K23-SSI/Rx/IU-C

Signal converter

Manual

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1. Safety and Responsibility

1.1 General Safety Information

This description is an essential part of the device and contains important information regarding installation, function and use. Failure to observe these instructions may result in damage or impair the safety of people and attachments.

Please read this description carefully and observe all safety and warning messages before commissioning the device for the first time. Keep this description for future reference.

A prerequisite for using this device description is that the relevant personnel have the appropriate qualifications. The device may be installed, configured, commissioned and maintained only by a trained electrician.

Exclusion of liability: The manufacturer is not liable for any personal injury or property damage that may occur as a result of improper installation, commissioning, use or servicing, or due to human misinterpretations or errors within this device description. In addition, the manufacturer reserves the right to make technical changes to the device or description at any time without prior notice. Therefore, possible discrepancies between the device and the description cannot be ruled out.

The safety of the plant or of the overall system in which this device is integrated is the responsibility of the installer of the plant or the overall system.

All general, country-specific, and application-specific safety regulations and standards must be observed and followed during installation, operation, and maintenance work.

If the device is used in processes in which a possible failure or incorrect operation can result in damage to the plant or personal injury, appropriate precautions must be taken to ensure that such consequences are safely prevented.

1.2 Intended Use

This device is intended for use in industrial machinery and plants only. Any other use is not deemed to be in compliance with the provisions and is solely the responsibility of the user. The manufacturer is not liable for damage caused by improper use. The device may only be installed in the correct manner and be used and operated in a technically perfect condition—in accordance with the technical data. The device is not suitable for explosion-protected areas or in areas of application not included in DIN EN 61010-1.

1.3 Installation

The device may only be installed and operated in an environment that meets the permissible temperature range. Adequate ventilation must be ensured and the device must not have any direct contact with hot or aggressive gases or liquids.

The unit must be disconnected from all voltage sources prior to installation and before any maintenance work. It must also be ensured that no further danger can arise from touching the disconnected voltage sources.

Devices that are supplied with AC voltage may only be connected to the low-voltage network via switches or circuit breakers. This switch must be positioned close to the device and must have a marking that identifies it as a disconnector.

Input and output cables for extra-low voltages must be separated from dangerous, current-carrying cables by means of double or reinforced insulation (SELV circuits).

All cables and insulation selected must correspond to the intended voltage and temperature range. Device and country-specific standards must also be observed, which apply to the cables in terms of design, shape, and quality. For information on permissible cable cross sections for the screw terminal connections, refer to the technical data.

Before commissioning, all connections and cables must be checked for a solid fit in the screw terminals. All screw terminals (including unused ones) must be screwed in as far as they will go to ensure that they are securely fastened and cannot come loose in the event of mechanical vibrations.

Overvoltages at the connections to the device must be limited to the values of the gas group II overvoltage category.

The general standards for switch cabinet construction in the machinery industry and the manufacturer's specific shielding regulations apply with regard to installation, wiring, ambient conditions, and shielding and grounding of supply cables.

1.4 Cleaning, Care, and Maintenance Instructions

To clean the front, use only a soft, slightly damp cloth. No cleaning work is intended or required for the rear of the device. Unscheduled cleaning is the responsibility of the competent maintenance personnel or the relevant technician.

During normal operation, the device does not require any maintenance procedures. In the event of unexpected problems, errors or malfunctions, the device must be sent to the manufacturer to be checked and repaired if necessary. Unauthorized opening and repair can result in impairment or even failure of the protective measures supported by the device.

2. General Information

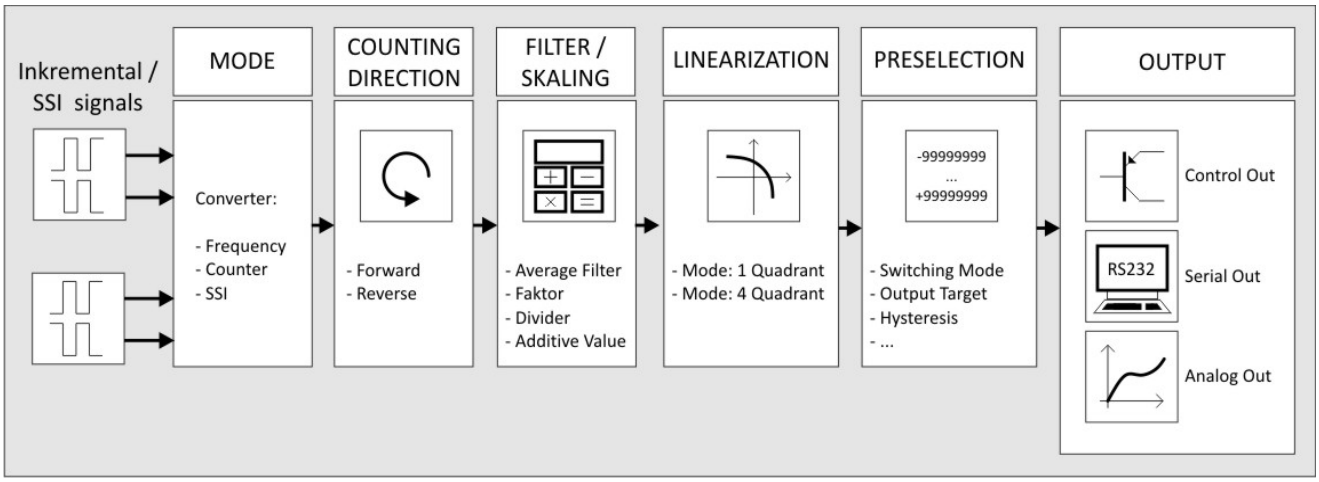
The device is designed as a signal converter with control inputs and outputs. Its extensive functions make it suitable for universal use.

2.1 Operating Modes

In general, all functions must be configured in the parameter menu. The device can be used in the following operating modes:

- Operation as a frequency converter for incremental input signals
- Operation as a position converter/counter for incremental input signals
- Operation as an absolute value converter for SSI signals

2.2 Function Diagram



2.3 Power LED / Error Messages

The device has a green LED on the front film. This lights up continuously as soon as the supply voltage of the device has been established. If an error occurs, the LED flashes in a 1-Hz cycle. The analog output is also modulated with 0 V or 0/4 mA. When there is no longer an error, the LED automatically lights up continuously again and the analog output reacts once more to the result currently pending.

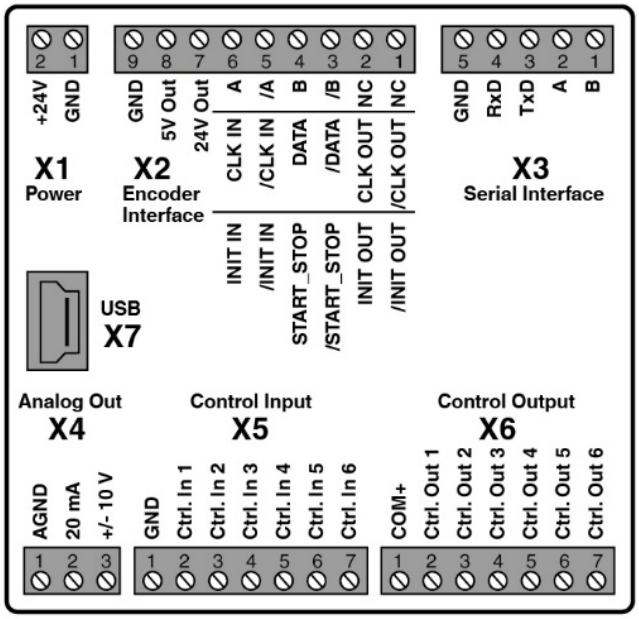
The exact error can be read out on the user interface (OS 6.0) via the serial interface. (→ Variable: Error_Status, Code: ";3"). See Chapter 4.

The individual error codes are explained in more detail below:

Error code (Error_Status)	Error name	Error description
0x00000001	Maximum Value	Measured value is greater than 99,999,999
0x00000002	Minimum Value	Measured value is less than -99,999,999
0x00000004	SSI Encoder Error	SSI Error bit set
0x00000010	Frequency (Input A) out of range	The maximum or minimum permissible input frequency at input A was exceeded or not reached with the exponential filter setting used.
0x00000020	Frequency (Input B) out of range	The maximum or minimum permissible input frequency at input B was exceeded or not reached with the exponential filter setting used.

3. Electrical Connections

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



3.1 DC Voltage Supply (X1)

The device can be supplied with a DC voltage between 18 and 30 V DC via terminal X1 pins 1 and 2. The current consumption depends, among other things, on the level of the supply voltage and the settings and is approx. 50 mA, plus the rotary encoder current taken from the auxiliary voltage output.

All GND connections are connected internally.

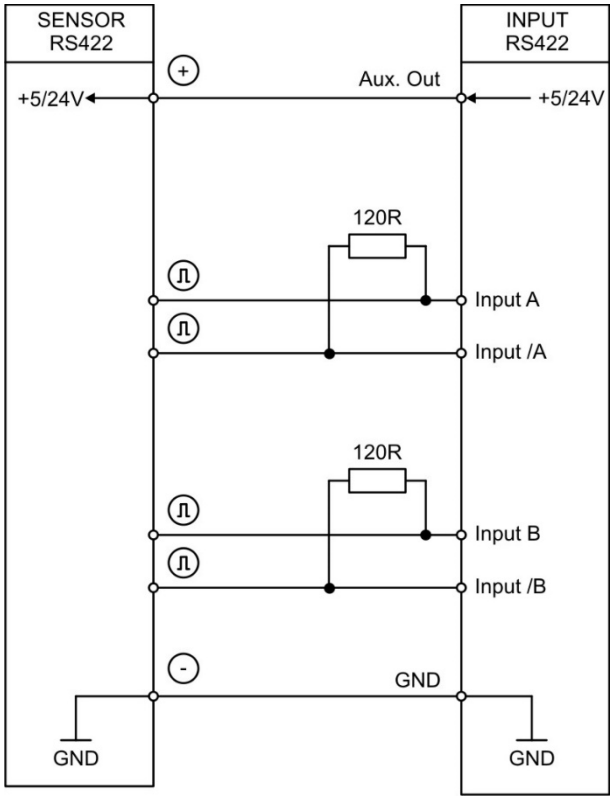
3.2 Auxiliary Voltage Output (X2)

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

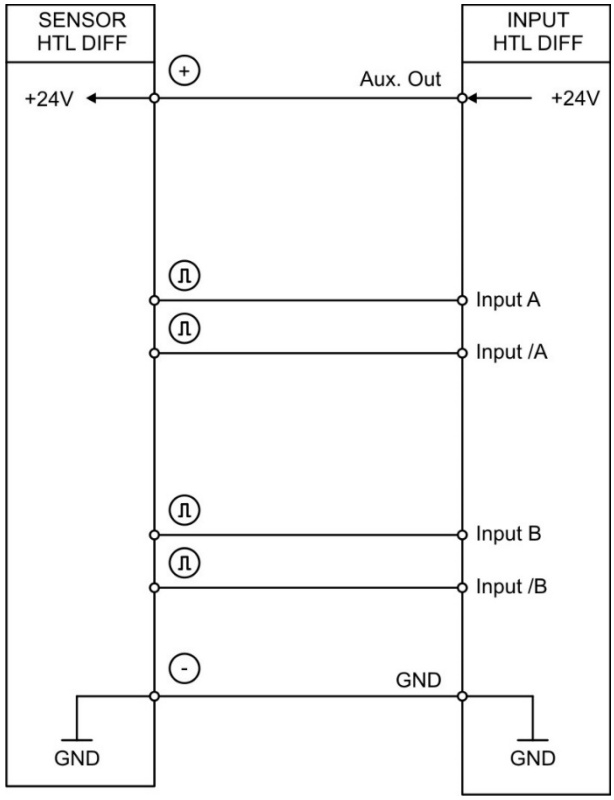
3.3 Incremental Rotary Encoder Input (X2)

A connection for various incremental signals is available at terminal X2 pins 3, 4, 5, and 6.

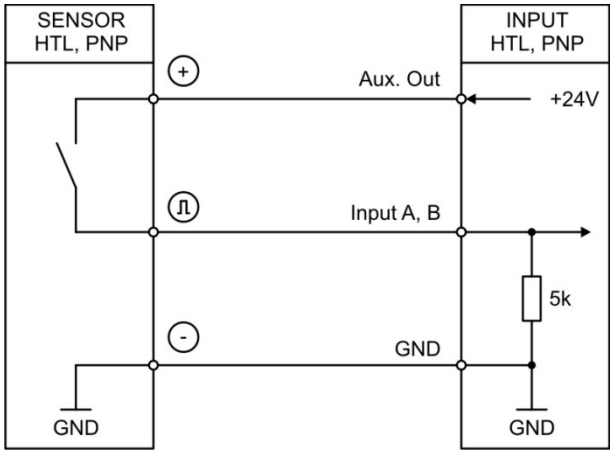
RS422



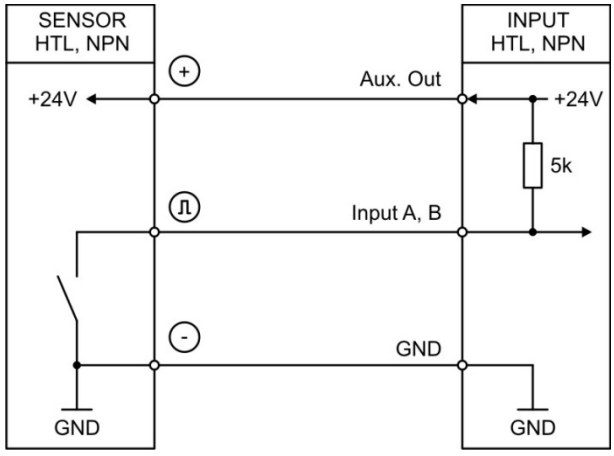
HTL DIFFERENTIAL



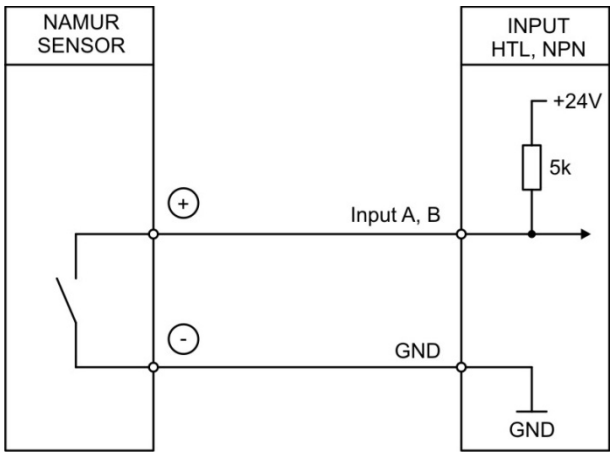
HTL PNP



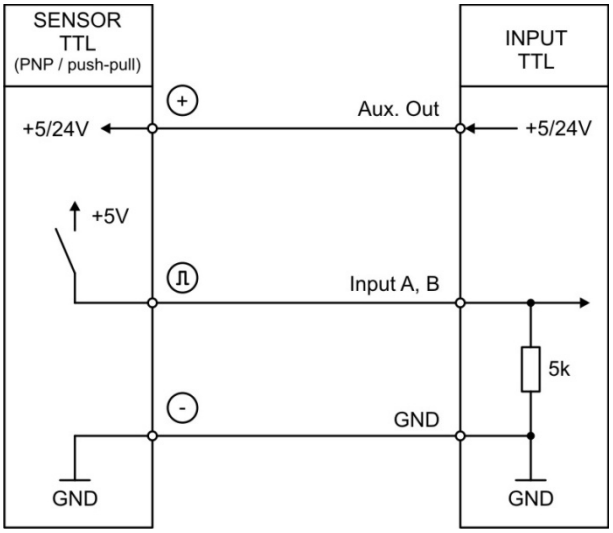
HTL NPN



HTL NPN (NAMUR)



TTL (PNP)



In general, open PNP inputs are "LOW" and open NPN inputs are "HIGH."

The input stages are designed for electronic pulse generators.

Note for mechanical switching contacts:

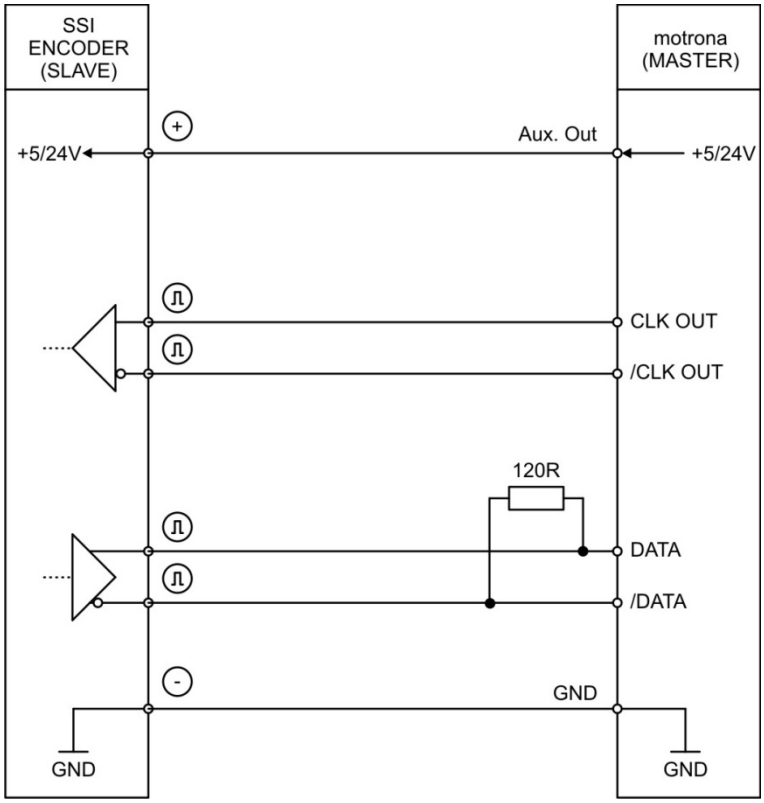
If, in exceptional cases, mechanical contacts are to be used as a pulse source, a commercially available external capacitor of approx. 10 µF must be installed at the terminals between GND(-) and the corresponding input (+). This attenuates the maximum input frequency to approximately 20 Hz and suppresses bouncing.

3.4 Absolute Rotary Encoder Input (X2)

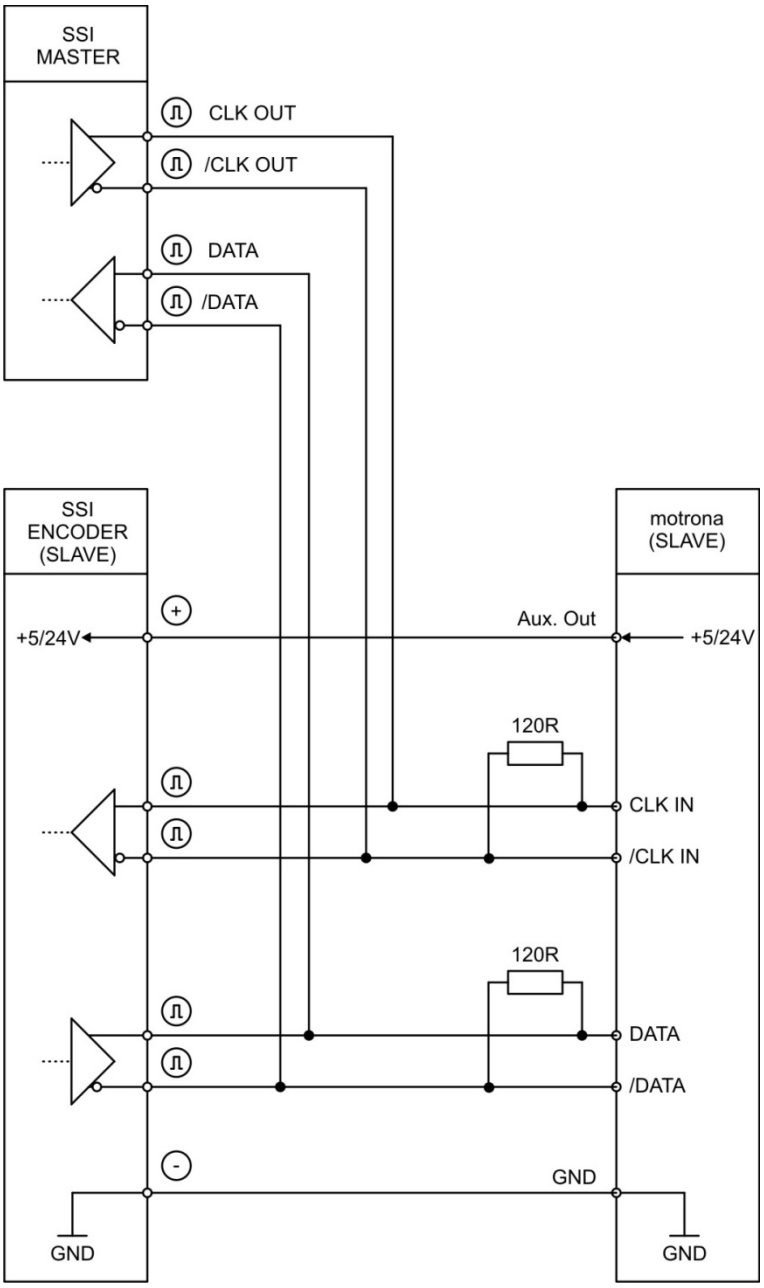
The SSI connection is available for managing operation at terminal X2 pins 1, 2, 3, 4.

The SSI connection is available for managed operation at terminal X2 pins 3, 4, 5, 6.

Connection for managing operation:



Connection for managed operation:



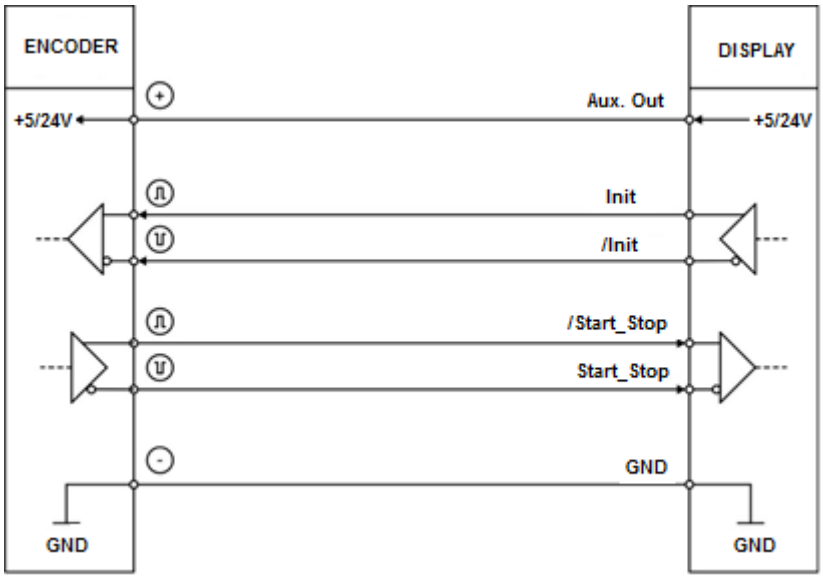
3.5 Start/Stop Encoder Inputs (X2)

The RS422 connection is available for the init pulse in managing operation at terminal X2 pins 1+2. The device generates the init pulse.

The RS422 connection is available for the init pulse in managed operation at terminal X2 pins 5+6. The init pulse is generated by an external device.

The RS422 connection is available for the Start/Stop pulse at terminal X2 pins 3+4.

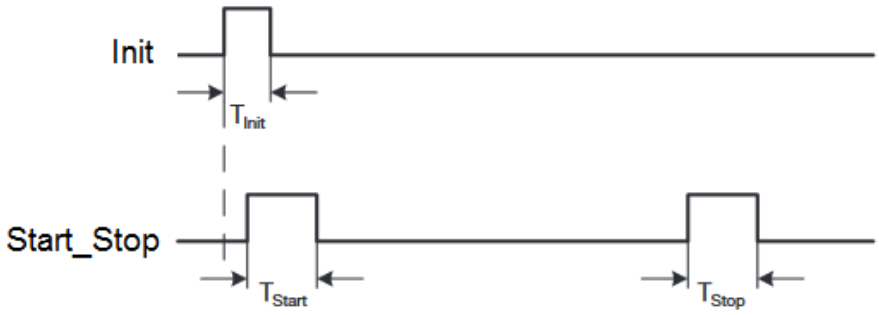
Connection of the RS422 signals



DPI measurement mode:

In managing operation, the init pulse is sent at regular intervals (=SAMPLING TIME [ms]) on the init line to the displacement transducer, the rising edge of which triggers a measurement.

The pulse duration of the init pulse can be set using the "INIT pulse TIME (µs)" parameter.



T_{Init}: 1 µs … 9 µs (adjustable)

T_{Start}: ~3 µs … 5 µs

T_{Stop}: ~3 µs … 5 µs

3.6 Control Inputs (X5)

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

Control input 1 (Ctrl. In 1) to control input 5 (Ctrl. In 5) are freely configurable in the COMMAND menu and are used for externally triggered functions such as releasing the self-locking mechanism, resetting the measurement result, or for

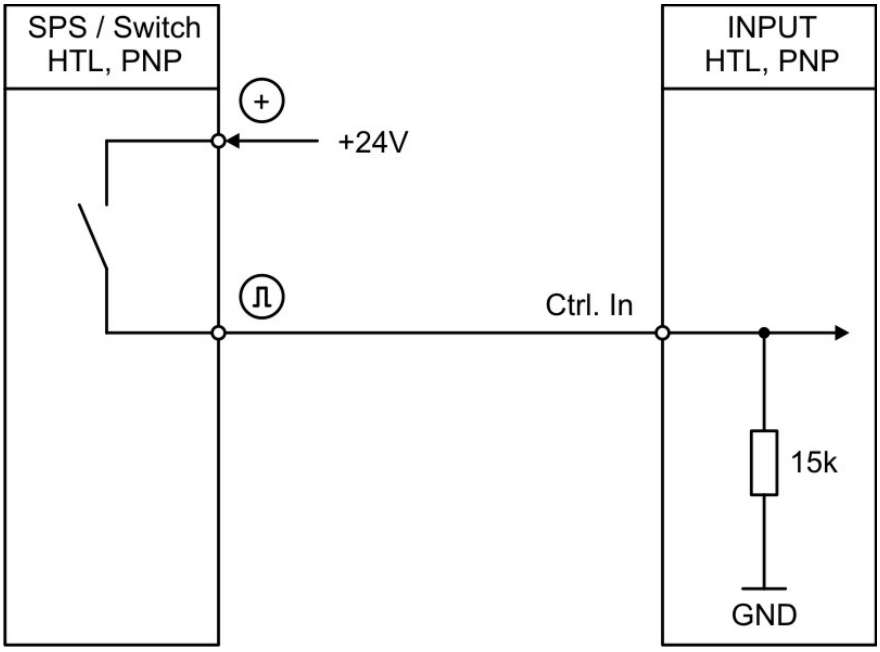
teaching the preselection values or the analog output.

Control input 6 (Ctrl. In 6) is used exclusively for resetting the device parameters to the "default" values and is therefore not freely configurable.

Note

An HTL pulse (rising edge) at Ctrl. In 6 resets the device to factory settings.

Connection of the control inputs:



Generally, open control inputs are "LOW."

The input stages are designed for electronic control signals.

Note for mechanical switching contacts:

With mechanical contacts as a pulse source, a commercially available external capacitor of approx. 10 µF must be installed between GND(-) and the corresponding input (+). This attenuates the maximum input frequency to approximately 20 Hz and suppresses bouncing.

3.7 Analog Output (X4)

A 16-bit analog output is available at terminal X4.

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

The following configuration is possible:

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

The analog output is proportional to the measurement result and refers to AGND potential.

AGND and device GND are connected internally.

CAUTION!

Parallel operation of voltage and current output is not permitted!

3.8 Serial Interface (X3)

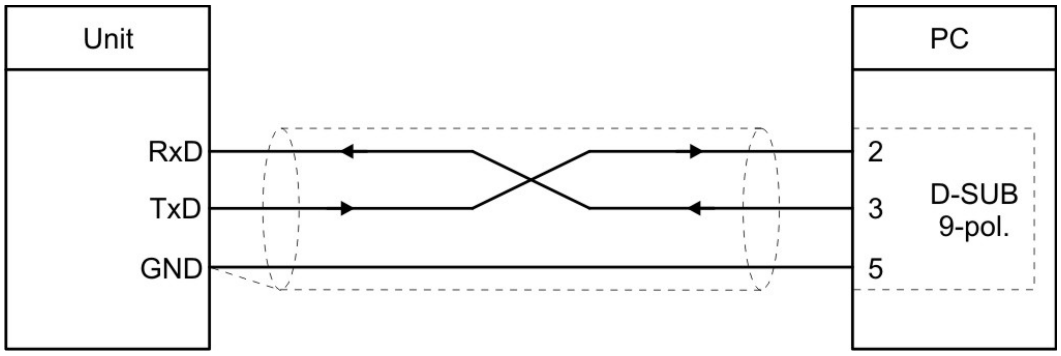
A serial interface (RS232 or RS485) is available at terminal X3.

This interface can be configured in the SERIAL MENU.

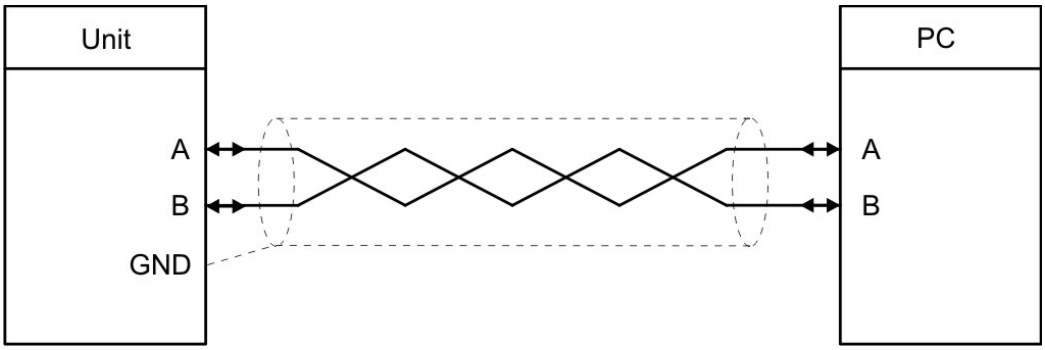
The RS232 or RS485 interface can be used as follows:

- For parameterization of the device during commissioning
- For changing parameters during operation
- For reading out actual values via PLC or PC

Connection of the RS232 interface:



Connection of the RS485 interface:



CAUTION!

Parallel operation of RS232 and RS485 is not permitted!

Default values: 9600 baud, 7even1

3.9 Control Outputs (X6)

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

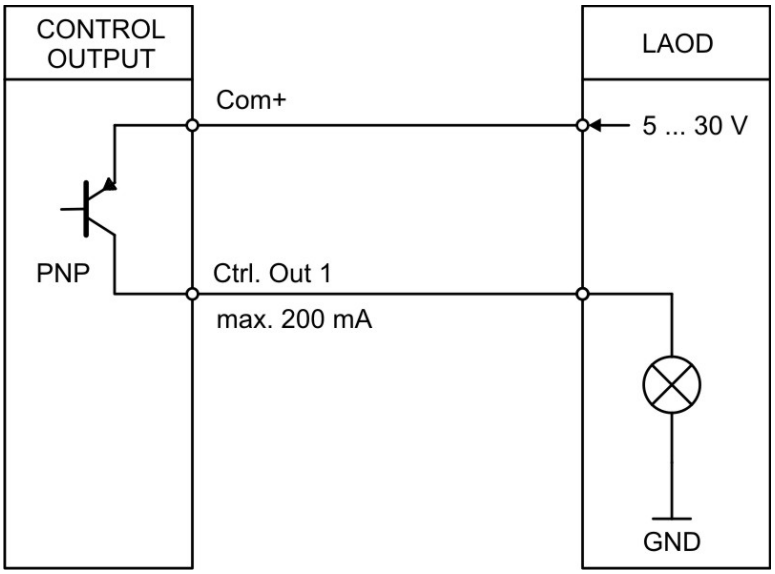
The switch conditions can be adjusted accordingly in the PRESELECTION MENU.

Outputs Ctrl. Out 1–6 are quick PNP control outputs.

The switching voltage is determined by the voltage supplied to terminal X6 pin 1 (COM+).

External attenuation measures are recommended for switching inductive loads.

Connection of the control outputs:



3.10 USB Interface (X7)

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

The USB interface can be used as follows:

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

Note

The serial USB communication is carried out at a baud rate of "*115200 baud*" and a serial data format of "*8none1*."
These values cannot be changed by the user!

4. Operating Software OS6.0 / OS10.0

The device is parameterized:

- via the serial interface using a PC and the OS6.0 operating software.
- via the USB interface using a PC and the OS10.0 operating software.

The free operating software OS6.0 and OS10.0 can be found at Pepperl-Fuchs.com

This section shows the overview of the individual menus and their parameters.

Menu	Parameter
GENERAL MENU	MODE ENCODER PROPERTIES ENCODER DIRECTION FACTOR DIVIDER ADDITIVE VALUE LINEARIZATION MODE BACKUP MEMORY FACTORY SETTINGS
FREQUENCY MODE	FREQUENCY MODE FREQUENCY BASE SAMPLING TIME 1 (S) WAIT TIME 1 (S) STANDSTILL TIME 1 (S) AVERAGE FILTER 1 SAMPLING TIME 2 (S) WAIT TIME 2 (S) AVERAGE FILTER 2
COUNTER MODE	COUNT MODE FACTOR A SET VALUE A FACTOR B SET VALUE B ROUND LOOP VALUE
SSI MODE	SSI MODE

Menu	Parameter
	ENCODER RESOLUTION
	DATA FORMAT
	BAUD RATE
	SSI ZERO
	HIGH BIT
	LOW BIT
	SSI OFFSET
	ROUND LOOP VALUE
	SAMPLING TIME (S)
	ERROR BIT
	ERROR POLARITY
PRESELECTION VALUES	PRESELECTION 1
	PRESELECTION 2
	PRESELECTION 3
	PRESELECTION 4
	PRESELECTION 5
	PRESELECTION 6
PRESELECTION 1 MENU	MODE 1
	HYSTERESIS 1
	PULSE TIME 1 (S)
	OUTPUT TARGET 1
	OUTPUT POLARITY 1
	OUTPUT LOCK 1
	STARTUP DELAY 1 (S)
PRESELECTION 2 MENU	MODE 2
	HYSTERESIS 2
	PULSE TIME 2 (S)
	OUTPUT TARGET 2
	OUTPUT POLARITY 2
	OUTPUT LOCK 2
	STARTUP DELAY 2 (S)
PRESELECTION 3 MENU	MODE 3
	HYSTERESIS 3
	PULSE TIME 3 (S)
	OUTPUT TARGET 3
	OUTPUT POLARITY 3
	OUTPUT LOCK 3

Menu	Parameter
	STARTUP DELAY 3 (S)
PRESELECTION 4 MENU	MODE 4 HYSTERESIS 4 PULSE TIME 4 (S) OUTPUT TARGET 4 OUTPUT POLARITY 4 (S) OUTPUT LOCK 4 STARTUP DELAY 4 (S)
PRESELECTION 5 MENU	MODE 5 HYSTERESIS 5 PULSE TIME 5 (S) OUTPUT TARGET 5 OUTPUT POLARITY 5 OUTPUT LOCK 5 STARTUP DELAY 5 (S)
PRESELECTION 6 MENU	MODE 6 HYSTERESIS 6 PULSE TIME 6 (S) OUTPUT TARGET 6 OUTPUT POLARITY 6 OUTPUT LOCK 6 STARTUP DELAY 6 (S)
SERIAL MENU	UNIT NUMBER SERIAL BAUD RATE SERIAL FORMAT SERIAL INIT SERIAL PROTOCOL SERIAL TIMER (S) SERIAL VALUE MODBUS
ANALOG MENU	ANALOG FORMAT ANALOG START ANALOG END ANALOG GAIN (%) ANALOG OFFSET (%)
COMMAND MENU	INPUT 1 ACTION INPUT 1 CONFIG

Menu	Parameter
	INPUT 2 ACTION INPUT 2 CONFIG INPUT 3 ACTION INPUT 3 CONFIG INPUT 4 ACTION INPUT 4 CONFIG INPUT 5 ACTION INPUT 5 CONFIG INPUT 6 ACTION (FACTORY SETTINGS) INPUT 6 CONFIG (RISING EDGE)
LINEARIZATION MENU	P1(X) P1(Y) P2(X) P2(Y) … … P23(X) P23(Y) P24(X) P24(Y)

4.1 General Menu

MODE (operating mode)

This parameter defines which measurement function (operating mode/mode) the device should fulfill.

Value	Designation	Function
0	**NOT DEFINED**	Operating mode: Not defined, modulation and measurement results are zero
1	FREQUENCY	Operating mode: Frequency converter, incremental signals (replaces FU252)
2	COUNTER	Operating mode: Counter, incremental signals (replaces ZU252)
3	SSI	Operating mode: Absolute value converter, SSI signals (replaces IV251)
4	START/STOP	Operating mode: Start/Stop interface converter

ENCODER PROPERTIES

This parameter defines the characteristics of the incremental input.

Value	Designation	Function
0	**RS422**	RS422 standard
1	HTL DIFFERENTIAL	HTL differential
2	HTL PNP	PNP (switching to +)
3	HTL NPN	NPN (switching to -)
4	TTL PNP	TTL PNP (switching to +)

ENCODER DIRECTION

This parameter reverses the direction of counting and/or travel.

Value	Designation	Function
0	**FORWARD**	Forward
1	REVERSE	Backward

FACTOR (multiplication factor)

This parameter defines the factor by which the measurement result is multiplied.

Value	Function
-99999999	Smallest value
1	Default value
99999999	Largest value

DIVIDER (division factor)

This parameter defines the divisor by which the measurement result is divided.

Value	Function
-99999999	Smallest value
1	Default value
99999999	Largest value

ADDITIVE VALUE (additive constant)

This parameter defines an additive constant, which is added to the measurement result.

Value	Function
-99999999	Smallest value
0	Default value
99999999	Largest value

LINEARIZATION MODE

This parameter defines the linearization function. Note the information in the appendix!

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

BACKUP MEMORY (retentive memory)

Value	Designation	Function
0	NO	No retentive memory
1	**YES**	Retentive memory active. Stores the actual value of the counter readings in the event of a power failure and "counter" mode is switched on.

FACTORY SETTINGS

Value	Designation	Function
0	**NO**	The factory settings are not loaded
1	YES	The factory settings are loaded

4.2 Frequency Mode

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

FREQUENCY MODE

This parameter determines which operating mode of the frequency measurement is desired.

Value	Designation	Function
0	**A ONLY**	Single-channel frequency measurement (only for channel A).
1	RATIO	Frequency ratio of both channels (channel B / channel A). Note: Interpretation of the result with four decimal places in the format +/- x.xxxx
2	PERCENT	Percentage deviation from channel B to channel A. Note: Interpretation of the result with two decimal places in the format +/- xxx.xx %
3	A + B	Frequency addition of both channels (channel A + channel B)
4	A - B	Frequency subtraction of both channels (channel A - channel B)
5	A/B x 90°	Frequency measurement with A/B x 90° signal. (Forward/backward—rotation direction monitoring)

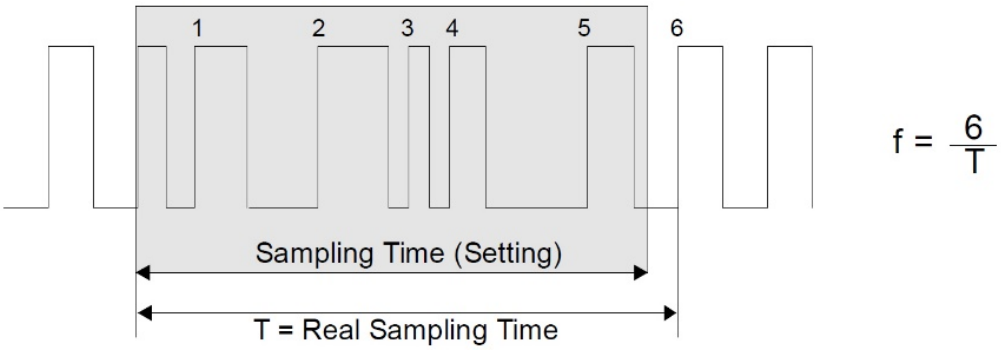
FREQUENCY BASE

Sets the desired base for frequency measurement (resolution).

Value	Function
0	1 Hz (Interpretation of result in format: xxxxxxxx Hz)
1	1/10 Hz (Interpretation of result in format: xxxxxxx.x Hz)
2	1/100 Hz (Interpretation of result in format: xxxxxx.xx Hz)
3	1/1000 Hz (Interpretation of result in format: xxxxx.xxx Hz)

SAMPLING TIME 1 (S)

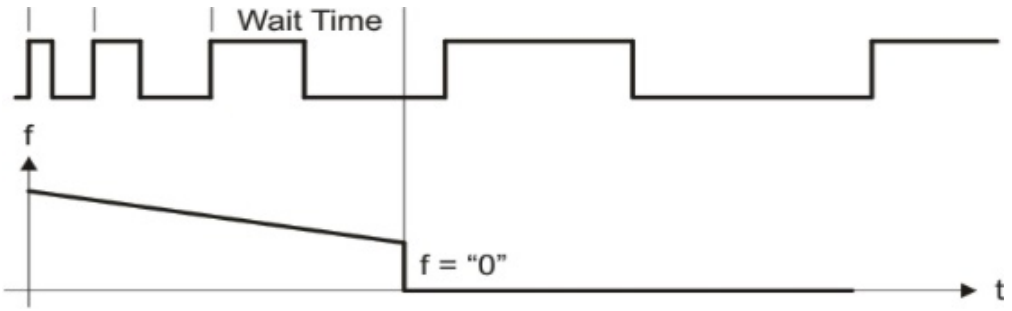
The set value is the minimum measuring time (for channel A) in seconds. The sampling time acts as a filter for irregular frequencies. This parameter directly affects the reaction time of the device.



Value	Function
0.001	Minimum measuring time in seconds
0.1	Default value
9.999	Maximum measuring time in seconds

WAIT TIME 1 (S)

The set value is the zero setting time. This parameter defines the duration of the lowest frequency, or the waiting time between two rising edges on channel A, at which the device detects the 0 Hz frequency. Frequencies with a duration greater than the set WAIT TIME 1 are evaluated as frequency = 0 Hz.



Value	Function
0.01	Frequency = 0 Hz for frequencies less than 100 Hz
1.00	Default value
79.99	Frequency = 0 Hz for frequencies less than ~ 0.01 Hz

STANDSTILL TIME 1 (S)

This parameter defines the downtime. If frequency = 0 Hz is detected at channel A, a downtime is signaled after xx.xx seconds and the startup override is reactivated. Downtime monitoring can be set in the PRESELECTION menu.

Value	Function
0.01	Shortest delay time in seconds
…	
99.99	Longest delay time in seconds

AVERAGE FILTER 1 (average determination)

Switchable average determination or filter function at unstable frequencies at input A for smoothing the analog signal. If the filter is set to 5 … 16, the device uses an exponential function. The time constant T (63 %) corresponds to the number of sampling cycles.
For example, SAMPLING TIME = 0.1 s and AVERAGE FILTER = exponential filter,
T (63 %) = 2 x sampling time.
This means that after 0.2 s, 63 % of the jump height is reached.

Value	Function
0	No average determination (quick response to any change)
1	Flowing average determination with two cycles
2	Flowing average determination with four cycles
3	Flowing average determination with eight cycles
4	Flowing average determination with 16 cycles
5	Exponential filter, T (63 %) = 2x SAMPLING TIME
6	Exponential filter, T (63 %) = 4x SAMPLING TIME
7	Exponential filter, T (63 %) = 8x SAMPLING TIME
8	Exponential filter, T (63 %) = 16x SAMPLING TIME
9	Exponential filter, T (63 %) = 32x SAMPLING TIME
10	Exponential filter, T (63 %) = 64x SAMPLING TIME
11	Exponential filter, T (63 %) = 128x SAMPLING TIME
12	Exponential filter, T (63 %) = 256x SAMPLING TIME
13	Exponential filter, T (63 %) = 512x SAMPLING TIME
14	Exponential filter, T (63 %) = 1024x SAMPLING TIME
15	Exponential filter, T (63 %) = 2048x SAMPLING TIME

Value	Function
16	Exponential filter, T (63 %) = 4096x SAMPLING TIME (very slow reaction)

CAUTION!

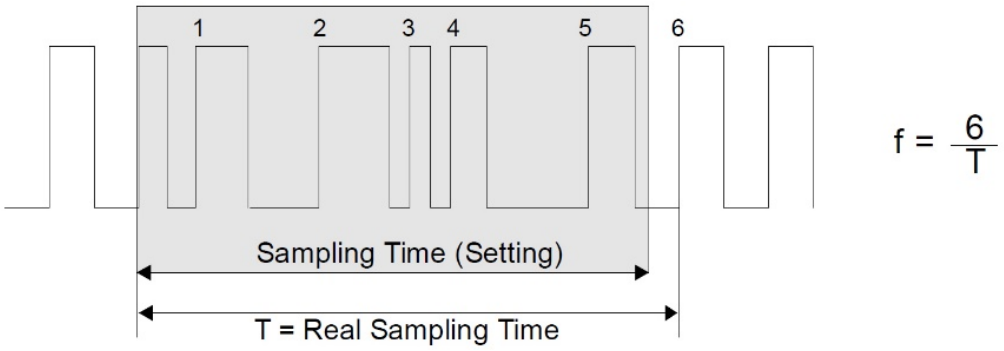
Maximum permissible frequency

When using the exponential filter, the maximum permissible frequencies at the input must not be exceeded otherwise a data type overflow will follow!
If the frequency is still exceeded, the frequency is replaced by the maximum permissible value with the corresponding setting for further calculation and an error is output. The LED flashes and the analog output modulates 0 V or 0/4 mA. The maximum permissible frequencies are listed below for the corresponding settings.

		FREQUENCY BASE			
		[0] – 1 Hz	[1] – 1/10 Hz	[2] – 1/100 Hz	[3] – 1/1000 Hz
AVERAGE FILTER 1+2	[5] - 2x	1,073,741,823 Hz	107,374,182.3 Hz	10,737,418.23 Hz	1,073,741.823 Hz
	[6] - 4x	536,870,911 Hz	53,687,091.1 Hz	5,368,709.11 Hz	536,870.911 Hz
	[7] - 8x	268,435,455 Hz	26,843,545.5 Hz	2,684,354.55 Hz	268,435.455 Hz
	[8] - 16x	134,217,727 Hz	13,421,772.7 Hz	1,342,177.27 Hz	134,217.727 Hz
	[9] - 32x	67,108,863 Hz	6,710,886.3 Hz	671,088.63 Hz	67,108.863 Hz
	[10] - 64x	33,554,431 Hz	3,355,443.1 Hz	335,544.31 Hz	33,554.431 Hz
	[11] - 128x	16,777,215 Hz	1,677,721.5 Hz	167,772.15 Hz	16,777.215 Hz
	[12] - 256x	8,388,607 Hz	838,860.7 Hz	83,886.07 Hz	8388.607 Hz
	[13] - 512x	4,194,303 Hz	419,430.3 Hz	41,943.03 Hz	4194.303 Hz
	[14] - 1024x	2,097,151 Hz	209,715.1 Hz	20,971.51 Hz	2097.151 Hz
	[15] - 2048x	1,048,575 Hz	104,857.5 Hz	10,485.75 Hz	1048.575 Hz
	[16] - 4096x	524,287 Hz	52,428.7 Hz	5242.87 Hz	524.287 Hz

SAMPLING TIME 2 (S)

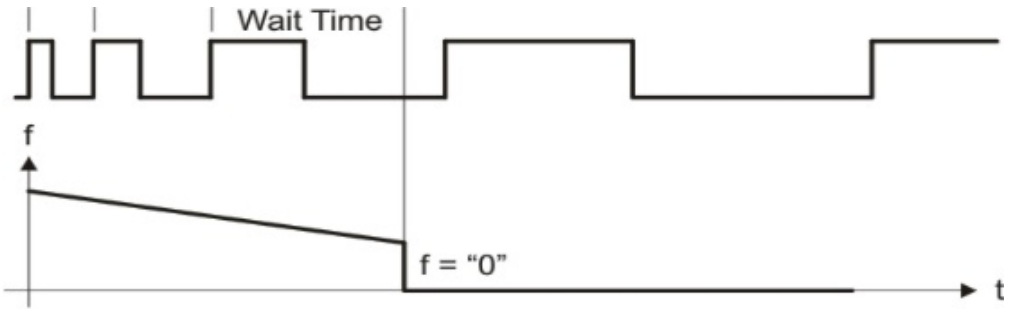
The set value is the minimum measuring time (for channel B) in seconds. The sampling time acts as a filter for irregular frequencies. This parameter directly affects the reaction time of the device.



Value	Function
0.001	Minimum measuring time in seconds
0.1	Default value
9.999	Maximum measuring time in seconds

WAIT TIME 2 (S)

The set value is the zero setting time. This parameter defines the duration of the lowest frequency, or the waiting time between two rising edges on channel B, at which the device detects the 0 Hz frequency. Frequencies with a duration greater than the set WAIT TIME 2 are evaluated as frequency = 0 Hz.



Value	Function
0.01	Frequency = 0 Hz for frequencies less than 100 Hz
1.00	Default value
79.99	Frequency = 0 Hz for frequencies less than ~ 0.01 Hz

AVERAGE FILTER 2 (average determination)

Switchable average determination or filter function at unstable frequencies at input B for smoothing the analog signal. If the filter is set to 5 … 16, the device uses an exponential function. The time constant T (63 %) corresponds to the number of sampling cycles.
E.g., SAMPLING TIME = 0.1 s and AVERAGE FILTER = exponential filter, T (63 %) = 2 x sampling time.
This means that after 0.2 s, 63 % of the jump height is reached.

Value	Function
0	No average determination (quick response to any change)
1	Flowing average determination with two cycles
2	Flowing average determination with four cycles
3	Flowing average determination with eight cycles
4	Flowing average determination with 16 cycles
5	Exponential filter, T (63 %) = 2x SAMPLING TIME
6	Exponential filter, T (63 %) = 4x SAMPLING TIME
7	Exponential filter, T (63 %) = 8x SAMPLING TIME
8	Exponential filter, T (63 %) = 16x SAMPLING TIME
9	Exponential filter, T (63 %) = 32x SAMPLING TIME
10	Exponential filter, T (63 %) = 64x SAMPLING TIME
11	Exponential filter, T (63 %) = 128x SAMPLING TIME
12	Exponential filter, T (63 %) = 256x SAMPLING TIME
13	Exponential filter, T (63 %) = 512x SAMPLING TIME
14	Exponential filter, T (63 %) = 1024x SAMPLING TIME
15	Exponential filter, T (63 %) = 2048x SAMPLING TIME
16	Exponential filter, T (63 %) = 4096x SAMPLING TIME (very slow reaction)

CAUTION!

Maximum permissible frequency

When using the exponential filter, the maximum permissible frequencies at the input must not be exceeded otherwise a data type overflow will follow!
If the frequency is still exceeded, the frequency is replaced by the maximum permissible value with the corresponding setting for further calculation and an error is output. The LED flashes and the analog output modulates 0 V or 0/4 mA. The maximum permissible frequencies have already been listed in the AVERAGE FILTER 1 parameter and can be taken from there.

4.3 Counter Mode

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

COUNT MODE

Selecting the counter configuration

Value	Designation	Function
0	A SINGLE	Input A is the counter input. Input B determines the counting direction: "LOW" = forward / "HIGH" = backward
1	A + B	Total: Counts A pulses + B pulses
2	A - B	Difference: Counts A pulses - B pulses
3	**A/B 90 x1**	Incrementing/decrementing counter for pulses with 2x90° offset (Single edge evaluation x1)
4	A/B 90 x2	Incrementing/decrementing counter for pulses with 2x90° offset (Double edge evaluation x2)
5	A/B 90 x4	Incrementing/decrementing counter for pulses with 2x90° offset (Quadruple edge evaluation x4)

FACTOR A

Pulse scaling factor for input A.

Example: if set to 1.23456, the device displays the value 123456 after 100,000 input pulses.

Value	Function
0.00001	Smallest value
1	Default value
99.99999	Largest value

SET VALUE A

In the case of a "RESET/SET COUNTER A" command (via control input), the counter of input A is set to the value set here.

Value	Function
-99999999	Smallest value
0	Default value
99999999	Largest value

FACTOR B

Pulse scaling factor for input B.

Example: if set to 1.23456, the device displays the value 123456 after 100,000 input pulses.

Value	Function
0.00001	Smallest value
1	Default value
99.99999	Largest value

SET VALUE B

In the case of a "RESET/SET COUNTER B" command (via control input), the counter of input B is set to the value set here.

Value	Function
-99999999	Smallest value
0	Default value
99999999	Largest value

ROUND LOOP VALUE

Defines the number of encoder steps if a concentricity function is desired. (Only for COUNT MODE: A SINGLE and A/B x 90)

Value	Function
0	No concentricity
…	
99999999	Number of steps for the concentricity function

4.4 SSI Mode

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

SSI MODE

SSI setting of the operating mode: Managing or managed
Depending on the SSI MODE, different terminals must be used for the SSI CLK:

Managing operation: Terminal X2—pins 1 and 2
Managed operation: Terminal X2—pins 5 and 6)

Value	Designation	Function
0	**PRIMARY**	Managing operation: Clock pulse for SSI rotary encoder is generated by the device.
1	SECONDARY	Managed operation: Clock pulse for SSI rotary encoder comes from external control.

ENCODER RESOLUTION

Resolution of the SSI rotary encoder (total number of all bits)

Value	Function
10	Smallest value
25	Default value
32	Largest value

DATA FORMAT

Setting of the SSI code (binary or gray)

Value	Designation	Function
0	**GRAY CODE**	Gray SSI code
1	BINARY CODE	Binary SSI code

BAUD RATE

Clock frequency of the SSI messages

Value	Designation	Function
0	2 MHZ	N.A.
1	1.5 MHZ	N.A.
2	**1 MHZ**	Clock frequency 1 MHz
3	500 KHZ	Clock frequency 500 kHz
4	250 KHZ	Clock frequency 250 kHz
5	100 KHZ	Clock frequency 100 kHz

SSI ZERO

In the event of a "ZERO POSITION" command (via control input), the current SSI position of the rotary encoder is transferred to the "SSI ZERO" parameter and the actual rotary encoder zero point is shifted accordingly. (rotary encoder zero point shift)

Value	Function
0	Smallest value
…	
999999999	Largest value

HIGH BIT (for bit suppression)

Defines the highest bit (MSB) to be evaluated of the bit suppression.

If all bits are to be evaluated, HIGH BIT must be set to the specified total bit number.

Value	Function
01	Smallest value
25	Default value
32	Largest value

LOW BIT (for bit suppression)

Defines the lowest bit (LSB) to be evaluated of the bit suppression.

If all bits are to be evaluated, LOW BIT must be set to "01."

Value	Function
01	Smallest value
…	
32	Largest value

SSI OFFSET

In the case of a "RESET/SET VALUE" command (via control input or PC user interface), the as yet unscaled position value currently being recorded (after bit suppression and any rotary encoder zero point shift) is transferred to the "SSI OFFSET" parameter and the measurement result is reset to zero. From the new zero point, it is now possible to move in the positive and negative directions, depending on the direction of rotation.

(Display zero point shift)

Value	Function
0	Smallest value
…	
999999999	Largest value

ROUND LOOP VALUE

Defines the number of rotary encoder steps if a concentricity function is desired.

Value	Function
0	No concentricity
…	
99999999	Number of steps for the concentricity function

SAMPLING TIME (S)

Determines the read-in cycle for the SSI signal in the managing operation

Value	Function
0.001	Minimum measuring time in seconds
0.010	Default value
9.999	Maximum measuring time in seconds

ERROR BIT

Defines the rotary encoder monitoring and the error bit

Value	Function
0	No error bit present. Checks that the connected rotary encoder is switched off.
…	
32	Position of the error bit to be evaluated. Checks that the connected rotary encoder is switched on.

ERROR POLARITY

Defines the polarity of the error bit in the event of a fault

Value	Function
0	Bit is low in the event of a fault
1	Bit is high in the event of a fault

Note

SSI values

To process SSI values, see Linearisierung and SSI-Wert einlesen in the Anhang

4.5 Start/Stop Mode

In this menu, the operation is defined as a start/stop interface converter.

INIT MODE

Managing or managed operation
Depending on the selected INIT MODE, different terminals must be used for the init pulse.

Managing operation: Terminal X2—pins 1 and 2
Managed operation: Terminal X2—pins 5 and 6

Value	Designation	Function
0	**PRIMARY**	Managing operation: Init pulse is generated by the device
1	SECONDARY	Managed operation: Init pulse is generated externally

SAMPLING TIME (ms)

Duration between two init pulses in milliseconds. Corresponds to the time after which a new measurement is started and directly affects the reaction time of the device.

Value	Function
00.200	Minimum measuring time
04.000	Default value
16.000	Maximum measuring time

INIT PULSE TIME (µs)

This parameter defines the pulse duration of the init pulse in microseconds.

Value	Function
1	Smallest value
2	Default value
9	Largest value

VELOCITY (m/s)

Waveguide velocity of the encoder used in m/s.

Value	Function
0001.00	Smallest value
2800.00	Default value
9999.99	Largest value

OPERATIONAL MODE

This parameter determines which type of measurement the device is to perform.

Value	Designation	Function
0	**POSITION**	Distance measurement
1	ANGLE	Angle measurement
2	SPEED	Velocity measurement

Note

For more information on the different "OPERATIONAL MODES" and interpretation of the respective measurement results, see Chapter 6.7)

OFFSET

Value	Function
00000.001	Smallest value
01000.000	Default value
99999.999	Largest value

In the event of a "Reset/Set Value" command via the control input or the PC user interface, the current position of the rotary encoder is transferred

in a non-volatile manner to the "OFFSET" parameter. (= zero point shift)

CIRCUMFERENCE (mm)

Value	Function
-99999999	Smallest value
0	Default value
99999999	Largest value

Sets the reference quantity in mm for an angle measurement.

The distance traveled, e.g., the extent to which to generate the subsequent ROUND LOOP VALUE, must be set here.

Note

Only for OPERATIONAL MODE: "ANGLE"

ROUND LOOP VALUE

Sets the desired data to be generated when the previous reference quantity CIRCUMFERENCE is reached.

Note

Only for OPERATIONAL MODE: "ANGLE"

Value	Function
1	Smallest value
360	Default value
99999999	Largest value

AVERAGE FILTER—POSITION (filter for average determination)

Switchable average determination for preventing position fluctuations.

Value	Function
0	No average determination
1	Flowing average determination with two cycles
2	Flowing average determination with four cycles
3	Flowing average determination with eight cycles
4	Flowing average determination with 16 cycles

STANDSTILL TIME(s)

This parameter defines the downtime. When downtime is detected, a downtime signal is signaled after xx.xx seconds and the startup override is reactivated.

Value	Function
0.01	Shortest delay time in seconds
…	
99.99	Longest delay time in seconds

Downtime monitoring can be set in the PRESELECTION MENU.

AVERAGE FILTER—SPEED (filter for average determination)

Switchable average determination for preventing velocity fluctuations.

Value	Function
0	No average determination
1	Flowing average determination with two cycles
2	Flowing average determination with four cycles
3	Flowing average determination with eight cycles
4	Flowing average determination with 16 cycles

4.6 Preselection Values

In this menu, the preselection values or switch points are set. The switch points always refer to the scaled measurement result "Measurement Result."

PRESELECTION 1

Preselection / switch point 1

Value	Function
-99999999	Smallest preselection value
1000	Default value
99999999	Largest preselection value

PRESELECTION 2

Preselection / switch point 2

Value	Function
-99999999	Smallest preselection value
2000	Default value
99999999	Largest preselection value

PRESELECTION 3

Preselection / switch point 3

Value	Function
-99999999	Smallest preselection value
3000	Default value
99999999	Largest preselection value

PRESELECTION 4

Preselection / switch point 4

Value	Function
-99999999	Smallest preselection value
4000	Default value
99999999	Largest preselection value

PRESELECTION 5

Preselection / switch point 5

Value	Function
-99999999	Smallest preselection value
5000	Default value
99999999	Largest preselection value

PRESELECTION 6

Preselection / switch point 6

Value	Function
-99999999	Smallest preselection value
6000	Default value
99999999	Largest preselection value

4.7 Preselection 1 Menu

MODE 1

Switch condition for preselection 1. Output switches according to the following condition:

Value	Designation	Function
0	**|RESULT|>=|PRES|**	Amount of measurement result greater than or equal to amount of PRESELECTION 1 With HYSTERESIS 1 not equal to 0, the following switch condition results: Measurement result >= PRESELECTION 1 → ON, Measurement result < PRESELECTION 1 – HYSTERESIS 1 →OFF
1	|RESULT|<=|PRES|	Amount of measurement result less than or equal to amount of PRESELECTION 1 (Startup override STARTUP DELAY recommended) With HYSTERESIS 1 not equal to 0, the following switch condition results: Measurement result <= PRESELECTION 1 → ON, Measurement result > PRESELECTION 1+ HYSTERESIS 1 →OFF

Value	Designation	Function
2	|RESULT|=|PRES|	Amount of measurement result equals amount of PRESELECTION 1. In conjunction with hysteresis, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. With HYSTERESIS 1 not equal to 0, the following switch condition results: Measurement result > PRESELECTION 1 + ½ HYSTERESIS 1 → OFF, Measurement result < PRESELECTION 1 – ½ HYSTERESIS 1 →OFF
3	RESULT>=PRES	Measurement result greater than or equal to preselection 1, e.g., overspeed With HYSTERESIS 1 not equal to 0, the following switch condition results: Measurement result >= PRESELECTION 1 → ON, Measurement result < PRESELECTION 1 – HYSTERESIS 1 →OFF
4	RESULT<=PRES	Measurement result less than or equal to preselection 1, e.g., underspeed (Startup override STARTUP DELAY recommended) With HYSTERESIS 1 not equal to 0, the following switch condition results: Measurement result <= PRESELECTION 1 → ON, Measurement result > PRESELECTION 1+ HYSTERESIS 1 →OFF
5	RESULT=PRES	Measurement result equals PRESELECTION 1. In conjunction with HYSTERESIS 1, a frequency band (preselection +/- ½ hysteresis) can be defined and monitored. With HYSTERESIS 1 not equal to 0, the following switch condition results: Measurement result > PRESELECTION 1 + ½ HYSTERESIS 1 → OFF, Measurement result < PRESELECTION 1 – ½ HYSTERESIS 1 →OFF
6	RESULT=0	Display value equal to 0 (downtime duration STANDSTILL TIME 1[s]),

Value	Designation	Function
		e.g., downtime monitoring. (Only in FREQUENCY operating mode).
7	RES>=PRES TRAIL	Trailing preselection 1: Measurement result greater than or equal to PRESELECTION 1 – PRESELECTION 4 PRESELECTION 4 is the trailing preselection of PRESELECTION 1
8	ERROR SET	Common alarm for device faults

HYSTERESIS 1

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

Value	Function
0	No switching hysteresis
…	
99999	Switching hysteresis of 99,999

PULSE TIME 1 (S)

Duration of the one-shot pulse for the switch condition of preselection 1

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

OUTPUT TARGET 1

Assignment of an output for the switch condition of preselection 1.

If multiple switch conditions are assigned to a single output, the output is active as soon as one of the switch conditions is met.

Value	Designation	Function
0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switch condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switch condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switch condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switch condition to Ctrl. Out 4
5	CTRL OUT 5	Assignment of the switch condition to Ctrl. Out 5
6	CTRL OUT 6	Assignment of the switch condition to Ctrl. Out 6

OUTPUT POLARITY 1

Switch state for the switch condition of preselection 1.

Value	Designation	Function
0	**ACTIVE HIGH**	Active "HIGH"
1	ACTIVE LOW	Active "LOW"

OUTPUT LOCK 1

Self-locking for the switch condition of preselection 1.

Value	Designation	Function
0	**NO**	No self-locking
1	YES	Self-locking

STARTUP DELAY 1 (S)

Startup override for the switch condition of preselection 1.

Time frame until the monitoring function is focused.
This setting only applies for switch conditions |RESULT|<=|PRES| or RESULT<=PRES and only for operating mode "FREQUENCY" MODE – channel A.

STARTUP DELAY is set at a frequency of 0 Hz to the parameter set here and started. The monitoring function remains deactivated until the set time has elapsed.

A setting of "60,000" activates automatic startup override. This means that the monitoring function remains deactivated until the preselection value / switch point is exceeded for the first time.

Value	Function
0.000	No startup override
…	
59,999	Startup override in seconds
60,000	Automatic startup override

4.8 Preselection 2 Menu

MODE 2

Switch condition for preselection 2, see PRESELECTION 1 MENU (except for trailing preselection).

Value	Designation	Function
		See PRESELECTION 1 MENU
6	RES>=PRES TRAIL	Trailing preselection 2: Display value greater than or equal to PRESELECTION 2 – PRESELECTION 5 PRESELECTION 5 is the trailing preselection of PRESELECTION 2

HYSTERESIS 2

Switching hysteresis for the switch condition of preselection 2. See PRESELECTION 1 MENU.

PULSE TIME 2 (S)

Duration of the one-shot pulse for the switch condition of preselection 2. See PRESELECTION 1 MENU.

OUTPUT TARGET 2

Assignment of an output for the switch condition of preselection 2.

Value	Designation	Function
0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switch condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switch condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switch condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switch condition to Ctrl. Out 4
5	CTRL OUT 5	Assignment of the switch condition to Ctrl. Out 5
6	CTRL OUT 6	Assignment of the switch condition to Ctrl. Out 6

OUTPUT POLARITY 2

Switch state for the switch condition of preselection 2. See PRESELECTION 1 MENU.

OUTPUT LOCK 2

Self-locking for the switch condition of preselection 2. See PRESELECTION 1 MENU.

STARTUP DELAY 2 (S)

Startup override for the switch condition of preselection 2. See PRESELECTION 1 MENU.

4.9 Preselection 3 Menu

MODE 3

Switch condition for preselection 3, see PRESELECTION 1 MENU (except for trailing preselection).

Value	Designation	Function
		See PRESELECTION 1 MENU
6	RES>=PRES TRAIL	Trailing preselection 3: Display value greater than or equal to PRESELECTION 3 – PRESELECTION 6 PRESELECTION 6 is the trailing preselection of PRESELECTION 3

HYSTERESIS 3

Switching hysteresis for the switch condition of preselection 3. See PRESELECTION 1 MENU.

PULSE TIME 3 (S)

Duration of the one-shot pulse for the switch condition of preselection 3. See PRESELECTION 1 MENU.

OUTPUT TARGET 3

Assignment of an output for the switch condition of preselection 3.

Value	Designation	Function
0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switch condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switch condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switch condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switch condition to Ctrl. Out 4
5	CTRL OUT 5	Assignment of the switch condition to Ctrl. Out 5
6	CTRL OUT 6	Assignment of the switch condition to Ctrl. Out 6

OUTPUT POLARITY 3

Switch state for the switch condition of preselection 3. See PRESELECTION 1 MENU.

OUTPUT LOCK 3

Self-locking for the switch condition of preselection 3. See PRESELECTION 1 MENU.

STARTUP DELAY 3 (S)

Startup override for the switch condition of preselection 3. See PRESELECTION 1 MENU.

4.10 Preselection 4 Menu

MODE 4

Switch condition for preselection 4, see PRESELECTION 1 MENU (except for trailing preselection).

Value	Designation	Function
		See PRESELECTION 1 MENU
6	RES>=PRES TRAIL	Trailing preselection 4: Display value greater than or equal to PRESELECTION 4 – PRESELECTION 1 PRESELECTION 1 is the trailing preselection of PRESELECTION 4

HYSTERESIS 4

Switching hysteresis for the switch condition of preselection 4. See PRESELECTION 1 MENU.

PULSE TIME 4 (S)

Duration of the one-shot pulse for the switch condition of preselection 4. See PRESELECTION 1 MENU.

OUTPUT TARGET 4

Assignment of an output for the switch condition of preselection 4.

Value	Designation	Function
0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switch condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switch condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switch condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switch condition to Ctrl. Out 4
5	CTRL OUT 5	Assignment of the switch condition to Ctrl. Out 5
6	CTRL OUT 6	Assignment of the switch condition to Ctrl. Out 6

OUTPUT POLARITY 4

Switch state for the switch condition of preselection 4. See PRESELECTION 1 MENU.

OUTPUT LOCK 4

Self-locking for the switch condition of preselection 4. See PRESELECTION 1 MENU.

STARTUP DELAY 4 (S)

Startup override for the switch condition of preselection 4. See PRESELECTION 1 MENU.

4.11 Preselection 5 Menu

MODE 5

Switch condition for preselection 5, see PRESELECTION 1 MENU (except for trailing preselection).

Value	Designation	Function
		See PRESELECTION 1 MENU
6	RES>=PRES TRAIL	Trailing preselection 5: Display value greater than or equal to PRESELECTION 5 – PRESELECTION 2 PRESELECTION 2 is the trailing preselection of PRESELECTION 5

HYSTERESIS 5

Switching hysteresis for the switch condition of preselection 5. See PRESELECTION 1 MENU.

PULSE TIME 5 (S)

Duration of the one-shot pulse for the switch condition of preselection 5. See PRESELECTION 1 MENU.

OUTPUT TARGET 5

Assignment of an output for the switch condition of preselection 5.

Value	Designation	Function
0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switch condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switch condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switch condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switch condition to Ctrl. Out 4
5	CTRL OUT 5	Assignment of the switch condition to Ctrl. Out 5
6	CTRL OUT 6	Assignment of the switch condition to Ctrl. Out 6

OUTPUT POLARITY 5

Switch state for the switch condition of preselection 5. See PRESELECTION 1 MENU.

OUTPUT LOCK 5

Self-locking for the switch condition of preselection 5. See PRESELECTION 1 MENU.

STARTUP DELAY 5 (S)

Startup override for the switch condition of preselection 5. See PRESELECTION 1 MENU.

4.12 Preselection 6 Menu

MODE 6

Switch condition for preselection 6, see PRESELECTION 1 MENU (except for trailing preselection).

Value	Designation	Function
		See PRESELECTION 1 MENU
6	RES>=PRES TRAIL	Trailing preselection 3: Display value greater than or equal to PRESELECTION 6 – PRESELECTION 3 PRESELECTION 3 is the trailing preselection of PRESELECTION 6

HYSTERESIS 6

Switching hysteresis for the switch condition of preselection 6. See PRESELECTION 1 MENU.

PULSE TIME 6 (S)

Duration of the one-shot pulse for the switch condition of preselection 6. See PRESELECTION 1 MENU.

OUTPUT TARGET 6

Assignment of an output for the switch condition of preselection 6.

Value	Designation	Function
0	NO	No assignment
1	**CTRL OUT 1**	Assignment of the switch condition to Ctrl. Out 1
2	CTRL OUT 2	Assignment of the switch condition to Ctrl. Out 2
3	CTRL OUT 3	Assignment of the switch condition to Ctrl. Out 3
4	CTRL OUT 4	Assignment of the switch condition to Ctrl. Out 4
5	CTRL OUT 5	Assignment of the switch condition to Ctrl. Out 5
6	CTRL OUT 6	Assignment of the switch condition to Ctrl. Out 6

OUTPUT POLARITY 6

Switch state for the switch condition of preselection 6. See PRESELECTION 1 MENU.

OUTPUT LOCK 6

Self-locking for the switch condition of preselection 6. See PRESELECTION 1 MENU.

STARTUP DELAY 6 (S)

Startup override for the switch condition of preselection 6. See PRESELECTION 1 MENU.

4.13 Serial Menu

The default settings for the serial interface are defined in this menu.

UNIT NUMBER

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

Value	Function
11	Smallest address without zero
…	
99	Largest address without zero

SERIAL BAUD RATE

This parameter is used to set the serial baud rate.

Value	Designation	Function
0	**9600**	9600 baud
1	19,200	19,200 baud
2	38,400	38,400 baud

SERIAL FORMAT

This parameter sets the bit data format.

Value	Designation	Function		
0	**7-EVEN-1**	7 data	Parity even	1 stop
1	7-EVEN-2	7 data	Parity even	2 stops
2	7-ODD-1	7 data	Parity odd	1 stop
3	7-ODD-2	7 data	Parity odd	2 stops
4	7-NONE-1	7 data	No parity	1 stop
5	7-NONE-2	7 data	No parity	2 stops
6	8-EVEN-1	8 data	Parity even	1 stop
7	8-ODD-1	8 data	Parity odd	1 stop
8	8-NONE-1	8 data	No parity	1 stop
9	8-NONE-2	8 data	No parity	2 stops

SERIAL INIT

This parameter determines the baud rate at which the initialization values are transferred to the PC user interface. When set to greater than 9600 baud, the duration of the initialization can be shortened.

Value	Designation	Function
0	**NO**	The initialization values are transferred at 9600 baud. The device then works again at the value set by the user
1	YES	The initialization values are transmitted at the baud rate set by the user in the SERIAL BAUD RATE parameter. The device then continues to work at the value set by the user

SERIAL PROTOCOL

Specifies the string for command-controlled or timed transmissions

(xxxxxxx = SERIAL VALUE).

At default 1, the unit no. is omitted and the transmission starts directly with the measured value, which enables a quicker transmission cycle.

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

SERIAL TIMER (S)

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

In the event of a request via the request protocol, the cyclical transmission is interrupted for 20 seconds.

Value	Function
0.000	Cyclical transmission is switched off and the device only sends SERIAL PRINT on command via a control input or request via request protocol
…	
60.000	Time cycle in seconds.

SERIAL VALUE

The parameter determines which value is transmitted.

Value	Code	Function
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 counter reading after linking without scaling, filter, etc.)
5	:5	Counter_A (counter reading—channel A)
6	:6	Counter_B (counter reading—channel B)

Value	Code	Function
7	:7	SSI_Data (read-in + any converted binary SSI value)
8	:8	SSI_Calc_Result (SSI value incl. SSI zero and SSI offset without scaling, filter, etc.)
9	:9	Minimum_Value (minimum value of Measurement_Result)
10	;0	Maximum_Value (maximum value of Measurement_Result)
11	;1	Analog_Out_Current (analog output modulation [in yA])
12	;2	Analog_Out_Percentage (analog output modulation percentage) (Measurement result in xxx.x %)

MODBUS

This parameter enables the Modbus protocol to be activated and the Modbus address to be set.

(For details on communication with the Modbus + protocol, see Modbus RTU Schnittstelle)

Value	Function
0	Serial interface uses the Lecom protocol
1 … 247	Serial interface uses the Modbus RTU protocol The set value is the Modbus address of the device.

4.14 Analog Menu

In this menu, the default settings for the analog output are defined.

ANALOG FORMAT

This parameter defines the output characteristics.

In the output format (-10 V … +10 V), the polarity of the output follows the sign of the measurement result. The analog output is proportional to the measurement result.

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

ANALOG START

This parameter is used to set the start value of the analog modulation.

The start value specifies the measurement result at which the analog output modulates 0 V or 0/4 mA.

Value	Function
-99999999	Smallest start value
0	Default value
99999999	Largest start value

ANALOG END

This parameter is used to set the end value of the analog modulation. The end value specifies the measurement result at which the analog output modulates its max. value (+/-) 10 V or 20 mA.

Value	Function
-99999999	Smallest end value
10000	Default value
99999999	Largest end value

ANALOG GAIN (%)

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

Example 1: 102.00 corresponds to a modulation of 10.2 V / 20.4 mA, once the ANALOG END value is reached.

Example 2: 95.00 corresponds to a modulation of 9.5 V / 18 mA, once the ANALOG END value is reached.

Value	Function
0.00	Smallest modulation
100.00	Default value
110.00	Largest modulation

ANALOG OFFSET (%)

This parameter is used to set the zero point shift of the output.

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

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

4.15 Command Menu

INPUT 1 ACTION (function input 1)

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

(s) = stat. switching characteristics (level modulation) → INPUT CONFIG must be set to ACTIVE LOW/HIGH.

(d) = dyn. switching characteristics (edge modulation) → INPUT CONFIG must be set to RISING/FALLING EDGE.

Value	Designation	Function	
0	**NO**	No function.	
1	RESET/SET VALUE	Transfers the currently recorded position value (after bit suppression and any rotary encoder zero point shift) to the "SSI offset" parameter (display zero point shift)—only in "SSI" mode Resets/sets both counter values (channels A and B) to the set values in SET VALUE A and B—only in "COUNTER" mode	(d) (s)
2	FREEZE	Freezes the current measurement result	(s)
3	TEACH ANALOG START	Transfers the current measurement result to the "Analog Start" parameter	(d)
4	TEACH ANALOG END	Transfers the current measurement result to the "Analog End" parameter	(d)
5	TEACH PRESELECTION 1	Transfers the current measurement result to the "Preselection 1" parameter	(d)
6	TEACH PRESELECTION 2	Transfers the current measurement result to the "Preselection 2" parameter	(d)
7	TEACH PRESELECTION 3	Transfers the current measurement result to the "Preselection 3" parameter	(d)
8	TEACH PRESELECTION 4	Transfers the current measurement result to the "Preselection 4" parameter	(d)
9	TEACH PRESELECTION 5	Transfers the current measurement result to the "Preselection 5" parameter	(d)
10	TEACH PRESELECTION 6	Transfers the current measurement result to the "Preselection 6" parameter	(d)

Value	Designation	Function	
11	RESET MIN/MAX	Resets the minimum/maximum value	(d) (s)
12	LOCK RELEASE	Releases the self-locking of all outputs	(d)
13	SERIAL PRINT	Sends the serial data (see "Serial Print" parameter)	(d)
14	ACTIVATE DATA	N.A.	
15	STORE DATA	N.A.	
16	TESTPROGRAM	N.A.	
17	CLEAR LOOP TIME	Resets the maximum loop time	(d)
18	RESET/SET COUNTER A	Resets/sets the counter value of channel A to the set values in SET VALUE A—only in "COUNTER" mode	(d) (s)
19	RESET/SET COUNTER B	Resets/sets the counter value of channel B to the set value in SET VALUE B—only in "COUNTER" mode	(d) (s)
20	LOCK COUNTER A	Counter (channel a) is disabled and does not count any further pulses as long as this command is present. —only in "COUNTER" mode	(s)
21	LOCK COUNTER B	Counter (channel B) is disabled and does not count any further pulses as long as this command is present. —only in "COUNTER" mode	(s)
22	ZERO POSITION	Transfers the current SSI position to the "SSI Zero" parameter (rotary encoder zero point shift)—only in "SSI" mode	(d) (s)
23	FACTORY SETTINGS	The device is reset to its factory settings.	(d)

PUT 1 CONFIG

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

Value	Designation	Function
0	ACTIVE LOW	Activates at "LOW" (static)
1	ACTIVE HIGH	Activates at "HIGH" (static)
2	**RISING EDGE**	Activates at rising edge (dynamic)
3	FALLING EDGE	Activates at falling edge (dynamic)

INPUT 2 ACTION

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

See function assignment for parameter INPUT 1 ACTION

INPUT 2 CONFIG

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

See activation assignment for parameter INPUT 1 CONFIG

INPUT 3 ACTION

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

See function assignment for parameter INPUT 1 ACTION

INPUT 3 CONFIG

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

See activation assignment for parameter INPUT 1 CONFIG

INPUT 4 ACTION

This parameter determines the control function of the input "Ctrl. In 4."

See function assignment for parameter INPUT 1 ACTION

INPUT 4 CONFIG

This parameter determines the switching characteristics for "Ctrl. In 4."

See activation assignment for parameter INPUT 1 CONFIG

INPUT 5 ACTION

This parameter determines the control function of the input "Ctrl. In 5"

See function assignment for parameter INPUT 1 ACTION

INPUT 5 CONFIG

This parameter determines the switching characteristics for "Ctrl. In 5."

See activation assignment for parameter INPUT 1 CONFIG

INPUT 6 ACTION (FACTORY SETTINGS)

This parameter is preset to "Factory Settings" (resets device to factory settings) and cannot be changed.

INPUT 6 CONFIG (RISING EDGE)

This parameter is preset to "Rising Edge" and cannot be changed.

4.16 Linearization Menu

This menu defines the linearization points.

For a description and examples of the linearization function, see Anhang.

P1(X) ... P24(X)

X coordinate of the linearization points.

This is the value that the device would generate without linearization on the basis of the input signal.

Value	Function
-99999999	Smallest value
0	Default value
99999999	Largest value

P1(Y) ... P24(Y)

Y coordinate of the linearization points.

This is the value that the device should generate instead of the x coordinate.

For example: P2(X) is replaced by P2(Y).

Value	Function
-99999999	Smallest value
0	Default value
99999999	Largest value

5. Appendix

5.1 Reading Out Data via Serial Interface

The free operating software OS 6.0 is available at: Pepperl-Fuchs.com

The code positions (SERIAL VALUE) defined in the SERIAL MENU can be read out serially at any time by a PC or a PLC. Communication with this device is based on the Drivecom protocol according to ISO 1745 or the Modbus RTU protocol. For details, refer to the chapter "Modbus RTU Interface" in this manual. See Chapter 5.2.

The request string for reading out data is:

EOT	AD1	AD2	C1	C2	ENQ

EOT = control characters (hex 04)

AD1 = device address, high byte

AD2 = device address, low byte

C1 = code position to be read out, high byte

C2 = code position to be read out, low byte

ENQ = control characters (hex 05)

If, for example, the current display value is to be read out from a device with device address 11 (code = 1), the detailed request string will be as follows:

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

If the request is correct, the response from the device is:

STX	C1	C2	xxxxx	ETX	BCC

STX = control characters (hex 02)

C1 = code position to be read out, high byte

C2 = code position to be read out, low byte

xxxxx = data to be read out

ETX = control characters (hex 03)

BCC = block check character

5.2 Modbus RTU Interface

The device's Modbus interface is a standard Modbus RTU node and offers the following Modbus functions:

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

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

5.2.1 Parameter Settings

Required parameter settings in the "Serial Menu":

UNIT NUMBER

Not valid for Modbus communication
(For setting the Modbus address, see "MODBUS" parameter)

SERIAL BAUD RATE

This parameter is used to set the serial baud rate.

Value	Designation	Function
0	**9600**	9600 baud
1	19,200	19,200 baud
2	38,400	38,400 baud

SERIAL FORMAT

This parameter sets the bit data format.

Value	Designation	Function
0	**7-EVEN-1**	Cannot be used with the Modbus protocol.
1	7-EVEN-2	
2	7-ODD-1	
3	7-ODD-2	
4	7-NONE-1	
5	7-NONE-2	

Value	Designation	Function		
6	8-EVEN-1	8 data	Parity even	1 stop
7	8-ODD-1	8 data	Parity odd	1 stop
8	8-NONE-1	Cannot be used with the Modbus protocol.		
9	8-NONE-2	8 data	No parity	2 stops

SERIAL INIT

Not valid for Modbus communication

SERIAL PROTOCOL

Not valid for Modbus communication

SERIAL TIMER (S)

Not valid for Modbus communication

SERIAL VALUE

Not valid for Modbus communication

MODBUS

This parameter activates the Modbus protocol and determines the Modbus address.

Value	Function
0	Do not use with Modbus protocol (Modbus is deactivated)
1 … 247	Modbus activated: The serial interface uses the Modbus RTU protocol The number set here determines the Modbus node address.

5.2.2 Read Holding Registers and Write Multiple Registers

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

Since all device registers are 32-bit registers, but Modbus holding registers are only 16-bit registers, each device register requires two holding registers. (For this reason, it is not possible to use the "Write Single Register" Modbus function.)

With each read or write operation, it is only possible to access a single device register, and therefore the "quantity (or number) of registers" in the Modbus

request must always be 2.

Access to Parameters

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

The holding register numbers for a specific parameter can be calculated using the parameter #, which can be found in the parameter table in the relevant device manual:

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

Example

Holding registers 0x0066 and 0x0067 hex provide access to parameter # 51 "PRESELECTION 1."

Access to Actual Values

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

Holding registers 0x1000 / 0x1001 hex → Actual values with serial code ":0" (display value)

Holding registers 0x1002 / 0x1003 hex → Actual values with serial code ":1"

Holding registers 0x1004 / 0x1005 hex → Actual values with serial code ":2"

Holding registers 0x1006 / 0x1007 hex → Actual values with serial code ":3"

Etc.

Access to Status Register

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

Holding registers 0x2000 / 0x2001 hex → Output status (Ctrl. Out status, read-only)

Holding registers 0x2002 / 0x2003 hex → Serial commands

Holding registers 0x2004 / 0x2005 hex → External commands (Ctrl. In status, read-only)

Holding registers 0x2006 / 0x2007 hex → All commands (read-only)

5.2.3 Read Coils and Write Single Coil

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

Coil number	Serial code of the command	Command	Function
0	54	RESET/SET	Transfers the currently detected position value to the "SSI offset" parameter—only in "SSI" mode
1	55	FREEZE DISPLAY	Freezes the current measurement result
2	56	TEACH ANALOG START	Transfers the current measurement result to the "Analog Start" parameter
3	57	TEACH ANALOG END	Transfers the current measurement result to the "Analog End" parameter
4	58	TEACH PRESELECTION 1	Transfers the current measurement result to the "Preselection 1" parameter
5	59	TEACH PRESELECTION 2	Transfers the current measurement result to the "Preselection 2" parameter
6	60	TEACH PRESELECTION 3	Transfers the current measurement result to the "Preselection 3" parameter
7	61	TEACH PRESELECTION 4	Transfers the current measurement result to the "Preselection 4" parameter
8	62	TEACH PRESELECTION 5	Transfers the current measurement result to the "Preselection 5" parameter
9	63	TEACH PRESELECTION 6	Transfers the current measurement result to the "Preselection 6" parameter
10	64	RESET MIN/MAX	Resets the minimum/maximum value
11	65	LOCK RELEASE	Releases the self-locking of all outputs

12	66	SERIAL PRINT (do not use with Modbus)	Sends the serial data (do not use with Modbus)
13	67	ACTIVATE DATA (not required with Modbus)	Activates data.(not required for Modbus)
14	68	STORE DATA	Saves to EEPROM.
15	69	TESTPROGRAM (do not use with Modbus)	Test program (do not use with Modbus).

5.2.4 Diagnostics

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

Other diagnostic functions are not available.

5.3 Parameter List / Serial Codes

#	Menu	Name	Code	Min.	Max.	Default
0	GENERAL MENU	MODE	00	0	3	0
1	GENERAL MENU	ENCODER PROPERTIES	01	0	4	0
2	GENERAL MENU	ENCODER DIRECTION	02	0	1	0
3	GENERAL MENU	FACTOR	03	-99999999	99999999	1
4	GENERAL MENU	DIVIDER	04	-99999999	99999999	1
5	GENERAL MENU	ADDITIVE VALUE	05	-99999999	99999999	0
6	GENERAL MENU	LINEARIZATION MODE	06	0	2	0
7	GENERAL MENU	BACKUP MEMORY	07	0	1	1
8	GENERAL MENU	FACTORY SETTINGS	08	0	1	0
9	GENERAL MENU	__	09	0	0	0
10	GENERAL MENU	__	10	0	0	0
11	GENERAL MENU	__	11	0	0	0
12	GENERAL MENU	__	12	0	0	0
13	FREQUENCY MODE	FREQUENCY MODE	13	0	5	0
14	FREQUENCY MODE	FREQUENCY BASE	14	0	3	2
15	FREQUENCY MODE	SAMPLING TIME 1 (S)	15	1	9999	100
16	FREQUENCY MODE	WAIT TIME 1 (S)	16	1	7999	100
17	FREQUENCY MODE	STANDSTILL TIME 1 (S)	17	1	9999	1
18	FREQUENCY MODE	AVERAGE FILTER 1	18	0	16	0

#	Menu	Name	Code	Min.	Max.	Default
19	FREQUENCY MODE	SAMPLING TIME 2 (S)	19	1	9999	100
20	FREQUENCY MODE	WAIT TIME 2 (S)	20	1	7999	100
21	FREQUENCY MODE	AVERAGE FILTER 2	21	0	16	0
22	FREQUENCY MODE	__	22	0	0	0
23	COUNTER MODE	COUNT MODE	23	0	5	3
24	COUNTER MODE	FACTOR A	24	1	9999999	100000
25	COUNTER MODE	SET VALUE A	25	-99999999	99999999	0
26	COUNTER MODE	FACTOR B	26	1	9999999	100000
27	COUNTER MODE	SET VALUE B	27	-99999999	99999999	0
28	COUNTER MODE	ROUND LOOP VALUE	28	0	99999999	0
29	COUNTER MODE	__	29	0	0	0
30	COUNTER MODE	__	30	0	0	0
31	SSI MODE	SSI MODE	31	0	1	0
32	SSI MODE	ENCODER RESOLUTION	32	10	32	25
33	SSI MODE	DATA FORMAT	33	0	1	0
34	SSI MODE	BAUD RATE	34	0	5	2
35	SSI MODE	SSI ZERO	35	0	999999999	0
36	SSI MODE	HIGH BIT	36	1	32	25
37	SSI MODE	LOW BIT	37	1	32	1
38	SSI MODE	SSI OFFSET	38	0	999999999	0
39	SSI MODE	ROUND LOOP VALUE	39	0	99999999	0
40	SSI MODE	SAMPLING TIME (S)	40	1	9999	10
41	SSI MODE	ERROR BIT	41	0	32	0
42	SSI MODE	ERROR POLARITY	42	0	1	0
43	SSI MODE	__	43	0	0	0
44	SSI MODE	__	44	0	0	0
45	SSI MODE	__	45	0	0	0
46	PRESELECTION VALUES	PRESELECTION 1	A0	-99999999	99999999	1000
47	PRESELECTION VALUES	PRESELECTION 2	A1	-99999999	99999999	2000
48	PRESELECTION VALUES	PRESELECTION 3	A2	-99999999	99999999	3000
49	PRESELECTION VALUES	PRESELECTION 4	A3	-99999999	99999999	4000

#	Menu	Name	Code	Min.	Max.	Default
50	PRESELECTION VALUES	PRESELECTION 5	A4	-99999999	99999999	5000
51	PRESELECTION VALUES	PRESELECTION 6	A5	-99999999	99999999	6000
52	PRESELECTION 1 MENU	MODE 1	A6	0	8	0
53	PRESELECTION 1 MENU	HYSTERESIS 1	A7	0	99999	0
54	PRESELECTION 1 MENU	PULSE TIME 1 (S)	A8	0	60000	0
55	PRESELECTION 1 MENU	OUTPUT TARGET 1	A9	0	6	1
56	PRESELECTION 1 MENU	OUTPUT POLARITY 1	B0	0	1	0
57	PRESELECTION 1 MENU	OUTPUT LOCK 1	B1	0	1	0
58	PRESELECTION 1 MENU	STARTUP DELAY 1 (S)	B2	0	60000	0
59	PRESELECTION 1 MENU	__	B3	0	0	0
60	PRESELECTION 1 MENU	__	B4	0	0	0
61	PRESELECTION 1 MENU	__	B5	0	0	0
62	PRESELECTION 1 MENU	__	B6	0	0	0
63	PRESELECTION 2 MENU	MODE 2	B7	0	8	0
64	PRESELECTION 2 MENU	HYSTERESIS 2	B8	0	99999	0
65	PRESELECTION 2 MENU	PULSE TIME 2 (S)	B9	0	60000	0
66	PRESELECTION 2 MENU	OUTPUT TARGET 2	C0	0	6	2
67	PRESELECTION 2 MENU	OUTPUT POLARITY 2	C1	0	1	0
68	PRESELECTION 2 MENU	OUTPUT LOCK 2	C2	0	1	0
69	PRESELECTION 2 MENU	STARTUP DELAY 2 (S)	C3	0	60000	0

#	Menu	Name	Code	Min.	Max.	Default
70	PRESELECTION 2 MENU	__	C4	0	0	0
71	PRESELECTION 2 MENU	__	C5	0	0	0
72	PRESELECTION 2 MENU	__	C6	0	0	0
73	PRESELECTION 2 MENU	__	C7	0	0	0
74	PRESELECTION 3 MENU	MODE 3	C8	0	8	0
75	PRESELECTION 3 MENU	HYSTERESIS 3	C9	0	99999	0
76	PRESELECTION 3 MENU	PULSE TIME 3 (S)	D0	0	60000	0
77	PRESELECTION 3 MENU	OUTPUT TARGET 3	D1	0	6	3
78	PRESELECTION 3 MENU	OUTPUT POLARITY 3	D2	0	1	0
79	PRESELECTION 3 MENU	OUTPUT LOCK 3	D3	0	1	0
80	PRESELECTION 3 MENU	STARTUP DELAY 3 (S)	D4	0	60000	0
81	PRESELECTION 3 MENU	__	D5	0	0	0
82	PRESELECTION 3 MENU	__	D6	0	0	0
83	PRESELECTION 3 MENU	__	D7	0	0	0
84	PRESELECTION 3 MENU	__	D8	0	0	0
85	PRESELECTION 4 MENU	MODE 4	D9	0	8	0
86	PRESELECTION 4 MENU	HYSTERESIS 4	E0	0	99999	0
87	PRESELECTION 4 MENU	PULSE TIME 4 (S)	E1	0	60000	0
88	PRESELECTION 4 MENU	OUTPUT TARGET 4	E2	0	6	4
89	PRESELECTION 4 MENU	OUTPUT POLARITY 4	E3	0	1	0

#	Menu	Name	Code	Min.	Max.	Default
90	PRESELECTION 4 MENU	OUTPUT LOCK 4	E4	0	1	0
91	PRESELECTION 4 MENU	STARTUP DELAY 4 (S)	E5	0	60000	0
92	PRESELECTION 4 MENU	__	E6	0	0	0
93	PRESELECTION 4 MENU	__	E7	0	0	0
94	PRESELECTION 4 MENU	__	E8	0	0	0
95	PRESELECTION 4 MENU	__	E9	0	0	0
96	PRESELECTION 5 MENU	MODE 5	F0	0	8	0
97	PRESELECTION 5 MENU	HYSTERESIS 5	F1	0	99999	0
98	PRESELECTION 5 MENU	PULSE TIME 5 (S)	F2	0	60000	0
99	PRESELECTION 5 MENU	OUTPUT TARGET 5	F3	0	6	5
100	PRESELECTION 5 MENU	OUTPUT POLARITY 5	F4	0	1	0
101	PRESELECTION 5 MENU	OUTPUT LOCK 5	F5	0	1	0
102	PRESELECTION 5 MENU	STARTUP DELAY 5 (S)	F6	0	60000	0
103	PRESELECTION 5 MENU	__	F7	0	0	0
104	PRESELECTION 5 MENU	__	F8	0	0	0
105	PRESELECTION 5 MENU	__	F9	0	0	0
106	PRESELECTION 5 MENU	__	G0	0	0	0
107	PRESELECTION 6 MENU	MODE 6	G1	0	8	0
108	PRESELECTION 6 MENU	HYSTERESIS 6	G2	0	99999	0
109	PRESELECTION 6 MENU	PULSE TIME 6 (S)	G3	0	60000	0

#	Menu	Name	Code	Min.	Max.	Default
110	PRESELECTION 6 MENU	OUTPUT TARGET 6	G4	0	6	6
111	PRESELECTION 6 MENU	OUTPUT POLARITY 6	G5	0	1	0
112	PRESELECTION 6 MENU	OUTPUT LOCK 6	G6	0	1	0
113	PRESELECTION 6 MENU	STARTUP DELAY 6 (S)	G7	0	60000	0
114	PRESELECTION 6 MENU	__	G8	0	0	0
115	PRESELECTION 6 MENU	__	G9	0	0	0
116	PRESELECTION 6 MENU	__	H0	0	0	0
117	PRESELECTION 6 MENU	__	H1	0	0	0
118	SERIAL MENU	UNIT NUMBER	90	11	99	11
119	SERIAL MENU	SERIAL BAUD RATE	91	0	2	0
120	SERIAL MENU	SERIAL FORMAT	92	0	9	0
121	SERIAL MENU	SERIAL INIT	9~	0	1	0
122	SERIAL MENU	SERIAL PROTOCOL	H2	0	1	0
123	SERIAL MENU	SERIAL TIMER (S)	H3	0	60000	0
124	SERIAL MENU	SERIAL VALUE	H4	0	3	0
125	SERIAL MENU	MODBUS	H5	0	247	0
126	SERIAL MENU	__	H6	0	0	0
127	SERIAL MENU	__	H7	0	0	0
128	ANALOG MENU	ANALOG FORMAT	H8	0	2	0
129	ANALOG MENU	ANALOG START	H9	-99999999	99999999	0
130	ANALOG MENU	ANALOG END	I0	-99999999	99999999	10000
131	ANALOG MENU	ANALOG GAIN %	I1	0	11000	10000
132	ANALOG MENU	ANALOG OFFSET %	I2	-9999	9999	0
133	COMMAND MENU	INPUT 1 ACTION	I3	0	23	0
134	COMMAND MENU	INPUT 1 CONFIG.	I4	0	3	2
135	COMMAND MENU	INPUT 2 ACTION	I5	0	23	0
136	COMMAND MENU	INPUT 2 CONFIG.	I6	0	3	2
137	COMMAND MENU	INPUT 3 ACTION	I7	0	23	0
138	COMMAND MENU	INPUT 3 CONFIG.	I8	0	3	2

#	Menu	Name	Code	Min.	Max.	Default
139	COMMAND MENU	INPUT 4 ACTION	I9	0	22	0
140	COMMAND MENU	INPUT 4 CONFIG.	J0	0	3	2
141	COMMAND MENU	INPUT 5 ACTION	J1	0	22	0
142	COMMAND MENU	INPUT 5 CONFIG.	J2	0	3	2
143	COMMAND MENU	INPUT 6 ACTION (FACTORY SETTINGS)	J3	22	22	22
144	COMMAND MENU	INPUT 6 CONFIG. (RISING EDGE)	J4	2	2	2
145	COMMAND MENU	__	J5	0	0	0
146	COMMAND MENU	__	J6	0	0	0
147	COMMAND MENU	__	J7	0	0	0
148	COMMAND MENU	__	J8	0	0	0
149	COMMAND MENU	__	J9	0	0	0
150	COMMAND MENU	__	K0	0	0	0
151	LINEARIZATION MENU	P1(X)	K1	-99999999	99999999	0
152	LINEARIZATION MENU	P1(Y)	K2	-99999999	99999999	0
153	LINEARIZATION MENU	P2(X)	K3	-99999999	99999999	0
154	LINEARIZATION MENU	P2(Y)	K4	-99999999	99999999	0
155	LINEARIZATION MENU	P3(X)	K5	-99999999	99999999	0
156	LINEARIZATION MENU	P3(Y)	K6	-99999999	99999999	0
157	LINEARIZATION MENU	P4(X)	K7	-99999999	99999999	0
158	LINEARIZATION MENU	P4(Y)	K8	-99999999	99999999	0
159	LINEARIZATION MENU	P5(X)	K9	-99999999	99999999	0
160	LINEARIZATION MENU	P5(Y)	L0	-99999999	99999999	0
161	LINEARIZATION MENU	P6(X)	L1	-99999999	99999999	0
162	LINEARIZATION MENU	P6(Y)	L2	-99999999	99999999	0

#	Menu	Name	Code	Min.	Max.	Default
163	LINEARIZATION MENU	P7(X)	L3	-99999999	99999999	0
164	LINEARIZATION MENU	P7(Y)	L4	-99999999	99999999	0
165	LINEARIZATION MENU	P8(X)	L5	-99999999	99999999	0
166	LINEARIZATION MENU	P8(Y)	L6	-99999999	99999999	0
167	LINEARIZATION MENU	P9(X)	L7	-99999999	99999999	0
168	LINEARIZATION MENU	P9(Y)	L8	-99999999	99999999	0
169	LINEARIZATION MENU	P10(X)	L9	-99999999	99999999	0
170	LINEARIZATION MENU	P10(Y)	M0	-99999999	99999999	0
171	LINEARIZATION MENU	P11(X)	M1	-99999999	99999999	0
172	LINEARIZATION MENU	P11(Y)	M2	-99999999	99999999	0
173	LINEARIZATION MENU	P12(X)	M3	-99999999	99999999	0
174	LINEARIZATION MENU	P12(Y)	M4	-99999999	99999999	0
175	LINEARIZATION MENU	P13(X)	M5	-99999999	99999999	0
176	LINEARIZATION MENU	P13(Y)	M6	-99999999	99999999	0
177	LINEARIZATION MENU	P14(X)	M7	-99999999	99999999	0
178	LINEARIZATION MENU	P14(Y)	M8	-99999999	99999999	0
179	LINEARIZATION MENU	P15(X)	M9	-99999999	99999999	0
180	LINEARIZATION MENU	P15(Y)	N0	-99999999	99999999	0
181	LINEARIZATION MENU	P16(X)	N1	-99999999	99999999	0
182	LINEARIZATION MENU	P16(Y)	N2	-99999999	99999999	0

#	Menu	Name	Code	Min.	Max.	Default
183	LINEARIZATION MENU	P17(X)	N3	-99999999	99999999	0
184	LINEARIZATION MENU	P17(Y)	N4	-99999999	99999999	0
185	LINEARIZATION MENU	P18(X)	N5	-99999999	99999999	0
186	LINEARIZATION MENU	P18(Y)	N6	-99999999	99999999	0
187	LINEARIZATION MENU	P19(X)	N7	-99999999	99999999	0
188	LINEARIZATION MENU	P19(Y)	N8	-99999999	99999999	0
189	LINEARIZATION MENU	P20(X)	N9	-99999999	99999999	0
190	LINEARIZATION MENU	P20(Y)	O0	-99999999	99999999	0
191	LINEARIZATION MENU	P21(X)	O1	-99999999	99999999	0
192	LINEARIZATION MENU	P21(Y)	O2	-99999999	99999999	0
193	LINEARIZATION MENU	P22(X)	O3	-99999999	99999999	0
194	LINEARIZATION MENU	P22(Y)	O4	-99999999	99999999	0
195	LINEARIZATION MENU	P23(X)	O5	-99999999	99999999	0
196	LINEARIZATION MENU	P23(Y)	O6	-99999999	99999999	0
197	LINEARIZATION MENU	P24(X)	O7	-99999999	99999999	0
198	LINEARIZATION MENU	P24(Y)	O8	-99999999	99999999	0

5.4 Serial Codes of the 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

5.5 Linearization

This function can be used to convert a linear input signal into a non-linear representation (or vice versa). Up to 24 linearization points are available, which can be distributed over the entire conversion range at various distances.

Linear interpolation takes place automatically between two predefined coordinates.

It is recommended that as many points as possible be positioned in places with strong curvature. In places with weak curvature, only a few points are needed.

To specify a linearization curve, the LINEARIZATION MODE parameter must be set to

1 QUADRANT or 4 QUADRANT (see diagram below).

Parameters P1(X) to P24(X) can be used to specify up to 24 X coordinates.

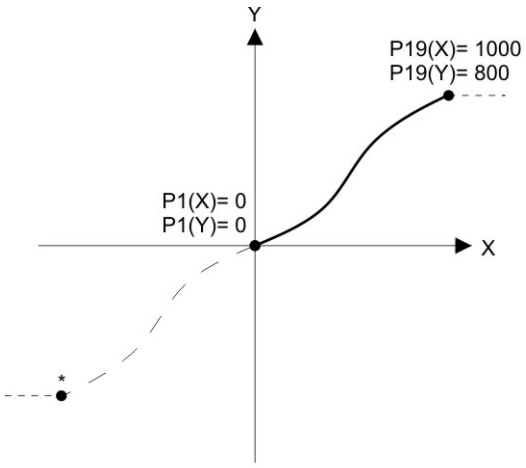
These correspond to display values without linearization.

Parameters P1(Y) to P24(Y) are used to enter the values that the measured value is to assume instead of the X values.

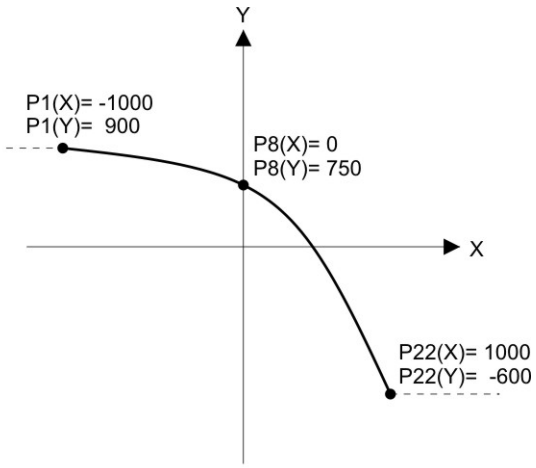
For example, the value P5(X) is replaced by the value P5(Y).

The X coordinates must be assigned continuously increasing values.

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



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



Example: Linearization Mode: 4 Quadrant

Mode: 1 Quadrant:

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

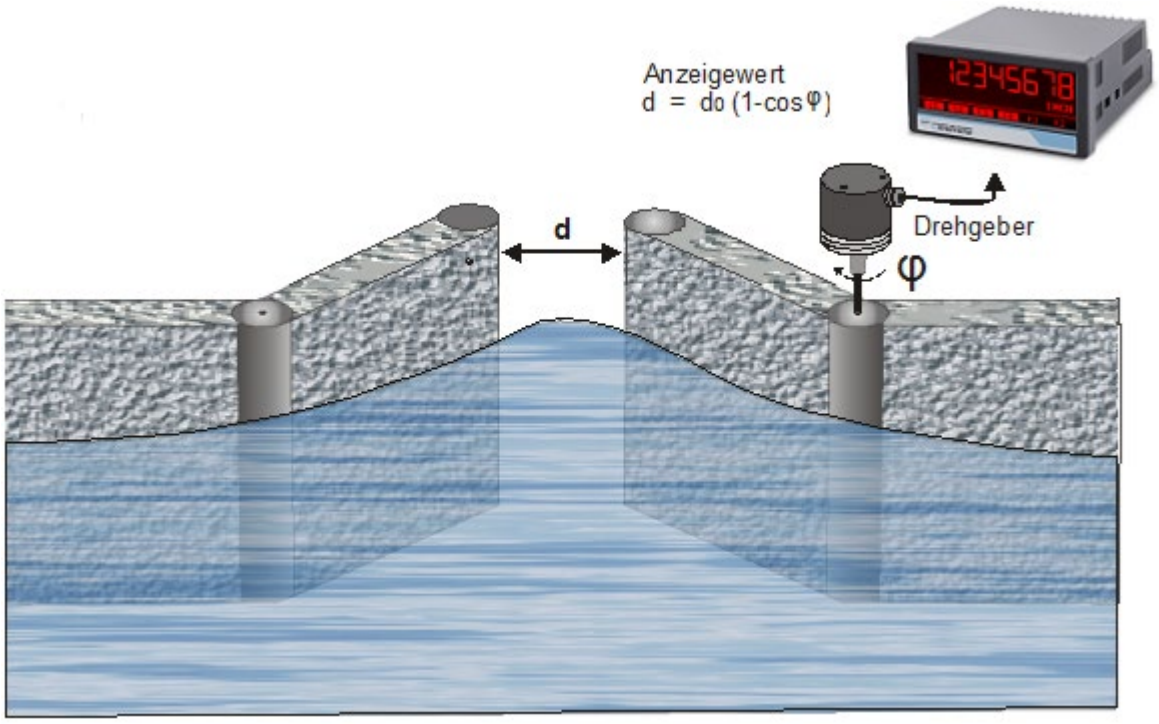
In the case of negative measured values, the curve is mirrored point-symmetrically.

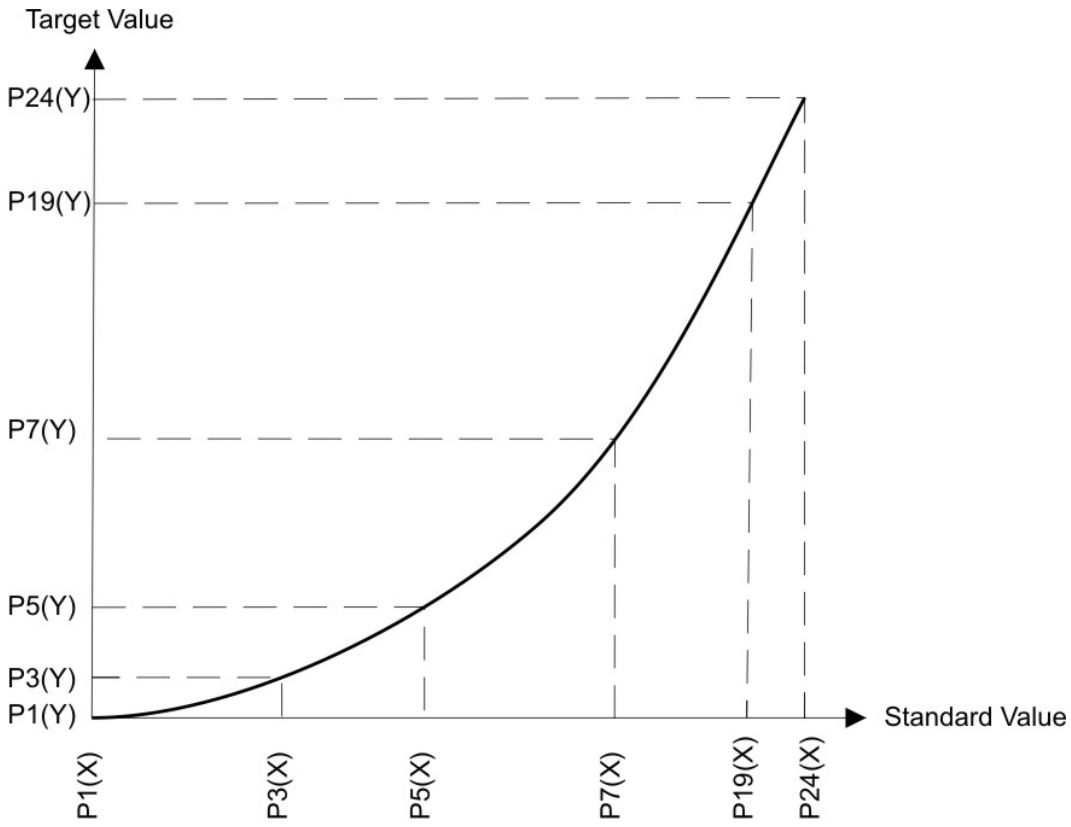
Mode: 4 Quadrant:

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

Linearization application example:

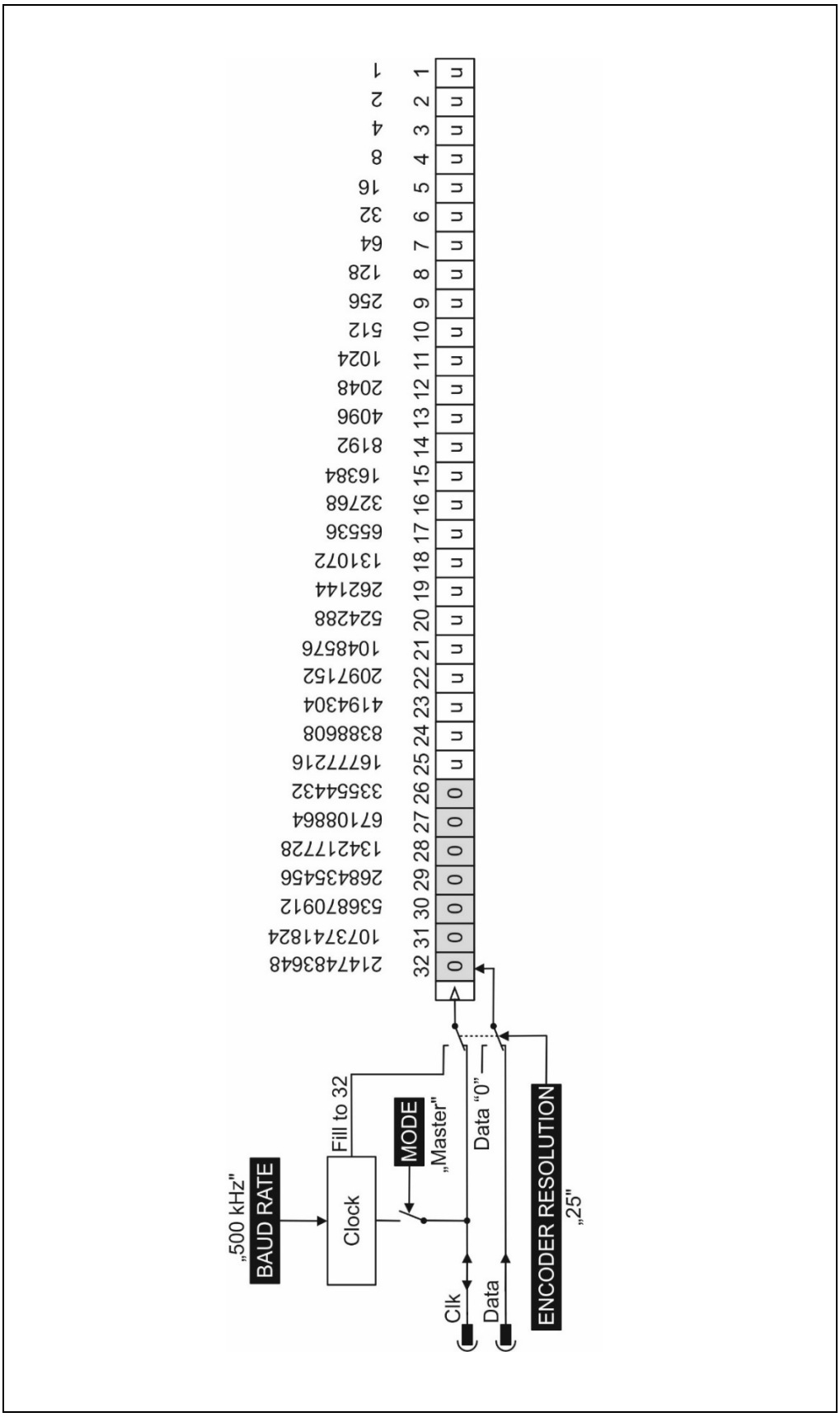
The image below shows a water lock, in which the opening width is detected by a rotary encoder and displayed. In this arrangement, the rotary encoder generates a signal proportional to the angle of rotation φ. However, a direct indication of the opening width "d" is desired.



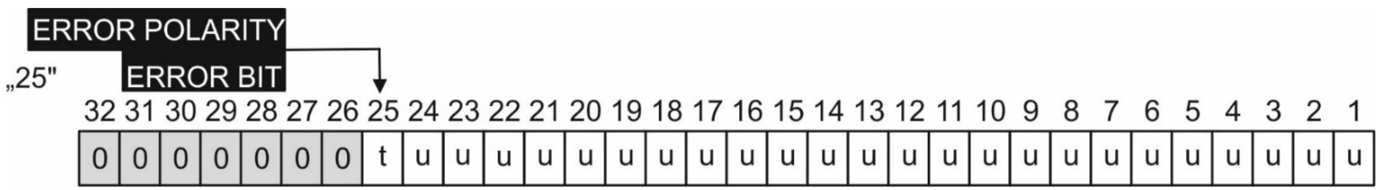
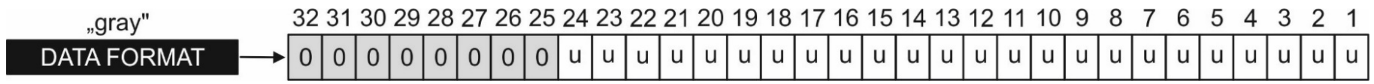
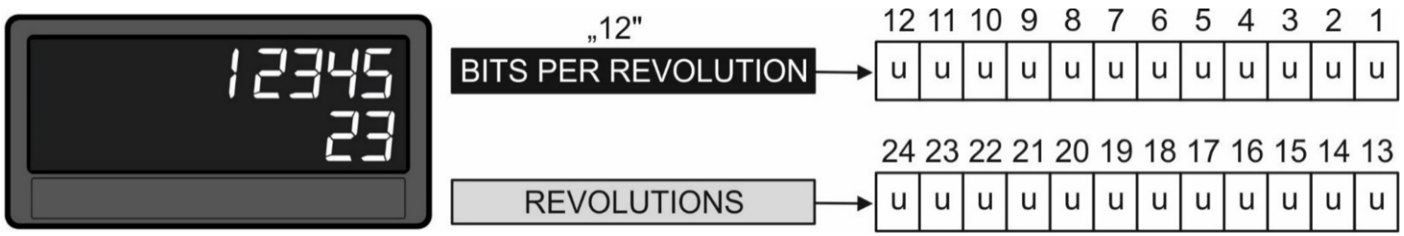


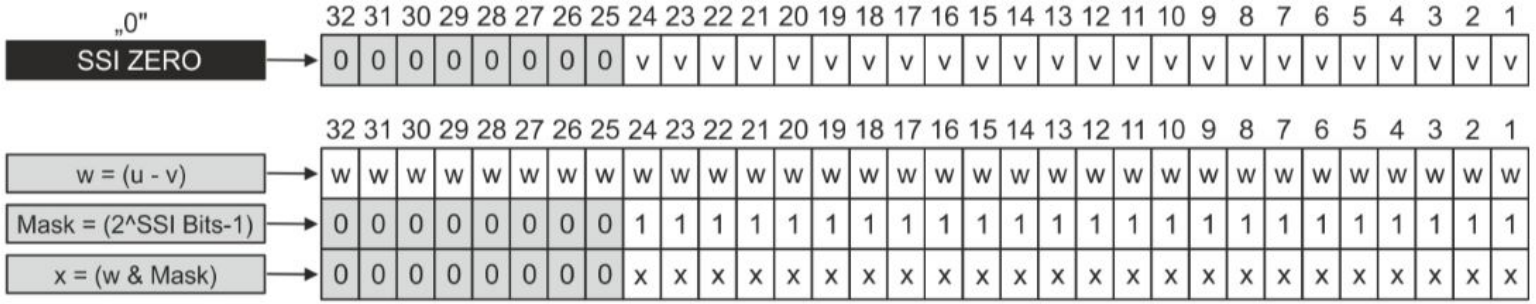
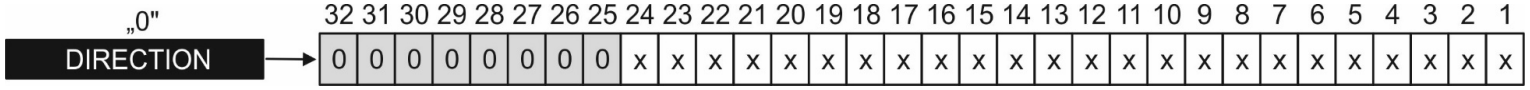
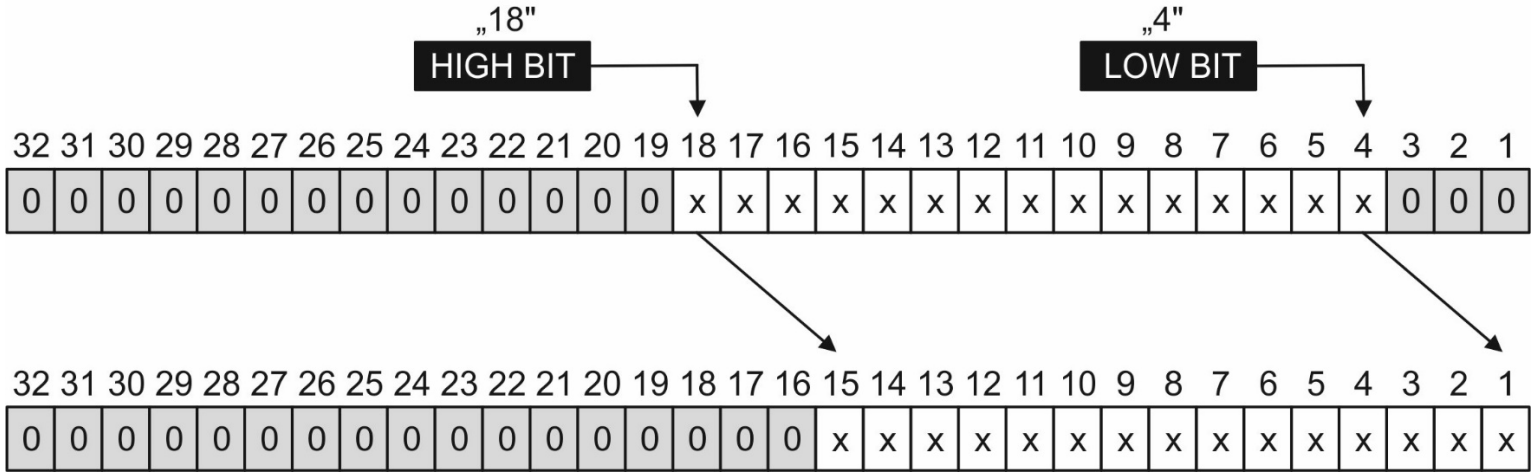
5.6 Reading in the SSI Value

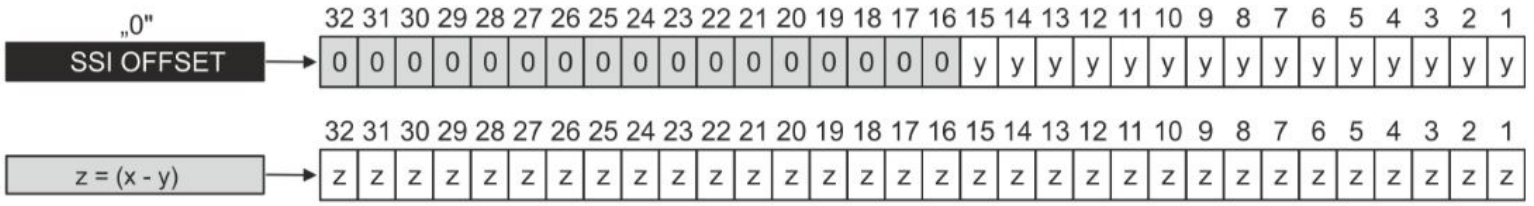
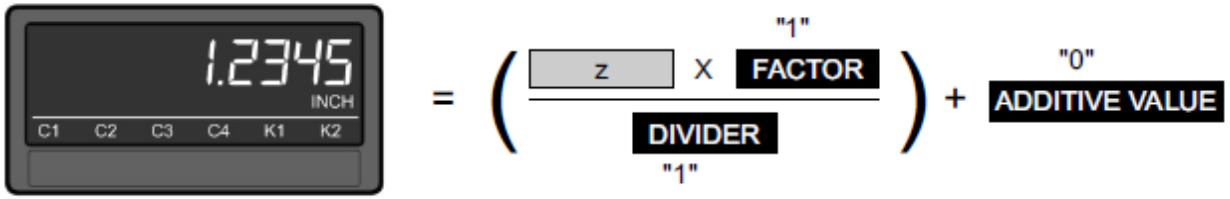
The received data is always filled internally to a 32-bit data length.



Internal processing and calculation of SSI data

Checking the error bit:	
Data conversion: Gray code → Binary	
Data partitioning: Bits per revolution and number of revolutions	

Calculating the SSI Zero Position:	
Checking the direction of rotation:	
Evaluating the bit suppression:	

Calculating the SSI offset:	
Calculating the display value:	

5.7 Operating Modes / OP Modes of the Start/Stop Interface

The device supports the following operating modes:

Managing Operation

- The device generates the init pulse for a connected rotary encoder.
- The two init connectors (INIT OUT, /INIT OUT) are configured as outputs.

Managed Operation

- An external devices generates the init pulse for a rotary encoder.
- The two init connectors (ext. INIT IN, ext. /INIT IN) are configured as inputs.

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

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

POSITION (distance measurement)

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

Interpretation of the measurement result for the distance measurement:

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

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

ANGLE (angle measurement)

For angle measurement, the desired position or angle output value per revolution can be specified using the "ROUND LOOP VALUE" parameter. This output value is generated as soon as the distance traveled (e.g., circumference), which is set as the reference quantity in the "CIRCUMFERENCE (in mm)" parameter, is reached. The output value then starts again at 0 until the distance traveled is reached again. (Round Loop function!)

Using existing scaling parameters (factor, divider, and additive value), this output value can be rescaled if desired.

Interpretation of the measurement result for the angle measurement:

The default setting ("CIRCUMFERENCE [mm] = 100,000" and "ROUND LOOP VALUE = 360," and "FACTOR = 1," "DIVIDER = 1" and "ADDITIVE VALUE = 0") is an angle or position output of "0 … 360" (e.g., degrees) every 100,000 mm.

SPEED (velocity measurement)

The velocity is detected and can be converted to another unit using existing scaling parameters (factor, divider, and additive value), if desired.

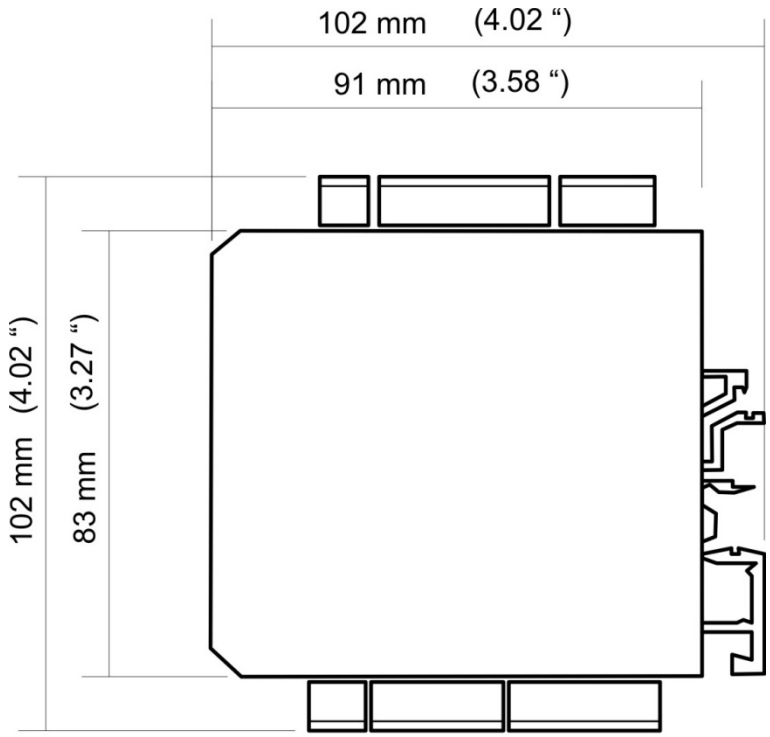
Interpretation of the measurement result for the velocity measurement:

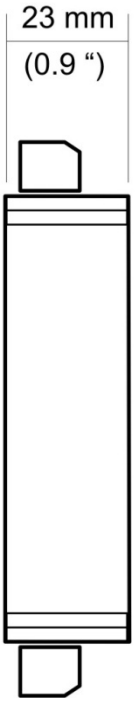
The default setting ("FACTOR = 1," "DIVIDER = 1" and "ADDITIVE VALUE = 0") is a velocity output in meters per second [m/s].

Note

The analog output, the switch points of the transistor outputs, and the linearization function always refer to the scaled measurement result of the selected operational mode.

5.8 Dimensions





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