NEW PRODUCTS

News about PLC/IPC/DRIVES

- Stepper motor positioning controllers with EtherCAT™
- Controllers for BLDC motors

See page 7

Modular drive concepts for BLDC motors and stepper motors

From the economical 50 W motor PCB solution for device construction, thru flexibly usable, freely programmable and bus-capable controllers, up to complete 500 W Plug & Drive motors for decentralized drive concepts

www.nanotec.com
Precision motors and controls

Standard and individual solutions for optimum drive applications

Whether as standard or individual solutions, Nanotec provides the optimum drive for applications that require maximum precision, reliability and functionality with a very small space requirement. Our motors and controls let you build on compliance with tight manufacturing tolerances and strict quality control in all processing steps. Virtually all automation tasks can be managed quickly, easily and efficiently with our universally deployable powerful motors and controls.

Customer-specific shaft, flange and connector versions provide the constructor and assembly team with an easy, fast, economic and reliable electric connection to the machine.

Speed-adapted windings optimize the working point and running performance.

We attach great importance to quality

As well as compliance with the requirements of the standards and relevant sets of regulations, certification in accordance with the latest standard ISO 9001:2008 by the TÜV Management Service documents the consistent customer orientation of our processes and our successful efforts towards continuous improvement of internal and external procedures.

Application example: Automation of an index punching machine with Nano

For a customer who controls the precision feed control of the punching knife in an index punching machine with a SMCI47-S-2 and Nanopro, the solution should be automated so that a PLC integrated in the line can move to the individual punching positions. The teach-in for a new order should continue to be carried out on a laptop, although the function of the inputs and outputs has been programmed in the SMCI47-S with Nanopro so that the program could be very simply configured on the supervisor PLC.

Index punching requires the possibility to move up to 31 individual index positions, each with a separately adjustable length. These positions are saved by the machine setter in individual positioning records of the controllers via Nanopro. The precision feed control of the punch is controlled by the PLC over five digital inputs of the SMCI47-S and the reference switch is connected to the sixth input of the controller.

Safeguarded against scrap by encoder monitoring

An A98918M404-E was selected as the motor in protection class IP65 that is not adversely affected by the dust that occurs during the punching process. The encoder integrated in the motor is monitored by the SMCI47-S and ensures that the controller registers an error if there is any mechanical stiffness or blockage, for example, to prevent the index from being brought to the wrong position.

The figures shown above present some examples of customer-specific stepper motor controllers that we can offer our customers at a favorable price. An overview of the entire range and variety of product variants of our compact drives and the diverse customer-specific versions is available at www.nanotec.com.

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Plug&Drive motors with integrated driver and external controller, flexible control per software configuration

- Microstep up to a 64th of a step
- Step multiplication/microstep emulation so that the smooth running of the microstep can also be used with older superordinate drivers that only output full or half steps.

Control via digital and analog inputs
- Up to 16 motion sequences (position or speed profiles) can be stored in the driver and selected, started and stopped via digital inputs
- Also speed, position or torque can be controlled via the analog input
- Inputs are freely configurable for additional functions (e.g., reference switch, enable)

Control over fieldbus
- Open protocol over RS232/RS485 with adjustable Baud rate of 9.6-115 kbit
- Standard protocol in compliance with CANopen/DSP402 over CAN bus

Sequential control with Nano
- Java-based programming language, programs run independently (without PC) on the Plug & Drive motor
- Access to all control parameters and inputs/outputs
- Variables, branches, loops, logical and mathematical functions
- Programs can be stored in the controller via RS485/USB

Simple configuration and start-up with our free-of-charge Nanopro and NanoCAN software.

A stepper motor can be put into operation in a few minutes with the Windows Nanopro software. It is just as easy to set specific motor and machine parameters, set up reference and limit switches, and much more. After the initial configuration of the drive, e.g., in positioning mode, the individual travel profiles – incl. different ramp types such as trapezoidal or sinusoidal ramps – can be set.

The behavior of the drive can be graphically displayed by an integrated scope function which is helpful, especially in the optimization of control parameters in closed loop mode. For an initial setting, sample values for standard motors are recommended that can be adapted to the requirements of the application by integrated autotuning. Specially developed for activation via CANopen, the NanoCAN commissioning software can now be used to conveniently set the general settings in the same way as RS485 via Nanopro.

SMCI external stepper motor controller with integrated positioning control, closed loop capable

SMCI33 and SMCI47-S positioning controls with final output stage

The two positioning controls cover the entire range of hybrid stepper motors with a power range of up to 3 Aphase (SMCI33) or 12 Aphase at a voltage of 21–48 V. A simple connection to different higher-order controls is possible through the 5-24 V wide range inputs.

Price example for SMCI33
1 pc.: 129.00 € Price per unit from 25 pcs.: 110.42 €
1 pc.: 199.90 € Price per unit from 25 pcs.: 169.15 €

For integration in your control system: SMCP33 control panel
- Same software features as SMCI drivers
- 48 V/2 A without cooling, 4 A with heat sink
- Simple integration due to PCB connector
- Can be networking via RS485, ideal for multiple axis applications

Price example for SMCP33
1 pc.: 69.00 € Price per unit from 25 pcs.: 58.65 €

Stepper motor power output stage with controller: SMCI12
- Ultracompact size of 42 x 4 x 15 mm
- 2 A phase current/24 V
- RS485 or CANopen interface
- dspDrive®
- Can be screwed directly onto a NEMA17 stepper motor

Price example for SMCI12
1 pc.: 59.90 € Price per unit from 25 pcs.: 50.91 €

Stepper motor power output stage with controller: SMCI35
- Compact size of 55 x 60 x 20 mm
- 6 A phase current/48 V
- RS232 communication
- Encoder input (closed loop capable)
- dspDrive®

Price example for SMCI35
1 pc.: 89.90 € Price per unit from 25 pcs.: 69.22 €

Stepper motor and BLDC motor final output stage with controller: SMCI36
- Compact size of 86 x 60 x 22 mm
- 6 A phase current/80 V
- RS485 or CANopen interface (configurable via jumper)
- Encoder input (closed loop capable) and separate connectors for Hall sensors
- dspDrive®

Price example for SMCI36, available from January 2011
1 pc.: 139.90 € Price per unit from 25 pcs.: 107.72 €

dspDrive® software-based current control with high resolution in open loop

The current in the motor of the latest generation of Nanotec hardware is no longer controlled by an integrated component, but is controlled directly by a digital signal processor. Unlike conventional ICs that resolve the winding current measurement and the target current value with only 6 or 8 bits, the new dspDrive carries out the entire control with a resolution of 12 bits. The parameters of the PI current controller can be adjusted to the motor and by the user as a function of the rpm. This has the following advantages in its application: it provides very smooth, low-resonance operation in its application with a sinusoidal current in the windings. The high resolution of the control loop means no more degradation and noise that cause the motor to resonate.
Plug&Drive stepper motors with integrated power and positioning electronics

Stepper motors with integrated closed loop and CANopen-capable controller
- Size: 56 mm
- Torque: max. 1.5 Nm
- Operating voltage: 24 V - 48 V
- Interface: RS485 / RS232 / CANopen
- Phase current: 3.5 A/phase
- Other features: dpDrive®

Price example for PD4-N5918L4204
1 pc. from: 378.90 €
Price per unit from 25 pcs.: 175.92 €

Now in two new versions:
- In protection class IP65 with two M12 connectors
- With flange size 60 mm and a torque up to 3 Nm (P4-N6018L4204)

Stepper motors with integrated closed loop and CANopen-capable controller
- Size: 86 mm
- Torque: max. 9 Nm
- Operating voltage: 24 V - 48 V
- Interface: RS485 / RS232 / CANopen
- Phase current: 7.5 A/phase
- Other features: IP65 standard

Price example for PD6-N8918S9504
1 pc. from: 519.90 €
Price per unit from 25 pcs.: 255.92 €

The Plug & Drive & motors provide you with the same features as our external controllers, but with encoders integrated directly in the motor. In comparison to a solution with external controller, a large part of the cabling expense is saved here as a minimum of just the power supply and the fieldbus interface still need to be wired. The possibility of connecting further sensors and actuators to the additional inputs and outputs of the motor makes a decentralized automation solution more convenient.

Our next generation of motor controllers: N10 with NanoIP
Based on our current generation of controls, but with even faster hardware and a new software concept, the N10 is the first controller that is targeted entirely at the Ethernet and fieldbus operation. Instead of parameterization via Windows software, we have created a subdirectory of the controller via NanoIP - a browser-based interface that makes the parameterization independent of the platform and can be simply adapted to his application by the customer himself.

N10 hardware
- Up to 80 V and 10 or 20 A depending on the version
- Constant current
- For stepper motors = BLDC motors
- Standard Ethernet connection for parameterization with NanoIP
- Either two Ethercat or CANopen interfaces depending on the fieldbus module
- 8-wide range inputs (5-24 V) and 8 switching outputs (up to 50 V, 1 A)
- 2 analog inputs
- 2 encoder inputs (one for commutation, one optional external position control)
- Output for holding brake
- Safe Torque Off acc. to IEC 61800-5-2

NanoIP
- A webserver runs on every motor controller which can be used to access NanoIP over the browser-based user interface
- Convenient access to the entire object dictionary for the parameterization of the drive, convenient auto tuning with integrated scope for analysis of the control response
- Own interfaces, e.g. with reduced configuration options for the machine operator, can be created simply by changing the HTML source code of NanoIP and can be loaded into a subdirectory of the controller via NanoIP
- Nanop programs can be imported onto the controller and started. The speed of NanoIP on the N10 has been greatly increased so that the reaction time to time-critical signals from inputs is less than 2 ms.

Multi-axle applications with CoDeSys and CANopen interpolated mode

Interpolated Mode now also makes it possible to drive Nanotec stepper motor controls or Plug & Drive Motors directly via path controls with CANopen interface in accordance with the DSP402 standard. This means a ready-to-use driver is available from 3S-Smart Software Solutions GmbH for the CoDeSys V3 SoftMotion soft PLC, for example, which makes the controller easy to integrate.

For the production of our Plug&Drive motors, sealant has to be applied to the lid. Due to the large number of variations that depend on the size of the motor or customer-specific versions, the applied sealing contour must be easy to change in production.

To automate this process, we have used our own motors in conjunction with CoDeSys

Two Plug & Drive PD4-N5918 motors move the dosing head onto the track prescribed by the soft PLC via toothed belt axes. The simple importing of contours from our CAD system means the production staff can produce new sealing contours without the need for PLC programming knowledge.

Integration of the Nanotec positioning controls in CoDeSys

After installation of the soft PLC, in our case on an industrial PC, the library supplied for the Nanotec CANopen drives is installed first. The two motors can then simply be added as devices and configured over the CAN bus (left figure) using the EDS (Electronic Datasheet) of the Plug & Drive motors.

The PDO Mapping and SDOs of the controller can be configured directly via CoDeSys (middle figure). CoDeSys is configured to the extent that the Plug & Drive motors can be accessed per CAN. DXF files can now be imported via the CNC menu of SoftMotion (right figure).

Importing and running through contours

After importing the moving curve, a CNC program is automatically generated. Also the moving curve can still be modified later, however, before it is converted into Gcode by CoDeSys.

After creation of the Gcode program, the simple user interface for the machine operator, that runs through the loaded contour at the single press of a button after the reference run, can be started.

Then the soft PLC only sends individual target positions of the contour to be moved through to the two Plug & Drive motors.

Interpolation of the curve lying between the individual points and the complete attitude and position control is taken over by the motor itself in closed loop mode (see box below).

Sinusoidal commutation with encoder during ClosedLoop operation

In contrast to conventional stepper motor positioning controls where only the motor is actuated or the position adjusted via the encoder, sinusoidal commutation controls the stator magnetic field via the rotary encoder as in a servomotor. In this mode the stepper motor behaves just like a high-pole servomotor, i.e. the conventional stepper motor noises and resonances disappear: up to its maximum torque the motor can no longer lose steps. This regulation always adjusts the level of the current to the torque currently required so that current consumption and heat generation are considerably reduced compared with a conventional stepper motor when the maximum torque is not permanently required.

Especially at speeds up to 1500 rpm or torques up to 10 Nm, the sinusoidal commutated stepper motor presents an economic alternative to conventional servosystems because, in contrast to these, a direct drive without gears is often possible.
BLDC motors

The latest version of Nanopro and the associated firmware for our motor controller with dspDrive also supports the control of BLDC motors, both via Hall sensors as well as via an encoder. Even if the motors are only controlled with Hall sensors, no simple block commutation is used but the windings are sinusoidally commutated through interpolation of the Hall signals. Configuration of the motor is carried out just as simply as already for the control of a stepper motor. After selection of the motor type, the constant current and the peak current can be set. In addition, the controller even offers the possibility of limiting the peak current over I²t.

Their advantages at a glance

- Significantly higher efficiency and power density than induction motors (with approx. 35% volume and weight reduction at the same load).
- Longest expected service life and quiet running using brushless technology with precision ball race.
- Mechanically interchangeable with stepper motors, and hence less construction expense and greater variety of parts.
- Large selection of economic components such as gears or encoders up to 1000 pulses per revolution for high-resolution positioning control, for example.
- Simple speed control through integrated Hall sensors – can be expanded into a high-performance servomotor for high speed ranges with the optional Nanotec encoder.
- Special low-cost gears with reduction ratios from 1:4 up to 1:256 are optionally available.

DB22
4 - 8 W, Ø 22 mm

Price example for DB22M01, nominal power 4 W - 4800 rpm
1 pc.: 62.90 €  
Price per unit from 25 pcs.: 44.03 €

DB28
6 – 16 W, Ø 28 mm

Price example for DB28S01, nominal power 6 W - 8000 rpm
1 pc.: 51.90 €  
Price per unit from 25 pcs.: 36.33 €

DB42
30 – 150 W, flange size 42 mm

Price example for DB42S01, Nominal power 30 W - 600 rpm
1 pc.: 39.90 €  
Price per unit from 25 pcs.: 27.90 €

DB57
50 – 100 W, flange size 56 mm

Price example for DB57S01, Nominal power 50 W - 2700 rpm
1 pc.: 63.90 €  
Price per unit from 25 pcs.: 44.73 €

DB87
250 – 650 W, flange size 86 mm

Price example for DB87L01-S: Nominal power 650 W - 3000 rpm
1 pc.: 206.90 €  
Price per unit from 25 pcs.: 144.83 €

Motors for harsh ambient conditions - stepper motors in protection class IP65

IP65 - AS2818 - AS4118 - AS5918 - AP8918 stepper motors with M12 connector in IP65

Machine-compliant stepper motors with protection class IP65 (except on shaft diameter) offer the constructor a consistent drive concept. They are mechanically interchangeable with the standard motors and because of the compact junction box, are only slightly longer. They can also be supplied with an integrated encoder.

Price example for AS5918S2804: Length 73 mm, holding torque 85 Ncm
1 pc.: 59.90 €  
Price per unit from 25 pcs.: 41.93 €

Linear actuators in the size 28 - 56mm

Principle: A threaded bushing is incorporated in the hollow shaft of the motor, which then adjusts the spindle in an axial direction. The spindle must be secured against torsion or an optimized antirotational device of the AR-28 / AR-41 series can be used.

L2818 series
- New construction, also available with encoder
- Trapezoidal spindle T10x2, 0.01 mm/step
- 80 N thrust, adjustable axial play
- Version available with antirotational device AR-28

Price example for L2818L6004-T5x5
1 pc.: 78.90 €  
Price per unit from 25 pcs.: 55.93 €

L4118 series
- Improved construction, also available with encoder
- Various pitches available, up to 0.005 mm/step
- Max. 500 N thrust, adjustable axial play
- Version available with antirotational device AR-41

Price example for L4118S1404-T6x1
1 pc.: 69.90 €  
Price per unit from 25 pcs.: 48.56 €

L5918 series
- New construction, also available with encoder
- Trapezoidal spindle T10x2, 0.01 mm/step
- 1000 N thrust, adjustable axial play
- Version available with antirotational device from Q1/2010

Price example for L5918S2008-T10x2
1 pc.: 119.00 €  
Price per unit from 25 pcs.: 83.93 €

Linear positioning drives, size 28 - 42mm

Principle: In linear positioning drives a thread is incorporated in the shaft of the motor and the nut guides the linear movement on the spindle.

LS2818/LS4118 series
- New construction, also available with encoder / M12 connector
- Various pitches, up to 0.005 mm/step
- Max. 400 N thrust, max. 150 mm stroke
- Different nuts available

Price example for LS4118S1404-T6x2
1 pc.: 119.00 €  
Price per unit from 25 pcs.: 83.93 €

Linear actuators for harsh ambient conditions

For series applications (from 100 pieces), we can also supply our linear actuators and linear positioning drives in protection class IP65. In the variant with antirotational device, the output of the pushrod can also be executed in IP

- L41, L59 series optionally with integrated encoder
- L59 series optionally with integrated controller PD4-N
- Antirotational device optionally with a Hall sensor as a limit switch
Product innovations

New ultraflat stepper motor
With a step angle of 1.8°, <10 mm construction depth, 6 Ncm, 4000 rpm. Ideal for slim or feeder applications where high accuracy is required despite low overall height!

Price example for ST6318F1004
1 pc.: 39.90 €  Price per unit from 25 pcs.: 27.93 €

3-phase stepper motors in construction sizes 40, 56, 86 and 110
3-phase stepper motors are traditionally used in many applications which especially require low level of noise and vibrations, which also show better running performance than the 2-phase motors for simple control. Due to modern control technology such as the dspDrive process of Nanotec controllers, this lead of 3-phase motors has disappeared more and more so that today they only occupy a small part of the market in standard applications. Nevertheless, there are still applications where 3-phase technology is advantageous, e.g. if higher synchronicity is required at low speeds. For such applications or if it would be technically too demanding to change to 2 phases, we now also offer 3-phase stepper motors (from 100 pieces) in sizes 56 and 86. We can now also control the motors with the new N10 controller. Just send us your specification!

New production building in China
Since 2005 we have been producing the motors of our new series in our joint venture at ChangZhou near Shanghai. Since we reached the limits of the existing building with 300 employees and a production volume of 120,000 motors per month, in June we moved into a new building with more than 5000 m² production space.

We took advantage of the relocation to further automate the mechanical production: Two new automatic honing machines for the stators and a powder coating installation for the rotors were installed. An additional special NC long turning lathe for producing the motor shafts now enables us to increase our depth of production in this sector, and hence we can react more flexibly and faster to customer-specific requirements.

Also in the final assembly, we can now produce up to 160,000 motors per month on 11 production lines that have been specifically oriented to motor types and quantity demands. Additional in-house cable assembly also makes us more independent of suppliers.

Due to our 20 years of experience in motor production in Asia, we naturally also place particular emphasis on quality assurance: Since 2006, we test samples of mechanical components on a Zeiss 3D coordinate measuring machine. For the final inspection of the motors, we employ specifically developed automatic testing devices at many points, e.g. for checking the back emf or axial play of the motor.

Our complete range of products can be found on the Internet at: www.nanotec.de

On the Internet you can find our complete range of products, of which we have simply shown a small selection here, and much more.
- Small quantities up to 25 pieces can be ordered directly from our website
- True-to-scale drawings as PDF, DWG, DXF or 3D – without registration or longwinded searching directly on the product site
- Torque characteristics of all motors for different operating voltages and controls
- Possible options for the motors, such as additional encoders, gearboxes, and safety brakes, are directly displayed. You do not have to search laboriously to find out which products are compatible
- More than 4000 possible versions available in stock

Motor modular system
More than 4000 possible versions available in stock

We can construct the optimum drive for you in just a few days from our versatile range of stepper motors and BLDC motors in many sizes and windings, plus a wide range of accessories consisting of gears, safety brakes, optical encoders and other options such as vibration dampers, shaft couplings, connection cables etc. More than 4000 combinations are possible with our stepper motor modular construction kit system.

Also available for other sizes

Example: ST5918 (NEMA 23) stepper motor with options

Gears
- GPL precision gear series from 22 to 80 mm, extended service life expectation
- GSGE angular gear series for Nema 34 and Nema 34 motors
- GSGE angular gear series for high speed and dynamics
- GPL economy planetary gear series provides cost savings for large series (22 to 56 mm)

Motor
- Hybrid stepper motors with a large range of services at favorable prices
- BLDC motors (22 to 86 mm) for high speed and dynamics
- Economic permanent magnet stepper motors from a size of 6 mm
- BL safety brake series economically in the series

Brake
- BKE safety brake series for a wide range of motor sizes
- Customer-specific brakes are also possible (up to 9 Nm)
- BL safety brake series for high interference immunity

Encoder
- New HD25541 1000 incr./rev encoder series for as little as 29.90 €
- Miniature encoder up to 200 incr./rev incl. connection cable
- New encoder for the NEDL series, Nanotec encoders for high interference immunity

Price example for ST6318F1004
1 pc.: 39.90 €  Price per unit from 25 pcs.: 27.93 €
The company

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