Technical Datasheet NMM1

For the following variants:

NMM1-SSI-V06-05-CR, NMM1-SSI-V14-05-CR

Version: 1.1.2

Contents

1 Document aim and conventions 3

2 Your product 3

2.1 Intended use and audience 3
2.2 Warranty, disclaimer 4
2.3 EU directives for product safety 4

3 Safety notes 4

3.1 Risk levels 4
3.2 Specific safety notes 4

4 Technical data, pin assignment 5

4.1 Ambient conditions 5
4.2 Dimensions 5
4.3 Electrical data 5
4.4 Sensor 5
4.5 Data interface / format 6
4.6 Pin assignment 6

5 Imprint, versions 7

1 Document aim and conventions

This document explains product data, product use and function. For combinations with other Nanotec products, please ask our sales team. We use the following typefaces:

Underlined text indicates cross references and hyperlinks.

- Example 1: Only use the product as per technical data and pin assignment.
- Example 2: Only use the product in valid ambient conditions.

Italic text means: This is a *named object,* a *menu path / item,* a *tab / file name* or (if necessary) an expression in a *foreign language*.

- Example 1: Select *File* > *New* > *Blank Document*.
- Example 2: Open the *Tool* tab and select *Comment*.
- Example 3: In principle, this document distinguishes between:
  - User (= *Nutzer; usuario; utente* [pt.]; *utilisateur; utente* [it.] etc.).
  - Third-party user (= *Drittnutzer; tercero usuario; terceiro utente; tiers utilisateur; terzo utente* etc.).
  - End user (= *Endnutzer; usuario final; utente final; utilisateur final; utente finale* etc.).

`Courier` marks `blocks of code` or `programming commands`.

- Example 1: Using Bash, call `sudo make install` to copy shared objects; then call `ldconfig`.
- Example 2: Use the following NanoLibAccessor function to change the logging level in NanoLib:

```
//
        ***** C++ variant *****
 void setLoggingLevel(LogLevel level);
```

Bold text emphasizes individual words of **critical** importance. Alternatively, bracketed exclamation marks emphasize the critical(!) importance.

- Example 1: Protect yourself, others and your equipment. Follow our **general** safety notes that are generally applicable to **all** Nanotec products.
- Example 2: For due protection, also follow our **specific** safety notes that apply to **this** specific product.

2 Your product

The *NMM1* magnetic, multi-turn absolute encoder with SSI interface records and stores the absolute rotor position of your motor. Nanotec installs, configures and calibrates the encoder on the motor.

Note: To store the absolute position of the rotor, the encoder powers the internal memory even while switched off by means of energy harvesting. When switched back on, it again finds the stored rotor position without problem.

Product highlights

- Electrical single-turn resolution: 17 bit
- Battery-free, maintenance-free
- Multi-turn range: 16 bit
- Energy harvesting: via Wiegand effect

2.1 Intended use and audience

The *NMM1* encoder is used as a component of drive systems in a range of industrial applications. Use the product as intended within its technical limits and approved ambient conditions.

Under no circumstance may this Nanotec product be integrated as a safety module. Products with a component manufactured by Nanotec must, upon delivery to the end user, be provided with corresponding warning messages and instructions for safe use and safe operation. All warning messages provided by Nanotec are to be immediately passed on to end users.

Audience and qualification

The product and this document address only technically trained experts such as:

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

Only experts may install and commission the product. Absolutely required are:

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

2.2 Warranty, disclaimer

Nanotec assumes no liability for damages and malfunctions from installation errors, failure to observe this document or improper repair. Selection and use of our products is the responsibility of plant engineer or user. Nanotec accepts no responsibility for product integration into the end system. The general terms and conditions at www.nanotec.com apply. **Note:** Modification / alteration to the product is illicit.

2.3 EU directives for product safety

The following EU directives were observed:

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

3 Safety notes

For proper use of the product, please make certain that all users and end users completely read, understand and observe this document.

3.1 Risk levels

Please note that all warning messages, alarm symbols and signal words in this document indicate various risk levels.

NOTICE

A NOTICE warns of wrong operation.

Material or ecological damage possible (not strictly injury).

►Instruction against **destructive** user **errors** (= mere material risks).

Note: A mere note in the flow text explains or simplifies a single step.

3.2 Specific safety notes

For due protection, observe **specific** warning messages that cover **this** specific product.

NOTICE

ESD-sensitive module damage: from electrostatics!

►Observe basic principles for ESD protection.

4 Technical data, pin assignment

Protect yourself, others and your equipment. Use the product only within its technical safety limits.

4.1 Ambient conditions

Use your product only in permissible environments.

Protection class according to EN/IEC 60529	IP20
Ambient °C (°F)	-40 to +105 °C (-40 to +221°F)
Impact resistance	≤ 200 g (semi-sinusoidal 6 ms, EN 60068-2-27)
Permanent impact resistance	≤ 20 g (semi-sinusoidal 16 ms, EN 60068-2-29)
Vibration resistance	≤ 20 g (10 to 1000 Hz, EN 60068-2-6)

4.2 Dimensions

Simplify product installation with properly dimensioned drawing.

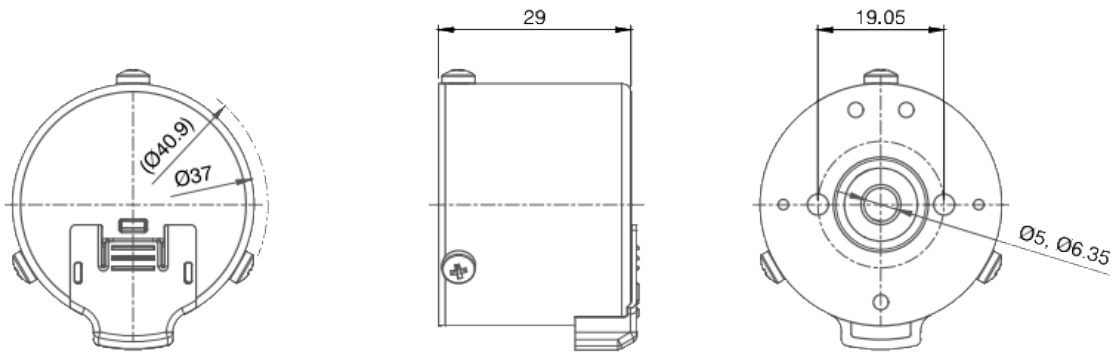


Fig. 1: Dimensions in millimeters.

4.3 Electrical data

Protection against both polarity-reversal and short-circuit makes the NMM1 particularly safe.

Electrical connection	JST BM08B-GHS-TBT (axial)
Polarity-reversal/short-circuit protection	Yes/Yes
Energy harvesting	Wiegand effect
Operating voltage	4.75 to 15 VDC
Consumption	≤ 0.3 W
Start-up time	≤ 100 ms
Clock input	RS 422
Clock frequency	300 kHz to 2.6 MHz

4.4 Sensor

The resolution is 17 bit (single turn) or 16 bit (multi-turn).

Single turn	Magnetic
Resolution *single turn*	17 bit = 2^{17}
Multi-turn technology	Independent magnetic pulse counter (battery-free/gearless)

Measurement range *multi-turn*	16 bit = 2^{16} revolutions
Accuracy	±0.3°
Count direction	Axis rotation clockwise (seen from front)
Maximum speed	12,000 rpm

4.5 Data interface / format

The **s**ynchronous **s**erial **i**nterface (SSI) transfers a 33-bits total of position values (17 + 16) per data packet.

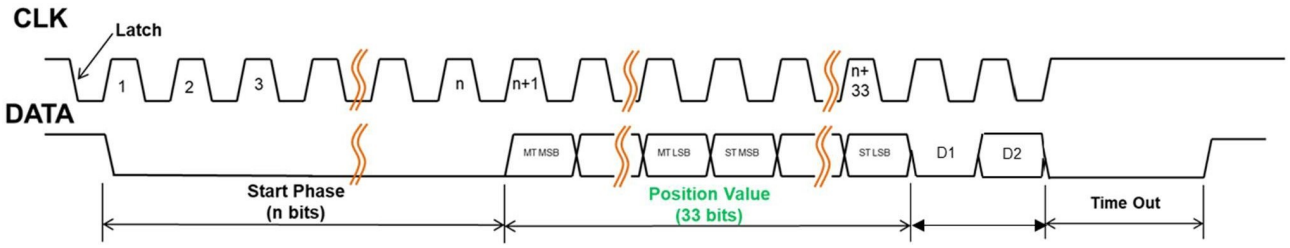


Fig. 2: Data transfer in SSI.

SSI interface

- Cycle time: 50 µs
- Timeout: 7 µs typ.

Data format (S303B)

- 16 start phase bits (= *0*) + multi-turn (16 bits) + single-turn (17 bits) + D1 + D2
- D1: Constant value = *0*
- D2: Error-bit for the display of the sensor-internal status:
  Value *1*: no error │ *0*: error

Prepare the SSI for *Nanotec CPB* 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:

63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
													0	0	0
47	**46**	**45**	**44**	**43**	**42**	**41**	**40**	**39**	**38**	**37**	**36**	**35**	**34**	**33**	**32**
0	0	0	0	0	0	0	0	0	0	0	0	0	POS	POS	POS
31	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**
POS	POS	POS	POS	POS	POS	POS	POS	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	POS	POS	POS	POS	POS	POS	S	E

*Fig. 3: NMM1 uses 51 status, start and position bits: 1 **S** for status (D1), 1 **E** for error (D2), 33 **POS** for position and 16 start bits (=0).*

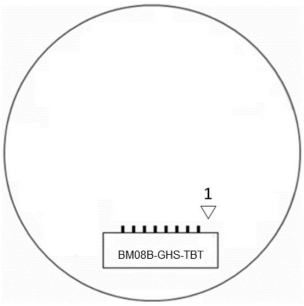
- **Bit 0** (= error): value *1* if no error occurred
- **Bit 1** (= D1): always value *0*

Please edit the following **sub-inidices** of $33B0_h$ accordingly and restart the controller after saving:

1. Set **$33B0_h$:06_h** to *2000000* (baud rate in Hz).
2. Set **$33B0_h$:05_h** to *51* (number of bits plus start bits).
3. Set **$33B0_h$:07_h** to *$FFFFFFFC_h$* (Position data: *POS* bits 2 to 31).
4. Set **$33B0_h$:08_h** to *7* (Position data: *POS* bits 32 to 34).
5. Set **$33B0_h$:09_h** to *3* (status and error bits 0 and 1).
6. Set **$33B0_h$:$0B_h$** to *1* (error bit = *1*, status bit = *0*).
7. To store the object: Insert *65766173_h* to **1010_h:06_h**.
8. Restart the controller.

4.6 Pin assignment

The following pins have a function.



BM08B-GHS-TBT (Pin: signal)

1 (black): GND
2 (n/a): -/-
3 (n/a): -/-
4 (white): Data +
5 (gray): Data -
6 (brown): CLK -
7 (green): CLK +
8 (red): Ub

5 Imprint, versions

Document	Changes	Product
1.0.0 (06/2022)	Edition	W001
1.1.0 (02/2023)	Chapter Prepare the SSI for Nanotec CPB controllers added	W001
1.1.1 (11/2023)	Dimension drawing updated	W001
1.1.2 (05/2024)	Accuracy added	W001