

# Operating Manual



## UZ210

Universal signal converter: Analog (V/mA) - Incremental / SSI / RS232 / RS485

### Product Features:

- Analog input for voltage, current or potentiometer operation
- Operation as frequency converter/-generator, positional / angular encoder or data logging possible
- Programmable curves with optionally repeating curve cycles
- Frequency output (HTL or TTL level, max. 1 MHz) proportional to the input signal
- Incremental output and SSI interface, for digital expression of linear or angular positions
- Incremental direction signal A, B under control of input signal and parameter settings
- Additional control functions similar to a motorized potentiometer
- USB programming port and serial interface (RS232 / RS485)
- Programmable marker resp. index pulse output (Z, /Z)
- Power supply 12 to 30 VDC

Die deutsche Beschreibung ist verfügbar unter:

[https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Uz210\\_d.pdf](https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Uz210_d.pdf)



The English description is available at:

[https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Uz210\\_e.pdf](https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Uz210_e.pdf)



La description en français est disponible sur:

[https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Uz210\\_f.pdf](https://www.motrona.com/fileadmin/files/bedienungsanleitungen/Uz210_f.pdf)



The operator software OS (freeware) is available at:

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



Version:	Description:
UZ21001a_af_hk/Feb12	First edition
UZ21002a_af_hk/Jul12	Extensions for communication via USB port
Uz210_02b_af_sn/Dec14	Extensions for inhibit-function
Uz210_02c_oi_/Dez-15/ag	Safety Instructions, Legal Notices and design added resp. updated. Connection diagram: mistake eliminated (X4/1 = GND instead of AGND). Analog in drawings: mistake eliminated (AGND = X4/6 instead of X4/1). Addition (Techn. Specifications): "SSI - only single transmission supported". Hint supplemented: Only RS232 or RS485 (not both at the same time).
Uz210_03a_oi/March 21/af/mbo	Additions of MODBUS

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# 1. Safety Instructions and Responsibility

## 1.1. General Safety Instructions

This operation manual is a significant component of the unit and includes important rules and hints about the installation, function and usage. Non-observance can result in damage and/or impairment of the functions to the unit or the machine or even in injury to persons using the equipment!

**Please read the following instructions carefully before operating the device and observe all safety and warning instructions! Keep the manual for later use.**

A pertinent qualification of the respective staff is a fundamental requirement in order to use these manual. The unit must be installed, connected and put into operation by a qualified electrician.

**Liability exclusion:** The manufacturer is not liable for personal injury and/or damage to property and for consequential damage, due to incorrect handling, installation and operation. Further claims, due to errors in the operation manual as well as misinterpretations are excluded from liability.

In addition the manufacturer reserve the right to modify the hardware, software or operation manual at any time and without prior notice. Therefore, there might be minor differences between the unit and the descriptions in operation manual.

The raiser respectively positioner is exclusively responsible for the safety of the system and equipment where the unit will be integrated.

During installation or maintenance all general and also all country- and application-specific safety rules and standards must be observed.

If the device is used in processes, where a failure or faulty operation could damage the system or injure persons, appropriate precautions to avoid such consequences must be taken.

## 1.2. Use according to the intended purpose

The unit is intended exclusively for use in industrial machines, constructions and systems. Non-conforming usage does not correspond to the provisions and lies within the sole responsibility of the user. The manufacturer is not liable for damages which has arisen through unsuitable and improper use.

Please note that device may only be installed in proper form and used in a technically perfect condition - in accordance to the Technical Specifications (see chapter [8](#)). The device is not suitable for operation in explosion-proof areas or areas which are excluded by the EN 61010-1 standard.

## 1.3. Installation

The device is only allowed to be installed and operated within the permissible temperature range. Please ensure an adequate ventilation and avoid all direct contact between the device and hot or aggressive gases and liquids.

Before installation or maintenance, the unit must be disconnected from all voltage-sources. Further it must be ensured that no danger can arise by touching the disconnected voltage-sources.

Devices which are supplied by AC-voltages, must be connected exclusively by switches, respectively circuit-breakers with the low voltage network. The switch or circuit-breaker must be placed as near as possible to the device and further indicated as separator.

Incoming as well as outgoing wires and wires for extra low voltages (ELV) must be separated from dangerous electrical cables (SELV circuits) by using a double resp. increased isolation.

All selected wires and isolations must be conform to the provided voltage- and temperature-ranges. Further all country- and application-specific standards, which are relevant for structure, form and quality of the wires, must be ensured. Indications about the permissible wire cross-sections for wiring are described in the Technical Specifications (see chapter [8](#)).

Before first start-up it must be ensured that all connections and wires are firmly seated and secured in the screw terminals. All (inclusively unused) terminals must be fastened by turning the relevant screws clockwise up to the stop.

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

## 1.4. EMC Guidelines

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

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

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

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

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

## 1.5. Cleaning, Maintenance and Service Notes

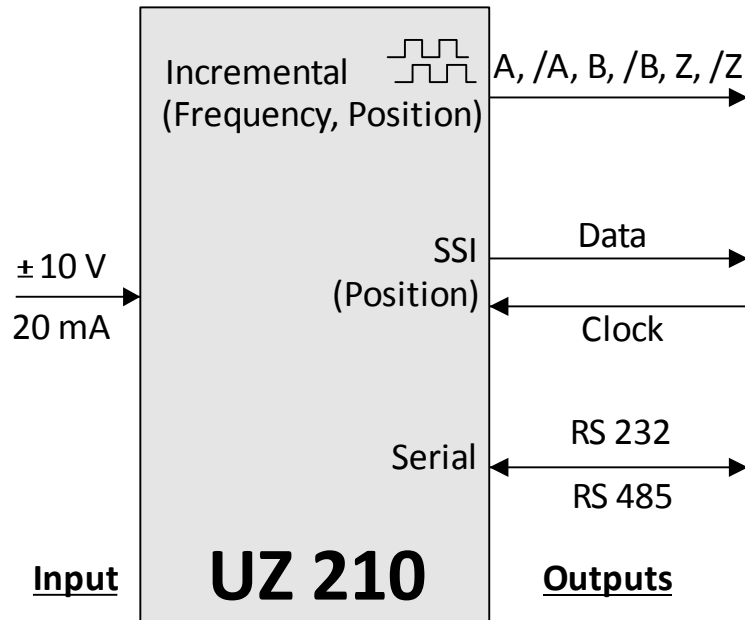
To clean the front of the unit please use only a slightly damp (not wet!), soft cloth. For the rear no cleaning is necessary. For an unscheduled, individual cleaning of the rear the maintenance staff or assembler is self-responsible.

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

## 2. Introduction

UZ 210 is a versatile and competitive signal converter and frequency generator for use with industrial applications in drive and automation technology.

### Functional overview:



The unit accepts analogue input signals (0 -  $\pm 10\text{ V}$ , 0 - 20 mA or 4 - 20 mA) for conversion to digital output signals.

Due to an inbuilt reference voltage source it is also easy to connect potentiometers or similar analogue transducer systems to the input of the unit.



The USB communication port is not available with the previous version UZ21001.

## 2.1. Operation as Signal Converter

The conversion output generated from the analogue input is available with following formats:

- **Frequency**  
The unit converts the analogue input into a proportional output frequency with a free programmable range between 0,01 Hz and 1 MHz. A full set of impulse channels A, /A, B, /B, Z, /Z is available and the direction information (A, B, 90°) automatically considers the actual state and course of the analogue input with regard to the related parameter settings. An external voltage connected to terminal [Com+] defines the output voltage level (range 5 - 30 V). Where no remote voltage has been applied (Com+ unconnected), the unit automatically provides a 4 volts output (TTL compatible).
- **Linear or angular position with incremental representation**  
The unit converts the analogue input into a positional or angular information similar to an incremental encoder. This means that e.g. the rotation angle of an analogue potentiometer shaft converts to real incremental encoder information. The unit provides a full set of output channels A, /A, B, /B, Z /Z, and the directional information (A, B, 90°) fully follows the mechanical motion of the potentiometer. The impulse level on the incremental output is determined by the remote voltage applied to terminal [Com+] (range 5 - 30 V). When no external voltage is applied (i.e. terminal Com+ unconnected) the unit automatically generates a 4 volts signal swing (TTL compatible).
- **Linear or angular position with absolute SSI output**  
The unit converts the analogue input into a positional or angular information similar to an absolute encoder with SSI interface. This means that e.g. the rotation angle of an analogue potentiometer shaft converts to real SSI encoder information. Similar to a real SSI encoder the UZ 210 converter always acts as a "Slave" responding to the clock signal of a remote SSI master unit. All SSI signal levels are in line with the common SSI standard (TTL-differential or RS422 respectively).
- **Serial and USB**  
At any time and with all modes of operation the conversion result of the unit is accessible by PC or PLC, via the serial interface (LECOM/MODBUS) or by the converter's USB port (LECOM).

## 2.2. Operation as Frequency or Position Generator (Motorized Potentiometer Mode)

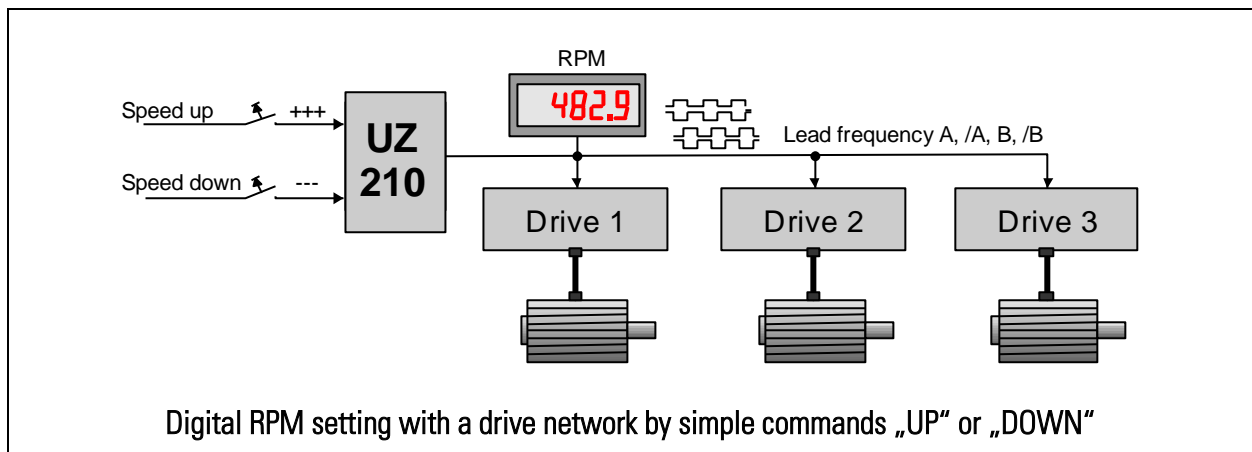
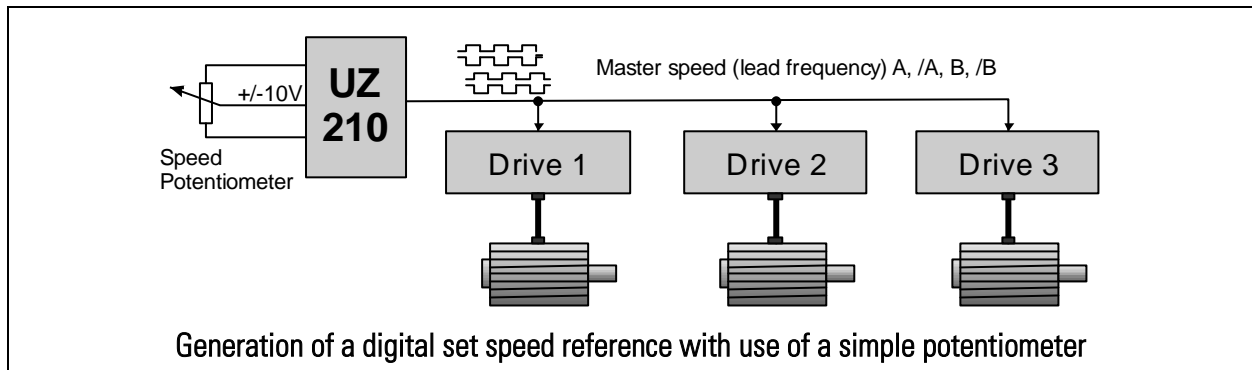
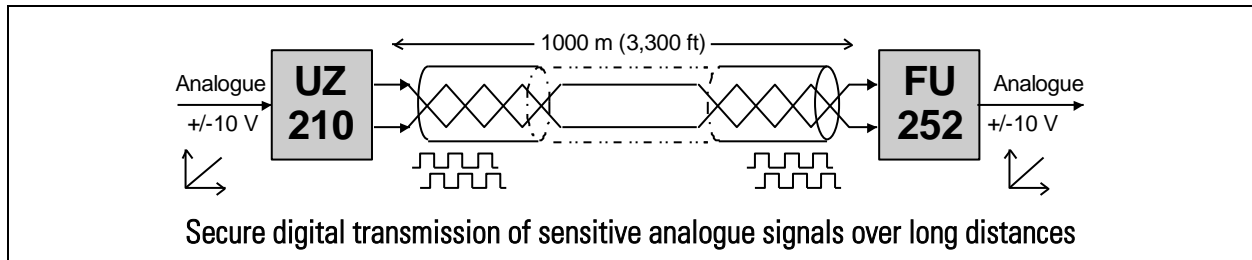
With this mode of operation the unit functions similar to a motorized potentiometer or to a digital positioning axis.

In frequency mode the unit generates a scalable frequency output where the frequency can be adjusted via remote commands „UP“ (increase) and „DOWN“ (decrease). In positioning mode the unit generates quadrature counting impulses in forward or reverse direction, under control of the „UP“ and „DOWN“ commands (virtual positioning axis).

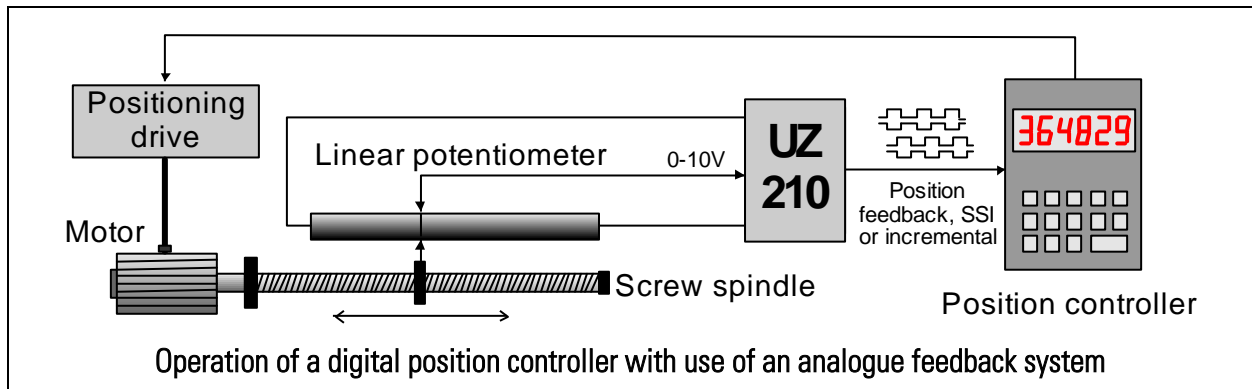
Moreover the unit provides a „Repeat“-Function for cyclic execution of frequency or position curves within programmable limits.

## 3. Typical Examples of Application

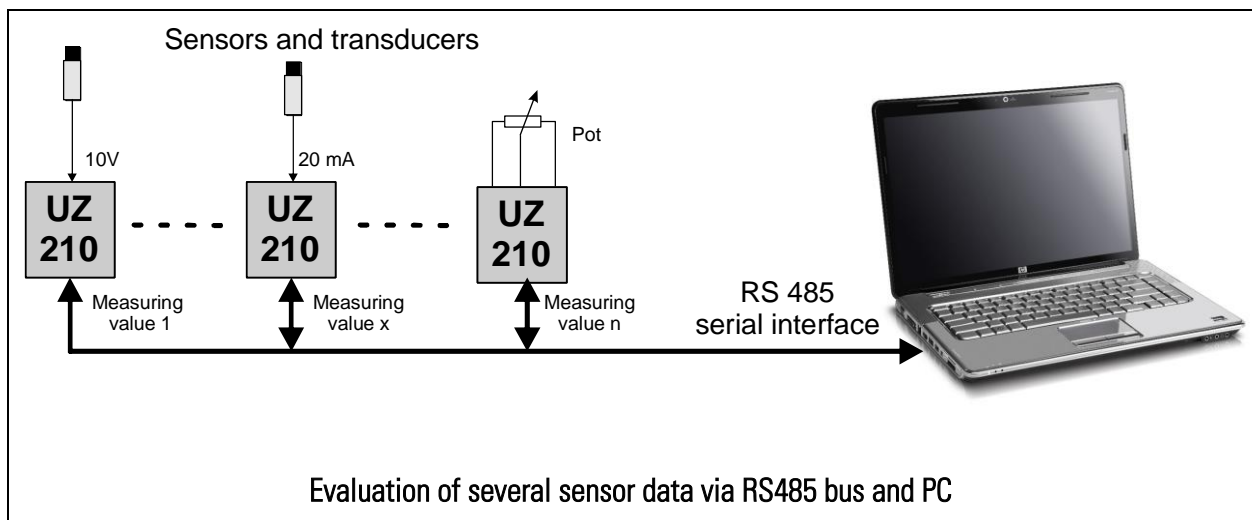
### 3.1. UZ 210 as Analogue-to-Frequency Converter or Generator



### 3.2. UZ 210 as Positional or Angular Encoder with Analogue Input

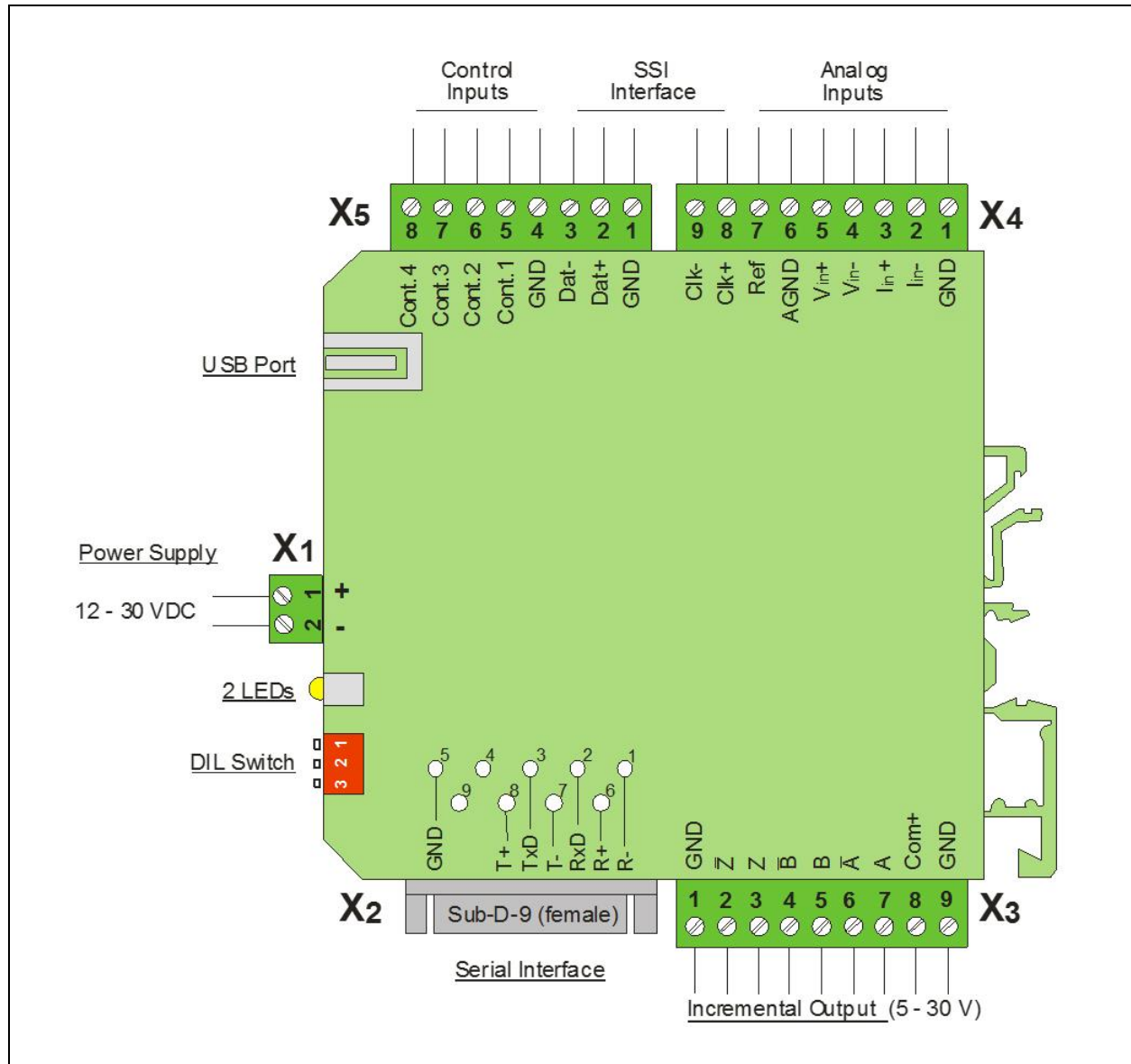


### 3.3. UZ 210 for PC Applications (Data Logging)



## 4. Connections and Control Elements

For electrical connection the unit provides four plug-in terminal strips **X1**, **X3**, **X4** and **X5**, with mechanical codification against accidental misconnection. The 9-position Sub-D-connector **X2** and the front USB port provide communication and PC setup of the unit.



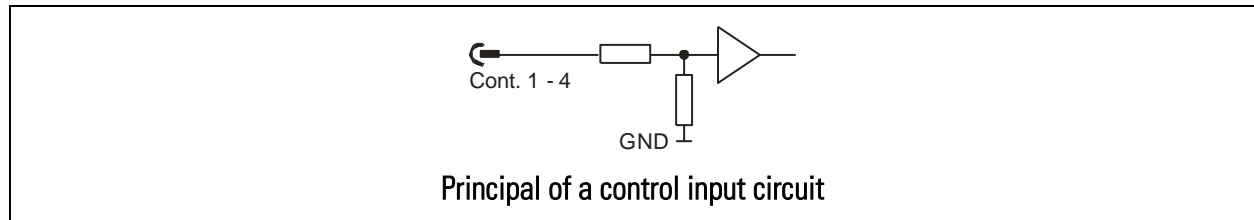
### 4.1. Power Supply

The UZ 210 converter requires a DC supply from 12 to 30 VDC applied to the screw terminals **X1** [1] (+) and **X1** [2] (-) (residual ripple  $\leq 0,5$  V). In idle state the typical consumption is approx. 50 mA (24 VDC input). The green front LED indicates that power is applied to the unit.

## 4.2. Control Inputs Control1 - Control4

Four control inputs with programmable function are accessible via terminals **X5** [5, 6, 7, 8]. The desired function can be assigned by the parameters [Input Config.] and [Input Function] of the „Command Setting“ menu.[a]

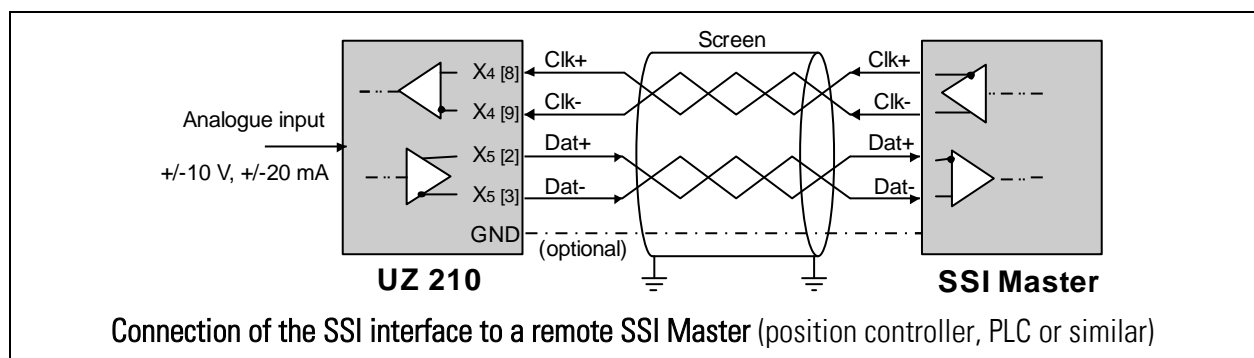
All control inputs are designed as PNP inputs, i.e. a positive voltage must be applied with reference to GND. The switching thresholds are  $LOW \leq 3\text{ V}$  and  $HIGH \geq 10\text{ V}$ , and the input impedance is about  $15\text{ k}\Omega$ .



## 4.3. The SSI Interface

A synchronous serial interface according to the industrial SSI standard is available on terminal strips **X4** and **X5**, for absolute signal transmission of positions or angles. In SSI operating mode the converter acts exactly like an SSI absolute encoder, i.e. it receives a clock signal from a remote Master via lines **X4** [8] (Clk+) and **X4** [9] (Clk-), and it sends the corresponding data via lines **X5** [2] (Dat+) and **X5** [3] (Dat-).

Please note that the unit will not provide any internal termination resistors. [b]

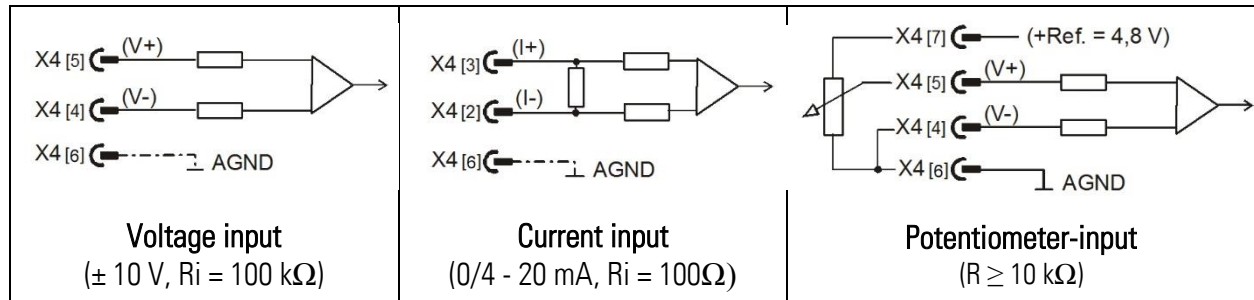


[a] See chapter [5.5](#)

[b] For recommendations about screening and signal termination please refer to the document "General Rules for Wiring, Screening and Earthing" available under the Support section of our website.

## 4.4. Analogue Inputs

The differential inputs on the input side of the converter accept standard voltages ( $\pm 10$  V), standard currents (0/4 - 20 mA) and also potentiometer connection. The drawings below explain the principle of the input circuits with each of the input connection modes. There should be a GND reference of the analog signal on at least one of the sides, otherwise the analog signal can float with respect to GND. To avoid this, V- or I- can then be connected to AGND, for example.

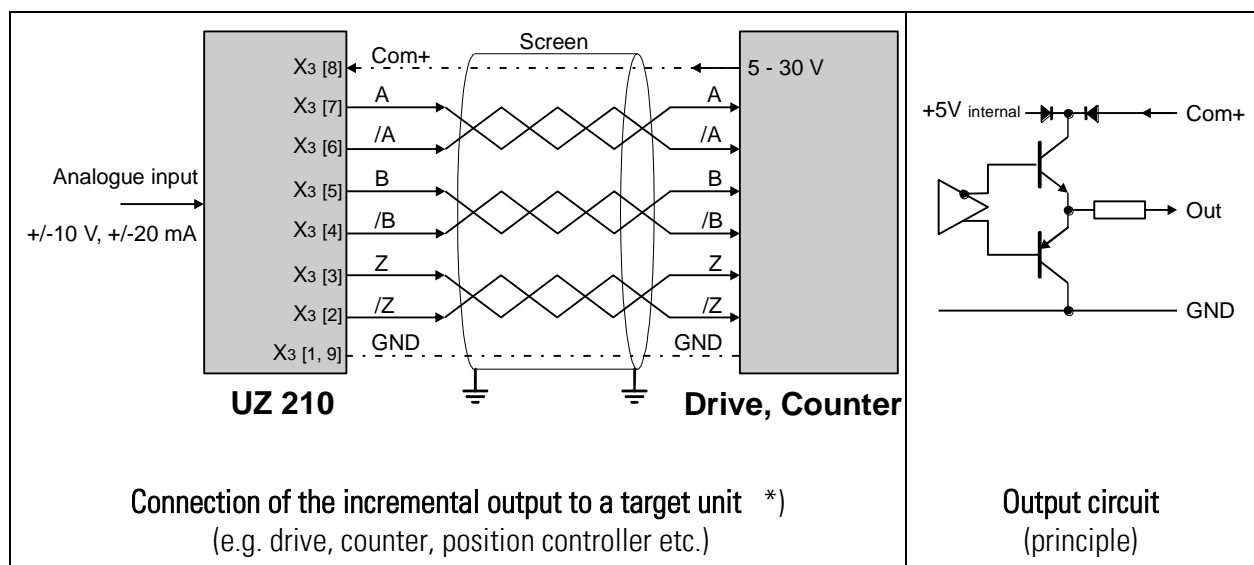


## 4.5. Incremental Outputs

A complete set of incremental channels A, /A, B, /B, Z and /Z is available for incremental representation of the analogue input signal. Inverted channels are for optional use and may remain unconnected if not needed (e.g. for transmission at a 24 volts impulse level with use of channels A and B only). Likewise also the marker pulse outputs Z and /Z may remain open when the application does not provide zero pulse evaluation.

Dependent on the respective Mode of Operation of the converter the incremental output signals represent either a frequency proportional to the analogue input signal (i.e. straight analogue-to-frequency conversion), or a linear or angular position (i.e. for applications with analogue linear scales or analogue angular transducers).

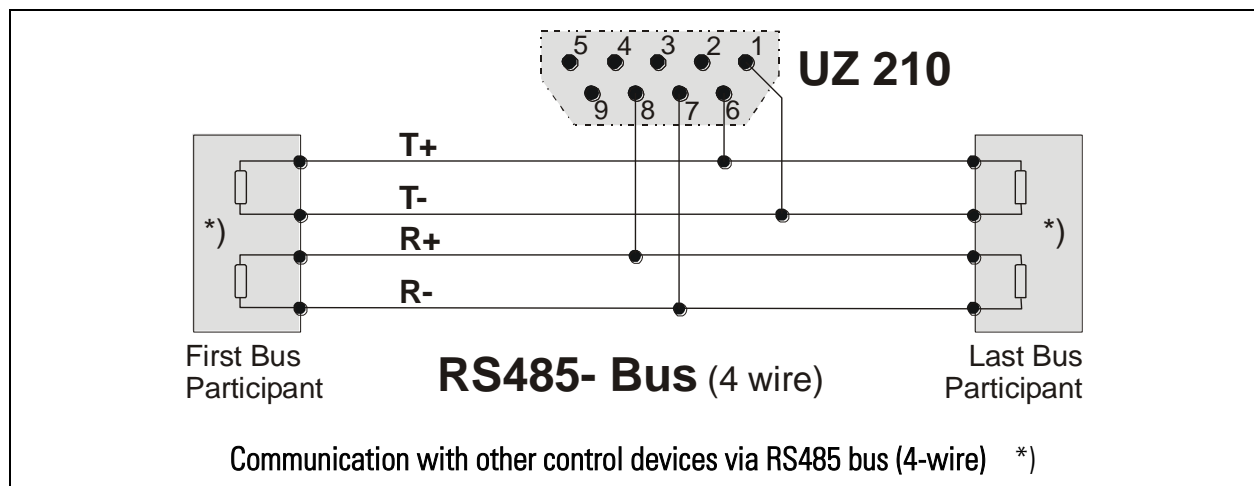
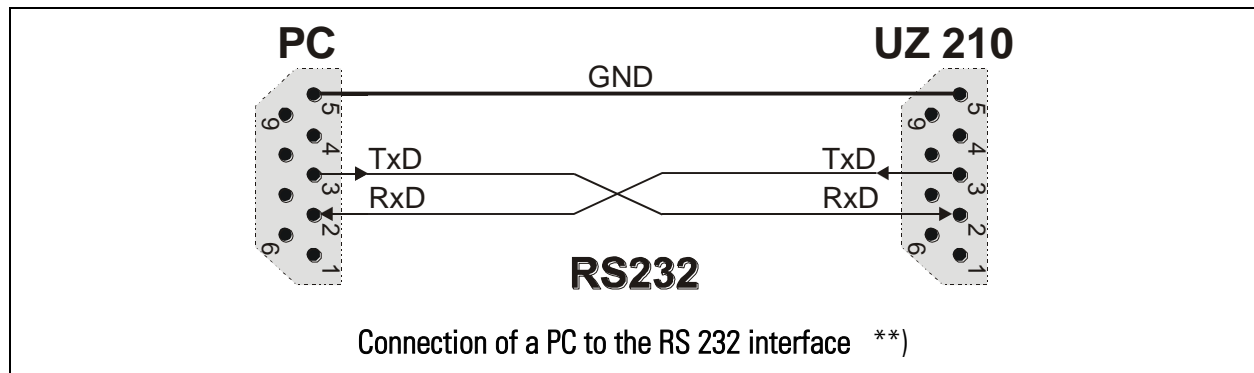
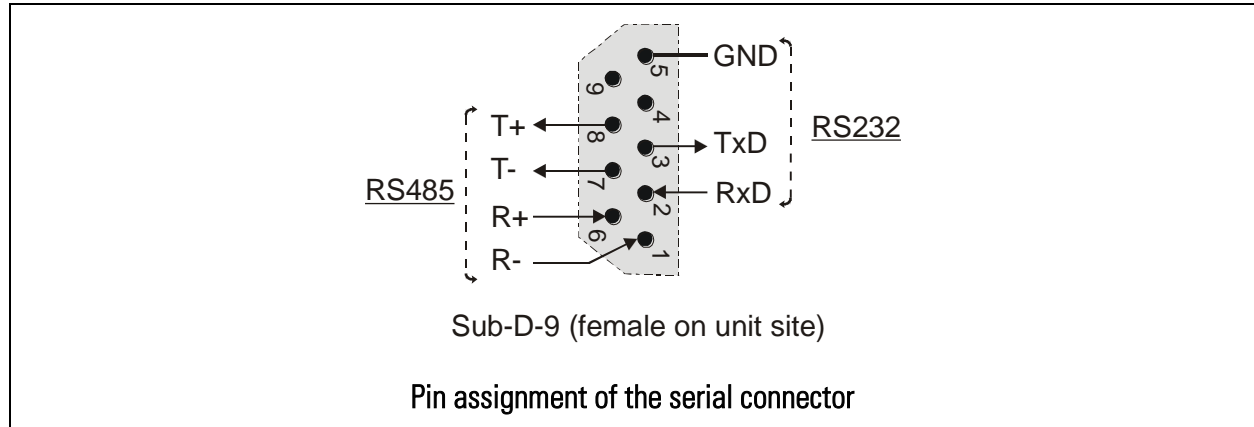
All output lines are equipped with push-pull drivers (short-circuit-proof) and the output swing (signal level) results from the remote voltage applied to terminal X3 [8]. Upon non-connection of this terminal the unit automatically generates a 4 volts TTL-compatible output.



- \*) For recommendations about screening and signal termination please refer to the document "General Rules for Wiring, Screening and Earthing" available under the Support section of our website.

## 4.6. The Serial Interface

Both, a serial RS 232 interface and a RS 485 interface are available on the unit; however the converter can only communicate by one or by the other interface, but not by both at a time. Serial communication allows readout of internal measuring and conversion results and is also required for setup and commissioning of the unit via PC.

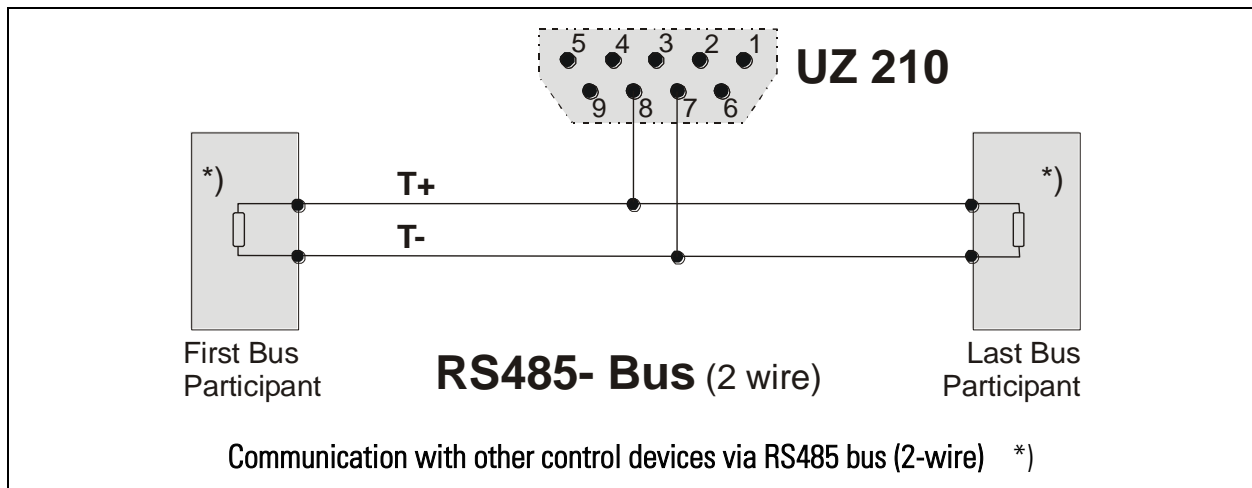


\*) For recommendations about screening and signal termination please refer to the document "General Rules for Wiring, Screening and Earthing" available under the Support section of our website.

\*\*) Please connect only pins 2, 3 and 5 as shown. Connection of the other pins (e.g. by using a fully occupied 9-conductor cable) will cause problems with communication.



Where both, RS232 and RS485 interface are in use, you can communicate by the one or by the other, but not by both interfaces at the same time.



\*) For recommendations about screening and signal termination please refer to the document "General Rules for Wiring, Screening and Earthing" available under the Support section of our website

## 4.7. The USB Communication Port

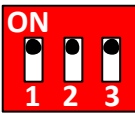
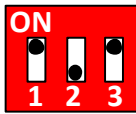
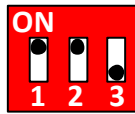
For connection of the converter to a PC via USB a connection cable with "type A" connectors on both sides is required (A-A-cable, available in Electronic Shops or from motrona).

Special hints for operation of the USB port can be found in chapter [7](#).



## 4.8. The Front DIL Switch and the Front LEDs

The 3-position DIL switch located on the front side provides the following settings:

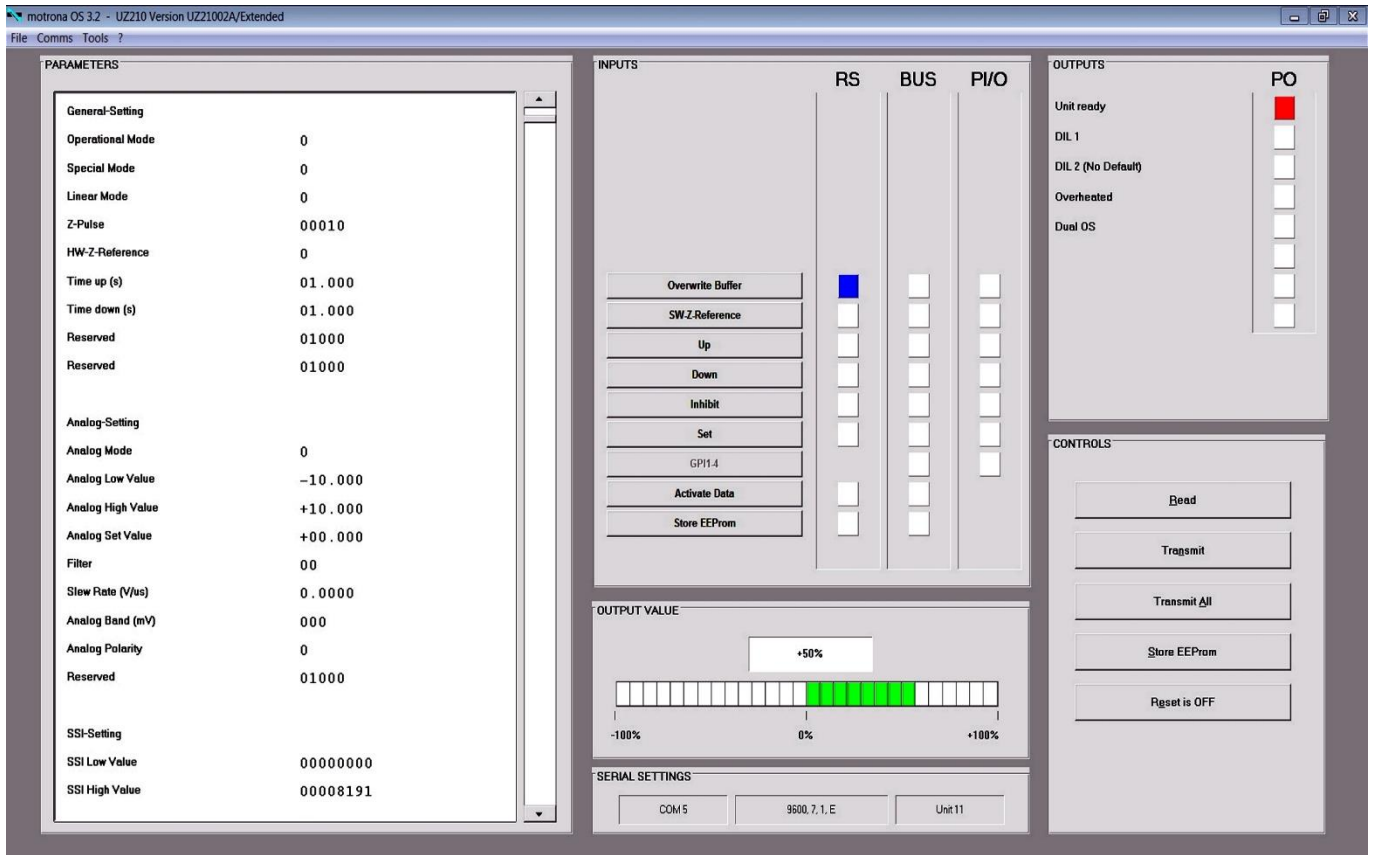
 <p><b>Normal Operation</b></p> <p>For normal operation of the converter all positions of the switch must be ON at any time.</p>	 <p><b>Reload Default Settings</b></p> <p>Upon next power-up all parameters will be overwritten by the factory default values.</p>	 <p><b>Programming-Mode</b></p> <p>For factory use only, e.g. to download a new firmware version to the unit</p>
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DIL switch settings are read once upon power up of the unit only. It is therefore important to cycle the power supply after any change of DIL switch settings, in order to activate the corresponding function.

The green LED on the front indicates that DC power is applied to the unit. The yellow LED remains OFF first after powering the unit up, then turns on after initialization of the processor, to indicate that the converter is ready for operation.

## 5. Parameter Settings OS

For setting of parameters and commissioning a PC with Operator Software OS is required. Please connect your PC to the unit via USB cable (see [4.7](#) and [7](#)) or by serial link (see [4.6](#)). The link to the free download can be found on page 2. After starting the OS software the following screen will appear:



If "OFFLINE" is shown in the top line, please click on "Com" to adapt the serial setting of your PC to the converter.

The parameter field allows to read and to edit all unit parameters according to need. The subsequent parameter tables explain the function and setting of each parameter in detail. The tables also inform about the factory default settings and the serial access codes of all parameters.



- It is possible to operate both, the serial interface and the USB port simultaneously.
- Special hints for serial communication can be found in chapter [6](#).
- Special hints for USB communication and for simultaneous operation of both communication ports can be found in chapter [7](#).

## 5.1. General Settings

No.	Parameter Description	Range	Default	Ser.
001	<b>Operational Mode:</b> 0: Analogue input => Frequency (incremental output) 1: Analogue input => Position (incremental output) [a] 2: Analogue input => Position (incremental output) [a] 3: Analogue input => Position (SSI interface)	0, 1, 2, 3	0	LECOM A0 MODBUS L00/(H02)
002	<b>Special Mode:</b> 0: standard operation as a signal converter 1: Function as „Motorized Potentiometer“ (frequency and position generator, keys „UP“ and „DOWN“) 2: Repeat-Function (cyclic course of frequency or position curves)	0, 1, 2	0	LECOM A1 MODBUS L04/(H06)
003	<b>Linear Mode:</b> Programmable Linearization [b] 0: Linearization OFF 1: Linearization in the positive range only (negative input values appear as a mirror of positive values) 2: Full range linearization of positive and negative inputs	0, 1, 2	0	LECOM A2 MODBUS L08/(H0A)
004	<b>Z-Pulse:</b> Number of increments between 2 marker pulses When this parameter is set to a value “n”, the converter generates an index output pulse after every “n” encoder impulses	5 - 60 000	10	LECOM A3 MODBUS L0C/(H0E)
005	<b>HW-Z-Reference:</b> Hardware Reference for marker pulse Parameter to define the function of control input [Cont1] 0: Free function assignment to [Cont1] Parameter 032 [Input 1 Function] assigns the function to the control input [Cont1] 1: a static HIGH signal on input [Cont1] will reset the marker pulse counter to zero (re-initialization) [c] 2: a rising edge on input [Cont1] will reset the marker pulse counter to zero (re-initialization) [c] 3: a falling edge on input [Cont1] will reset the marker pulse counter to zero (re-initialization) [c]	0, 1, 2, 3	0	LECOM A4 MODBUS L10/(H12)
006	<b>Time up:</b> Ramp time for UP commands (increase output with motorized potentiometer and repeat functions)	0,001 - 99,999 sec	1,000	LECOM A5 MODBUS L14/H16
007	<b>Time down:</b> Ramp time for DOWN commands (decrease output with motorized potentiometer and repeat functions)	0,001 - 99,999 sec	1,000	LECOM A6 MODBUS L18/H1A
008	Reserved, no function			
009	Reserved, no function			

- [a] Mode 1 uses a fixed time raster of 100  $\mu$ sec. causing a possible minimum output frequency of 10 kHz. Mode 2 uses variable input sampling and therefore can also generate frequencies lower than 10 kHz with slow changes of the input position
- [b] See chapter [5.9](#)
- [c] Input „Cont1“ is now reserved for this function only and no more available for other assignments, i.e. it is mandatory to set parameter [Input1 Function] to “0”.

## 5.2. Analogue Settings (Analogue Input)

No.	Parameter Description	Range	Default	Ser.
010	<b>Analogue Mode:</b> Input characteristics 0: Input signal = voltage ( $\pm 10$ V) 1: Input signal = current (0/4 - 20 mA)	0, 1	0	LECOM A9 MODBUS L24/(H26)
011	<b>Analogue Low Value:</b> Beginning of the analogue range	$\pm 10\,000$ mV	-10 000	LECOM B0 MODBUS L28/H2A
012	<b>Analogue High Value:</b> End of the analogue range	$\pm 10\,000$ mV	+10 000	LECOM B1 MODBUS L2C/H2E
013	<b>Analogue Set Value:</b> Preset value for the analogue input )	$\pm 10\,000$ mV	0	LECOM B2 MODBUS L30/H34
014	<b>Analogue Filter:</b> Filter function for the analogue input (used for smoothing of unstable analogue input signals) 00: Filter OFF (immediate response) 01: Filter LOW, fast response ( $T$ ca. 50 $\mu$ sec) --- 05: Filter MEDIUM, medium response ( $T$ ca. 800 $\mu$ sec) --- 12: Filter HIGH, very slow response ( $T$ ca. 100 msec)	0 - 12	0	LECOM B3 MODBUS L34/(H36)
015	<b>Analogue Slew Rate:</b> Limitation of the dynamic slope of analogue input signals to a maximum value according to setting	0 - 1,0000 V/ $\mu$ sec	0	LECOM B4 MODBUS L38/(H3A)
016	<b>Analogue Band:</b> Dead band for signal changes The output will only respond to changes of the analogue input if they are greater than the dead band setting	0 - 100 mV	0	LECOM B5 MODBUS L3C/(H3E)
017	<b>Analogue Polarity:</b> positive or negative frequencies 0: The direction information A/B (90°) will change according to input signal and parameter setting 1: All impulse outputs are in forward direction only (A always leading B), no reverse frequencies (This setting is not relevant with „Operational Mode = 3“, SSI)	0, 1	0	LECOM B6 MODBUS L40/(H42)
018	Reserved, no function			

### 5.3. SSI Setting (SSI Data Transmission)

No.	Parameter Description	Range	Default	Ser.
019	<b>SSI Low Value:</b> Beginning of the SSI output value where the analogue input equals to „Analogue Low Value“	1 - 33554431 (25 Bit)	0	LECOM B8 MODBUS L48/H4A
020	<b>SSI High Value:</b> End of the SSI output value where the analogue input equals to „Analogue High Value“	1 - 33554431 (25 Bit)	8191 (13 Bit)	LECOM B9 MODBUS L4C/H4E
021	<b>SSI Format:</b> Coding of the SSI signal 0: Output data is Gray coded 1: Output data is binary coded	0, 1	0	LECOM C0 MODBUS L50/(H52)
022	<b>SSI Baud Rate:</b> SSI transmission speed	0,001 - 1,000 MHz	0,100	LECOM C1 MODBUS L54/H56
023	<b>SSI Bit:</b> Resolution, total length of one SSI telegram	10 - 25 Bit	25	LECOM C2 MODBUS L58/(H5A)
024	Reserved, no function			

\*) see parameter No. 032 [Input1 Function]

### 5.4. Encoder Setting (Incremental Output)

No.	Parameter Description	Range	Default	Ser.
025	<b>POS Low Value:</b> Beginning of the position count where the analogue input equals to „Analogue Low Value“	±100 000 000 (increments)	0	LECOM C4 MODBUS L60/H62
026	<b>POS High Value:</b> End of the position count where the analogue input equals to „Analogue High Value“	±100 000 000 (increments)	10 000	LECOM C5 MODBUS L64/H66
027	<b>FRE Low Value:</b> Start value of the frequency where the analogue input equals to „Analogue Low Value“	± 1 000 000.00 (Hz)	-1000.00	LECOM C6 MODBUS L68/H68
028	<b>FRE High Value:</b> End value of the frequency where the analogue input equals to „Analogue High Value“	± 1 000 000.00 (Hz)	+1000.00	LECOM C7 MODBUS L6C/H6E
029	Reserved, no function			
030	Reserved, no function			

## 5.5. Command Setting (Control Inputs)

No.	Parameter Description	Range	Default	Ser.
031	<b>Input 1 Config:</b> Switching characteristics of input „Cont1“ 0: Function active with static LOW level 1: Function active with static HIGH level	0, 1	0	LECOM D0 MODBUS L78/(H7A)
032	<b>Input 1 Function:</b> Function of input „Cont 1“ 0: no function assigned 1: <b>Function „Set“</b> . Forces the analogue input temporary to the fixed value according to the setting of [Analogue Set Value] (see parameter Nr. 013) 2: <b>Function „Inhibit“</b> . Disables temporary all changing at the analog input and freeze the last value 3: <b>Function „DOWN“</b> . Down-function (decrease value) with motorized potentiometer applications 4: <b>Funktion „UP“</b> . Up-function (increase value) with motorized potentiometer applications 5: <b>Function „Z-Reference“</b> . Assigns a static Reset function for the marker impulse counter *) 6: <b>Function „Print“</b> . The input will trigger a serial transmission of the specified measuring value.	0 - 6	0	LECOM D1 MODBUS L7C/(H7E)
033	<b>Input 2 Config:</b> see „Input 1 Config“	0, 1	0	LECOM D2 MODBUS L80/(H82)
034	<b>Input 2 Function:</b> see „Input 1 Function“	0 - 6	0	LECOM D3 MODBUS L84/(H86)
035	<b>Input 3 Config:</b> see „Input 1 Config“	0, 1	0	LECOM D4 MODBUS L8C/(H8A)
036	<b>Input 3 Function:</b> see „Input 1 Function“	0 - 6	0	LECOM D5 MODBUS L90/(H92)
037	<b>Input 4 Config:</b> see „Input 1 Config“	0, 1	0	LECOM D6 MODBUS L94/(H96)
038	<b>Input 4 Function:</b> see „Input 1 Function“	0 - 6	0	LECOM D7 MODBUS L98/(H98)
039	Reserved, no function			
040	Reserved, no function			

\*) Function only suitable for slow and purely static Reset (e.g. for index referencing in standstill).  
For dynamic requirements please refer to parameter 005 [HW-Z-Reference]

## 5.6. Serial Setting (RS232/RS485 Interface)

No.	Parameter Description	Range	Default	Ser.
041	<b>Unit Number</b> (serial device address)	11 ... 99	11	LECOM 90 MODBUS LA4/(HA6)
042	<b>Serial Baud Rate</b> (communication speed) (only for LECOM, do not describe for MODBUS) 0 = 9600 Bauds 1 = 4800 Bauds 2 = 2400 Bauds 3 = 1200 Bauds 4 = 600 Bauds 5 = 19 200 Bauds 6 = 38 400 Bauds 7 = 56 000 Bauds 8 = 57 600 Bauds 9 = 76 800 Bauds 10 = 115 200 Bauds	0 - 10	0	LECOM 91 MODBUS LA8/(HAA)
043	<b>Serial Format</b> (byte format of serial data) (only for LECOM, do not describe for MODBUS) 0 = 7 Data, Parity even, 1 Stop 1 = 7 Data, Parity even, 2 Stop 2 = 7 Data, Parity odd, 1 Stop 3 = 7 Data, Parity odd, 2 Stop 4 = 7 Data, no Parity, 1 Stop 5 = 7 Data, no Parity, 2 Stop 6 = 8 Data, Parity even, 1 Stop 7 = 8 Data, Parity odd, 1 Stop 8 = 8 Data, no Parity, 1 Stop 9 = 8 Data, no Parity, 2 Stop	0 ... 9	0	LECOM 92 MODBUS LAC/(HAE)
044	<b>Serial Protocol</b> (transmit protocol with Printer-Mode *) 0 = Transmission = Unit No. – Data, LF, CR 1 = Transmission = Data, LF, CR	0 ... 1	0	LECOM E0 MODBUS LB0/(HB2)
045	<b>Serial Timer</b> (setting for timed transmissions (sec.) *)	0.000 ... 9.999	0	LECOM E1 MODBUS LB4/(HB6)
046	<b>Register Code</b> (serial register code of the transmit value *)	0 ... 19	16	LECOM E2 MODBUS LB8/(HBA)
047	<b>Serial Mode</b> (Protocol selection) 0 = LECOM Protocol 1 = MODBUS RTU, 8 Daten, Parity Even, 1 Stop 2 = MODBUS RTU, 8 Daten, Parity Odd, 1 Stop 3 = MODBUS RTU, 8 Daten, No Parity, 2 Stop	0 ... 3	0	LECOM E3 MODBUS LBC/(HBE)
048	<b>MB Address</b> (MODBUS Adresse)	1 ... 247	1	LECOM E4 MODBUS LC0/(HC2)
049	<b>Reserved</b> , no function			

\*) More information about serial operation of the unit can be found in chapter [6](#).

## 5.7. Linearization Setting

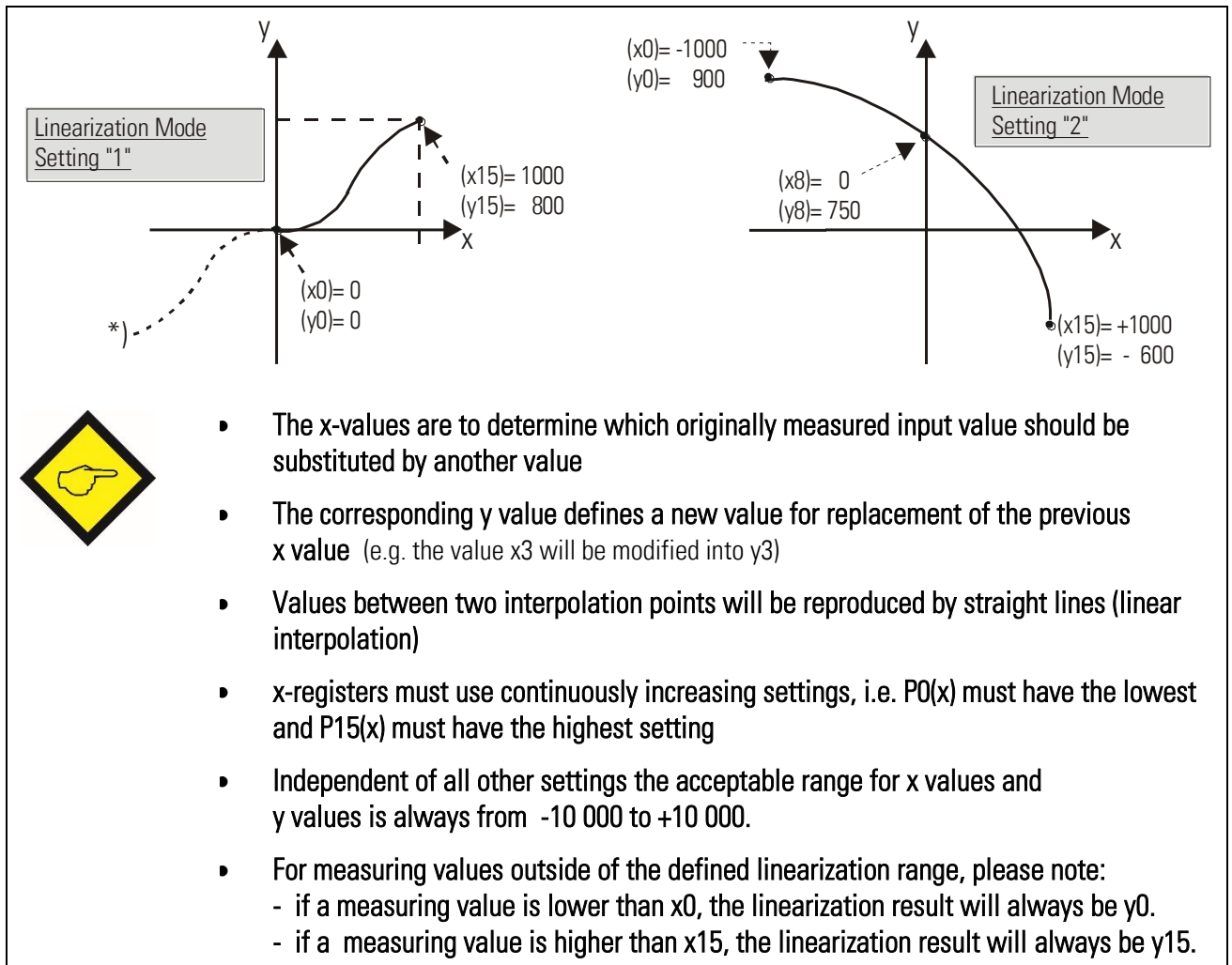
No.	Linearization Table	Range	Default	Ser.
050	First interpolation point (x0, original value)	-10 000 ... +10 000	0	LECOM E6
051	First interpolation point (y0 as substitution for x0)			MODBUS LC8/HCA
052	Second interpolation point (x1, original value)			...
053	Second interpolation point (y1 as substitution for x1)			...
	etc. ---->			...
080	Last interpolation point (x15, original value)			...
081	Last interpolation point (y15 as substitution for x15)			LECOM H7 MODBUS L144/H146

## 5.8. MB-CRC-Calculator

Nr.	Parameter	Range	Default	Ser.
082	<b>MB CRC Reset:</b> Reset the CRC Calculator If MB CRC Reset = 0 is set, the CRC Calculator in the monitor field (variable <7) is set to XXXXFFFF If MB CRC Reset = 0 is set, the CRC Calculator in the monitor field (variable <7) is set to XXXXFFFF. If MB CRC Reset = 1 is set, the CRC value is recalculated with each MB byte.	0...1	0	LECOM 00 MODBUS L148/(H14A)
083	<b>MB CRC Byte:</b> CRC Calc. via input bytes The MB bytes can be transferred to this memory cell one after the other and then the CRC checksum can be read out in the monitor field (variable <7). The checksum is to be determined for the MB command 0x07 0x11. - MB CRC reset = 0, MB byte = 7dec + transmit change -> Variable <7 = 0XXXXX FFFF (reset) - MB CRC Reset = 1, MB Byte = 7dez + Transmit change -> Variable <7 = 0XXXXX 82FE - MB Byte = 17dez + Transmit change -> Variable <7 = 0XXXXX 8CC3 Now the command can be composed -> 07 11 C3 8C Note that with MODBUS first the LByte and then the HByte is sent with the CRC, therefore it must be swapped.	0 ... 255	0	LECOM 01 MODBUS L14C/(H14E)
084	Reserved, no function			

## 5.9. Hints for Use of the Linearization Function

The drawings below explain the difference between the settings „Linear Mode” = 1 and „Linear Mode” = 2:



## 6. Hints for Serial Communication

Serial communication with the UZ210 converter is intended to be used for

- Setup and programming of the unit by PC with operator software OS
- Automatic and cyclic transmission of converter data to a PC or PLC or data logger (Printer Mode)
- Communication via communication protocol LECOM
- Communication via communication protocol MODBUS

This chapter describes the most essential communication functions only.

### 6.1. Automatic and Cyclic Data Transmission

Set any cycle time unequal to zero to parameter [Serial Timer]. Set the serial access code of the register you would like to transmit to parameter [Register Code]. In theory you could transmit any of all available internal register values by serial link, however in the current case only the following register makes really sense:

Parameter „Register Code“	Code internal	Value for transmission
16	LECOM ; 6	Analogue input value, scaled in mV
16	MODBUS L1064	Analogue input value, scaled in mV

Depending on the setting of parameter [Serial Protocol] the unit transmits one of the following two strings (xxxx = Converter Data, LF = Line Feed [hex. 0A], CR = Carriage Return [hex 0D])  
(Leading zeros will not be transmitted)

	(Unit No.)											
Serial Protocol = 0 :	1	1	+/-	X	X	X	X	X	X	LF	CR	
Serial Protocol = 1 :			+/-	X	X	X	X	X	X	LF	CR	

## 6.2. Communication Protocol LECOM

When communicating with the unit via LECOM protocol, you have full read/write access to all internal parameters, states and actual values. The LECOM protocol uses the DRIVECOM standard according to DIN ISO 1745. The serial access codes of all parameters can be found in the parameter description (see chapter 5).

To request data from the unit, the following request string must be sent:

EOT	AD1	AD2	C1	C2	ENQ
EOT = control character (Hex 04) AD1 = unit address, High Byte AD2 = unit address, Low Byte C1 = register code to read, High Byte C2 = register code to read, Low Byte ENQ = control character (Hex 05)					

The table below shows how to request the actual analogue input data (register code ;6) from a converter with the serial unit number 11:

ASCII-Code:	EOT	1	1	;	6	ENQ
Hexadecimal:	04	31	31	3B	36	05
Binary:	0000 0100	0011 0001	0011 0001	0011 1011	0011 0100	0000 0101

Upon correct receipt of the request string the unit will respond:

STX	C1	C2	x x x x x x x	ETX	BCC
STX = control character (Hex 02) C1 = register code to read, High Byte C2 = register code to read, Low Byte xxxxx = data (measuring value) ETX = control character (Hex 03) BCC = block check character					

Leading zeros will not be transmitted. The block check character BCC is composed by an EXCLUSIVE-OR function of all characters from C1 up to and including ETX.

To write parameter data to the unit the following data string must be sent:

EOT	AD1	AD2	STX	C1	C2	x x x x x x	ETX	BCC
EOT = control character (Hex 04) AD1 = unit address, High Byte AD2 = unit address, Low Byte STX = control character (Hex 02) C1 = register code to write data, High Byte C2 = register code to write data, Low Byte xxxxx = data, new parameter value ETX = control character (Hex 03) BCC = Block check character								

Upon correct receipt the unit will respond by ACK, otherwise by NAK.

Every new parameter sent will first wait in a buffer memory, without affecting the function.

This feature enables the user, during normal converter operation, to prepare a complete new parameter set in the background.

To activate transmitted parameters you must write the numeric value "1" to the [Activate Data] register. This immediately activates all changed settings at the same time.

Where you like the new parameters to remain valid also after the next power up of the unit, you still have to write the numeric value "1" to the [Store EEPROM] register. This will store all new data to the EEPROM of the unit. Otherwise, after power down the unit would return with the previous parameter settings.

Function	Code
Activate Data	67
Store EEPROM	68

Both commands provide dynamic operation, i.e. it is enough to just send "1" to the corresponding location. After execution the command will reset to zero automatically.

**Example:** send [Activate Data] to the converter with unit number 11:

ASCII	EOT	1	1	STX	6	7	1	ETX	BCC
Hex	04	31	31	02	36	37	31	03	33

### 6.3. MODBUS communication protocol

If you communicate with the device via the MODBUS protocol, you have full read and write access to all internal parameters, states and actual values. The counter uses the MODBUS RTU protocol. The serial access codes for all parameters of the device are given in the parameter descriptions in section 5. With the help of the USB access the parameter Serial Mode can be changed from LECOM to MODBUS. The Serial Baud Rate parameter refers to both protocols. The parameter MB Address can be used to set the MODBUS device address. The settings 1..247 are permitted here. Attention : For MODBUS the checksum sequence L/H is thus just the opposite of the data.

The UZ210 supports the Reading Holding Register function (R, FCT = 03), the Report Slave ID function (R, FCT = 11) and the Preset Single Register function (W, FCT = 06).

To request data from the device, the following request string must be sent:

ADR	FCT	STH	STL	CRH	CRL	CRCL	CRCH
ADR = MB address (parameter) FCT = function (Hex 03) STH = start address, High Byte STL = start address, Low Byte CRH = number of registers High Byte CRL = number of registers, Low Byte CRCL = checksum CRC16, Low Byte CRCH = checksum CRC16, High Byte							

For example, if the parameter Z-Pulse (MODBUS ST = 00 0C (hex), 32 Bit = 2 Word -> MODBUS CR = 00 02) is to be read out from a device with device address 07, the detailed request string is as follows:

Designation:	ADR	FCT	STH	STL	CRH	CRL	CRCL	CRCH
Hexadecimal:	07	03	00	0C	00	02	04	6E
Binary:	0000 0111	0000 0011	0000 0000	0000 1100	0000 0000	0000 0010	0000 0100	0110 1110

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

ADR	FCT	CB	DATA	CRCL	CRCH
ADR = MB address (parameter) FCT = function (Hex 03) CB = number of bytes, here 4 Bytes DATA = data, 4 bytes (32 Bit) CRCx = check sum CRC16					

<b>Designation:</b>	ADR	FCT	CB	DATA	CRCL	CRCH
<b>Hexadecimal:</b>	07	03	04	00 00 00 0A	1C	34
<b>Binary:</b>	0000 0111	0000 0011	0000 0100		0001 1100	0011 0100

The read data corresponds to a setting value of the parameter Z pulse of 10.

- The Reading Holding Registers function supports 2 word (32-bit) accesses to the direct parameter addresses (0x0, 0x4, 0x8, 0xC..).
- The Reading Holding Register function also supports more than 2 word accesses to the direct parameter addresses (0x0, 0x4, 0x8, 0xC..) for range readout.

To describe a parameter, the following string must be sent:

ADR	FCT	REH	REL	DAH	DAL	CRCL	CRCH
ADR = MB address (parameter) FCT = function (Hex 06) REH = register address, High Byte REL = register address, Low Byte DAH = data High Byte DAL = data Low Byte CRCL = check sum CRC16, Low Byte CRCH = check sum CRC16, High Byte							

For example, if the parameter SSI High Value (MODBUS ST = 00 4E, 004C (hex), MODBUS DA = 00 04, 00 02) is to be written in a device with device address 07, then the detailed request string for the High Word Register is:

<b>Designation:</b>	ADR	FCT	REH	REL	DAH	DAL	CRCL	CRCH
<b>Hexadecimal:</b>	07	06	00	4E	00	04	E8	78
<b>Binary:</b>	0000 0111	0000 0011	0000 0000	0100 1110	0000 0000	0000 0100	1110 1000	0111 1000

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

ADR	FCT	REG	DATA	CRCL	CRCH
ADR = MB address (parameter) FCT = function (Hex 06) REG = register address DATA = data CRCx = check sum CRC16					

<b>Designation:</b>	ADR	FCT	REG	DATA	CRCL	CRCH
<b>Hexadecimal:</b>	07	06	00 4E	00 04	E8	78
<b>Binary:</b>	0000 0111	0000 0110			1110 1000	0111 1000

String for writing the low word register:

<b>Designation:</b>	ADR	FCT	REH	REL	DAH	DAL	CRCL	CRCH
<b>Hexadecimal:</b>	07	06	00	4C	00	02	C9	BA
<b>Binary:</b>	0000 0111	0000 0011	0000 0000	0100 0110	0000 0000	0000 0010	0110 1001	1011 1010

The written data corresponds to a setting value of the parameter SSI High Value of 262146. (00 04 00 02 hex). The newly sent parameter is first temporarily stored in the device without affecting the function. Thus it is possible to prepare several new parameters in the background while the device function is running.

If the transmitted parameters are to be activated, an "Activate Data" must be sent to the device. If the transmitted parameters are to be activated, an "Activate Data" must be sent to the device. This activates all changed parameters at the same time.

To execute an "Activate Data", the following string must be sent:

<b>Designation:</b>	ADR	FCT	REH	REL	DAH	DAL	CRCL	CRCH
<b>Hexadecimal:</b>	07	06	FF	FE	00	01	19	88
<b>Binary:</b>	0000 0111	0000 0011	1111 1111	1111 1110	0000 0000	0000 0001	0001 1001	1000 1000

It is important to ensure, that a range violation of the parameter results in it not being transferred to the buffer. The permissible parameter ranges can be taken from the parameter description and are defined for the parameter SSI High Value from 1 to 33554431.

If the new parameters are to remain permanently stored even after the power supply is switched off, a "Store EEPROM" must also be sent to the device. Thus all new data are also stored in the EEPROM of the device. Otherwise, the device returns to the original parameter set after a new switch-on.

To execute a "Store EEPROM", the following string must be sent:

<b>Designation:</b>	ADR	FCT	REH	REL	DAH	DAL	CRCL	CRCH
<b>Hexadecimal:</b>	07	06	FF	FE	00	02	34	49
<b>Binary:</b>	0000 0111	0000 0011	1111 1111	1111 1110	0000 0000	0000 0010	0011 0100	0100 1001

For negative parameter values such as -10000, the value must be divided into two 16-bit values and transmitted with two write accesses. (-10000 dec = FFFF D8F0 hex).

An ID can be requested to identify the device:

To request an ID, the following string must be sent:

<b>Designation:</b>	ADR	FCT	CRCL	CRCH
<b>Hexadecimal:</b>	07	11	C3	8C
<b>Binary:</b>	0000 0111	0001 0001	1100 0011	1000 1100

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

<b>Designation:</b>	ADR	FCT	BYTE	RUN	DATA	CRCL	CRCH
<b>Hexadecimal:</b>	07	11	12	FF	55 5A 32 31 30 30 32 41 55 5A 32 31 30 30 32 41	E4	D7
<b>Binary:</b>	0000 0111	0001 0000	0001 0020	1111 1111		1110 0100	1101 0111

55 5A 32 31 30 32 41 corresponds in ASCII format : UZ21002A

Here the unit header, which is also visible in the OS, is shown. It identifies the device (UZ210) with software version (03A), as well as the special number if available.

Division of the memory range:

Memory address (dec)	MODBUS-FCT	R-Access	Read / Write	Note
0...335 0...332 (32 Bit)	03 (R) 06 (W)	2-124 Words 1 Word	R/W	Parameter range
1000..1127 1000..1124 (32 Bit)	03 (R)	2-64 Words	Read only	Variable range
FFFE (hex, 16 Bit)	06 (W)	1 Word	Write only	Command range

## 7. Hints for Operation of the USB Port

The following notes only apply to the Windows 7.0, 8.0 and 8.1 operating systems. Windows 10 automatically detects the USB interface of the device.

Prior to using the USB port it is mandatory to store the driver file „**motrona\_vcom.inf**“ in a user-defined directory of the PC (any directory according to your own choice will be fine). The driver file is available for download from the SUPPORT section of the motrona website [www.motrona.com](http://www.motrona.com).

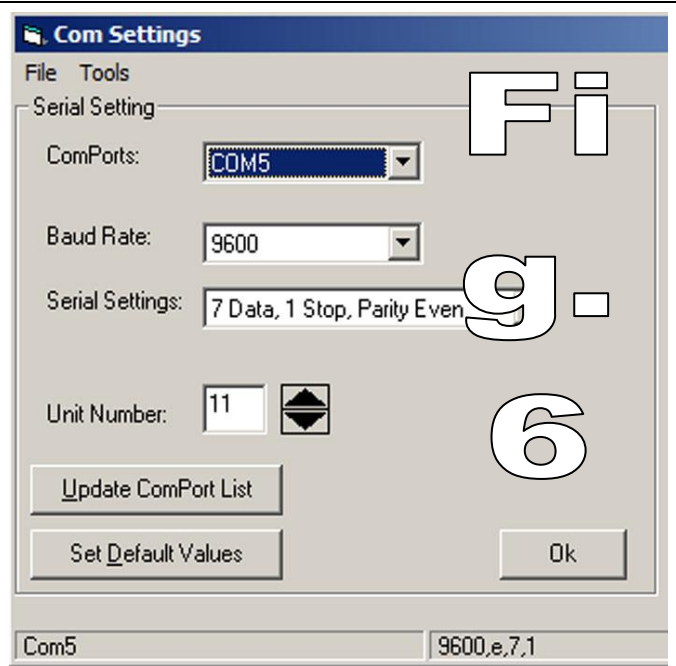
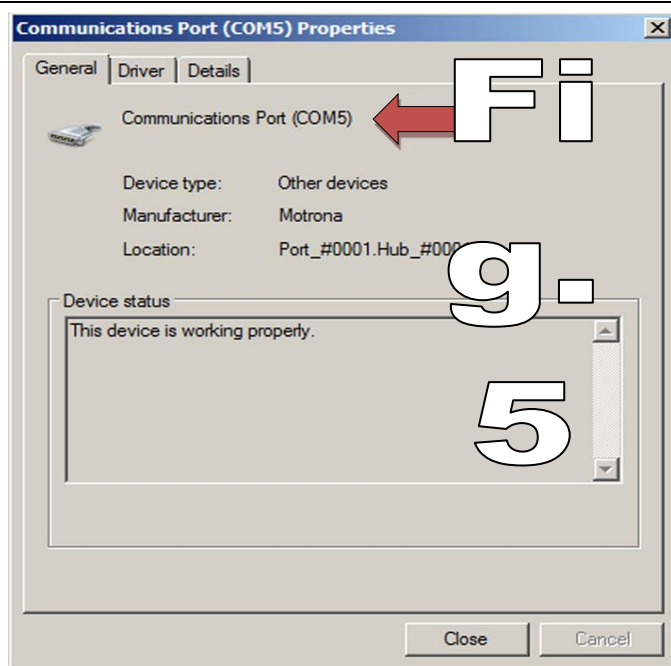
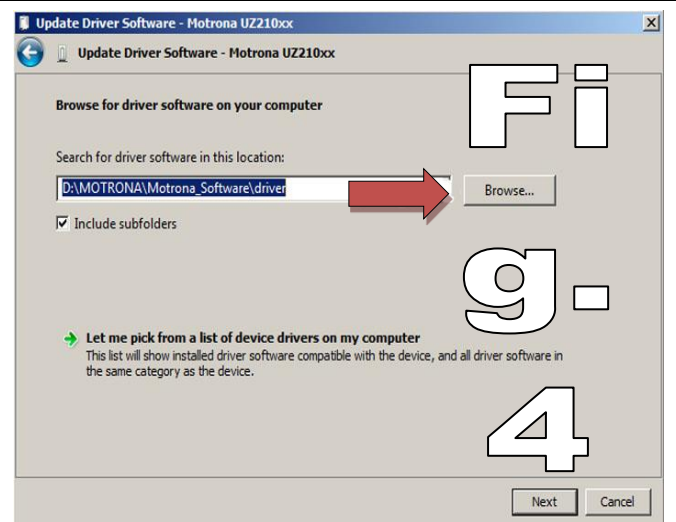
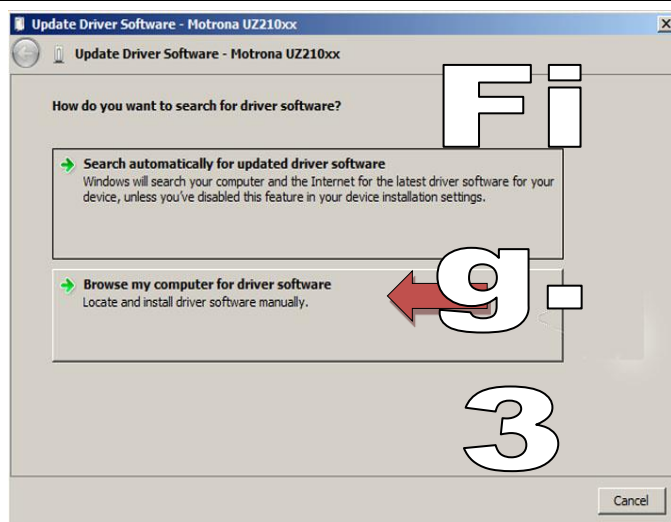
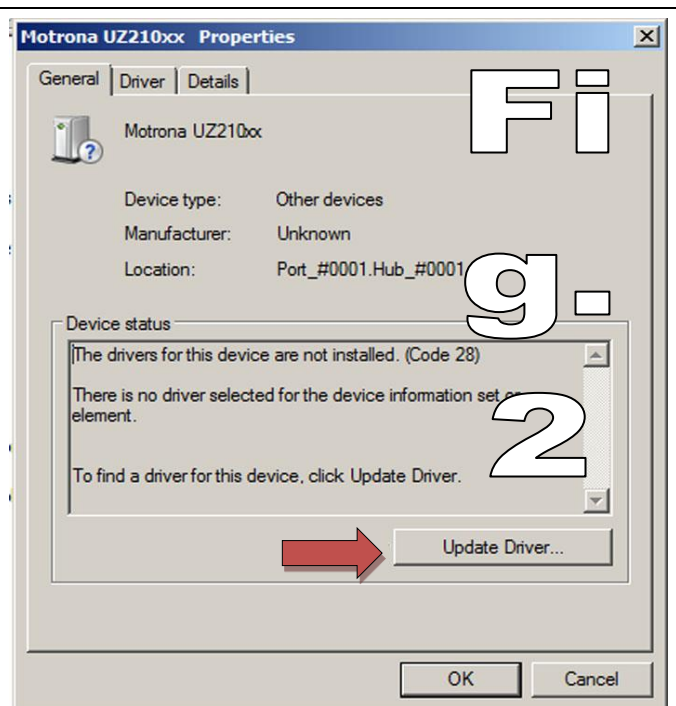
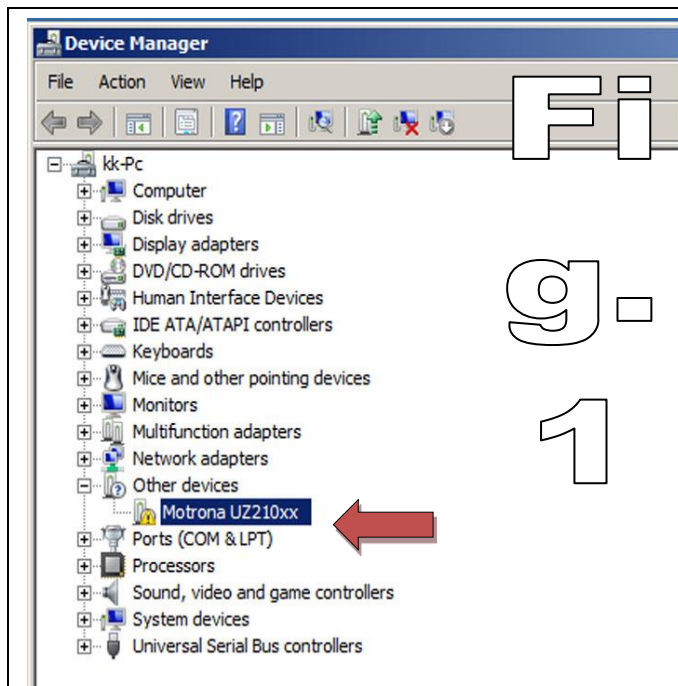
After the very first USB connection between PC and converter the Plug-and-Play-Function of the PC will first try to find a suitable driver via Internet. You are free to either abort the internet search or to just wait for the message “no suitable driver found”. After this, please follow the subsequent steps to install the driver manually:

- Click to **Start**, select **Control Panel** and from there choose **Device Manager**. Among other devices the device manager will now indicate one unit named **Motrona\_UZ210xx** (Fig. 1).
- Double-click to **Motrona\_UZ210\_xx** and choose **Update Driver** (Fig. 2)
- Now select **Browse my computer for driver software**. Then select exactly the folder to where before you have saved the **motrona\_vcom.inf** driver file. In our example the driver has been stored on drive D in the folder **MOTRONA\Motrona\_Software\driver** (Fig. 3 and 4).
- After assignment of the driver, the USB Port will be configured as a communication interface and the number of the Virtual Com Port attached by the system is shown on the screen (in our example this is COM 5, see Fig. 5).
- Now we are ready to start the OS Operator software. Please select first the „Com“ menu of the OS software to set the communication parameters correspondingly (Fig. 6).

USB communication between converter and PC has now successfully been installed and the OS Operator Software is ready to work.



- When two OS Operator Software programs are running at the same time (one via USB and the other via serial), the indicator box **Dual OS** of the **OUTPUTS** column will be ON (this indication responds with a short delay).
- In the **Inputs** field both columns, **Serial** and **Bus** will now be active. Column **Serial** indicates all commands released by the PC actually in use, and column **Bus** indicates all commands released by the other (remote) OS Software. At any time column **Extern** indicates the switching state of the hardware command inputs of the unit.
- It is possible to disable parameter settings and changes coming from the other (remote) OS software. This can be achieved by setting the command **Overwrite Buffer** to ON. When switched ON, the commands „Activate Data“ and „Store EEPROM“ of the second communication channel will be suppressed. This is to ensure that parameter settings can happen only by the PC currently used, and no undesirable modifications will get in from the other (remote) communication port.
- **Whenever two PC's run the OS software simultaneously, it is important to never enter the Test menu from any of the two sides!**



## 8. Technical Specifications

<b>Power supply:</b>	Input voltage: 12 ... 30 VDC Protection circuit: reverse polarity protection Ripple: $\leq 10\%$ at 24 VDC Consumption: approx. 50 mA (unloaded) Connections: screw terminal, 1.5 mm <sup>2</sup> / AWG 16
<b>Analog input:</b>	Voltage input: -10 ... +10 V / 0 ... 10 V Internal resistance: $R_i \approx 120\text{ k}\Omega$ Current input: 0 ... 20 mA / 4 ... 20 mA Internal resistance: $R_i \approx 100\text{ }\Omega$ Resolution: 14 bit ( $\pm 13$ bit) Accuracy: 0.1 % Update-time: 100 $\mu$ s (in accordance to 10000 measuring values per second) max. Input frequency: 1 kHz (with 10 sampling points) VREF for external potentiometer: approx. 4.8 V (+/- 0.1%) Internal VREF resistance: $R_i \approx 240\text{ }\Omega$ Connections: screw terminal, 1.5 mm <sup>2</sup> / AWG 16
<b>Control inputs:</b>	Number of inputs: 4 Characteristic: PNP, active high Signal levels: HTL: LOW = 0 ... 3 V, HIGH = 10 ... 30 V Internal resistance: $R_i \approx 1.5\text{ k}\Omega$ Input current: approx. 2 mA Minimum pulse time: 1 msec (5 $\mu$ s at Cont.1 when [HW-Z-Reference] $\neq 0$ ) Connections: screw terminal, 1.5 mm <sup>2</sup> / AWG 16
<b>Incremental output:</b>	Signal levels: HTL: 5 ... 30 V (depends from the external supply) or TTL / RS422: 4 V (no external supply necessary) Channels: A, /A, B, /B, Z, /Z Frequency range: 0.01 Hz ... 1 MHz Output current: max. 30 mA (per channel) Output circuit: push-pull Reaction time: < 260 $\mu$ s Fastest position change possibility: 1 increment / $\mu$ s Protection circuit: short circuit proof Connections: screw terminal, 1.5 mm <sup>2</sup> / AWG 16
<b>SSI interface:</b>	Function: simulates an SSI absolute encoder Standard: according to the SSI standard, 10 ... 25 bit, binary or Gray (supports only single transmission but not multiple-transmission) Clock (input): TTL-differential / RS485 [Clk+], [Clk-] Data (output): TTL-differential / RS485 [Dat+], [Dat-] Termination resistors: internally not provided SSI baud rate: max. 1 MHz Connections: screw terminal, 1.5 mm <sup>2</sup> / AWG 16
<b>Serial interface:</b>	Format: RS232 or RS485 (2- or 4-wire) Baud rates: 600, 1200, 2400, 9600 (Default), 19200, 38400, 56000, 57600, 76800 and 115200 Connections: SUB-D connector (female), 9-pin
<b>USB interface:</b>	Version: USB 2.0 Driver: motrona_vcom.inf (download on <a href="http://www.motrona.com">www.motrona.com</a> ) Connections: by USB-Port, connector type „A

## Continuation "Technical Specifications"

<b>Housing:</b>	Material: plastic Mounting: 35 mm top hat rail (according to EN 60715) Dimensions (w x h x d): 22.5 x 102 x 102 mm Protection class: IP20 Weight: approx. 100 g
<b>Temperature range:</b>	Operation: 0 °C ... +45 °C / +32 ... +113 °F Storage: (not condensing) -25 °C ... +70 °C / -13 ... +158 °F (not condensing)
<b>Conformity &amp; standards:</b>	EMC 2014/30/EU: EN 61326-1: 2013 for industrial location EN 55011: 2017 / CISPR11: 2017 Class A RoHS (II) 2011/65/EU RoHS (III) 2015/863: EN IEC 63000: 2018

## 9. Dimensions

