

Operating Manual



ES001

Incremental encoder simulator to simulate the function of incremental encoders & scales

Product Features:

- Output frequency adjustable from 50 to 500 kHz
- Indexing function to generate impulse chains with a counted number of impulses
- Outputs A, /A, B, /B, Z, /Z with 5 V-TTL or HTL level (10 to 30 VDC)
- Adjustable direction of rotation (phase relation A / B)
- Programmable marker pulse distance
- 5 to 30 VDC power supply

| Version: | Description: |
|------------------------|--|
| ES00101a /kk/hk/Nov06 | First edition |
| Es001_01b_oi/dez-15/ag | Design, "Safety Instructions" and "Technical Specifications" updated. Minor corrections and "Legal notices" supplemented. |

| Legal notices: |
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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 [5](#)). 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 [5](#)).

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 --> "[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

Incremental encoders and measuring systems can be found in nearly every application of machine building industry. With consideration of this, an adequate simulator can be advantageously used for the following jobs:

- Testing of machine components or control units, without need to have all mechanical details ready and available
- „Dry testing“ during commissioning, with the machine in standstill
- Setup and inspection of electronic measuring systems, converters, counters etc. including test of cables and wiring
- Localization of error sources with malfunction and trouble-shooting

ES001 provides simulation of a wide speed range, from single step and slow motion up to encoder frequencies of 500 kHz. The unit is suitable to generate TTL and HTL level impulses with forward or reverse rotation, including a programmable zero pulse. Clearly arranged display and operator panels ensure simple and easy operation of the unit.



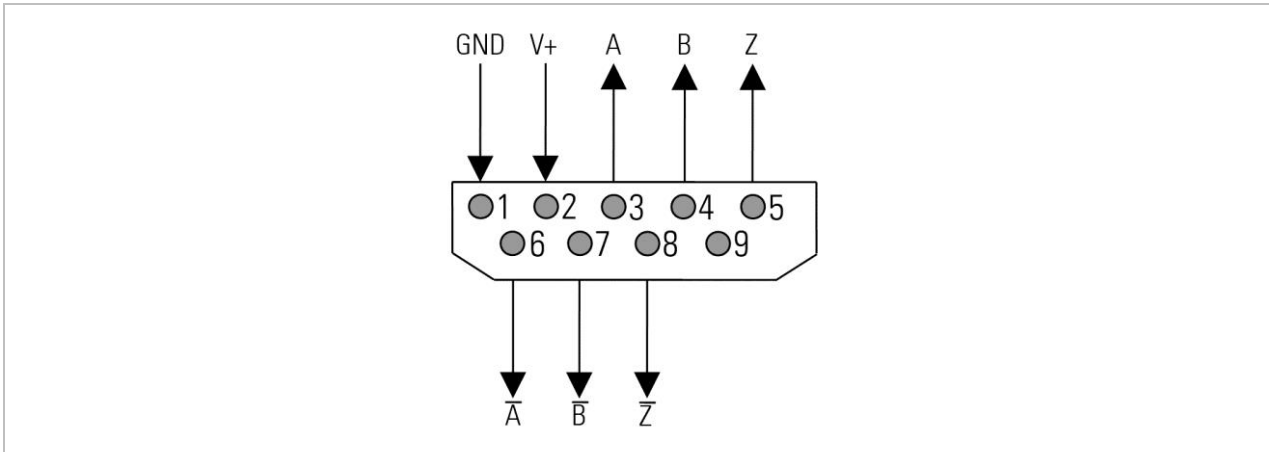
With simulation of encoders providing an integral part of a closed control loop, the frequency generated by the ES001 simulator will not follow the control signals of the system, which may cause irregular machine functions.

For a complete closed-loop encoder simulation, please consider our V/f-converter model “UF251”.

3. Connections

The diagram below shows the wiring of the unit via the 9-position Sub-D-connector (male connector on unit site). Assembled connection cables with female connector on one side and wires with conductor sleeves on the other side are available on request.

Pin assignment:



The unit accepts a power supply from 5 to 30 VDC, which must be applied to pins 1 and 2 of the connector. The maximum current consumption is about 100 mA. In general, the same power source will be used which normally would also supply the encoder, but also any other remote power source is acceptable.



Pin assignment: For technical reasons, the pin assignment of the ES001 encoder simulator diverges from the usual motrona standard pin assignments.



Indication of insufficient power supply:

All LEDs will be lit at the same time when the supply voltage falls below the acceptable minimum level. When you observe this, the unit is not ready to work.

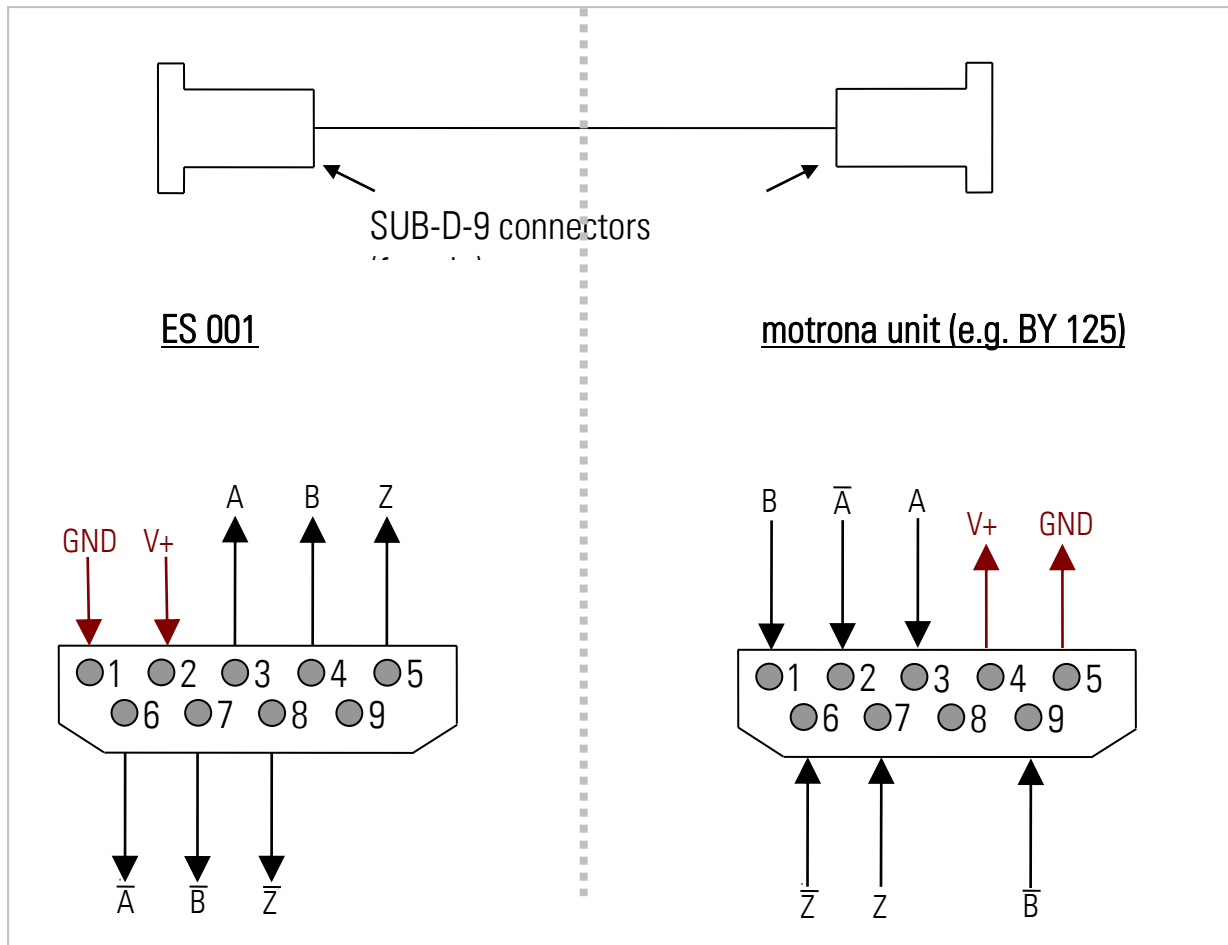
3.1 TTL or HTL Output Level

The square wave output swing only depends on the power supply voltage. To produce TTL outputs, the simulator must receive a 5 VDC power input. To produce HTL signals, the input voltage must be accordingly higher.

The output level will always be about 1.5 V lower than the power supply voltage.

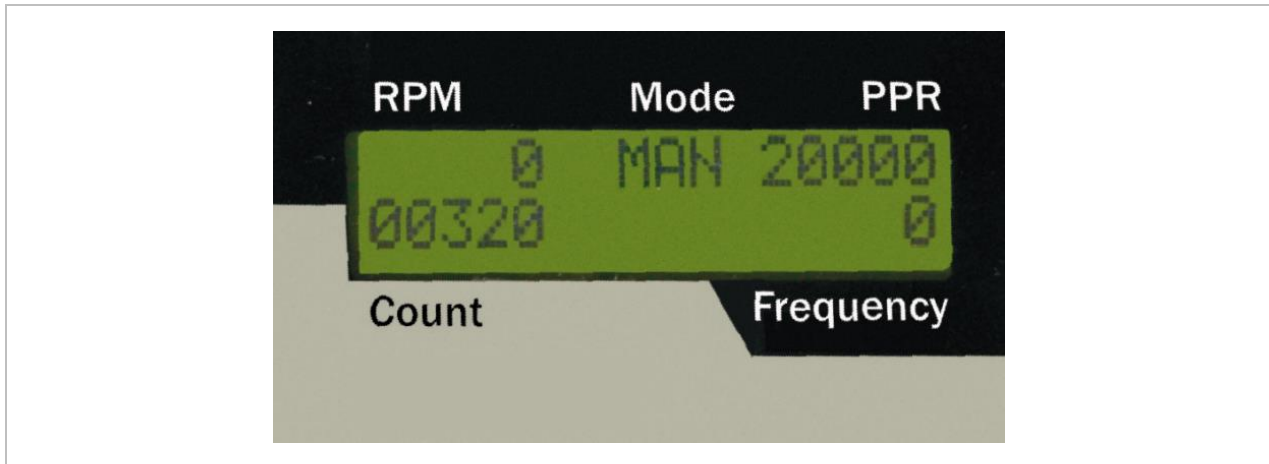
3.2 Connection to other motrona units

Due to different pin assignments, the two ends of a cable with Sub-D-connectors are not interconvertible. To avoid misconnection, we recommend to either code the two connectors, or to at least mark the cable ends clearly.



4. Display and Control Panels

4.1 Display Panel



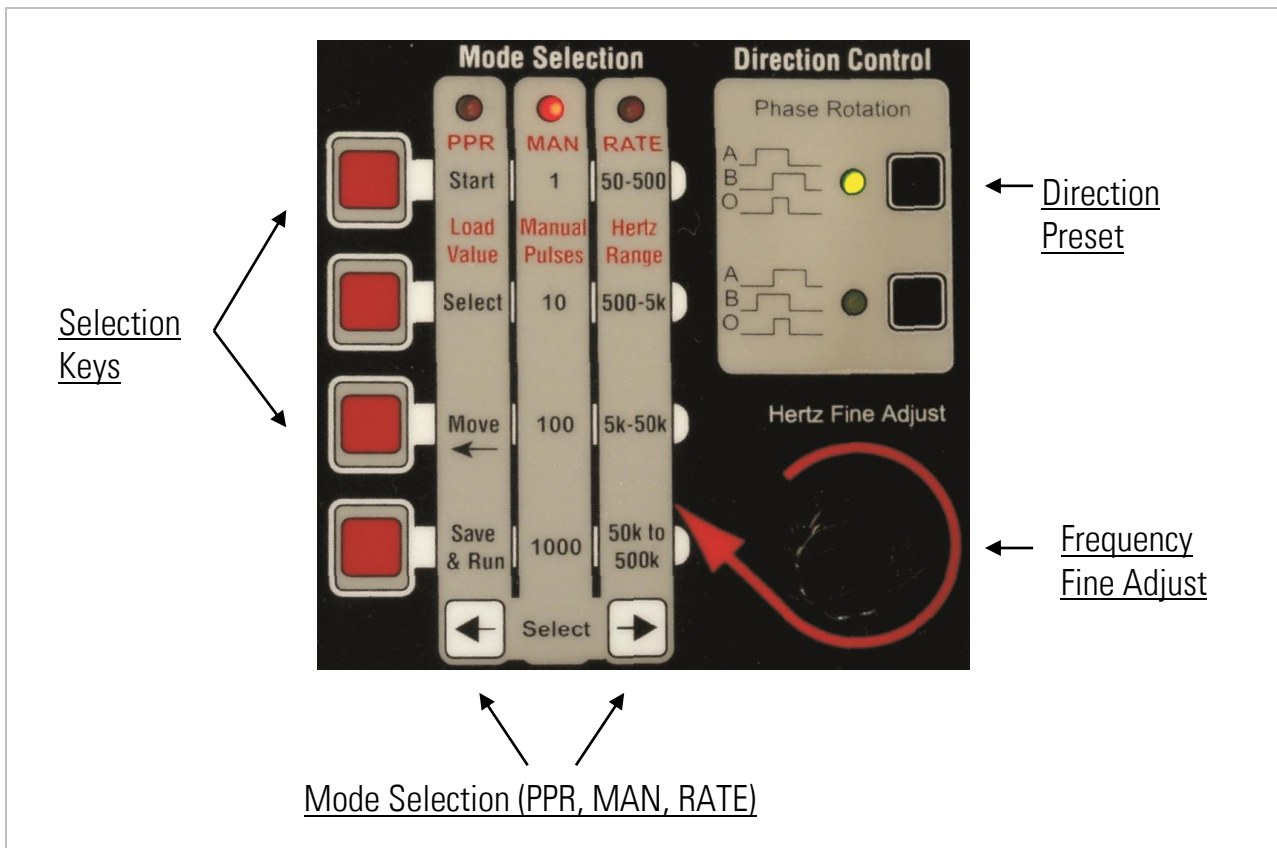
The display panel is grouped into the following 5 sections:

| Section | Description | Setting Range | Display Range |
|-----------|--|----------------|---|
| RPM | Actual speed (rev./min) (= 60 * Frequency/ PPR) | | 0 ... 15000 ←←←←← (with overflow) |
| Mode | Actual operating mode | PPR, MAN, RATE | |
| PPR | Preset number of pulses per rev. | 2 ... 99999 | |
| Count | Number of output pulses | | 0 ... 99999 |
| Frequency | Actual output frequency | | 40 Hz ... 500 kHz |

Depending on the operation mode, the display sections may have different meanings as described under [4.3](#).

4.2 Control Panel

The control panel is grouped into the sections Mode-Selection, Direction Control and Hertz Fine Adjust



4.3 Operating Modes PPR, MAN and RATE

The desired operating mode can be selected by means of the two Mode Select Keys. The red LED at the top of each column shows the selected function (PPR, MAN or RATE). At the same time, the function appears in the mode section of the LCD display.

4.3.1 The PPR Mode

This mode provides preselection of the desired encoder ppr number (number of encoder pulses per revolution). The setting range is from 2 to 99999. The following functions are assigned to the red selection keys:

| Key | Function | Description |
|------------|-------------------------|--|
| Start | Reset | Starts a new selection process by setting the PPR number to an initial value of 2 |
| Select | Increment | The actual digit is incremented by 1 (loop 1, 2,..., 9, 0, 1, 2, .. etc.) |
| Move | Shift the digit to left | Shifts the actual digit one space to the left and automatically shifts a zero to the previous position to increment the next digit |
| Save & Run | Store | Stores the actual ppr setting and sets the counter in the „Count“ section to zero. The unit is ready to work. |

The selected PPR number (= pulses between two marker pulses) appears in the „PPR“ section.

4.3.2 The MAN Mode

This mode provides the facility to manually control the number of output signals sent. Each operation of one of the red keys sends the number of output pulses indicated on the middle column of the control panel (1, 10, 100 or 1000 pulses). The associated output frequency can beforehand be selected in the "Rate" mode.

The total number of transmitted pulses is indicated in the "Count" display.

The associated output frequency is indicated in the "Frequency" field.

4.3.3 The RATE Mode

This mode provides continuous impulse generation with the adjusted output frequency. The four red keys allow preselection of the following frequency ranges:

- 50-500: Range 50 Hz to 500 Hz,
- 500- 5k: Range 500 Hz to 5 kHz,
- 5k-50k: Range 5 kHz to 50 kHz
- 50k-500k: Range 50 kHz to 500 kHz

Speeds between the ranges can be precisely adjusted to the desired value by rotating the "Hertz Fine Adjust" knob.

The LCD display indicates the following details:

| RPM | Mode | PPR |
|---|-----------|---|
| Encoder frequency (rev./min) | RATE | Number of pulses per encoder revolution |
| Actual count number (position) within one encoder revolution. | | Output frequency |
| Count | Frequency | |

4.3.4 Direction Control

Two keys in the Direction Control Field provide selection of forward or reverse direction.

- Pressing the upper key results in a signal with output A rising before B.
- Pressing the lower key results in a signal with output B rising before A.
- The selected direction is indicated by a green LED.



If none of the green LEDs is lit, this indicates that no output signal will be generated.

5. Technical Specifications

| | | |
|------------------------------------|--|--|
| Power supply: | Input voltage: Protection circuit Ripple: Consumption: | 5 ... 30 VDC reverse polarity protection $\leq 10\%$ at 24 VDC approx. 100 mA |
| Connections: | Connector type: | SUB-D connector (male), 9-pin |
| Incremental output: | Signal levels: Channels: Output frequency: Selectable frequency ranges: | 5 V-TTL or 10 ... 30 V HTL (according to the power supply voltage). Please note: The level of HTL outputs correspond to the power supply voltage <u>minus approximately 1.5 V</u> . A, /A, B, /B, Z, /Z 50 Hz ... 500 KHz <ul style="list-style-type: none"> • 50 Hz ... 500 Hz, • 500 Hz ... 5 kHz, • 5 kHz ... 50 kHz • 50 kHz ... 500 kHz |
| Display elements: | Display: LEDs: | LCD, 2 x 16 characters, 5,1 mm x 3 mm 2 green LEDs for actual direction indication 3 red LEDs for the selected operation mode |
| Housing: | Material / type: Dimensions (w x h x d): Protection class: Weight: | plastic desk housing 95 x 150 x 40 mm / 3.740 x 5.901 x 1.575 IP20 approx. 250 g |
| Temperature range: | Operation: Storage: | 0 °C ... +45 °C / +32 ... +113 °F (not condensing) -25 °C ... +70 °C / -13 ... +158 °F (not condensing) |
| Conformity & standards: | EMC 2004/108/EC: Guideline 2011/65/EU: | EN 61000-6-2, EN 61000-6-3, EN 61000-6-4 RoHS-conform |

6. Dimensions

