Smart encoders & actuators

# User's guide

# IF42

- IF42 signal converter (incremental or SSI to parallel)
- For HTL/TTL/RS-422/NPN/PNP incremental encoders and sensors
- For single/multiturn SSI encoders up to 32 bits
- 25 bit parallel output via 25-pin D-Sub connector
- Serial interface via mini USB port for configuration
- Parametrization via free software
- Slim and space-saving housing with DIN rail mounting

Suitable for the following models:

- IF42

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# Typographic and iconographic conventions

In this guide, to make it easier to understand and read the text the following typographic and iconographic conventions are used:

- parameters and objects both of the device and the interface are coloured in **GREEN**;
- alarms are coloured in **RED**;
- states are coloured in **FUCSIA**.

When scrolling through the text some icons can be found on the side of the page: they are expressly designed to highlight the parts of the text which are of great interest and significance for the user. Sometimes they are used to warn against dangers or potential sources of danger arising from the use of the device. You are advised to follow strictly the instructions given in this guide in order to guarantee the safety of the user and ensure the performance of the device. In this guide the following symbols are used:

| | |
|---|---|
|  | This icon, followed by the word WARNING, is meant to highlight the parts of the text where information of great significance for the user can be found: user must pay the greatest attention to them! Instructions must be followed strictly in order to guarantee the safety of the user and a correct use of the device. Failure to heed a warning or comply with instructions could lead to personal injury and/or damage to the unit or other equipment. |
|  | This icon, followed by the word NOTE, is meant to highlight the parts of the text where important notes needful for a correct and reliable use of the device can be found. User must pay attention to them! Failure to comply with instructions could cause the equipment to be set wrongly: hence a faulty and improper working of the device could be the consequence. |
|  | This icon is meant to highlight the parts of the text where suggestions useful for making it easier to set the device and optimize performance and reliability can be found. Sometimes this symbol is followed by the word EXAMPLE when instructions for setting parameters are accompanied by examples to clarify the explanation. |

# Preliminary information

This guide is designed to provide the most complete information the operator needs to correctly and safely install and operate the **IF42 signal converter**.

IF42 is designed to **convert incremental digital signals or SSI encoder data into parallel signals**. A wide range of incremental encoders and digital sensors is applicable: quadrature encoders with HTL level output and PNP, NPN, Push-Pull or Namur characteristics, using A and B outputs with 90° displacement; single channel impulse sources such as proximity switches or photocells providing HTL level at PNP or NPN or Namur characteristics; TTL/RS-422 quadrature encoders with AB and /AB output lines; symmetric single channel sources with TTL/RS-422 output providing differential signal (i.e. A and /A); asymmetric single channel sources with TTL level (without inverted signal, i.e. A only). It can be connected to all singleturn and multiturn encoders and sensors fitted with 10- to 32-bit resolution standard SSI interface and either Binary or Gray code.
The unit will then convert the sensor or encoder information into a parallel signal. The device is equipped with a 25-pin D-Sub female connector.
It is also possible to convert serial data into a parallel format.

For technical specifications please refer to the product datasheet.

To make it easier to read the text, this guide can be divided into two main sections.

In the first section (from section 1 to section 4) general information concerning the safety, the mechanical installation and the electrical connection.

In the second section (from section 5 to section 8) both general and specific information is given on the operator menu and the setup procedure.

### Operational modes

All functions can be configured in the parameter menu.
The device can be set to one of the following operation modes:

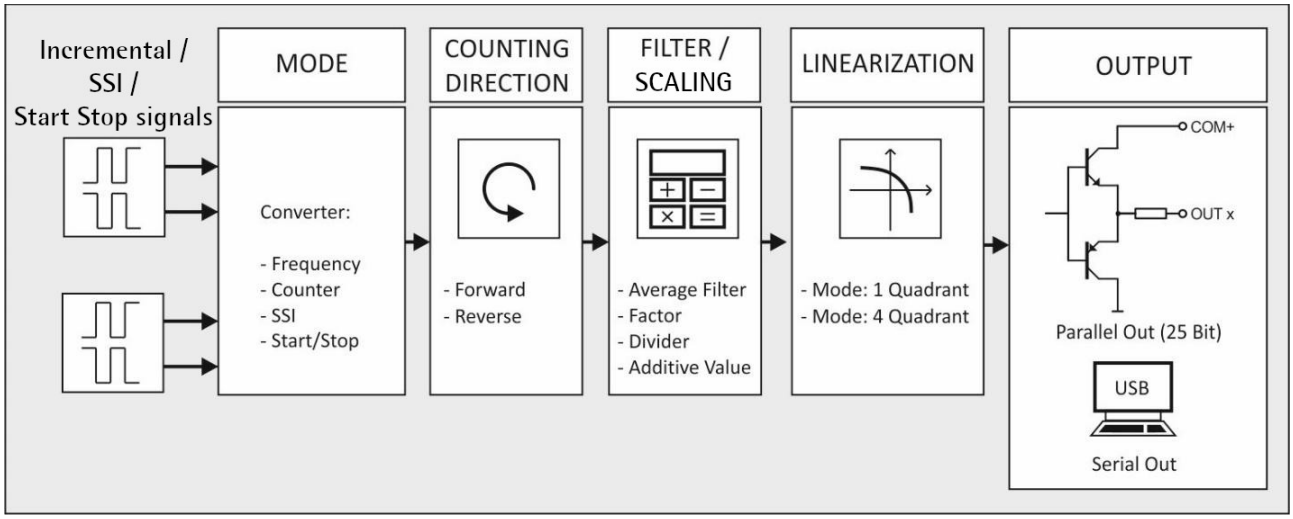
- Operation as frequency converter for incremental input signals, **Mode** = 1 = FREQUENCY, see the **Mode** parameter in the "5.2 General menu" section on page 33.

- Operation as position transducer / counter for incremental input signals, **Mode** = 2 = COUNTER, see the **Mode** parameter in the "5.2 General menu" section on page 33.

- Operation as absolute value converter for signals of a start/stop interface, **Mode** = 4 = START / STOP, see the **Mode** parameter in the "5.2 General menu" section on page 33.

- Operation as absolute value converter for SSI signals, **Mode** = 3 = SSI, see the **Mode** parameter in the "5.2 General menu" section on page 33.

## Functional diagram




## Compatibility

This product is designed to be compatible with previous converter IF52. It is able to replace the functionality of the previous models and also adds some other new options; however some minor differences need to be noted with regard to the parameter settings.
The main differences between this product and the respective previous model are listed below.

| | IF42 | IF52 |
|---|---|---|
| **Operating mode:** | Extension of the parallel converter by additional operating modes.<br>(Frequency, counter and start / stop to parallel converter.)<br><br>Possible configurations for incremental inputs:<br><br>RS-422 (TTL), HTL Differential, HTL PNP, HTL NPN or TTL PNP (asymmetrical)<br><br>The setting made in the corresponding parameter then applies to both inputs (A and B). | Only SSI to parallel converter without switchable operating mode. |
| **Control Inputs:** | Number of inputs: 3 (freely configurable)<br>Format: HTL | Number of inputs 1 (fixed configuration)<br>Format: HTL |
| **Encoder Supply:** | Output voltage: 5Vdc and 24Vdc<br>Output current: max. 250 mA | Not available |
| **Serial Interface:** | USB interface via mini USB connector<br>Baud rate: 115,200 Baud<br>Format: 8 none 1 | RS-232/RS-485 via 9-position D-SUB connector (female)<br>Baud rate: 600, 1200, 2400, 4800, 9600, 19200, or 38400 Baud |
| **Housing:** | Dimensions: 23 w x 102 h x 102 d mm<br>Weight: approx. 100 g | Dimensions: 40 w x 79 h x 91 d mm<br>Weight: approx. 190 g |
| **Device parametrization:** | Only via operator software OS | Via operator software OS6.0 and partially via DIL switches |

# 1 - Safety summary

## 1.1 Safety

- Always adhere to the professional safety and accident prevention regulations applicable to your country during device installation and operation;
- installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected and stationary mechanical parts;
- device must be used only for the purpose appropriate to its design: use for purposes other than those for which it has been designed could result in serious personal and/or the environment damage;
- high current, voltage and moving mechanical parts can cause serious or fatal injury;
- warning ! Do not use in explosive or flammable areas;
- failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment;
- Lika Electronic assumes no liability for the customer's failure to comply with these requirements.

## 1.2 Electrical safety

- Turn OFF power supply before connecting the device;
- connect following to explanation in the "4 - Electrical connections" section on page 16;
- in compliance with 2014/30/EU norm on electromagnetic compatibility, following precautions must be taken:

- before handling and installing the equipment, discharge electrical charge from your body and tools which may come in touch with the device;
- power supply must be stabilized without noise; install EMC filters on device power supply if needed;
- always use shielded cables (twisted pair cables whenever possible);
- avoid cables runs longer than necessary;
- avoid running the signal cable near high voltage power cables;
- mount the device as far as possible from any capacitive or inductive noise source; shield the device from noise source if needed;
- minimize noise by connecting the unit to ground (GND). Make sure that ground (GND) is not affected by noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user.

## 1.3 Mechanical safety

- Install the device following strictly the information in the "3 - Mounting instructions" section on page 13;
- do not disassemble the unit;
- do not tool the unit;

- delicate electronic equipment: handle with care;
- do not subject the device to knocks or shocks;
- respect the environmental characteristics of the device.

## 2 - Identification

Device can be identified through the **order code** and the **serial number** printed on the label applied to its body. Information is listed in the delivery document too. Please always quote the order code and the serial number when reaching Lika Electronic for purchasing spare parts or needing assistance. For any information on the technical characteristics of the product, refer to the technical catalogue.

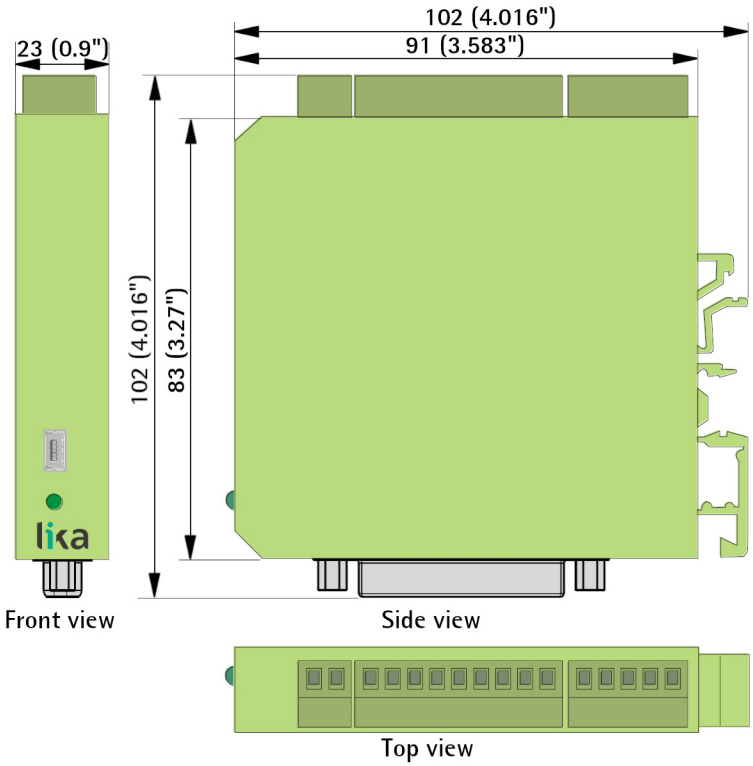
**Warning**: devices having order code ending with "/Sxxx" may have mechanical and electrical characteristics different from standard and be supplied with additional documentation for special connections (Technical info).

# 3 - Mounting instructions

**WARNING**
Installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected and mechanical parts compulsorily in stop.

## 3.1 Overall dimensions

IF42 signal converter must be installed and protected inside the electric panel. It provides DIN rail mounting and can quickly snap onto a DIN rail with built-in DIN rail clips that require no additional brackets or supports.



### 3.2 Installation

The device is allowed to be installed and operated only within the permissible temperature range (-20°C +60°C / -4°F +140°F). Please ensure an adequate ventilation and avoid any direct contact between the device and gases / liquids.
Before installation or maintenance, the unit must be disconnected from all voltage sources. Furthermore it must be ensured that no danger can arise in the event of contact with the disconnected voltage sources.
Devices which are supplied by AC voltages must be connected only by means of switches or circuit breakers with low voltage circuit. The switch or circuit breaker must be installed 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 double or increased insulation.
All selected wires and insulations must comply with the provided voltage and temperature ranges. Furthermore 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 product datasheet.

Before starting the unit for the first time it must be ensured that all connections and wires are firmly plugged in and secured to the screw terminal blocks. All terminal blocks (including unused ones) must be fastened by turning the relevant screws clockwise up to the end position.

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

For placement, wiring, environmental conditions as well as shielding and earthing/grounding of the supply lines you must comply with the general standards stated for industrial automation industry and the specific shielding instructions provided by the manufacturer.

### 3.3 Interference resistance

All connections are protected against electromagnetic interference.
However, it must be ensured that the lowest possible capacitive or inductive interference acts on the unit and the connecting cables at the installation location of the unit.

The following measures are necessary to achieve this result:

- shielded cable must always be used for all input and output signals;
- control lines (digital inputs and outputs, relay outputs) must not exceed 30 m in length and must not leave the building;
- the cable shields must be connected to earth over a large area using shield clamps;
- the wiring of the ground lines (GND or 0V) must be star-shaped and must not be connected several times to ground;

- the device should be installed in a metal housing and as far away as possible from sources of interference;
- the cable routing must not be parallel to power lines and other lines with interference.

### 3.4 Cleaning, maintenance and service notes

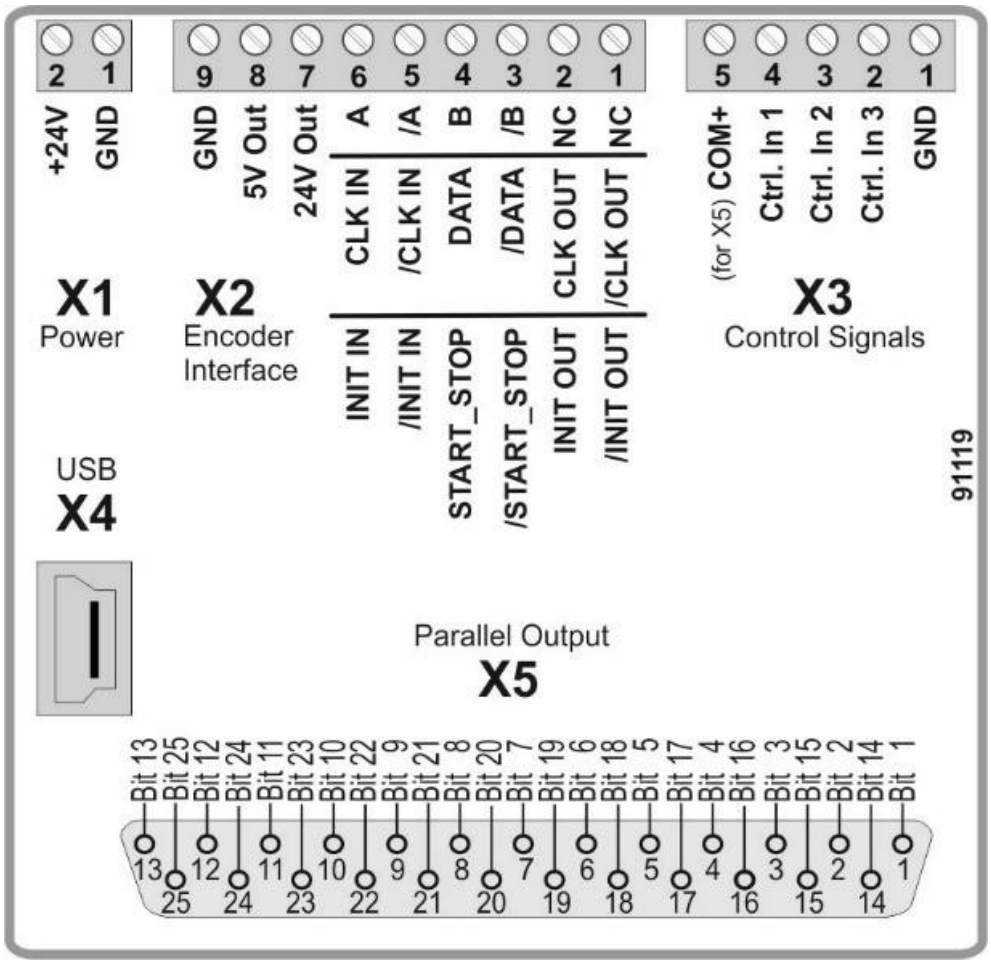
To clean the front of the unit please just use a slightly damp (not wet!), soft cloth. For the rear side no cleaning is necessary. For an unscheduled, individual cleaning of the rear side the maintenance technicians or installation operators are self-responsible.

During normal operation no maintenance is necessary. In case of unexpected problems, failures or malfunctions the device must be shipped back to the manufacturer for any checking, adjustment or repair (if necessary). Unauthorized opening and repair operations can have negative effects or cause failures to the protection measures of the unit.

# 4 - Electrical connections

**WARNING**
Power supply must be turned off before performing any electrical connection!

The terminal block screws must be tightened using a slotted screwdriver having a 2 mm wide blade.




## 4.1 DC power supply (X1 Power)

**DC power supply technical specifications**

| | |
|---|---|
| Input voltage: | 18Vdc ... 30Vdc |
| Protection circuit: | reverse polarity protection |
| Power consumption: | approx. 30 mA (unloaded) |
| Fuse protection: | external fuse T 0.5 A |

The unit accepts DC power supply from 18 to 30 V through terminal blocks 1 and 2 of X1. The power consumption depends on the level of the supply voltage (approx. 25 mA) and the additional current required by the Auxiliary Voltage

output (terminal X2, pins 9 – GND + 8 – 5V Out or 7 - 24V Out, see the following "4.2 Auxiliary voltage output (X2 Encoder Interface)" section).

All GND terminal blocks are internally connected.

### 4.2 Auxiliary voltage output (X2 Encoder Interface)

**Auxiliary voltage output technical specifications**

| | |
|---|---|
| Output voltage: | 5Vdc and 24Vdc (approx. 1 V lower than the power supply voltage) |
| Output current: | max. 250 mA |

Terminal blocks 7, 8 and 9 of terminal X2 provide an auxiliary output useful for supplying sensors and encoders. Two auxiliary voltages are available: 5Vdc and 24Vdc. The 24Vdc output voltage depends on the power supply of the device.

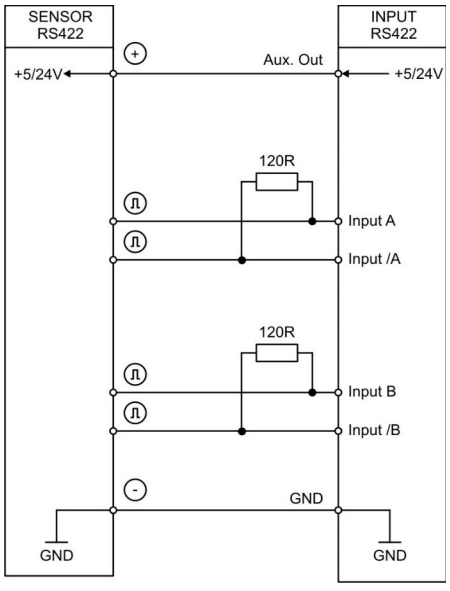
### 4.3 Incremental encoder input (X2 Encoder Interface)

**Incremental encoder input technical specifications**

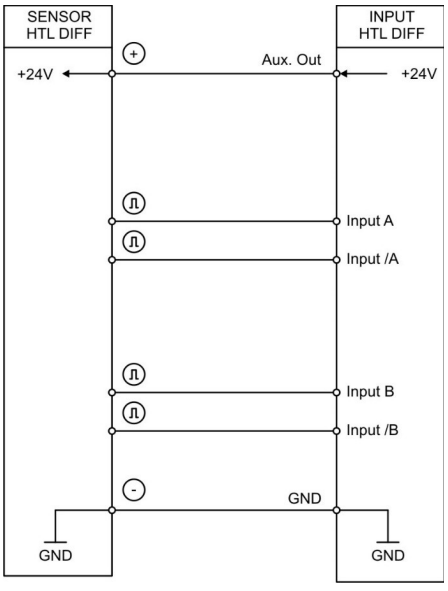
| | |
|---|---|
| Number of inputs: | A, /A, B, /B |
| Configuration: | RS-422, TTL, HTL differential, HTL PNP or HTL NPN |
| RS-422: | max. 1 MHz (RS-422 differential signal > 0.5 V) |
| HTL differential | max. 500 kHz (HTL differential signal > 2 V) |
| TTL/ HTL PNP / NPN: | max. 250 kHz |
| Load: | max. 6 mA / Ri > 5 kOhm / 10 pF |
| Accuracy frequency measurement: | ± 50 ppm, ± 1 digit |

Pins 3, 4, 5 and 6 of terminal X2 provide a connection for several types of incremental signals.

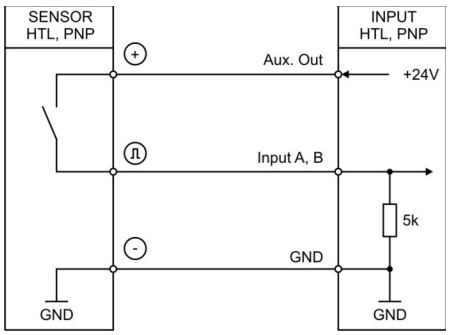
**RS-422**



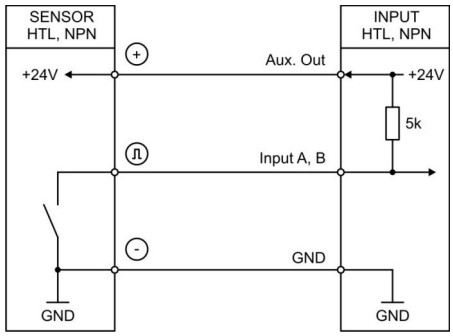

**HTL DIFFERENTIAL**



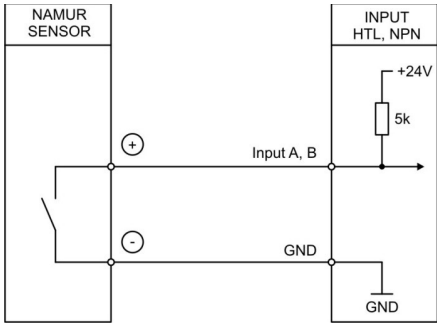
### HTL PNP



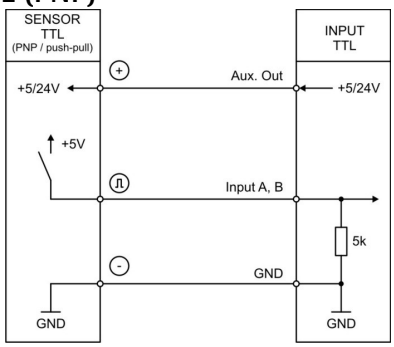

### HTL NPN




### 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.
For information on the the Frequency mode and the incremental interface please refer to the "5.3 Frequency mode menu" section on page 36.
For information on the the Counter mode and the incremental interface please refer to the "5.4 Counter mode menu" section on page 42.

#### 4.3.1 Note about 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.

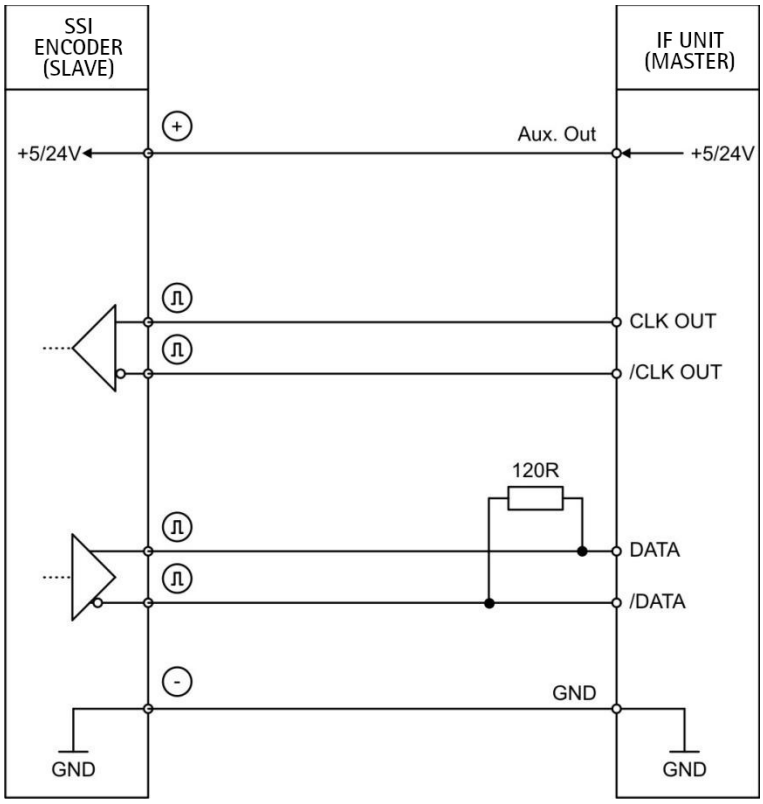
## 4.4 SSI absolute encoder input (X2 Encoder Interface)

**Absolute encoder input technical specifications**

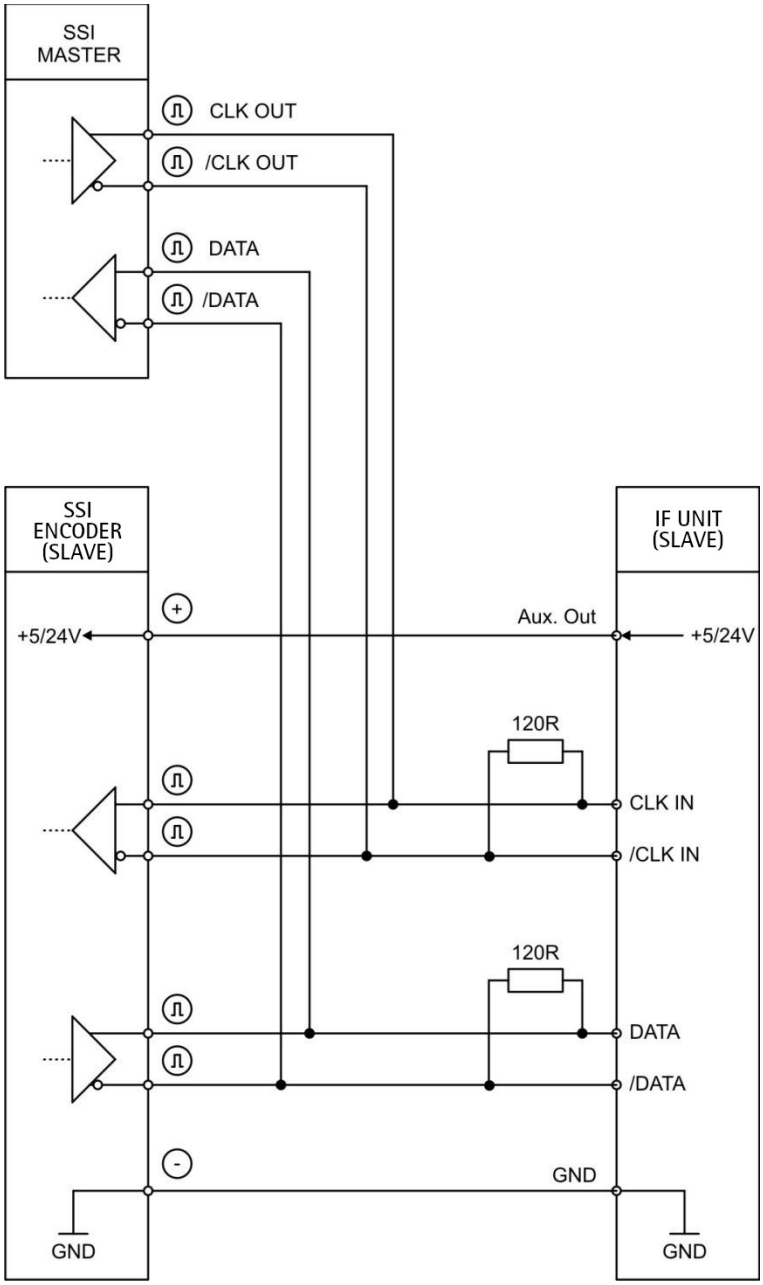
| | |
|---|---|
| Input format: | TTL differential, RS-422 standard |
| Number (channels): | CLK IN or OUT, /CLK IN or OUT, DATA, /DATA |
| Configuration: | Master or Slave |
| Format: | Binary or Gray code |
| Frequency: | max. 1 MHz |
| Resolution: | 10 ... 32 bits |
| Load: | Max. 3 mA / Ri > 10 kOhm / 10 pF |

Pins 1, 2, 3, 4 of terminal X2 provide the connection when **SSI mode** = 0 = MASTER.
Pins 3, 4, 5, 6 of terminal X2 provide the connection when **SSI mode** = 1 = SLAVE.
For information on the the SSI Master / Slave mode and the SSI interface please refer to the "5.5 SSI mode menu" section on page 44.

### 4.4.1 Connection for SSI mode = 0 = Master



### 4.4.2 Connection for SSI mode = 1 = Slave



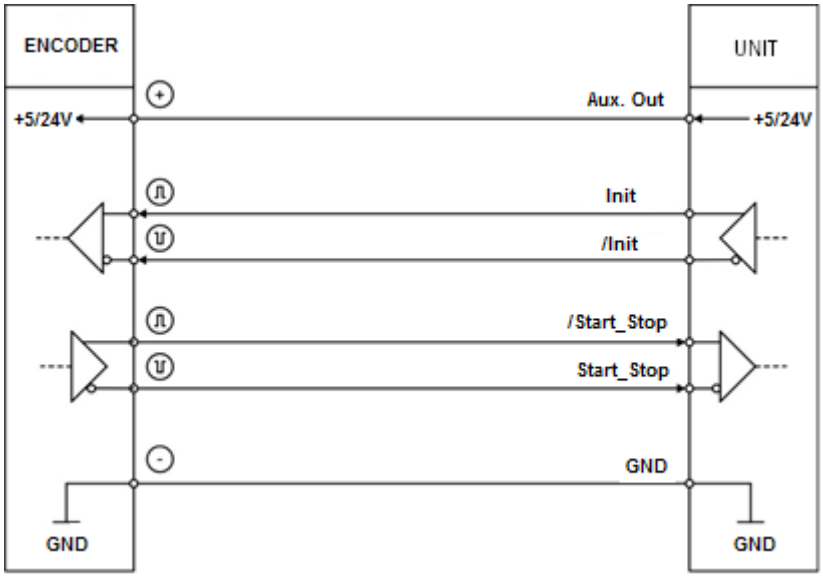
## 4.5 Start/Stop encoder inputs (X2 Encoder Interface)

**Start/Stop encoder inputs technical specifications**

| | |
|---|---|
| RS-422 input: | 1 x (START_STOP, /START_STOP); 1 x (INIT_IN, /INIT_IN) |
| RS-422 output: | 1 x (INIT OUT, /INIT OUT) |
| Pulse width Init pulse: | 1 ... 9 µs (settable) |
| Frequency Init pulse: | 62.5 Hz - 5000 Hz (settable) |
| Clock frequency: | 48 MHz |
| Resolution: | depending on the speed of the encoder (e.g. 0.059 mm / step at v = 2,850 m/s) |

Pins 1 + 2 of terminal X2 provide the RS-422 connection for the Init pulse when **Init mode** = 0 = MASTER (see on page 56): the device generates the Init pulse by itself.
Pins 5 + 6 of terminal X2 provide the RS-422 connection for the Init pulse when **Init mode** = 1 = SLAVE (see on page 56): the Init pulse is generated by an external device.
Pins 3 + 4 of terminal X2 provide the RS-422 connection for the Start-Stop pulse.
For information on the the Start/Stop mode please refer to the "5.6 Start/Stop mode menu" section on page 56.

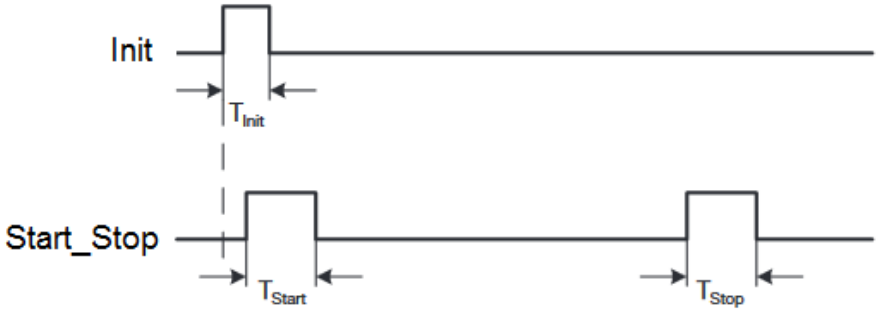
### 4.5.1 Connection of the RS-422 signals




### 4.5.2 DPI measurement operation

When **Init mode** = 0 = MASTER (see on page 56), the Init pulse is sent to the position sensor on the init line at regular intervals (see the **Sampling time (ms)** parameter on page 56), the rising edge of the Init pulse triggers a measurement.

The pulse width of the Init pulse can be set by means of the **Init pulse time (µs)** parameter, see on page 56.




$T_{Init}$: 1 ... 9 µs (it can be set by means of the **Init pulse time (µs)** parameter)
$T_{start}$: ~ 3 ... 5 µs
$T_{stop}$: ~ 3 ... 5 µs

## 4.6 Control inputs (X3 Control Signals)

**Control inputs technical specifications**

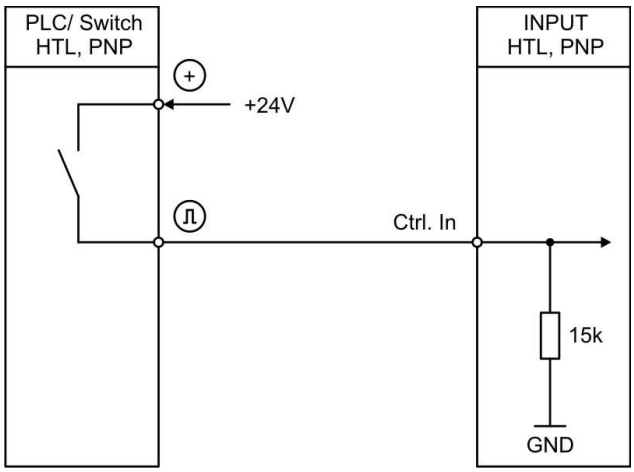
| | |
|---|---|
| Number of inputs: | 3 |
| Format: | HTL, PNP (Low 0 ... 3 V, high 9 ... 30 V) |
| Frequency: | max. 10 kHz |
| Load: | max. 2 mA / Ri > 15 kohm / 470 pF |

Three control inputs are available at pins 2, 3 and 4 of terminal X3, they have HTL PNP characteristics.

In the **Command** menu (see the "5.9 Command menu" section on page 67) the operation of the control inputs 1 and 2 5 (Ctrl. In 1 and Ctrl. In 2) is freely configurable. They are used for functions to be triggered from an external source, e.g. for resetting the measurement result or for freezing the parallel output.

Control input 3 (Ctrl. In 3) is used exclusively for resetting the device parameters to the default values. Thus it is not freely configurable. The device is reset to the factory setting by applying a HTL pulse ("ACTIVE HIGH") to Ctrl. In 3 for 1 second at least.

### 4.6.1 Wiring of the control inputs




Unconnected control inputs are always "LOW".
All inputs are designed to receive impulses from an electronic impulse source.

### 4.6.2 Note about 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 Serial interface (X4 USB)

**Serial interface technical specifications**

| | |
|---|---|
| Connector type: | Mini USB |
| Baud rate: | 115,200 baud |
| Format: | 8 Data Bits, No Parity Bit, 1 Stop Bit |

A serial USB interface (mini USB) is available through terminal X4.
It can be configured in the **Serial** menu, see the "5.7 Serial menu" section on page 61.

The USB interface can be used:

- for easy setup and commissioning of the unit
- to modify settings and parameters during operation
- to read out current measuring values via PC

**NOTE**
The serial USB communication is achieved with a baud rate of 115,200 baud; the format is 8 Data Bits, No Parity Bit, 1 Stop Bit and cannot be changed by the user.

For connection use a standard mini-USB / USB cable available in the market.

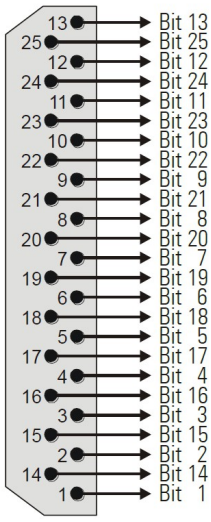
## 4.8 Parallel output (X5 Parallel Output) / COM + (X3 Control Signals)

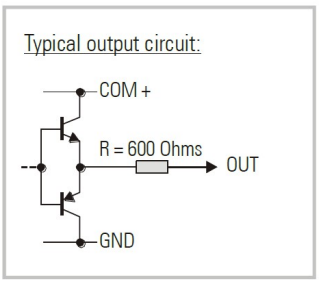
**Parallel output technical specifications**

| | |
|---|---|
| Output format: | Binary Gray or BCD |
| Resolution: | 25 Bits |
| Signal level: | Push-Pull, 0 ... 35 V* (external input at COM+ required, see terminal block 5 of terminal X3) |
| Output current: | max. 20 mA (at 24 V) |
| Internal resistance: | Ri ≈ 600 Ohm |
| Protection circuit: | *) short-circuit proof up to max. 27 V |
| Sampling time: | 0. 001 s ... 9.999 s (adjustable) |

The parallel outputs are 25 short-circuit proof Push-Pull outputs. The common, independent supply voltage of the outputs is applied to terminal X3 - pin 5 (COM +). The supply voltage at COM + should not exceed +27 V, otherwise the permanent short circuit resistance of the outputs can no longer be guaranteed.
The voltage drop between COM + and an output in the HIGH state is approx. 1 volt (unloaded).

25-pin D-Sub connector (female on unit side)



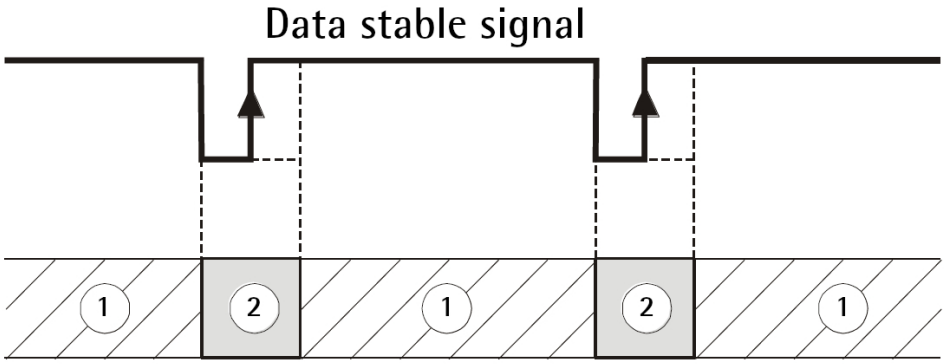

### 4.8.1 "Error" – Output

In the parallel menu (see the "5.8 Parallel menu" section on page 65), the Special pin function parameter can be used to configure the bit 25 output (or the bit 24 output – if a data stable signal is also configured) as an "Error" signal. In this case, a LOW signal (or HIGH signal) indicates that an error has been detected. For further information please refer to the next "4.9 Diagnostic LED" section on page 27.

### 4.8.2 "Data stable" – output

In the parallel menu (see the "5.8 Parallel menu" section on page 65), the Special pin function parameter can be used to configure the bit 25 output as a "Data stable" signal.

In this case a LOW state (or HIGH state) indicates that parallel output data is stable and will not change. The rising edge (or falling edge) of the signal still guarantees stable data and can be used for remote Latch of the parallel data.
The LOW duration (or HIGH duration) of the signal is at least 1/3 of the value set next to the **Parallel update time (s)** parameter. The picture below shows the signal path of the "data stable" output with the "Active LOW" setting. With the "Active HIGH" setting the signal form is inverted accordingly.




Zone 1: Parallel output data subject to change
Zone 2: Parallel output data is stable

### 4.9 Diagnostic LED

The device is equipped with a green LED on its front side, it is meant to show visually the operating or fault status of the unit, according to the following table.

| GREEN LED | Description |
|---|---|
| **ON** | It is ON when the supply voltage is applied to the device. |
| **FLASHING at 1 Hz** | If an error occurs, the LED flashes at 1 Hz. |

In case of error, the LED flashes at 1 Hz. If the error no longer exists, the LED automatically lights up again permanently and the parallel output provides the current value.
The exact error can be read out via the serial interface by means of the user interface (OS).
(→ Variable: Error_Status, Code: "; 3")

The individual error codes are explained below:

| Error code: (Error_Status) | Error identification | Error description |
|---|---|---|
| 0x00000001 | Maximum Value | If Special pin function is set to "**0 = DATA & DATA**": the measured value is greater than +16,777,215 (= $2^{24}$ – 1)<br>If Special pin function is set to "**1 = ERROR & DATA**", "**2 = /ERROR & DATA**", "**3 = ERROR & /ERROR**", "**4 = DATASTABLE & DATA**", "**5 = /DATASTABLE & DATA**" or "**10 = DATASTABLE & /DATASTABLE**": the measured value is greater than +8,388,607 (= $2^{23}$ – 1).<br>If Special pin function is set to "**6 = DATASTABLE & ERROR**", "**7 = DATASTABLE & /ERROR**", "**8 = /DATASTABLE & ERROR**" or "**9 = /DATASTABLE & /ERROR**": the measured value is greater than +4,194,303 (= $2^{22}$ – 1).<br>See on page 66. |
| 0x00000002 | Minimum Value | If Special pin function is set to "**0 = DATA & DATA**": the measured value is less than -16,777,215 (= $-2^{24}$)<br>If Special pin function is set to "**1 =** |

| | | |
|---|---|---|
| | | **ERROR & DATA**", "**2 = /ERROR & DATA**", "**3 = ERROR & /ERROR**", "**4 = DATASTABLE & DATA**", "**5 = /DATASTABLE & DATA**" or "**10 = DATASTABLE & /DATASTABLE**": the measured value is less than -8,388,608 (= $-2^{23}$).<br>If **Special pin function** is set to "**6 = DATASTABLE & ERROR**", "**7 = DATASTABLE & /ERROR**", "**8 = /DATASTABLE & ERROR**" or "**9 = /DATASTABLE & /ERROR**": the measured value is less than -4,194,304 (= $-2^{22}$).<br>See on page 66. |
| 0x00000004 | SSI Encoder Error | SSI error bit set (only if **Mode** is set to "**3 = SSI**", see on page 33). |
| 0x00000008 | Encoder Fault | For internal test purposes only! |
| 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 (only if **Mode** is set to "**1 = FREQUENCY**", see on page 33). |
| 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 (only if **Mode** is set to "**1 = FREQUENCY**", see on page 33). |
| 0x00000040 | Start/Stop Encoder Error | No "start" and no "stop" pulse detected between two "init" pulses. Check sensor connections! Only if **Mode** is set to "**4 = START / STOP**", see on page 33. |
| 0x00000080 | Position Encoder Outside the Limit | No "stop" pulse detected between two "init" pulses. Possible cause: No position sensor or position sensor outside the limits. Only if **Mode** is set to "**4 = START / STOP**", see on page 33. |

# 5 – Menus and parameters

## 5.1 Overview of the structure

The following tables offer an overview of the menus and their relevant parameters. The names of the menus are printed in bold and the associated parameters are listed just below. Depending on the device model and the selected operation mode, only the available menus / parameters are shown.
The parametrization is done via serial interface by means of a PC and the operating software OS.

**NOTE**
In the pages that describe the menus, the default values are highlighted with grey background.

| |
|---|
| **General menu**, see the "5.2 General menu" section on page 33 |
| Mode, see on page 33 |
| Encoder properties, see on page 33 |
| Encoder direction, see on page 33 |
| Factor, see on page 34 |
| Divider, see on page 34 |
| Additive value, see on page 34 |
| Linearization mode, see on page 34 |
| Back up memory, see on page 35 |
| Factory settings, see on page 35 |

It is only available if the Mode parameter in the **General** menu (see on page 33) is set to "1 = FREQUENCY".

| |
|---|
| **Frequency mode menu**, see the "5.3 Frequency mode menu" section on page 36 |
| Frequency mode, see on page 36 |
| Frequency base, see on page 36 |
| Sampling time 1 (s), see on page 37 |
| Wait time 1 (s), see on page 37 |
| Standstill time 1 (s), see on page 38 |
| Average filter 1, see on page 38 |
| Sampling time 2 (s), see on page 39 |
| Wait time 2 (s), see on page 40 |
| Average filter 2, see on page 40 |

It is only available if the Mode parameter in the **General** menu (see on page 33) is set to "2 = COUNTER".

| |
|---|
| **Counter mode menu**, see the "5.4 Counter mode menu" section on page 42 |
| Count mode, see on page 42 |
| Factor A, see on page 42 |
| Set value A, see on page 42 |
| Factor B, see on page 43 |
| Set value B, see on page 43 |
| Round loop value, see on page 43 |

It is only available if the Mode parameter in the **General** menu (see on page 33) is set to "3 = SSI".

| |
|---|
| **SSI mode menu**, see the "5.5 SSI mode menu" section on page 44 |
| SSI mode, see on page 44 |
| Encoder resolution, see on page 44 |
| Data format, see on page 44 |
| Baud rate, see on page 44 |
| SSI zero, see on page 45 |
| High bit, see on page 45 |
| Low bit, see on page 45 |
| SSI offset, see on page 45 |
| Round loop value, see on page 46 |
| Sampling time (s), see on page 46 |
| Error bit, see on page 46 |
| Error polarity, see on page 46 |

It is only available if the Mode parameter in the **General** menu (see on page 33) is set to "4 = START / STOP".

| |
|---|
| **Start/Stop mode menu**, see the "5.6 Start/Stop mode menu" section on page 56 |
| Init mode, see on page 56 |
| Sampling time (ms), see on page 56 |
| Init pulse time (µs), see on page 56 |
| Velocity (m/s), see on page 57 |
| Operational mode, see on page 57 |
| Offset, see on page 57 |

| |
|---|
| Circumference (mm), see on page 57 |
| Round loop value, see on page 58 |
| Average filter - position, see on page 58 |
| Standstill time (s), see on page 58 |
| Average filter - speed, see on page 58 |

| |
|---|
| **Serial menu**, see the "5.7 Serial menu" section on page 61 |
| Unit number, see on page 61 |
| Serial baud rate, see on page 61 |
| Serial format, see on page 61 |
| Serial init, see on page 62 |
| Serial protocol, see on page 62 |
| Serial timer (s), see on page 63 |
| Serial value, see on page 63 |
| MODBUS, see on page 64 |

| |
|---|
| **Parallel menu**, see the "5.8 Parallel menu" section on page 65 |
| Parallel mode, see on page 65 |
| Parallel inv., see on page 65 |
| Parallel value, see on page 65 |
| Parallel update time (s), see on page 66 |
| Special pin function, see on page 66 |

| |
|---|
| **Command menu**, see the "5.9 Command menu" section on page 67 |
| Input 1 action, see on page 67 |
| Input 1 config, see on page 68 |
| Input 2 action, see on page 68 |
| Input 2 config, see on page 68 |
| Input 3 action (factory settings), see on page 68 |
| Input 3 config (active high), see on page 68 |

It is only available if the **Linearization mode** parameter in the **General** menu (see on page 34) is set to either "1 – 1 QUADRANT" or "2 – 4 QUADRANT".

| |
|---|
| **Linearization menu**, see the "5.10 Linearization menu" section on page 69 |
| **P1(X)**, see on page 69 |
| ... |
| **P24(X)**, see on page 69 |
| **P1(Y)**, see on page 69 |
| ... |
| **P24(Y)**, see on page 69 |

## 5.2 General menu

The default values are highlighted with grey background.

### Mode

This parameter allows to set the desired measuring function.

| | | |
|---|---|---|
| **0** | **NOT DEFINED** | Operating mode: Not defined, modulation and measurement results are zero |
| **1** | **FREQUENCY** | Operating mode: Frequency converter, incremental signals. See the "5.3 Frequency mode menu" section on page 36 |
| **2** | **COUNTER** | Operating mode: Counter, incremental signals. See the "5.4 Counter mode menu" section on page 42 |
| **3** | **SSI** | Operating mode: Absolute value converter, SSI signals (it replaces IF52 converter). See the "5.5 SSI mode menu" section on page 44 |
| **4** | **START / STOP** | Operating mode: Start / Stop interface converter. See the "5.6 Start/Stop mode menu" section on page 56 |

### Encoder properties

This parameter sets the characteristics of the incremental input.
Only relevant when Mode: "1 = FREQUENCY" and Mode: "2 = COUNTER"

| | | |
|---|---|---|
| **0** | **RS422** | RS-422 |
| **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 allows to set the counting direction: the count will be up when the encoder rotates clockwise / counter-clockwise (or the axis moves forward / backward).

| | | |
|---|---|---|
| **0** | **FORWARD** | Count up with clockwise / forward direction |
| **1** | **REVERSE** | Count up with counter-clockwise / reverse direction |

### Factor

This parameter sets the factor by which the result of the measurement will be multiplied.

| | |
|---|---|
| **-99999999** | Smallest value |
| **1** | Default value |
| **99999999** | Highest value |

### Divider

This parameter sets the divisor by which the result of the measurement will be divided.

| | |
|---|---|
| **-99999999** | Smallest value |
| **1** | Default value |
| **99999999** | Highest value |

### Additive value

This parameter sets the additive constant that will be added to the result of the measurement.

| | |
|---|---|
| **-99999999** | Smallest value |
| **0** | Default value |
| **99999999** | Highest value |

### Linearization mode

This parameter activates and sets the linearisation function. See the "5.10 Linearization menu" section on page 69 and the "5.10.1 Description of the linearisation function" section on page 69.

| | | |
|---|---|---|
| **0** | **OFF** | No linearisation |
| **1** | **1 QUADRANT** | Linearisation using 1 quadrant (see on page 69). |
| **2** | **4 QUADRANT** | Linearisation using 4 quadrants (see on page 69). |

## Back up memory

Only relevant when Mode: "2 = COUNTER"

| | | |
|---|---|---|
| **0** | **NO** | No memory backup following a power failure |
| **1** | **YES** | Memory backup is active. If the "Counter" Mode is enabled, the unit stores the current value of the counter readings in case of power failure |

## Factory settings

At any time you can return all settings to the factory default values.
Default values are highlighted with grey background in this manual.

**WARNING**
This action will reset all parameters to factory default values and customised settings will be lost. After reset you will have to repeat your individual set-up procedure.

| | | |
|---|---|---|
| **0** | **NO** | No default values are loaded |
| **1** | **YES** | Load default values of all parameters |

## 5.3 Frequency mode menu

This menu sets the device for operation 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. It is only available if the Mode parameter in the **General** menu (see on page 33) is set to "1 = FREQUENCY".

### Frequency mode

This parameter sets the desired frequency measurement mode.

| | | |
|---|---|---|
| **0** | **A ONLY** | Single-channel frequency measurement (only for channel A) |
| **1** | **RATIO** | Frequency ratio of both channels (channel B / channel A).<br>Note: the result with 4 decimal digits must be interpreted in the following format: +/- x.xxxx |
| **2** | **PERCENT** | Percentage deviation from channel B to channel A.<br>Note: the result with 2 decimal digits must be interpreted in the following 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. (Detection of forward / reverse direction of rotation) |

### Frequency base

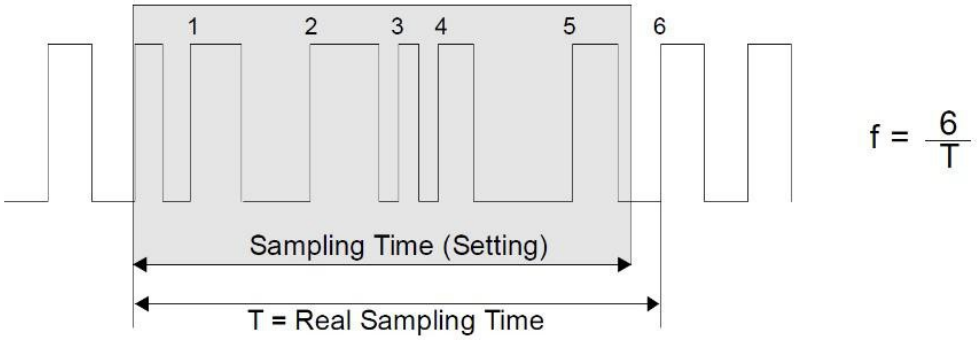
It sets the desired basis for the frequency measurement (resolution).

| | | |
|---|---|---|
| **0** | 1 Hz | (the result must be interpreted in the format: xxxxxxxx Hz) |
| **1** | 1/10 Hz | (the result must be interpreted in the format: xxxxxxx.x Hz) |
| **2** | 1/100 Hz | (the result must be interpreted in the format: xxxxxx.xx Hz) |
| **3** | 1/1000 Hz | (the result must be interpreted in the format: xxxxx.xxx Hz) |

## Sampling time 1 (s)

It allows to set the minimum measuring time (for channel A). This parameter is used as a filter in case of uneven frequencies. It directly affects the response time of the unit. The value is expressed in seconds (s).

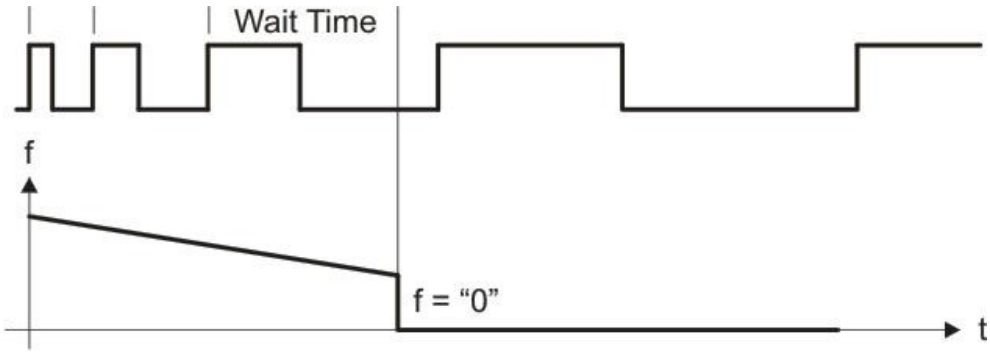
| | |
|---|---|
| **0.001** | Shortest Sampling time |
| **0.1** | Default value |
| **9.999** | Longest Sampling time |




## Wait time 1 (s)

This parameter sets the span of time of the lowest frequency, i.e. the time between two rising edges on channel A when the device detects the frequency 0 Hz. Frequencies whose span of time is longer than the set **Wait time 1 (s)** will be evaluated as frequency = 0 Hz. The value is expressed in seconds (s).

| | |
|---|---|
| **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 sets the time after which a standstill condition is acknowledged. When the "frequency = 0 Hz" condition is detected in channel A, after the delay xx.xx set next to this parameter the unit warns of the standstill condition.

| | |
|---|---|
| **0.01** | Shortest time |
| **...** | |
| **99.99** | Longest time |

## Average filter 1

Selectable average or filter function to avoid measuring fluctuations due to unstable frequencies on channel A and obtain smooth parallel signals. With settings 5 to 16, the device uses an exponential filter. The time constant T (63%) corresponds to the sampling cycles.

EXAMPLE

If **Sampling time 1 (s)** = 0.1 s and **Average filter 1** = "Exponential filter, T (63 %) = 2x **Sampling time 1 (s)**", after 0.2 seconds, 63% of the step size is reached.

| | |
|---|---|
| **0** | No average value will be created (quick reaction to every change) |
| **1** | Floating average within 2 cycles |
| **2** | Floating average within 4 cycles |
| **3** | Floating average within 8 cycles |
| **4** | Floating average within 16 cycles |
| **5** | Exponential filter, T (63 %) = 2x **Sampling time 1 (s)** |
| **6** | Exponential filter, T (63 %) = 4x **Sampling time 1 (s)** |
| **7** | Exponential filter, T (63 %) = 8x **Sampling time 1 (s)** |
| **8** | Exponential filter, T (63 %) = 16x **Sampling time 1 (s)** |
| **9** | Exponential filter, T (63 %) = 32x **Sampling time 1 (s)** |
| **10** | Exponential filter, T (63 %) = 64x **Sampling time 1 (s)** |
| **11** | Exponential filter, T (63 %) = 128x **Sampling time 1 (s)** |
| **12** | Exponential filter, T (63 %) = 256x **Sampling time 1 (s)** |
| **13** | Exponential filter, T (63 %) = 512x **Sampling time 1 (s)** |
| **14** | Exponential filter, T (63 %) = 1024x **Sampling time 1 (s)** |
| **15** | Exponential filter, T (63 %) = 2048x **Sampling time 1 (s)** |
| **16** | Exponential filter, T (63 %) = 4096x **Sampling time 1 (s)** (very slow reaction) |

**NOTE**

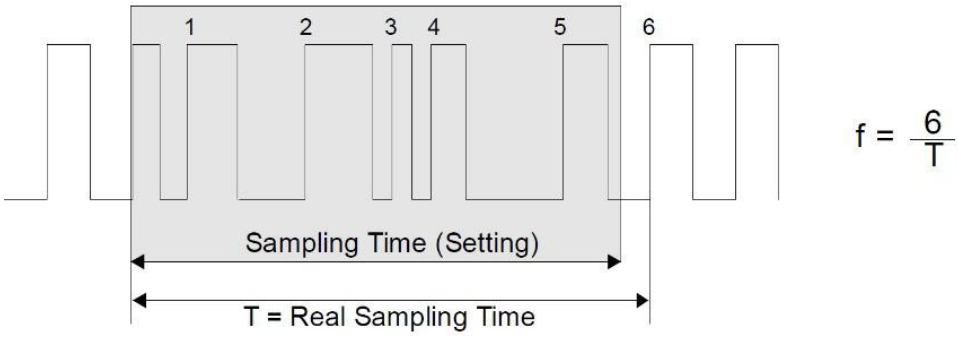
When using the exponential filter, the maximum permissible frequencies at the input must not be exceeded, otherwise a data type overflow will result!
If the frequency is exceeded nevertheless, the frequency is replaced by the maximum permissible value (according to the corresponding setting) for further calculation and an error is output. The LED flashes.
Here are the max. frequencies that are allowed for the corresponding settings.

| | | Frequency base | | | |
|---|---|---|---|---|---|
| | | **0** = 1 Hz | **1** = 1/10 Hz | **2** = 1/100 Hz | **3** = 1/1000 Hz |
| Average filter 1 | **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 |

## Sampling time 2 (s)

It allows to set the minimum measuring time (for channel B). This parameter is used as a filter in case of uneven frequencies. It directly affects the response time of the unit. The value is expressed in seconds (s).

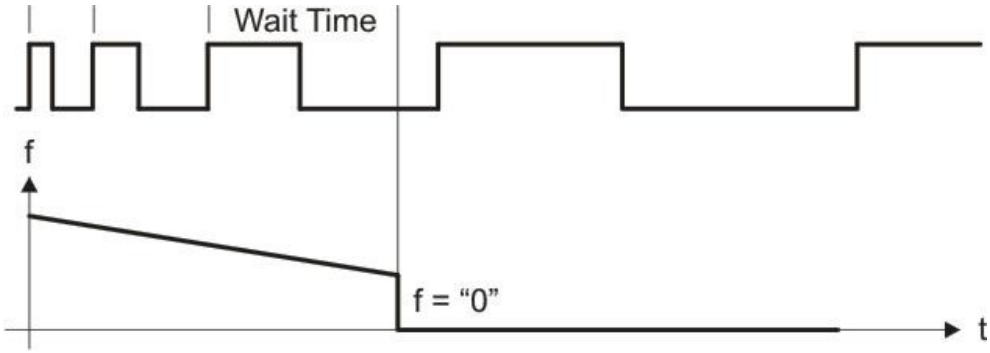
| | |
|---|---|
| **0.001** | Shortest Sampling time |
| **0.1** | Default value |
| **9.999** | Longest Sampling time |



## Wait time 2 (s)

This parameter sets the span of time of the lowest frequency, i.e. the time between two rising edges on channel B when the device detects the frequency 0 Hz. Frequencies whose span of time is longer than the set **Wait time 2 (s)** will be evaluated as frequency = 0 Hz. The value is expressed in seconds (s).

| | |
|---|---|
| **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 |




## Average filter 2

Selectable average or filter function to avoid measuring fluctuations due to unstable frequencies on channel B and obtain smooth parallel signals. With settings 5 to 16, the device uses an exponential filter. The time constant T (63%) corresponds to the sampling cycles.

**EXAMPLE**

If **Sampling time 2 (s)** = 0.1 s and **Average filter 2** = "Exponential filter, T (63 %) = 2x **Sampling time 2 (s)**", after 0.2 seconds, 63% of the step size is reached.

| | |
|---|---|
| **0** | No average value will be created (quick reaction to every change) |
| **1** | Floating average within 2 cycles |
| **2** | Floating average within 4 cycles |
| **3** | Floating average within 8 cycles |
| **4** | Floating average within 16 cycles |
| **5** | Exponential filter, T (63 %) = 2x **Sampling time 2 (s)** |
| **6** | Exponential filter, T (63 %) = 4x **Sampling time 2 (s)** |
| **7** | Exponential filter, T (63 %) = 8x **Sampling time 2 (s)** |
| **8** | Exponential filter, T (63 %) = 16x **Sampling time 2 (s)** |
| **9** | Exponential filter, T (63 %) = 32x **Sampling time 2 (s)** |
| **10** | Exponential filter, T (63 %) = 64x **Sampling time 2 (s)** |

| | |
|---|---|
| **11** | Exponential filter, T (63 %) = 128x **Sampling time 2 (s)** |
| **12** | Exponential filter, T (63 %) = 256x **Sampling time 2 (s)** |
| **13** | Exponential filter, T (63 %) = 512x **Sampling time 2 (s)** |
| **14** | Exponential filter, T (63 %) = 1024x **Sampling time 2 (s)** |
| **15** | Exponential filter, T (63 %) = 2048x **Sampling time 2 (s)** |
| **16** | Exponential filter, T (63 %) = 4096x **Sampling time 2 (s)** (very slow reaction) |

**NOTE**

When using the exponential filter, the maximum permissible frequencies at the input must not be exceeded, otherwise a data type overflow will result!
If the frequency is exceeded nevertheless, the frequency is replaced by the maximum permissible value (according to the corresponding setting) for further calculation and an error is output. The LED flashes.
Here are the max. frequencies that are allowed for the corresponding settings.

| | | Frequency base | | | |
|---|---|---|---|---|---|
| | | **0** = 1 Hz | **1** = 1/10 Hz | **2** = 1/100 Hz | **3** = 1/1000 Hz |
| Average filter 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 |

## 5.4 Counter mode menu

This menu sets the device for operation as a position transducer for incremental signals (pulse, sum, difference, up or down counter). Both inputs A and B are active. It is only available if the Mode parameter in the **General** menu (see on page 33) is set to "2 = COUNTER".

### Count mode

This parameter defines the counter operation.

| | | |
|---|---|---|
| **0** | **A SINGLE** | Input A is a counting input. Input B sets 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: if Factor A is set = 1.23456, 100,000 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

If you send a "RESET / SET COUNTER A" command (via control input; see the "5.9 Command menu" section on page 67; or via PC user interface), the counter of input A will be set to the value set next to this parameter.

| | |
|---|---|
| **-999999999** | Smallest value |
| **0** | Default value |
| **99999999** | Highest value |

## Factor B

Scaling factor for input B.

For example: if **Factor B** is set = 1.23456, 100,000 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

If you send a "RESET / SET COUNTER B" command (via control input; see the "5.9 Command menu" section on page 67; or via PC user interface), the counter of input B will be set to the value set next to this parameter.

| | |
|---|---|
| **-999999999** | Smallest value |
| **0** | Default value |
| **99999999** | Highest value |

## Round loop value

This parameter sets the number of encoder steps if a round-loop function is desired.
Only relevant when **Count mode**: "0 = A SINGLE" and **Count mode**: "3 = A/B 90 x1", "4 = A/B 90 x2", "5 = A/B 90 x4".

| | |
|---|---|
| **0** | Round-loop function is disabled. |
| **...** | |
| **99999999** | Number of steps for the round-loop function. |

## 5.5 SSI mode menu

This menu sets the device for operation as absolute value converter (SSI signals). It is only available if the Mode parameter in the **General** menu (see on page 33) is set to "3 = SSI".

### SSI mode

It sets whether the device operates as an SSI Master or an SSI Slave.

**WARNING**

Depending on the set SSI mode, different terminal blocks must be used for the SSI clock!

If SSI mode = Master, use terminal X2 - Pins 1 and 2, see on page 19

If SSI mode = Slave, use terminal X2 - Pins 5 and 6, see on page 19

| | | |
|---|---|---|
| **0** | **MASTER** | Master mode: the clock for the SSI encoder is sent by the device |
| **1** | **SLAVE** | Slave mode: the clock for the SSI encoder is sent by the external Master |

### Encoder resolution

It sets the resolution of the SSI encoder (total number of bits).

| | |
|---|---|
| **10** | Smallest value |
| **25** | Default value |
| **32** | Highest value |

### Data format

It sets the SSI code (Binary or Gray)

| | | |
|---|---|---|
| **0** | **GRAY CODE** | Information is provided in Gray code |
| **1** | **BINARY CODE** | Information is provided in Binary code |

### Baud rate

It sets the clock frequency of the SSI telegrams.

| | | |
|---|---|---|
| **0** | **2 MHZ** | Not available |
| **1** | **1.5 MHZ** | Not available |
| **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

If you send a "ZERO POSITION" command (via control input; see the "5.9 Command menu" section on page 67; or via PC user interface), the current SSI position of the encoder is transferred to this **SSI zero** parameter and the actual encoder zero point is shifted accordingly (encoder zero offset).

| | |
|---|---|
| **0** | Smallest value |
| **...** | |
| **999999999** | Highest value |

### High bit

It sets the highest evaluated bit (MSB) for bit blanking.
If all bits should be evaluated, **High bit** must be set to the total number of bits.

| | |
|---|---|
| **01** | Smallest value |
| **25** | Default value |
| **32** | Highest value |

### Low bit

It sets the lowest evaluated bit (LSB) for bit blanking.
If all bits should be evaluated, **Low bit** must be set to "01".

| | |
|---|---|
| **01** | Smallest value |
| **...** | |
| **32** | Highest value |

### SSI offset

If you send a "RESET/SET VALUE" command (via control input, see the "5.9 Command menu" section on page 67; or via PC user interface), the not scaled yet, currently acquired position value (after bit suppression and encoder zero offset, if performed) is transferred to this **SSI offset** parameter and the position value is set to zero. From the new zero point, you can now move toward positive and negative direction, depending on the direction of rotation.

| | |
|---|---|
| **0** | Smallest value |
| **...** | |
| **999999999** | Highest value |

### Round loop value

This parameter sets the number of encoder counts if a round-loop function is desired.

| | |
|---|---|
| **0** | Round-loop function is disabled. |
| **...** | |
| **99999999** | Number of counts for the round-loop function. |

### Sampling time (s)

It sets the reading cycle for the SSI signal when the **SSI mode** = 0 = Master. The value is expressed in seconds (s).

| | |
|---|---|
| **0.001** | Minimum measurement time |
| **0.010** | Default value |
| **9.999** | Maximum measurement time |

### Error bit

It enables the encoder monitoring and sets the position of the error bit to be evaluated.

| | |
|---|---|
| **0** | Monitoring of connected encoder is disabled.<br>No error bit available. |
| **...** | |
| **32** | Monitoring of connected encoder is enabled.<br>Position of the error bit to be evaluated. |

### Error polarity

It sets the polarity of the error bit in the case of an error.

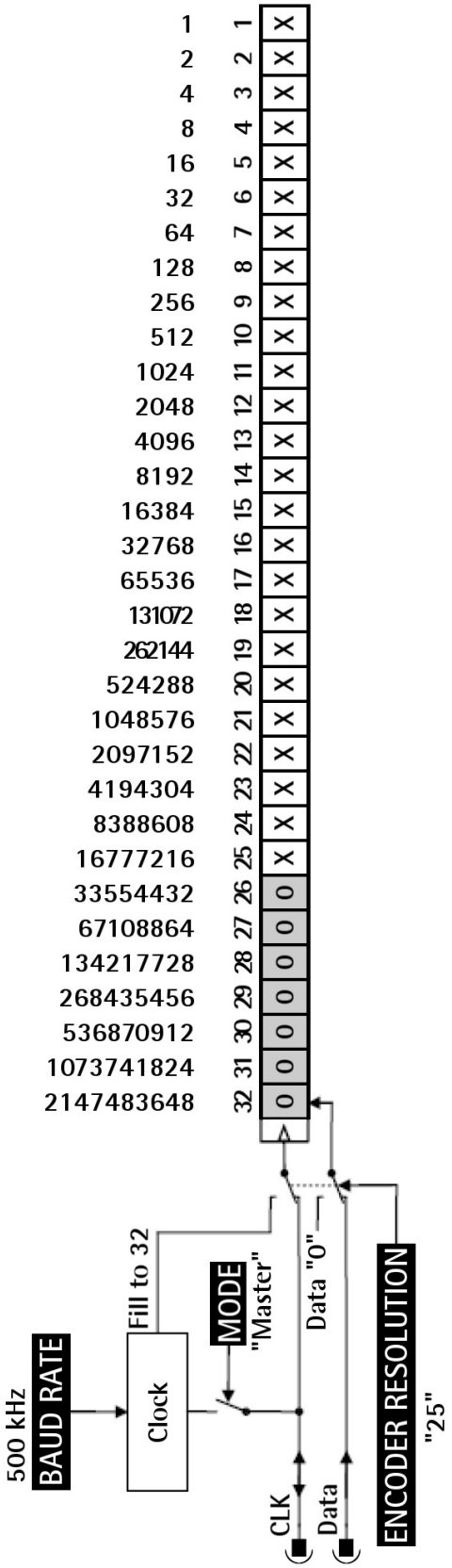
| | |
|---|---|
| **0** | Bit is low in the case of an error |
| **1** | Bit is high in the case of an error |

**NOTE**

For more information on the processing of the SSI value see the "5.5.1 Reading the SSI data" and "5.5.2 Internal processing and calculation of SSI data" sections on page 47 and ff.

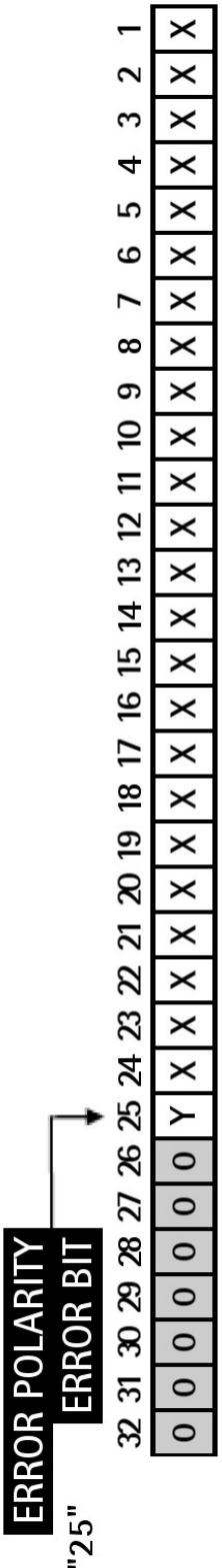
### 5.5.1 Reading the SSI data

Received data has always a length of 32 bits.



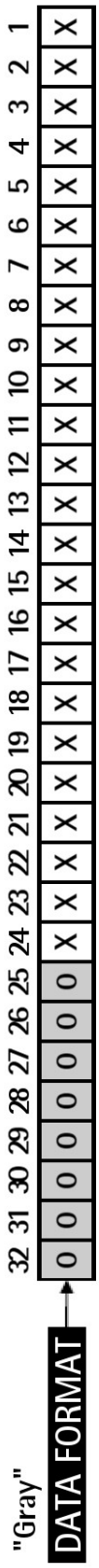
### 5.5.2 Internal processing and calculation of SSI data

#### 5.5.2.1 Checking the error bit



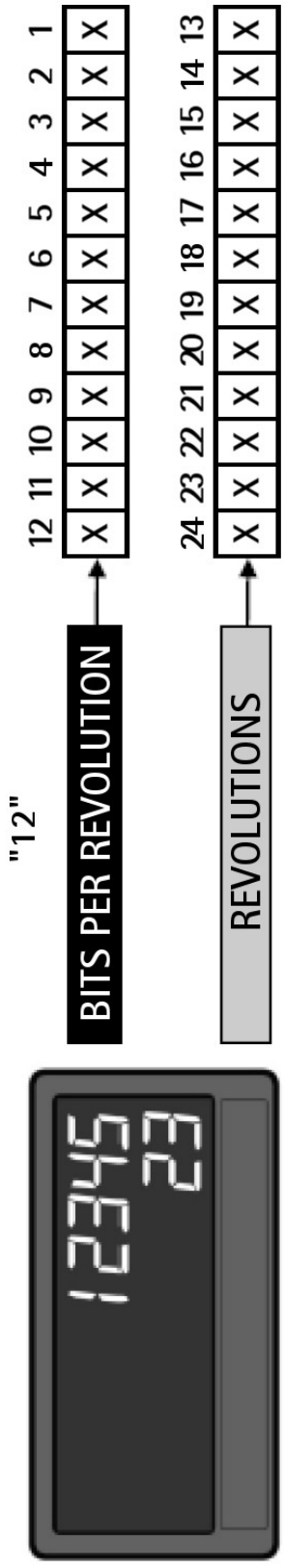
### 5.5.2.2 Data conversion

Gray code → Binary code.



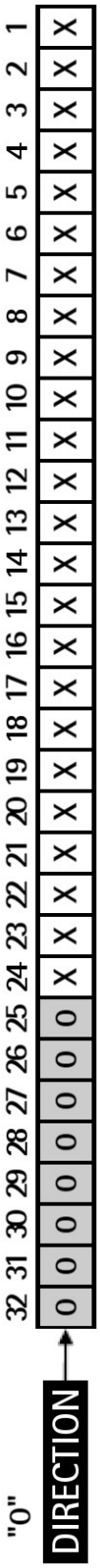
### 5.5.2.3 Data splitting

Bit per revolution and number of revolutions.

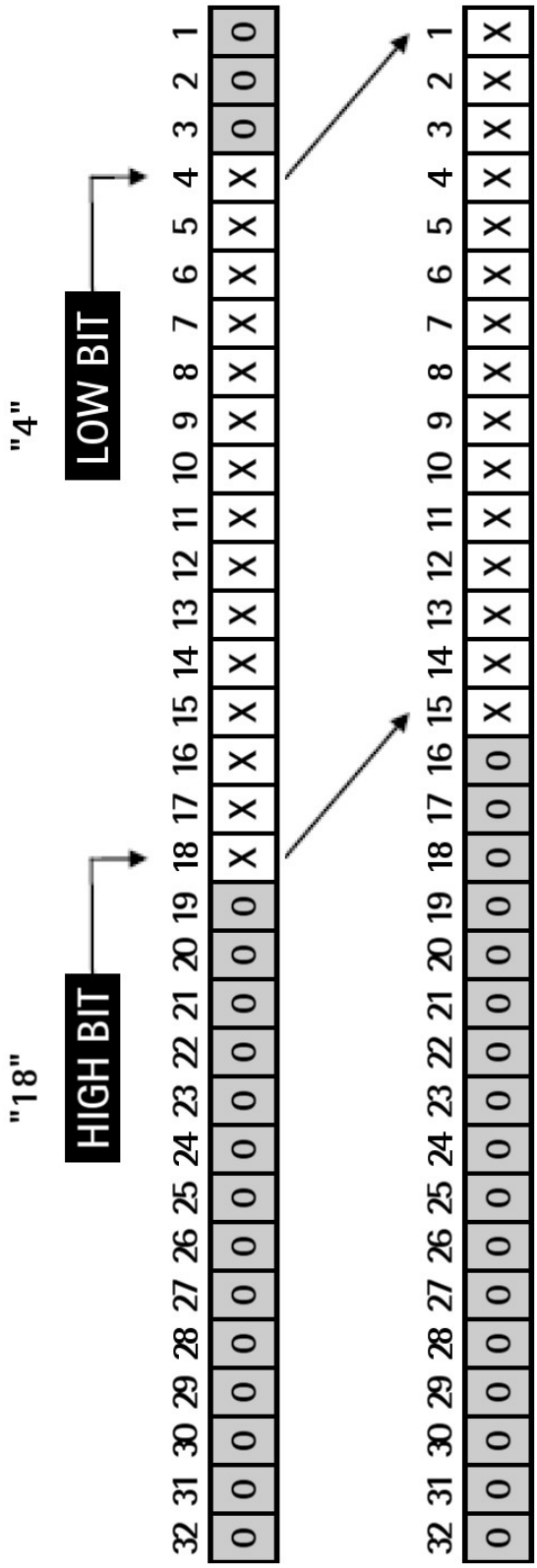


### 5.5.2.4 Considering the SSI zero position

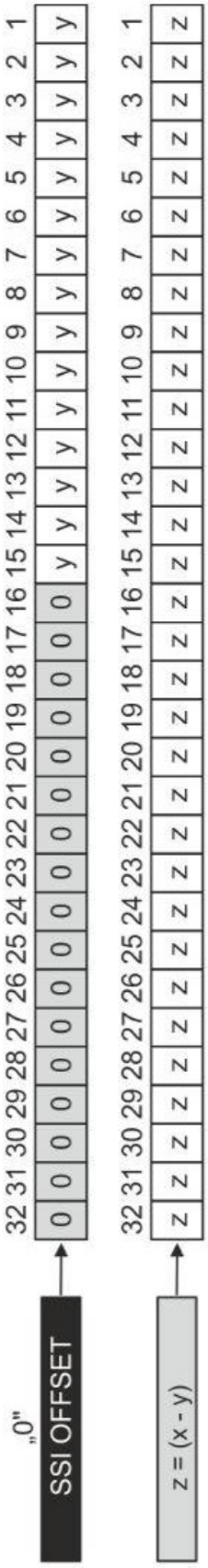
### 5.5.2.5 Checking the direction of rotation



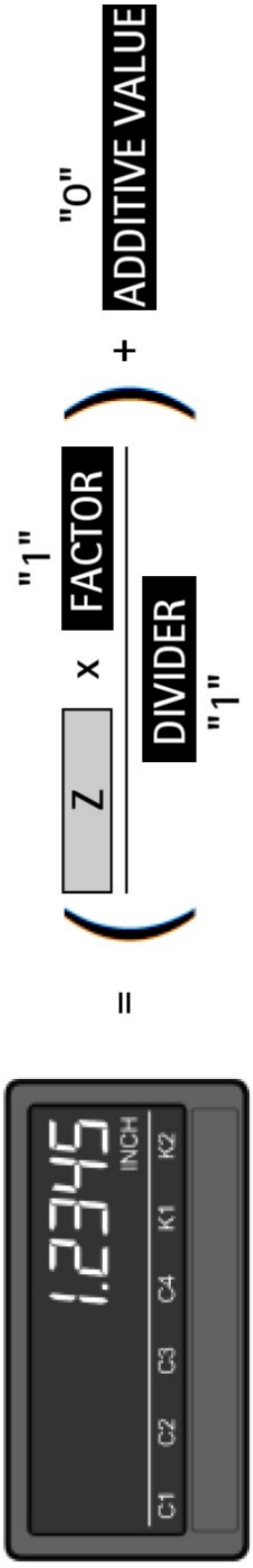
### 5.5.2.6 Evaluation of the bit blanking



### 5.5.2.7 Considering the SSI offset



### 5.5.2.8 Calculation of the display value



## 5.6 Start/Stop mode menu

This menu sets the device for operation as a Start / Stop interface converter. It is only available if the **Mode** parameter in the **General** menu (see on page 33) is set to "4 = START / STOP".

### Init mode

It sets whether the device operates as a Master or a Slave.

**WARNING**

Depending on the set **Init mode**, different terminal blocks must be used for the Init pulse!

If **Init mode** = Master, use terminal X2 - Pins 1 and 2, see on page 19

If **Init mode** = Slave, use terminal X2 - Pins 5 and 6, see on page 19

| | | |
|---|---|---|
| **0** | **MASTER** | Operation as a Master: the Init pulse is generated by the device. |
| **1** | **SLAVE** | Operation as a Slave: the Init pulse is generated by an external Master. |

### Sampling time (ms)

Duration of the gap between two init pulses. It corresponds to the time before a new measurement starts and directly affects the reaction time of the device. The value is expressed in milliseconds (ms).

| | |
|---|---|
| **00.200** | Minimum measurement time |
| **04.000** | Default value |
| **16.000** | Maximum measurement time |

### Init pulse time (µs)

This parameter sets the pulse width of the Init pulse. The value is expressed in microseconds (µs).

| | |
|---|---|
| **1** | Smallest value |
| **2** | Default value |
| **9** | Highest value |

### Velocity (m/s)

Waveguide velocity of the encoder. The value is expressed in meters per second (m/s).

| | |
|---|---|
| **0001.00** | Smallest value |
| **2800.00** | Default value |
| **9999.99** | Highest value |

### Operational mode

This parameter sets the type of measurement the device should operate.

| | | |
|---|---|---|
| **0** | **POSITION** | Measurement of the distance |
| **1** | **ANGLE** | Measurement of the angle |
| **2** | **SPEED** | Measurement of the speed |

**NOTE**

For more information on the available **Operational mode** options and the interpretation of the relevant measurement results see the "5.6.1 Operating modes of the Start/Stop interface" section on page 59.

### Offset

If you send a "Reset/Set Value" command (via control input; see the "5.9 Command menu" section on page 67; or via PC user interface), the current position of the encoder is stored next to this **Offset** parameter in a non-volatile manner (zero offset!).

| | |
|---|---|
| **-99999999** | Smallest value |
| **0** | Default value |
| **99999999** | Highest value |

### Circumference (mm)

It sets the reference size for an angle measurement. The value is expressed in millimeters (mm).
The covered distance (e.g. the circumference) at which the subsequent output value (**Round loop value**) is to be generated must be set here.
Only relevant when **Operational mode** = "1 = ANGLE".

| | |
|---|---|
| **00000.001** | Smallest value |
| **01000.000** | Default value |
| **99999.999** | Highest value |

## Round loop value

It sets the desired measured value to be generated when the previous reference value (**Circumference (mm)**) is reached.
Only relevant when **Operational mode** = "1 = ANGLE".

| | |
|---|---|
| **1** | Smallest value |
| **360** | Default value |
| **99999999** | Highest value |

## Average filter - position

It sets a filter for the average value. The average value can be activated to avoid fluctuations in the position.

| | |
|---|---|
| **0** | No average value |
| **1** | Average value within 2 cycles |
| **2** | Average value within 4 cycles |
| **3** | Average value within 8 cycles |
| **4** | Average value within 16 cycles |

## Standstill time (s)

This parameter sets the time after which a standstill condition is acknowledged. When a standstill condition is detected, after the delay xx.xx set next to this parameter the unit warns of the standstill condition.

| | |
|---|---|
| **0.01** | Shortest delay time in seconds |
| **...** | |
| **99.99** | Longest delay time in seconds |

## Average filter - speed

It sets a filter for the average value. The average value can be activated to avoid fluctuations in the speed.

| | |
|---|---|
| **0** | No average value |
| **1** | Average value within 2 cycles |
| **2** | Average value within 4 cycles |
| **3** | Average value within 8 cycles |
| **4** | Average value within 16 cycles |

### 5.6.1 Operating modes of the Start/Stop interface

The device supports the following operating modes:

- **Init mode** = 0 = MASTER
  - The Init pulse for the connected encoder is generated by the device.
  - The two Init connections (INIT OUT, /INIT OUT, terminal X2 - Pins 1 and 2, see on page 19) are configured as outputs in this case.

- **Init mode** = 1 = SLAVE
  - The Init pulse for the connected encoder is generated by an external device.
  - The two Init connections (INIT IN, /INIT IN, terminal X2 - Pins 5 and 6, see on page 19) are configured as inputs in this case.

The desired operating mode can be selected in this section by choosing the "MASTER" / "SLAVE" option next to the **Init mode** parameter, see on page 56.

The device can be operated also in the following three "Operational Modes". The desired measurement function (measurement of the distance, measurement of an angle or measurement of the velocity) can be selected by choosing the "POSITION", "ANGLE" and "SPEED" options respectively next to the **Operational mode** parameter in this section, see on page 57.

- **POSITION (measurement of the distance)**

The current position of the 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**, see on page 34), e.g. for serial readout of the position value in a desired unit.

*How to interpret the result of the measurement of the distance:*

The use of the default setting of the scaling parameters (**Factor** = 1, **Divider** = 1 and **Additive value** = 0) results in a measurement of the position expressed in micrometers (µm).
For example, to get a position value expressed in "inches" with three fictitious decimal places, the **Factor** parameter must be set to "10", the **Divider** parameter to "254" and the **Additive value** parameter to "0".

- **ANGLE (measurement of the angle)**

If you need to measure an angle, the desired position or angle output value per rotation can be specified by means of the **Round loop value** parameter. This output value is generated as soon as the covered distance (e.g. circumference), which is set as the reference value next to the **Circumference (mm)** parameter, 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**, see on page 34), this output value can be scaled if desired.

*How to interpret the result of the measurement of the angle:*

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.

- **SPEED (measurement of the speed)**

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

*How to interpret the result of the measurement of the speed:*

The default setting (**Factor** = 1, **Divider** = 1 and **Additive value** = 0) corresponds to a velocity output expressed in meters per second (m/s).

**NOTE**
The parallel output and the linearization function always refer to the result of the scaled measured value according to the selected operational mode!

## 5.7 Serial menu

The **Serial** menu allows to configure the basic settings of the serial interface (mini USB connector X4). For complete information on the serial port features, please refer to the "4.7 Serial interface (X4 USB)" section on page 24.

### Unit number

This parameter allows to set the address of the serial device. You can assign to the unit any address number between 11 and 99. The address must not contain any "0" because such numbers (20, 30, ...) are reserved for collective addressing (broadcast address).

**NOTE**
The address is set to "11" for USB interface and cannot be adjusted.

| | |
|---|---|
| **11** | Smallest address value |
| **...** | (not used) |
| **99** | Highest address value (not used) |

### Serial baud rate

This parameter allows to set the serial transmission speed (baud rate).
Available options are:

**NOTE**
The baud rate is set to "115200" for USB interface and cannot be adjusted.

| | | |
|---|---|---|
| **0** | **9600** | 9,600 baud (not used) |
| **1** | **19200** | 19,200 baud (not used) |
| **2** | **38400** | 38,400 baud (not used) |
| **3** | **115200** | 115,200 baud |

### Serial format

This parameter allows to set the bit data format.

**NOTE**
The serial data format is set to "8-NONE-1" for USB interface and cannot be adjusted.

| | | Data Bits | Parity Bit | Stop Bits |
|---|---|---|---|---|
| **0** | **7-EVEN-1 *** | 7 | even | 1 |
| **1** | **7-EVEN-2 *** | 7 | even | 2 |
| **2** | **7-ODD-1 *** | 7 | odd | 1 |

| | | | | |
|---|---|---|---|---|
| **3** | **7-ODD-2 *** | 7 | odd | 2 |
| **4** | **7-NONE-1 *** | 7 | no | 1 |
| **5** | **7-NONE-2 *** | 7 | no | 2 |
| **6** | **8-EVEN-1 *** | 8 | even | 1 |
| **7** | **8-ODD-1 *** | 8 | odd | 1 |
| **8** | **8-NONE-1** | 8 | no | 1 |
| **9** | **8-NONE-2 *** | 8 | no | 2 |

* Not available

## Serial init

This parameter allows to set the baud rate for the transmission of the initialization values to the OS software tool. If you set transmission values higher than 9.600 baud, the duration of the initialization procedure will be shortened.

**NOTE**
The initialization values are always transmitted at 115,200 baud for USB interface.

| | | |
|---|---|---|
| **0** | **NO** | The initialization values will be transmitted at 9.600 baud. After initialization the unit will operate according to the user settings again. |
| **1** | **YES** | The initialization values will be transmitted according to the user defined baud rate (**Serial baud rate** parameter). After initialization the unit will go on operating according to the user settings again. |

## Serial protocol

It sets the sequence of characters to be sent when using the serial output for cyclic data transmission under time control (see the **Serial timer (s)** parameter). If you set the option "1" the unit address is removed from the string, this results in a slightly faster transmission cycle.

The transmission string will be as follows:
Option 0

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| UN | UN | + / - | X | X | X | X | X | X | X | LF | CR |

Option 1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| + / - | X | X | X | X | X | X | X | LF | CR |

Where:

| | |
|---|---|
| UN UN | = serial address, e.g. "1 1". See the **Unit number** parameter on page 61 (option **0** only) |
| + / - | = plus / minus signs, i.e. positive / negative sign of transmitted value |
| X X X X X X X X | = data to be transmitted according to the setting in the **Serial value** parameter |
| LF | = line feed character |
| CR | = carriage return character |

| | |
|---|---|
| **0** | Transmission string with serial address |
| **1** | Transmission string without serial address |

## Serial timer (s)

This parameter sets the cycle time for the cyclic transmission of data set in the **Serial value** parameter when using the serial output. The value is expressed in seconds (s). In case of a serial request, the cyclic transmission is stopped for 20 s.

| | |
|---|---|
| **0.000** | Cyclic transmission is switched off. The unit will send data following a serial request or a "**13 – Serial print**" command (see the **Input 1 action** and **Input 2 action** parameters on pages 67 and 68). |
| **...** | |
| **60.000** | Cycle time expressed in seconds. |

## Serial value

This parameter sets the value to be transmitted.

| Setting | Code | Description |
|---|---|---|
| **0** | :0 | Measurement_Result (Result after linking, scaling, filter, etc.) |
| **1** | :1 | Converted_Output_Value (Parallel output data after conversion) |
| **2** | :2 | Frequency_1 (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 + SSI value converted into binary if requested) |
| **8** | :8 | SSI_Calc_Result (SSI value including 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 | Reserved |
| **12** | ;2 | Reserved |
| **13** | ;3 | Error Status (Reading the error code) |
| **14** | ;4 | SSI Read Value (non-converted SSI value, as read) |
| **15** | ;5 | SSI Loop Value (SSI value after round loop calculation) |
| **16** | ;6 | Current Speed |
| **17** | ;7 | Current Position (Start Stop: position [in µm] with offset, without scaling) |
| **18** | ;8 | Current Angle (Start Stop: e.g. angle with offset, without scaling) |
| **19** | ;9 | Raw Position (Start Stop: position [in µm] without Offset and without scaling) |

## MODBUS

**NOTE**
Modbus protocol cannot be selected via USB interface in this device.

| | |
|---|---|
| **0** | Modbus protocol is disabled: the serial interface is using the Lecom protocol. |
| **1 ... 247** | Modbus protocol is enabled: the serial interface is using the Modbus RTU protocol.<br>The set value is the Modbus address of the device.<br>Not used in this unit. |

## 5.8 Parallel menu

The **Parallel** menu allows to configure the basic settings of the parallel output (connector X5 + terminal block 5 of connector X3). For complete information on the parallel port features, please refer to the "4.8 Parallel output (X5 Parallel Output) / COM + (X3 Control Signals)" section on page 25.

### Parallel mode

It sets the output format of the parallel output and the source of the input data.

| | | |
|---|---|---|
| **0** | **BINARY** | Parallel output format as Binary code.<br>Data source: "Measurement Result". |
| **1** | **GRAY** | Parallel output format as Gray code.<br>Data source: "Measurement Result". |
| **2** | **BCD** | Parallel output format as BCD code.<br>Data source: "Measurement Result". |
| **3** | **BINARY** | Parallel output format as Binary code.<br>Data source: **Parallel value**. |
| **4** | **GRAY** | Parallel output format as Gray code.<br>Data source: **Parallel value**. |
| **5** | **BCD** | Parallel output format as BCD code.<br>Data source: **Parallel value**. |

### Parallel inv.

It inverts the data at the parallel output.

| | | |
|---|---|---|
| **0** | **NORMAL** | Data at the parallel output is output normally.<br>Logic 1 corresponds to HIGH at parallel output.<br>Logic 0 corresponds to LOW at parallel output. |
| **1** | **INVERTED** | Data at the parallel output is output inverted.<br>Logic 1 corresponds to LOW at parallel output.<br>Logic 0 corresponds to HIGH at parallel output. |

### Parallel value

The value stored next to this parameter appears directly at the parallel output if the **Parallel mode** parameter is set to values greater than 2. The parameter has the serial access code "B1" and can be written via the serial interface.
This function can be useful for testing the outputs and the wiring!

| | |
|---|---|
| **-16777216** | Smallest value |
| **0** | Default value |
| **+16777215** | Highest value |

## Parallel update time (s)

It sets the refresh time of the parallel output. The value is expressed in seconds.

| | |
|---|---|
| **0.001** | Minimum update time |
| **0.010** | Default value |
| **9.999** | Maximum update time |

## Special pin function

It sets the function of the bit 24 and bit 25 parallel output (pin 24 + pin 25).

| | | |
|---|---|---|
| **0** | **DATA & DATA** | Pin 25 is normal data output (Bit 25)<br>Pin 24 is normal data output (Bit 24) |
| **1** | **ERROR & DATA** | Pin 25 indicates that an error is present [ACTIVE HIGH]<br>Pin 24 is normal data output (Bit 24) |
| **2** | **/ERROR & DATA** | Pin 25 indicates that an error is present [ACTIVE LOW]<br>Pin 24 is normal data output (Bit 24) |
| **3** | **ERROR & /ERROR** | Pin 25 indicates that an error is present [ACTIVE HIGH]<br>Pin 24 indicates that an error is present [ACTIVE LOW] |
| **4** | **DATA STABLE & DATA** | Pin 25 indicates that data is stable [ACTIVE HIGH]<br>Pin 24 is normal data output (Bit 24) |
| **5** | **/DATA STABLE & DATA** | Pin 25 indicates that data is stable [ACTIVE LOW]<br>Pin 24 is normal data output (Bit 24) |
| **6** | **DATA STABLE & ERROR** | Pin 25 indicates that data is stable [ACTIVE HIGH]<br>Pin 24 indicates that an error is present [ACTIVE HIGH] |
| **7** | **DATA STABLE & /ERROR** | Pin 25 indicates that data is stable [ACTIVE HIGH]<br>Pin 24 indicates that an error is present [ACTIVE LOW] |
| **8** | **/DATA STABLE & ERROR** | Pin 25 indicates that data is stable [ACTIVE LOW]<br>Pin 24 indicates that an error is present [ACTIVE HIGH] |
| **9** | **/DATA STABLE & /ERROR** | Pin 25 indicates that data is stable [ACTIVE LOW]<br>Pin 24 indicates that an error is present [ACTIVE LOW] |
| **10** | **DATA STABLE & /DATA STABLE** | Pin 25 indicates that data is stable [ACTIVE HIGH]<br>Pin 24 indicates that data is stable [ACTIVE LOW] |

### 5.9 Command menu

The **Command** menu allows to configure the operation of the inputs "4 - Ctrl. In 1", "3 - Ctrl. In 2" and "2 - Ctrl. In 3"of terminal X3.
For complete information on the control inputs features, please refer to the "4.6 Control inputs (X3 Control Signals)" section on page 23.

#### Input 1 action

This parameter sets the function of the input "4 - Ctrl. In 1".

| | | | |
|---|---|---|---|
| **0** | NO | No function | |
| **1** | RESET/SET VALUE | If Mode is set to "**SSI**": it transfers the currently detected position value (after bit suppression and encoder zero offset shift if necessary) into the parameter SSI offset (display offset).<br>If Mode is set to "**Counter**": it resets / sets both counter values (channel A and B) to the values set next to Set value A and Set value B respectively.<br>If Mode is set to "**Start/Stop**": power-failure-proof stored transfer of the current position or angle measurement to the Offset parameter. | (d) (s) |
| **2** | FREEZE | It freezes the current measurement result or parallel output | (s) |
| **3** | SSI ZERO POSITION | If Mode is set to "**SSI**": it transfers the current SSI position to the SSI zero parameter (encoder zero offset) | (d) (s) |
| **4** | RESET/SET COUNTER A | If Mode is set to "**Counter**": it resets / sets the counter value of channel A to the value set next to Set value A | (d) (s) |
| **5** | RESET/SET COUNTER B | If Mode is set to "**Counter**": it resets / sets the counter value of channel B to the value set next to Set value B | (d) (s) |
| **6** | LOCK COUNTER A | If Mode is set to "**Counter**": the counter (channel A) is disabled and does not count any further pulses as long as this command is active | (s) |
| **7** | LOCK COUNTER B | If Mode is set to "**Counter**": the counter (channel B) is disabled and does not count any further pulses as long as this command is active | (s) |
| **8** | RESET MIN/MAX | It resets the minimum / maximum value | (d) (s) |
| **9** | FACTORY SETTINGS | The device is reset to the factory | (d) |

| | | | |
|---|---|---|---|
| | | settings. Pulse must be applied for 1 second at least. | |

(s) = static switching (level evaluation)
**Input 1 config** parameter must be set to be active at LOW / HIGH level (see options 0 – ACTIVE LOW and 1 – ACTIVE HIGH).
(d) = dynamic switching (edge evaluation)
**Input 1 config** parameter must be set to activate at rising / falling edge (see options 2 – RISING EDGE and 3 - FALLING EDGE).

### Input 1 config

This parameter sets the switching characteristics of the input "4 - Ctrl. In 1".

| | | |
|---|---|---|
| **0** | **ACTIVE LOW** | It is active at "LOW" level (static) |
| **1** | **ACTIVE HIGH** | It is active at "HIGH" level (static) |
| **2** | **RISING EDGE** | It activates at rising edge (dynamic) |
| **3** | **FALLING EDGE** | It activates at falling edge (dynamic) |

### Input 2 action

This parameter sets the function of the input "3 - Ctrl. In 2". For complete information please refer to the **Input 1 action** parameter on page 67.

### Input 2 config

This parameter sets the switching characteristics of the input "3 - Ctrl. In 2". For complete information please refer to the **Input 1 config** parameter above.

### Input 3 action (factory settings)

This parameter is fixed to "9 = Factory Settings" and cannot be changed. For complete information please refer to the **Input 1 action** parameter on page 67.

### Input 3 config (active high)

This parameter is fixed to "2 = Rising edge" and cannot be changed. For complete information please refer to the **Input 1 config** parameter above.

## 5.10 Linearization menu

The linearisation function is configured in this menu. This menu is displayed only if the **Linearization mode** parameter in the **General** menu (see on page 34) is set to either "1 – 1 QUADRANT" or "2 – 4 QUADRANT"; if 0 – OFF option is set, the **Linearization** menu does not appear. The linearisation function always refers to the scaled measurement result.

For a complete description of the linearisation function and some examples refer to the "5.10.1 Description of the linearisation function" section below.

**P1(X)**

...

**P24(X)**

X-coordinate of the linearisation point.
This value represents the display value the unit shows on the display without linearisation.

| | |
|---|---|
| **-99999999** | Smallest X-coordinate |
| **0** | Default value |
| **+99999999** | Largest X-coordinate |

**P1(Y)**

...

**P24(Y)**

Y-coordinate of the linearisation point.
This is the display value the unit will show on the display after linearisation.

**EXAMPLE**
**P2(X)** parameter value will be replaced by **P2(Y)** parameter value.

| | |
|---|---|
| **-99999999** | Smallest Y-coordinate |
| **0** | Default value |
| **+99999999** | Largest Y-coordinate |

### 5.10.1 Description of the linearisation function

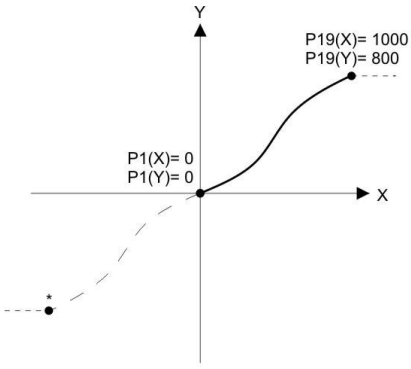
The linearisation function allows to convert a linear input signal into a non-linear representation (or vice versa). 24 programmable X / Y coordinates (interpolation points) are available for input 1 and input 2, they can be freely arranged over the whole conversion range at any desired distance. The unit uses linear interpolation between two coordinates. Therefore it is advisable to set

several coordinates where the curvature is greater and only few coordinates where the curvature is lesser.
If you need to set an individual linearisation curve, the **Linearization mode** parameter in the **General** menu (see on page 34) must be set to either "1 - 1 QUADRANT" or "2 - 4 QUADRANT" (see the diagrams below).

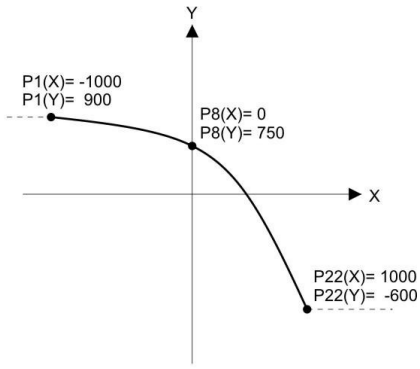
The parameters **P1(X)** to **P24(X)** are used to specify the coordinates on the x-axis. These are the measuring values that the unit would normally generate according to the actual input signal.

Parameters **P1(Y)** to **P24(Y)** are the values that the unit will generate instead of the X values, i.e. for instance **P5(Y)** replaces **P5(X)** etc.

**The X coordinates must use continuously increasing settings, i.e. P1(X) must have the lowest setting while P24(X) must have the highest setting (P1(X) < P2(X) < P3(X) ... < P23(X) < P24(X)). If the measured value is greater than the last defined X value, the corresponding Y value is displayed.**



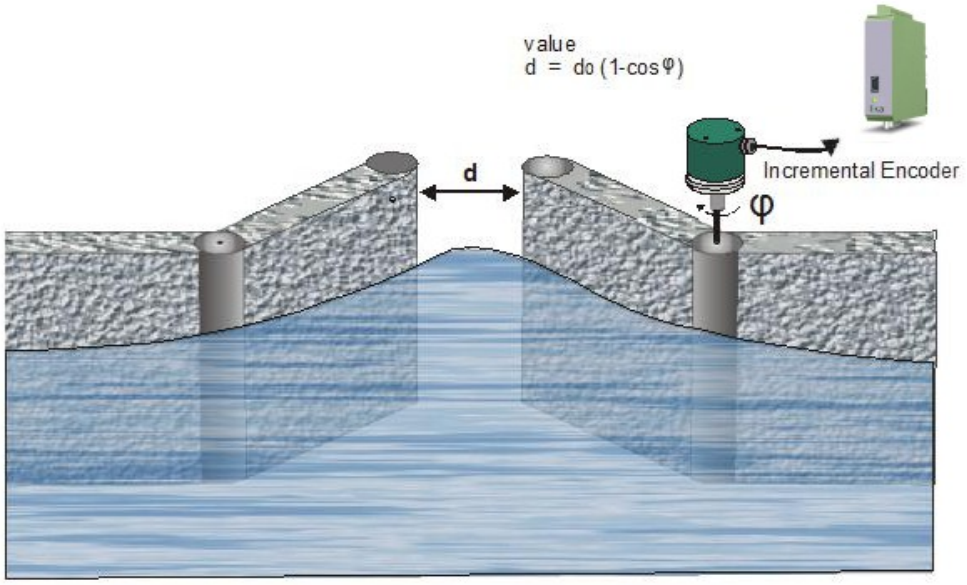

Example: Linearization Mode: 1 Quadrant
* Linearization is point symmetric to 1. Quadrant



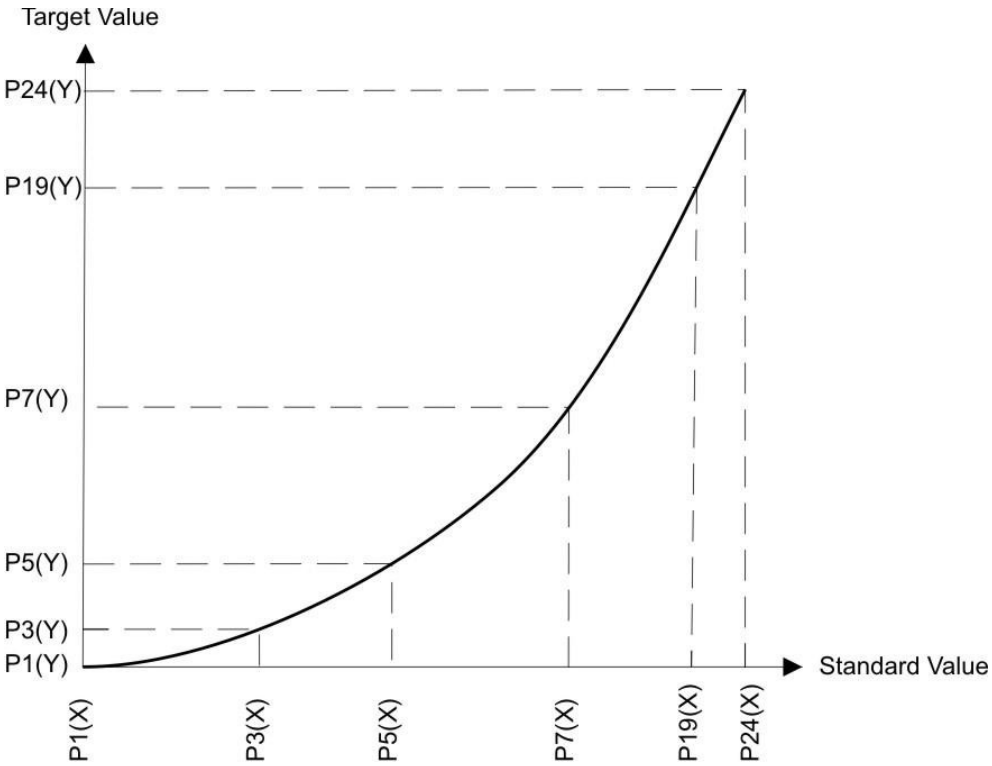

Example: Linearization Mode: 4 Quadrant

If the **Linearization mode** parameter in the **General** menu is set to "1 – 1 QUADRANT", **P1(X)** parameter must be set to zero. Linearisation is only defined in the positive range and the negative range will be mirrored symmetrical with respect to the central point.
If the **Linearization mode** parameter in the **General** menu is set to "2 – 4 QUADRANT", **P1(X)** parameter can be set also to a negative value. If the measured value is smaller than **P1(X)**, **P1(Y)** is displayed.

**EXAMPLE**
The picture below shows a sluiceway where the gate is controlled by means of an incremental encoder. We want to display the opening of the gate "d", the existing encoder information is proportional to the angular information φ.




In this case we need to convert a non-linear input signal (incremental encoder signals φ) into a linear representation (opening of the gate "d"). In the x-axis we must set the actual values detected by the encoder while in the y-axis we will set the opening values of the gate.



# 6 - Appendix

## 6.1 Data readout via serial interface

All codes shown in the **Serial value** parameter (see the "5.7 Serial menu" section on page 61) are available for serial readout by a PC or a PLC. For communication the display uses the Drivecom Protocol according to ISO 1745. All details about protocols can be found in the user's guide "MAN Serial Protocol IFxx_LD25x_LD30x I_E.pdf" (it is available for download from our web page www.lika.biz).

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 CTRL D (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 CTRL E (Hex 05)

**EXAMPLE**
The following example shows the request string for readout of the current input frequency (code = :1) from a unit having address "11":

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

Following a correct request, the unit will respond:

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

STX = control character CTRL B (Hex 02)
C1 = register code, High Byte
C2 = register code, Low Byte
xxxxx = readout data
ETX = control character CTRL C (Hex 03)
BCC = block check character

# 7 - Parameters / serial codes

## 7.1 General menu

See the "5.2 General menu" section on page 33

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 0 | Mode | 00 | 0 | 4 | 0 |
| 1 | Encoder properties | 01 | 0 | 4 | 0 |
| 2 | Encoder direction | 02 | 0 | 1 | 0 |
| 3 | Factor | 03 | -99999999 | 99999999 | 1 |
| 4 | Divider | 04 | -99999999 | 99999999 | 1 |
| 5 | Additive value | 05 | -99999999 | 99999999 | 1 |
| 6 | Linearization mode | 06 | 0 | 2 | 0 |
| 7 | Back up memory | 07 | 0 | 1 | 1 |
| 8 | Factory settings | 08 | 0 | 1 | 0 |
| 9 | - | 09 | 0 | 0 | 0 |
| 10 | - | 10 | 0 | 0 | 0 |

## 7.2 Frequency mode menu

See the "5.3 Frequency mode menu" section on page 36

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 11 | Frequency mode | 11 | 0 | 5 | 0 |
| 12 | Frequency base | 12 | 0 | 3 | 2 |
| 13 | Sampling time 1 (s) | 13 | 1 | 9999 | 100 |
| 14 | Wait time 1 (s) | 14 | 1 | 7999 | 100 |
| 15 | Standstill time 1 (s) | 15 | 1 | 9999 | 1 |
| 16 | Average filter 1 | 16 | 0 | 16 | 0 |
| 17 | Sampling time 2 (s) | 17 | 1 | 9999 | 100 |
| 18 | Wait time 2 (s) | 18 | 1 | 799 | 100 |
| 19 | Average filter 2 | 19 | 0 | 16 | 0 |
| 20 | - | 20 | 0 | 0 | 0 |
| 21 | - | 21 | 0 | 0 | 0 |

### 7.3 Counter mode menu

See the "5.4 Counter mode menu" section on page 42

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 22 | Count mode | 22 | 0 | 5 | 3 |
| 23 | Factor A | 23 | 1 | 9999999 | 100000 |
| 24 | Set value A | 24 | -99999999 | 99999999 | 0 |
| 25 | Factor B | 25 | 1 | 9999999 | 100000 |
| 26 | Set value B | 26 | -99999999 | 99999999 | 0 |
| 27 | Round loop value | 27 | 0 | 99999999 | 0 |
| 28 | - | 28 | 0 | 0 | 0 |
| 29 | - | 29 | 0 | 0 | 0 |

### 7.4 SSI mode menu

See the "5.5 SSI mode menu" section on page 44

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 30 | SSI mode | 30 | 0 | 1 | 0 |
| 31 | Encoder resolution | 31 | 10 | 32 | 25 |
| 32 | Data format | 32 | 0 | 1 | 0 |
| 33 | Baud rate | 33 | 0 | 5 | 2 |
| 34 | SSI zero | 34 | 0 | 99999999 | 0 |
| 35 | High bit | 35 | 1 | 32 | 25 |
| 36 | Low bit | 36 | 1 | 32 | 1 |
| 37 | SSI offset | 37 | 0 | 99999999 | 0 |
| 38 | Round loop value | 38 | 0 | 9999999 | 0 |
| 39 | Sampling time (s) | 39 | 1 | 9999 | 10 |
| 40 | Error bit | 40 | 0 | 32 | 0 |
| 41 | Error polarity | 41 | 0 | 1 | 0 |
| 42 | - | 42 | 0 | 0 | 0 |
| 43 | - | 43 | 0 | 0 | 0 |

### 7.5 Start/Stop mode menu

See the "5.6 Start/Stop mode menu" section on page 56

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 44 | Init mode | 44 | 0 | 1 | 0 |
| 45 | Sampling time (ms) | 45 | 200 | 16000 | 4000 |
| 46 | Init pulse time (µs) | 46 | 1 | 9 | 2 |
| 47 | Velocity (m/s) | 47 | 100 | 999999 | 280000 |
| 48 | Operational mode | 48 | 0 | 2 | 0 |
| 49 | Offset | 49 | -99999999 | 99999999 | 0 |
| 50 | Circumference (mm) | 50 | 1 | 99999999 | 100000 |
| 51 | Round loop value | 51 | 1 | 99999999 | 360 |
| 52 | Average filter - position | 52 | 0 | 4 | 0 |
| 53 | Standstill time (s) | 53 | 1 | 9999 | 1 |
| 54 | Average filter - speed | A0 | 0 | 4 | 0 |
| 55 | - | A1 | 0 | 0 | 0 |
| 56 | - | A2 | 0 | 0 | 0 |

### 7.6 Serial menu

See the "5.7 Serial menu" section on page 61

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 57 | Unit number | 90 | 11 | 11 | 11 |
| 58 | Serial baud rate | 91 | 0 | 2 | 0 |
| 59 | Serial format | 92 | 0 | 9 | 0 |
| 60 | Serial init | 9~ | 0 | 1 | 0 |
| 61 | Serial protocol | A3 | 0 | 1 | 0 |
| 62 | Serial timer (s) | A4 | 0 | 60000 | 0 |
| 63 | Serial value | A5 | 0 | 19 | 0 |
| 64 | MODBUS | A6 | 0 | 0 | 0 |
| 65 | - | A7 | 0 | 0 | 0 |
| 66 | - | A8 | 0 | 0 | 0 |

### 7.7 Parallel menu

See the "5.8 Parallel menu" section on page 65

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 67 | Parallel mode | A9 | 0 | 5 | 0 |
| 68 | Parallel inv. | B0 | 0 | 1 | 0 |
| 69 | Parallel value | B1 | -16777216 | 16777215 | 0 |
| 70 | Parallel update time (s) | B2 | 1 | 9999 | 10 |
| 71 | Special pin function | B3 | 0 | 10 | 0 |

### 7.8 Command menu

See the "5.9 Command menu" section on page 67

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 72 | Input 1 action | B4 | 0 | 9 | 0 |
| 73 | Input 1 config | B5 | 0 | 3 | 2 |
| 74 | Input 2 action | B6 | 0 | 9 | 0 |
| 75 | Input 2 config | B7 | 0 | 3 | 2 |
| 76 | Input 3 action (factory settings) | B8 | 9 | 9 | 9 |
| 77 | Input 3 config (active high) | B9 | 2 | 2 | 2 |
| 78 | - | C0 | 0 | 0 | 0 |
| 79 | - | C1 | 0 | 0 | 0 |

### 7.9 Linearization menu

See the "5.10 Linearization menu" section on page 69

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 80 | P1(X) | C2 | -99999999 | 99999999 | 0 |
| 81 | P1(Y) | C3 | -99999999 | 99999999 | 0 |
| 82 | P2(X) | C4 | -99999999 | 99999999 | 0 |
| 83 | P2(Y) | C5 | -99999999 | 99999999 | 0 |
| 84 | P3(X) | C6 | -99999999 | 99999999 | 0 |
| 85 | P3(Y) | C7 | -99999999 | 99999999 | 0 |
| 86 | P4(X) | C8 | -99999999 | 99999999 | 0 |
| 87 | P4(Y) | C9 | -99999999 | 99999999 | 0 |
| 88 | P5(X) | D0 | -99999999 | 99999999 | 0 |
| 89 | P5(Y) | D1 | -99999999 | 99999999 | 0 |
| 90 | P6(X) | D2 | -99999999 | 99999999 | 0 |
| 91 | P6(Y) | D3 | -99999999 | 99999999 | 0 |
| 92 | P7(X) | D4 | -99999999 | 99999999 | 0 |
| 93 | P7(Y) | D5 | -99999999 | 99999999 | 0 |
| 94 | P8(X) | D6 | -99999999 | 99999999 | 0 |
| 95 | P8(Y) | D7 | -99999999 | 99999999 | 0 |
| 96 | P9(X) | D8 | -99999999 | 99999999 | 0 |
| 97 | P9(Y) | D9 | -99999999 | 99999999 | 0 |
| 98 | P10(X) | E0 | -99999999 | 99999999 | 0 |
| 99 | P10(Y) | E1 | -99999999 | 99999999 | 0 |
| 100 | P11(X) | E2 | -99999999 | 99999999 | 0 |
| 101 | P11(Y) | E3 | -99999999 | 99999999 | 0 |
| 102 | P12(X) | E4 | -99999999 | 99999999 | 0 |

(continue on next page)

(continued)

| # | Parameter | Serial code | Min. value | Max. value | Default value |
|---|---|---|---|---|---|
| 103 | P12(Y) | E5 | -99999999 | 99999999 | 0 |
| 104 | P13(X) | E6 | -99999999 | 99999999 | 0 |
| 105 | P13(Y) | E7 | -99999999 | 99999999 | 0 |
| 106 | P14(X) | E8 | -99999999 | 99999999 | 0 |
| 107 | P14(Y) | E9 | -99999999 | 99999999 | 0 |
| 108 | P15(X) | F0 | -99999999 | 99999999 | 0 |
| 109 | P15(Y) | F1 | -99999999 | 99999999 | 0 |
| 110 | P16(X) | F2 | -99999999 | 99999999 | 0 |
| 111 | P16(Y) | F3 | -99999999 | 99999999 | 0 |
| 112 | P17(X) | F4 | -99999999 | 99999999 | 0 |
| 113 | P17(Y) | F5 | -99999999 | 99999999 | 0 |
| 114 | P18(X) | F6 | -99999999 | 99999999 | 0 |
| 115 | P18(Y) | F7 | -99999999 | 99999999 | 0 |
| 116 | P19(X) | F8 | -99999999 | 99999999 | 0 |
| 117 | P19(Y) | F9 | -99999999 | 99999999 | 0 |
| 118 | P20(X) | G0 | -99999999 | 99999999 | 0 |
| 119 | P20(Y) | G1 | -99999999 | 99999999 | 0 |
| 120 | P21(X) | G2 | -99999999 | 99999999 | 0 |
| 121 | P21(Y) | G3 | -99999999 | 99999999 | 0 |
| 122 | P22(X) | G4 | -99999999 | 99999999 | 0 |
| 123 | P22(Y) | G5 | -99999999 | 99999999 | 0 |
| 124 | P23(X) | G6 | -99999999 | 99999999 | 0 |
| 125 | P23(Y) | G7 | -99999999 | 99999999 | 0 |
| 126 | P24(X) | G8 | -99999999 | 99999999 | 0 |
| 127 | P24(Y) | G9 | -99999999 | +99999999 | 0 |

## 7.10 Serial codes of commands

| Serial code | Command |
|---|---|
| 54 | RESET/SET |
| 55 | FREEZE DISPLAY |
| 56 | SSI ZERO POSITION |
| 57 | RESET/SET COUNTER A |
| 58 | RESET/SET COUNTER B |
| 59 | LOCK COUNTER A |
| 60 | LOCK COUNTER B |
| 61 | RESET MIN. / MAX. |
| 62 | FACTORY SETTINGS |
| 63 | - |
| 64 | - |
| 65 | CLEAR LOOP TIME |
| 66 | SERIAL PRINT |
| 67 | ACTIVATE DATA |
| 68 | STORE DATA |
| 69 | TESTPROGRAM |

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| Document release | Release date | Description |
|---|---|---|
| 1.0 | 20.05.2020 | First issue |
| 1.1 | 17.02.2021 | Special pin function information added, serial information updated, error codes updated |


Dispose separately

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