

## PU202

Level converter & encoder signal generator without potential separation

### Product features:

- Converts HTL signals from 10 up to 30 V (A / B / Z) into the corresponding TTL / RS422 format (the inverted channels included)
- Further different standards of direction signals can be converted into a 90° phase shifted A/B square wave signal
- Open PCB version with plastic-housing for a simple snapping onto top hat rails according to EN 60715
- Input frequency max. 200 kHz
- 5 VDC power supply

Version:	Description:
PU20202c/Sept.07/hk	Remake as brochure with A5 format
Pu202_02d/Okt-15/ag	<ul style="list-style-type: none"> <li>- Safety Instructions and Technical Specification updated</li> <li>- Design updated and Legal notices supplemented</li> <li>- Pulse diagram correction (10 ... 30 V instead of 12-30V)</li> <li>- Pulse diagram moved from page 1 into a new chapter (2.1)</li> </ul>

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## Table of Contents

<b>1.</b>	<b>Safety Instructions and Responsibility .....</b>	<b>3</b>
1.1	General Safety Instructions.....	3
1.2	Use according to the intended purpose .....	3
1.3	Installation.....	4
1.4	Cleaning, Maintenance and Service Notes.....	4
<b>2.</b>	<b>Introduction .....</b>	<b>5</b>
<b>3.</b>	<b>Construction, Dimensions .....</b>	<b>6</b>
<b>4.</b>	<b>Power Supply.....</b>	<b>7</b>
<b>5.</b>	<b>Connections.....</b>	<b>7</b>
<b>6.</b>	<b>Modes of Operation.....</b>	<b>8</b>
6.1.	Quadrature Input A/B .....	8
6.2.	Impulses on line A only, static direction select on line B .....	8
6.3.	Separate impulse lines for forward and reverse.....	8
<b>7.</b>	<b>Output Signal.....</b>	<b>9</b>
<b>8.</b>	<b>Technical Specifications .....</b>	<b>10</b>

# 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.

For placement, wiring, environmental conditions as well as shielding and earthing/grounding of the supply lines the general standards of industrial automation industry and the specific shielding instructions of the manufacturer are valid. Please find all respective hints and rules on [www.motrona.com/download.html](http://www.motrona.com/download.html) --> "[General EMC Rules for Wiring, Screening and Earthing]".

## 1.4 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.

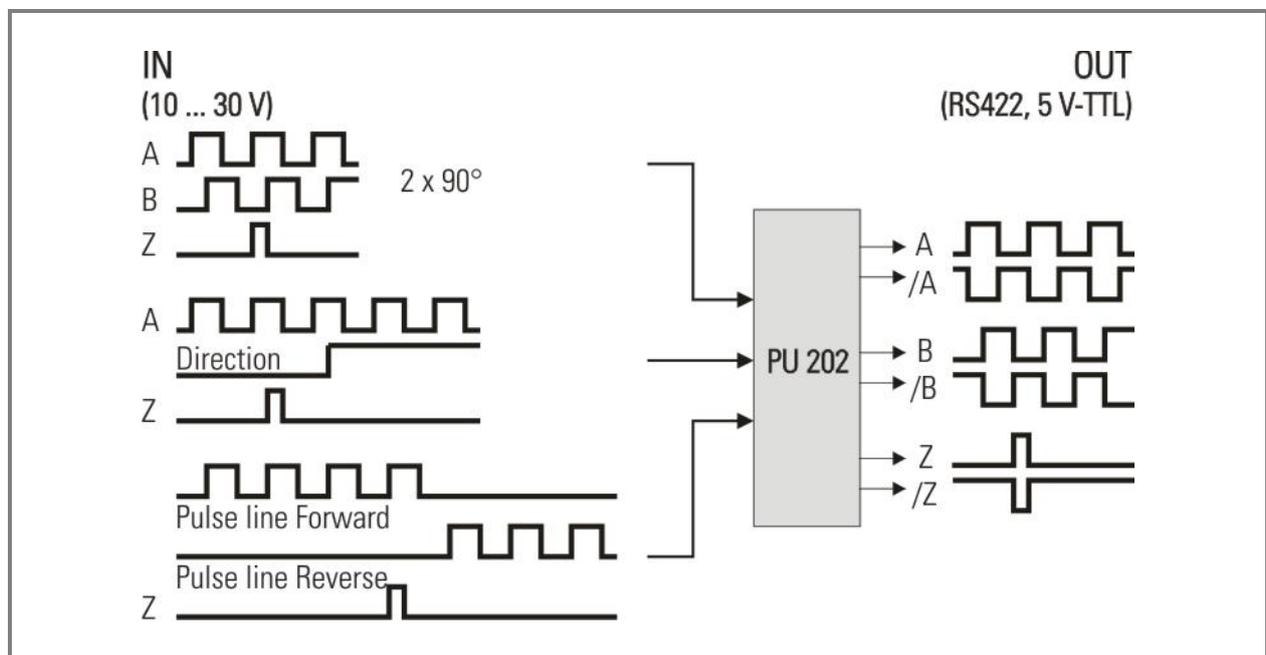
## 2. Introduction

PU202 is designed for conversion of HTL impulse signals (10 ... 30 VDC) to RS422 Standard or TTL level, including complements. Also, the unit can translate different modes of direction control to the A / B quadrature mode ( $2 \times 90^\circ$ ), which is required for the majority of controllers.

Some measuring systems or PLC positioning cards generate pulses on one line whilst another line provides static information of the direction of rotation. Other systems use two separate lines, one to transmit the forward pulses and the other to transmit the reserves pulses.

The PU 202 converter can translate any of these formats to the usual A/B quadrature standard, as shown in the drawing below.

### 2.1. In- and output pulse diagram:



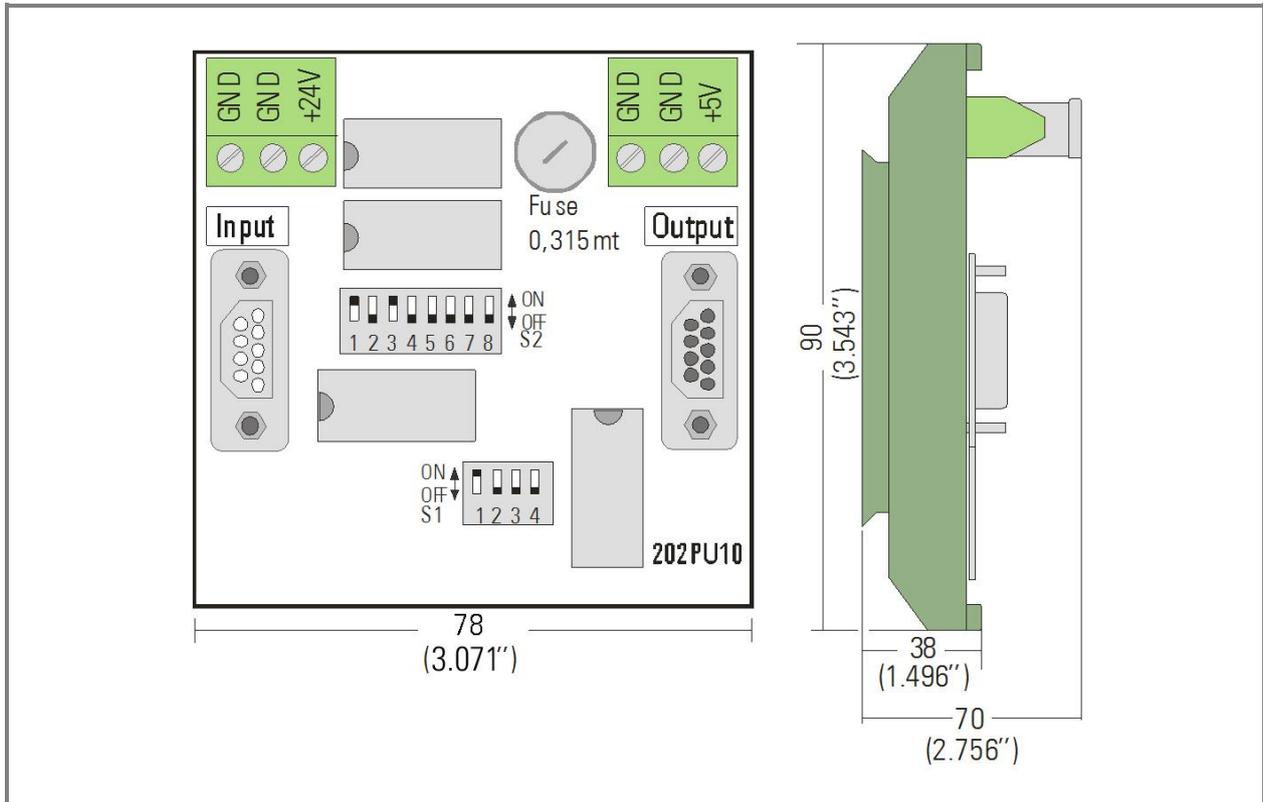
For vice-versa conversion of level and direction signal, see type PU204.

### 3. Construction and dimensions

The unit is designed as a PCB with a plastic-housing for a simple snapping onto top hat rails according to the EN 60715 norm.

The impulse input are available on a 9-pin SUB-D-connector (female).

For power supply of the unit and of encoders, two 3-way screw terminals are available.



## 4. Power Supply

The unit does not possess its own power supply unit. It must be supplied by an external source with +5 VDC +/-10% (approx. 50mA), which can either be connected to the 9-position output connector or the screw terminals marked "GND" and "5V" (see connection diagram below).

Pin 4 of the **output** connector is internally connected to the +5V screw terminal.

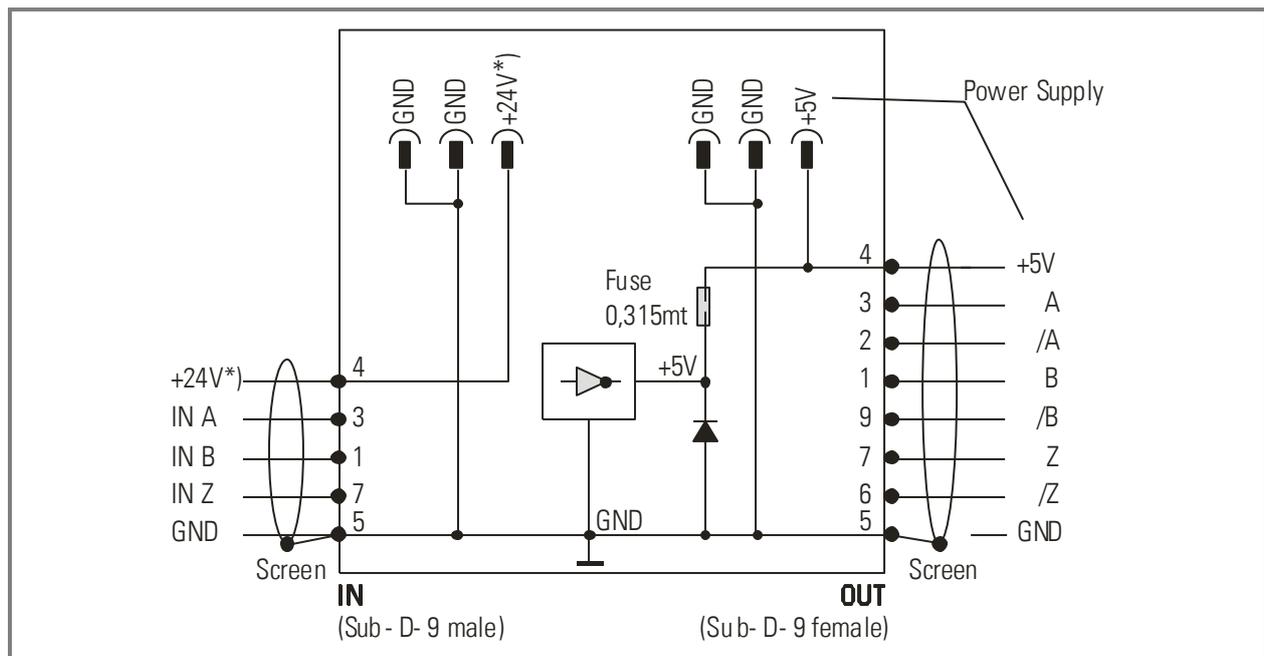
Also, Pin 4 of the **input** connector is on same potential as the +24V screw terminal.

This enables the user to externally supply an encoder system via the Sub- D- connector without necessity to split the 9- wire cable.

The +24V\*) screw terminal serves as encoder supply only and does not affect the operation of the unit.

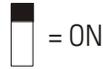
The 5 VDC unit supply is protected against wrong polarity by a diode and a fuse.

## 5. Connection diagram

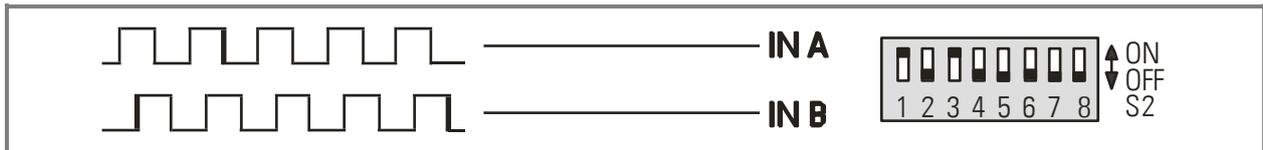


## 6. Operation Modes

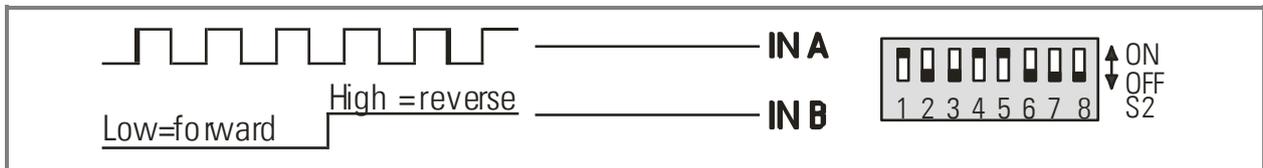
The output signals are always the same, independent of the mode of operation, but the inputs may have different functions. The mode can be selected by the 8-position DIL-switch S2. The index pulse (Z) will only be converted to TTL-level, but not be affected by the mode setting.



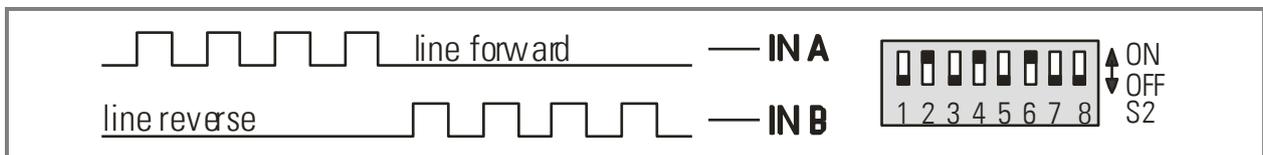
### 6.1. Quadrature Input A/B (2 x 90°)



### 6.2. Impulses on line A only, static direction select on line B



### 6.3. Separate impulse lines for forward and reverse



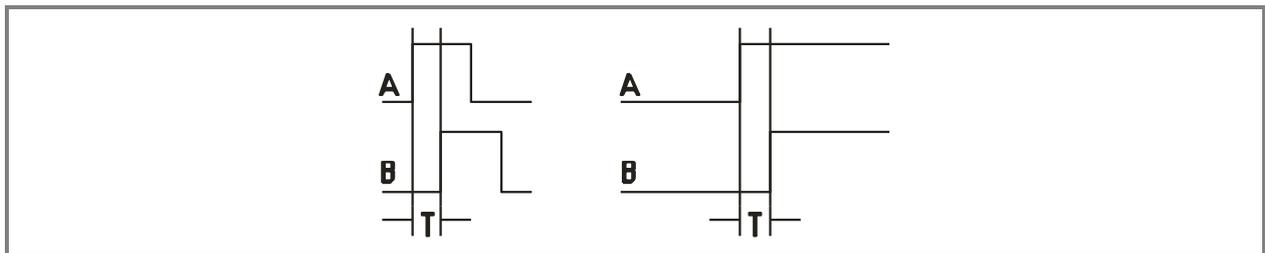
This mode of operation requires that one of the two inputs is in LOW state while the other input line receives the pulses.

# 7. Output Signal

The quadrature output operates with a phase displacement between signals A/A' and B/B'.

In case of a quadrature type input signal with 90° phase shifting according to [6.1](#), the output appears with the same displacement of 90°. However, with inputs according to [6.2](#) and [6.3](#), the phase displacement at the output will be **constant in time**, therefore will correspond to 90° only at a certain input frequency and will become smaller with lower input frequencies.

This in general, this is not a restriction for proper detection of the direction, because most of the controllers can clearly interpret this information, even when the phase is barely visible on an oscilloscope.



DIL switch slider S1 permits selection of 5 different times. The frequency is shown in brackets at which the phase displacement corresponds to 90°.

ON OFF S1     **T = 0,4 μsec. (625kHz)**

ON OFF S1     **T = 1,1 μsec. (227kHz)**

ON OFF S1     **T = 4 μsec. (62,5kHz)**

ON OFF S1     **T = 11 μsec. (22,7kHz)**

ON OFF S1     **T = 40 μsec. (6,25kHz)**

## 8. Technical Specifications

<b>Power supply:</b>	Input voltage: Protection: Ripple: Consumption: Connections:	5 VDC +/- 10 % reverse polarity protection and fuse (0,315 A medium time lag) $\leq 10 \%$ approx. 50 mA (unloaded) selectively by 1,5 mm <sup>2</sup> / AWG 16 screw terminal or 9-pin male SUB-D connector
<b>Encoder supply:</b>	Only external voltage:	The external supplied voltage is looped-through and available at the male SUB-D connector (no fragmentation necessary).
<b>Incremental input:</b>	Levels: Input logic: Internal resistance: Channels: Frequency: Connections:	HTL (10 ... 30 V) PNP $R_i \approx 10 \text{ k}\Omega$ A, B, Z max. 200 kHz male SUB-D connector, 9-pin
<b>Incremental output:</b>	Levels: Channels: Output current: Signal delay: Connections:	5 V-TTL / RS422 A, /A, B, /B, Z, /Z max. 20 mA per channel approx. 800 ns female SUB-D connector, 9-pin
<b>Housing:</b>	Material: Mounting: Dimensions (w x h x d): Protection class: Weight:	plastic 35 mm top hat rail (according to EN 60715) 78 x 90 x 70 mm / 3.071 x 3.543 x 2.756 inch IP20 approx. 100 g
<b>Ambient temperature:</b>	Operation: Storage:	0 °C ... +45 °C / +32 ... +113 °F (not condensing) -25 °C ... +70 °C / -13 ... +158 °F (not condensing)
<b>Failure rate:</b>	MTBF in years:	83.1 a (long-term usage at 60 °C / 140 °F)
<b>Conformity &amp; standards:</b>	EMC 2004/108/EC: Guideline 2011/65/EU:	EN 61000-6-2, EN 61000-6-3, EN 61000-6-4 RoHS-conform