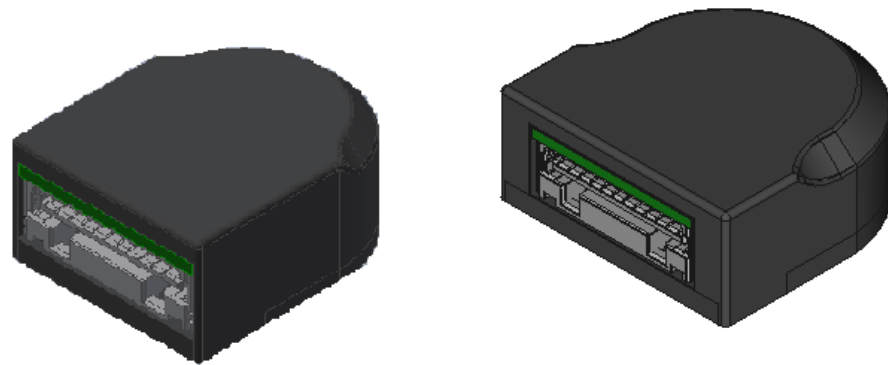


Technical Datasheet **NME3**

For following variants:

NME3 incremental, NME3 SSI



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1 Document, audience, intended use

This technical data sheet replaces no OEM instruction. For correct product use, please follow the valid OEM instructions and ask our sales team about combinations with other Nanotec products. The *NME3* magnetic rotary encoder with incremental / SSI interface records the rotor position of your motor. Use it as intended only, within approved technical limits and ambient conditions.

Audience, qualification

The product and this document address to technically trained experts alone, such as **development, application, plant engineers, installers**, and **service staff**. Only experts may install, commission and operate the product. Absolutely required are:

- Training and experience in working with motors, their control and electrostatically threatened components
- Reading and understanding of this and all applicable documents
- Knowledge of all valid regulations

Disclaimer

Nanotec is not liable for damage / malfunction from installation errors, failure to observe this document, or improper repair. The audience alone is responsible for selecting / operating / using our products. We accept no liability for product integration in the end system. The general terms and conditions at www.nanotec.com apply (us.nanotec.com for clients of Nanotec Electronic USA). **Note:** Product modification / alteration is illicit.

2 Your product

The **RoHS** directive (2011/65/EU, 2015/863/EU) was observed. Nanotec installs, configures and calibrates the encoder on the motor.

Product variants, article numbers

Find your product variant by part number logic.

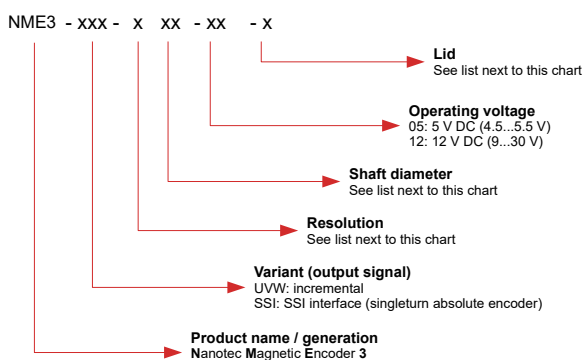


Fig. 1: Product-logical part numbers.

Resolution = Letter

- **A** = 2000 ppr with quadrature, incremental
- **B** = 4000 ppr with quadrature, incremental
- **C** = 8000 ppr with quadrature, incremental
- **W** = 16384 ppr with quadrature, incremental
- **X** = 2^{16} , SSI

Shaft diameter on motor = Number

- **11** = 4 mm
- **14** = 5 mm
- **06** = 6.35 mm

Lid, housing, size

- **C1** = Closed lid, small housing
- **C2** = Closed lid, large housing

Intended use

The *NME3* is used as a component of drive systems in a range of industrial applications. Use the product as intended within the limits defined in the technical data (see Technical data) and the approved ambient conditions.

Under no circumstances may this Nanotec product be integrated as a safety component in a product or system. All products containing a component manufactured by Nanotec must, upon delivery to the end user,

be provided with corresponding warning notices and instructions for safe use and safe operation. All warning notices provided by Nanotec must be passed on directly to the end user.

3 Technical data

Use the product only within its technical limits.

3.1 Ambient conditions

For your own safety, use your product in permissible environments only.

Ambient temperature (operation)	-20 to +105 °C (-4 to +221 °F)
Ambient temperature (storage)	-40 to +105 °C (-40 to +221 °F)
Air humidity (non-condensing)	0 to 90 %

3.2 Dimensions

Observe the correct dimensional drawing for product installation (all dimensions in millimeters).

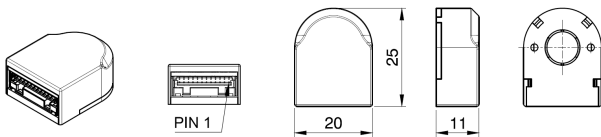


Fig. 2: NME3-xxx-xxx-xx-C1 (= closed lid, small housing).

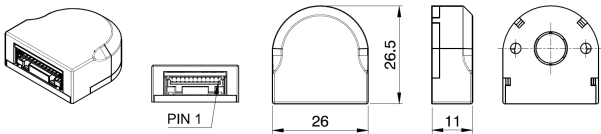


Fig. 3: NME3-xxx-xxx-xx-C2 (= closed lid, large housing).

3.3 Electrical data

NOTICE



ESD-sensitive module damage: from electrostatics!

- ▶ Observe basic principles for ESD protection.

NOTICE



Electronic damage: from mispolarized supply voltage!

- ▶ Assign connectors correctly.
- ▶ Use correct connector types.

Operated at either five or twelve volts, the NME3 encodes motor speeds up to 30,000 rpm.

Operating voltage	<ul style="list-style-type: none"> ■ Incremental: 4.5 to 5.5 VDC (≤ 26 V overvoltage protection)
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Consumption (without load)	<ul style="list-style-type: none"> ■ SSI: 9 to 30 VDC ■ Incremental: ≤ 30 mA @5 VDC ■ Incremental: ≤ 17 mA @12 VDC
Consumption (with 120 Ω load)	<ul style="list-style-type: none"> ■ Incremental: ≤ 125 mA @5 VDC ■ SSI: ≤ 30 mA @12 VDC
Clock input SSI	RS 485 / 422
Clock frequency SSI	500 kHz to 2.625 MHz
Maximum speed	<ul style="list-style-type: none"> ■ NME3-xxx-Wxx-xx-xx: 14,000 rpm ■ All further variants: 30,000 rpm
Max. acceleration	50,000 rpm /s
Dynamic accuracy @ constant max. acceleration	+/- 0.5° (typical value)
Accuracy @ standstill / constant speed	+/- 0.2° (typical value)

3.4 Pinning incremental

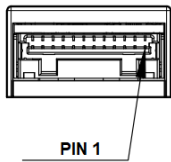


Fig. 4: Molex Clik-Mate 5023861270 (Pin: Signal).

1: Ub ¹	4: B\	7: I	10: Hall 3 ²
2: A\	5: B	8: Hall 1 ²	11: -/-
3: A	6: I\	9: Hall 2 ²	12: GND ³

¹Voltage supply. ²With BLDC motors only. ³Not connected to motor housing.

Signal levels

Ub = 5 V	Load	High level	Low level
A, A\, B, B\, I, I\	35 mA	≥ 4,5 V	≤ 0,3 V
Hall 1 to 3	4 mA	≥ 4,5 V	≤ 0,4 V

3.5 Pinning SSI

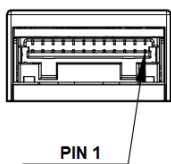


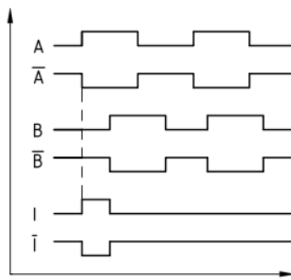
Fig. 5: Molex Clik-Mate 5023861270 (Pin: Signal).

1: Ub ¹	4: Data +	7: -/-	10: -/-
2: Clock + ²	5: Data -	8: -/-	11: -/-
3: Clock - ²	6: -/-	9: -/-	12: GND ³

¹Voltage supply. ²120 Ω between clock + and clock - internal. ³Not connected to motor housing.

3.6 Output signals

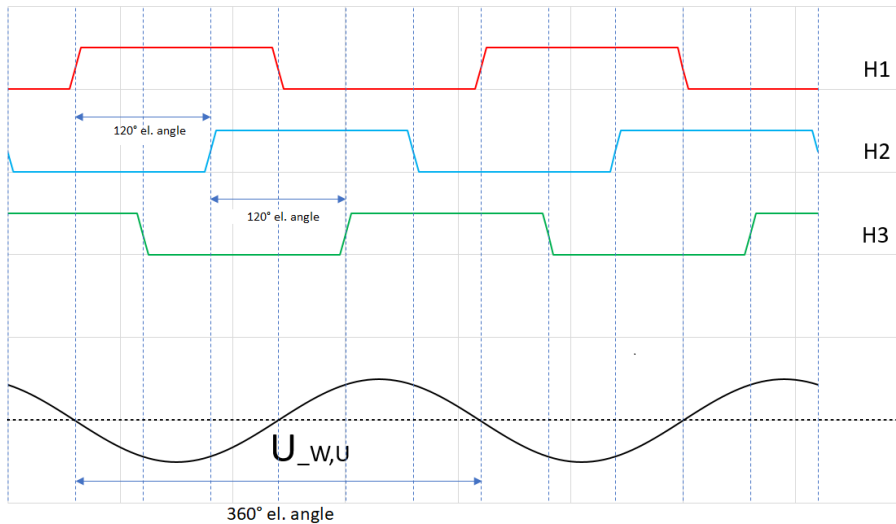
Incremental output



As an incremental encoder, the NME3 sends the motor position via two channels **A**, **B** plus index **I**.

Fig. 6: The index signal **I** runs in sync with channel **A**'s rising edge.

If the motor axis rotates clockwise (viewed from front), channel **A**'s signal leads channel **B** by 90 degrees (electrical).

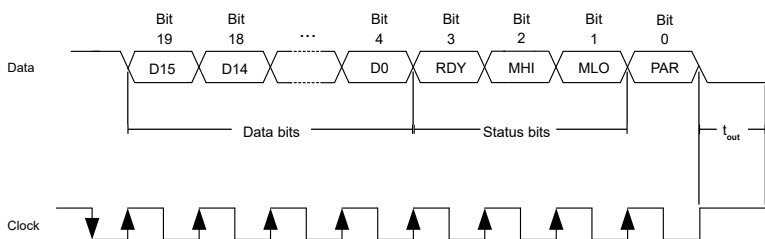


To BLDC motors, a NME3 also sends Hall signals. Nanotec configures these only for BLDC motors.

Fig. 7: Hall signals **H1** to **H3** and EMF back voltage **U_{w,u}** (clockwise motor spin).

Rising and falling H1 edges in the zero crossings of the motor voltage between phase **W** and **U** (= back EMF).

Differential SSI output



As an SSI encoder, single-turn and absolute, the NME3 processes clock signals up to 2.625 MHz.

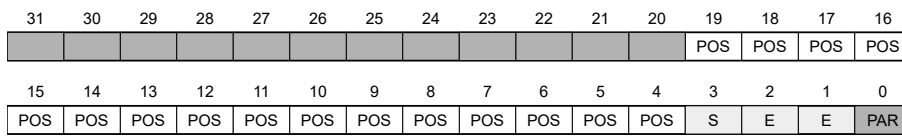
Fig. 8: SSI signal binary-coded; with 16 data bits, followed by 3 status bits, a parity bit, and $\geq 18\text{-}\mu\text{s}$ timeout (t_{out}).

- **TTL level:** 5 V (RS 485 / 422).
- **Maximum Clock frequency:** 2.625 MHz.
- **Data bits (position value):** Current position transfer starts with the next rising clock edge. Data travel with the most significant bit (MSB) first, one bit per rising edge.
- **Status bits:** Data bits are followed by three status bits (**RDY**, **MHI**, **MLO**)*.
- **Parity bit (PAR):** Parity is even.
- **Timeout (t_{out}):** After 18 μs , you can call a new data packet via clock signal.

* **RDY (ready):** The chip is ready (= 1), the parity is even. Please contact Nanotec if the value for **MHI (magnet high error)** or **MLO (magnet low error)** remains high (= 1).

Prepare the SSI for Nanotec controllers

This example shows how to prepare the SSI interface of *Nanotec CPB* controllers in object $33B0_h$ so that they detect the encoder during *Autosetup* (see controller manual) and duly process its data.



- **1-2** (= error): value 0 if no error occurred
- **3** (= RDY): always value 1

Fig. 9: NME3 uses 21 status and position bits: **S** for status (RDY), 2 **E** for error (MHI, MLO), 16 **POS** for position.

You need to write the following **sub-indices** of $33B0_h$ accordingly and restart the controller after saving:

1. Set the baud rate in $33B0_h:06_h$ (2625000 Hz) and the number of bits plus parity bit (20) in $33B0_h:05_h$.
2. Position data: Set POS bits 4 to 19 in $33B0_h:07_h$ to 1 (value $FFFF0_h$).
3. Status and error: Set bits 1-3 in $33B0_h:09_h$ to 1. Set bit 0 to 0, because the controller ignores the parity bit (value 14)
4. The error bits should have the value 0, the status bit the value 1. Insert value 8 in $33B0_h:0B_h$.
5. To store the object: Insert 65766173_h to $1010_h:06_h$.
6. Restart the controller.

4 Imprint, marking, versions

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Nanotec Electronic GmbH & Co. KG | Kapellenstr. 6 | 85622 Feldkirchen | Germany
 Phone +49 (0)89 900 686-0 | Fax +49 (0)89 900 686-50 | info@nanotec.de | www.nanotec.com



Document	++ Added >> Changed ## Fixed	Product
0.7.0 ^{2021.01}	Beta version	W003
1.0.0 ^{2022.10}	Release	W004
	<ul style="list-style-type: none"> ■ ++ 18-bit version ■ >> Hardware update 	
1.1.0 ^{2023.09}	<ul style="list-style-type: none"> ■ >> <u>Product variants</u> (new resolutions) ■ >> <u>Signal levels</u> ■ ++ Acceleration and accuracy specifications 	W004