

# Technical Datasheet **NME3**

For the 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 run the product. Always required is the qualification for the product's assembly, commissioning and maintenance as part of an **overall** machine /system as well as:

- 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

Product modification /alteration is illicit. Nanotec is not liable for damage /malfunction from installation error, failure to observe this document, or undue repair; nor for product integration in the end system or interaction (= third-party ware). The audience alone is liable for selecting /running /using our products. Our risk analysis for partly completed machinery (if applicable) only rated the hazards of duly installed and networked *single* products. Risks in the *overall* system are exempt and to be rated by the *audience*. The general terms & conditions at [www.nanotec.com](http://www.nanotec.com) apply ([us.nanotec.com](http://us.nanotec.com) for clients of Nanotec USA).

## 2 Your product

Nanotec installs, configures and calibrates the encoder on the motor.

### Product variants, article numbers

Find your product variant by part number logic.

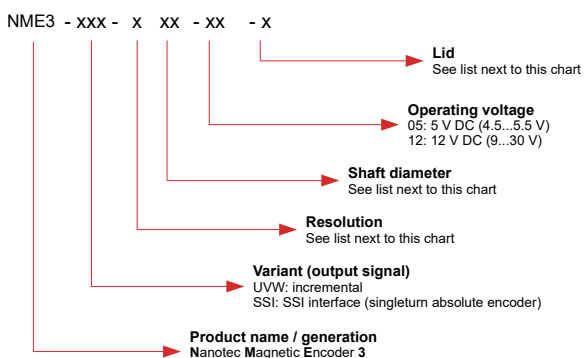


Fig. 1: Product-logical part numbers.

### 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<sup>16</sup>, 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).

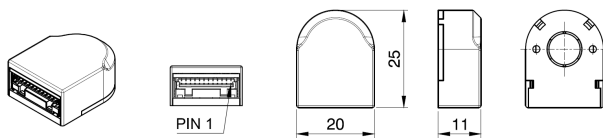


Fig. 2: NME3-xxx-xxx-xx-C1 (= closed lid, small housing).

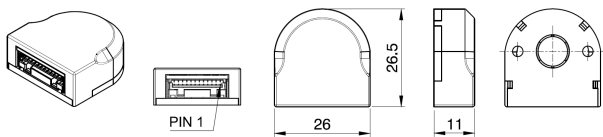


Fig. 3: NME3-xxx-xxx-xx-C2 (= closed lid, large housing).

#### 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"> <li>■ Incremental: 4.5 to 5.5 VDC (≤ 26 V overvoltage protection)</li> <li>■ SSI: 9 to 30 VDC</li> </ul>
Consumption (without load)	<ul style="list-style-type: none"> <li>■ Incremental: ≤ 30 mA @5 VDC</li> </ul>

Consumption (with 120 Ω load)	<ul style="list-style-type: none"> <li>■ Incremental: ≤ 17 mA @12 VDC</li> <li>■ Incremental: ≤ 125 mA @5 VDC</li> <li>■ SSI: ≤ 30 mA @12 VDC</li> </ul>
Clock input SSI	RS 485 / 422
Clock frequency SSI	500 kHz to 2.625 MHz
Maximum speed	<ul style="list-style-type: none"> <li>■ NME3-xxx-<b>W</b>xx-xx-xx: 14,000 rpm</li> <li>■ All further variants: 30,000 rpm</li> </ul>
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

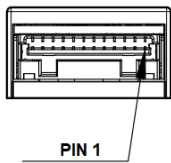


Fig. 4: Molex Clik-Mate 5023861270 (Pin: Signal).

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

<sup>1</sup>Voltage supply. <sup>2</sup>With BLDC motors only. <sup>3</sup>Not connected to motor housing.

#### Signal levels

<b>Ub = 5 V</b>	<b>Load</b>	<b>High level</b>	<b>Low level</b>
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

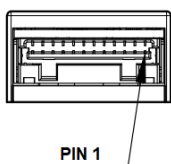


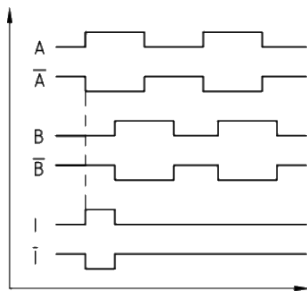
Fig. 5: Molex Clik-Mate 5023861270 (Pin: Signal).

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

<sup>1</sup>Voltage supply. <sup>2</sup>120 Ω between clock + and clock - internal. <sup>3</sup>Not connected to motor housing.

### 3.6 Output signals

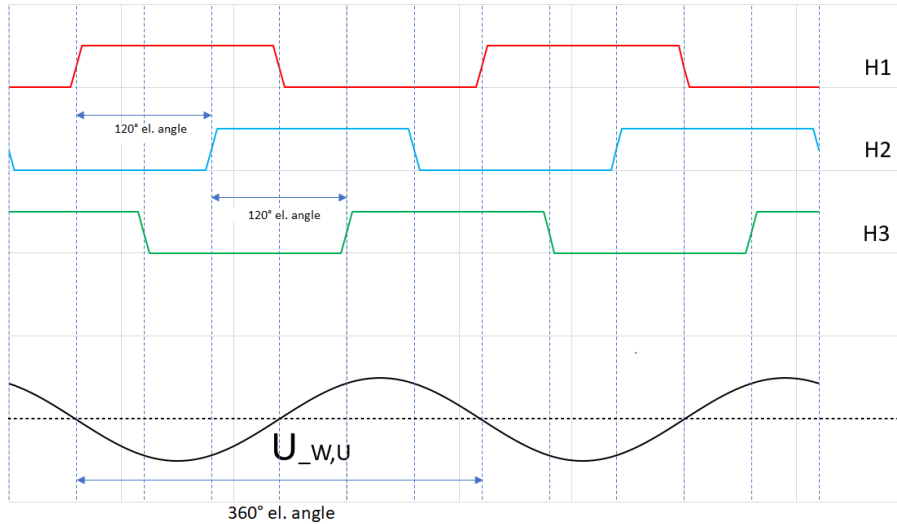
### Incremental output



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 shaft rotates clockwise (seen from front), channel **A**'s signal leads channel **B** by 90 degrees (electrical).

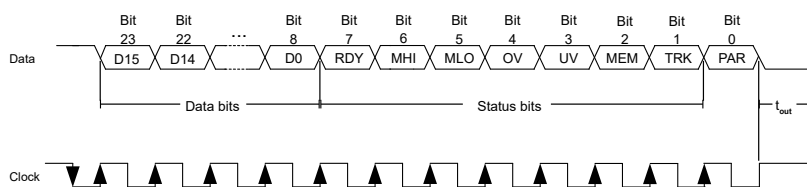


To BLDC motors, a NME3 also sends Hall signals. Nanotec configures these only for BLDC motors.

Fig. 7: Hall signals **H1** to **H3** and EMF back voltage **U<sub>w,u</sub>** (clockwise motor spin).

Rising and falling H1 edges lie 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 7 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 seven status bits (**RDY**, **MHI**, **MLO**, **OV**, **UV**, **MEM**, **TRK**).
- **Parity bit (PAR):** Parity is even.
- **Timeout ( $t_{out}$ ):** After 18  $\mu\text{s}$ , you can call a new data packet via clock signal.

\* **RDY (ready):** The chip is ready (= 1), parity is even. Please contact Nanotec if one of the following error bits remains high (= 1): **MHI (magnet high)**, **MLO (magnet low)**, **MEM (memory)**, **TRK (tracker)**. If **OV (overvoltage)** or **UV (undervoltage)** remains high (= 1), check and adjust the supply line.

### Prepare the SSI for Nanotec controllers

Edit the 33B0<sub>h</sub> **sub-indices** below so that the *Nanotec CPB* controllers in *Autosetup* (see controller manual) duly process the encoder and its data:

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
								POS	POS	POS	POS	POS	POS	POS	POS
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
POS	POS	POS	POS	POS	POS	POS	POS	S	E	E	E	E	E	E	PAR

- **1-6** (= error): value 0 if no error occurred
- **7** (= RDY): always value 1

Fig. 9: NME3 uses 23 status and position bits: **S** for status (RDY), 6 **E** for error (MHI, MLO, OV, UV, MEM, TRK); and 16 **POS** for position.

You need to write the following **sub-indices** of 33B0<sub>h</sub> accordingly and restart the controller after saving:

1. Set **33B0<sub>h</sub>:06<sub>h</sub>** to 2625000 (baud rate in Hz).
2. Set **33B0<sub>h</sub>:05<sub>h</sub>** to 24 (number of bits plus parity bit).
3. Set **33B0<sub>h</sub>:07<sub>h</sub>** to FFFF00<sub>h</sub> (Position data: POS bits 8 to 23).
4. Set **33B0<sub>h</sub>:09<sub>h</sub>** to FE<sub>h</sub> (status and error bits 1-7 = 1, bit 0 = 0 because the controller ignores the parity bit).
5. Set **33B0<sub>h</sub>:0B<sub>h</sub>** to 80<sub>h</sub> (error bits = 0, status bit = 1).
6. To store the object: Insert 65766173<sub>h</sub> to **1010<sub>h</sub>:06<sub>h</sub>**.
7. Restart the controller.

## 4 Imprint, marking, versions

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Document	+ Added   > Changed   # Fixed	Product
1.2.0 <sup>2025.01</sup>	Revision. # New data and status bits for SSI.	W004
1.1.0 <sup>2023.09</sup>	+ Acceleration and accuracy specifications. > <u>Product variants</u> (new resolutions). > <u>Signal levels</u> .	W004
1.0.0 <sup>2022.10</sup>	Release. + 18-bit version. > Hardware update.	W004
0.7.0 <sup>2021.01</sup>	Beta version.	W003