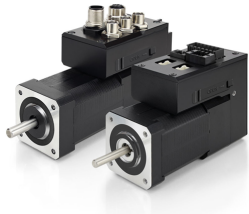


PD2-E EtherCAT





Short instructions

Original: de

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Introduction

The *PD2-E* is a brushless motor with integrated controller in two versions in protection classes IP30 and IP65, respectively. The integrated absolute encoder (single-turn and multi-turn variants available) makes immediate operation possible in *closed-loop* mode without homing.

This instruction describes the installation and commissioning of the motor. You can find the detailed documentation for the product and motor data sheets on **us.nanotec.com**. The short instructions do not replace the *technical manual* of the motor.

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Intended use

The *PD2-E* motor with integrated controller 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 (in particular, see **Permissible operating voltage**) and the approved **Environmental conditions**. This Nanotec product may not be integrated as a safety component in a product or system under any circumstances.

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.

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 shall apply. **Comment:** Modifications/changes to the product as well as opening the product are prohibited.

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.

EU directives for product safety

The following EU directives were observed:

- RoHS directive (2011/65/EU, 2015/863/EU)
- EMC directive (2014/30/EU)

Other applicable regulations

In addition to this technical manual, the following regulations are to be observed:

- Accident-prevention regulations
- Local regulations on occupational safety

Safety and warning notices



CAUTION!

Risk of burning from hot surfaces!
The motor can become very hot during operation. If touched, this could result in burns.
► During use, make certain that the environmental conditions are ensured and that operation takes place within the limits defined by the technical data.
► Install the motor in such a way that heat dissipation and passive cooling are possible.
► After switching off, wait until all components have cooled before you touch them.

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.

NOTICE

Damage to the electronics if the supply voltage is connected with reversed polarity!
Polarity reversal results in a short-circuit between supply voltage and GND (earth) via the power diode.
► Install a line protection device (fuse) in the supply line.

Technical details and pin assignment

Environmental condition	Value
Protection class	• <i>PD2-E...-30-...</i>: IP30 • <i>PD2-E...-65-...</i>: IP65 (IP54 at the shaft output)
Degree of contamination	2
Ambient temperature (operation)	-10 ... +40°C
Ambient temperature (storage and transport)	-20 ... +85°C
Relative humidity (operation), non-condensing	0 ... 85%
Relative humidity (storage and transport), non-condensing	0 ... 85%
Absolute humidity (storage and transport), non-condensing	30 g/m ³
Max. altitude of site above <i>sea level</i> / (without drop in performance in operation)	1500 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

Electrical data	
Operating voltage of motor (rated value)	48 V DC Except for variants PD2-EB... B -...: 24 V DC

Permissible range of the operating voltage	11.4...57.6 V DC
Logic voltage (rated value)	24 V DC
Voltage range of the logic supply	11.4...30 V DC
Rated current	• PD2-EB42MB-... : 3.1 A rms • PD2-EB42MD-... : 1.5 A rms • PD2-EB42LB-... : 4.8 A rms • PD2-EB42LD -... : 2.4 A rms • PD2-EB42CD -... : 3.66 A rms • PD2-E421... (steppers) : 1.8 A rms
Peak current (for max. 1 s)	• PD2-EB42MB-... : 9.3 A rms • PD2-EB42MD-... : 4.6 A rms • PD2-EB42LB-... : 14.4 A rms • PD2-EB42LD -... : 7.2 A rms • PD2-EB42CD -... : 11 A rms • PD2-E421... (steppers) : 3 A rms

Technical data

Operating modes	<i>Profile Position Mode, Profile Velocity Mode, Profile Torque Mode, Velocity 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>EtherCAT, analog input, NanoJ program</i>
Inputs	4 digital inputs (+5 V/+24 V (V+Logic) DC), switchable by means of software, factory settings: 5 V 2 analog inputs 0...24 V
Outputs	2 digital outputs, <i>Push-Pull</i> , (+5 V/+24 V (V +Logic) DC) max. 100 mA 1 PWM brake output for external holding brake
Integrated encoder	• PD2-...-E-x(x): Magnetic, single-turn absolute encoder, 16 bits • PD2-...-M-x(x): Magnetic, multi-turn absolute encoder, 16 bits multi-turn, 17 bits single-turn resolution
Protection circuit	Overvoltage and undervoltage protection Overtemperature protection (> 80 °C on the power board

Overtemperature protection

Above a temperature of approx. 80 °C on the power board the power part of the controller switches off and the error bit is set. After cooling down and confirming the error , 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 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.

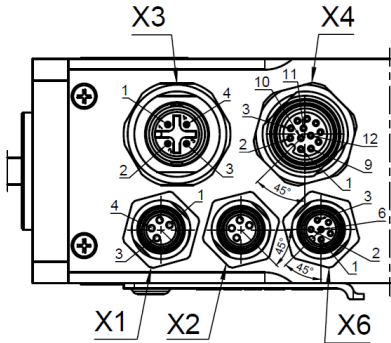
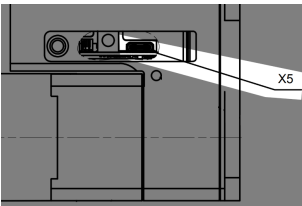
Flash rate	Error
1	General
2	Voltage
3	Temperature
4	Overcurrent
5	Controller
6	Watchdog-Reset



NOTICE

For each error that occurs, a more precise error code is stored in object **1003_h**.

Connections



Connection	Function	Pin assignment / description
X1	EtherCAT IN	1. TD+ 2. RD+ 3. TD- 4. RD-
X2	EtherCAT OUT	
X3	Connection for the power supply	1. V+ 2. V+ 3. GND 4. GND 12 - 57.6 V DC
X4	In- / Outputs and and external logic supply	1. GND 2. Digital input 1: 5 V / 24 V, switchable with object 323A_h , max. 1 MHz 3. Digital input 2: 5 V / 24 V, switchable with object 323A_h , max. 1 MHz 4. Digital input 3: 5 V / 24 V, switchable with object 323A_h , max. 1 MHz 5. Digital input 4: 5 V / 24 V, switchable with object 323A_h , max. 1 MHz 6. Analog input 1: 12 Bit, 0 V...+24 V 7. Analog input 2: 12 Bit, 0 V...+24 V 8. Digital output 1: Push-Pull, switchable 5 V / V+ Logic with 323A_h , max. 100 mA 9. Digital output 2: Push-Pull, switchable 5 V / V+ Logic with 323A_h , max. 100 mA 10. V+ Logic: 12 - 30 V DC 11. Brake +: PWM controlled output for optional external holding brake, max. V + Logic, 400 mA, 20 kHz 12. Brake -
X5	USB, Typ C	Configuration interface
X6 (only with PD2-E(B)42x(x)-xS-...)	STO (<i>Safe Torque Off</i>) Detailed description in the document <i>Functional description STO</i> at us.nanotec.com .	1. STO-A-IN 2. STO-A-RTN 3. b2: STO-FBH 4. STO-FBL 5. STO-B-IN 6. STO-B-RTN

NOTICE

- EMC: For a DC power supply line longer than 30 m or when using the motor on a DC bus, additional interference-suppression and protection measures are necessary.
- An EMI filter is to be inserted in the DC supply line as close as possible to the controller/motor.
- Long data or supply lines are to be routed through ferrites.

The *Plug & Drive Studio 3* software offers you an option for performing the configuration and adapting the motor parameters to your application. You can find further information in the document *Plug & Drive Studio 3: User Manual* at us.nanotec.com.

Observe the following notes:

CAUTION!

Moving parts can cause hand injuries!

If you touch moving parts during running operation, hand injuries may result.

- Do not reach for moving parts during operation. After switching off, wait until all movements have ended.

CAUTION!

In free-standing operation, motor movements are uncontrolled and can cause injuries.

If the motor is unsecured, it can, e. g., fall down. Foot injuries or damage to the motor could occur.

- If you operate the motor free-standing, observe the motor, switch it off immediately in the event of danger and make certain that the motor cannot fall down.

CAUTION!

Moving parts can catch hair and loose clothing.

During running operation, moving parts can catch hair or loose clothing, which may lead to injuries.

- If you have long hair, wear a hairnet or take other suitable protective measures when near moving parts. Do not work with loose clothing or ties near moving parts.

NOTICE

EMC: Current-carrying cables – particularly around supply cables – produce electromagnetic alternating fields. These can interfere with the motor and other devices.

Suitable measures may be:

- Use shielded cables and earth the cable shielding on both ends over a short distance.
- Keep power supply cables as short as possible.
- Use cables with cores in twisted pairs.
- Earth motor housing with large contact area over a short distance.
- Lay supply and control cables separately.
- Connect a charging capacitor of approx. 1000 µF per ampere rated current parallel to the supply voltage.

The motor rotates at 30 rpm if the *enable input* is set.