control – motion – interface

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ZU 252

Incremental Counter Module
With Analogue Output and Serial Interface

- Counter suitable for quadrature signals (A/B, 90º) as well as single channel inputs
- Counting inputs selectable to TTL/ RS422 format or to HTL / 10-30 volts format
- Maximum counting frequency 1 MHz
- Analogue outputs +/-10 V, 0-20 mA and 4-20 mA, polarity following the sign of the internal counter
- Analogue conversion time 1 msec only
- RS 232 and RS 485 interfaces for serial readout of the counter
- Also suitable for conversion of the sum or the difference of two separate counts
- Facility for free linearization of the analogue output by 16 interpolation points
- Easy to set up by TEACH procedure, or by PC and Windows software

Operating Instructions

Safety Instructions

- This manual is an essential part of the unit and contains important hints about function, correct handling and commissioning. Non-observance can result in damage to the unit or the machine or even in injury to persons using the equipment!
- The unit must only be installed, connected and activated by a qualified electrician
- It is a must to observe all general and also all country-specific and application-specific safety standards
- When this unit is used with applications where failure or maloperation could cause damage to a machine or hazard to the operating staff, it is indispensable to meet effective precautions in order to avoid such consequences
- Regarding installation, wiring, environmental conditions, screening of cables and earthing, you must follow the general standards of industrial automation industry
- - Errors and omissions excepted –

Version:	Description:
ZU25201a/ HK/AF/ Apr.08	Original version
ZU25201b/ HK/AF/Dez.08	Explanation DIL2/7+8 and other supplements
ZU25201c/pp/Jan.12	Name changed from “Register Code” to “Serial Value”

Table of Contents

1. Compatibility Hint

This product is a successor model of the thousandfold approved converter type ZU251. The new product is suitable for a 100% replacement of the previous model, however some differences must be observed with DIL switch settings and parameter settings.
Some essential advantages of ZU252 compared to ZU251 are:

- Maximum frequency 1 MHz (instead of 500 kHz)
- Capability to accept even single-ended TTL input signals
  (i.e. TTL inputs A and B only, without inverted signals /A and /B)
- Setting of analogue formats +/-10V, +10V, 0-20 mA and 4-20 mA can be done by supplementary DIL switch (no more PC required)
- Enhanced auxiliary output 5 V / 250 mA for encoder supply

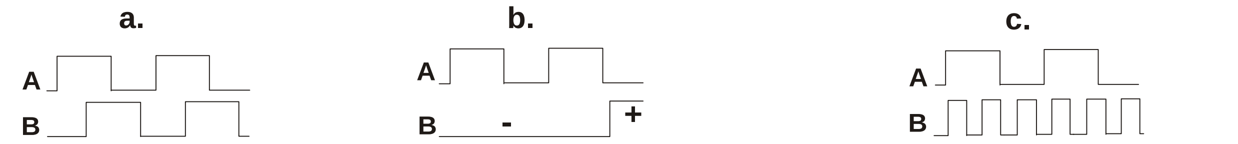
2. Introduction

ZU 252 represents a small and low-cost, but highly performing converter for industrial applications, where incremental counting of positions or events must be converted to either analogue format or serial data. The unit has been designed as a compact module with 12 screw terminals and a 9-position SUB-D connector (female). The housing is suitable for standard DIN rail mounting.

The impulse input side provides channels A, B and also the inverted lines /A, /B which should be used with TTL/ RS422 input signals. The unit can count and convert the following formats to analogue and serial:

a. Up/down count with quadrature input (A/B, 90°).
   The polarity of the analogue output and the sign of the serial data depend on the sign of the actual counting result
b. Single channel impulses on channel A.
   Input B sets the counting direction and therefore also the polarity of the output (LOW = negative, HIGH = positive).

   Please observe:
   - Open NPN inputs are HIGH
   - Open PNP inputs are LOW
   - Open RS422 inputs may cause problems, therefore please set unused inputs to HTL by means of the DIL switches
c. Dual count of fully independent events on channels A and B, where the output signal represents the sum or the difference of both counts.



A and B, quadrature 90° | A=impulse, B=static direction signal | A and B: independant counting events

The definitions for “zero analogue output” and “full scale analogue output” definition can be set over the full counting range of +/-8 decades (-99 999 999 to +99 999 999)

3. Applicable Encoders and Sensors

The converter can accept the following impulse sources:

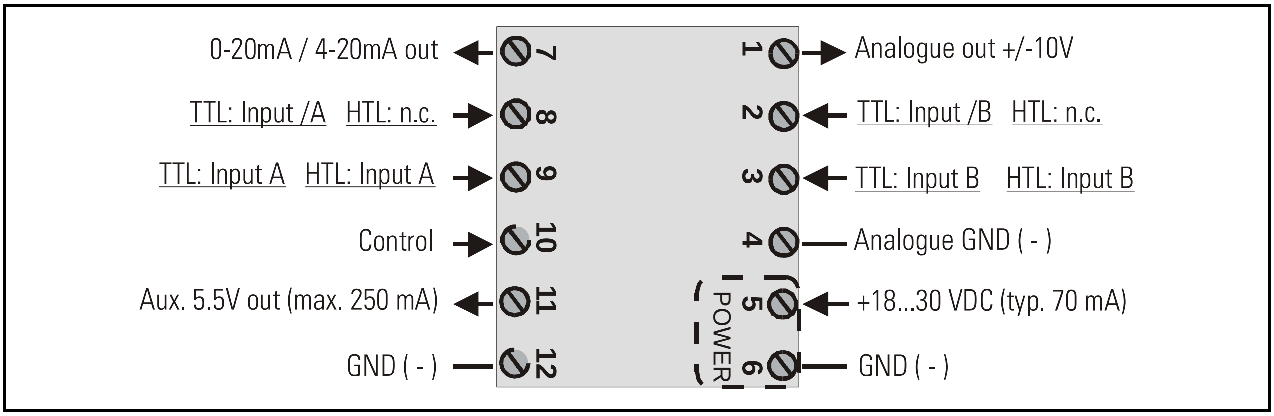
The ZU252 converter can accept the following impulse sources:

- Quadrature encoders with HTL level output (10 – 30 V) and either PNP or NPN or Push-Pull or NAMUR characteristics, using A and B outputs wit 90° displacement
- Single channel impulse sources like proximity switches or photocells, providing HTL level at PNP or NPN or Namur characteristics
- TTL / RS422 quadrature encoders with output lines A, /A ,B and /B
- Symmetric single channel sources with TTL / RS422 output, providing differential signals (i.e. A and /A)
- Asymmetric single channel sources with TTL level (without inverted signals, i.e. A only)

In general, HTL encoders will be supplied from the same source as the converter itself.
For supply of TTL encoders, the unit provides an auxiliary output of 5.5 volts
(stabilized, max. 250 mA).

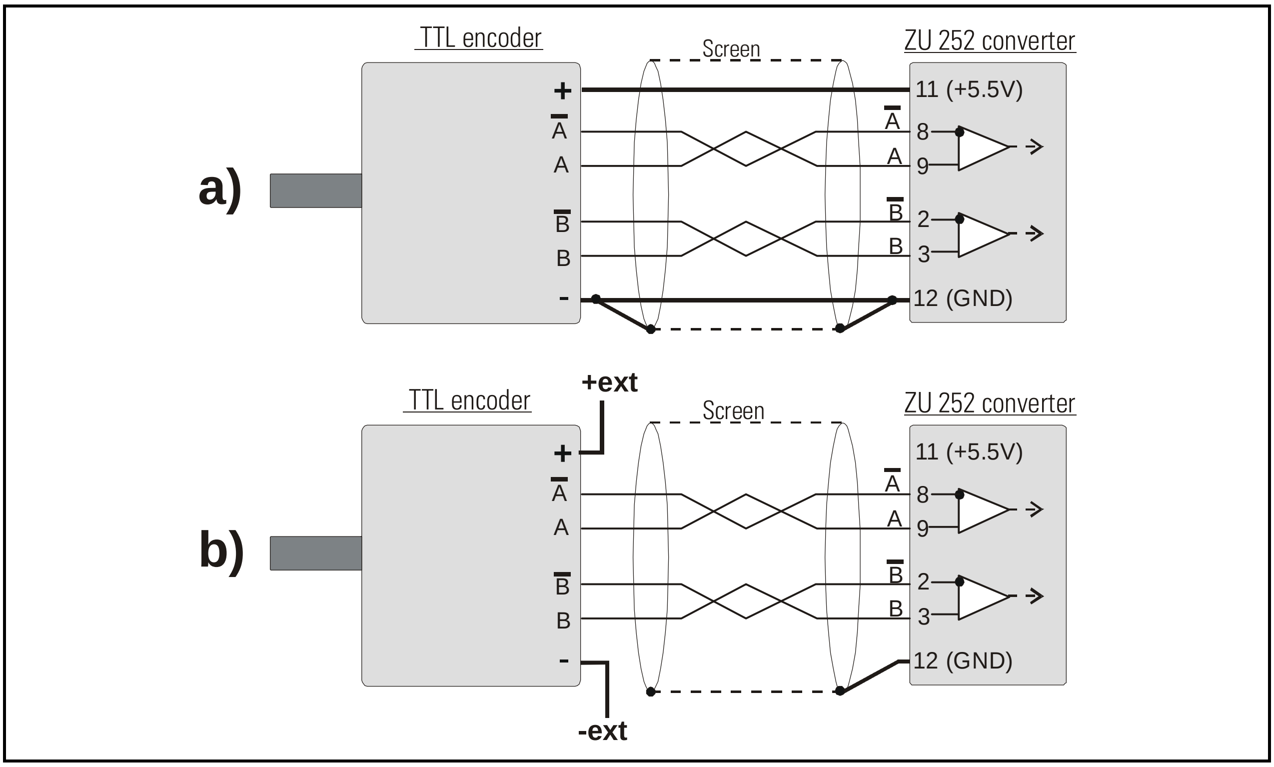
4. Terminal Assignment

We recommend connecting the Minus wire of the power supply to earth potential.
Please observe that, under poor earthing and grounding conditions, multiple earth connections of screens and GND terminals may cause severe problems. In such cases it may be better to have only one central earthing point for the whole system.
GND terminals 4, 6 and 12 are connected internally. Depending on input voltage and load of the auxiliary voltage output, the total power consumption of the unit is approx. 70 mA (see specifications).



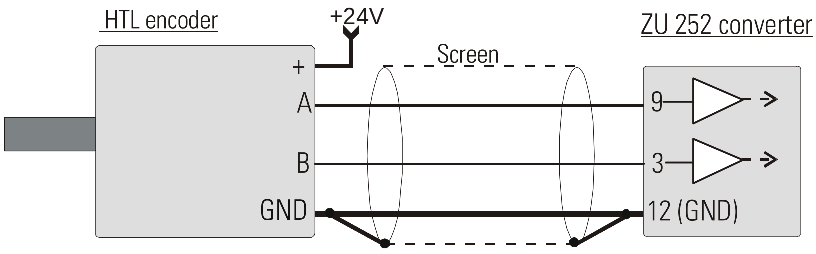
4.1. Incremental encoders TTL / RS 422

If applicable, the encoder can be supplied from the ZU252 converter. Where the encoder is already supplied from a remote source, we recommend fully differential operation, with no GND connection between encoder and converter (see figures a. and b.)



4.2. Incremental encoder HTL / 12-30V

The encoder may be supplied from the same source as the converter, or from another source.



4.3. Proximity switches, photocells etc.

This connection is fully similar to a HTL incremental encoder. With single-channel operation, input B remains unconnected or can be used to select the output polarity. With use of two independent counting events for forming the sum or the difference, input B operates as the second counting input.

For use of sensors providing 2-wire **NAMUR** characteristics:

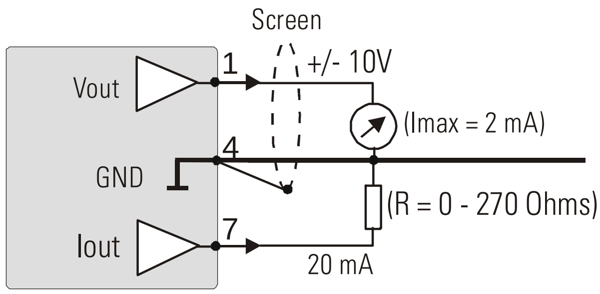
- Set the inputs to HTL and NPN
- Connect the positive wire of the sensor to the corresponding input and the negative wire to GND.

4.4. Control Input

The control input available on terminal 10 provides programmable characteristics and functions for activation of different commands (e.g. Reset, see parameter "Input setting)

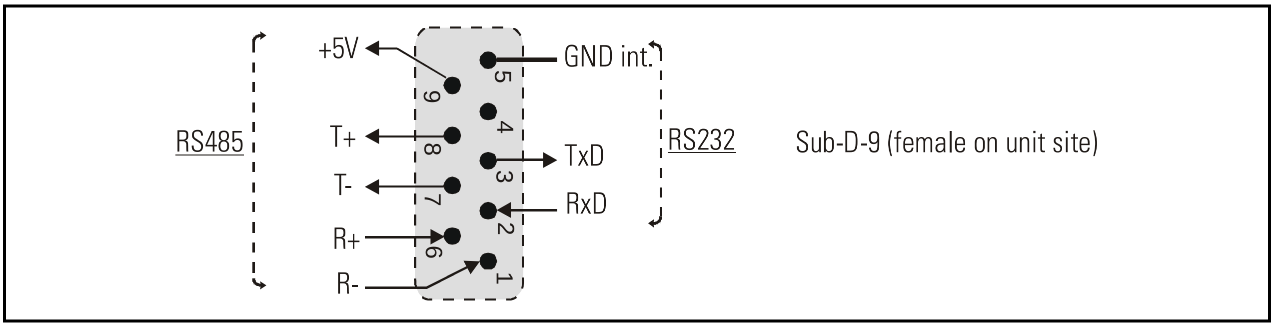
4.5. Analogue outputs

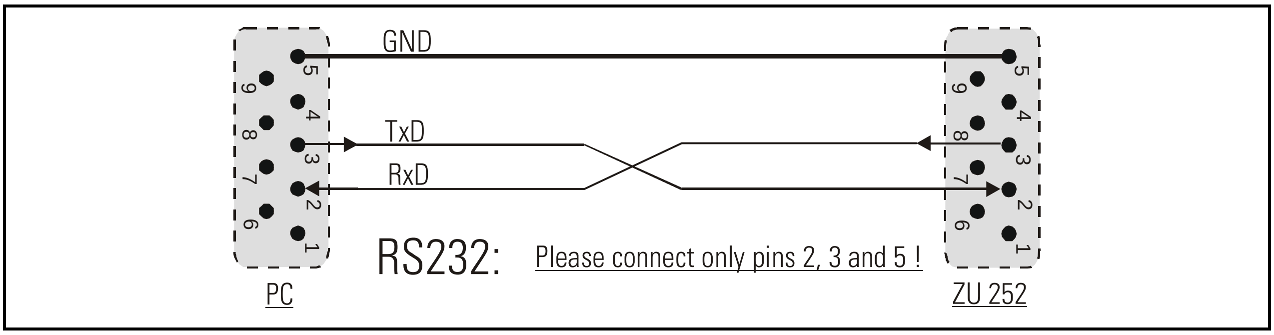
The unit provides a +/-10V voltage output and a 0-20 mA / 4-20 mA current output at a resolution of 14 bits, i.e. the voltage output operates in steps of 1.25 mV and the current output operates in steps of 2.5 µA. The nominal load of the voltage output is 2 mA, the current output accepts loads between 0 Ohms and 270 Ohms.
The analogue ground uses a separate terminal, which however internally is connected to the GND potential of the power supply.

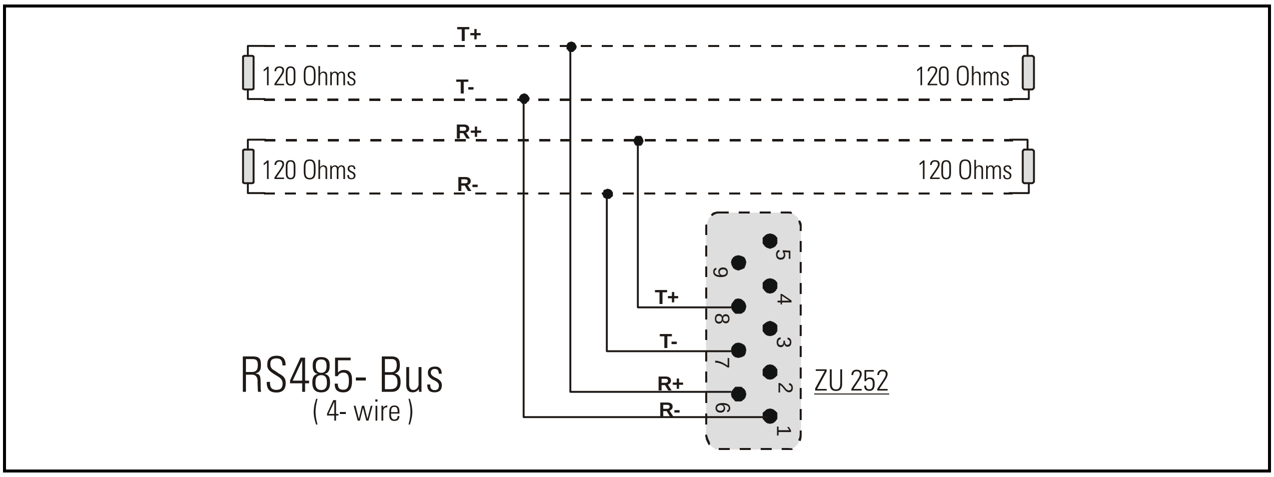


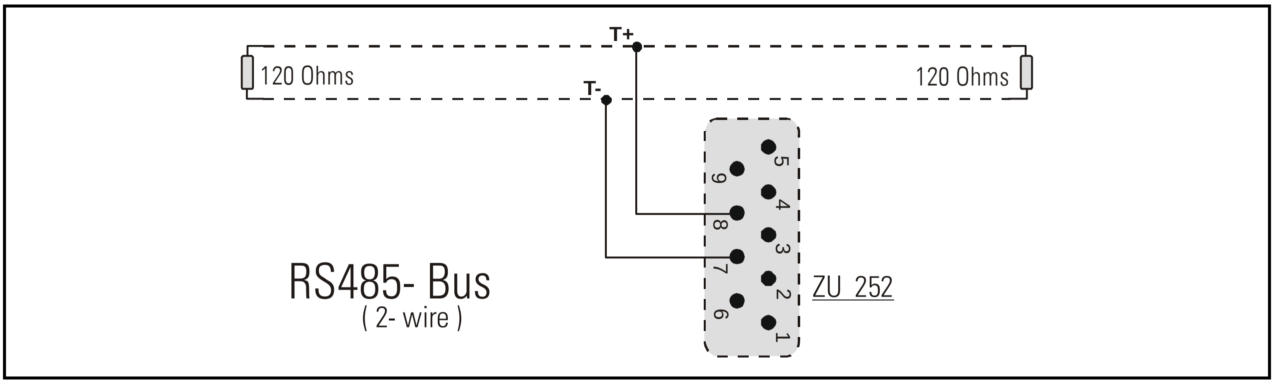
4.6. Serial interfaces

The unit provides a RS232 interface and a RS485 interface, however only one of the two can be used at a time. Serial communication allows to read out the counting result and to set parameters and variables by PC, according to need.





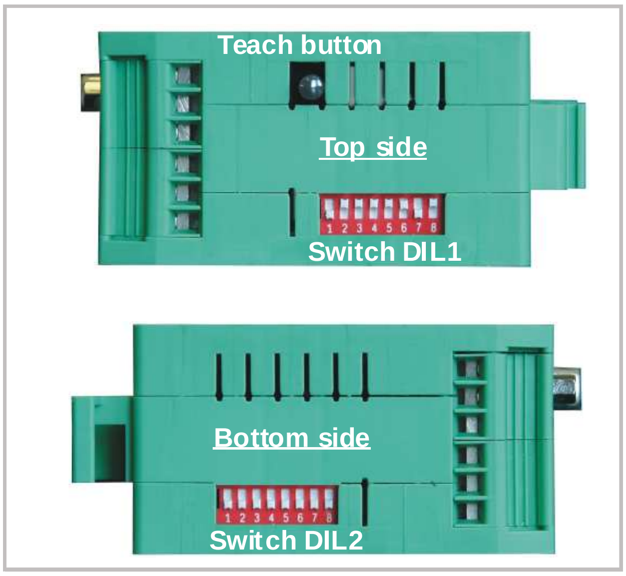




5. DIL Switch Settings

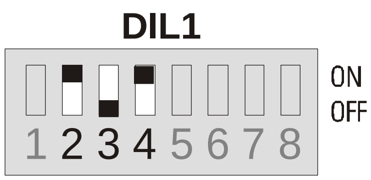
There is one 8-position switch located on the top side (DIL1), and another 8-position switch is located on the bottom side of the unit (DIL2). These switches provide major settings of the desired properties of the unit.

> Changes of switch settings will become active only after cycling the power supply of the unit!
>
> Positions 7 and 8 of switch DIL2 are for internal factory use only and must both be set to OFF at any time during normal operation



5.1. Basic mode of operation and power-down memory setting

Positions 2 and 3 of switch DIL1 on the top side set the mode of operation, and position 4 allows setting of the power-down behavior of the unit:



2	3	Mode of operation
on	on	Input A only
on	off	Quadrature operation A / B / 90°
off	on	Sum A + B or difference A - B
off	off	A = counting input, B = direction control (up/dn)

Position 4 off: Power-down memory off. Upon power up the counter either resets to zero or sets to the value programmed under parameter „Set Value" *)

Position 4 on: Power-down memory on. Upon power up the counter re-loads the previous value before power down

*) see Parameter „Power-up Mode"

5.2. Impulse levels and symmetric / asymmetric input formats

Positions 5 and 7 of DIL1 together with positions 3 to 6 of DIL2 allow setting of all imaginable combinations of levels and formats.

- All subsequent tables use the following definitions:
  „0" = switch OFF, „1" = switch ON and
  „x" = position not important
- Switch settings refer to impulse inputs A / B only, but the Control Input (terminal 10) provides always HTL / PNP format, i.e. you must apply a positive voltage 10 – 30 volts to activate the function
- Where you use 2-wire sensors with NAMUR characteristics, connect the positive pole of the sensor to the corresponding input terminal, and the negative pole to GND
- Where subsequently you read (A) or (B), this indicates that the inputs expect asymmetric (single-ended) signals and you will not need the corresponding inverted signals
- Where however you read (A and /A) or (B and /B), this indicates that the inputs expect symmetric differential signals according to RS422 standard, i.e. it is mandatory to apply also the inverted signals

5.2.1. Standard settings

If you just use encoders or sensors according to common industrial standards, and if also all input signals should have the same level, you just can use one of the following three standard settings and do not need to consider all further alternatives of switch settings.

DIL1				DIL2				Input Characteristics	Encoder Type
5	6	7		3	4	5	6		
0		**0**		**0**	**0**	**0**	**0**	Asymmetric HTL input (A, B), 10 - 30 V level, NPN (switching to -) or Push-Pull or NAMUR characteristics	Standard HTL encoders, Proximity switches, Photo switches etc.
1		**0**		**0**	**0**	**0**	**0**	Asymmetric HTL input (A, B), 10 - 30 V level, PNP (switching to +) or Push-Pull characteristics	PNP Proximity switches, Photo switches etc.
0		**1**		**0**	**0**	**0**	**0**	Symmetric TTL signals or RS422 signals (A, /A), (B, /B) (differential, including inverted signal)	Standard TTL encoders providing A, /A, B, /B output channels

5.2.2. Settings for special applications

Where you find that the standard settings shown before are not suitable for your application, please go through the following setting options and find out the input levels and characteristics you need.

DIL1				DIL2				Characteristics of input A	Characteristics of input B
5	6	7		3	4	5	6		
x		**x**		**0**	**0**	**0**	**1**	TTL level (A)	TTL level (B)
x		**x**		**0**	**0**	**1**	**0**	HTL level (A and /A)	HTL level (B and /B)
x		**x**		**0**	**0**	**1**	**1**	TTL level (A)	TTL level (B and /B)
x		**x**		**0**	**1**	**0**	**0**	TTL level (A and /A)	TTL level (B)
x		**x**		**0**	**1**	**0**	**1**	HTL level NPN (A)	HTL level PNP (B)
x		**x**		**0**	**1**	**1**	**0**	HTL level NPN (A)	TTL level (B and /B)
x		**x**		**0**	**1**	**1**	**1**	HTL level NPN (A)	TTL level (B)
x		**x**		**1**	**0**	**0**	**0**	HTL level PNP (A)	TTL level (B and /B)
x		**x**		**1**	**0**	**0**	**1**	HTL level PNP (A)	TTL level (B)
x		**x**		**1**	**0**	**1**	**0**	HTL level PNP (A)	HTL level NPN (B)
x		**x**		**1**	**0**	**1**	**1**	TTL level (A and /A)	HTL level NPN (B)
x		**x**		**1**	**1**	**0**	**0**	TTL level (A)	HTL level NPN (B)
x		**x**		**1**	**1**	**0**	**1**	TTL level (A and /A)	HTL level PNP (B)
x		**x**		**1**	**1**	**1**	**0**	TTL level (A)	HTL level PNP (B)

5.3. Analogue output format

The desired output format of the analogue output can be set by positions 1 and 2 of switch DIL2

DIL2		Output format	
1	2		
0	**0**	Voltage 0 … +10 V ←	With this setting the format depends on the parameter „Analogue Mode" which can be set by PC. Since the factory default setting of parameter "Analogue Mode" is "1", the format will be a 0 … +10 V output under default conditions.
0	**1**	Voltage +/- 10 V	
1	**0**	Current 4 – 20 mA	
1	**1**	Current 0 – 20 mA	

5.4. Selecting the RS232 or the RS485 serial interface

Position 1 of switch DIL1 selects between the RS232 interface and the RS485 interface. All connection details have already been explained in section 4.6.

DIL1 / 1		Serial Interface
0		RS232 interface is active (RS485 is switched off)
1		RS485 interface is active (RS232 is switched off)

5.5. Teach function, Test function, loading of default settings

Positions 6 and 8 of switch DIL1 allow to set the following functions:

DIL1			Function
6	8		
x	**0**		Unit returns to the factory default parameters after power-down
x	**1**		Unit always keeps the parameters according to customer setting
0	**x**		Push button and yellow LED operate in TEACH mode (see 6.)
1	**x**		Push button and yellow LED operate in TEST mode, Teach is disabled (see 6.)

After successful commissioning, please make sure to set positions 6 and 8 to "ON". Otherwise, cycling of the power supply or touching the push button inadvertently would result in overwriting your parameter settings

6. Setup Procedure

For all basic applications you can use the Teach feature for commissioning of the unit. Extended functions need a PC for setup and are described under section 8.

As a first step it is advisable to check the input pulses by means of the LED marked "Status". Position 6 of DIL1 must be set to ON for this test.

When you press the TEACH button one time, the yellow LED will be lit after the unit detected a pulse on input A. The LED will be OFF when no input pulse has been detected.

When you press the TEACH button once more, you can also check input B (if applicable). With use of mode A+B and two independent impulse sources, again the yellow LED will be lit after a pulse has been detected on input B.

6.1. Operation as single channel counter (without direction signal) or as positional counter (with direction signal)

- Settings: Make sure that the DIL switches are set according to the encoder in use, and that position 6 of switch DIL1 is OFF (Teach function active).
- Self test: Upon power up, both front LED's must be lit first, and the yellow status LED must switch off after the self-test has been concluded successfully (approx.1 sec.).
- Scaling of the analogue output with use of the Teach function:

  Press the Teach button one time. The status LED will blink in a slow sequence now while the unit waits for setting of the minimum counter state, this is the state where later you expect the analogue output to be zero (in general, this will be with counter=0). Please set the counter to the desired state or move the encoder to the desired position and reset the counter to zero. Then press the Teach button again. This stores your minimum counter definition.

  The LED will blink in a fast sequence now and the unit waits for setting of the maximum counter state, this is the state where later you expect full scale analogue output. Please get the counter to the desired state or move your encoder to the desired position. Then press the teach button once more. This stores your maximum counter definition and the LED will switch off.

After this Teach procedure, your analogue output is set to 0–10 volts swing between the minimum and the maximum counter state.

6.2. Operation as a summing or differential counter with two independent impulse inputs (A+B, A-B)

In principle, the Teach procedure is exactly the same as shown under 6.1, but the minimum and maximum counter states already refer to the sum or the difference of the count on both inputs.

7. Readout of the Actual Counter State by Serial Communication

At any time you can read out the actual counter state and more values via serial link. For setting of serial communication parameters etc., you must however apply PC setup anyway, as shown later.

ZU 252 uses the DRIVECOM communication protocol according to the ISO 1745 standard. Details about the protocol can be found in our document "SERPRO.doc", available for download under

www.motrona.com

The following register codes are available for readout:

C1	C2	Description
:	8	Actual conversion result, scaled as % of full scale output, format xxx.xxx % *)
;	0	Actual count of input A
;	4	Actual count of input B
;	3	Actual output voltage of the analogue output, scaling 0 – 10 000 millivolts

*) under consideration of the scaling operands as shown in section 10.

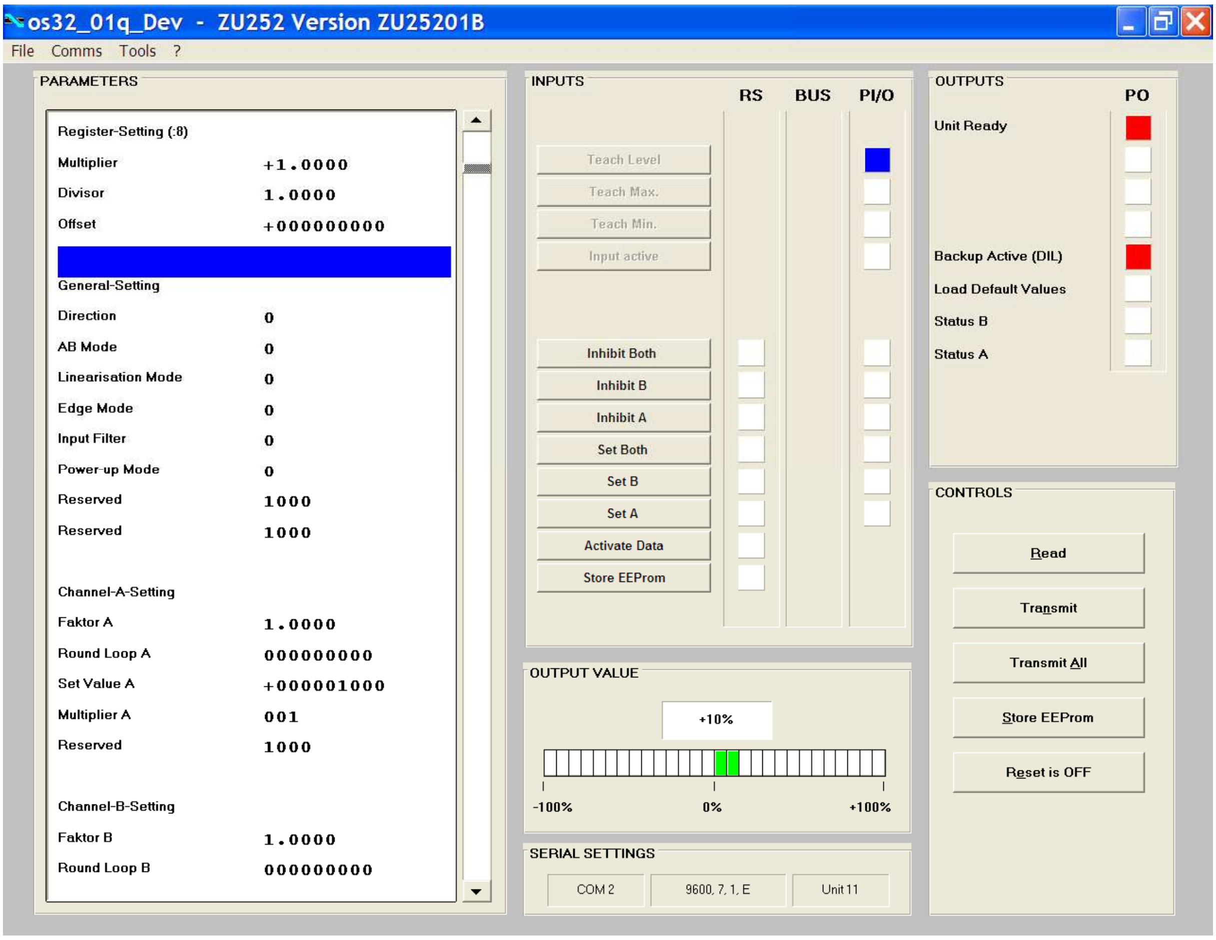
8. PC Setup Using the OS3.2 Operator Software

You can apply the full set of functions when you use a PC and our operator software OS3.x for setup of the unit (actual software version is OS3.2).
You can download this software and more instructions from our homepage

www.motrona.com

Connect your PC to the converter, using a serial RS232 cable like shown in section 4.6 of this manual. Make sure the cable only uses pins 2, 3 and 5. Pins 2 and 3 must be crossed.

Run the OS3.x software and you will see the following screen:



If your text and color fields remain empty and the headline says „OFFLINE“, you must verify your serial settings and the DIL switch setting. To do this, select „Comms“ from the menu bar.

- Ex factory, all motrona units use the following serial standard settings: **Unit No. 11, Baud rate 9600, 1 start/ 7 data/ parity even/ 1 stop bit**
- If the serial settings of your unit should be unknown, you can run the „SCAN“ function from the „TOOLS“ menu to find out.

9. Displays and Softkeys

The edit window for all unit parameters can be found on the left side of the screen.

The INPUTS field shows the softkeys to switch the control commands on or off. Display boxes in the RS column indicate when the corresponding command is set to ON by PC. Display boxes in the PI/O column indicate that the corresponding command is ON by external hardware.

The boxes in the OUTPUTS field provide information about the state of the unit, where “Status A” and “Status B” are especially useful to check the counting inputs:

- Status A is lit when a counting pulse is detected on input A
- Status B is lit when a counting pulse is detected on input B
  (with operation modes A+B or A-B only)

The color bar graph displays the actual output state in a range of +/- 100 % of full scale.

Control keys are available for readout, transmission and storage of parameters.

10. Parameter Settings

Parameter	Description
„Register :8“ Setting:	
Multiplier Divisor Offset	These operands allow to convert the result to the desired engineering units. The conversion affects the numeric value for serial read out from register <:8> only, but not the scaling of the analogue output. With the settings Multiplier = 1,0000 Divisor = 1,0000 Offset = 0,0000 the readout from register < :8 > equals to the percentage result (xxx.xxx%), where 100,000% has been defined by the TEACH minimum and TEACH maximum settings

Readout from <:8> = Measuring result in % of full scale x $\frac{\text{x Operand}}{\text{/Operand}}$ + +/-Operand

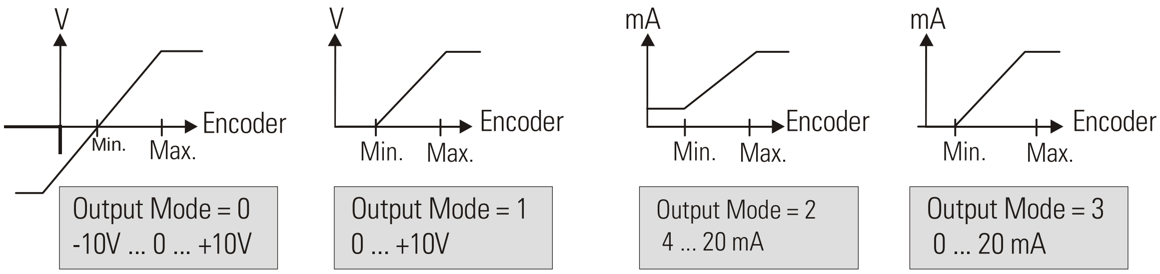
With “Divisor” set to 0 the whole conversion will be skipped, resulting in lower calculation time and the shortest possible conversion time.

The calculation result from [Multiplier : Divisor] must not exceed a value of 15 000 !

Direction:	Can be used to invert the polarity of the analogue output signal when converting quadrature A/B input signals or A=impulse and B=direction. 0 = no inversion of the polarity 1 = inversion of the polarity
A/B Mode:	Sets the counting mode with two independent single-channel inputs 0 = no combination 1 = sum A + B 2 = difference A – B See DIL switch settings in chapter 5.1.
Linearization Mode:	Sets the mode of linearization. 0: Linearization off, registers P1_x to P16_y do not affect the output characteristics. 1: Linearization in a range of 0 – 100% 2: Linearization over full range –100% to +100% See example in chapter „Linearization“

Parameter	Description
Edge Mode:	This setting, with use of quadrature A/B input, allows simple count (x1) or full quadrature count (x4), by either accepting rising edges from input A only, or all rising and falling edges from inputs A and B 0 = simple count (x1) 1 = quadrature count (x4)
Input Filter	Programmable hardware filter for the impulse inputs 0 Filter off, inputs accept full frequency range 1 Filter cuts frequencies higher then 500 kHz 2 Filter cuts frequencies higher than 100 kHz 3 Filter cuts frequencies higher than 10 kHz When using the filter, all frequencies higher than indicated above will no more be evaluated correctly.
Power up Mode:	Sets the action of the counter upon power up: 0 = Loads the previous value from power down memory 1 = Resets the counter to zero 2 = Sets counter to the value specified by register “Set Value”
Channel A Setting:	
Factor A	Impulse scaling factor for counter input A. Setting 1.0000 results in one increment with every input pulse, whereas setting 0.5000 would need 10 input pulses to increment by 5 etc.
Round Loop A:	This register limits the counting range to a repeating loop. With setting of 1000, in upwards direction 999 is followed by to 000, and in downwards direction the counter sets to 1000 when reaching zero. Setting this register to 000 000 provides counting over the full range.
Set Value A:	Upon external Set command, the input A counter presets to the datum set here (range +/-100 000 000). The analogue output follows the new counter state according to its output scaling.
Multiplier A	Multiplier for multiple count of one input impulse on A (001 – 999)
Channel B Setting: (only for operation modes A+B or A-B)	
Factor B	Impulse scaling factor for counter input B (see Factor A)
Round Loop B:	(see “Round Loop A, but input B)
Set Value B:	(see “Set Value A”, but input B)
Multiplier B	(see “Multiplier A”, but input B)

Parameter	Description
Analogue Setting	
Teach Minimum Teach Maximum	These settings define your minimum and maximum count for input A (respectively A/B quadrature), where your analogue output moves from 0 V to 10 V. You can enter your minimum and maximum settings as follows: • either by operating the Teach pushbutton (as described under 6.1). You will find your Teach result in the Edit window every time after clicking to “Read” • or by entering the counter settings directly to the parameter field of your screen, without using the TEACH function. Please store every parameter by the ENTER key, or – after conclusion of all entries – click to “Transmit All” and then to “Store EEProm” to save your settings.
	When using sum mode (A+B) or the differential modes (A-B), these settings already refer to the sum or to the difference of the counter.
Output Mode:	Selects the output format of the analogue outputs as shown:



Analogue Offset:	Allows adjusting the analogue zero output over the full range (-9999 mV ... 0 ... +9999 mV respectively -19998 µA ... 0 ... +19998 µA)
Analogue Gain:	Sets the maximum output swing of the analogue output. Setting of 1000 results in 10 volts respectively 20 milliamps of output swing.

Parameter	Description
Serial Communication:	
Unit Number:	Especially with RS 485 applications it is necessary to attach a specific address to each unit, since up to 32 units can be connected to the same bus. You can choose any address number between 11 and 99. Factory setting = **11** The address must not contain a "0" because these numbers are reserved for collective addressing.

Serial Baud Rate:

Setting	Baud
0*	9600
1	4800
2	2400
3	1200
4	600
5	19 200
6	38 00
* = Factory setting	

Serial Format:

Setting	Data bits	Parity	Stop bits
0*	7	even	1
1	7	even	2
2	7	odd	1
3	7	odd	2
4	7	none	1
5	7	none	2
6	8	even	1
7	8	odd	1
8	8	none	1
9	8	none	2
* = Factory setting			

Serial Protocol: Selects the serial protocol for the cyclic transmission.
0 : the string starts with the serial address of the unit ("Unit Number"), followed by a space and the value of the register to be read out. The string ends with a "Line Feed" character and a "Carriage Return" character.

1 : the unit number is omitted and the string starts with the register value directly. This allows a little faster transmission because of the shorter transmission time.

	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

Parameter	Description
Serial Timer:	This register determines the cycle time in seconds for the cyclic transmission. E. g. with a setting of 0.100 the selected register value will be transmitted every 100 ms. The accuracy of the timer is +/-500 µs. Setting the register to 0 disables cyclic transmissions.
Serial Value:	Selects the register to be transmitted cyclically. Setting of 00 selects register code **:0**, setting of 01 selects register code **:1** etc.

The communication can operate in either "PC-Mode" or in "Printer Mode".

With "PC-Mode", the unit waits for a request string and responds by a corresponding data string.
For details of the protocol see description "SERPRO".

With "Printer Mode" the unit sends data without any request and under Timer control. As soon as the unit receives a character, it automatically switches to PC Mode and operates according to protocol. When for a period of 20 sec. no character has been received, the unit switches automatically to "Printer Mode" and restarts cyclic data transmission.

Input Setting:	
Input Configuration	Sets the behavior of the Control input (terminal 10): **0** = static operation with "high" level **1** = dynamic operation by rising edge **2** = dynamic operation by falling edge **3** = dynamic operation by rising edge *) **4** = dynamic operation by falling edge **) 5 = static operation with "low" level
Input Function	Sets the function of the Control input (terminal 10): **0** = no function **1** = Set counter A to "Set Value A" **2** = Set counter B to "Set Value B" **3** = Set counter A to "Set Value A" and counter B to "Set Value B" **4** = Inhibit counter A (disable count) **5** = Inhibit counter B (disable count) **6** = Inhibit counters A and B **7** = Activate a serial data transmission cycle

*) Equal to 1 (double command function for reasons of compatibility to the previous model)

**) Equal to 2 (double command function for reasons of compatibility to the previous model)

Parameter	Description
Backup Setting:	
Backup A Backup Rest A Backup B Backup Rest B	Upon power-down the unit saves the actual counter values to the registers Backup A and Backup B. Since the counters use impulse scaling factors, there may be remainders which need to be considered later for error-free continuation of the count. These remainders are stored in the corresponding “Rest” registers
Linearisation Setting:	
P1_x to P16_x: P1_y to P16_y:	Interpolation points for linearization (initial values) Interpolation points for linearization (substitute values) (see chapter 11)

11. Free Programmable Linearization

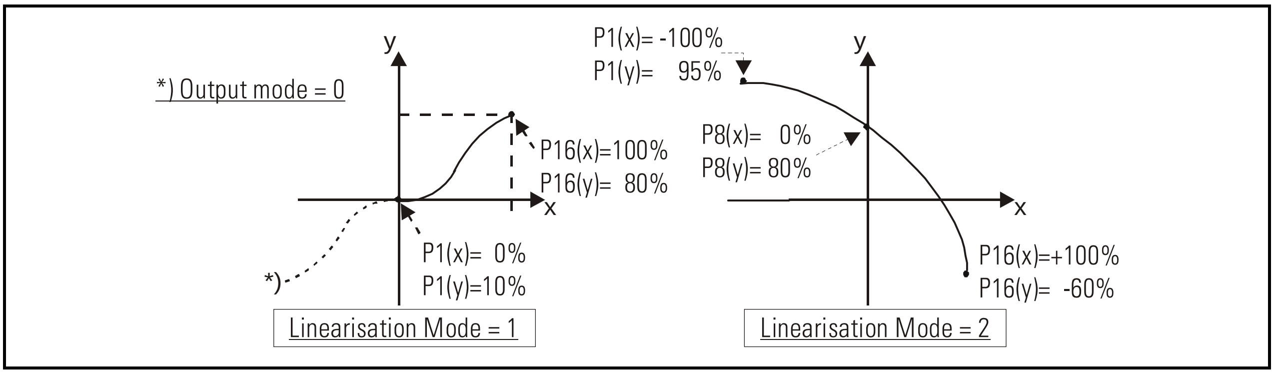
This programmable feature allows the user to convert the linear counting process to a non-linear analogue output. There are 16 programmable interpolation points available, which can be set in any desired distance over the full conversion range. Between two coordinates, the unit uses linear interpolation. Therefore it is advisable to use more points in a range with strong curves and only a few points where the curvature is less.
To specify your desired linearization curve, you must first set the „Linearization Mode“ register to either 1 or 2.

Use registers **P1(x)** to **P16(x)** to specify the coordinates on the x-axis. These are the analogue output values that the unit normally would generate according to the actual count. The settings are in % of full scale.

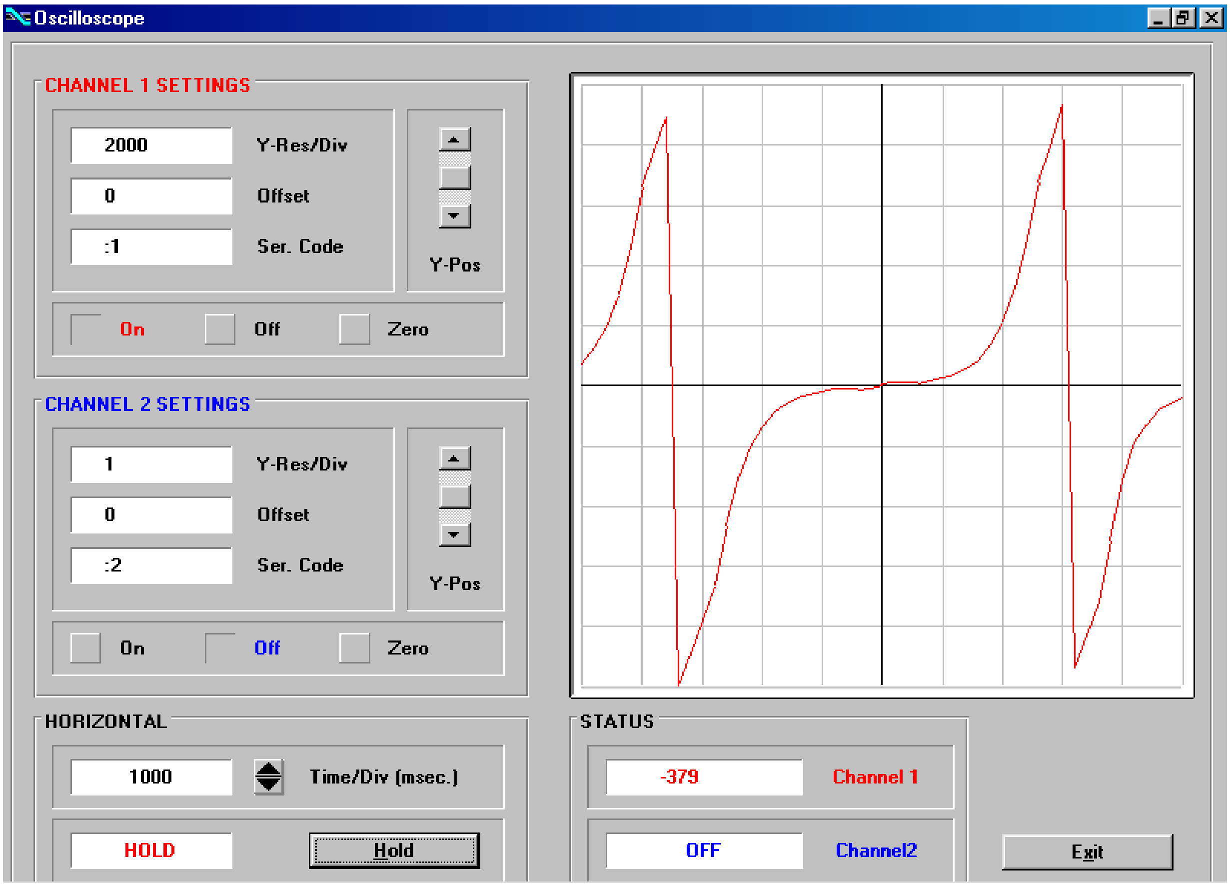
Now enter the attached values to registers **P1(y)** to **P16(y)**. These are the values that the analogue output will generate <u>instead</u> of the x- values

Example: the value set to register P2(y) will substitute original value P2(x) etc.

- x-registers must use continuously increasing settings, i.e. P1(x) must have the lowest and P16(x) must have the highest setting
- All entries use a percentage format of xx.xxx% full scale. Setting 0.000% means zero output and setting 100.000% means full scale output.
- With Linearization Mode set to 1, it is a must to set P1(x) to 0% and P16(x) to 100%. Linearization is defined in the positive range only and the negative range will be a mirror image of the positive range with reference to zero.
- With Linearization Mode set to 2, it is a must to set P1(x) to –100% and P16(x) to +100%. This enables the user to set curves which are not symmetric to the zero position.



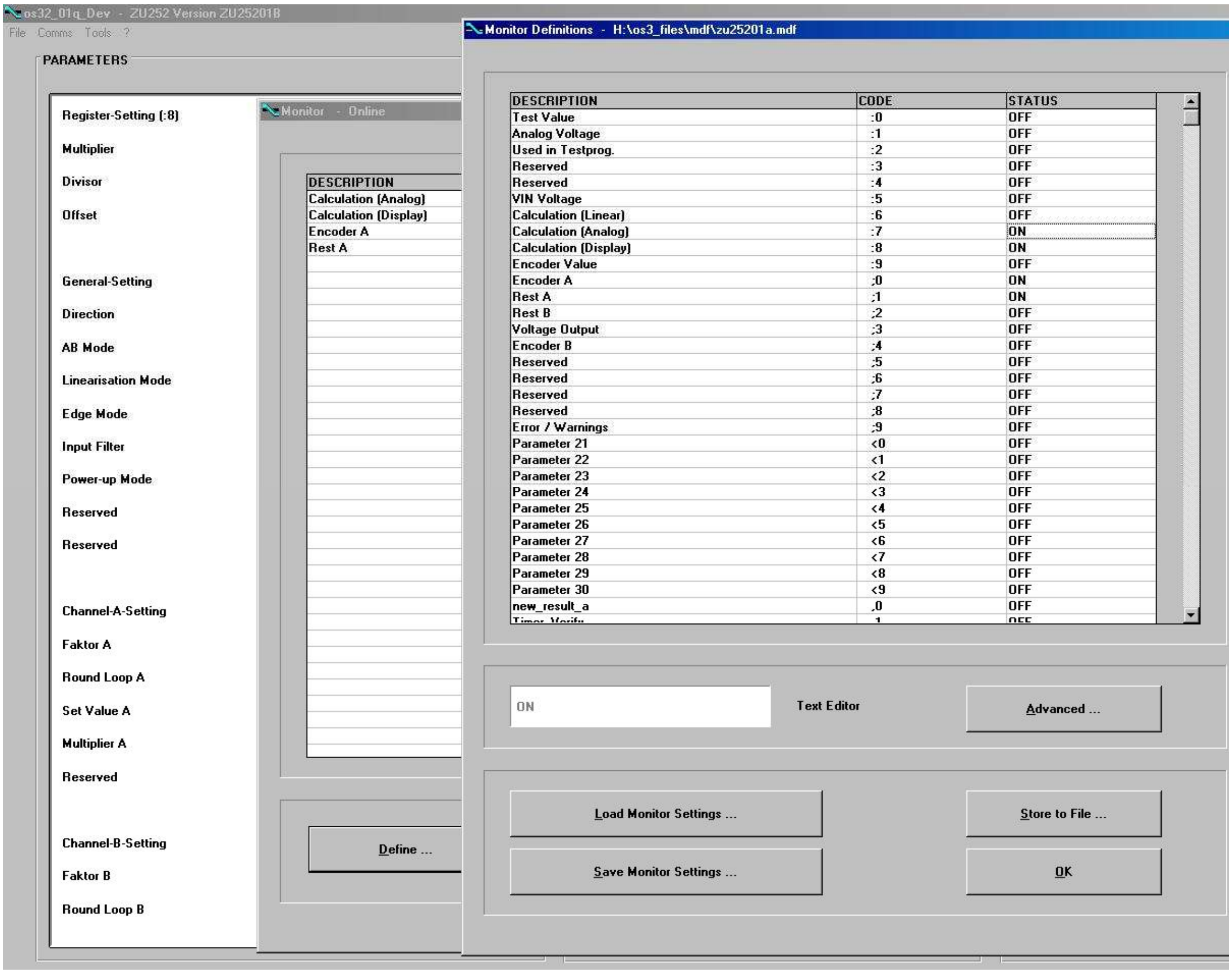
You can visualize your curve on the PC screen or by means of an external oscilloscope. For this, select TOOLS, then TEST and there „Analogue Voltage Function“. The unit will now simulate a repeating counting cycle over the full range and generate the analogue signal accordingly. When you use the Scope function of the operator software, you must set the serial code „ :1 “ to record the analogue output.



12. Monitor Functions

The monitor function of the OS3.2 PC software allows to display some important data on the PC screen with a continuous refresh cycle.

Select „Monitor“ from the „Tools“ menu to open the basic view of the monitor window. Click to “Define” to open the definition window. You will find a list with all accessible parameters and actual values, where however the texts may be unfounded.



With ZU252, the following registers may be useful:

C1	C2	Description
:	8	Actual conversion result in % of „full scale“, format xxx.xxx % *)
;	0	Actual count, input A
;	4	Actual count, input B
;	3	Actual analogue output, scaling 0 – 10 000 millivolts

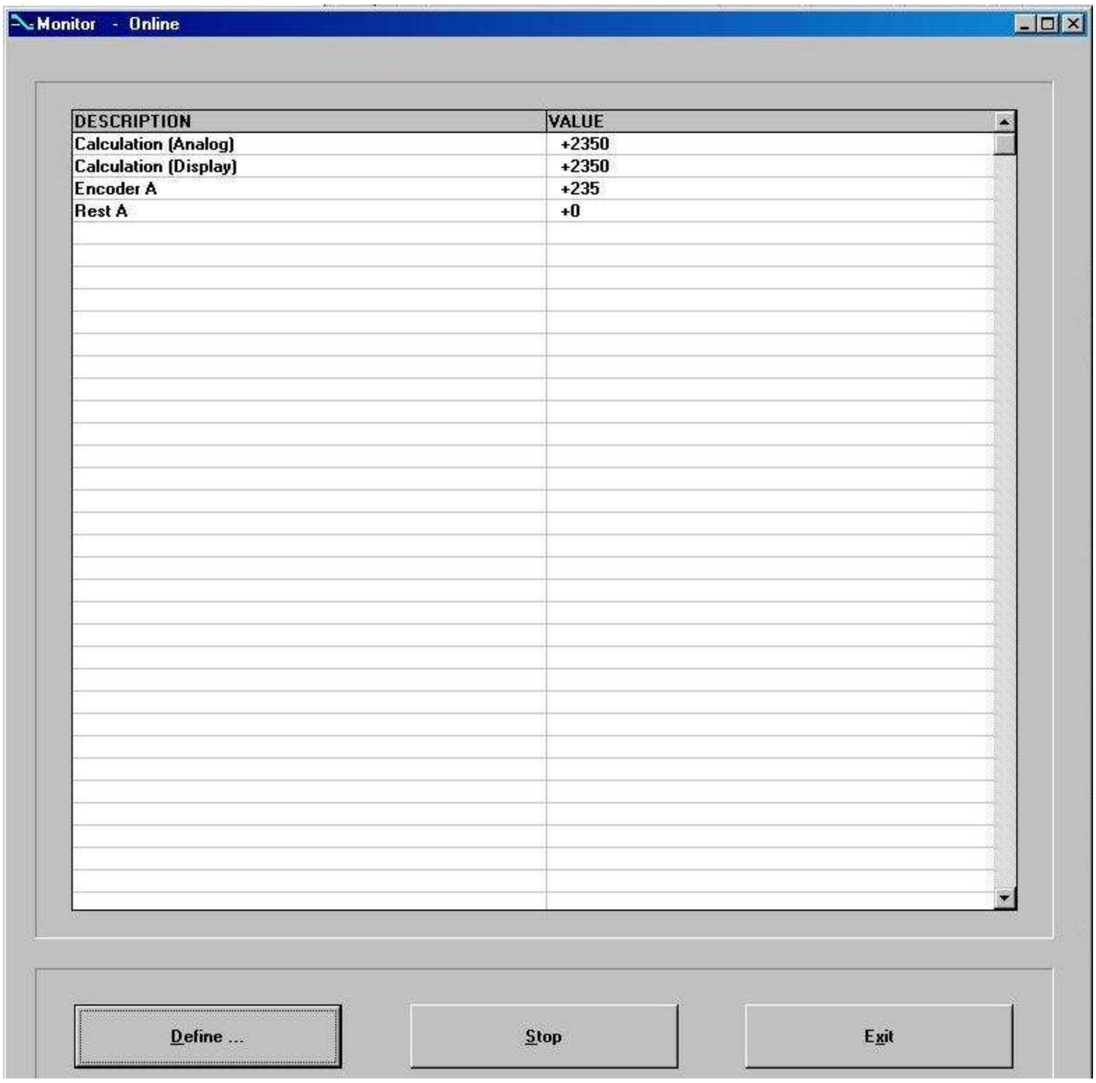
Click to the Status field, next to the desired register code (where you read ON or OFF). Now you can toggle this position between ON and OFF by touching any key.

Set all of the register codes to ON which you afterwards would like to trace on the monitor. Switch all unused register codes to OFF.

To change the text shown with the register code, click to the corresponding text field. The same text will now appear in the “Text Editor” window below the parameter window. Rename the text according to your desire and press ENTER to store the new text in the corresponding monitor line.

When all desired codes have been set to ON and the texts have been renamed according to need, click OK. Where, besides the display data on the screen, you also like to record all data to a file on your hard disc, click first to „Store to File“ and set the corresponding check box.

After staring the monitor you will see the following window, where all values are updated continuously.



13. Data Readout via Serial Interface

All register codes from chapter 12. are also available for serial readout by PC or PLC. For communication the FU252 converter uses the Drivecom Protocol according to ISO 1745. All protocol details can be found in our manual **SERPRO_2a.doc** which is available for download from our homepage

www.motrona.com

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

EOT		AD1	AD2	C1	C2	ENQ

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

The following example shows the request string for readout of the actual conversion result (code :8) from a unit with unit address 11:

ASCII Code:	EOT	1	1	:	8	ENQ
Hex Code:	04	31	31	3A	38	05
Binary Code:	0000 0100	0011 0001	0011 0001	0011 1010	0011 1000	0000 0101

After a correct request, the unit will respond:

STX	C1	C2	x x x x x x x	ETX	BCC

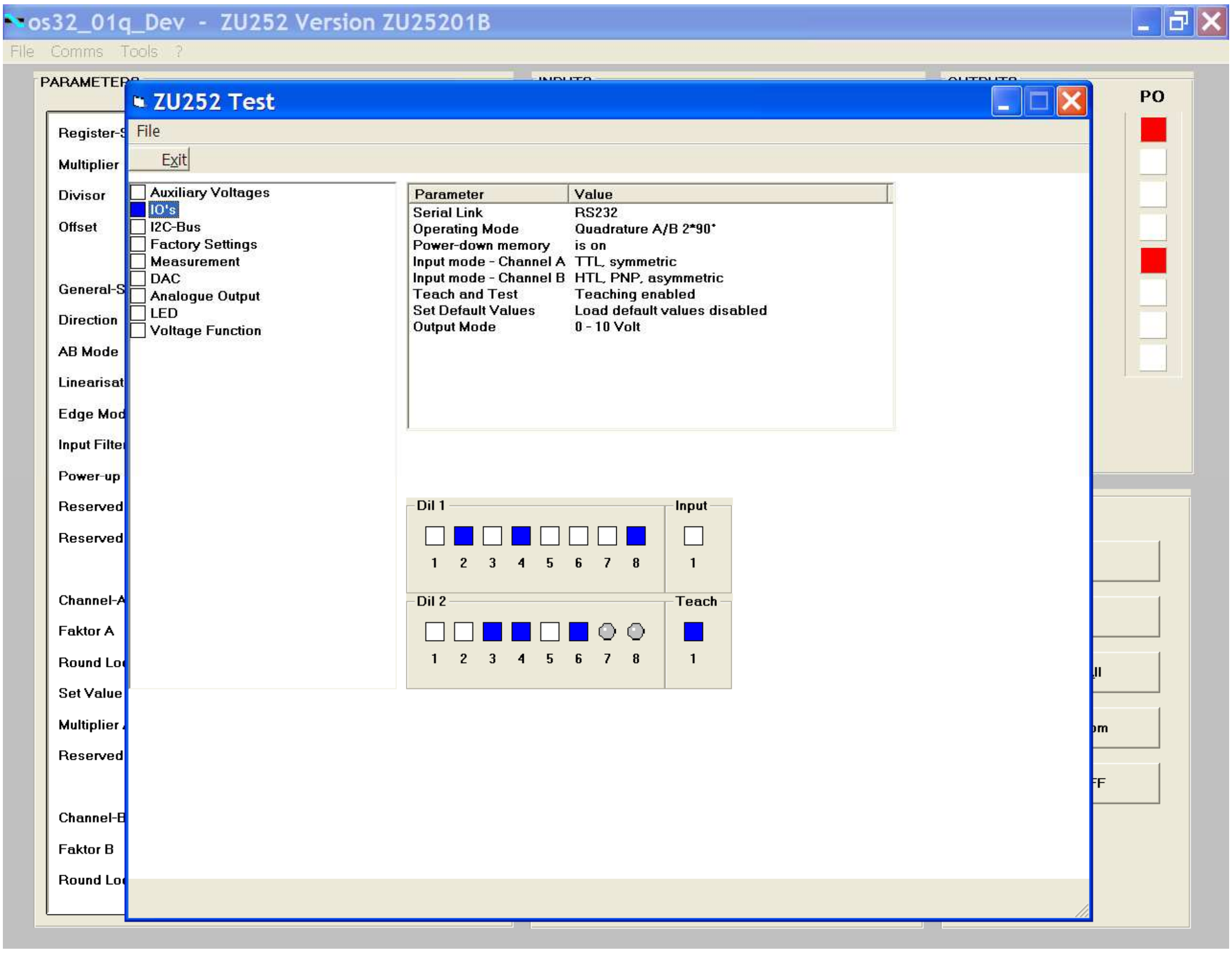
STX = control character (Hex 02)
C1 = register code, High Byte
C2 = register code, Low Byte
xxxxx = readout data
ETX = control character (Hex 03)
BCC = block check character

For all further details see SERPRO_2a.doc.

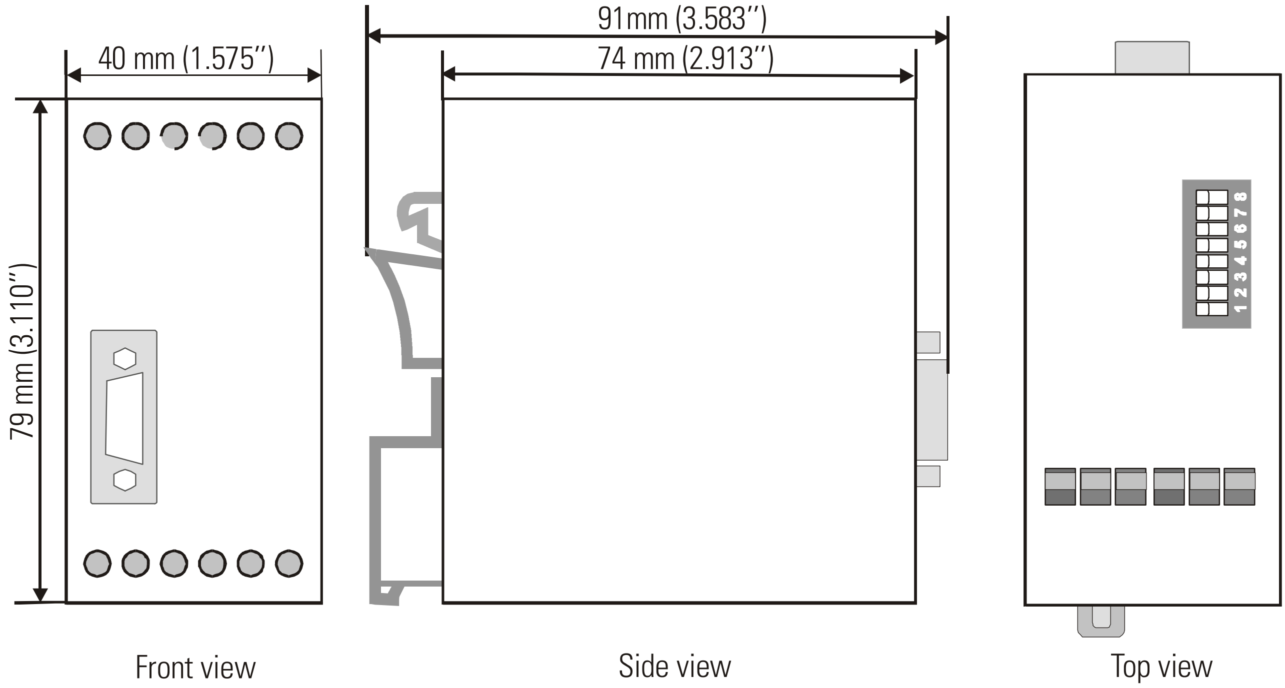
14. Test Functions

When you select TEST from the TOOLS menu, you are able to verify the following data, by clicking to the corresponding field:

- Actual counter values
- DIL switch settings
- Internal supply voltages
- Analogue output state



15. Dimensions



16. Technical Specifications

Power Supply	:	18...30 VDC
Power consumption	:	approx. 85 mA at 18 V approx. 60 mA at 30 V (+5.5V uncharged)
Encoder supply	:	+5.5V +/- 5% (max. load: 250mA)
Inputs (RS422/TTL differential)	:	RS422 compatible (differential level min. 1 V) or TTL differential, f_{max} = 1 MHz
Inputs TTL single-ended	:	LOW < 0.5V, HIGH > 2.5V, f_{max} = 200 kHz
Inputs HTL single-ended	:	LOW < 3V, HIGH > 10V, f_{max} = 200 kHz, (Ri=4,75 kOhm)
Input „Control“	:	LOW < 3V, HIGH > 10V, min. pulse duration 3 msec.
Analogue outputs	:	+/- 10 V (> 5 kOhm) 0-20 mA / 4-20 mA (< 270 Ohm)
Step width of analogue outputs	:	1.25 mV / 2.5 µA
Analogue resolution	:	14 bits (+ 10V / +20mA ... -10V/ -20mA)
Accuracy of analogue output	:	0.1% +/- 1 digit
Response time counter => analogue (normal operation):	:	approx. 1 msec
Reset time of the analogue output upon external reset command	:	1 msec
Temperature range	:	Operation: 0° ... +45°C (+32 … +113°F) Storage: -25° … +70°C (-13 … +158 °F)
Weight	:	approx. 190 g
Conformity and standards	:	EMC 2004/108/EC: EN 61000-6-2 EN 61000-6-3

Parameter List

Parameter	Min	Max	Default	Positions	Sign	Ser. Code
Multiplier	-99999	99999	10000	+/- 5	4	00
Divisor	0	99999	10000	5	4	01
Offset	-100000000	100000000	0	+/- 9	0	02
Direction	0	1	0	1	0	46
AB Mode	0	2	0	1	0	10
Linearisation Mode	0	2	0	1	0	08
Edge Mode	0	1	0	1	0	09
Input Filter	0	3	0	1	0	D2
Power-up Mode	0	2	0	1	0	14
Factor A	1	99999	10000	5	4	05
Round Loop A	0	100000000	0	9	0	13
Set Value A	-100000000	100000000	0	+/- 9	0	12
Multiplier A	1	999	1	3	0	D5
Factor B	1	99999	10000	5	4	06
Round Loop B	0	100000000	0	9	0	D7
Set Value B	-100000000	100000000	0	+/- 9	0	D8
Multiplier B	1	999	1	3	0	D9
Teach Min	-10000000	100000000	0	+/- 9	0	03
Teach Max	-10000000	100000000	10000	+/- 9	0	04
Analogue Mode	0	3	1	1	0	07
Analogue Offset	-9999	9999	0	+/- 4	0	47
Analogue Gain	0	10000	1000	5	0	48
Serial Unit No.	0	99	11	2	0	90
Serial Baud Rate	0	6	0	1	0	91
Serial Format	0	9	0	1	0	92
Serial Protocol	0	1	0	1	0	30
Serial Timer	0	99999	0	5	3	31
Serial Value	0	19	8	2	0	32
Input Configuration	0	5	0	1	0	11
Input Function	0	7	0	1	0	E2
Backup A	-100000000	100000000	0	+/- 9	0	33
Backup B	-100000000	100000000	0	+/- 9	0	34
Rest A	-10000	10000	0	+/- 5	0	35
Rest B	-10000	10000	0	+/- 5	0	36
P1(x)	-100000	100000	100000	+/- 6	3	A0
P1(y)	-100000	100000	100000	+/- 6	3	A1
P2(x)	-100000	100000	100000	+/- 6	3	A2
P2(y)	-100000	100000	100000	+/- 6	3	A3…(A9)…(C9)
P16(x)	-100000	100000	100000	+/- 6	3	D0
P16(y)	-100000	100000	100000	+/- 6	3	D1

17. Setup Form

Date:	Software:
Operator:	Serial No.:

Register Setting (:8)	Multiplier:	Divisor:	Offset:

General Setting	Direction: Linearization Mode: Input Filter:	AB Mode: Edge Mode: Power-up Mode:

Input		Channel A	Channel B
	Factor		
	Round Loop		
	Set Value		
	Multiplier		

Analogue Setting	Teach Minimum: Teach Maximum:	Analogue Mode: Analogue Offset : Analogue Gain:

Serial Communication	Serial Unit No: Serial Baud Rate: Serial Format:	Serial Protocol: Serial Timer: Serial Value:

Input Setting:	Input Configuration:	Input Function:

Backup-Setting:		Channel A	Channel B
	Backup		
	Rest		

Linearization			
P1(x):	P1(y):	P9(x):	P9(y):
P2(x):	P2(y):	P10(x):	P10(y):
P3(x):	P3(y):	P11(x):	P11(y):
P4(x):	P4(y):	P12(x):	P12(y):
P5(x):	P5(y):	P13(x):	P13(y):
P6(x):	P6(y):	P14(x):	P14(y):
P7(x):	P7(y):	P15(x):	P15(y):
P8(x):	P8(y):	P16(x):	P16(y):

DIL Switch 1							
-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-

DIL Switch 2							
-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
						OFF	OFF