outside the Limit | No "start" and no "stop" pulse detected between two "init" pulses. (only for PV210) Possible cause: No position sensor or position sensor outside the limits. |

4. Electrical Connections

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



4.1. DC Power Supply (X1)

The unit accepts DC supply from 18 to 30 V at the terminals X1 1 and 2. The power consumption depends on the level of the supply voltage with approx. 50 mA and the additional current required at the Auxiliary Voltage Output.

All GND terminals are internally interconnected.

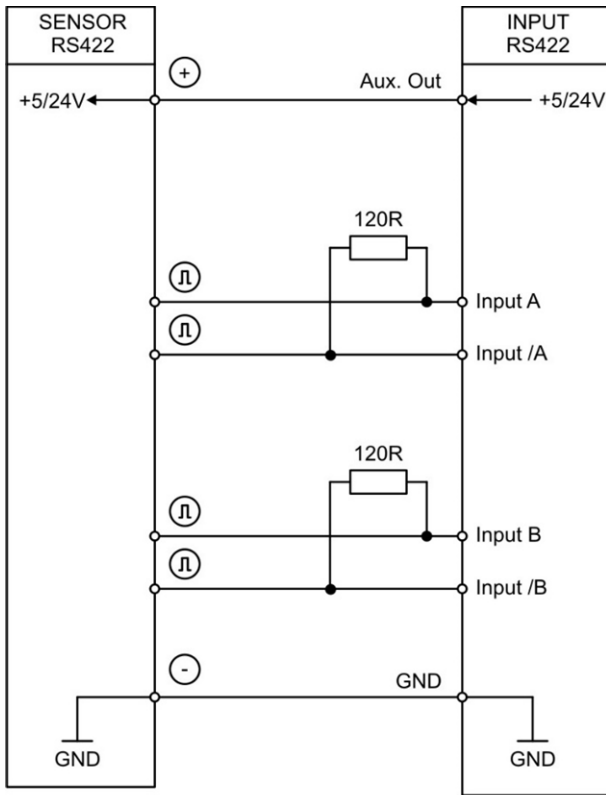
4.2. Auxiliary voltage output (X2)

Two auxiliary voltages (24 VDC and 5 VDC) are available as encoder / sensor supply at terminal X2 pins 7, 8 and 9. The 24 VDC output voltage depends on the device supply (see technical data).

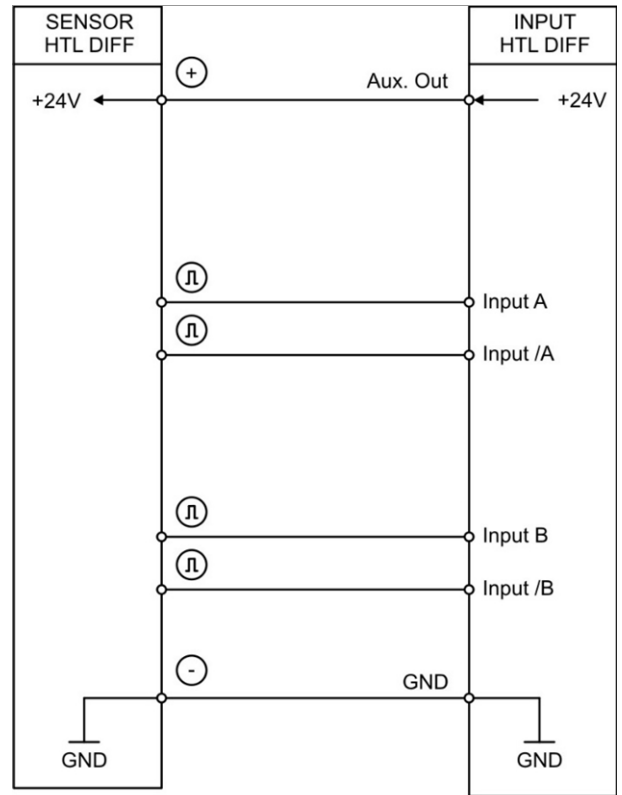
4.3. Incremental encoder input (X2)

Terminal X2 pins 3, 4, 5 and 6 provide a connection for various incremental signals.

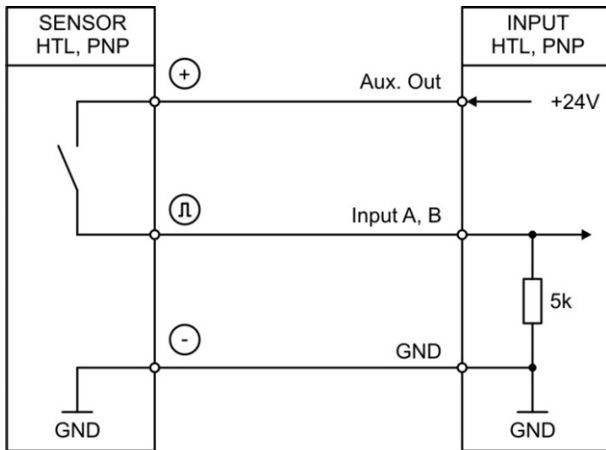
RS422



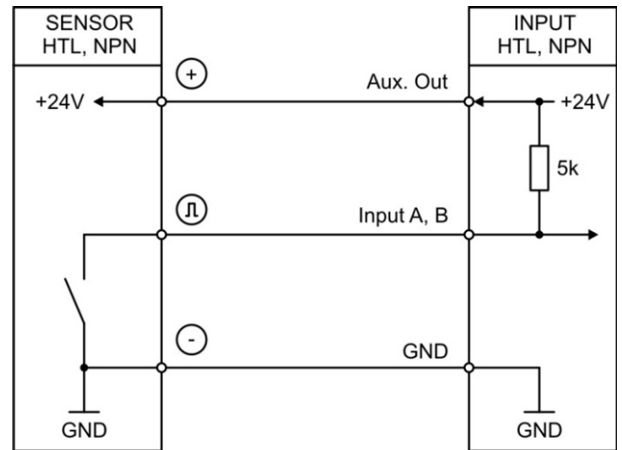
HTL DIFFERENTIAL



HTL PNP

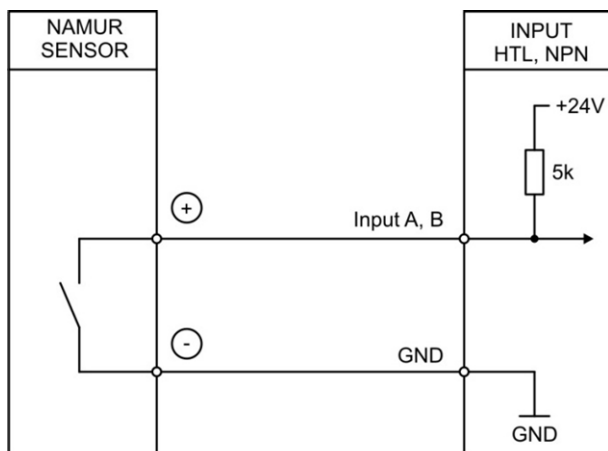


HTL NPN

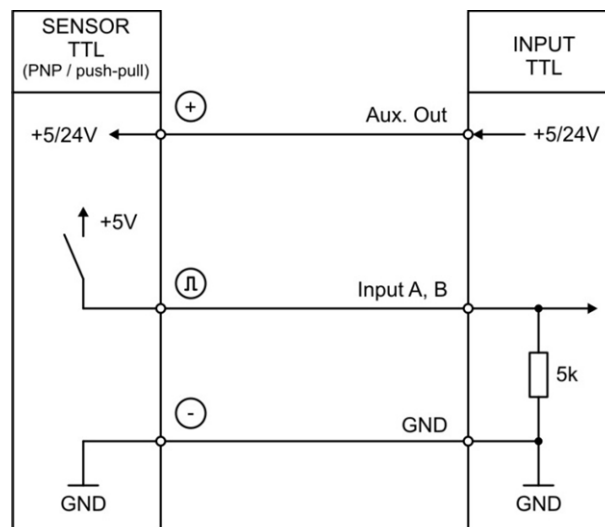


Continuation „Incremental encoder input (X2)“:

HTL NPN (NAMUR)



TTL (PNP)



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:

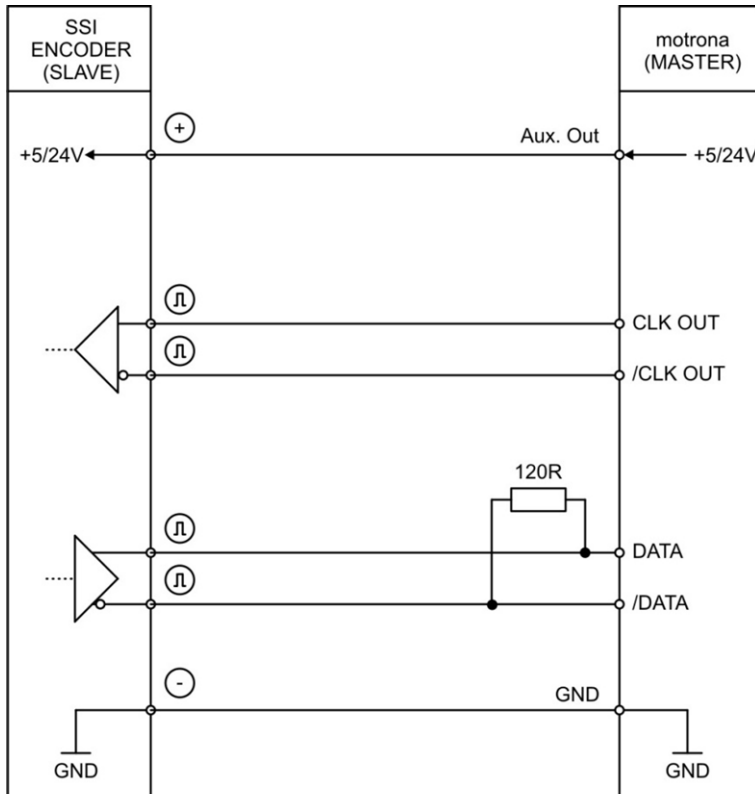
When exceptionally mechanical contacts are used, please connect an external capacitor between GND (-) and the corresponding input (+). A capacity of 10 μF will reduce the input frequency to 20 Hz and miscounting due to contact bouncing will be eliminated.

4.4. SSI-Absolute encoder input (X2)

At terminal X2 pin 1, 2, 3, 4 the SSI connection for the MODE MASTER is available.

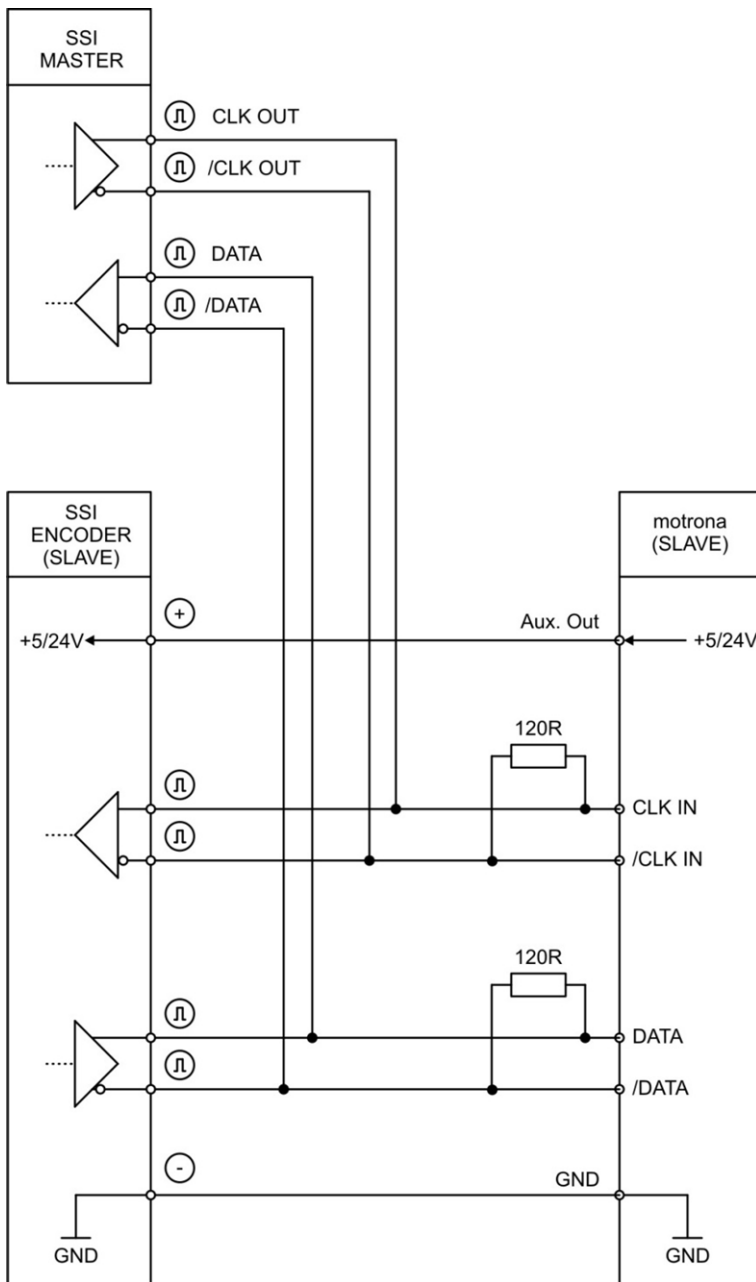
At terminal X2 pin 3, 4, 5, 6 the SSI connection for the MODE SLAVE is available.

Connection for **MODE Master**:



Continuation „SSI-Absolute encoder input (X2)“:

Connection for **MODE Slave**:



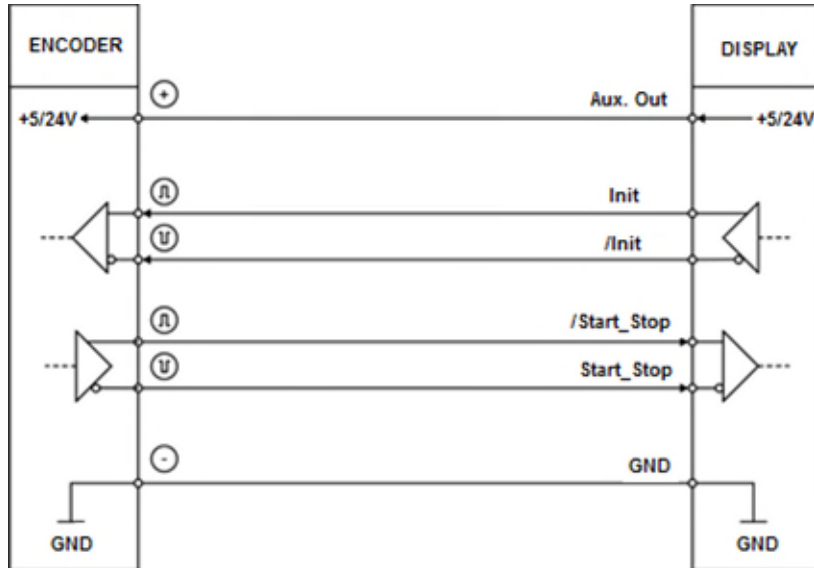
4.5. Start-stop encoder inputs (X2)

At terminal X2 - Pin 1+2 the RS422 connection for the init pulse in "MODE MASTER" is available. (Device generates Init pulse itself!).

At terminal X2 - Pin 5+6 the RS422 connection for the init pulse in "MODE SLAVE" is available. (Init pulse is generated by an external device!).

At terminal X2 - Pin 3 + 4 the RS422 connection for the Sart-Stop pulse is available.

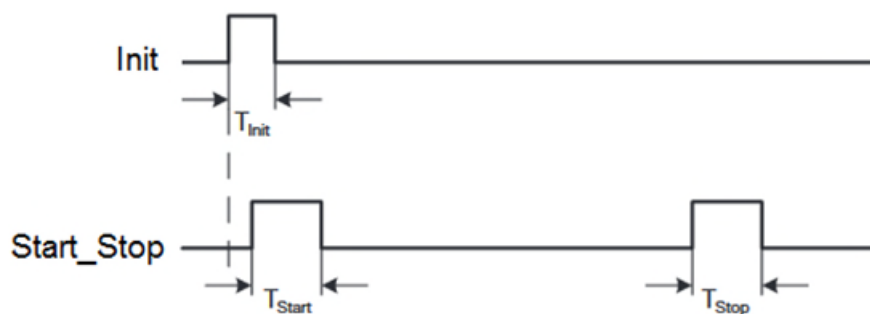
Connection of the RS422 signals:



DPI measurement operation

In the "MODE MASTER", the init pulse is sent to the position sensor on the init line at regular intervals (SAMPLING TIME (ms)), whose rising edge triggers a measurement.

The pulse width of the init pulse can be set by means of the "INIT PULSE TIME (μs)" parameter.



| | |
|--------------------|----------------------------------|
| T_{Init} | 1...9 μs (adjustable) |
| T_{Start} | ~3...5 μs |
| T_{Stop} | ~3...5 μs |

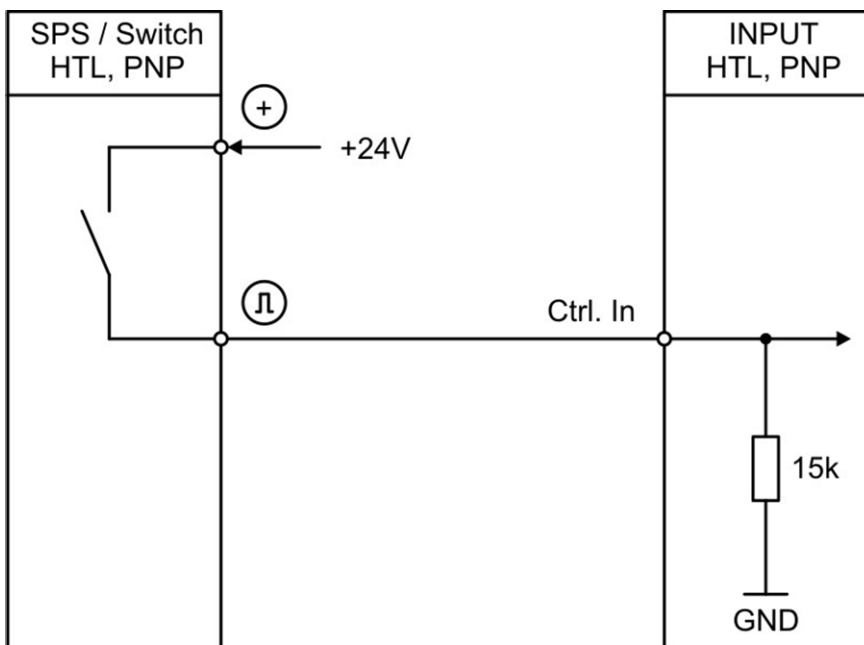
4.6. Control Inputs (X5)

At terminal X5 pins 2,3,4,5,6 and 7 there are six control inputs with HTL PNP characteristic available. Control Input 1 (Ctrl. In 1) to Control Input 5 (Ctrl. In 5) are freely configurable in the COMMAND MENU and are used for functions to be triggered externally. eg. for releasing the latching, resetting the measurement result or for teaching the preset values or the analog output. Control input 6 (Ctrl. In 6) is used exclusively for resetting the device parameters to the "default" values. Thus, it is not freely configurable.



Note: With an HTL pulse (ACTIVE HIGH) on Ctrl. In 6, the device is reset to the factory settings. The HTL pulse must be applied for at least one second.

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.

4.7. Analog output (X4)

A 16 bit analog output is available at terminal X4 pin 1, 2 and 3.
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.

4.8. Serial interface (X3)

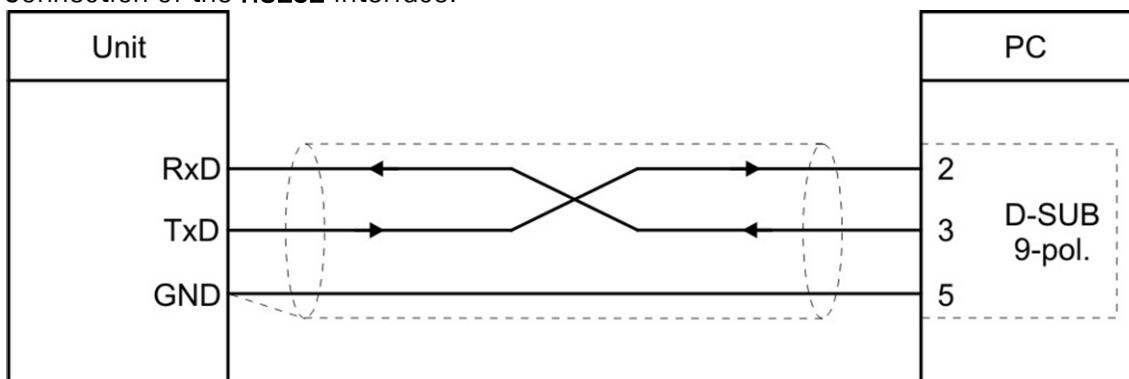
A serial interface (RS232 or RS485) is available at terminal X3. This interface can be configured in the SERIAL MENU.

The serial interface RS232 or RS485 can be used:

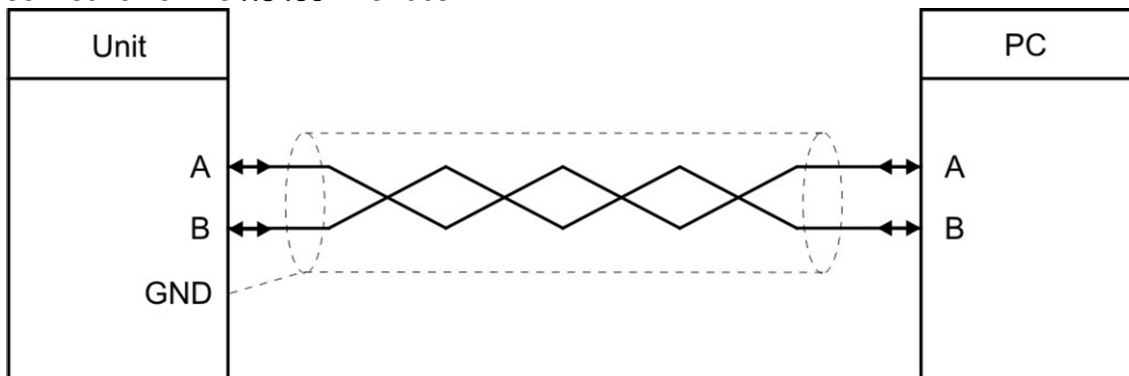
- for easy setup and commissioning of the units
- to modify settings and parameters during operation
- to read out internal states and actual measuring values by PC or PLC

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

Connection of the RS232 interface:



Connection of the RS485-interface:



Important: Parallel operation of RS232 and RS485 is not allowed!

4.9. USB interface (X7)

A serial USB interface (mini USB) is available at X7.

The USB interface can be used as follows:

- For parameterization of the device during commissioning
- To change parameters during operation
- For reading out actual values via PC



The serial USB communication is done with a baud rate of "115200 Baud" and a serial data format of "8none1" and cannot be changed by the user!

4.10. Control outputs (X6)

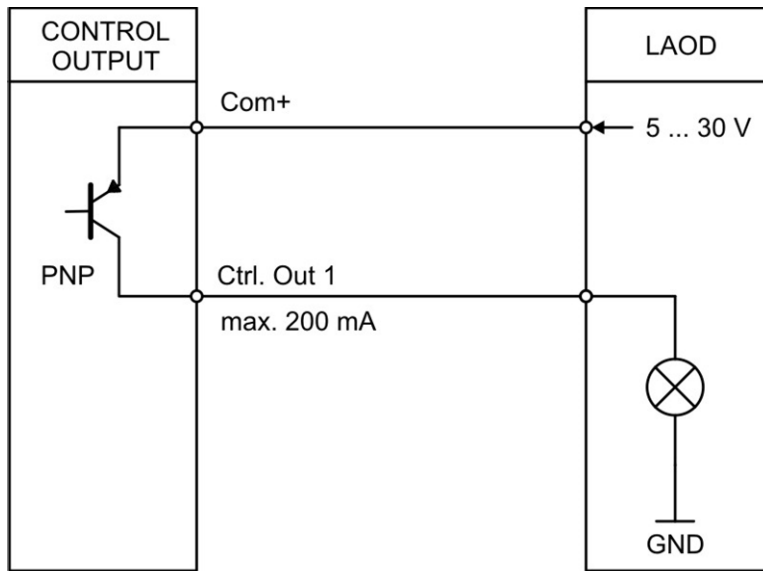
Six control outputs are available at terminal X6 pin 2, 3, 4, 5, 6 and 7.

Switching conditions can be set in the PRESELECTION MENU. The output Ctrl. Out1 – 6 are fast PNP outputs with a switching capability of 5 – 30 Volt / 200 mA per channel.

The switching voltage of the outputs must be applied to input terminal X6 pin 1 (COM+).

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

Wiring of the **control-outputs**:



5. Parameter / Overview-Menu Structure

The parameterization of the device is realized via the serial interface with a PC and the operating software OS. The link to the free download can be found on page 2.

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.

| Menu / Parameter | Menu / Parameter |
|--|---|
| GENERAL MENU MODE ENCODER PROPERTIES ENCODER DIRECTION FACTOR DIVIDER ADDITIVE VALUE LINEARIZATION MODE BACKUP MEMORY FACTORY SETTINGS | MODE SSI SSI MODE ENCODER RESOLUTION DATA FORMAT BAUD RATE SSI ZERO HIGH BIT LOW BIT SSI OFFSET ROUND LOOP VALUE SAMPLING TIME (S) ERROR BIT ERROR POLARITY |
| MODE FREQUENCY FREQUENCY MODE FREQUENCY BASE SAMPLING TIME 1 (S) WAIT TIME 1(S) STANDSTILL TIME 1 (S) AVERAGE FILTER 1 SAMPLING TIME 2 (S) WAIT TIME 2(S) AVERAGE FILTER 2 | MODE START/STOP INIT MODE SAMPLING TIME (ms) INIT PULSE TIME (µs) VELOCITY (m/s) OPERATIONAL MODE OFFSET CIRCUMFERENCE (mm) ROUND LOOP VALUE AVERAGE FILTER - POSITION STANDSTILL TIME (s) AVERAGE FILTER - SPEED |
| MODE COUNTER COUNT MODE FACTOR A SET VALUE A FACTOR B SET VALUE B ROUND LOOP VALUE | PRESELECTION VALUES PRESELECTION 1 PRESELECTION 2 PRESELECTION 3 PRESELECTION 4 PRESELECTION 5 PRESELECTION 6 |

Continuation „Parameter / menu structure“:

| Menu / Parameter |
|---|
| PRESELECTION 1 MENU |
| MODE 1 HYSTERESIS 1 PULSE TIME 1 (S) OUTPUT TARGET 1 OUTPUT POLARITY 1 OUTPUT LOCK 1 START UP DELAY 1 (S) |
| PRESELECTION 2 MENU |
| MODE 2 HYSTERESIS 2 PULSE TIME 2 (S) OUTPUT TARGET 2 OUTPUT POLARITY 2 OUTPUT LOCK 2 START UP DELAY 2 (S) |
| PRESELECTION 3 MENU |
| MODE 3 HYSTERESIS 3 PULSE TIME 3 (S) OUTPUT TARGET 3 OUTPUT POLARITY 3 OUTPUT LOCK 3 START UP DELAY 3 (S) |
| PRESELECTION 4 MENU |
| MODE 4 HYSTERESIS 4 PULSE TIME 4 (S) OUTPUT TARGET 4 OUTPUT POLARITY 4 (S) OUTPUT LOCK 4 START UP DELAY 4 (S) |
| PRESELECTION 5 MENU |
| MODE 5 HYSTERESIS 5 PULSE TIME 5 (S) OUTPUT TARGET 5 OUTPUT POLARITY 5 OUTPUT LOCK 5 START UP DELAY 5 (S) |

| Menu / Parameter |
|---|
| PRESELECTION 6 MENU |
| MODE 6 HYSTERESIS 6 PULSE TIME 6 (S) OUTPUT TARGET 6 OUTPUT POLARITY 6 OUTPUT LOCK 6 START UP DELAY 6 (S) |
| SERIAL MENU |
| UNIT NUMBER SERIAL BAUD RATE SERIAL FORMAT SERIAL PROTOCOL SERIAL TIMER (S) SERIAL VALUE MODBUS UNIT NUMBER (USB) SERIAL BAUD RATE (USB) SERIAL FORMAT (USB) |
| ANALOG MENU |
| ANALOG FORMAT ANALOG START ANALOG END ANALOG GAIN (%) ANALOG OFFSET (%) |

Continuation „Parameter / menu structure“:

| Menu / Parameter |
|---------------------------|
| COMMAND MENU |
| INPUT 1 ACTION |
| INPUT 1 CONFIG |
| INPUT 2 ACTION |
| INPUT 2 CONFIG |
| INPUT 3 ACTION |
| INPUT 3 CONFIG |
| INPUT 4 ACTION |
| INPUT 4 CONFIG |
| INPUT 5 ACTION |
| INPUT 5 CONFIG |
| INPUT 6 ACTION |
| INPUT 6 CONFIG |
| LINEARISATION MENU |
| P1(X) |
| P1(Y) |
| P2(X) |
| P2(Y) |
| ... |
| ... |
| P23(X) |
| P23(Y) |
| P24(X) |
| P24(Y) |

5.1. General Menu

| MODE | | |
|---|---------------------|---|
| This parameter specifies the selected measuring function. | | |
| 0 | NOT DEFINED | Operating mode: Not defined, modulation and measurement results are zero |
| 1 | FREQUENCY | Operating mode: Frequency converter, incremental signals (replaces FU252) |
| 2 | COUNTER | Operating mode: Counter, incremental signals (replaces ZU252) |
| 3 | SSI | Operating mode: Absolute value converter, SSI signals (replaces IV251) |
| 4 | START / STOP | Operating mode: Start / Stop – interface converter |

| ENCODER PROPERTIES | | |
|---|-------------------------|-----------------------|
| This parameter determines the characteristics of the incremental input. (Note: Only relevant for MODE: "FREQUENCY" and MODE: "COUNTER"!) | | |
| 0 | RS422 | RS422 |
| 1 | HTL DIFFERENTIAL | HTL differential |
| 2 | HTL PNP | PNP (switch to +) |
| 3 | HTL NPN | NPN (switch to -) |
| 4 | TTL PNP | TTL PNP (switch to +) |

| ENCODER DIRECTION | | |
|---|----------------|---------|
| This parameter reverses the counting or traversing direction. | | |
| 0 | FORWARD | Forward |
| 1 | REVERSE | Reverse |

| FACTOR | | |
|--|------------------|----------------|
| This parameter defines the factor with which the measurement result is multiplied. | | |
| | -99999999 | Smallest value |
| | 1 | Default value |
| | 99999999 | Highest value |

| DIVIDER | | |
|--|-----------------|----------------|
| This parameter defines the divisor with which the measurement result is divided. | | |
| | 1 | Smallest value |
| | 1 | Default value |
| | 99999999 | Highest value |

| ADDITIVE VALUE | | |
|--|------------------|----------------|
| This parameter defines an additive constant, which is added to the measurement result. | | |
| | -99999999 | Smallest value |
| | 0 | Default value |
| | 99999999 | Highest value |

Continuation „General Menu“:

| LINEARIZATION MODE | | |
|---|-------------------|----------------------------------|
| This parameter defines the linearization function. Observe notes in the appendix! | | |
| 0 | OFF | No linearization |
| 1 | 1 QUADRANT | Linearization in the 1. quadrant |
| 2 | 4 QUADRANT | Linearization in all 4 quadrants |

| BACK UP MEMORY | | |
|--|------------|---|
| (Note: Only relevant for MODE: "COUNTER!") | | |
| 0 | NO | No back up memory –up by power failure |
| 1 | YES | Back up memory is active. Saves the actual value of the counter readings in case of power failure and switched on mode "Counter". |

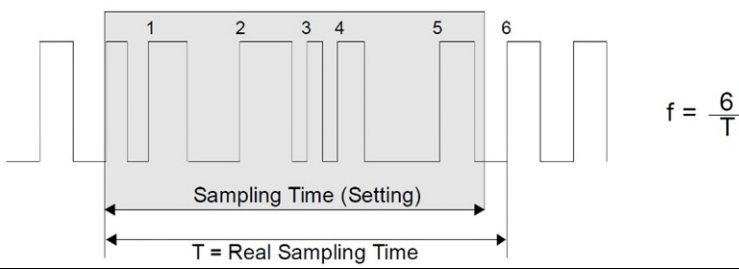
| FACTORY SETTINGS | | |
|-------------------------|------------|--|
| 0 | NO | No default values are loaded |
| 1 | YES | Load default values of all parameters (grey marked default values) |

5.2. Mode Frequency

In this menu the operation is defined as a frequency converter (incremental signals). Depending on the selected operating mode, only channel A or both channels (channel A and channel B) are active.

| FREQUENCY MODE | | |
|--|-----------|---|
| This parameter determines which frequency measurement mode is desired. | | |
| 0 | A ONLY | Single-channel frequency measurement (only for channel A) |
| 1 | RATIO | Frequency ratio of both channels (channel B / channel A). <u>Note:</u> Interpretation of the result with 4 decimal places in the format +/- x.xxxx |
| 2 | PERCENT | Percent deviation from channel B to channel A. <u>Note:</u> Interpretation of the result with 2 decimal places in the format +/- xxx.xx % |
| 3 | A + B | Frequency addition of both channels (channel A + channel B) |
| 4 | A - B | Frequency subtraction of both channels (channel A - channel B) |
| 5 | A/B x 90° | Frequency measurement with A / B x 90° signal. (Forward / reverse direction of rotation detection) |

| FREQUENCY BASE | | |
|---|---|--|
| Setting the desired basis for the frequency measurement (resolution). | | |
| | 0 | 1 Hz (Interpretation of the result in the format: xxxxxxxx Hz) |
| | 1 | 1/10 Hz (Interpretation of the result in the format: xxxxxxx.x Hz) |
| | 2 | 1/100 Hz (Interpretation of the result in the format: xxxxxx.xx Hz) |
| | 3 | 1/1000 Hz (Interpretation of the result in the format: xxxxx.xxx Hz) |

| SAMPLING TIME 1 (S) | | |
|---|-------|------------------------|
| The set value corresponds to the minimum measuring time (for channel A) in seconds. | | |
| The sampling time serves as a filter at irregular frequencies. | | |
| This parameter directly influences the reaction time of the device. | | |
| | 0,001 | Shortest Sampling time |
| | 0,1 | Default value |
| | 9,999 | Longest Sampling time |
|  <p style="text-align: right;">$f = \frac{6}{T}$</p> | | |

Continuation „Mode Frequency“:

| | |
|--|---|
| WAIT TIME 1 (S) | |
| This parameter defines the period time of the lowest frequency, accordingly the time between two rising signal edges on channel A detecting frequency 0 Hz. Frequencies with a period time higher than the set "WAIT TIME 1" will be detected as frequency = 0 Hz. | |
| 0,01 | Frequency = 0 Hz, for frequencies below 100 Hz |
| 1,00 | Default value |
| 79,99 | Frequency = 0 Hz, for frequencies below 0,01 Hz |
| | |

| | |
|---|--------------------------|
| STANDSTILL TIME 1 (S) | |
| This parameter defines the time setting for standstill definition. A time of xx.xx seconds after detection "Frequency = 0 Hz " at channel A the unit signals "standstill" and reactivates the start-up-delays. Stand still detection can be set in PRESELECTION MENU. | |
| 0,01 | Shortest time in seconds |
| ... | |
| 99,99 | Largest time in seconds |

Continuation „Mode Frequency“:

AVERAGE FILTER 1

Selectable averaging or filter function for unstable frequencies at input A for smoothing the analog signal. At settings 5 to 16, the device uses an exponential function.

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 (quick reaction to every change) |
| | 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 |
| | 9 | Exponential filter, T (63 %) = 32x SAMPLING TIME |
| | 10 | Exponential filter, T (63 %) = 64x SAMPLING TIME |
| | 11 | Exponential filter, T (63 %) = 128x SAMPLING TIME |
| | 12 | Exponential filter, T (63 %) = 256x SAMPLING TIME |
| | 13 | Exponential filter, T (63 %) = 512x SAMPLING TIME |
| | 14 | Exponential filter, T (63 %) = 1024x SAMPLING TIME |
| | 15 | Exponential filter, T (63 %) = 2048x SAMPLING TIME |
| | 16 | Exponential filter, T (63 %) = 4096x SAMPLING TIME (very slow reaction) |

Notice:



When using the exponential filter, the maximum permissible frequencies at the input must not be exceeded due to an otherwise following data type overflow!

If the frequency is nevertheless exceeded, the frequency is replaced by the maximum permissible value (with corresponding setting) for further calculation and an error is output. The LED flashes and the analogue output consequently controls 0 V or 0/4 mA.

The maximum allowable frequencies are listed below for the associated settings.

| | | FREQUENCY BASE | | | |
|---------------------------|--------------|------------------|------------------|------------------|------------------|
| | | [0] - 1 Hz | [1] - 1/10 Hz | [2] - 1/100 Hz | [3] - 1/1000 Hz |
| AVERAGE FILTER 1+2 | [5] - 2x | 1.073.741.823 Hz | 107.374.182,3 Hz | 10.737.418,23 Hz | 1.073.741,823 Hz |
| | [6] - 4x | 536.870.911 Hz | 53.687.091,1 Hz | 5.368.709,11 Hz | 536.870,911 Hz |
| | [7] - 8x | 268.435.455 Hz | 26.843.545,5 Hz | 2.684.354,55 Hz | 268.435,455 Hz |
| | [8] - 16x | 134.217.727 Hz | 13.421.772,7 Hz | 1.342.177,27 Hz | 134.217,727 Hz |
| | [9] - 32x | 67.108.863 Hz | 6.710.886,3 Hz | 671.088,63 Hz | 67.108,863 Hz |
| | [10] - 64x | 33.554.431 Hz | 3.355.443,1 Hz | 335.544,31 Hz | 33.554,431 Hz |
| | [11] - 128x | 16.777.215 Hz | 1.677.721,5 Hz | 167.772,15 Hz | 16.777,215 Hz |
| | [12] - 256x | 8.388.607 Hz | 838.860,7 Hz | 83.886,07 Hz | 8.388,607 Hz |
| | [13] - 512x | 4.194.303 Hz | 419.430,3 Hz | 41.943,03 Hz | 4.194,303 Hz |
| | [14] - 1024x | 2.097.151 Hz | 209.715,1 Hz | 20.971,51 Hz | 2.097,151 Hz |
| | [15] - 2048x | 1.048.575 Hz | 104.857,5 Hz | 10.485,75 Hz | 1.048,575 Hz |
| | [16] - 4096x | 524.287 Hz | 52.428,7 Hz | 5.242,87 Hz | 524,287 Hz |

Continuation „Mode Frequency“:

SAMPLING TIME 2 (S)
 The set value corresponds to the minimum measuring time (for channel B) in seconds.
 The sampling time serves as a filter at irregular frequencies.
 This parameter directly influences the reaction time of the device

| | |
|--------------|------------------------|
| 0,001 | Shortest Sampling time |
| 0,1 | Default value |
| 9,999 | Longest Sampling time |

WAIT TIME 2 (S)
 This parameter defines the period time of the lowest frequency, accordingly the time between two rising signal edges on channel B detecting frequency 0 Hz. Frequencies with a period time higher than the set "WAIT TIME 2" will be detected as frequency = 0 Hz.

| | |
|--------------|---|
| 0,01 | Frequency = 0 Hz, for frequencies below 100 Hz |
| 1,00 | Default value |
| 79,99 | Frequency = 0 Hz, for frequencies below 0,01 Hz |

Continuation „Mode Frequency“:

AVERAGE FILTER 2

Selectable averaging or filter function for unstable frequencies at input A for smoothing the analog signal. At settings 5 to 16, the device uses an exponential function.

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 (quick reaction to every change) |
| 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 |
| 9 | Exponential filter, T (63 %) = 32x SAMPLING TIME |
| 10 | Exponential filter, T (63 %) = 64x SAMPLING TIME |
| 11 | Exponential filter, T (63 %) = 128x SAMPLING TIME |
| 12 | Exponential filter, T (63 %) = 256x SAMPLING TIME |
| 13 | Exponential filter, T (63 %) = 512x SAMPLING TIME |
| 14 | Exponential filter, T (63 %) = 1024x SAMPLING TIME |
| 15 | Exponential filter, T (63 %) = 2048x SAMPLING TIME |
| 16 | Exponential filter, T (63 %) = 4096x SAMPLING TIME (very slow reaction) |

Notice:



When using the exponential filter, the maximum permissible frequencies at the input must not be exceeded due to an otherwise following data type overflow!

If the frequency is nevertheless exceeded, the frequency is replaced by the maximum permissible value (with corresponding setting) for further calculation and an error is output. The LED flashes and the analogue output consequently controls 0 V or 0/4 mA.

The maximum permissible frequencies have already been listed in parameter AVERAGE FILTER 1 and can be taken there.

5.3. Mode Counter

In this menu, the operation is defined as a position transducer for incremental signals (pulse, sum, difference, up or down counter). Input A and B are active.

| 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 A | | |
|--|-----------------|----------------|
| Scaling factor for input A. | | |
| For example: A setting of factor 1.23456 and 100000 input pulses will result in a value of 123456 for input A. | | |
| | 0,00001 | Smallest value |
| | 1 | Default value |
| | 99,99999 | Highest value |

| SET VALUE A | | |
|--|------------------|----------------|
| With a "RESET / SET COUNTER A" command (via control input), the counter of input A is set to this value. | | |
| | -99999999 | Smallest value |
| | 0 | Default value |
| | +99999999 | Highest value |

| FACTOR B | | |
|--|-----------------|----------------|
| Scaling factor for input B. | | |
| For example: A setting of factor 1.23456 and 100000 input pulses will result in a value of 123456 for input B. | | |
| | 0,00001 | Smallest value |
| | 1 | Default value |
| | 99,99999 | Highest value |

| SET VALUE B | | |
|--|------------------|----------------|
| With a "RESET / SET COUNTER B" command (via control input), the counter of input B is set to this value. | | |
| | -99999999 | Smallest value |
| | 0 | Default value |
| | +99999999 | Highest value |

| ROUND LOOP VALUE | | |
|--|-----------------|--|
| Defines the number of encoder steps if a round-loop function is desired. (Only for COUNT MODE: A SINGLE and A / B x 90) | | |
| | 0 | Round-loop function is turned off. |
| | ... | |
| | 99999999 | Number of steps for the round-loop function. |

5.4. Mode SSI

In this menu the operation is defined as absolute value converter (SSI signals).

| SSI MODE | | |
|--|---------------|---|
| SSI Setting of the operating mode: Maser or Slave | | |
| Depending on the SSI MODE, different terminals must be used for the SSI CLK! | | |
| (Mode Master: Terminal X2 - Pin 1 and 2 / Mode Slave: Terminal X2 - Pin 5 and 6) | | |
| 0 | MASTER | Master-Mode: Clock for SSI encoder comes from the device |
| 1 | SLAVE | Slave-Mode: Clock for SSI encoder comes from the external master. |

| ENCODER RESOLUTION | | |
|--|-----------|----------------|
| Resolution of the SSI encoder (total number of bits) | | |
| | 10 | Smallest value |
| | 25 | Default value |
| | 32 | Highest value |

| DATA FORMAT | | |
|---------------------------------------|--------------------|----------------|
| Setting the SSI code (binary or gray) | | |
| 0 | GRAY CODE | SSI-Code Gray |
| 1 | BINARY CODE | SSI-Code Binär |

| BAUD RATE | | |
|----------------------------------|----------------|-------------------------|
| Clock frequency of SSI telegrams | | |
| 0 | 2 MHZ | N.A. |
| 1 | 1.5 MHZ | N.A. |
| 2 | 1 MHZ | Clock frequency 1 MHz |
| 3 | 500 KHZ | Clock frequency 500 kHz |
| 4 | 250 KHZ | Clock frequency 250 kHz |
| 5 | 100 KHZ | Clock frequency 100 kHz |

| SSI ZERO | | |
|--|------------------|----------------|
| In the case of a "ZERO POSITION" command (via control input), the current SSI position of the encoder is transferred to the "SSI ZERO" parameter and the actual encoder zero point is shifted accordingly. (Encoder zero offset) | | |
| | 0 | Smallest value |
| | ... | |
| | 999999999 | Highest value |

| HIGH BIT (for bit blanking) | | |
|---|-----------|----------------|
| Defines the highest evaluated bit (MSB) for bit blanking. | | |
| If all bits should be evaluated, HIGH BIT must be set to the given total number of bit. | | |
| | 01 | Smallest value |
| | 25 | Default value |
| | 32 | Highest value |

Continuation „Mode SSI“:

| | | |
|--|-----------|----------------|
| LOW BIT (for bit blanking) Defines the lowest evaluated bit (MSB) for bit blanking. If all bits should be evaluated, LOW BIT must be set to 01. | | |
| | 01 | Smallest value |
| | ... | |
| | 32 | Highest value |


| | | |
|--|------------------|----------------|
| SSI OFFSET In the case of a „RESET/SET VALUE“ command (via control input or PC user interface) the not yet scaled, currently acquired position value (after bit suppression and possibly performed encoder zero offset) is transferred to the "SSI OFFSET" parameter and the display zeroed. From the new display zero point, you can now move in positive and negative direction, depending on the direction of rotation. (Display offset) | | |
| | 0 | Smallest value |
| | ... | |
| | 999999999 | Highest value |

| | | |
|---|------------------|--|
| ROUND LOOP VALUE Defines the number of encoder steps when a round-loop function is desired. | | |
| | 0 | Round-loop function is turned off. |
| | ... | |
| | 999999999 | Number of steps for the round-loop function. |

| | | |
|--|--------------|-------------------------------------|
| SAMPLING TIME (S) Determines the read cycle for the SSI signal in the Master MODE. | | |
| | 0.001 | Minimum measurement time in seconds |
| | 0.010 | Default value |
| | 9.999 | Maximum measurement time in seconds |

| | | |
|--|-----------|--|
| ERROR BIT Defines the encoder monitoring and the error bit | | |
| | 0 | No error bit available. Review on connected sensor is turned off. |
| | ... | |
| | 32 | Position of the error bits to be evaluated Review on connected sensor is turned on. |

| | | |
|--|----------|-------------------------------------|
| ERROR POLARITY Defined the polarity of the error bit in the case of an error | | |
| | 0 | Bit is low in the case of an error |
| | 1 | Bit is high in the case of an error |

| | |
|---|--|
|  | Note: SSI value processing see appendix (chapter 6.5 and 6.6) |
|---|--|

5.5. Mode Start/Stop


This menu defines the operating as Start / Stop – interface converter.

| INIT MODE | | |
|---|---------------|--|
| Operating mode: Master or Slave | | |
| Depending on the selected INIT MODE, different terminals must be used for the Init pulse! (Mode Master: terminal X2 – Pin 1 and 2 / Mode Slave: terminal X2 – Pin 5 and 6) | | |
| 0 | MASTER | Master-operation: Init pulse is generated by the device. |
| 1 | SLAVE | Slave-operation: Init pulse comes from an external master. |

| SAMPLING TIME (ms) | | |
|---|---------------|--------------------------|
| Period duration between two init pulses (in milliseconds). Corresponds to the time after a new measurement is started and directly affects the reaction time of the device. | | |
| | 00.200 | Minimum measurement time |
| | 04.000 | Default value |
| | 16.000 | Maximum measurement time |

| INIT PULSE TIME (μs) | | |
|---|----------|----------------|
| This parameter defines the pulse width of the Init pulse (in microseconds). | | |
| | 1 | Smallest value |
| | 2 | Default value |
| | 9 | Highest value |

| VELOCITY (m/s) | | |
|---|----------------|----------------|
| Waveguide velocity of the encoder (in m/s). | | |
| | 0001.00 | Smallest value |
| | 2800.00 | Default value |
| | 9999.99 | Highest value |

| OPERATIONAL MODE | | |
|---|-----------------|----------------------|
| This parameter determines which measurement type the device should run. | | |
| 0 | POSITION | Distance measurement |
| 1 | ANGLE | Angle measurement |
| 2 | SPEED | Speed measurement |
|  Note: For further information regarding the different "OPERATIONAL MODES" and interpretation of the respective measurement results see appendix! (Chapter 6.7) | | |

| OFFSET | | |
|---|------------------|----------------|
| In the case of a "Reset/Set Value" command (via control input or PC user interface) the current position of the encoder is transferred to the "OFFSET" parameter in a non-volatile manner. (zero offset!) | | |
| | -99999999 | Smallest value |
| | 0 | Default value |
| | 99999999 | Highest value |

Continuation „Mode Start/Stop“:

| | | |
|--|------------------|----------------|
| CIRCUMFERENCE (mm) | | |
| Setting the reference size (in "mm") for an angle measurement. The distance covered (e.g. circumference) at which the subsequent output value (ROUND LOOP VALUE) is to be generated must be set here. (Note: Only for OPERATIONAL MODE: "ANGLE") | | |
| | 00000.001 | Smallest value |
| | 01000.000 | Default value |
| | 99999.999 | Highest value |

| | | |
|---|-----------------|----------------|
| ROUND LOOP VALUE | | |
| Setting of the desired measured value to be generated when the previous reference value ("CIRCUMFERENCE") is reached. (Note: Only for OPERATIONAL MODE: "ANGLE") | | |
| | 1 | Smallest value |
| | 360 | Default value |
| | 99999999 | Highest value |

| | | |
|---|----------|-------------------------------------|
| AVERAGE FILTER – POSITION (filter for average value) | | |
| The average value can be switched to avoid position fluctuations. | | |
| | 0 | No average value |
| | 1 | Flowing mean value with 2 cycles |
| | 2 | Flowing average value with 4 cycles |
| | 3 | Flowing average value with 8 cycles |
| | 4 | Flowing mean value with 16 cycles |

| | | |
|--|--------------|--------------------------------|
| STANDSTILL TIME (s) | | |
| This parameter defines the time for standstill definition. If standstill is detected, standstill is signalled after xx,xx seconds and the start-up suppression is reactivated. A standstill monitoring can be set in the PRESELECTION MENU. | | |
| | 0,01 | Shortest delay time in seconds |
| | ... | |
| | 99,99 | Longest delay time in seconds |

| | | |
|---|----------|-------------------------------------|
| AVERAGE FILTER – SPEED (filter for average value) | | |
| The average value can be switched to avoid velocity fluctuations. | | |
| | 0 | No average value |
| | 1 | Flowing mean value with 2 cycles |
| | 2 | Flowing average value with 4 cycles |
| | 3 | Flowing average value with 8 cycles |
| | 4 | Flowing mean value with 16 cycles |

5.6. Preselection Values

This menu is used to set the preselection values of the switching points. The switching points always refer to the scaled measurement result "Measurement Result"!

| PRESELECTION 1 | | |
|----------------------------------|-------------|----------------|
| Preselection / switching point 1 | | |
| | -99999999 | Smallest value |
| | 1000 | Default value |
| | +99999999 | Highest value |

| PRESELECTION 2 | | |
|----------------------------------|-------------|----------------|
| Preselection / switching point 2 | | |
| | -99999999 | Smallest value |
| | 2000 | Default value |
| | +99999999 | Highest value |

| PRESELECTION 3 | | |
|----------------------------------|-------------|----------------|
| Preselection / switching point 3 | | |
| | -99999999 | Smallest value |
| | 3000 | Default value |
| | +99999999 | Highest value |

| PRESELECTION 4 | | |
|----------------------------------|-------------|----------------|
| Preselection / switching point 4 | | |
| | -99999999 | Smallest value |
| | 4000 | Default value |
| | +99999999 | Highest value |

| PRESELECTION 5 | | |
|----------------------------------|-------------|----------------|
| Preselection / switching point 5 | | |
| | -99999999 | Smallest value |
| | 5000 | Default value |
| | +99999999 | Highest value |

| PRESELECTION 6 | | |
|----------------------------------|-------------|----------------|
| Preselection / switching point 6 | | |
| | -99999999 | Smallest value |
| | 6000 | Default value |
| | +99999999 | Highest value |

5.7. Preselection 1 Menu

| MODE 1 | | |
|--|--------------------------------------|---|
| Switching conditions for preselection 1. Output 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 1(s)), e. g. standstill monitoring. (Only in MODE: "START/STOP" + OPERATIONAL MODE: "SPEED" and in MODE: "FREQUENCY"). |
| 7 | $\text{RES} \geq \text{PRES-TRAIL}$ | Trailing PRESELECTION 1: Display value is greater or equal PRESELECTION 1 – PRESELECTION 4 \rightarrow ON, PRESELECTION 4 is the trailing value from PRESELECTION 1 |
| 8 | ERROR SET | Error message for device errors. |

Continuation „Preselection 1 Menu“:

| | | |
|--|--------------|-------------------------------|
| HYSTERESIS 1 | | |
| This parameter defines the switching hysteresis of the switch-off point for preselection 1 | | |
| | 0 | No switching hysteresis |
| | ... | |
| | 99999 | 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 for the switching condition of preselection 1. If more than one switching condition is assigned to one output, 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 CTRL OUT 5 | Switching condition assigned to "Ctrl. Out 5" |
| | 6 CTRL OUT 6 | Switching condition assigned to "Ctrl. Out 6" |

| | | |
|--|----------------------|---|
| 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. Time to start the monitoring function. This adjustment is only valid for the switching condition $|\text{RESULT}| \leq |\text{PRES}|$ or $\text{RESULT} \leq \text{PRES}$ and only for MODE „FREQUENCY“ – Channel A or MODE: „START/STOP“ + OPERATIONAL MODE: „SPEED“.

START UP DELAY is set to this parameter, when the frequency is detected as 0 Hz (or at a velocity of 0 m/s). The monitoring function remains deactivated until the set time has elapsed.

With a setting "60.000", the automatic start override is activated. The monitoring function remains deactivated until the preset value / switching point is exceeded for the first time.

| | | |
|--|---------------|---------------------------------|
| | 0.000 | No start-up suppression |
| | ... | |
| | 59.999 | Start-up suppression in seconds |
| | 60.000 | Automatic start-up suppression |

5.8. Preselection 2 Menu

| | | |
|---|-----------------|---|
| MODE 2 | | |
| Switching conditions for preselection 2., see chapter PRESELECTION 1 MENU (except the trailing value) | | |
| | | See chapter PRESELECTION 1 MENU |
| 7 | RES>=PRES-TRAIL | Trailing PRESELECTION 2: Display value is greater or equal PRESELECTION 2 – PRESELECTION 5 → ON, PRESELECTION 5 is the trailing value from PRESELECTION 2 |

| |
|---|
| 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 for the switching condition of preselection 2. See chapter PRESELECTION 1 MENU. | | |
| 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 | CTRL OUT 5 | Switching condition assigned to "Ctrl. Out 5" |
| 6 | CTRL OUT 6 | Switching condition assigned to "Ctrl. Out 6" |

| |
|---|
| 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. |

5.9. Preselection 3 Menu

| | | |
|---|-----------------|---|
| MODE 3 | | |
| Switching conditions for preselection 3. see chapter PRESELECTION 1 MENU (except the trailing value). | | |
| | | See chapter PRESELECTION 1 MENU |
| 7 | RES>=PRES-TRAIL | Trailing PRESELECTION 3: Display value is greater or equal PRESELECTION 3 – PRESELECTION 6 → ON, PRESELECTION 6 is the trailing value from PRESELECTION 3 |

| |
|---|
| 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 for the switching condition of preselection 3. See chapter PRESELECTION 1 MENU. | | |
| 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 | CTRL OUT 5 | Switching condition assigned to "Ctrl. Out 5" |
| 6 | CTRL OUT 6 | Switching condition assigned to "Ctrl. Out 6" |

| |
|---|
| 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 (S) |
| Start-up suppression for the switching condition of preselection 3. See chapter PRESELECTION 1 MENU. |

5.10. Preselection 4 Menu

| | | |
|--|-----------------|---|
| MODE 4 | | |
| Switching conditions for preselection 4. see chapter PRESELECTION 1 MENU (except the trailing value) | | |
| | | See chapter PRESELECTION 1 MENU |
| 7 | RES>=PRES-TRAIL | Trailing PRESELECTION 4: Display value is greater or equal PRESELECTION 4 – PRESELECTION 1 → ON, PRESELECTION 1 is the trailing value from PRESELECTION 4 |

| |
|---|
| 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 4. See chapter PRESELECTION 1 MENU. |

| | | |
|--|------------|---|
| OUTPUT TARGET 4 | | |
| Assignment of an output for the switching condition of preselection 4. See chapter PRESELECTION 1 MENU. | | |
| 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 | CTRL OUT 5 | Switching condition assigned to "Ctrl. Out 5" |
| 6 | CTRL OUT 6 | Switching condition assigned to "Ctrl. Out 6" |

| |
|---|
| 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 (S) |
| Start-up suppression for the switching condition of preselection 4. See chapter PRESELECTION 1 MENU. |

5.11. Preselection 5 Menu

| | | |
|--|-----------------|---|
| MODE 5 | | |
| Switching conditions for preselection 5. see chapter PRESELECTION 1 MENU (except the trailing value) | | |
| | | See chapter PRESELECTION 1 MENU |
| 7 | RES>=PRES-TRAIL | Trailing PRESELECTION 5: Display value is greater or equal PRESELECTION 5 – PRESELECTION 2 → ON, PRESELECTION 2 is the trailing value from PRESELECTION 5 |

| |
|---|
| HYSTERESIS 5 |
| This parameter defines the switching hysteresis of the switch-off point for preselection 5. See chapter PRESELECTION 1 MENU. |

| |
|---|
| PULSE TIME 5 (S) |
| Duration of output pulse for the switching condition of preselection 5. See chapter PRESELECTION 1 MENU. |

| | | |
|--|------------|---|
| OUTPUT TARGET 5 | | |
| Assignment of an output for the switching condition of preselection 5. See chapter PRESELECTION 1 MENU. | | |
| 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 | CTRL OUT 5 | Switching condition assigned to "Ctrl. Out 5" |
| 6 | CTRL OUT 6 | Switching condition assigned to "Ctrl. Out 6" |

| |
|---|
| OUTPUT POLARITY 5 |
| Polarity for the switching condition of preselection 5. See chapter PRESELECTION 1 MENU. |

| |
|--|
| OUTPUT LOCK 5 |
| Latch for the switching condition of preselection 5. See chapter PRESELECTION 1 MENU. |

| |
|---|
| START UP DELAY 5 (S) |
| Start-up suppression for the switching condition of preselection 5. See chapter PRESELECTION 1 MENU. |

5.12. Preselection 6 Menu

| | | |
|--|-----------------|---|
| MODE 6 | | |
| Switching conditions for preselection 6. see chapter PRESELECTION 1 MENU (except the trailing value) | | |
| | | See chapter PRESELECTION 1 MENU |
| 7 | RES>=PRES-TRAIL | Trailing PRESELECTION 6: Display value is greater or equal PRESELECTION 6 – PRESELECTION 3 → ON, PRESELECTION 3 is the trailing value from PRESELECTION 6 |

| |
|---|
| HYSTERESIS 6 |
| This parameter defines the switching hysteresis of the switch-off point for preselection 6. See chapter PRESELECTION 1 MENU. |

| |
|---|
| PULSE TIME 6 (S) |
| Duration of output pulse for the switching condition of preselection 6. See chapter PRESELECTION 1 MENU. |

| | | |
|--|------------|---|
| OUTPUT TARGET 6 | | |
| Assignment of an output for the switching condition of preselection 6. See chapter PRESELECTION 1 MENU. | | |
| 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 | CTRL OUT 5 | Switching condition assigned to "Ctrl. Out 5" |
| 6 | CTRL OUT 6 | Switching condition assigned to "Ctrl. Out 6" |

| |
|---|
| OUTPUT POLARITY 6 |
| Polarity for the switching condition of preselection 6. See chapter PRESELECTION 1 MENU. |

| |
|--|
| OUTPUT LOCK 6 |
| Latch for the switching condition of preselection 6. See chapter PRESELECTION 1 MENU. |

| |
|---|
| START UP DELAY 6 (S) |
| Start-up suppression for the switching condition of preselection 6. See chapter PRESELECTION 1 MENU. |

5.13. Serial Menu

This menu defines the basic settings of serial interface.

| UNIT NUMBER | | |
|---|-----------|------------------|
| 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 |

Continuation „Serial Menu“:

| SERIAL PROTOCOL | | | | | | | | | | | | |
|--|---|---|---|-----|---|---|---|---|---|---|----|----|
| Determines the sequence of characters send, when using the serial output for cyclic data transmission under time control (xxxxxxx = value SERIAL VALUE). | | | | | | | | | | | | |
| Setting „1“ removes the unit address from the string which allows a slight faster transmission cycle. | | | | | | | | | | | | |
| | 0 | Transmission report = Unit Nr., +/-, data, LF, CR | | | | | | | | | | |
| | | 1 | 1 | +/- | X | X | X | X | X | X | X | LF |
| | 1 | Transmission report = +/-, data, LF, CR | | | | | | | | | | |
| | | +/- | X | X | X | X | X | X | X | X | LF | CR |

| SERIAL TIMER (S) | | |
|---|--------|--|
| 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) | | |
| | 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. | | | |
| Einstellung | Code | Bedeutung | |
| 0 | :0 | Measurement_Result (Result after linking, scaling, filter, etc.) | |
| 1 | :1 | Analog_Out_Voltage (Analog output modulation (in mV)) | |
| 2 | :2 | Frequency (measured frequency - channel A without scaling) | |
| 3 | :3 | Frequency_2 (measured frequency - channel B without scaling) | |
| 4 | :4 | Counter (total count after linking without scaling, filters, etc.) | |
| 5 | :5 | Counter_A (counter reading - channel A) | |
| 6 | :6 | Counter_B (counter reading - channel B) | |
| 7 | :7 | SSI_Data (read + possibly converted binary SSI value) | |
| 8 | :8 | SSI_Calc_Result (SSI value incl. SSI zero and SSI offset without scaling, filters, etc.) | |
| 9 | :9 | Minimum_Value (Minimum value of Measurement_Result) | |
| 10 | ;0 | Maximum_Value (Maximum value of Measurement_Result) | |
| 11 | ;1 | Analog_Out_Current (Analog output modulation (in yA)) | |
| 12 | ;2 | Analog_Out_Percentage (Percentage analog output level) (Measurement result in xxx.x %) | |
| 13 | ;3 | Error Status (Reading the error code) | |
| 14 | ;4 | SSI Read Value (readed, unconverted SSI value) | |
| 15 | ;5 | SSI Loop Value (SSI value after round loop calculation) | |
| 16 | ;6 | Actual Speed () | |
| 17 | ;7 | Actual Position (Start Stop: position [in µm] with offset without scaling) | |
| 18 | ;8 | Actual Angle (Start Stop: e.g. angle with offset without scaling) | |
| 19 | ;9 | Raw Position (Start Stop: position [in µm] without Offset and without scaling)) | |

Continuation „Serial Menu“:

| | | |
|---|------------------|---|
| MODBUS | | |
| This parameter enables the Modbus protocol and determines the Modbus address. For details of the Modbus communication please refer to the additional manual Modbus_RTU | | |
| | 0 | Modbus disabled Serial interface is using Lecom protocol (Motrona-default protocol) |
| | 1 ... 247 | Modbus enabled: Serial interface is using Modbus RTU protocol The set value is the Modbus address of the device. |

| | | |
|--|-----------|------------------|
| UNIT NUMBER (USB) | | |
| This parameter can be used to set serial device addresses for the USB interface. | | |
| <u>Note:</u> This is permanently set to "11" and cannot be changed by the user. | | |
| | 11 | Kleinste Adresse |

| | | | |
|---|----------|---------------|-------------|
| SERIAL BAUD RATE (USB) | | | |
| This parameter is used to set the serial baud rate of the USB interface. | | | |
| <u>Note:</u> This is permanently set to "115200" baud and cannot be changed by the user. | | | |
| | 0 | 115200 | 115200 Baud |

| | | | |
|--|----------|-----------------|---|
| SERIAL FORMAT (USB) | | | |
| This parameter is used to set the bit data format of the USB interface. | | | |
| <u>Note:</u> This is permanently set to „8-none-1“ and cannot be changed by the user. | | | |
| | 0 | 8-NONE-1 | 8 Data no Parity 1 Stop |

5.14. Analog Menu

This menu defines the basic settings of the analog output. The analog output always refers to the scaled "Measurement Result"!

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...20MA | 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 end value |
| 0 | Default Wert |
| +99999999 | Highest end 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.

| | |
|--------|---------------|
| 0,00 | Smallest gain |
| 100,00 | Default value |
| 103,00 | Highest gain |

ANALOG OFFSET (%)

This parameter defines the zero offset of the analog output.

z. B. 0.20 result in an offset of 0.02 V or 0.04 mA at ANALOG START value

| | |
|--------|-----------------|
| -99,99 | Smallest offset |
| 0 | Default value |
| +99,00 | Highest offset |

5.15. Command Menu

| INPUT 1 ACTION _(function Input 1) | | | |
|--|----------------------|---|---------|
| This parameter defines the function of the input "Ctrl. In 1". | | | |
| (s) = static switching (level evaluation), INPUT CONFIG must be set to active LOW / HIGH | | | |
| (d) = dynamic switching (edge evaluation), INPUT CONFIG must be set to RISING/FALLING EDGE | | | |
| 0 | NO | No function | |
| 1 | RESET/SET VALUE | Mode "SSI" : Transfer of the currently detected position value (after bit suppression and possibly performed encoder zero offset shift) into the parameter "SSI offset" (display offset) Mode "Counter" : Reset / set of both counter values (channel A and B) to the set values in SET VALUE A u. B Mode "Start/Stop" : Power-failure-proof stored transfer of the current position or angle measurement to the "Offset" parameter. | (d) (s) |
| 2 | FREEZE | Freezing of the current measurement result | (s) |
| 3 | TEACH ANALOG START | Transfer of the current measurement result in the parameter "Analog Start" | (d) |
| 4 | TEACH ANALOG END | Transfer of the current measurement result in the parameter "Analog End" | (d) |
| 5 | TEACH PRESELECTION 1 | Transfer of the current measurement result into the parameter "Preselection 1" | (d) |
| 6 | TEACH PRESELECTION 2 | Transfer of the current measurement result into the parameter "Preselection 2" | (d) |
| 7 | TEACH PRESELECTION 3 | Transfer of the current measurement result into the parameter "Preselection 3" | (d) |
| 8 | TEACH PRESELECTION 4 | Transfer of the current measurement result into the parameter "Preselection 4" | (d) |
| 9 | TEACH PRESELECTION 5 | Transfer of the current measurement result into the parameter "Preselection 5" | (d) |
| 10 | TEACH PRESELECTION 6 | Transfer of the current measurement result into the parameter "Preselection 6" | (d) |
| 11 | RESET MIN/MAX | Reset the minimum / maximum value | (d) (s) |
| 12 | LOCK RELEASE | Release latching of all outputs | (d) |
| 13 | SERIAL PRINT | Sending of serial data, see parameter SERIAL VALUE | (d) |
| 14 | ACTIVATE DATA | N.A. | |
| 15 | STORE DATA | N.A. | |
| 16 | TESTPROGRAM | N.A. | |
| 17 | CLEAR LOOP TIME | Reset of the maximum "Loop Time" | (d) |
| 18 | RESET/SET COUNTER A | Mode "Counter" : Reset / set the counter value of channel A to the set value in SET VALUE A | (d) (s) |
| 19 | RESET/SET COUNTER B | Mode "Counter" : Reset / set the counter value of channel B to the set value in SET VALUE B | (d) (s) |
| 20 | LOCK COUNTER A | Mode "Counter" : Counter (channel A) is locked and does not count any further pulses as long as this command is present. | (s) |
| 21 | LOCK COUNTER B | Mode "Counter" : Counter (channel B) is locked and does not count any further pulses as long as this command is present. | (s) |
| 22 | ZERO POSITION | Mode "SSI" : Transfer of the current SSI position in the parameter "SSI-Zero" (encoder zero offset) | (d) (s) |
| 23 | FACTORY SETTINGS | Device is reset to factory settings | (d) |

Continuation „Command Menu“:

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 control 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.

INPUT 4 ACTION

This parameter defines the function of the input "Ctrl. In 4".
See parameter INPUT 1 ACTION.

INPUT 4 CONFIG

This parameter defines the switching characteristics of the input "Ctrl. In 4".
See parameter INPUT 1 CONFIG.

INPUT 5 ACTION

This parameter defines the function of the input "Ctrl. In 5".
See parameter INPUT 1 ACTION.

INPUT 5 CONFIG

This parameter defines the switching characteristics of the input "Ctrl. In 5".
See parameter INPUT 1 CONFIG.

INPUT 6 ACTION (FACTORY SETTINGS)

This parameter is permanently preset to "Factory Settings" and can not be changed.

INPUT 6 CONFIG (RISING EDGE)

This parameter is permanently preset to "Rising Edge" and can not be changed.

5.16. Linearization Menu

The linearization function is defined in this menu. The linearization function always refers to the scaled "Measurement Result"!

Linearization description and examples are shown in the appendix.

| | |
|---|-----------------------|
| P1(X) ... P24(X) | |
| X-coordinate of the linearization point. This is the value that the device would generate without linearization depending on the input signal. | |
| -99999999 | Smallest X-coordinate |
| 0 | Default value |
| +99999999 | Largest X-coordinate |

| | |
|--|-----------------------|
| P1(Y) ... P24(Y) | |
| Y-coordinate of the linearization point. This is the value that the device should generate instead of the x coordinate. e.g. P2 (X) is replaced by P2 (Y). | |
| -99999999 | Smallest X-coordinate |
| 0 | Default value |
| +99999999 | Largest X-coordinate |

6. Appendix

6.1. Data readout via serial interface

The free operator software OS is available at: <https://www.motrona.com/en/support/software.html>
All codes shown in the parameter SERIAL VALUE are available for serial readout by PC or PLC. The communication of Motrona-devices is based on the Drivecom protocol according to ISO 1745 or the Modbus RTU protocol. All protocol details can be found in our manual SERPRO (Drivecom) which is available for download from the homepage www.motrona.en and in the chapter "Modbus RTU Interface" in this manual.

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 |
| Hexadecimal: | 04 | 31 | 31 | 3A | 31 | 05 |
| Binary: | 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. Modbus RTU Interface

The Modbus interface of the touchMatrix series is a standard Modbus RTU Slave and provides the following Modbus functions:

- Read Coils
- Write Single Coil
- Read Holding Registers
- Write Multiple Registers
- Diagnosis

For the operation of the interface module and the understanding of this manual basic knowledge in Modbus RTU communication is presupposed.

6.2.1. Parameter setting

Required parameter settings in "Serial menu":

| | | |
|--|--|--|
| UNIT NUMBER | | |
| Not valid for Modbus communication (For setting of Modbus address see parameter "MODBUS") | | |

| | | |
|---|-------|------------|
| 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 | Do not use with 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 bits | Parity even | 1 stop bit |
| 7 | 8-ODD-1 | 8 data bits | Parity odd | 1 stop bit |
| 8 | 8-NONE-1 | Do not use with Modbus protocol | | |
| 9 | 8-NONE-2 | 8 data bits | no Parity | 2 stop bits |

Continuation "Parameter setting":

| | |
|--|--|
| 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 for Modbus protocol (Modbus disabled) |
| 1 ... 247 | Modbus enabled: Serial interface is using Modbus RTU protocol The number set here determines the Modbus node address. |

6.2.2. Read Holding Registers and Write Multiple Registers

With the functions "Read Holding Registers" and "Write Multiple Registers" it is possible to access all registers of the device.

All variables (actual data) and status registers are mapped to Modbus Holding Registers. However, as all registers of the device are 32 bit registers but Modbus Holding registers are only 16 bit registers, each register of the device requires two Holding registers. (For this reason the use of Modbus function "Write Single Register" is not possible.)

It is only possible to access to one single register of the touchMATRIX device by each read or write operation, therefore the "Quantity (or number) of registers" in the Modbus request must always be 2.

Access to parameters

Holding Register 0x0000 / 0x0001 hex and following allow access to the device parameters.

The holding register numbers for a certain parameter can be calculated by the parameter # that can be found in the parameter table in the touchMatrix device manual:

Holding Register low = (parameter #) x 2

Holding Register high = (parameter #) x 2 + 1

Example:

Access to parameter #63 "PRESELECTION 1" by Holding Register 0x007E and 0x007F hex.

Continuation "Read Holding Registers und Write Multiple Registers":

Access to actual data

Holding Register 0x1000 / 0x1001 hex and following allow access to variables of the device (actual data registers):

Holding Register 0x1000 / 0x1001 hex → Actual data with serial Code ":0" (Display value)

Holding Register 0x1002 / 0x1003 hex → Actual data with serial Code ":1"

Holding Register 0x1004 / 0x1005 hex → Actual data with serial Code ":2"

Holding Register 0x1006 / 0x1007 hex → Actual data with serial Code ":3"

etc.

Access to status registers

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

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 Command (Ctrl. In status, read only)

Holding Register 0x2006 / 0x2007 hex → All Commands (read only)

6.2.3. Read Coils and Write Single Coil

With the functions "Read Coils" and "Write Single Coil" it is possible to read and set/reset single commands:

| Coil number | Serial code of command | Command | |
|-------------|------------------------|----------------------|---|
| 0 | 54 | RESET/SET | Transfer of the currently detected position value into the parameter "Offset" Setting Counter A and Counter B to "Set Value" |
| 1 | 55 | FREEZE DISPLAY | Freezing of the current measurement result |
| 2 | 56 | TEACH ANALOG START | Transfer of the current measurement result in the parameter "Analog Start" |
| 3 | 57 | TEACH ANALOG END | Transfer of the current measurement result in the parameter "Analog End" |
| 4 | 58 | TEACH PRESELECTION 1 | Transfer of the current measurement result into the parameter "Preselection 1" |
| 5 | 59 | TEACH PRESELECTION 2 | Transfer of the current measurement result into the parameter "Preselection 2" |
| 6 | 60 | TEACH PRESELECTION 3 | Transfer of the current measurement result into the parameter "Preselection 3" |
| 7 | 61 | TEACH PRESELECTION 4 | Transfer of the current measurement result into the parameter "Preselection 4" |
| 8 | 62 | TEACH PRESELECTION 5 | Transfer of the current measurement result into the parameter "Preselection 5" |
| 9 | 63 | TEACH PRESELECTION 6 | Transfer of the current measurement result into the parameter "Preselection 6" |
| 10 | 64 | RESET MIN/MAX | Reset the minimum / maximum value |
| 11 | 65 | LOCK RELEASE | Release latching of all outputs |

Continuation "Read Coils and Write Single Coil"

| | | | |
|----|----|--|---|
| 12 | 66 | SERIAL PRINT (do not use with Modbus) | Sending of serial data, see parameter SERIAL VALUE |
| 13 | 67 | ACTIVATE DATA (not required with Modbus) | The data is activated. |
| 14 | 68 | STORE DATA | Store to EEPROM |
| 15 | 69 | TESTPROGRAM (do not use with Modbus) | Testprogram (do not use with Modbus) |
| 16 | 5: | CLEAR LOOP TIME | Reset the maximum loop time |
| 17 | 5; | RESET/SET COUNTER A | Mode „Counter“: Reset / set the counter value of channel A to the value set in SET VALUE A. |
| 18 | 5< | RESET/SET COUNTER B | Mode „Counter“: Reset / set the counter value of channel B to the value set in SET VALUE B. |
| 19 | 5= | LOCK COUNTER A | Mode „Counter“: The counter (channel A) is deactivated and does not count any further pulses as long as this command is present. |
| 20 | 5> | LOCK COUNTER B | Mode „Counter“: The counter (channel B) is deactivated and does not count any further pulses as long as this command is present. |
| 21 | 5? | ZERO POSITION | Mode „SSI“: Transfer of the current SSI position to the "SSI zero" parameter (encoder zero offset). |

6.2.4. Diagnose

The device supports the diagnostics subfunction 00 "Return Query Data". Other diagnostics functions are not available.

6.3. Parameter / serial codes

| # | Menü | Name | Code | Min | Max | Default |
|----|----------------|-----------------------|------|-----------|-----------|---------|
| 1 | GENERAL MENU | MODE | 00 | 0 | 4 | 0 |
| 2 | GENERAL MENU | ENCODER PROPERTIES | 01 | 0 | 4 | 0 |
| 3 | GENERAL MENU | ENCODER DIRECTION | 02 | 0 | 1 | 0 |
| 4 | GENERAL MENU | FACTOR | 03 | -99999999 | 99999999 | 1 |
| 5 | GENERAL MENU | DIVIDER | 04 | 1 | 99999999 | 1 |
| 6 | GENERAL MENU | ADDITIVE VALUE | 05 | -99999999 | 99999999 | 0 |
| 7 | GENERAL MENU | LINEARIZATION MODE | 06 | 0 | 2 | 0 |
| 8 | GENERAL MENU | BACKUP MEMORY | 07 | 0 | 1 | 1 |
| 9 | GENERAL MENU | FACTORY SETTINGS | 08 | 0 | 1 | 0 |
| 10 | GENERAL MENU | — | 09 | 0 | 0 | 0 |
| 11 | GENERAL MENU | — | 10 | 0 | 0 | 0 |
| 13 | MODE FREQUENCY | FREQUENCY MODE | 11 | 0 | 5 | 0 |
| 14 | MODE FREQUENCY | FREQUENCY BASE | 12 | 0 | 3 | 2 |
| 15 | MODE FREQUENCY | SAMPLING TIME 1 (S) | 13 | 1 | 9999 | 100 |
| 16 | MODE FREQUENCY | WAIT TIME 1 (S) | 14 | 1 | 7999 | 100 |
| 17 | MODE FREQUENCY | STANDSTILL TIME 1 (S) | 15 | 1 | 9999 | 1 |
| 18 | MODE FREQUENCY | AVERAGE FILTER 1 | 16 | 0 | 16 | 0 |
| 19 | MODE FREQUENCY | SAMPLING TIME 2 (S) | 17 | 1 | 9999 | 100 |
| 20 | MODE FREQUENCY | WAIT TIME 2 (S) | 18 | 1 | 7999 | 100 |
| 21 | MODE FREQUENCY | AVERAGE FILTER 2 | 19 | 0 | 16 | 0 |
| 22 | MODE FREQUENCY | — | 20 | 0 | 0 | 0 |
| 23 | MODE FREQUENCY | — | 21 | 0 | 0 | 0 |
| 25 | MODE COUNTER | COUNT MODE | 22 | 0 | 5 | 3 |
| 26 | MODE COUNTER | FACTOR A | 23 | 1 | 9999999 | 100000 |
| 27 | MODE COUNTER | SET VALUE A | 24 | -99999999 | 99999999 | 0 |
| 28 | MODE COUNTER | FACTOR B | 25 | 1 | 9999999 | 100000 |
| 29 | MODE COUNTER | SET VALUE B | 26 | -99999999 | 99999999 | 0 |
| 30 | MODE COUNTER | ROUND LOOP VALUE | 27 | 0 | 99999999 | 0 |
| 31 | MODE COUNTER | — | 28 | 0 | 0 | 0 |
| 32 | MODE COUNTER | — | 29 | 0 | 0 | 0 |
| 34 | MODE SSI | SSI MODE | 30 | 0 | 1 | 0 |
| 35 | MODE SSI | ENCODER RESOLUTION | 31 | 10 | 32 | 25 |
| 36 | MODE SSI | DATA FORMAT | 32 | 0 | 1 | 0 |
| 37 | MODE SSI | BAUD RATE | 33 | 0 | 5 | 2 |
| 38 | MODE SSI | SSI ZERO | 34 | 0 | 999999999 | 0 |
| 39 | MODE SSI | HIGH BIT | 35 | 1 | 32 | 25 |
| 40 | MODE SSI | LOW BIT | 36 | 1 | 32 | 1 |
| 41 | MODE SSI | SSI OFFSET | 37 | 0 | 999999999 | 0 |
| 42 | MODE SSI | ROUND LOOP VALUE | 38 | 0 | 99999999 | 0 |
| 43 | MODE SSI | SAMPLING TIME (S) | 39 | 1 | 9999 | 10 |
| 44 | MODE SSI | ERROR BIT | 40 | 0 | 32 | 0 |
| 45 | MODE SSI | ERROR POLARITY | 41 | 0 | 1 | 0 |
| 46 | MODE SSI | — | 42 | 0 | 0 | 0 |
| 47 | MODE SSI | — | 43 | 0 | 0 | 0 |

Continuation "Parameter / serial codes":

| # | Menu | Name | Code | Min | Max | Default |
|----|---------------------|------------------------------|------|-----------|----------|---------|
| 49 | MODE START/STOP | INIT MODE | 44 | 0 | 1 | 0 |
| 50 | MODE START/STOP | SAMPLING TIME (ms) | 45 | 200 | 16000 | 4000 |
| 51 | MODE START/STOP | INIT PULSE TIME (ys) | 46 | 1 | 9 | 2 |
| 52 | MODE START/STOP | VELOCITY (m/s) | 47 | 100 | 999999 | 280000 |
| 53 | MODE START/STOP | OPERATIONAL MODE | 48 | 0 | 2 | 0 |
| 54 | MODE START/STOP | OFFSET | 49 | -99999999 | 99999999 | 0 |
| 55 | MODE START/STOP | CIRCUMFERENCE (mm) | 50 | 1 | 99999999 | 100000 |
| 56 | MODE START/STOP | ROUND LOOP VALUE | 51 | 1 | 99999999 | 360 |
| 57 | MODE START/STOP | AVERAGE FILTER - POSITION | 52 | 0 | 4 | 0 |
| 58 | MODE START/STOP | STANDSTILL TIME (s) | 53 | 1 | 9999 | 1 |
| 59 | MODE START/STOP | AVERAGE FILTER - SPEED | U0 | 0 | 4 | 0 |
| 60 | MODE START/STOP | ___ | U1 | 0 | 0 | 0 |
| 61 | MODE START/STOP | ___ | U2 | 0 | 0 | 0 |
| 63 | PRESELECTION VALUES | PRESELECTION 1 | A0 | -99999999 | 99999999 | 1000 |
| 64 | PRESELECTION VALUES | PRESELECTION 2 | A1 | -99999999 | 99999999 | 2000 |
| 65 | PRESELECTION VALUES | PRESELECTION 3 | A2 | -99999999 | 99999999 | 3000 |
| 66 | PRESELECTION VALUES | PRESELECTION 4 | A3 | -99999999 | 99999999 | 4000 |
| 67 | PRESELECTION VALUES | PRESELECTION 5 | A4 | -99999999 | 99999999 | 5000 |
| 68 | PRESELECTION VALUES | PRESELECTION 6 | A5 | -99999999 | 99999999 | 6000 |
| 70 | PRESELECTION 1 MENU | MODE 1 | A6 | 0 | 8 | 0 |
| 71 | PRESELECTION 1 MENU | HYSTERESIS 1 | A7 | 0 | 99999 | 0 |
| 72 | PRESELECTION 1 MENU | PULSE TIME 1 (S) | A8 | 0 | 60000 | 0 |
| 73 | PRESELECTION 1 MENU | OUTPUT TARGET 1 | A9 | 0 | 6 | 1 |
| 74 | PRESELECTION 1 MENU | OUTPUT POLARITY 1 | B0 | 0 | 1 | 0 |
| 75 | PRESELECTION 1 MENU | OUTPUT LOCK 1 | B1 | 0 | 1 | 0 |
| 76 | PRESELECTION 1 MENU | START UP DELAY 1 (S) | B2 | 0 | 60000 | 0 |
| 77 | PRESELECTION 1 MENU | ___ | B3 | 0 | 0 | 0 |
| 78 | PRESELECTION 1 MENU | ___ | B4 | 0 | 0 | 0 |
| 79 | PRESELECTION 1 MENU | ___ | B5 | 0 | 0 | 0 |
| 80 | PRESELECTION 1 MENU | ___ | B6 | 0 | 0 | 0 |
| 82 | PRESELECTION 2 MENU | MODE 2 | B7 | 0 | 8 | 0 |
| 83 | PRESELECTION 2 MENU | HYSTERESIS 2 | B8 | 0 | 99999 | 0 |
| 84 | PRESELECTION 2 MENU | PULSE TIME 2 (S) | B9 | 0 | 60000 | 0 |
| 85 | PRESELECTION 2 MENU | OUTPUT TARGET 2 | C0 | 0 | 6 | 2 |
| 86 | PRESELECTION 2 MENU | OUTPUT POLARITY 2 | C1 | 0 | 1 | 0 |
| 87 | PRESELECTION 2 MENU | OUTPUT LOCK 2 | C2 | 0 | 1 | 0 |
| 88 | PRESELECTION 2 MENU | START UP DELAY 2 (S) | C3 | 0 | 60000 | 0 |
| 89 | PRESELECTION 2 MENU | ___ | C4 | 0 | 0 | 0 |
| 90 | PRESELECTION 2 MENU | ___ | C5 | 0 | 0 | 0 |
| 91 | PRESELECTION 2 MENU | ___ | C6 | 0 | 0 | 0 |
| 92 | PRESELECTION 2 MENU | ___ | C7 | 0 | 0 | 0 |
| 94 | PRESELECTION 3 MENU | MODE 3 | C8 | 0 | 8 | 0 |
| 95 | PRESELECTION 3 MENU | HYSTERESIS 3 | C9 | 0 | 99999 | 0 |
| 96 | PRESELECTION 3 MENU | PULSE TIME 3 (S) | D0 | 0 | 60000 | 0 |

Continuation "Parameter / serial codes":

| # | Menu | Name | Code | Min | Max | Default |
|-----|---------------------|----------------------|------|-----|-------|---------|
| 97 | PRESELECTION 3 MENU | OUTPUT TARGET 3 | D1 | 0 | 6 | 3 |
| 98 | PRESELECTION 3 MENU | OUTPUT POLARITY 3 | D2 | 0 | 1 | 0 |
| 99 | PRESELECTION 3 MENU | OUTPUT LOCK 3 | D3 | 0 | 1 | 0 |
| 100 | PRESELECTION 3 MENU | START UP DELAY 3 (S) | D4 | 0 | 60000 | 0 |
| 101 | PRESELECTION 3 MENU | ___ | D5 | 0 | 0 | 0 |
| 102 | PRESELECTION 3 MENU | ___ | D6 | 0 | 0 | 0 |
| 103 | PRESELECTION 3 MENU | ___ | D7 | 0 | 0 | 0 |
| 104 | PRESELECTION 3 MENU | ___ | D8 | 0 | 0 | 0 |
| 106 | PRESELECTION 4 MENU | MODE 4 | D9 | 0 | 8 | 0 |
| 107 | PRESELECTION 4 MENU | HYSTERESIS 4 | E0 | 0 | 99999 | 0 |
| 108 | PRESELECTION 4 MENU | PULSE TIME 4 (S) | E1 | 0 | 60000 | 0 |
| 109 | PRESELECTION 4 MENU | OUTPUT TARGET 4 | E2 | 0 | 6 | 4 |
| 110 | PRESELECTION 4 MENU | OUTPUT POLARITY 4 | E3 | 0 | 1 | 0 |
| 111 | PRESELECTION 4 MENU | OUTPUT LOCK 4 | E4 | 0 | 1 | 0 |
| 112 | PRESELECTION 4 MENU | START UP DELAY 4 (S) | E5 | 0 | 60000 | 0 |
| 113 | PRESELECTION 4 MENU | ___ | E6 | 0 | 0 | 0 |
| 114 | PRESELECTION 4 MENU | ___ | E7 | 0 | 0 | 0 |
| 115 | PRESELECTION 4 MENU | ___ | E8 | 0 | 0 | 0 |
| 116 | PRESELECTION 4 MENU | ___ | E9 | 0 | 0 | 0 |
| 118 | PRESELECTION 5 MENU | MODE 5 | F0 | 0 | 8 | 0 |
| 119 | PRESELECTION 5 MENU | HYSTERESIS 5 | F1 | 0 | 99999 | 0 |
| 120 | PRESELECTION 5 MENU | PULSE TIME 5 (S) | F2 | 0 | 60000 | 0 |
| 121 | PRESELECTION 5 MENU | OUTPUT TARGET 5 | F3 | 0 | 6 | 5 |
| 122 | PRESELECTION 5 MENU | OUTPUT POLARITY 5 | F4 | 0 | 1 | 0 |
| 123 | PRESELECTION 5 MENU | OUTPUT LOCK 5 | F5 | 0 | 1 | 0 |
| 124 | PRESELECTION 5 MENU | START UP DELAY 5 (S) | F6 | 0 | 60000 | 0 |
| 125 | PRESELECTION 5 MENU | ___ | F7 | 0 | 0 | 0 |
| 126 | PRESELECTION 5 MENU | ___ | F8 | 0 | 0 | 0 |
| 127 | PRESELECTION 5 MENU | ___ | F9 | 0 | 0 | 0 |
| 128 | PRESELECTION 5 MENU | ___ | G0 | 0 | 0 | 0 |
| 130 | PRESELECTION 6 MENU | MODE 6 | G1 | 0 | 8 | 0 |
| 131 | PRESELECTION 6 MENU | HYSTERESIS 6 | G2 | 0 | 99999 | 0 |
| 132 | PRESELECTION 6 MENU | PULSE TIME 6 (S) | G3 | 0 | 60000 | 0 |
| 133 | PRESELECTION 6 MENU | OUTPUT TARGET 6 | G4 | 0 | 6 | 6 |
| 134 | PRESELECTION 6 MENU | OUTPUT POLARITY 6 | G5 | 0 | 1 | 0 |
| 135 | PRESELECTION 6 MENU | OUTPUT LOCK 6 | G6 | 0 | 1 | 0 |
| 136 | PRESELECTION 6 MENU | START UP DELAY 6 (S) | G7 | 0 | 60000 | 0 |
| 137 | PRESELECTION 6 MENU | ___ | G8 | 0 | 0 | 0 |
| 138 | PRESELECTION 6 MENU | ___ | G9 | 0 | 0 | 0 |
| 139 | PRESELECTION 6 MENU | ___ | H0 | 0 | 0 | 0 |
| 140 | PRESELECTION 6 MENU | ___ | H1 | 0 | 0 | 0 |
| 142 | SERIAL MENU | UNIT NUMBER | T7 | 11 | 99 | 11 |
| 143 | SERIAL MENU | SERIAL BAUD RATE | T8 | 0 | 2 | 0 |
| 144 | SERIAL MENU | SERIAL FORMAT | T9 | 0 | 9 | 0 |
| 145 | SERIAL MENU | SERIAL PROTOCOL | H2 | 0 | 1 | 0 |

Continuation "Parameter / serial codes":

| # | Menu | Name | Code | Min | Max | Default |
|-----|--------------------|------------------------|------|-----------|----------|---------|
| 146 | SERIAL MENU | SERIAL TIMER (S) | H3 | 0 | 60000 | 0 |
| 147 | SERIAL MENU | SERIAL VALUE | H4 | 0 | 19 | 0 |
| 148 | SERIAL MENU | MODBUS | H5 | 0 | 247 | 0 |
| 149 | SERIAL MENU | UNIT NUMBER (USB) | 90 | 11 | 11 | 11 |
| 150 | SERIAL MENU | SERIAL BAUD RATE (USB) | 91 | 0 | 0 | 0 |
| 151 | SERIAL MENU | SERIAL FORMAT (USB) | 92 | 0 | 0 | 0 |
| 153 | ANALOG MENU | ANALOG FORMAT | H8 | 0 | 2 | 0 |
| 154 | ANALOG MENU | ANALOG START | H9 | -99999999 | 99999999 | 0 |
| 155 | ANALOG MENU | ANALOG END | I0 | -99999999 | 99999999 | 10000 |
| 156 | ANALOG MENU | ANALOG GAIN % | I1 | 0 | 10300 | 10000 |
| 157 | ANALOG MENU | ANALOG OFFSET % | I2 | -9999 | 9999 | 0 |
| 159 | COMMAND MENU | INPUT 1 ACTION | I3 | 0 | 23 | 0 |
| 160 | COMMAND MENU | INPUT 1 CONFIG. | I4 | 0 | 3 | 2 |
| 161 | COMMAND MENU | INPUT 2 ACTION | I5 | 0 | 23 | 0 |
| 162 | COMMAND MENU | INPUT 2 CONFIG. | I6 | 0 | 3 | 2 |
| 163 | COMMAND MENU | INPUT 3 ACTION | I7 | 0 | 23 | 0 |
| 164 | COMMAND MENU | INPUT 3 CONFIG. | I8 | 0 | 3 | 2 |
| 165 | COMMAND MENU | INPUT 4 ACTION | I9 | 0 | 22 | 0 |
| 166 | COMMAND MENU | INPUT 4 CONFIG. | J0 | 0 | 3 | 2 |
| 167 | COMMAND MENU | INPUT 5 ACTION | J1 | 0 | 22 | 0 |
| 168 | COMMAND MENU | INPUT 5 CONFIG. | J2 | 0 | 3 | 2 |
| 169 | COMMAND MENU | INPUT 6 ACTION | J3 | 22 | 22 | 22 |
| 170 | COMMAND MENU | INPUT 6 CONFIG. | J4 | 2 | 2 | 2 |
| 171 | COMMAND MENU | --- | J5 | 0 | 0 | 0 |
| 172 | COMMAND MENU | --- | J6 | 0 | 0 | 0 |
| 173 | COMMAND MENU | --- | J7 | 0 | 0 | 0 |
| 174 | COMMAND MENU | --- | J8 | 0 | 0 | 0 |
| 175 | COMMAND MENU | --- | J9 | 0 | 0 | 0 |
| 176 | COMMAND MENU | --- | K0 | 0 | 0 | 0 |
| 178 | LINEARIZATION MENU | P1(X) | K1 | -99999999 | 99999999 | 0 |
| 179 | LINEARIZATION MENU | P1(Y) | K2 | -99999999 | 99999999 | 0 |
| 180 | LINEARIZATION MENU | P2(X) | K3 | -99999999 | 99999999 | 0 |
| 181 | LINEARIZATION MENU | P2(Y) | K4 | -99999999 | 99999999 | 0 |
| 182 | LINEARIZATION MENU | P3(X) | K5 | -99999999 | 99999999 | 0 |
| 183 | LINEARIZATION MENU | P3(Y) | K6 | -99999999 | 99999999 | 0 |
| 184 | LINEARIZATION MENU | P4(X) | K7 | -99999999 | 99999999 | 0 |
| 185 | LINEARIZATION MENU | P4(Y) | K8 | -99999999 | 99999999 | 0 |
| 186 | LINEARIZATION MENU | P5(X) | K9 | -99999999 | 99999999 | 0 |
| 187 | LINEARIZATION MENU | P5(Y) | L0 | -99999999 | 99999999 | 0 |
| 188 | LINEARIZATION MENU | P6(X) | L1 | -99999999 | 99999999 | 0 |
| 189 | LINEARIZATION MENU | P6(Y) | L2 | -99999999 | 99999999 | 0 |
| 190 | LINEARIZATION MENU | P7(X) | L3 | -99999999 | 99999999 | 0 |
| 191 | LINEARIZATION MENU | P7(Y) | L4 | -99999999 | 99999999 | 0 |
| 192 | LINEARIZATION MENU | P8(X) | L5 | -99999999 | 99999999 | 0 |
| 193 | LINEARIZATION MENU | P8(Y) | L6 | -99999999 | 99999999 | 0 |

Continuation "Parameter / serial codes":

| # | Menu | Name | Code | Min | Max | Default |
|-----|--------------------|--------|------|-----------|----------|---------|
| 194 | LINEARIZATION MENU | P9(X) | L7 | -99999999 | 99999999 | 0 |
| 195 | LINEARIZATION MENU | P9(Y) | L8 | -99999999 | 99999999 | 0 |
| 196 | LINEARIZATION MENU | P10(X) | L9 | -99999999 | 99999999 | 0 |
| 197 | LINEARIZATION MENU | P10(Y) | M0 | -99999999 | 99999999 | 0 |
| 198 | LINEARIZATION MENU | P11(X) | M1 | -99999999 | 99999999 | 0 |
| 199 | LINEARIZATION MENU | P11(Y) | M2 | -99999999 | 99999999 | 0 |
| 200 | LINEARIZATION MENU | P12(X) | M3 | -99999999 | 99999999 | 0 |
| 201 | LINEARIZATION MENU | P12(Y) | M4 | -99999999 | 99999999 | 0 |
| 202 | LINEARIZATION MENU | P13(X) | M5 | -99999999 | 99999999 | 0 |
| 203 | LINEARIZATION MENU | P13(Y) | M6 | -99999999 | 99999999 | 0 |
| 204 | LINEARIZATION MENU | P14(X) | M7 | -99999999 | 99999999 | 0 |
| 205 | LINEARIZATION MENU | P14(Y) | M8 | -99999999 | 99999999 | 0 |
| 206 | LINEARIZATION MENU | P15(X) | M9 | -99999999 | 99999999 | 0 |
| 207 | LINEARIZATION MENU | P15(Y) | N0 | -99999999 | 99999999 | 0 |
| 208 | LINEARIZATION MENU | P16(X) | N1 | -99999999 | 99999999 | 0 |
| 209 | LINEARIZATION MENU | P16(Y) | N2 | -99999999 | 99999999 | 0 |
| 210 | LINEARIZATION MENU | P17(X) | N3 | -99999999 | 99999999 | 0 |
| 211 | LINEARIZATION MENU | P17(Y) | N4 | -99999999 | 99999999 | 0 |
| 212 | LINEARIZATION MENU | P18(X) | N5 | -99999999 | 99999999 | 0 |
| 213 | LINEARIZATION MENU | P18(Y) | N6 | -99999999 | 99999999 | 0 |
| 214 | LINEARIZATION MENU | P19(X) | N7 | -99999999 | 99999999 | 0 |
| 215 | LINEARIZATION MENU | P19(Y) | N8 | -99999999 | 99999999 | 0 |
| 216 | LINEARIZATION MENU | P20(X) | N9 | -99999999 | 99999999 | 0 |
| 217 | LINEARIZATION MENU | P20(Y) | 00 | -99999999 | 99999999 | 0 |
| 218 | LINEARIZATION MENU | P21(X) | 01 | -99999999 | 99999999 | 0 |
| 219 | LINEARIZATION MENU | P21(Y) | 02 | -99999999 | 99999999 | 0 |
| 220 | LINEARIZATION MENU | P22(X) | 03 | -99999999 | 99999999 | 0 |
| 221 | LINEARIZATION MENU | P22(Y) | 04 | -99999999 | 99999999 | 0 |
| 222 | LINEARIZATION MENU | P23(X) | 05 | -99999999 | 99999999 | 0 |
| 223 | LINEARIZATION MENU | P23(Y) | 06 | -99999999 | 99999999 | 0 |
| 224 | LINEARIZATION MENU | P24(X) | 07 | -99999999 | 99999999 | 0 |
| 225 | LINEARIZATION MENU | P24(Y) | 08 | -99999999 | 99999999 | 0 |

Serial codes of commands:

| Serial Code | Command |
|-------------|----------------------|
| 54 | RESET/SET |
| 55 | FREEZE DISPLAY |
| 56 | TEACH ANALOG START |
| 57 | TEACH ANALOG END |
| 58 | TEACH PRESELECTION 1 |
| 59 | TEACH PRESELECTION 2 |
| 60 | TEACH PRESELECTION 3 |
| 61 | TEACH PRESELECTION 4 |
| 62 | TEACH PRESELECTION 5 |
| 63 | TEACH PRESELECTION 6 |
| 64 | RESET MIN/MAX |
| 65 | LOCK RELEASE |
| 66 | SERIAL PRINT |
| 67 | ACTIVATE DATA |
| 68 | STORE DATA |
| 69 | TESTPROGRAM |
| 5: | CLEAR LOOP TIME |
| 5; | RESET/SET COUNTER A |
| 5< | RESET/SET COUNTER B |
| 5= | LOCK COUNTER A |
| 5> | LOCK COUNTER B |
| 5? | ZERO POSITION |

6.4. Linearization

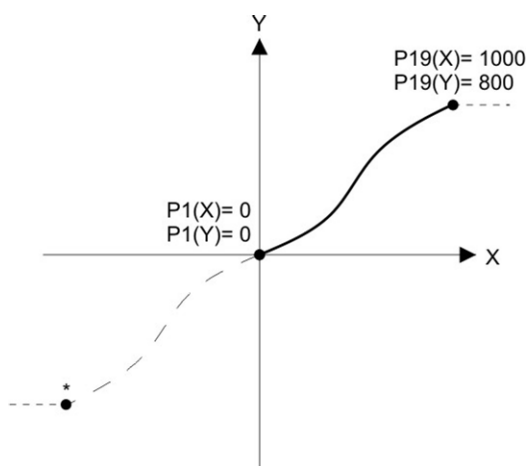
The linearization function of this unit allows converting a linear input signal into a non-linear developing (or vice versa). There are 24 programmable x/y coordinates available, which can be set in any desired distance over the full conversion range. Between two coordinates, the unit uses linear interpolation.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

⁵ To specify an individual linearization curve, the parameter LINEARISAZATION MODE must be set to either 1 QUADRANT or 4 QUADRANT (see following diagram).

⁶ 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.

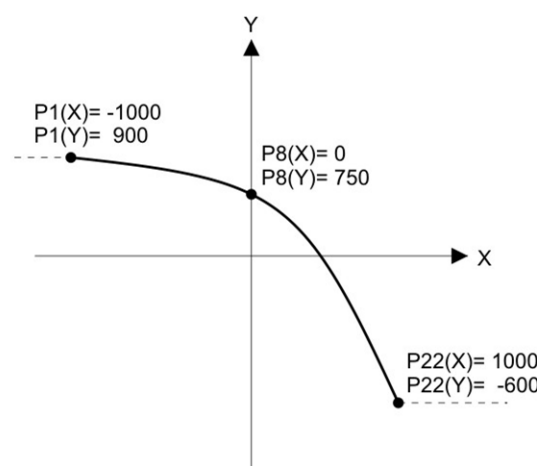
⁷ Now enter the attached values to parameter P1(Y) to P24(Y). These are the values that the unit will generate instead of the x- values, i.e. P5(Y) replaces P5(X) etc.

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:

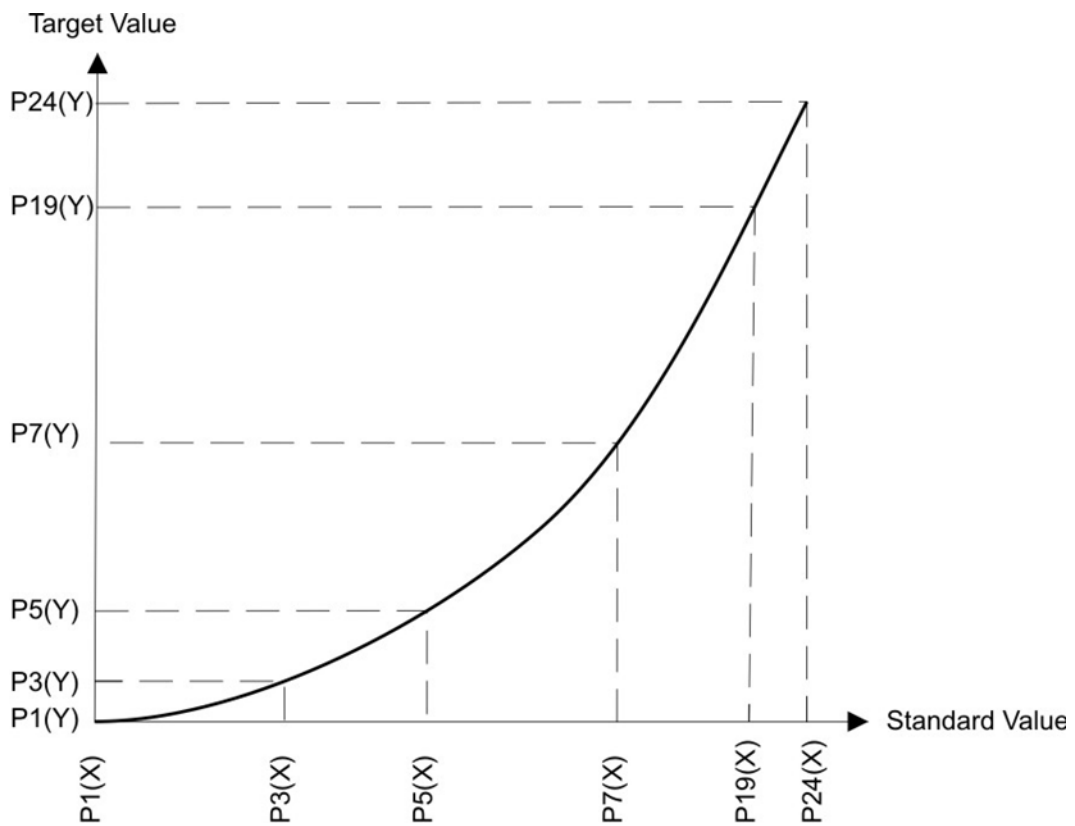
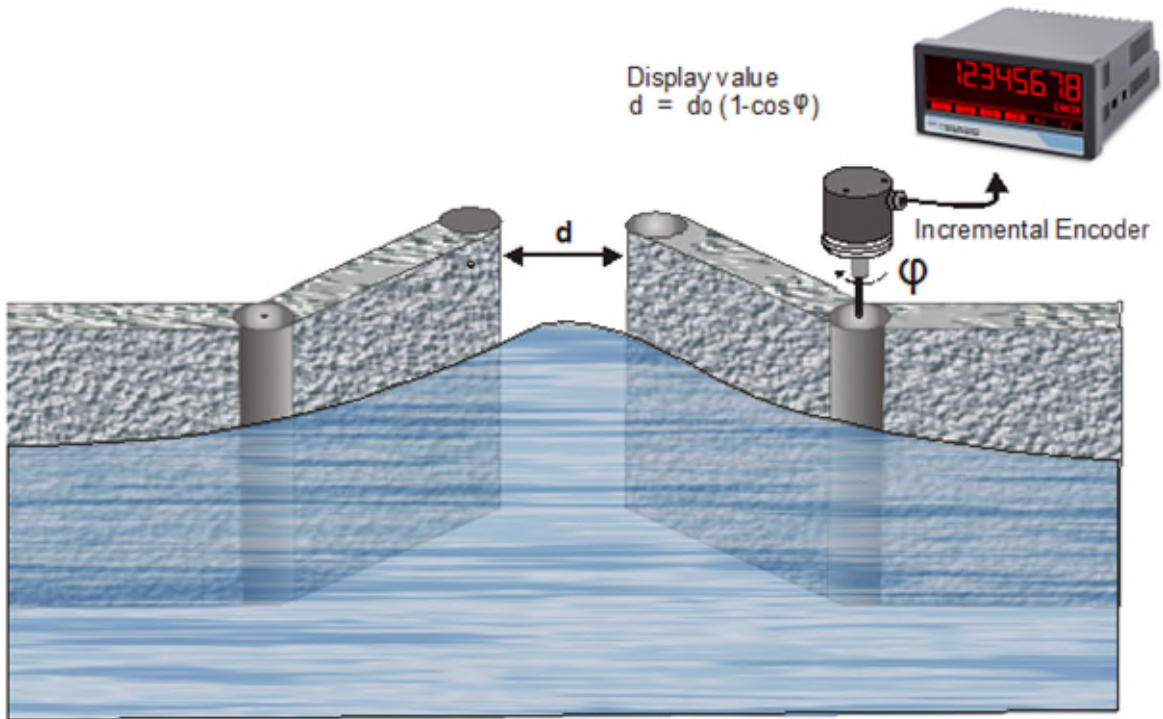
P1(X) must be set to zero. Linearization is only defined in the positive range and the negative range will be mirrored symmetric to central point.

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.

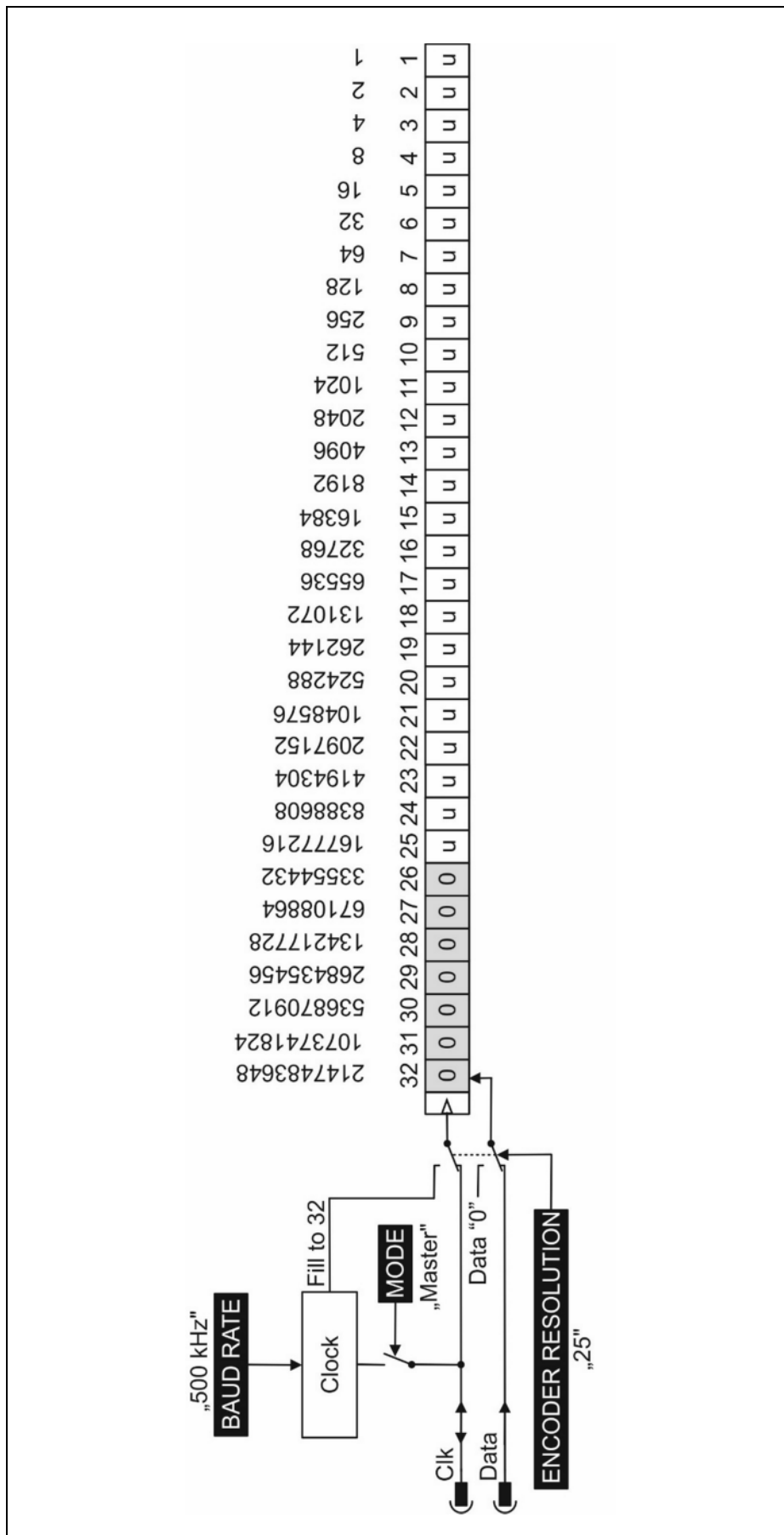
Application Example:

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 .

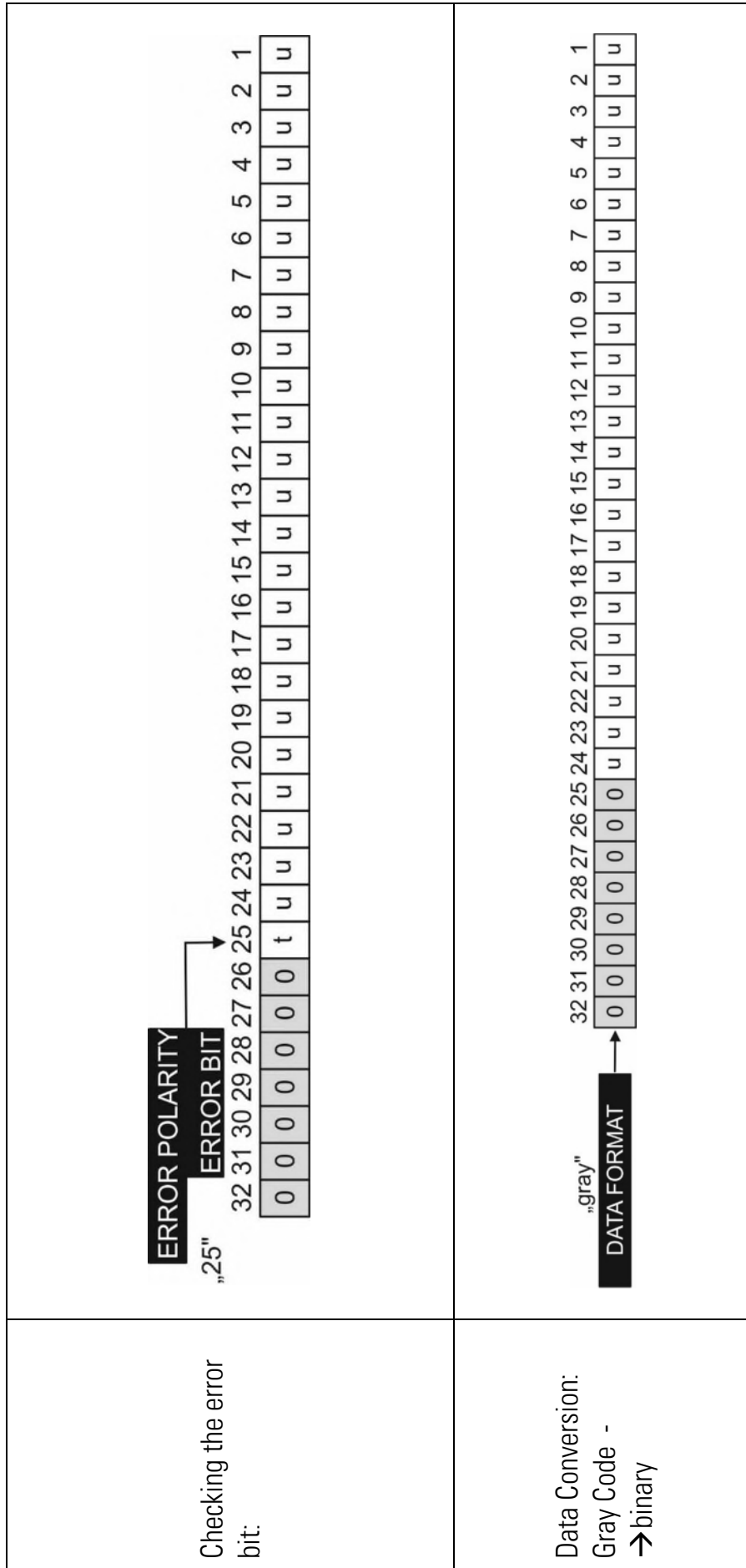


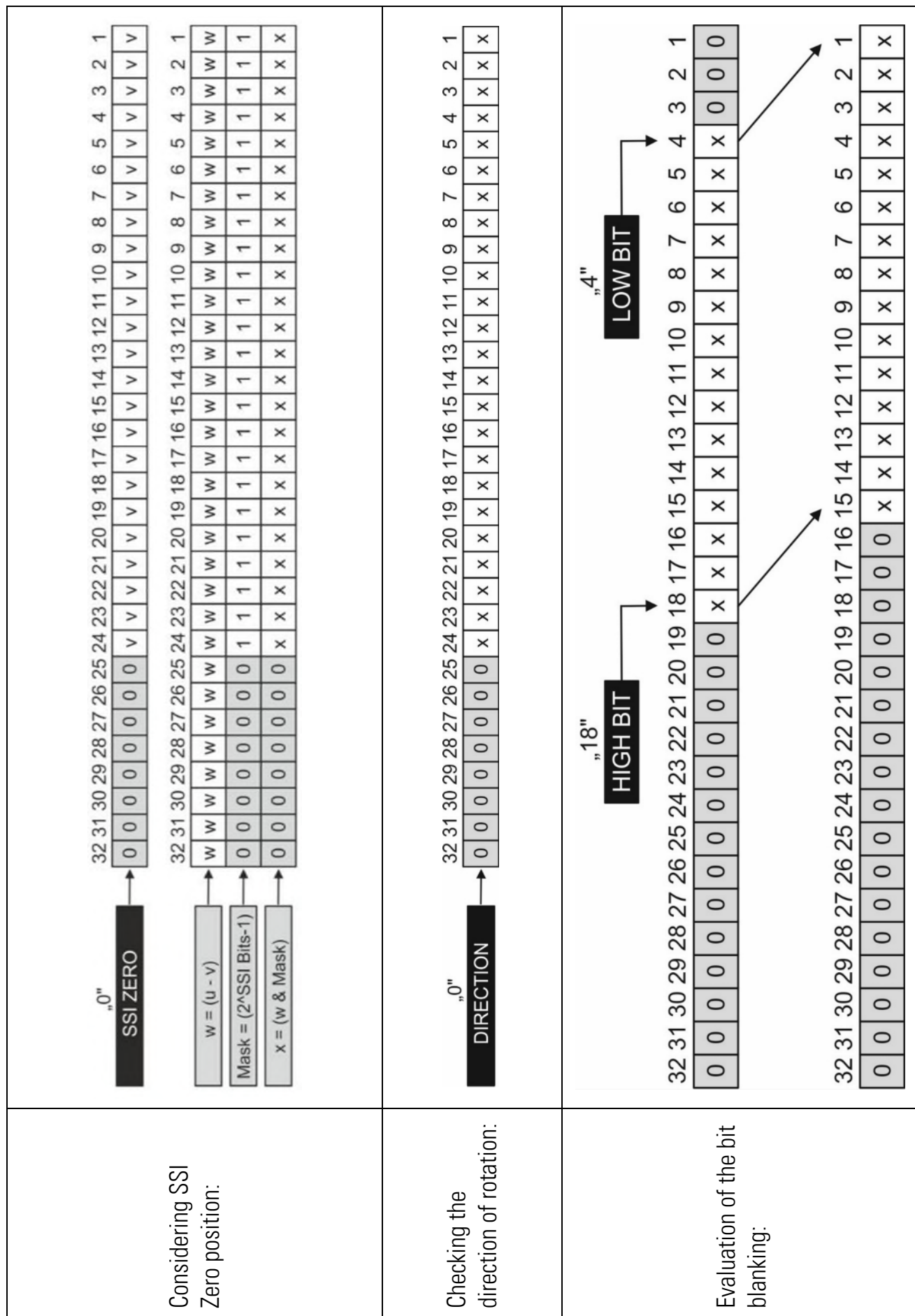
6.5. Reading SSI-Value

The received data is always filled to 32 bit data length.



6.6. Internal processing and calculation of SSI data





| | |
|-----------------------------------|---|
| <p>Considering SSI Offset:</p> | <p>0" SSI OFFSET</p> <p>z = (x - y)</p> |
| <p>Calculation Display Value:</p> | <p>1.2345 INCH</p> <p>z / DIVIDER * FACTOR + ADDITIVE VALUE</p> |

6.7. Operating modes / OP modes of the Start/Stop interface

The device supports the following operating modes:

- **MASTER**
 - The Init pulse for the connected encoder is generated by the device.
 - The two Init connections (INIT OUT, /INIT OUT) are configured as outputs in this case.
- **SLAVE**
 - The Init pulse for the encoder is generated by an external device.
 - The two Init connections (ext. INIT IN, ext. /INIT IN) are configured as inputs in this case.

The desired operating mode can be selected in the "General Menu" using the "INIT MODE" parameter.

The device can also be operated in the following three "Operational Modes". The desired measurement function (distance measurement, angle measurement or velocity measurement) can be selected from among by means of the "OPERATIONAL MODE" parameter.

- **POSITION** (distance measurement)

The current position of the position encoder is determined on the basis of a run-time measurement consisting of a start and stop pulse and can be converted into another unit, if desired, using the existing scaling parameters (Factor, Divider and Additive Value) (e.g. for serial readout of the position value in a desired unit).

Interpretation of the measurement result during distance measurement:

The default setting of the scaling parameters ("FACTOR = 1", "DIVIDER = 1" and "ADDITIVE VALUE = 0") corresponds to a position measurement result in micrometers (μm).

For example, to get a position in "inch" with three fictitious decimal places, the parameter "FACTOR" must be set to "10", the parameter "DIVIDER" to "254" and the parameter "ADDITIVE VALUE" to "0".

- **ANGLE** (angle measurement)

For angle measurement, the desired position or angle output value per rotation can be specified by means of parameter "ROUND LOOP VALUE". This output value is generated as soon as the distance covered (e.g. circumference), which is set as the reference value in the parameter "CIRCUMFERENCE (in mm)", is reached. Afterwards the output value starts again at 0 until the covered distance is reached again. (Round Loop Function!)

Using existing scaling parameters (Factor, Divider and Additive Value), this output value can be rescaled if desired.

Interpretation of the measurement result during angle measurement:

The default setting ("CIRCUMFERENCE (mm) = 100.000" and "ROUND LOOP VALUE = 360", as well as "FACTOR = 1", "DIVIDER = 1" and "ADDITIVE VALUE = 0") corresponds to an angle output or position output of "0...360" (e.g.: degrees) every 100.000 mm.

Continuation "Operating modes / OP modes of the Start/Stop interface"

- **SPEED** (speed measurement)

The speed is recorded and can be converted again into another unit using existing scaling parameters (Factor, Divider and Additive Value), if desired.

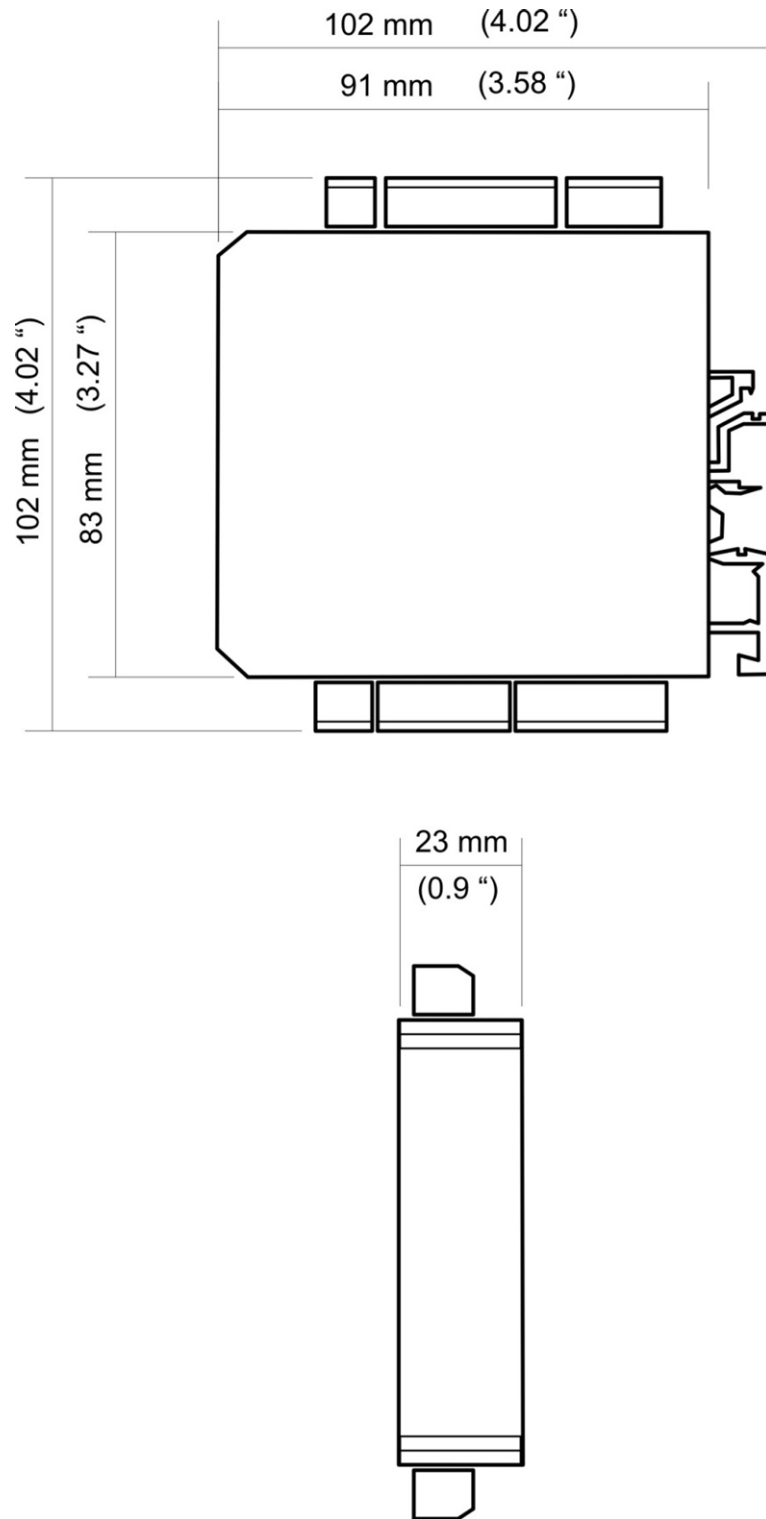
Interpretation of the measurement result during speed measurement:

The default setting ("FACTOR = 1", "DIVIDER = 1" and "ADDITIVE VALUE = 0") corresponds to a velocity output in meters per second [m/s].



The analog output, the setpoints of the transistor outputs and the linearization function always refer to the scaled measuring result of the selected operational mode!

6.8. Dimensions



6.9. Technical Specifications:

| Technical Specifications | | |
|----------------------------------|---|--|
| Connections: | Connector type: | screw terminal, 1.5 mm ² / AWG 16 |
| Power supply (DC):: | Input voltage: Protection circuit: Consumption: Fuse protection: | 18 ... 30 VDC reverse polarity protection approx. 50 mA (unloaded) extern: T 0.5 A |
| Encoder supply: | Output voltage: Output current: | 5 VDC and 24 VDC (approx. 1 V lower than the power supply) max. 250 mA |
| Incremental-inputs: | Number (channels): Configuration: RS422: HTL differential: HTL Single Ended: TTL: Frequency measurement accuracy: | A, B (HTL Single Ended, TTL Single Ended) A, /A, B, /B (RS422, HTL Differential) RS422, HTL differential, HTL Single Ended, TTL max. 1 MHz (RS422 differential signal > 0,5 V) max. 1 MHz (HTL differential signal > 1 V) max. 350 kHz, (Low: 0 ... 5V, High: 9 ... 30 V) max. 350kHz, (Low: 0 ... 0.6V, High: 2.2 ... 5V) +/- 50 ppm |
| SSI interface: | Number (channels): Configuration: Format: Frequency: Resolution: Load: | Clock, /Clock, Data, /Data Master or Slave Binary or Gray code max. 1 MHz 10 ... 32 Bit Max. 3 mA / Ri > 10 kOhm / 10 pF |
| Start/Stop-interface: | RS422 input: RS422 output: Pulse width Init-pulse: Frequency Init-pulse: Clock frequency time measurement:: Resolution: | 1 x (Start_Stop, /Start_Stop); 1x (ext. Init_In, ext. /Init_In) 1 x (Init_Out, /Init_Out) 1 ... 9 µs (adjustable) 62,5 Hz - 5000 Hz (adjustable) 48 MHz Depending on the waveguide velocity of the encoder. (e.g. 0,059mm / step at v = 2850 m/s) |
| Control inputs: | Number of inputs: Format: Frequency: Load: | 6 HTL, PNP (10 ... 30 V) max. 10 kHz max. 2 mA / Ri > 15 kOhm / 470 pF |
| Analog-output: | Configuration: Voltage output: Current output: Resolution: Accuracy: Reaction time: | current or voltage operation -10...+10 V (max. 2mA) 0/4 ... 20 mA (burden: max. 270 Ohm) 16 Bit ± 0,1 % 0°C ... +45°C ± 0,15 % -20°C ... 0°C und +45°C ... +60°C < 1 ms |
| Control-Outputs: | Number of outputs: Format / level: Output current: Reaction time: | 6 5 ... 30 V (depends on the Com+ voltage), PNP max. 200 mA < 1 ms |
| Serial interface: | Format: Baudrate: | RS232 oder RS485 9600, 19200 oder 38400 baud |
| USB interface: | Mini-USB: | 115200 Baud, Data Format 8 none 1 |
| Display: | LED: | green status LED |
| Housing: | Material: Mounting: Dimensions (w x h x d): Protection class: Weight: | Plastic housing 35 mm DIN rail (EN 60715) 23 x 102 x 102 mm IP20 approx. 100 g |
| Ambient temperature: | Operation: Storage: | -20°C ... +60°C (not condensing) -25°C ... +75°C (not condensing) |
| Failure rate: | MTBF in years: | 59,1 a (Continuous operation at 60 ° C) |
| Conformity and standards: | EMC 2014/30/EU: RoHS (II) 2011/65/EU RoHS (III) 2015/863: | EN 61326-1: 2013 for industrial location EN 55011: 2016 + A1: 2017 + A11: 2020 Class A EN IEC 63000: 2018 |