



Short instructions

Translation of the

Nanotec Electronic GmbH & Co. KG

Kapellenstraße 6

85622 Feldkirchen, Germany

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original: de

Phone: +49 (89) 900 686-0

Fax: +49 (89) 900 686-50

info@nanotec.de

Introduction

The *N6* is a controller for the *open-loop* or *closed loop* operation of stepper motors and the *closed loop* operation of BLDC motors.

This manual describes the functions of the controller and the available operating modes. It also shows how you can address and program the controller via the communication interface.

You can find further information on the product on **us.nanotec.com**.

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Intended use

The *N6* serves to control stepper motors and BLDC motors and is used as a component in drive systems in a wide range of industrial applications.

Use the product as intended within the limits defined in the technical data (in particular, see **Permissible operating voltage**) and the approved **Environmental conditions**. This Nanotec product may under no circumstances 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 including instructions for safe use and safe operation. All warning notices provided by Nanotec must be passed on directly to the end user.

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, and application engineers.
- Only specialists may install, program and commission the product. Specialist staff are persons who
- have appropriate training and experience in working with motors and their controller,
  - are familiar with and understand the content of this technical manual,
  - know the applicable regulations.

Warranty and disclaimer

Nanotec shall not be liable for damage and malfunctions attributable to installation errors, failure to observe this document or improper repair. The plant engineer, operating company and user shall be responsible for the selection, operation and use of our products. Nanotec shall not take responsibility for integration of the product in the end system. The general terms and conditions listed at [www.nanotec.de](http://www.nanotec.de) shall apply. **Note:** Conversion/modification as well as opening of the product are prohibited.


Other applicable regulations

- In addition to this technical manual, the following regulations are to be observed:
- Accident-prevention regulations
  - Local regulations on occupational safety

EU directives for product safety

- The following EU directives were observed:
- RoHS directive (2011/65/EU, 2015/863/EU)
  - EMC directive (2014/30/EU)


Safety and warning notices

**NOTICE**

**Damage to the controller!**

Changing the wiring during operation may damage the controller.


► Only change the wiring in a de-energized state. After switching off, wait until the capacitors have discharged.

**NOTICE**

**Damage to the controller due to excitation voltage of the motor!**

Voltage peaks during operation may damage the controller.

► Install suitable circuits (e.g., charging capacitor) that reduce voltage peaks.

**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.

Technical details and pin assignment

Environmental conditions

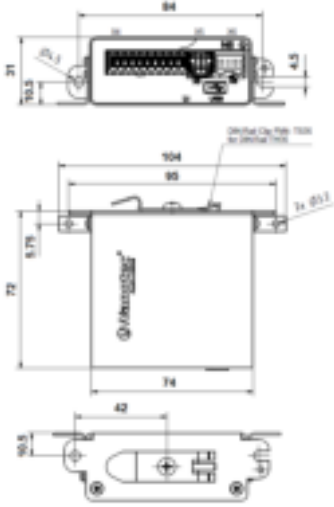
Environmental condition	Value
Protection class	IP20
Degree of contamination	2
Ambient temperature (operation)	-10 ... +40°C
Ambient temperature (storage and transport)	-25 ... +85°C
Relative humidity (operation), non-condensing	0 ... 85%
Relative humidity (storage and transport), non-condensing	0 ... %
Absolute humidity (storage and transport), non-condensing	30 g/m <sup>3</sup>
Max. altitude of site above <i>sea level</i>	2000 m (drop in performance above 1000 m: -1%/100 m)
Max. altitude of site above <i>sea level</i> (storage and transport)	3000 m

Electrical properties and technical data

Property	Description / value
Operating voltage	12 V -5%...57.6 V DC
Rated current	6 A <sub>rms</sub>
Peak current	N6-1-... ( <i>low current</i> ): 6 A <sub>rms</sub> N6-2-... ( <i>high current</i> ): 18 A <sub>rms</sub> for 5 seconds
Commutation	Stepper motor – open loop, stepper motor – closed loop with encoder, BLDC motor – closed loop with Hall sensor, and BLDC motor – closed loop with encoder
Operating modes	<i>Profile Position Mode, Profile Velocity Mode, Profile Torque Mode, Homing Mode, Interpolated Position Mode, Cyclic Sync Position Mode, Cyclic Sync Velocity Mode, Cyclic Synchronous Torque Mode, Clock-Direction Mode</i>
Set value setting / programming	<i>CANopen, Clock-direction, analog, NanoJ program</i>
Interfaces	CANopen, USB
Inputs	<ul style="list-style-type: none"><li>• 6 inputs, 5 V/24 V (=UB_Logic), switchable by means of software, factory setting: 5 V</li><li>• 2 analog inputs 0 to +24 V, 12-bit resolution</li></ul>
Outputs	3 outputs, 5 V/24 V (=UB_Logic), switchable by means of software, 100 mA
Brake connection	1 PWM output, max. 1.5 A, 20 kHz
Sensor inputs	1 incremental encoder (5 V), 3 Hall sensors (5 V), 1 SSI encoder (10 V)

Property	Description / value
Protection circuit	Overvoltage and undervoltage protection Overtemperature protection (> 75° Celsius on the power board) Polarity reversal protection

Dimensioned drawings and installation options



You can secure the controller by its side tabs to a flat mounting surface using screws or mount it on a TH35 DIN rail in your switch cabinet using the supplied DIN rail clip.

Overtemperature protection

Above a temperature of approx. 75°C on the power board the power part of the controller switches off and the fault bit is set. After cooling down and resetting the fault , the controller again functions normally.

LED signaling

Power LED

The power LED indicates the current status.


Normal operation

In normal operation, the green power LED L1 flashes briefly once per second.

Case of an error

If an error has occurred, the LED turns red and signals an error number. The following table shows the meaning of the error numbers.

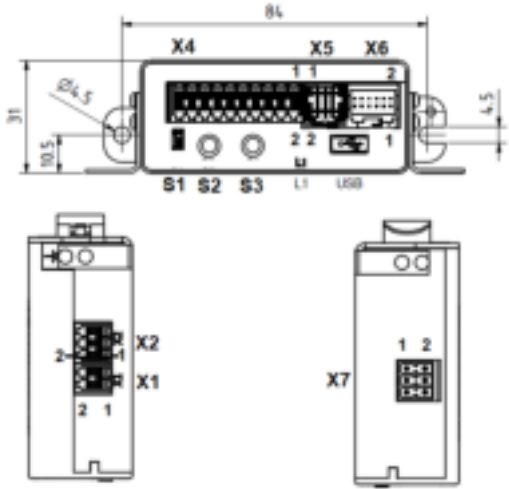
Flash rate	Error
1	General
2	Voltage
3	Temperature
4	Overcurrent
5	Controller
6	Watchdog-Reset

**NOTICE**

For each error that occurs, a more precise error code is stored in object **1003<sub>h</sub>**.

Pin assignment

Pin 1 and 2 are marked below.



Connector	Function	Pin assignment / description
X1 min. : 1 mm <sup>2</sup> (AWG 17)	Motor	<b>Note:</b> Motor wires are to be routed through ferrites (74271222 from Würth or equivalent). <ol style="list-style-type: none"><li>1. <b>A</b> (Stepper) <b>U</b> (BLDC)</li><li>2. <b>A</b>\ (Stepper) <b>V</b> (BLDC)</li><li>3. <b>B</b> (Stepper) <b>W</b> (BLDC)</li><li>4. <b>B</b>\ (Stepper)</li></ol>
X2 UB: 1 mm <sup>2</sup> (AWG 17) UB_Logic; 0.8 mm <sup>2</sup> (AWG 18)	Supply	<ol style="list-style-type: none"><li>1. <b>GND_L-</b>, GND for the Logic Supply UB_Logic</li><li>2. <b>+UB_Logic</b>;12 V - 30 V DC</li><li>3. <b>Ballast-</b></li><li>4. <b>Ballast+</b></li><li>5. <b>GND_P</b>, GND for the Main Supply UB</li><li>6. <b>+UB</b>;12 V - 57,6 V DC</li></ol>
X4	In- / Outputs	<ol style="list-style-type: none"><li>1. <b>+10 V</b>; Output voltage, max. 350 mA</li><li>2. <b>GNDD</b>; GND for digital In/Outs</li><li>3. <b>+5 V</b>; Output voltage, max. 350 mA</li><li>4. <b>GNDD</b>; GND for digital In/Outs</li><li>5. <b>Digital output 1</b>:5 / 24 V (UB_Logic) switchable, 100 mA</li><li>6. <b>Digital output 2</b>: :5 / 24 V (UB_Logic) switchable, 100 mA</li><li>7. <b>Digital output 3</b>: :5 / 24 V (UB_Logic) switchable, 100 mA</li><li>8. <b>GNDD</b>; GND for digital In/Outs</li><li>9. <b>Digital input 1</b>; 5 V / 24 V, switchable</li><li>10. <b>Digital input 2</b>; 5 V / 24 V, switchable</li><li>11. <b>Digital input 3</b>; 5 V / 24 V, switchable</li><li>12. <b>Digital input 4</b>; 5 V / 24 V, switchable</li><li>13. <b>Digital input 5</b>; 5 V / 24 V, switchable</li><li>14. <b>Digital input 6</b>; 5 V / 24 V, switchable</li><li>15. <b>GNDA</b>; GND for Analog input</li><li>16. <b>Analog input 1</b>: 0 V...+24 V, 12-Bit-resolution</li><li>17. <b>GNDA</b>; GND for Analog input</li><li>18. <b>Analog input 2</b>: 0 V...+24 V, 12-Bit-resolution</li><li>19. <b>Brake-</b>: GND for brake</li><li>20. <b>Brake+</b>: PWM-controlled output, 5 V / 24 V switchable, up to 20 KHz, max. 1500 mA</li></ol>
X5	SSI Encoder	<ol style="list-style-type: none"><li>1. <b>GND</b></li><li>2. <b>SHIELD</b></li><li>3. <b>n.c.</b></li><li>4. <b>DATA B</b></li><li>5. <b>DATA A</b></li><li>6. <b>CLCK B</b>; up to 10 MHz</li><li>7. <b>CLCK A</b>; up to 10 MHz</li><li>8. <b>Vcc</b>; +10 V DC, outputs- und Supply voltage for SSI Encoder, max. 350 mA</li></ol>

