2014

Smart encoders & actuators

User's guide

IF40
IF41

- IF40 signal converter (incremental to analog or serial)
- For HTL/TTL/RS-422/NPN/PNP incremental encoders and sensors
- IF41 signal converter (SSI to analog or serial)
- For single/multiturn SSI encoders up to 32 bits
- 16 bit analogue output -10 ... +10V, 0 ... 20mA, 4 ... 20mA
- RS-232 / RS-485 serial output
- Parametrization via free software and USB serial interface

Suitable for the following models:

- IF40
- IF41

General Contents

General contents

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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 **IF40 and IF41 signal converters**.

IF40 is designed to **convert incremental digital signals into either analogue signals (current or voltage) or serial data format (RS-232/RS-485)**. 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).
IF41 is designed to **convert SSI encoder data into either analogue signal (current or voltage) or serial data format (RS-232/RS-485)**. 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 deliver a current or voltage analogue signal proportional to the incremental counting or the encoder position. The **analogue current signal** range is **0 to 20 mA** and **4 to 20 mA**; while the **analogue voltage signal** range is **-10 to +10 V**.

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:

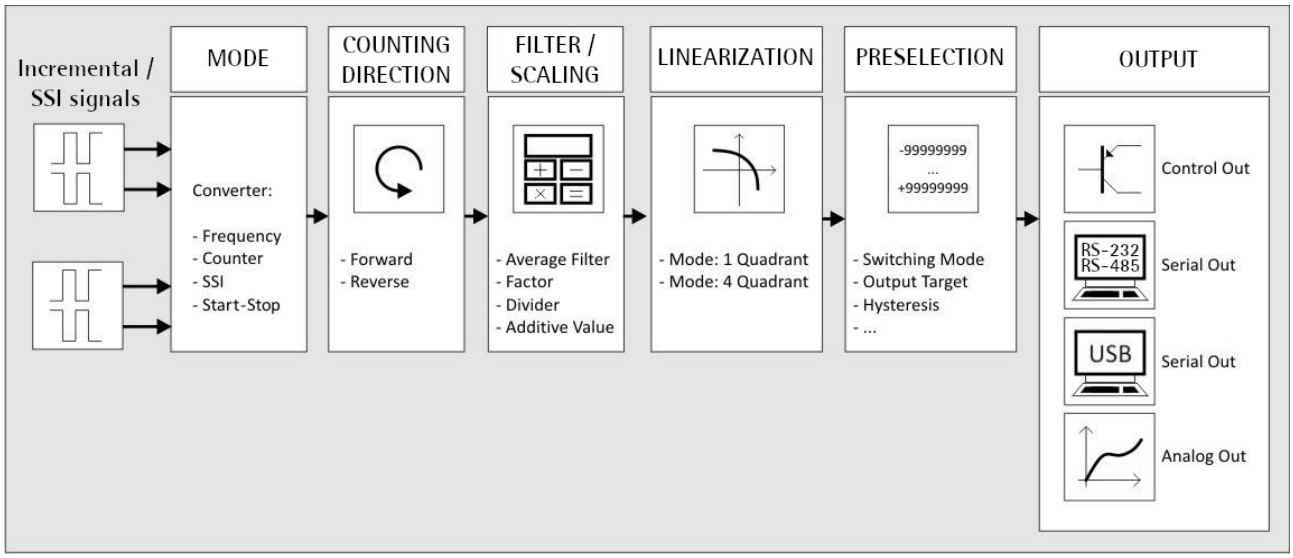
- Operation as frequency converter for incremental input signals, **Mode** = 1 = FREQUENCY, see the **Mode** parameter in the "5.2 General menu" section on page 40 (IF40).

- 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 40 (IF40).

- 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 40 (IF40).

- Operation as absolute value converter for SSI signals, **Mode** = 3 = SSI, see the **Mode** parameter in the "5.2 General menu" section on page 40 (IF41).

Functional diagram



Compatibility

This product is designed to be compatible with previous converters IF50 and IF51. 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.

	IF40 / IF41	IF50 / IF51
Incremental Input:	Possible configurations: RS-422 (TTL), HTL Differential, HTL PNP, HTL NPN or TTL PNP (asymmetrical) The setting made in the corresponding parameter then applies to both inputs (A and B).	Possible configurations: RS-422 (TTL), HTL Differential, HTL PNP, HTL NPN or TTL (asymmetrical) The desired setting can be made separately for each channel (A and B) using the corresponding DIL switches.
Control Inputs:	Number of inputs: 6 Format: HTL	Number of inputs 1 Format: HTL
Control Outputs:	Number of outputs: 6 Format / Level: 5 ... 30 V, PNP Output current: max. 200 mA Reaction time: < 1 ms	No switching outputs
Encoder Supply:	Output voltage: 5Vdc and 24Vdc Output current: max. 250 mA	Output voltage: 5Vdc Output current: max. 250 mA
Serial Interface:	RS-232/RS-485 via screw terminals Baud rate: 9600, 19200 or 38400 Baud	RS-232/RS-485 via 9-position D-SUB connector (female) Baud rate: 600, 1200, 2400, 4800, 9600,

		19200, or 38400 Baud
Housing:	Dimensions: 23 w x 102 h x 102 d mm Weight: approx. 100 g	Dimensions: 40 w x 79 h x 91 d mm Weight: approx. 190 g
Device parametrization:	Only via operator software OS	Via operator software OS6.0 and partially via DIL switches
Operating modes for Frequency:	Only channel A Ratio B/A Percentage deviation from channel B to A Sum A+B Difference A-B A/B x 90	Only channel A Ratio A/B Sum A+B A/Bx90 Only channel B Product AxB Difference A-B A= Impulse, B = Direction

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 20;
- 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. See also the "3.3 EMC guidelines" section on page 18.

1.3 Mechanical safety

- Install the device following strictly the information in the "3 - Mounting instructions" section on page 17;
- 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.

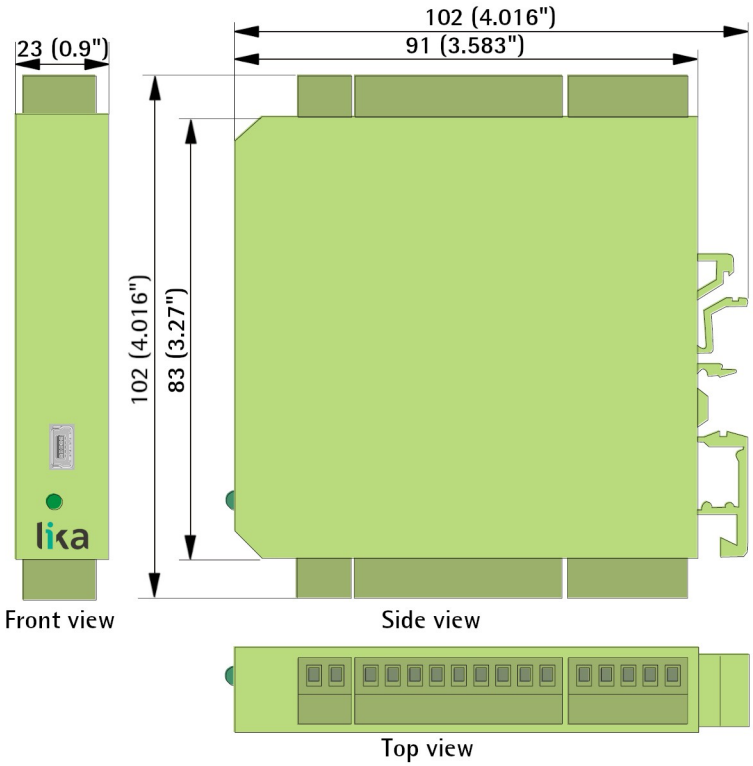
Warning: devices having order code ending with "/Sxxx" may have mechanical and electrical characteristics different from standard and be supplied with additional documentation for special connections (Technical info).

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

IF40 / IF41 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 EMC guidelines

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 signals as well as for control input and output lines;
- cables for digital controls (digital I/Os, relay outputs) must not exceed 30 m in length and are allowed for in building operation only;
- 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 be connected to earth at one single point only;

- 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

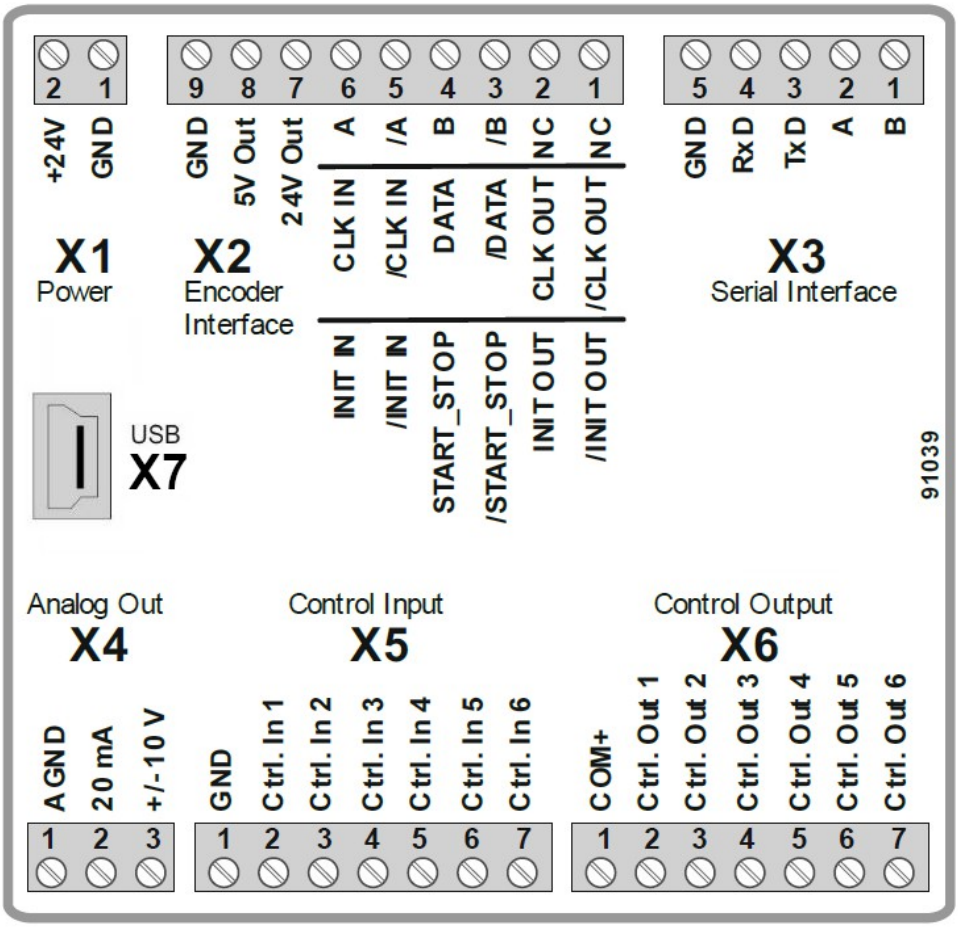
To clean the front of the unit please just use a slightly damp (not wet!), soft cloth. For the rear side no cleaning is necessary. For an unscheduled, individual cleaning of the rear side the maintenance technicians or installation operators are self-responsible.

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. 50 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. 50 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.

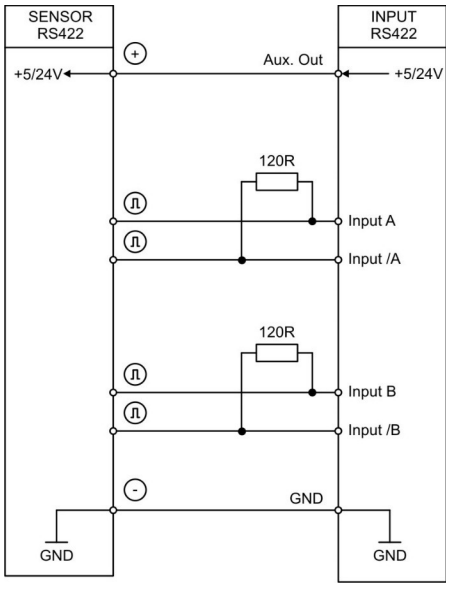
4.3 Incremental encoder input (X2 Encoder Interface)

Incremental encoder input technical specifications

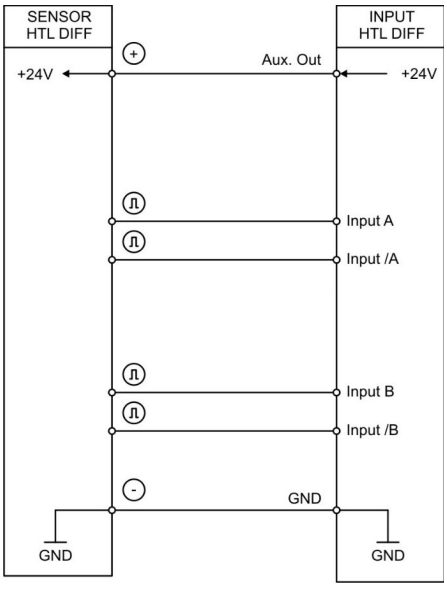
Number of inputs:	A, B (HTL Single Ended, TTL Single Ended) A, /A, B, /B (RS-422, HTL Differential)
Configuration:	RS-422, TTL, HTL differential, HTL Single Ended
RS-422:	max. 1 MHz (RS-422 differential signal > 0.5 V)
HTL differential:	max. 1 MHz (HTL differential signal > 1 V)
HTL Single Ended:	max. 350 kHz (Low: 0 ... 5 V; High: 9 ... 30 V)
TTL:	max. 350 kHz (Low: 0 ... 0.6 V; High: 2.2 ... 5 V)
Frequency measurement accuracy:	± 50 ppm

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

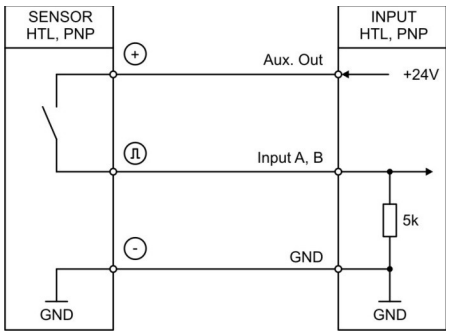
RS-422



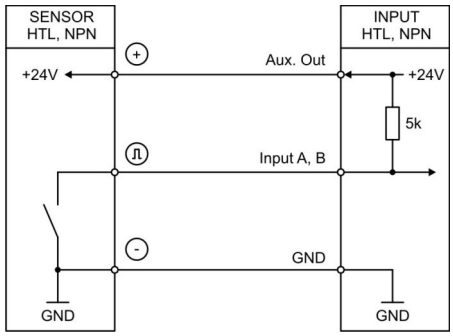
HTL DIFFERENTIAL



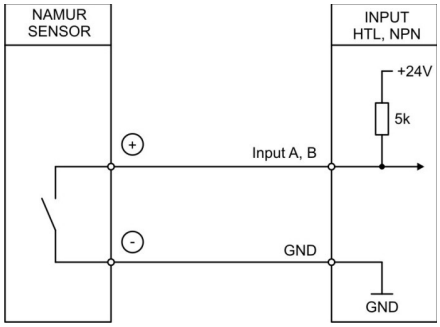
HTL PNP



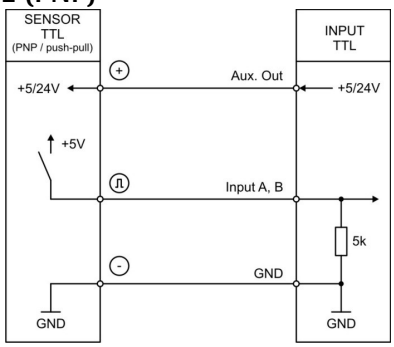
HTL NPN



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 43.
For information on the the Counter mode and the incremental interface please refer to the "5.4 Counter mode menu" section on page 51.

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.

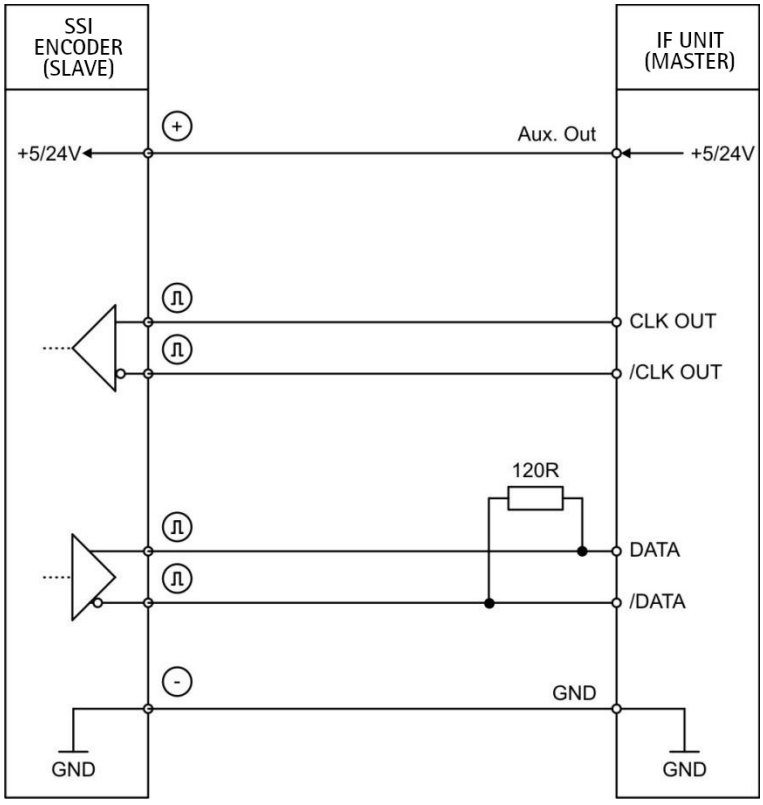
4.4 Absolute encoder input (X2 Encoder Interface)

Absolute encoder input technical specifications

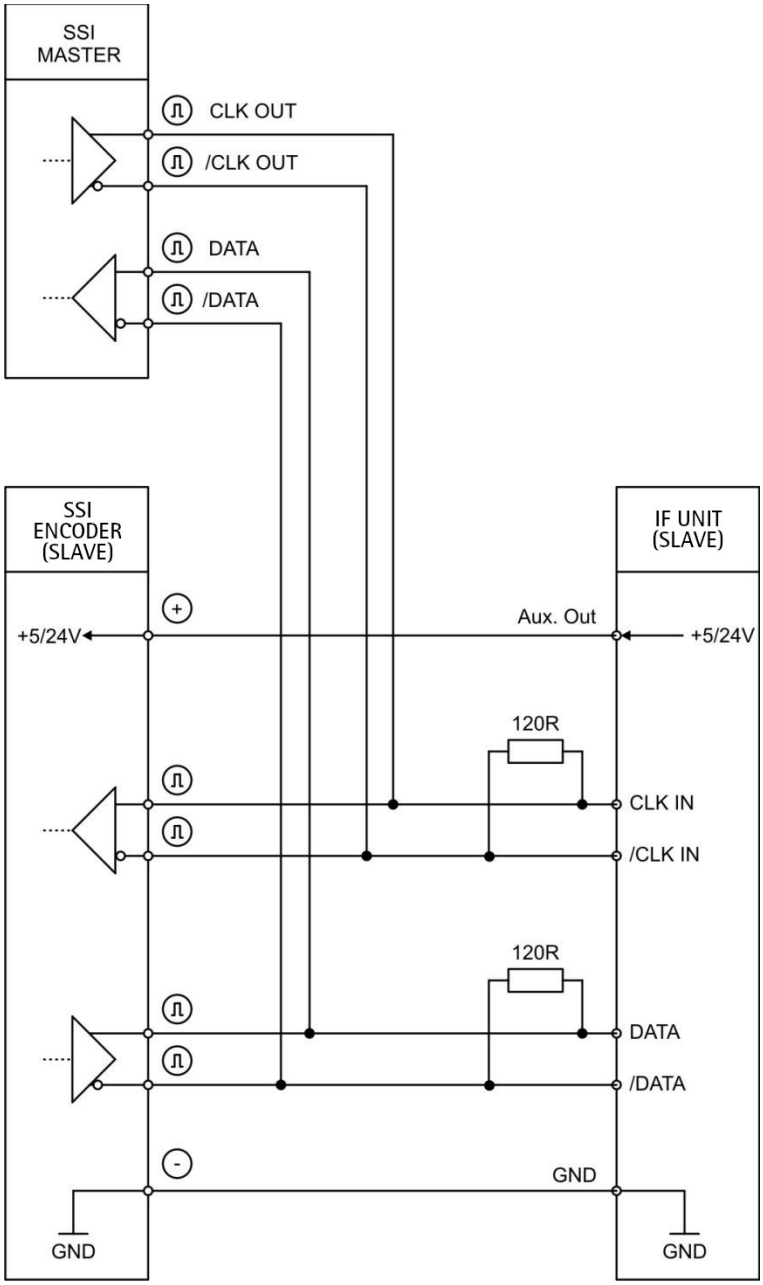
Number (channels):	CLK IN or OUT, /CLK IN or OUT, DATA, /DATA
Configuration:	Master or Slave
Format:	Binary or Gray code
Frequency:	max. 1 MHz
Resolution:	10 ... 32 bits
Load:	Max. 3 mA / Ri > 10 kOhm / 10 pF

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 54.

4.4.1 Connection scheme when SSI mode = 0 = Master



4.4.2 Connection scheme when SSI mode = 1 = Slave



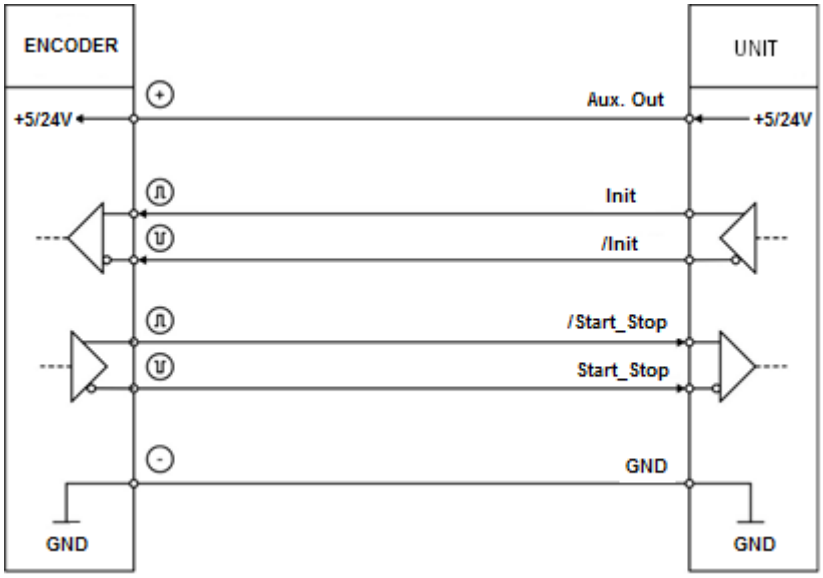
4.5 Start/Stop encoder inputs (X2 Encoder Interface)

Start/Stop encoder inputs technical specifications

RS-422 input:	1 x (Start_Stop = DATA, /Start_Stop = /DATA); 1 x (ext. Init_In = CLK IN, ext. /Init_In = /CLK IN)
RS-422 output:	1 x (Init_Out = CLK OUT, /Init_Out = /CLK OUT)
Pulse width Init pulse:	1 ... 9 µs (settable)
Frequency Init pulse:	62.5 Hz - 5000 Hz (settable)
Clock frequency time measurement:	48 MHz
Resolution:	depending on the waveguide velocity 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 66): 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 66): 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 Start/Stop mode please refer to the "5.6 Start/Stop mode menu" section on page 66.

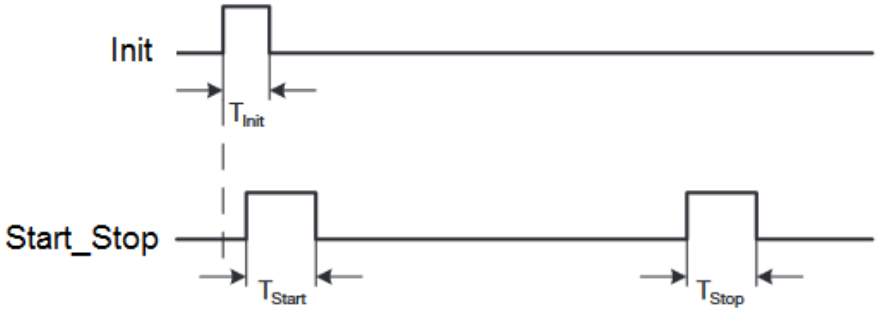
4.5.1 Connection of the RS-422 signals



4.5.2 DPI measurement operation

When **Init mode** = 0 = MASTER (see on page 66), the Init pulse is sent to the position sensor on the init line at regular intervals (see the **Sampling time (ms)** parameter on page 66), 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 66.



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 Serial interface (X3 Serial Interface)

Serial interface technical specifications

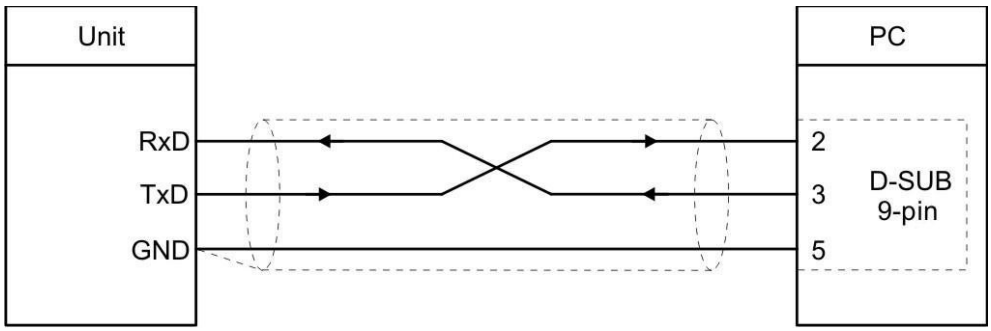
Format:	RS-232 or RS-485
Baud rate:	9,600, 19,200, and 38,400 baud

A serial interface (RS-232 / RS-485) is available through terminal X3.
It can be configured in the **Serial** menu, see the "5.14 Serial menu" section on page 87.

The RS-232 / RS-485 serial interface can be used:

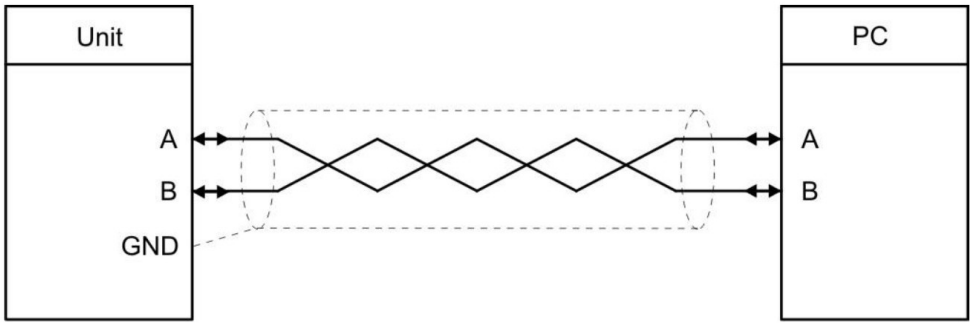
- for easy setup and commissioning of the unit
- to modify settings and parameters during operation
- to read out internal states and current measuring values via PC or PLC

The following drawing shows the RS-232 connection to a PC by using a standard D-Sub 9-pin connector:



An optional kit fitted with RS-232/USB adapter for the communication between the encoder and the PC is available. The order code is **EC-USB/RS232**.

The following drawing shows the RS-485 connection to a PC by using a standard D-Sub 9-pin connector:



WARNING
RS-232 and RS-485 interfaces cannot be operated simultaneously.

4.7 Analogue output (X4 Analog Out)

Analogue output technical specifications

Configuration:	Current or voltage operation
Voltage output (0):	-10 V ... +10 V (max. 2 mA)
Current output (1):	0 ... 20 mA (burden: max. 270 Ohm)
Current output (2):	4 ... 20 mA (burden: max. 270 Ohm)
Resolution:	16 bits
Accuracy:	±0.1% 0°C ... +45°C
	±0.15% -20°C ... 0°C, +45°C ... +60°C
Reaction time:	< 1 ms

A 16 bit analogue output is available through terminal blocks 1, 2, and 3 of terminal X4.
It can be configured and scaled in the **Analog** menu, see the "5.15 Analog menu" section on page 91.

The following configurations are available (see the **Analog format** parameter on page 91):

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

The analogue output is proportional to the reference source and is referenced to potential AGND.
AGND and GND are internally connected.

WARNING
Voltage and current outputs of the analogue output cannot be operated simultaneously.

4.8 Control inputs (X5 Control Input)

Control inputs technical specifications

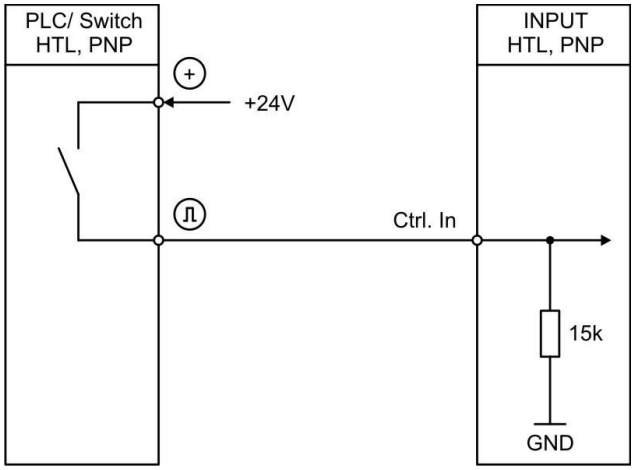
Number of inputs:	6
Format:	HTL, PNP (10 ... 30 V)
Frequency:	max. 10 kHz
Load:	max. 2 mA / Ri > 15 kOhm / 470 pF

Six control inputs are available at pins 2, 3, 4, 5, 6, and 7 of terminal X5, they have HTL PNP characteristics.

In the **Command** menu (see the "5.16 Command menu" section on page 93) the operation of the control inputs from 1 to 5 (Ctrl. In 1 to Ctrl. In 5) is freely configurable. They are used for functions to be triggered from an external source, e.g. for releasing the latching, for resetting the measurement result or for teaching the preset values or the analog output.

Control input 6 (Ctrl. In 6) is only used to reset 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 (rising edge) to Ctrl. In 6. The HTL pulse must be applied for 1 second at least.

4.8.1 Wiring of the control inputs



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

4.8.2 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.

4.9 Control outputs (X6 Control Output)

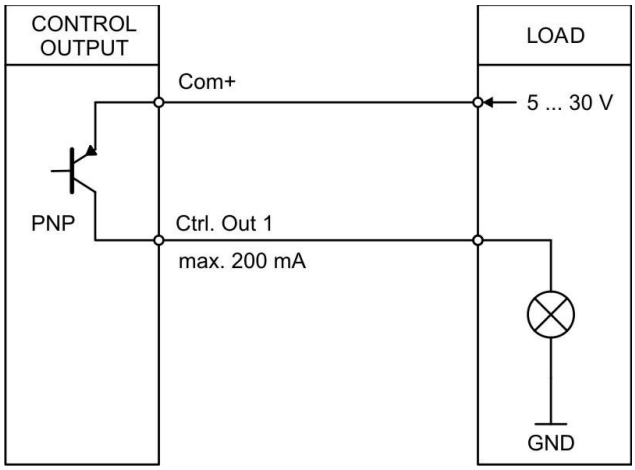
Control outputs technical specifications

Number of outputs:	6
Format / level:	5 ... 30 V (depending on the Com+ voltage), PNP
Output current:	max. 200 mA
Reaction time:	< 1 ms

Six control outputs are available at terminal blocks 2, 3, 4, 5, 6, and 7 (+ terminal block 1 for switching voltage) of terminal X6.
The switching conditions can be set in the **Preselection 1 ... Preselection 6** menus, see the "5.8 Preselection 1 menu" ... "5.13 Preselection 6 menu" sections on pages 73, 77, 79, 81, 83 and 85 respectively. The outputs "2 - Ctrl. Out 1", "3 - Ctrl. Out 2", "4 - Ctrl. Out 3", "5 - Ctrl. Out 4", "6 - Ctrl. Out 5" and "7 - Ctrl. Out 6" are fast PNP outputs with a switching capability of 5÷30 V / 200 mA per channel.

The switching voltage of the outputs must be applied to input terminal block 1 (COM+) of terminal X6.
In case of switching inductive loads it is advisable to use an external filtering of the coils.

4.9.1 Wiring of the control outputs



4.10 Serial USB interface (X7 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 X7.
It can be configured in the **Serial** menu, see the "5.14 Serial menu" section on page 87.

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.

4.11 Diagnostic LED

The device is equipped with one 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 value of the analog output is "frozen" at 0 V or 0/4 mA. If the error no longer exists, the LED automatically lights up again permanently and the analogue output provides the current value.
If the error no longer exists, the LED will automatically light up again permanently.
In addition, a "collective fault message" can be transmitted via one of the control outputs, if required. To do this, the Mode *X* parameter of the respective switching output must be set to **8 = ERROR SET** (see for instance the Mode 1 parameter in the "5.8 Preselection 1 menu" section on page 73).
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	Measured value is greater than 99999999
0x00000002	Minimum Value	Measured value is less than -99999999
0x00000004	SSI Encoder Error	SSI error bit set (only if Mode is set to "**3 = SSI**", see on page 40).
0x00000008	Encoder Fault	Wire break detection is active.
0x00000010	Frequency (Input A) out of range	Maximum or minimum permissible input frequency at input A has been exceeded or fallen below with the exponential filter setting used (only if Mode is set to "**1 = FREQUENCY**", see on page 40).
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 40).

0x00000040	Start/Stop Encoder Error	No "start" and no "stop" pulse detected between two "init" pulses. Check the sensor connections! Only if **Mode** is set to "**4 = START / STOP**", see on page 40.
0x00000080	Position Encoder Outside the Limit	No "start" and 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 40.

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 40
Mode, see on page 40
Encoder properties, see on page 40
Encoder direction, see on page 40
Factor, see on page 41
Divider, see on page 41
Additive value, see on page 41
Linearization mode, see on page 41
Back up memory, see on page 42
Factory settings, see on page 42

It is only available if the Mode parameter in the **General** menu (see on page 40) is set to "1 = FREQUENCY".

Frequency mode menu, see the "5.3 Frequency mode menu" section on page 43
Frequency mode, see on page 43
Frequency base, see on page 43
Sampling time 1 (s), see on page 44
Wait time 1 (s), see on page 44
Standstill time 1 (s), see on page 45
Average filter 1, see on page 45
Sampling time 2 (s), see on page 47
Wait time 2 (s), see on page 47
Average filter 2, see on page 48

It is only available if the Mode parameter in the **General** menu (see on page 40) is set to "2 = COUNTER".

Counter mode menu, see the "5.4 Counter mode menu" section on page 51
Count mode, see on page 51
Factor A, see on page 51
Set value A, see on page 51
Factor B, see on page 52
Set value B, see on page 52
Round loop value, see on page 52

It is only available if the Mode parameter in the **General** menu (see on page 40) is set to "3 = SSI".

SSI mode menu, see the "5.5 SSI mode menu" section on page 54
SSI mode, see on page 54
Encoder resolution, see on page 54
Data format, see on page 54
Baud rate, see on page 54
SSI zero, see on page 55
High bit, see on page 55
Low bit, see on page 55
SSI offset, see on page 55
Round loop value, see on page 56
Sampling time (s), see on page 56
Error bit, see on page 56
Error polarity, see on page 56

It is only available if the Mode parameter in the **General** menu (see on page 40) is set to "4 = START / STOP".

Start/Stop mode menu, see the "5.6 Start/Stop mode menu" section on page 66
Init mode, see on page 66
Sampling time (ms), see on page 66
Init pulse time (µs), see on page 66
Velocity (m/s), see on page 67
Operational mode, see on page 67
Offset, see on page 67

Preselection 3 menu, see the "5.10 Preselection 3 menu" section on page 79
Mode 3, see on page 79
Hysteresis 3, see on page 79
Pulse time 3 (s), see on page 79
Output target 3, see on page 79
Output polarity 3, see on page 80
Output lock 3, see on page 80
Start up delay 3 (s), see on page 80

Preselection 4 menu, see the "5.11 Preselection 4 menu" section on page 81
Mode 4, see on page 81
Hysteresis 4, see on page 81
Pulse time 4 (s), see on page 81
Output target 4, see on page 81
Output polarity 4, see on page 82
Output lock 4, see on page 82
Start up delay 4 (s), see on page 82

Preselection 5 menu, see the "5.12 Preselection 5 menu" section on page 83
Mode 5, see on page 83
Hysteresis 5, see on page 83
Pulse time 5 (s), see on page 83
Output target 5, see on page 83
Output polarity 5, see on page 84
Output lock 5, see on page 84
Start up delay 5 (s), see on page 84

Preselection 6 menu, see the "5.13 Preselection 6 menu" section on page 85
Mode 6, see on page 85
Hysteresis 6, see on page 85
Pulse time 6 (s), see on page 85
Output target 6, see on page 85
Output polarity 6, see on page 86

Input 6 action (factory settings), see on page 96
Input 6 config (rising edge), see on page 96

It is only available if the **Linearization mode** parameter in the **General** menu (see on page 41) is set to either "1 – 1 QUADRANT" or "2 – 4 QUADRANT".

Linearization menu, see the "5.17 Linearization menu" section on page 97
P1(X), see on page 97
...
P24(X), see on page 97
P1(Y), see on page 97
...
P24(Y), see on page 97

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 43
2	**COUNTER**	Operating mode: Counter, incremental signals (it replaces IF50 converter). See the "5.4 Counter mode menu" section on page 51
3	**SSI**	Operating mode: Absolute value converter, SSI signals (it replaces IF51 converter). See the "5.5 SSI mode menu" section on page 54
4	**START / STOP**	Operating mode: Start / Stop interface converter. See the "5.6 Start/Stop mode menu" section on page 66

Encoder properties

This parameter sets the characteristics of the incremental input.
Only relevant when Mode is set to "1 = FREQUENCY" or "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 "5.17 Linearization menu" section on page 97 and the "5.17.1 Description of the linearisation function" section on page 97.

0	**OFF**	No linearisation
1	**1 QUADRANT**	Linearisation using 1 quadrant (see on page 97).
2	**4 QUADRANT**	Linearisation using 4 quadrants (see on page 97).

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 Mode = 2 = "Counter" 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 40) 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). 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. 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

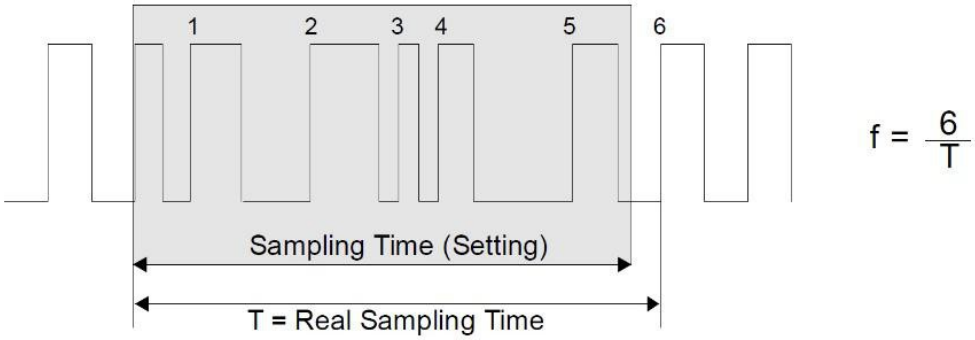
It sets the desired basis for the frequency measurement (resolution).

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).

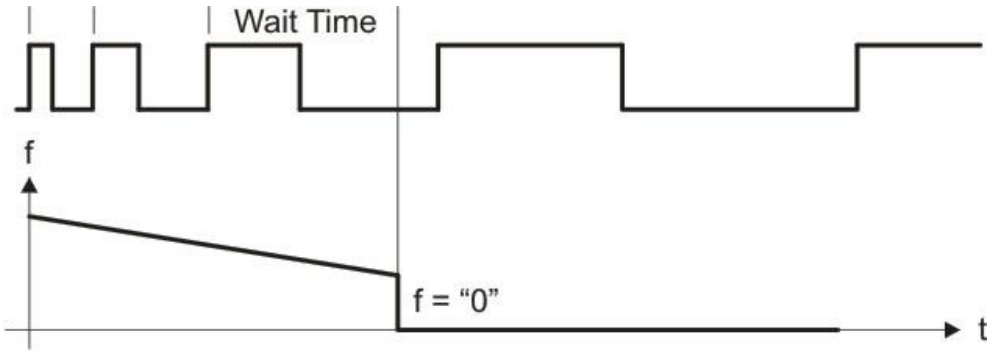
0.001	Shortest Sampling time
0.1	Default value
9.999	Longest Sampling time



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 and reactivates the start up delays (see the **Start up delay x (s)** parameter in the **Preselection 1** ... **Preselection 6** menus on pages 73, 77, 79, 81, 83 and 85 respectively). The value is expressed in seconds (s).
Standstill detection can be set in the **Preselection 1** ... **Preselection 6** menus, see on pages 73, 77, 79, 81, 83 and 85 respectively.

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 analog 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
1	Floating average within 2 cycles (quick reaction to every change)
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

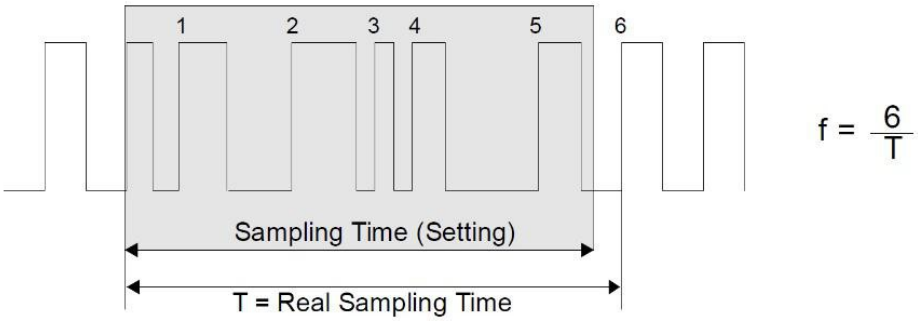
When using the exponential filter, the maximum permissible frequencies at the input must not be exceeded, otherwise a data type overflow will result!
If the frequency is exceeded nevertheless, the frequency is replaced by the maximum permissible value (according to the corresponding setting) for further calculation and an error is output. The LED flashes and the analogue output is consequently set to 0 V or 0/4 mA.
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).

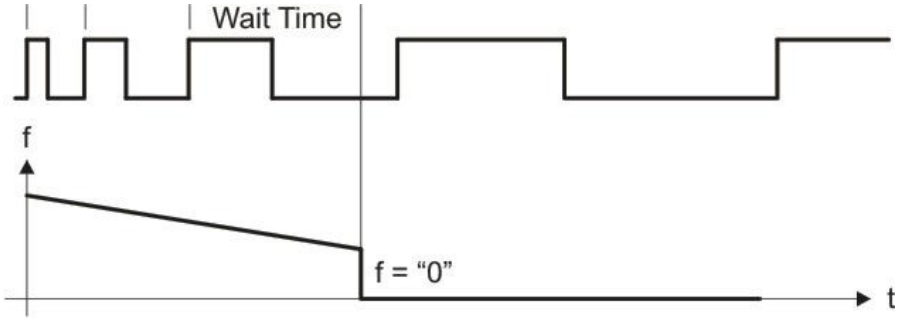
0.001	Shortest Sampling time
0.1	Default value
9.999	Longest Sampling time



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 analog 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
1	Floating average within 2 cycles (quick reaction to every change)
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 and the analogue output is consequently set to 0 V or 0/4 mA.
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

EXAMPLE

A 1024 PPR resolution incremental encoder is coupled to the IF40 unit. Its incremental values need to be converted into 4 – 20 mA analogue signals. We want the 4 to 20mA range be adjusted so that, for example, 4 mA is 300 RPM and 20 mA is 1500 RPM with linear relationship.
The unit will be configured as follows:

GENERAL menu (see the "5.2 General menu" section on page 40)
Mode → 1 = FREQUENCY
Encoder properties → setting depends on the connected encoder (see on page 40)
Factor → 1
Divider → 1
Additive value → 0

FREQUENCY MODE menu (see the "5.3 Frequency mode menu" section on page 43)
Frequency mode → setting depends on the connected encoder, e.g. A/B x 90 or A Only (see on page 43)
Frequency base → 0

ANALOG menu (see the "5.15 Analog menu" section on page 91)
Analog format → 2 = 4 ... 20 MA

Analog start → 5120 (1024 * 300 / 60, that is the frequency of a 1024 PPR resolution encoder at 300 RPM)
Analog end → 25600 (1024 * 1500 / 60, that is the frequency of a 1024 PPR resolution encoder at 1500 RPM)

All other parameters are set to defaults.

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 40) 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 "5.16 Command menu" section on page 93; 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 "5.16 Command menu" section on page 93; 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** is set to "0 = A SINGLE", or "3 = A/B 90 x1", or "4 = A/B 90 x2", or "5 = A/B 90 x4".

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

EXAMPLE

The IF40 must be set to work as a pulse counter to analogue converter.
As an example, an interval of 0 ... 10,000 pulses is to be converted into an analogue voltage signal (0 ... 10V). It has to be possible to count forwards and backwards within these intervals. For the sake of simplicity, an RS-422 encoder (A/B 90° TTL) is considered in this example.

The unit will be configured as follows:

GENERAL menu (see the "5.2 General menu" section on page 40)
Mode → 1 = COUNTER

Encoder properties → 0 = RS422 in the example, (setting depends on the connected encoder, see on page 40)
Factor → 1
Divider → 1
Additive value → 0

COUNT MODE menu (see the "5.4 Counter mode menu" section on page 51)
Count mode → setting depends on the connected encoder, e.g. A/B x 90 or A Only (see on page 51)

ANALOG menu (see the "5.15 Analog menu" section on page 91)
Analog format → 0 = -10 ... 10 V
Analog start → 0 (pulse value for 0 V)
Analog end → 10000 (pulse value for +10 V)

All other parameters are set to defaults.

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 40) 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 = 0 = Master, use terminal X2 - Pins 1 and 2, see on page 23

If SSI mode = 1 = Slave, use terminal X2 - Pins 5 and 6, see on page 23

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 "5.16 Command menu" section on page 93; 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 "5.16 Command menu" section on page 93; 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. No error bit available.
...	
32	Monitoring of connected encoder is enabled. Position of the error bit to be evaluated.

Error polarity

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

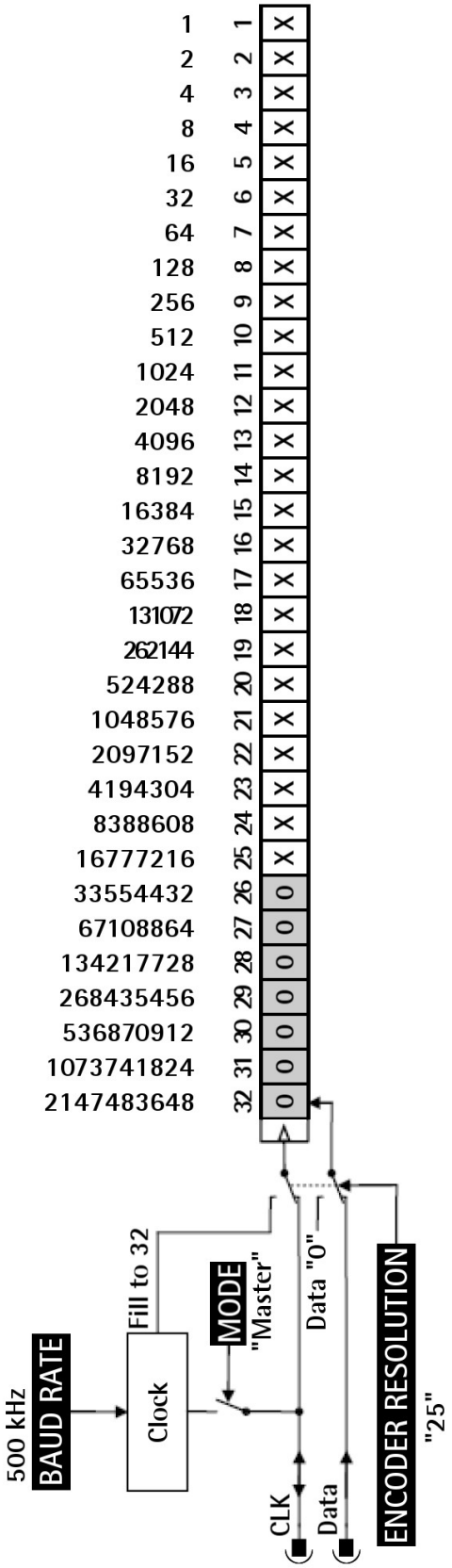
0	The bit is low in case of error
1	The bit is high in case of error

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 57 and ff.

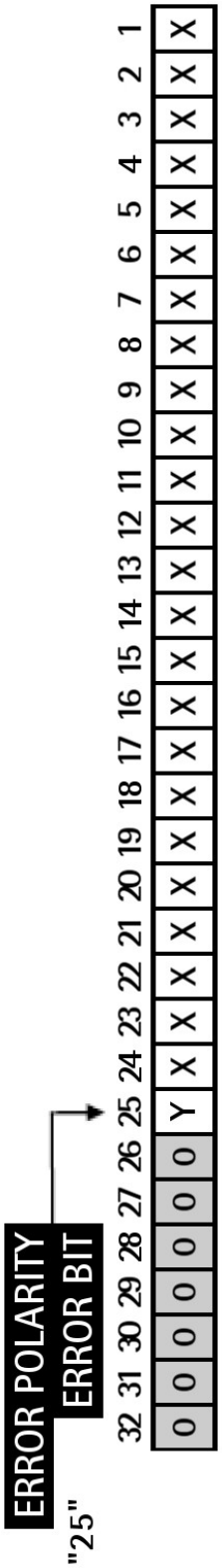
5.5.1 Reading the SSI data

Received data has always a length of 32 bits.



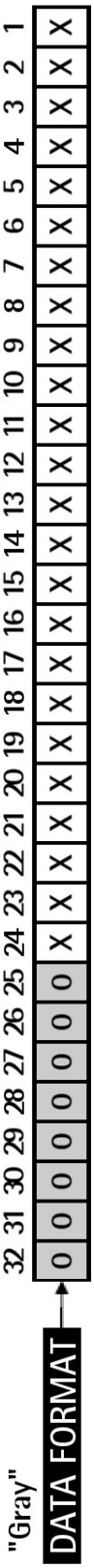
5.5.2 Internal processing and calculation of SSI data

5.5.2.1 Checking the error bit



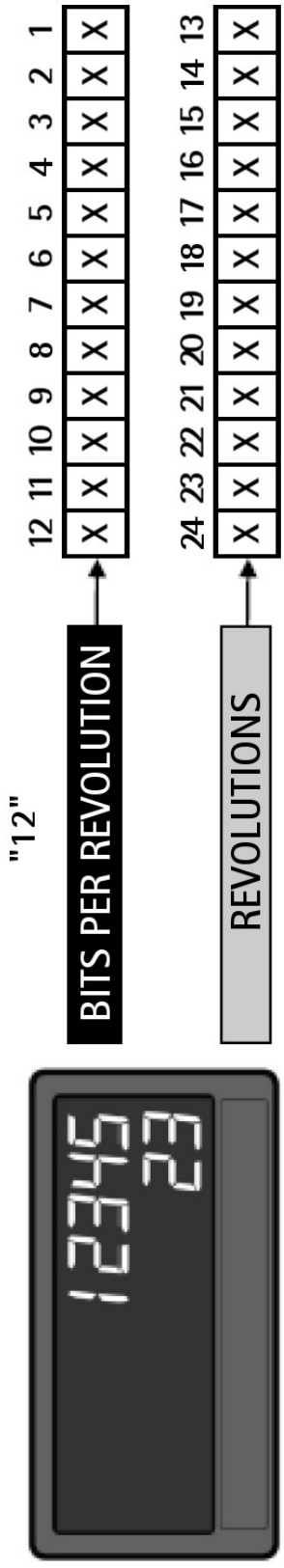
5.5.2.2 Data conversion

Gray code → Binary code.



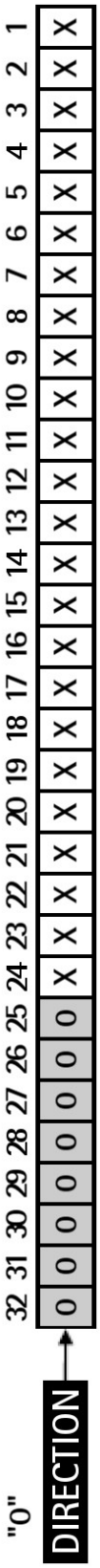
5.5.2.3 Data splitting

Bit per revolution and number of revolutions.

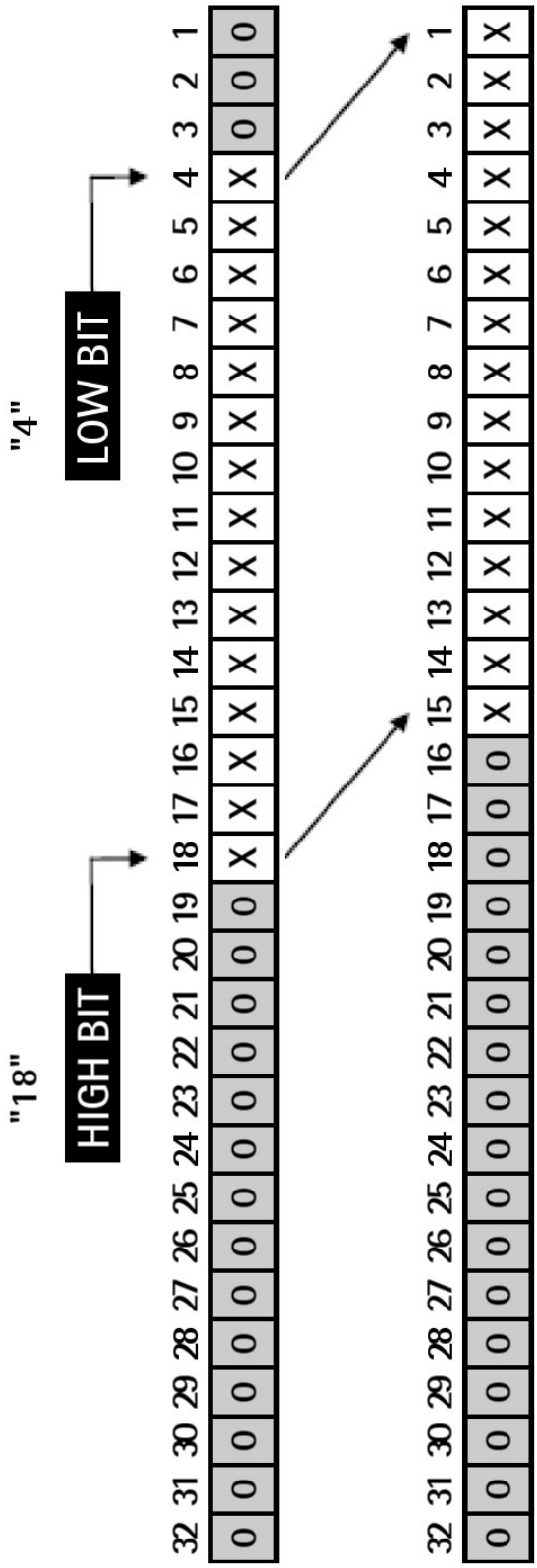


5.5.2.4 Considering the SSI zero position

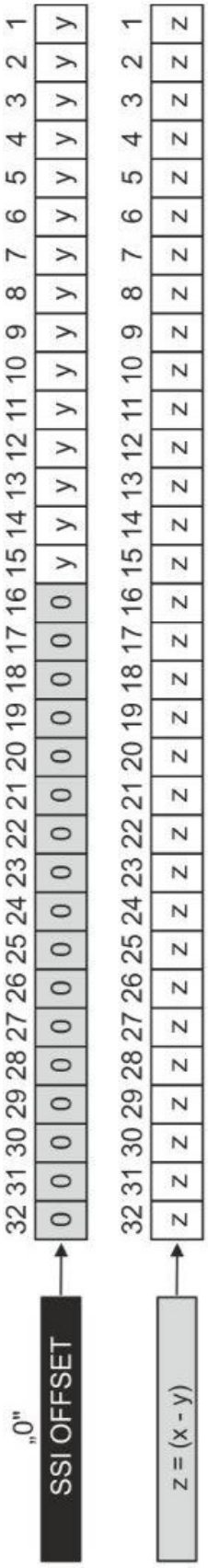
5.5.2.5 Checking the direction of rotation



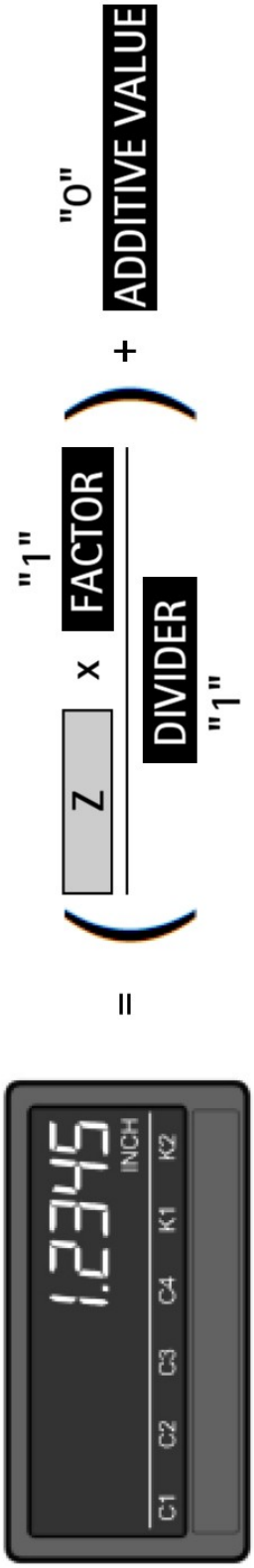
5.5.2.6 Evaluation of the bit blanking



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 40) 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 23

If **Init mode** = Slave, use terminal X2 - Pins 5 and 6, see on page 23

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 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 69.

Offset

If you send a "Reset/Set Value" command (via control input; see the "5.16 Command menu" section on page 93; 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 and reactivates the start up delays (see the **Start up delay x (s)** parameter in the **Preselection 1** ... **Preselection 6** menus on pages 73, 77, 79, 81, 83 and 85 respectively). The value is expressed in seconds (s).
Standstill detection can be set in the **Preselection 1** ... **Preselection 6** menus, see on pages 73, 77, 79, 81, 83 and 85 respectively.

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 = CLK OUT, /INIT OUT = /CLK OUT, terminal X2 - Pins 1 and 2, see on page 23) 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 (ext. INIT IN = CLK IN, ext. /INIT IN = /CLK IN, terminal X2 - Pins 5 and 6, see on page 23) 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 66.

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 67.

- **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 41), 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 41), 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 the 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 analog output, the setpoints of the transistor outputs, and the linearization function always refer to the result of the scaled measured value according to the selected operational mode!

5.7 Preselection values menu

The **Preselection values** menu is used to set the preselection values or the switching points.
The switching points always refer to the scaled "measurement result".

Preselection 1

Preselection / switching point 1. The features of **Preselection 1** must be set in the **Preselection 1** menu, see the "5.8 Preselection 1 menu" section on page 73.

-99999999	Smallest value
1000	Default value
+99999999	Highest value

Preselection 2

Preselection / switching point 2. The features of **Preselection 2** must be set in the **Preselection 2** menu, see the "5.9 Preselection 2 menu" section on page 77.

-99999999	Smallest value
2000	Default value
+99999999	Highest value

Preselection 3

Preselection / switching point 3. The features of **Preselection 3** must be set in the **Preselection 3** menu, see the "5.10 Preselection 3 menu" section on page 79.

-99999999	Smallest value
3000	Default value
+99999999	Highest value

Preselection 4

Preselection / switching point 4. The features of **Preselection 4** must be set in the **Preselection 4** menu, see the "5.11 Preselection 4 menu" section on page 81.

-99999999	Smallest value
4000	Default value
+99999999	Highest value

Preselection 5

Preselection / switching point 5. The features of **Preselection 5** must be set in the **Preselection 5** menu, see the "5.12 Preselection 5 menu" section on page 83.

-99999999	Smallest value
5000	Default value
+99999999	Highest value

Preselection 6

Preselection / switching point 6. The features of **Preselection 6** must be set in the **Preselection 6** menu, see the "5.13 Preselection 6 menu" section on page 85.

-99999999	Smallest value
6000	Default value
+99999999	Highest value

5.8 Preselection 1 menu

The **Preselection 1** menu sets the characteristics of **Preselection 1**.

Mode 1

Switching conditions for **Preselection 1**. The output switches under the following conditions:

0	**|RESULT|>=|PRES|**	Absolute value is greater than or equal to the absolute value of **Preselection 1**. If **Hysteresis 1** is greater than 0, the following switching condition arises: Absolute value ≥ **Preselection 1** → ON Absolute value < **Preselection 1** – **Hysteresis 1** → OFF
1	**|RESULT|<=|PRES|**	Absolute value is less than or equal to the absolute value of **Preselection 1** (start up delay setting – see the **Start up delay 1 (s)** parameter on page 75- is advisable). If **Hysteresis 1** is greater than 0, the following switching condition arises: Absolute value ≤ **Preselection 1** → ON Absolute value > **Preselection 1** + **Hysteresis 1** → OFF
2	**|RESULT|=|PRES|**	Absolute value is equal to the absolute value of **Preselection 1**. A range (**Preselection 1** +/- ½ **Hysteresis 1**) can be defined and monitored along with a hysteresis value. If **Hysteresis 1** is greater than 0, the following switching condition arises: Absolute value > **Preselection 1** + ½ **Hysteresis 1** → OFF Absolute value < **Preselection 1** - ½ **Hysteresis 1** → OFF
3	**RESULT >= PRES**	Absolute value is greater than or equal to **Preselection 1**, e.g. an overspeed id detected. If **Hysteresis 1** is greater than 0, the following switching condition arises: Absolute value ≥ **Preselection 1** → ON Absolute value < **Preselection 1** – **Hysteresis 1** → OFF
4	**RESULT <= PRES**	Absolute value is less than or equal to **Preselection 1**, e.g. an underspeed is detected (start up delay setting -see the **Start up delay 1 (s)** parameter on page 75- is advisable). If **Hysteresis 1** is greater than 0, the following

		switching condition arises: Absolute value ≤ **Preselection 1** → ON Absolute value > **Preselection 1** + **Hysteresis 1** → OFF
5	**RESULT = PRES**	Absolute value is equal to **Preselection 1**. A range (**Preselection 1** +/- ½ **Hysteresis 1**) can be defined and monitored along with a hysteresis value. If **Hysteresis 1** is greater than 0, the following switching condition arises: Absolute value > **Preselection 1** + ½ **Hysteresis 1** → OFF Absolute value < **Preselection 1** - ½ **Hysteresis 1** → OFF
6	**RESULT = 0**	Absolute value is zero (standstill after **Standstill time 1 (s)**), e. g. monitoring of standstill. (Only if **Mode** is set to "START/STOP" and **Operational mode** is set to "SPEED"; or if **Mode** is set to "FREQUENCY").
7	**RES>=PRES-TRAIL**	Trailing **Preselection 1**: Absolute value is greater than or equal to **Preselection 1** – **Preselection 4** → ON **Preselection 4** is the trailing preselection from **Preselection 1**.
8	**ERROT SET**	Error message for device errors, see also on page 32.

Hysteresis 1

This parameter sets the switching hysteresis of the switch-off point for **Preselection 1** value.

0	No switching hysteresis
...	
99999	Switching hysteresis = 99999

Pulse time 1 (s)

Duration of the output pulse for the switching condition of **Preselection 1** value.

0.000	No output pulse (static signal)
...	
60.000	Pulse duration = 60 seconds

Output target 1

Assignment of an output for the switching condition of **Preselection 1** value.
If more than one switching condition is assigned to the output, the output is set when one switching condition at least is true.

0	**NO**	No switching condition assigned
1	**CTRL OUT 1**	Switching condition assigned to X6 "2 - Ctrl. Out 1"
2	**CTRL OUT 2**	Switching condition assigned to X6 "3 - Ctrl. Out 2"
3	**CTRL OUT 3**	Switching condition assigned to X6 "4 - Ctrl. Out 3"
4	**CTRL OUT 4**	Switching condition assigned to X6 "5 - Ctrl. Out 4"
5	**CTRL OUT 5**	Switching condition assigned to X6 "6 - Ctrl. Out 5"
6	**CTRL OUT 6**	Switching condition assigned to X6 "7 - Ctrl. Out 6"

Output polarity 1

Polarity for the switching condition of **Preselection 1**.

0	**ACTIVE HIGH**	Switching condition is true → Active "HIGH"
1	**ACTIVE LOW**	Switching condition is true → Active "LOW"

Output lock 1

Latch for the switching condition of **Preselection 1**.

0	**NO**	No latch for **Preselection 1**
1	**YES**	Latch for **Preselection 1** (command **12 - LOCK RELEASE** -see the **Input 1 action** parameter on page 93- will clear the latch).

Start up delay 1 (s)

Start up delay setting / suppression for the switching condition of **Preselection 1**.
This adjustment only applies to the switching conditions **1 - |RESULT|<=|PRES|** and **4 - RESULT<=PRES** (see the **Mode 1** parameter on page 73).
Start up delay 1 (s) is set to this parameter when the frequency is detected as 0 Hz (or the speed is 0 m/s). The monitoring function remains deactivated until the set time has elapsed.
If the parameter is set to "60.000", the automatic start override is activated. The monitoring function remains deactivated until the preset value / switching point is exceeded for the first time.

0	No start up delay setting
...	
59.999	Start up delay setting expressed in seconds
60.000	Automatic start-up delay

5.9 Preselection 2 menu

The **Preselection 2** menu sets the characteristics of **Preselection 2**.

Mode 2

Switching conditions for **Preselection 2**. The output switches under the following conditions:

0 ... 6 and 8		For complete information on the switching conditions 0 ... 6 and 8, please refer to the **Mode 1** parameter in the "5.8 Preselection 1 menu" section on page 73.
7	**RES>=PRES-TRAIL**	Trailing **Preselection 2**: Absolute value is greater than or equal to **Preselection 2** – **Preselection 5** → **ON** **Preselection 5** is the trailing preselection from **Preselection 2**.

Hysteresis 2

This parameter sets the switching hysteresis of the switch-off point for **Preselection 2** value. For complete information please refer to the **Hysteresis 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Pulse time 2 (s)

Duration of the output pulse for the switching condition of **Preselection 2** value. For complete information please refer to the **Pulse time 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output target 2

Assignment of an output for the switching condition of **Preselection 2** value. For complete information please refer to the **Output target 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

0	**NO**	See "5.8 Preselection 1 menu" section on page 73
1	**CTRL OUT 1**	
2	**CTRL OUT 2**	Switching condition assigned to X6 "3 - Ctrl. Out 2"
3	**CTRL OUT 3**	See "5.8 Preselection 1 menu" section on page 73
4	**CTRL OUT 4**	
5	**CTRL OUT 5**	
6	**CTRL OUT 6**	

Output polarity 2

Polarity for the switching condition of **Preselection 2**. For complete information please refer to the **Output polarity 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output lock 2

Latch for the switching condition of **Preselection 2**. For complete information please refer to the **Output lock 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Start up delay 2 (s)

Start up delay setting / suppression for the switching condition of **Preselection 2**. For complete information please refer to the **Start up delay 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

5.10 Preselection 3 menu

The **Preselection 3** menu sets the characteristics of **Preselection 3**.

Mode 3

Switching conditions for **Preselection 3**. The output switches under the following conditions:

0 ... 6 and 8		For complete information on the switching conditions 0 ... 6 and 8, please refer to the **Mode 1** parameter in the "5.8 Preselection 1 menu" section on page 73.
7	**RES>=PRES-TRAIL**	Trailing **Preselection 3**: Absolute value is greater than or equal to **Preselection 3** – **Preselection 6** → **ON** **Preselection 6** is the trailing preselection from **Preselection 3**.

Hysteresis 3

This parameter sets the switching hysteresis of the switch-off point for **Preselection 3** value. For complete information please refer to the **Hysteresis 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Pulse time 3 (s)

Duration of the output pulse for the switching condition of **Preselection 3** value. For complete information please refer to the **Pulse time 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output target 3

Assignment of an output for the switching condition of **Preselection 3** value. For complete information please refer to the **Output target 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

0	**NO**	See "5.8 Preselection 1 menu" section on page 73
1	**CTRL OUT 1**	
2	**CTRL OUT 2**	
3	**CTRL OUT 3**	Switching condition assigned to X6 "4 - Ctrl. Out 3"
4	**CTRL OUT 4**	See "5.8 Preselection 1 menu" section on page 73
5	**CTRL OUT 5**	
6	**CTRL OUT 6**	

Output polarity 3

Polarity for the switching condition of **Preselection 3**. For complete information please refer to the **Output polarity 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output lock 3

Latch for the switching condition of **Preselection 3**. For complete information please refer to the **Output lock 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Start up delay 3 (s)

Start up delay setting / suppression for the switching condition of **Preselection 3**. For complete information please refer to the **Start up delay 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

5.11 Preselection 4 menu

The **Preselection 4** menu allows to set the characteristics for **Preselection 4**.

Mode 4

Switching conditions for **Preselection 4**. The output switches under the following conditions:

0 ... 6 and 8		For complete information on the switching conditions 0 ... 6 and 8, please refer to the **Mode 1** parameter in the "5.8 Preselection 1 menu" section on page 73.
7	**RES>=PRES-TRAIL**	Trailing **Preselection 4**: Absolute value is greater than or equal to **Preselection 4** – **Preselection 1** → **ON** **Preselection 1** is the trailing preselection from **Preselection 4**.

Hysteresis 4

This parameter sets the switching hysteresis of the switch-off point for **Preselection 4** value. For complete information please refer to the **Hysteresis 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Pulse time 4 (s)

Duration of the output pulse for the switching condition of **Preselection 4** value. For complete information please refer to the **Pulse time 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output target 4

Assignment of an output for the switching condition of **Preselection 4** value. For complete information please refer to the **Output target 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

0	**NO**	See "5.8 Preselection 1 menu" section on page 73
1	**CTRL OUT 1**	
2	**CTRL OUT 2**	
3	**CTRL OUT 3**	
4	**CTRL OUT 4**	Switching condition assigned to X6 "5 - Ctrl. Out 4"
5	**CTRL OUT 5**	See "5.8 Preselection 1 menu" section on page 73
6	**CTRL OUT 6**	

Output polarity 4

Polarity for the switching condition of **Preselection 4**. For complete information please refer to the **Output polarity 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output lock 4

Latch for the switching condition of **Preselection 4**. For complete information please refer to the **Output lock 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Start up delay 4 (s)

Start up delay setting / suppression for the switching condition of **Preselection 4**. For complete information please refer to the **Start up delay 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

5.12 Preselection 5 menu

The **Preselection 5** menu allows to set the characteristics for **Preselection 5**.

Mode 5

Switching conditions for **Preselection 5**. The output switches under the following conditions:

0 ... 6 and 8		For complete information on the switching conditions 0 ... 6 and 8, please refer to the **Mode 1** parameter in the "5.8 Preselection 1 menu" section on page 73.
7	**RES>=PRES-TRAIL**	Trailing **Preselection 5**: Absolute value is greater than or equal to **Preselection 5** – **Preselection 2** → **ON** **Preselection 2** is the trailing preselection from **Preselection 5**.

Hysteresis 5

This parameter sets the switching hysteresis of the switch-off point for **Preselection 5** value. For complete information please refer to the **Hysteresis 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Pulse time 5 (s)

Duration of the output pulse for the switching condition of **Preselection 5** value. For complete information please refer to the **Pulse time 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output target 5

Assignment of an output for the switching condition of **Preselection 5** value. For complete information please refer to the **Output target 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

0	**NO**	See "5.8 Preselection 1 menu" section on page 73
1	**CTRL OUT 1**	
2	**CTRL OUT 2**	
3	**CTRL OUT 3**	
4	**CTRL OUT 4**	
5	**CTRL OUT 5**	Switching condition assigned to X6 "6 - Ctrl. Out 5"
6	**CTRL OUT 6**	See "5.8 Preselection 1 menu" section on page 73

Output polarity 5

Polarity for the switching condition of **Preselection 5**. For complete information please refer to the **Output polarity 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output lock 5

Latch for the switching condition of **Preselection 5**. For complete information please refer to the **Output lock 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Start up delay 5 (s)

Start up delay setting / suppression for the switching condition of **Preselection 5**. For complete information please refer to the **Start up delay 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

5.13 Preselection 6 menu

The **Preselection 6** menu allows to set the characteristics for **Preselection 6**.

Mode 6

Switching conditions for **Preselection 6**. The output switches under the following conditions:

0 ... 6 and 8		For complete information on the switching conditions 0 ... 6 and 8, please refer to the **Mode 1** parameter in the "5.8 Preselection 1 menu" section on page 73.
7	**RES>=PRES-TRAIL**	Trailing **Preselection 6**: Absolute value is greater than or equal to **Preselection 6** – **Preselection 3** → **ON** **Preselection 3** is the trailing preselection from **Preselection 6**.

Hysteresis 6

This parameter sets the switching hysteresis of the switch-off point for **Preselection 6** value. For complete information please refer to the **Hysteresis 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Pulse time 6 (s)

Duration of the output pulse for the switching condition of **Preselection 6** value. For complete information please refer to the **Pulse time 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output target 6

Assignment of an output for the switching condition of **Preselection 6** value. For complete information please refer to the **Output target 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

0	**NO**	See "5.8 Preselection 1 menu" section on page 73
1	**CTRL OUT 1**	
2	**CTRL OUT 2**	
3	**CTRL OUT 3**	
4	**CTRL OUT 4**	
5	**CTRL OUT 5**	
6	**CTRL OUT 6**	Switching condition assigned to X6 "7 - Ctrl. Out 6"

Output polarity 6

Polarity for the switching condition of **Preselection 6**. For complete information please refer to the **Output polarity 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Output lock 6

Latch for the switching condition of **Preselection 6**. For complete information please refer to the **Output lock 1** parameter in the "5.8 Preselection 1 menu" section on page 73.

Start up delay 6 (s)

Start up delay setting / suppression for the switching condition of **Preselection 6**. For complete information please refer to the **Start up delay 1 (s)** parameter in the "5.8 Preselection 1 menu" section on page 73.

5.14 Serial menu

The **Serial** menu allows to configure the basic settings of the serial interface (of both the terminal blocks 1, 2, 3, 4 and 5 of connector X3 and the serial USB). For complete information on the serial port and serial USB features, please refer to the "4.6 Serial interface (X3 Serial Interface)" section on page 27; and to the "4.10 Serial USB interface (X7 USB)" section on page 31.

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).

11	Smallest address value
...	
99	Highest address value

Serial baud rate

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

0	**9600**	9,600 baud
1	**19200**	19,200 baud
2	**38400**	38,400 baud

Serial format

This parameter allows to set the bit data format.

		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

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 in the previous page (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.

00.000	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**, **Input 2 action** and **Input 3 action** parameters on pages 93 and 95).
...	
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	Analog_Out_Voltage (Analog output modulation [in mV])
2	:2	Frequency (measured frequency - channel A)
3	:3	Frequency_2 (measured frequency - channel B)
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	Analog_Out_Current (Analog output modulation [in µA])
12	;2	Analog_Out_Percentage (Percentage of the analog output level) (Measurement result in xxx.x %)
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

This parameter enables the Modbus protocol and allows to set the Modbus address.
For details on the Lecom protocol please refer to the "6 - Appendix" section on page 100.
For details on the Modbus communication please refer to the "7 - Modbus RTU Interface" section on page 101.

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. The set value is the Modbus address of the device.

Unit number (USB)

This parameter allows to set the address of the serial USB interface.

NOTE
This value is set fixed to "11" and cannot be changed by the user.

11	Smallest address value

Serial Baud rate (USB)

This parameter allows to set the serial transmission speed (baud rate) of the USB interface.

NOTE
This value is set fixed to "0 = 115200" and cannot be changed by the user.

0	**115200**	115,200 baud

Serial format (USB)

This parameter allows to set the bit data format of the USB interface.

NOTE
This value is set fixed to "0 = 8-NONE-1" and cannot be changed by the user.

		Data Bits	Parity Bit	Stop Bits
0	**8-NONE-1**	8	no	1

5.15 Analog menu

The **Analog** menu allows to configure the basic settings of the analogue output (terminal blocks 1, 2, and 3 of terminal X4). The analog output always refers to the scaled "Measurement Result".
For complete information on the analogue output features, please refer to the "4.7 Analogue output (X4 Analog Out)" section on page 28.

Analog format

This parameter sets the characteristics of the analogue output. The analogue output is proportional to the absolute value.
If **Analog format** is set to "**0 = -10...10V**", the polarity of the analogue output depends on the polarity of the absolute value.

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

Analog start

This parameter sets the start value of the analogue conversion. The start value corresponds to the absolute value for an analogue output of 0 V or 0 mA or 4 mA depending on the set **Analog format**.

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

Analog end

This parameter sets the end value of the analogue conversion. The end value corresponds to the absolute value for an analogue output of (+/-)10 V or 20 mA depending on the set **Analog format**.

-99999999	Smallest end value
10000	Default value
+99999999	Highest end value

Analog gain (%)

This parameter sets the maximum conversion of the analogue output expressed in percentage (%).

0.00	Smallest gain
100.00	Default value
103.00	Highest gain

EXAMPLE
If you set "102.00" next to this item the result will be a conversion of 10.2 V or 20.4 mA when the value set next to the **Analog end** parameter is reached.
If you set "95.00" next to this item the result will be a conversion of 9.5 V or 18 mA when the value set next to the **Analog end** parameter is reached.

Analog offset (%)

This parameter sets the zero offset of the analogue output.

-99.99	Smallest offset
0	Default value
+99.99	Highest offset

EXAMPLE
If you set "0.20" next to this item the result will be an offset of 0.02 V or 0.04 mA as regards the **Analog start** value.

5.16 Command menu

The **Command** menu allows to configure the operation of the inputs "2 - Ctrl. In 1", "3 - Ctrl. In 2", "4 - Ctrl. In 3", "5 - Ctrl. In 4", "6 - Ctrl. In 5" and "7 - Ctrl. In 6" of terminal X5.
For complete information on the control inputs features, please refer to the "4.8 Control inputs (X5 Control Input)" section on page 29.

Input 1 action

This parameter sets the function of the input "2 - 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). 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. 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	(s)
3	TEACH ANALOG START	It transfers the current measurement result to the **Analog start** parameter	(d)
4	TEACH ANALOG END	It transfers the current measurement result to the **Analog end** parameter	(d)
5	TEACH PRESELECTION 1	It transfers the current measurement result to the **Preselection 1** parameter	(d)
6	TEACH PRESELECTION 2	It transfers the current measurement result to the **Preselection 2** parameter	(d)
7	TEACH PRESELECTION 3	It transfers the current measurement result to the **Preselection 3** parameter	(d)
8	TEACH PRESELECTION 4	It transfers the current measurement result to the **Preselection 4** parameter	(d)
9	TEACH PRESELECTION 5	It transfers the current measurement result to the **Preselection 5** parameter	(d)
10	TEACH PRESELECTION 6	It transfers the current measurement result to the **Preselection 6** parameter	(d)
11	RESET MIN/MAX	It resets the minimum / maximum value	(d) (s)

12	LOCK RELEASE	It releases the latching of all outputs	(d)
13	SERIAL PRINT	It sends serial data, see the **Serial value** parameter	(d)
14	ACTIVATE DATA	N.A.	
15	STORE DATA	N.A.	
16	TESTPROGRAM	N.A.	
17	CLEAR LOOP TIME	It resets the maximum value of "Loop Time"	(d)
18	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)
19	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)
20	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)
21	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)
22	ZERO POSITION	If **Mode** is set to "**SSI**": it transfers the current SSI position to the **SSI zero** parameter (encoder zero offset)	(d) (s)
23	FACTORY SETTINGS	The device is reset to the factory settings	(d)

(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).
N.A. = not available

Input 1 config

This parameter sets the switching characteristics of the input "2 - 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 93.

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 on page 95.

Input 3 action

This parameter sets the function of the input "4 - Ctrl. In 3". For complete information please refer to the **Input 1 action** parameter on page 93.

Input 3 config

This parameter sets the switching characteristics of the input "4 - Ctrl. In 3". For complete information please refer to the **Input 1 config** parameter on page 95.

Input 4 action

This parameter sets the function of the input "5 - Ctrl. In 4". For complete information please refer to the **Input 1 action** parameter on page 93.

Input 4 config

This parameter sets the switching characteristics of the input "5 - Ctrl. In 4". For complete information please refer to the **Input 1 config** parameter on page 95.

Input 5 action

This parameter sets the function of the input "6 - Ctrl. In 5". For complete information please refer to the **Input 1 action** parameter on page 93.

Input 5 config

This parameter sets the switching characteristics of the input "6 - Ctrl. In 5". For complete information please refer to the **Input 1 config** parameter on page 95.

Input 6 action (factory settings)

This parameter is fixed to "23 = Factory Settings" and cannot be changed. For complete information please refer to the **Input 1 action** parameter on page 93.

Input 6 config (rising edge)

This parameter is fixed to "2 = Rising edge" and cannot be changed. For complete information please refer to the **Input 1 config** parameter on page 95.

5.17 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 41) 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 "5.17.1 Description of the linearisation function" section below.

P1(X)

...

P24(X)

X-coordinate of the linearisation point.
This value represents the value the unit provides 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 value the unit will provide 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

5.17.1 Description of the linearisation function

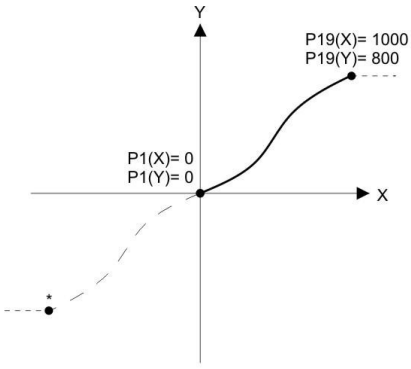
The linearisation function allows to convert a linear input signal into a non-linear representation (or vice versa). 24 programmable X / Y coordinates (interpolation points) are available for input 1 and input 2, they can be freely arranged over the whole conversion range at any desired distance. The 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 41) must be set to either "1 - 1 QUADRANT" or "2 - 4 QUADRANT" (see the diagrams below).

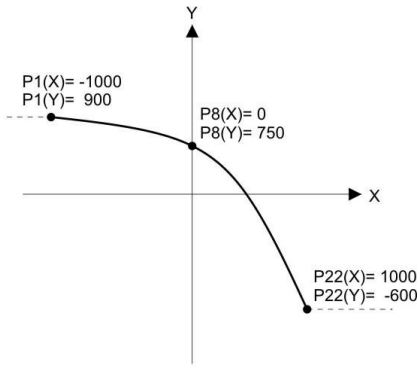
The parameters **P1(X)** to **P24(X)** are used to specify the coordinates on the x-axis. These are the measuring values that the unit would normally generate according to the actual input signal.

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 provided.



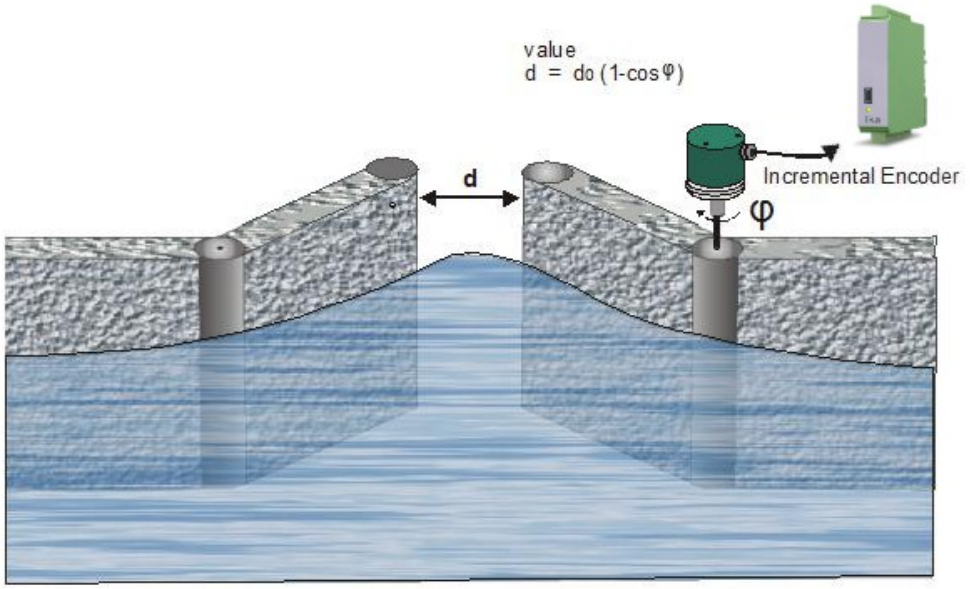
Example: Linearization Mode: 1 Quadrant
* Linearization is point symmetric to 1. Quadrant



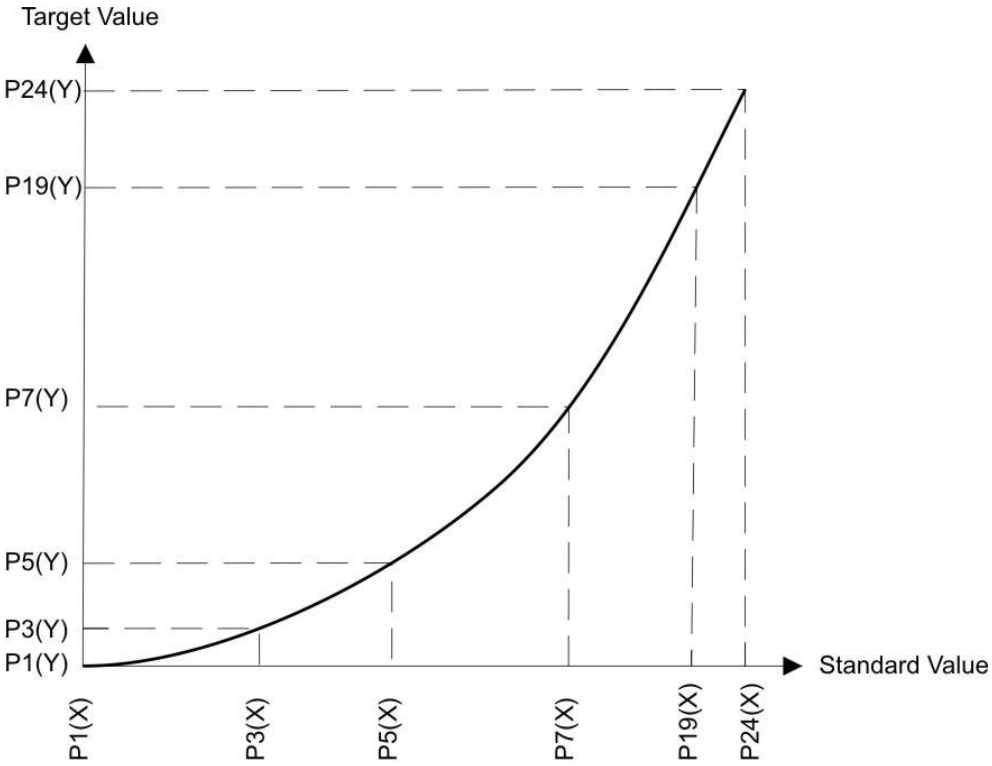
Example: Linearization Mode: 4 Quadrant

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 provided.

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 "5.14 Serial menu" section on page 87) are available for serial readout by a PC or a PLC. For communication the unit uses the Drivecom Protocol according to ISO 1745 or the Modbus RTU protocol. 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); or in the "7 - Modbus RTU Interface" section in the next page of this manual.

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

EOT	AD1	AD2	C1	C2	ENQ

EOT = control character 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 as follows:

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 - Modbus RTU Interface

The device is a standard Modbus RTU Slave and provides the following Modbus functions:

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

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

7.1 Parameter setting

The following parameters available in the "5.14 Serial menu" section (see on page 87) are required for Modbus protocol:

Unit number

Not used for Modbus communication.
If you need to set the Modbus address refer to the **MODBUS** parameter on page 90.

Serial baud rate

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

0	**9600**	9,600 baud
1	**19200**	19,200 baud
2	**38400**	38,400 baud

Serial format

This parameter allows to set the bit data format.

		Data Bits	Parity Bit	Stop Bits
0	7-EVEN-1	Not used for Modbus communication		
1	7-EVEN-2			
2	7-ODD-1			
3	7-ODD-2			
4	7-NONE-1			
5	7-NONE-2			
6	**8-EVEN-1**	8	even	1
7	**8-ODD-1**	8	odd	1

8	8-NONE-1	Not used for Modbus communication		
9	**8-NONE-2**	8	no	2

Serial protocol
Not used for Modbus communication.

Serial timer (s)
Not used for Modbus communication.

Serial value
Not used for Modbus communication.

MODBUS
This parameter enables the Modbus protocol and allows to set the Modbus address.

0	Not used for Modbus communication, Modbus protocol is disabled.
1 ... 247	Modbus protocol is enabled: the serial interface is using the Modbus RTU protocol. The set value is the Modbus address of the device.

7.2 Modbus Communication
The Modbus functions described hereafter are available.

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

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

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

7.2.2 Access to parameters

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

The holding register numbers for a certain parameter can be calculated by means of the parameter # that can be found in the parameter table in this manual (see the "8 - Parameters / serial codes" section on page 106):
Holding Register low = (parameter #) x 2
Holding Register high = (parameter #) x 2 + 1

EXAMPLE
Access the parameter # 63 **Preselection 1** by using the Holding Register 0x007E and 0x007F hex.

7.2.3 Access to current data

Holding Register 0x1000 / 0x1001 hex and the followings allow to access the variables of the device (actual data registers):
Holding Register 0x1000 / 0x1001 hex → Current data with serial Code ":0" (Display value)
Holding Register 0x1002 / 0x1003 hex → Current data with serial Code ":1"
Holding Register 0x1004 / 0x1005 hex → Current data with serial Code ":2"
Holding Register 0x1006 / 0x1007 hex → Current data with serial Code ":3"
etc.

7.2.4 Access to status registers

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

Holding Register 0x2000 / 0x2001 hex → Output Status (Ctrl. Out status, read only)
Holding Register 0x2002 / 0x2003 hex → Serial Commands
Holding Register 0x2004 / 0x2005 hex → External Command (Ctrl. In status, read only)
Holding Register 0x2006 / 0x2007 hex → All Commands (read only)

7.2.5 Read Coils and Write Single Coil

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

Coil number	Serial code of command	Command	
0	54	Reset / Set	It transfers the currently detected position value to the **SSI offset** parameter It sets the Counter A and the Counter B to **Set value A** and **Set value B** respectively
1	55	Freeze Display	It freezes the current

			measurement result
2	56	Teach Analog Start	It transfers the current measurement result to the **Analog start** parameter
3	57	Teach Analog End	It transfers the current measurement result to the **Analog end** parameter
4	58	Teach Preselection 1	The current measurement result is stored as **Preselection 1**
5	59	Teach Preselection 2	The current measurement result is stored as **Preselection 2**
6	60	Teach Preselection 3	The current measurement result is stored as **Preselection 3**
7	61	Teach Preselection 4	The current measurement result is stored as **Preselection 4**
8	62	Teach Preselection 5	The current measurement result is stored as **Preselection 5**
9	63	Teach Preselection 6	The current measurement result is stored as **Preselection 6**
10	64	Reset Min/Max	Reset of the min. / max. values
11	65	Lock Release	Release latching of all outputs
12	66	Serial Print	It sends serial data, see the **Serial value** parameter (do not use with Modbus)
13	67	Activate Data	Data is activated (not required with Modbus)
14	68	Store Data	Store to EEPROM
15	69	Testprogram	Test program (do not use with Modbus)
16	5:	Clear Loop Time	It resets the maximum loop time
17	5;	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**
18	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**
19	5=	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
20	5>	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
21	5?	Zero position	If **Mode** is set to "**SSI**": it transfers the current SSI position to the **SSI zero** parameter (encoder zero offset)

7.2.6 Diagnostics

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

8 - Parameters / serial codes

8.1 General menu

See the "5.2 General menu" section on page 40

#	Parameter	Serial code	Min. value	Max. value	Default value
1	Mode	00	0	4	0
2	Encoder properties	01	0	4	0
3	Encoder direction	02	0	1	0
4	Factor	03	-99999999	99999999	1
5	Divider	04	-99999999	99999999	1
6	Additive value	05	-99999999	99999999	1
7	Linearization mode	06	0	2	0
8	Back up memory	07	0	1	1
9	Factory settings	08	0	1	0
10	-	09	0	0	0
11	-	10	0	0	0

8.2 Frequency mode menu

See the "5.3 Frequency mode menu" section on page 43

#	Parameter	Serial code	Min. value	Max. value	Default value
13	Frequency mode	11	0	5	0
14	Frequency base	12	0	3	2
15	Sampling time 1 (s)	13	1	9999	100
16	Wait time 1 (s)	14	1	7999	100
17	Standstill time 1 (s)	15	1	9999	1
18	Average filter 1	16	0	16	0
19	Sampling time 2 (s)	17	1	9999	100
20	Wait time 2 (s)	18	1	799	100
21	Average filter 2	19	0	16	0
22	-	20	0	0	0
23	-	21	0	0	0

8.3 Counter mode menu

See the "5.4 Counter mode menu" section on page 51

#	Parameter	Serial code	Min. value	Max. value	Default value
25	Count mode	22	0	5	3
26	Factor A	23	1	9999999	100000
27	Set value A	24	-99999999	99999999	0
28	Factor B	25	1	9999999	100000
29	Set value B	26	-99999999	99999999	0
30	Round loop value	27	0	99999999	0
31	-	28	0	0	0
32	-	29	0	0	0

8.4 SSI mode menu

See the "5.5 SSI mode menu" section on page 54

#	Parameter	Serial code	Min. value	Max. value	Default value
34	SSI mode	30	0	1	0
35	Encoder resolution	31	10	32	25
36	Data format	32	0	1	0
37	Baud rate	33	0	5	2
38	SSI zero	34	0	99999999	0
39	High bit	35	1	32	25
40	Low bit	36	1	32	1
41	SSI offset	37	0	99999999	0
42	Round loop value	38	0	9999999	0
43	Sampling time (s)	39	1	9999	10
44	Error bit	40	0	32	0
45	Error polarity	41	0	1	0
46	-	42	0	0	0
47	-	43	0	0	0

8.5 Start/Stop mode menu

See the "5.6 Start/Stop mode menu" section on page 66

#	Parameter	Serial code	Min. value	Max. value	Default value
49	Init mode	44	0	1	0
50	Sampling time (ms)	45	200	16000	4000
51	Init pulse time (µs)	46	1	9	2
52	Velocity (m/s)	47	100	999999	280000
53	Operational mode	48	0	2	0
54	Offset	49	-99999999	99999999	0
55	Circumference (mm)	50	1	99999999	100000
56	Round loop value	51	1	99999999	360
57	Average filter - position	52	0	4	0
58	Standstill time (s)	53	1	9999	1
59	Average filter - speed	U0	0	4	0
60	-	U1	0	0	0
61	-	U2	0	0	0

8.6 Preselection values menu

See the "5.7 Preselection values menu" section on page 71

#	Parameter	Serial code	Min. value	Max. value	Default value
63	Preselection 1	A0	-99999999	99999999	1000
64	Preselection 2	A1	-99999999	99999999	2000
65	Preselection 3	A2	-99999999	99999999	3000
66	Preselection 4	A3	-99999999	99999999	4000
67	Preselection 5	A4	-99999999	99999999	5000
68	Preselection 6	A5	-99999999	99999999	6000

8.7 Preselection 1 menu

See the "5.8 Preselection 1 menu" section on page 73

#	Parameter	Serial code	Min. value	Max. value	Default value
70	Mode 1	A6	0	8	0
71	Hysteresis 1	A7	0	99999	0
72	Pulse time 1 (s)	A8	0	60000	0
73	Output target 1	A9	0	6	1
74	Output polarity 1	B0	0	1	0
75	Output lock 1	B1	0	1	0
76	Start up delay 1 (s)	B2	0	60000	0
77	-	B3	0	0	0
78	-	B4	0	0	0
79	-	B5	0	0	0
80	-	B6	0	0	0

8.8 Preselection 2 menu

See the "5.9 Preselection 2 menu" section on page 77

#	Parameter	Serial code	Min. value	Max. value	Default value
82	Mode 2	B7	0	8	0
83	Hysteresis 2	B8	0	99999	0
84	Pulse time 2 (s)	B9	0	60000	0
85	Output target 2	C0	0	6	2
86	Output polarity 2	C1	0	1	0
87	Output lock 2	C2	0	1	0
88	Start up delay 2 (s)	C3	0	60000	0
89	-	C4	0	0	0
90	-	C5	0	0	0
91	-	C6	0	0	0
92	-	C7	0	0	0

8.9 Preselection 3 menu

See the "5.10 Preselection 3 menu" section on page 79

#	Parameter	Serial code	Min. value	Max. value	Default value
94	Mode 3	C8	0	8	0
95	Hysteresis 3	C9	0	99999	0
96	Pulse time 3 (s)	D0	0	60000	0
97	Output target 3	D1	0	6	3
98	Output polarity 3	D2	0	1	0
99	Output lock 3	D3	0	1	0
100	Start up delay 3 (s)	D4	0	60000	0
101	-	D5	0	0	0
102	-	D6	0	0	0
103	-	D7	0	0	0
104	-	D8			

8.10 Preselection 4 menu

See the "5.11 Preselection 4 menu" section on page 81

#	Parameter	Serial code	Min. value	Max. value	Default value
106	Mode 4	D9	0	8	0
107	Hysteresis 4	E0	0	99999	0
108	Pulse time 4 (s)	E1	0	60000	0
109	Output target 4	E2	0	6	4
110	Output polarity 4	E3	0	1	0
111	Output lock 4	E4	0	1	0
112	Start up delay 4 (s)	E5	0	60000	0
113	-	E6	0	0	0
114	-	E7	0	0	0
115	-	E8	0	0	0
116	-	E9	0	0	0

8.11 Preselection 5 menu

See the "5.12 Preselection 5 menu" section on page 83

#	Parameter	Serial code	Min. value	Max. value	Default value
118	Mode 5	F0	0	8	0
119	Hysteresis 5	F1	0	99999	0
120	Pulse time 5 (s)	F2	0	60000	0
121	Output target 5	F3	0	6	5
122	Output polarity 5	F4	0	1	0
123	Output lock 5	F5	0	1	0
124	Start up delay 5 (s)	F6	0	60000	0
125	-	F7	0	0	0
126	-	F8	0	0	0
127	-	F9	0	0	0
128	-	G0	0	0	0

8.12 Preselection 6 menu

See the "5.13 Preselection 6 menu" section on page 85

#	Parameter	Serial code	Min. value	Max. value	Default value
130	Mode 6	G1	0	8	0
131	Hysteresis 6	G2	0	99999	0
132	Pulse time 6 (s)	G3	0	60000	0
133	Output target 6	G4	0	6	6
134	Output polarity 6	G5	0	1	0
135	Output lock 6	G6	0	1	0
136	Start up delay 6 (s)	G7	0	60000	0
137	-	G8	0	0	0
138	-	G9	0	0	0
139	-	H0	0	0	0
140	-	H1	0	0	0

8.13 Serial menu

See the "5.14 Serial menu" section on page 87

#	Parameter	Serial code	Min. value	Max. value	Default value
142	Unit number	T7	11	99	11
143	Serial baud rate	T8	0	2	0
144	Serial format	T9	0	9	0
145	Serial protocol	H2	0	1	0
146	Serial timer (s)	H3	0	60000	0
147	Serial value	H4	0	19	0
148	MODBUS	H5	0	247	0
149	Unit number (USB)	90	11	11	11
150	Serial Baud rate (USB)	91	0	0	0
151	Serial format (USB)	92	0	0	0

8.14 Analog menu

See the "5.15 Analog menu" section on page 91

#	Parameter	Serial code	Min. value	Max. value	Default value
153	Analog format	H8	0	2	0
154	Analog start	H9	-99999999	99999999	0
155	Analog end	I0	-99999999	99999999	10000
156	Analog gain (%)	I1	0	11000	10000
157	Analog offset (%)	I2	-9999	9999	0

8.15 Command menu

See the "5.16 Command menu" section on page 93

#	Parameter	Serial code	Min. value	Max. value	Default value
159	Input 1 action	I3	0	23	0
160	Input 1 config	I4	0	3	2
161	Input 2 action	I5	0	238	0
162	Input 2 config	I6	0	3	2
163	Input 3 action	I7	0	23	0
164	Input 3 config	I8	0	3	2
165	Input 4 action	I9	0	22	0
166	Input 4 config	J0	0	3	2
167	Input 5 action	J1	0	22	0
168	Input 5 config	J2	0	3	2
169	Input 6 action (factory settings)	J3	23	23	23
170	Input 6 config (rising edge)	J4	2	2	2
171	-	J5	0	0	0
172	-	J6	0	0	0
173	-	J7	0	0	0
174	-	J8	0	0	0
175	-	J9	0	0	0
176	-	K0	0	0	0

8.16 Linearization menu

See the "5.17 Linearization menu" section on page 97

#	Parameter	Serial code	Min. value	Max. value	Default value
178	P1(X)	K1	-99999999	99999999	0
179	P1(Y)	K2	-99999999	99999999	0
180	P2(X)	K3	-99999999	99999999	0
181	P2(Y)	K4	-99999999	99999999	0
182	P3(X)	K5	-99999999	99999999	0
183	P3(Y)	K6	-99999999	99999999	0
184	P4(X)	K7	-99999999	99999999	0
185	P4(Y)	K8	-99999999	99999999	0
186	P5(X)	K9	-99999999	99999999	0
187	P5(Y)	L0	-99999999	99999999	0
188	P6(X)	L1	-99999999	99999999	0
189	P6(Y)	L2	-99999999	99999999	0
190	P7(X)	L3	-99999999	99999999	0

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#	Parameter	Serial code	Min. value	Max. value	Default value
191	P7(Y)	L4	-99999999	99999999	0
192	P8(X)	L5	-99999999	99999999	0
193	P8(Y)	L6	-99999999	99999999	0
194	P9(X)	L7	-99999999	99999999	0
195	P9(Y)	L8	-99999999	99999999	0
196	P10(X)	L9	-99999999	99999999	0
197	P10(Y)	M0	-99999999	99999999	0
198	P11(X)	M1	-99999999	99999999	0
199	P11(Y)	M2	-99999999	99999999	0
200	P12(X)	M3	-99999999	99999999	0
201	P12(Y)	M4	-99999999	99999999	0
202	P13(X)	M5	-99999999	99999999	0
203	P13(Y)	M6	-99999999	99999999	0
204	P14(X)	M7	-99999999	99999999	0
205	P14(Y)	M8	-99999999	99999999	0
206	P15(X)	M9	-99999999	99999999	0
207	P15(Y)	N0	-99999999	99999999	0
208	P16(X)	N1	-99999999	99999999	0
209	P16(Y)	N2	-99999999	99999999	0
210	P17(X)	N3	-99999999	99999999	0
211	P17(Y)	N4	-99999999	99999999	0
212	P18(X)	N5	-99999999	99999999	0
213	P18(Y)	N6	-99999999	99999999	0
214	P19(X)	N7	-99999999	99999999	0
215	P19(Y)	N8	-99999999	99999999	0
216	P20(X)	N9	-99999999	99999999	0
217	P20(Y)	O0	-99999999	99999999	0
218	P21(X)	O1	-99999999	99999999	0
219	P21(Y)	O2	-99999999	99999999	0
220	P22(X)	O3	-99999999	99999999	0
221	P22(Y)	O4	-99999999	99999999	0
222	P23(X)	O5	-99999999	99999999	0
223	P23(Y)	O6	-99999999	99999999	0
224	P24(X)	O7	-99999999	99999999	0
225	P24(Y)	O8	-99999999	99999999	0

8.17 Serial codes of commands

Serial code	Command
54	RESET/SET
55	FREEZE DISPLAY
56	TEACH ANALOG START
57	TEACH ANALOG END
58	TEACH PRESELECTION 1
59	TEACH PRESELECTION 2
60	TEACH PRESELECTION 3
61	TEACH PRESELECTION 4
62	TEACH PRESELECTION 5
63	TEACH PRESELECTION 6
64	RESET MIN. / MAX.
65	LOCK RELEASE
66	SERIAL PRINT
67	ACTIVATE DATA
68	STORE DATA
69	TESTPROGRAM

5:	CLEAR LOOP TIME
5;	RESET/SET COUNTER A
5<	RESET/SET COUNTER B
5=	LOCK COUNTER A
5>	LOCK COUNTER B
5?	ZERO POSITION

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1.0	20.05.2020	First issue
1.1	21.09.2020	USB interface added, translation into Italian
1.2	19.02.2021	Minor amendments
1.3	18.09.2024	Examples added in the Counter menu and Frequency menu sections, Serial menu section updated, serial codes updated, minor amendments

Dispose separately

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