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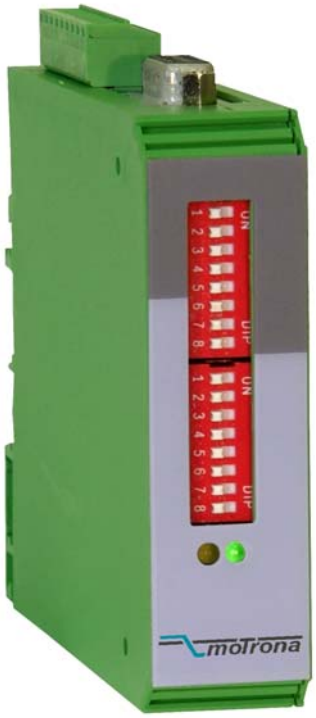
control – motion – interface

PU 210

Level Converter, Potential Separator and Direction Signal Decoder for Incremental Encoder Signals



- Signal inputs A, B, Z and /A, /B, /Z, adjustable to either RS422 format or TTL level or HTL (10-30V) level
- Signal outputs A, B, Z and /A, /B, /Z, likewise adjustable to either RS422 format or TTL level or HTL (10-30V) level
- Potential separation between input and output
- Conversion of a A/B quadrature direction signal to a static direction output and vice-versa
- Encoder connection alternatively via Sub-D-connectors or parallel screw terminal strips

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:
PU21001d/af/hk/Aug.05	Original Edition
PU21001d/af/hk/Feb.06	Edition A5 GER/ENG/FRA
PU21002a/kk/hk/Feb.08	Corrections: HTL output level, switch assignments A/B/Z

Table of Contents

1. Introduction

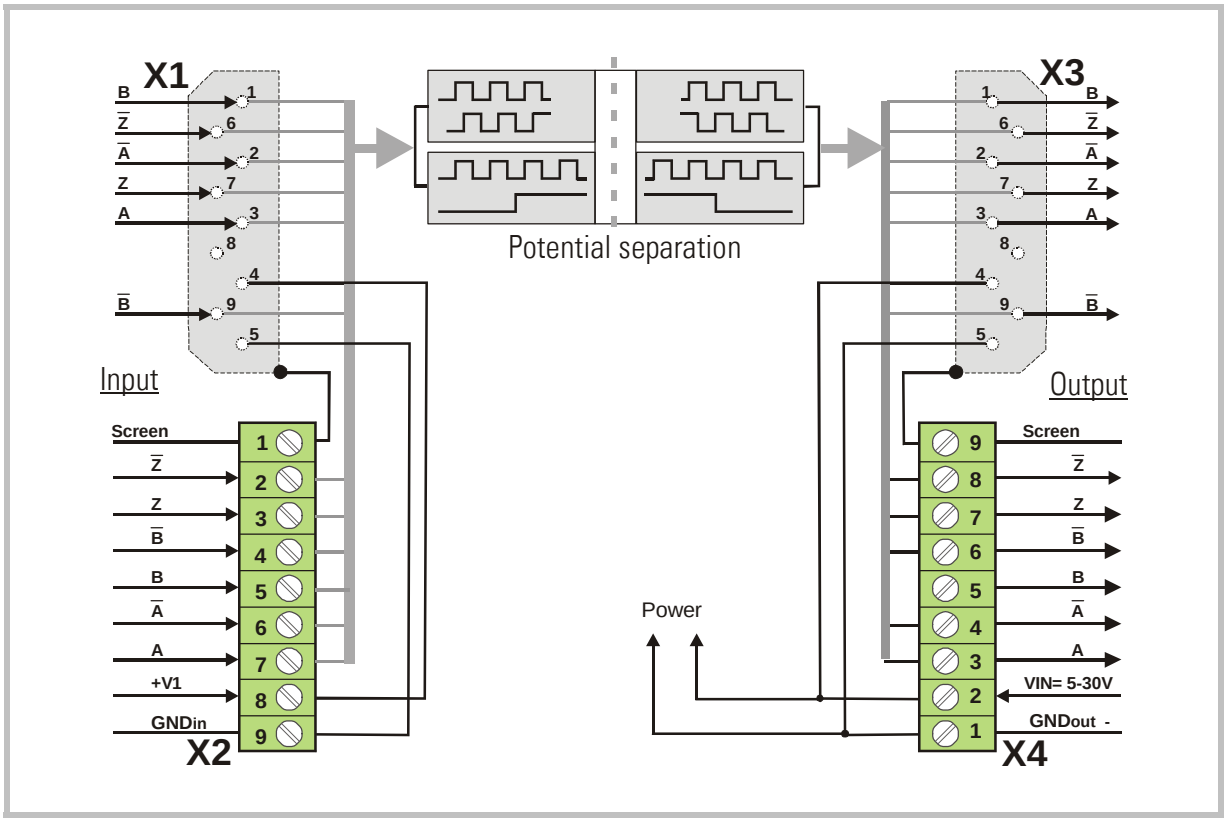
This universal level converter, on the input side, can accept single channel and quadrature encoder signals with either RS422 format or TTL level or HTL (10-30V) level. Where the signal provides direction information, the direction may be defined by either an A/B-90° phase displacement, or by a static direction signal.

Independent of the input level and the mode of direction information, the output provides A, /A, B, /B und Z, /Z signals, and again the direction may be selected as quadrature A/B format or as a static direction signal. The outputs provide push-pull characteristics and the output level is about 1.5 volts lower than the power supply voltage (+5 to +30 volts DC).

Inputs and outputs are isolated via inductive high-speed couplers. All signals can be connected alternatively via Sub-D-connectors or by parallel screw terminal strips.

PU210 uses a slim and space-saving plastic housing for DIN rail mounting.

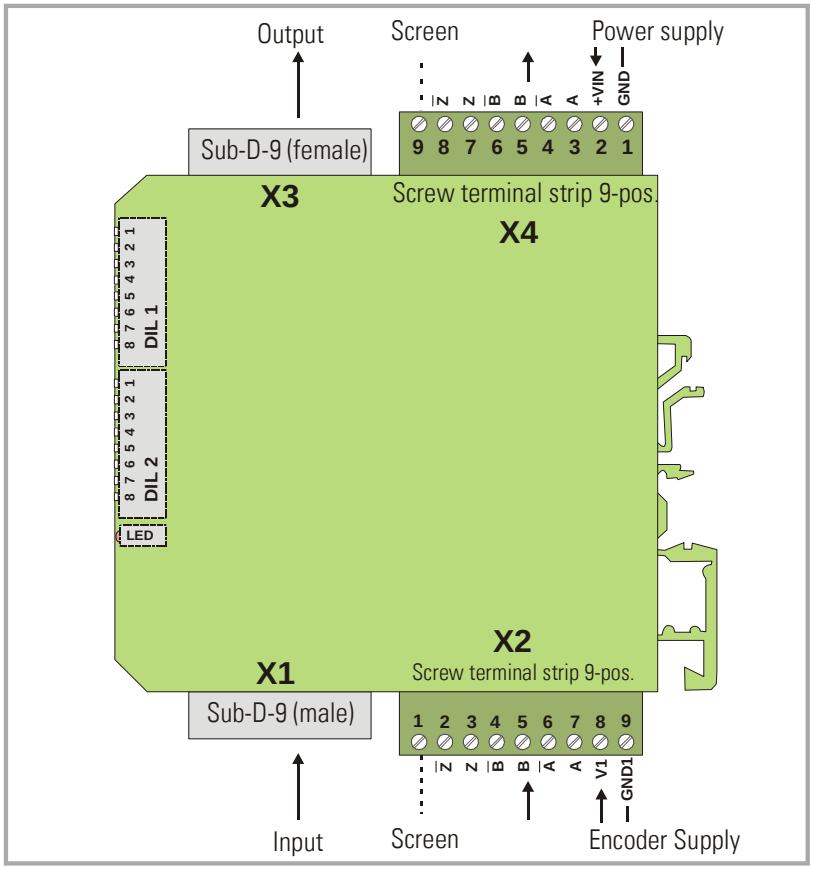
The subsequent block diagram explains all essential details:



Even with differential operation on the input side it may be advantageous to connect the signal common to GNDin (terminal 9 of X2 or pin 5 of X1).

This may result in better signal quality and will not affect at all the potential separation between input and output

2. Construction and Electrical Connections



2.1. Power supply

The unit requires a DC supply between 5 and 30 volts.
The level of the supply voltage will at the same time determine the output swing
(voltage drop approx. 1.5 volts, i.e. 24V power supply will result in a 22.5 V output swing)

The supply voltage can either be applied to the screw terminals marked “GND” and “+VIN” on terminal strip X4, or also to the female Sub-D-9 output connector X3, using pin 5 (GND) and pin 4 (+VIN).

2.2. Encoder supply

On the input side, pin 4 (+) and pin 5 (-) of the Sub-D-connector X1 can be used for encoder supply, provided that a corresponding supply voltage is applied to the parallel screw terminals V1 and GND1 of terminal strip X2. The unit itself does not provide any internal encoder supply.

2.3. Function of the LEDs

The green LED on the front side is to indicate „power on“.
The yellow LED indicates directly the input impulses from input channel A.

3. Switch settings

The front DIL switches require a few settings depending on the signal levels and the mode of indicating the direction on inputs and outputs

3.1. Input characteristics

You can set the desired input characteristics by switch DIL2, positions 6, 7 and 8

0=OFF 1=ON								DIL2
8	7	6	5	4	3	2	1	
1 (Z)	1 (B)	1 (A)						**Single-ended input:** Only signals A, B and Z are connected, the inverted inputs /A, /B, /Z remain unconnected. Acceptable input level: HTL 10 – 30 volts (PNP only, must switch to +)
0 (Z)	0 (B)	0 (A)						**Differential input (RS422):** with every signal, also the corresponding inverted signal must be connected (A, /A, B, /B, Z, /Z). Acceptable input level: 3 – 30 volts
								• Setting of the input format is separately for each of the encoder channels, according to above indications (A), (B), (Z) • With RS422 setting, the corresponding input will accept RS422 signals as well as differential TTL signals and also 10-30 V HTL levels • Single-ended signals always require HTL level (10-30 volts) (A special version with single-ended TTL inputs is available on request)

3.2. Output level

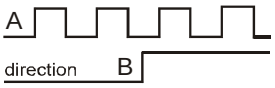
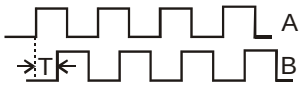
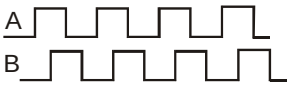
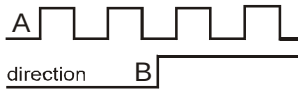
The output level depends directly on the power supply level applied to VIN. However, for best edge steepness and short-circuit-proof, switch DIL1, positions 1 to 6 must be set with regard to the level used.

The output always provides the inverted signals, even when these are not available on the input side.

0=OFF 1=ON								DIL1
8	7	6	5	4	3	2	1	Output
		0	0	0	0	0	0	HTL (VIN > 8 V)
		1	1	1	1	1	1	TTL / RS422 (VIN < 8V)

3.3. Definition of the direction of rotation

The unit is designed to evaluate quadrature direction information (A/B, 2x90°) and static direction information as well. Furthermore it can convert the direction information from one format to the respective other format. Positions 3, 4 and 5 of switch DIL2 provide individual selection for input and output.

0=OFF 1=ON								DIL2	
8	7	6	5	4	3	2	1		
			0	0	1			 Input: static direction	 Output: quadrature direction
			0	1	0			 Input: quadrature direction	 Output: static direction
			1	0	0			Output format = input format	

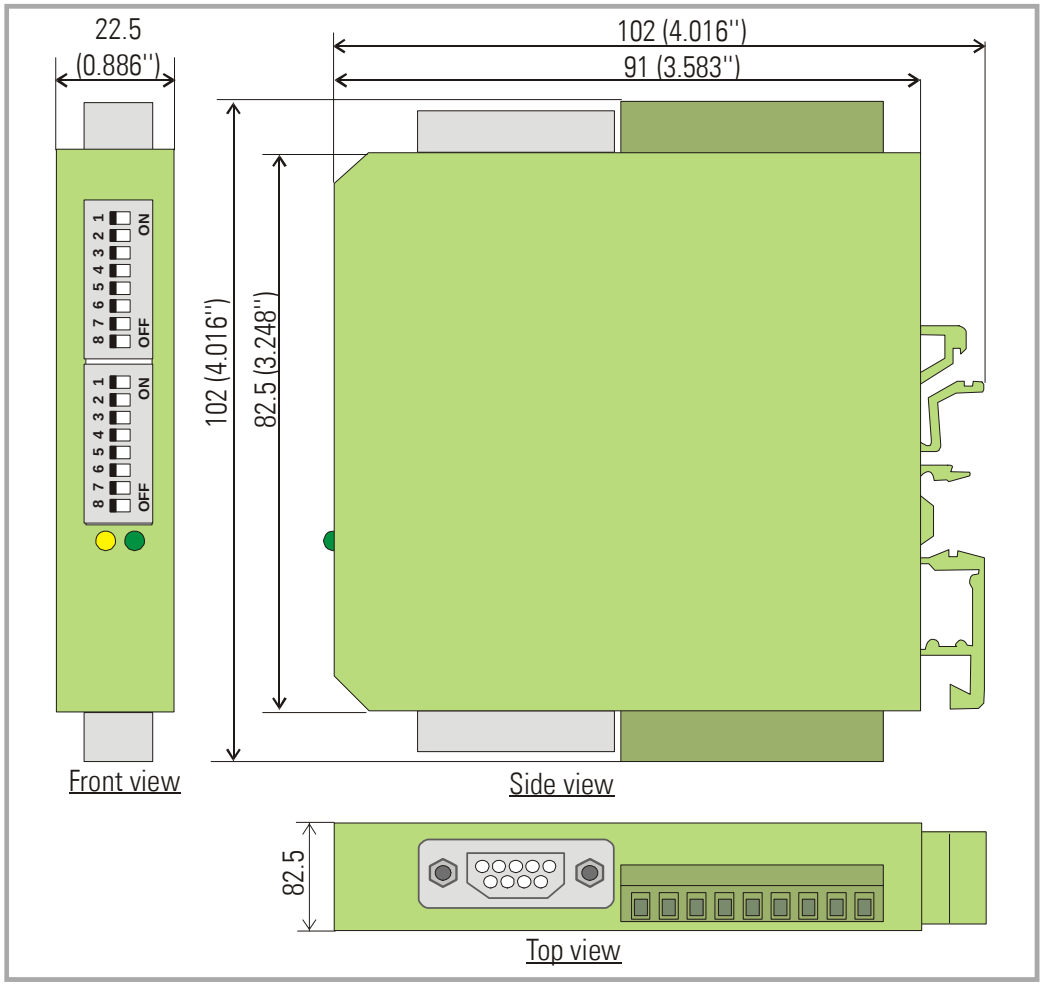
3.4. Phase displacement A/B

These settings are only relevant with single channel input signals (input A alone or A with B as a static direction information), when this information needs to be converted into a quadrature A/B format at the output.
In this case the unit will generate a time-constant phase displacement "T". This displacement can of course correspond to 90° at a specific frequency only, which however will not be a disadvantage with most of the target units available on the market.
Please select the time of A/B displacement according to the maximum frequency indications given in the setting table.
Displacement times will add up when several positions are switched on at the same time.

0=OFF 1=ON								DIL1	
8	7	6	5	4	3	2	1		
	1							T = +22us (12 kHz)	Time displacement A/B
1								T = +5us (50 kHz)	

0=OFF 1=ON								DIL2	
8	7	6	5	4	3	2	1		
							1	T = +2.5us (100 kHz)	Time displacement A/B
						1		T = +1us (250 kHz)	

4. Dimensions and Specifications



Power Supply Vin	:	5 - 30 V DC
Current consumption (without load)	:	50 mA
Max. frequency	:	500 kHz (RS422), 300 kHz (HTL)
Input	:	Differential (A, /A, B, /B, Z, /Z), level 3 – 30 V or Single-ended (A, B, Z), level 10 – 30 V
Output	:	HTL or TTL, push/pull (A, /A, B, /B, Z, /Z) 5 - 30V, 30 mA
Propagation delay time	:	approx. 600 ns
Temperature range (°C)	:	Operation: 0° – 45 °C (32 – 113°F) Storage: -25° - + 75°C (-13 - 158°F)
Weight	:	approx. 100g
Conformity and standards	:	EMC 89/336/EEC: EN 61000-6-2 EN 61000-6-3 LV73/23/EEC : EN 61010-1