Technical Datasheet NME2

For the following variants:

NME2 incremental, NME2 SSI

Version: 1.2.0

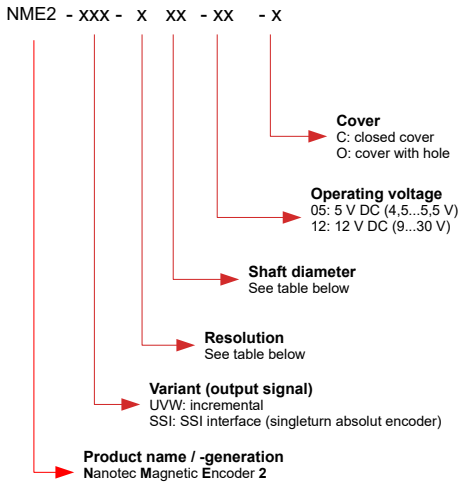
Contents

1 Introduction

The *NME2* is a magnetic rotary encoder for detecting the rotor position of motors. The attachment to a motor and parameterization/calibration are performed by Nanotec. This data sheet contains the encoder's technical data and describes its function. You can find information on possible combinations with Nanotec motors and other mechanical drawings at us.nanotec.com.

1.1 Variants and article numbers

Fig. 1: Order code for NME2 variants.



Letter	Resolution [CPR]
U	2^{16}(65536 [PPR] with quadrature)
V	2^{17} (131072 [PPR])
W	2^{12}(16384 [PPR] with quadrature)

Number	Shaft diameter of the motor
14	5 mm
06	6.35 mm
13	8 mm
10	10 mm
15	15 mm

1.2 Version information

Data sheet version	Date	Changes	Hardware version
1.0.0	06/2020	Edition	W002
1.0.1	03/2021	■ max. permissible altitude removed ■ SSI output signals level added	W002
1.0.2	08/2021	New variants with 4096 [CPR] added.	W002

Data sheet version	Date	Changes	Hardware version
1.1.0	08/2023	Corrections in the chapter Output signals: ■ The Hall sensors sequence was corrected. ■ The Index signal is synchronous to the channel B edge. ■ The max. clock rrequency is 4 MHz. Sub-chapter Prepare the SSI for Nanotec controllers was added.	W002
1.2.0	02/2026	Correction in the chapter Output signals: The Index signal is synchronous to the channel A edge for setpper motors, different to BLDC.	W002

1.3 Copyright, marking and contact

1.4 Intended use

The *NME2* 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 electrical properties and 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.

1.5 Warranty and disclaimer

Nanotec is not liable for damage and malfunction from installation errors, failure to observe this document, or improper repair. Responsible for the selection, operation, use of our products is the plant engineer, operator and user. Nanotec accepts no liability for product integration in the end system. The general terms and conditions at www.nanotec.com apply (customers of Nanotec Electronic USA please see us.nanotec.com).
Note: Product modification / alteration is illicit.

1.6 Target group and qualification

The product and this documentation are directed towards technically trained specialists staff such as:

- Development engineers
- Plant engineers
- Installers/service personnel
- Application engineers

Only specialists may install and commission the product. Specialist staff are persons who

- have appropriate training and experience in work with motors and their control,
- are familiar with and understand the content of this technical manual,
- know the applicable regulations.

1.7 EU directives for product safety

The following EU directives were observed:

- RoHS directive (2011/65/EU, 2015/863/EU)

1.8 Used icons

All notices are in the same format. The degree of the hazard is divided into the following classes.

CAUTION!

The CAUTION notice indicates a possibly dangerous situation.

Failure to observe the notice **may** result in moderately severe injuries.

► Describes how you can avoid the dangerous situation.

NOTICE

Indicates a possible incorrect operation of the product.

Failure to observe the notice may result in damage to this or other products.

► Describes how you can avoid the incorrect operation.

TIP

Shows a tip for the application or task.

1.9 Text conventions

Underlined text indicates cross references and hyperlinks: Use the product as intended within the techically defined safety limits (see electrical properties and technical data) and under the approved ambient conditions.

Text in *italics* marks named objects: The *NME2* is an external magnetic encoder for detecting the rotor position of motors.

2 Safety and warning notices

NOTICE

Damage to the electronics through improper handling of ESD-sensitive components!

The device contains components that are sensitive to electrostatic discharge. Improper handling can damage the device.

► Observe the basic principles of ESD protection when handling the device.

NOTICE

Damage to the electronics by connecting the supply voltage with wrong polarity.

Reverse polarity protection is not provided.

►Observe the pin assignment and use a connector plug of the appropriate type.

3 Technical details and pin assignment

3.1 Ambient conditions

Ambient condition	Value
Protection class according to EN/IEC 60529	IP30
Ambient temperature (operation)	-25… +105°C
Ambient temperature (storage)	-25… +105°C
Air humidity (non-condensing)	0 … 95%

3.2 Dimensioned drawings

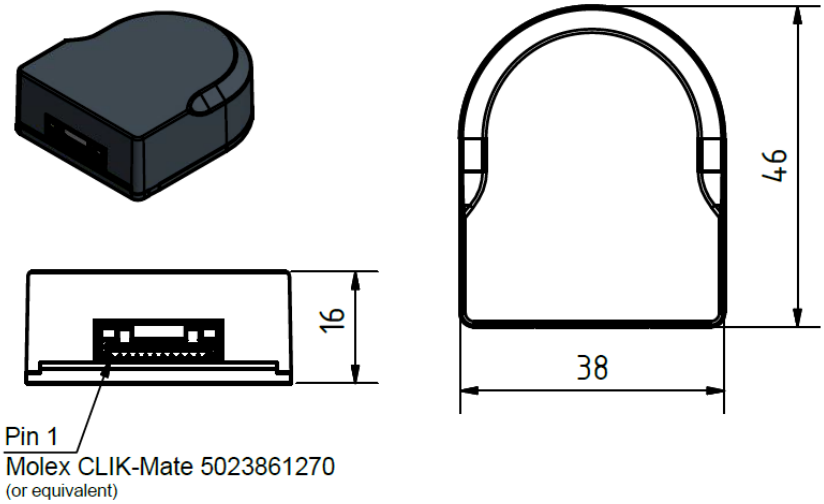


Fig. 2: INME2-xxx-xxx-xx-C (with closed cover), all dimensions in mm.

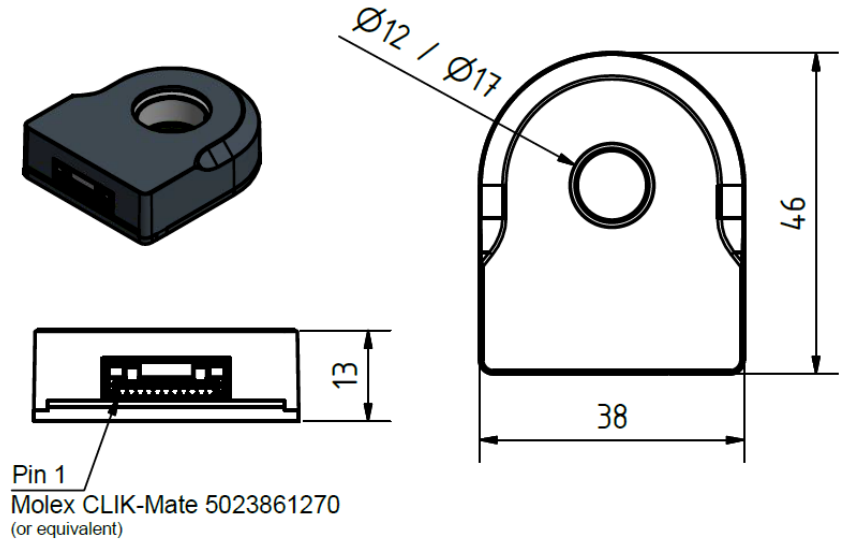


Fig. 3: INME2-xxx-x10-xx-O (12-mm hole) and NME2-xxx-x15-xx-O (17-mm hole).

3.3 Electrical properties and technical data

Property	Description / value
Operating voltage	■ NME2-xxx-xxx-05-x: 4.5 … 5.5 V DC

Property	Description / value
	■ NME2-xxx-xxx-12-x: 9 … 30 V DC
Typical current consumption (without load)	■ NME2-xxx-xxx-05-x: 50 mA @5 V ■ NME2-xxx-xxx-12-x: 40 mA @12 V
Resolution (CPR – without quadrature)	■ NME2-xxx-Uxx-xx-x: 2^{16} (65536) positions per mechanical revolution with quadrature (16384 [CPR] without quadrature) ■ NME2-xxx-Vxx-xx-x: 2^{17} (131072) positions per mechanical revolution ■ NME2-xxx-Wxx-xx-x: 2^{14} (16384) positions per mechanical revolution with quadrature (4096 [CPR] without quadrature)
Maximum mechanical speed	12000 revolutions/minute

3.4 Pin assignment

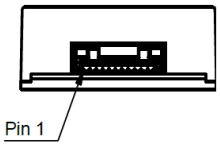


Fig. 4: Location of Pin 1.

- Type: Molex CLIK-Mate 5023861270
- Mating connector (not included in scope of delivery):
  - Housing: Molex CLIK-Mate 5023801200 (or equivalent)
  - Contacts: Molex CLIK-Mate 5023810000 (or equivalent)
- Suitable Nanotec cable: ZK-NME2-12-500-S

Incremental encoder

The following pin assignment applies for the variants with incremental output signals (NME2-UVW-xxx-xx-x):

Pin	Function	Note
1	Ub	For connection for the supply voltage, see Electrical properties and technical data
2	A\	
3	A	
4	B\	
5	B	
6	I\	
7	I	
8	Hall 1	with BLDC motors only
9	Hall 2	with BLDC motors only
10	Hall 3	with BLDC motors only
11	Preset	See Preset function
12	GND	not connected to motor housing

The following signal levels (Ub =5 V, load = 20 mA) apply for differential encoder signals A, A\, B, B\, I, I\ of variants NME2-UVW-xxx-xx-x:

High level	Low level
≥ 2.4 V	≥ 0.4 V

The following signal levels (Ub = 5 V, load = 4 mA) apply for Hall sensors Hall 1, Hall 2, Hall 3 of variants NME2-UVW-xxx-xx-x (only present with BLDC motors):

High level (Ub = 4.5 V)	Low level (Ub = 4.5-5.5 V)
≥ 4 V	≥ 0.5 V

SSI encoder

The following pin assignment applies for the variants with SS interface (NME2-SSI-xxx-xx-x):

Pin	Function	Note
1	Ub	For connection for the supply voltage, see Electrical properties and technical data
2	Clock +	see *SSI output signals* 120 ohm termination resistor between clock + clock - internal
3	Clock -	see *SSI output signals* 120 ohm termination resistor between clock + clock - internal
4	Data OUT +	see *SSI output signals*
5	Data OUT -	see *SSI output signals*
6	n.c	
7	n.c	
8	n.c	
9	n.c	
10	n.c	
11	Preset	See Preset function
12	GND	not connected to motor housing

Preset function

With the preset function, you can set the internal index or the zero position of the encoder to a new position. The electronics of the encoder then stores this position and in the future then outputs the index signal or the zero position at this position.

CAUTION!

Uncontrolled motor movements!

► Switch off the control before you trigger the preset function.

► Restart your controller after the preset and, if necessary, recalibrate or perform another auto setup before switching the drive back to control operation.

To define the new index or zero position, proceed as follows:

1. Move to the desired position with the motor.
2. Trigger the preset function by applying the supply voltage of the encoder to pin 11 (preset). The voltage should be applied for at least 3 seconds.
3. Switch off the power supply of the encoder.

The next time the encoder is switched on, it outputs the index signal at this position (zero position).

3.5 Output signals

3.5.1 Incremental output signals (NME2-UVW-xxx-xx-x)

BLDC motors

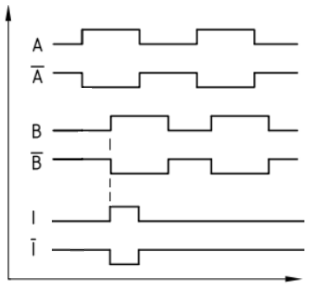


Fig. 5: When mounted on BLDC motors: If the motor shaft rotates clockwise (seen from front), channel A's signal leads channel B by 90° (electrical). The index signal is 90° wide and synchronous to the channel B edge.

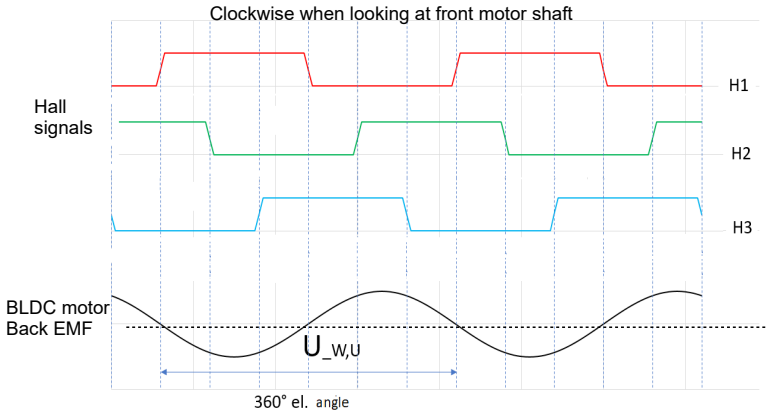


Fig. 6: The Hall signals (preconfigured only if attached to BLDC motors) are arranged such that the rising and falling Hall 1 edges lie at the zero crossings of the back EMF voltage Uw, u (phase voltage W after U).

Stepper motors

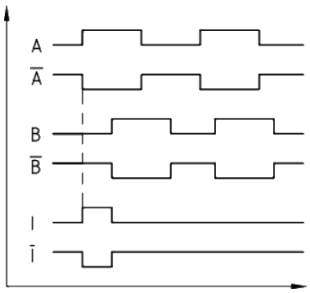


Fig. 7: When mounted on stepper motors: If the motor shaft rotates clockwise (seen from front), channel A's signal leads channel B by 90° (electrical). The index signal is 90° wide and synchronous to the channel A edge.

3.5.2 SSI output signals (NME2-SSI-xxx-xx-x)

The SSI interface signals are RS-485/422-compatible (differential transfer) with 5 V TTL level. Clock signals tick up to 4 MHz.

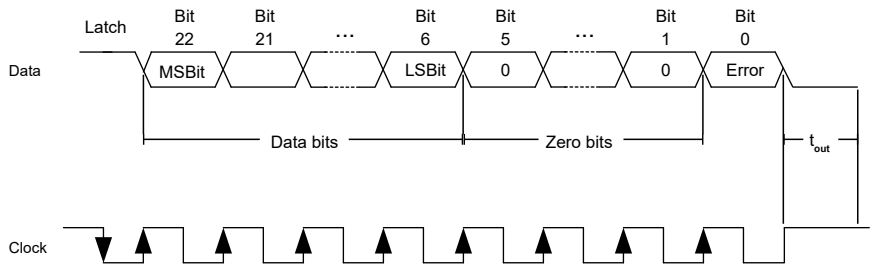


Fig. 8: SSI signal curve, binary-coded from a total of 23 bits.

Latch: Data do flow as of the first falling clock signal edge; first bit is 1.

Data bits (position value): The actual position transmits as of the next rising clock signal edge = data transfer (17 bits) with the highest value bit (MSB) first, each bit on the rising clock signal edge.

Zero bits: Five zero bits follow the data bits. **Error bit:** This end bit tells if internal errors occurred (= *0*) or not (= *1*). After a **20-µs timeout** (t_{out}), you can fetch a new data packet by clock signal. Ex works, the absolute encoder zero position is at the zero crossing of the back EMF voltage $U_{w,\,u}$ (phase voltage W *after* U).

Prepare the SSI for *Nanotec* controllers

Edit the $33B0_h$ **sub-inidices** 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

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
POS	POS	POS	POS	POS	POS	POS	POS	POS	POS	0	0	0	0	0	E

*Fig. 9: NME2 transfers 23 bits: **E** for error, 17 **POS** for position, 5 zero bits*

- **0** (= error): value *1* if no error occurred
- **1-5**: always value *0*

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

1. Set $\mathbf{33B0_h{:}06_h}$ to *2625000* (baud rate in Hz).
2. Set $\mathbf{33B0_h{:}05_h}$ to *23* (number of bits).
3. Set $\mathbf{33B0_h{:}07_h}$ to $7FFFC0_h$ (Position data: *POS* bits 6 to 22).
4. Set $\mathbf{33B0_h{:}09_h}$ to *1* (error bit 0).
5. Set $\mathbf{33B0_h{:}0B_h}$ to *1* (error bit should have the value *1*).
6. To store the object: Insert 65766173_h to $\mathbf{1010_h{:}06_h}$.
7. Restart the controller.