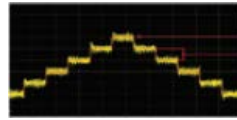


# NPM<sub>PM</sub>



±0.4nm jitter  
1nm steps



## EtherCAT<sup>®</sup> Dual & Single Axis NanoPWM<sup>™</sup> Drive Module

### **Powerful & Smart EtherCAT Drive Module**

- > Two drives per module for Gantry control
- > Voltage: 12Vdc – 100Vdc
- > Current: Up to 13.3A / 40A (cont./peak)

### **The Ultimate Drive for Demanding Positioning Applications**

- > Sub-nanometer standstill jitter
- > Nanometer tracking error and optimal velocity smoothness

### **Smart Motion related I/O**

- > Digital I/O
  - > Inputs: 4 encoder registration MARK / general purpose
  - > Outputs: 2 Position Event Generators, 2 motor brake / general purpose
- > Analog I/O
  - > Inputs: 4, 12 bit resolution, +/-10V
  - > Outputs: 4, 16 bit resolution, +/-10V

### **Uncompromising speed and resolution**

- > Up to 4 Analog Sin-Cos 1Vptp encoders with frequency up to 10MHz
- > Encoder multiplication of 4 to 65,536
- > Automatic encoder compensation and error detection
- > Dual feedback support
- > Two squared Sin-Cos
- > Position feed forward for active vibration isolation systems
- > Optional internal relays for dynamic braking (shorting motor phases)

### **A Lower Cost of Ownership Alternative to Linear Drives**

- > Lower heat dissipation
- > Better reliability
- > Significantly smaller
- > Simpler supply requirements
- > Digitally controlled and easy setup

The NPM<sub>PM</sub> is a line of the most advanced PWM servo drives available today.

It is specifically designed to address the most demanding applications with regards to move and settle times, standstill jitter, and velocity smoothness, such as wafer metrology and inspection, FPD inspection, and ultra-precision machining for processing of optical components. It is based on the proprietary and unique **NanoPWM** technology that exceeds stand still jitter and tracking error performance that until now has been achieved only with linear drives, with reduced cost of ownership.

With the optional combination of a 10MHz laser encoder interface and the powerful **ServoBoost** algorithm, demanding sub-nanometer resolution positioning systems can achieve ultimate throughput and accuracy with minimal sensitivity to disturbances and stage to stage manufacturing differences.

The NPM<sub>PM</sub> is a slave that runs under any ACS EtherCAT master.

A comprehensive set of software support tools are provided for module configuration, setup and tuning.

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## Specifications

Per Axis	A	B	C	D
Continuous/peak current Sine amplitude [A]	3.3/10	6.6/20	10/30	13.3/40
Continuous/peak current [Arms]	2.3/7	4.6/14.1	7/21.2	9.4/28.2
Maximum cont. Input current [Arms]	2.6	5.3	8	10.6
Maximum heat dissipation[W]	7+0.9x (no. of drives)	7+2.1x(no. of drives)	7+3.7x(no. of drives)	7+5.6x(no. of drives)
Peak current time [sec]	1			
Minimum load inductance @100Vdc [mH]. Can be derated linearly for lower voltages	0.05			
Per Module				
Control voltage input [Vdc]	24 ±10%			
Drive voltage input range [Vdc]	12 – 100 (90 recommended)			
Maximum drive voltage [Vdc]	(Vin motor) x 88%			
Maximum cont. input current [Arms]	5.2	10.6	16	21.2

### Drives

Type: digital current control with field oriented control and space vector modulation.  
 Programmable Current loop bandwidth: up to 5 kHz.  
 Commutation type: sinusoidal. Initialization with or without Hall sensors.  
 Built-in motor phases shortening relays  
 Switching method: advanced unipolar PWM.  
 Protection: Over and under voltage, Over current, Phase to phase and phase to ground short (short circuit on one of the motor phases might damage the drive).

### Supplies

The module is fed by two power sources, a motor supply and a 24Vdc control supply. During emergency conditions there is no need to remove the 24Vdc control supply.  
 Motor Drive Supply:  
 Range: 12Vdc to 100Vdc,  
 Recommended range: 12Vdc - 90Vdc.  
 Current rating should be calculated based on actual load.  
 If regen resistor is required, it should be added in parallel to motor supply with 102V activation.  
 Mating connector is not supplied.  
 Control Supply:  
 Range: 24Vdc ± 10%.  
 Maximum input current / power: 0.9A @ 21.6V/ 20W without motor brakes  
 With 2 motor brakes: 1.9A@21.6Vdc/42W.  
 Built-in motor phases shortening Relays  
 Protection: reverse polarity. A 3A external fuse must be used.  
 Mating connector is supplied

### Motor Types

Two- and three-phase permanent magnet synchronous (DC brushless/AC servo), DC brush, Voice coil, Two- and three-phase stepper (micro-stepping open or closed loop).

### Feedback

Types: Incremental digital encoders (AqB), Hall inputs, analog Sin-Cos (optional), absolute encoders (optional).  
 Incremental Digital Encoder: Two per axis. A&B, I and Clk/Dir  
 Type: Differential RS-422. Max. rate: 50M quad counts/sec.  
 Protection: Encoder error, not connected.  
 Sin-Cos Analog Encoder: Up to two per axis.  
 Type: 1Vptp, differential.  
 Programmable multiplication factor: x4 to x65,536.  
 Maximum frequency: 500kHz or 10MHz.  
 Maximum acceleration with Sin-Cos encoder: 10<sup>8</sup> sine periods/second<sup>2</sup>.  
 Absolute Encoder (optional): Up to two. Smart-Abs, Panasonic, BiSS-B/C, SSI, Sanyo Denki.  
 Hall inputs: A set of three per axis.  
 Type: single-ended, 5V, source, open cathode. Input current: <7mA.  
 Feedback supplies: For all digital feedback devices: 5V, 0.5A. For all analog feedback devices: 5V, 1.5A.

### Analog I/O

Analog Inputs: Four, ±10V, differential, 12 bit resolution.  
 Max. input frequency: 1 kHz. Offset: <30 mV.  
 Analog Outputs: Four, ±10V, differential, 16 bit resolution.  
 Offset: ±50mV, Bandwidth: 5 kHz. Max. output load: 10KΩ, Noise/Ripple: <40mV.  
 Squared Sin-Cos output: Two, differential RS422.

### EtherCAT Communication

Two ports, In and Out, RJ45 Connector

### Digital I/O

For different I/O configurations see ordering options.  
 Safety Inputs: Left & right limit inputs per axis.  
 Type: 24V/ source (default), single ended, opto-isolated, input current 4-14 mA  
 STO: 24V/ source (default), single ended, opto-isolated, input current 4-14 mA  
 Registration Mark: (High Speed Position Capture): Four, 24V±20%, opto-isolated, two terminals. Input current 4-14mA.  
 All dedicated inputs can be used as general purpose inputs.  
 Motor Mechanical Brake: Two, 24V/source (default), single ended, opto-isolated, 0.1A.  
 External Motor relay control: Two, 24V ±20%, source, 0.5A. These outputs are used to shorten the phases of the motors by external relays (if the optional internal relays are not present).  
 PEG (Position Event Generator): Two, Pulse or State, Differential, RS422.  
 Pulse width: 26nSec to 1.75mSec. Maximum rate: 10MHz.  
 All dedicated outputs can be used as general purpose outputs.

### Environment

Operating range: 0°C to + 40°C.  
 Storage and transportation range: -25°C to +60°C.  
 Humidity (operating range): 5% to 90% non-condensing.

### Dimensions

257 x 154.9 x 50.9 mm<sup>3</sup>.

### Accessories

NPXpm-ACC1: Mating connectors kit  
 UDMmc&NPXpm-ACC2: (J1) mating 2m flying lead cable  
 STO-ACC1: 2 meter cable with flying leads

### Certifications

CE: Yes  
 Safety: IEC 61800-5-1  
 EMC: EN61800-3  
 UL: UL 61800-5-1 (Pending)  
 Functional Safety: IEC 61800-5-1, IEC 61800-5-2

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Ordering Options	Field	Example User Selection	Values
Number of axes/drives	1	2	1, 2
Current	2	A	A - 3.3/10A B - 6.6/20A C - 10/30A D - 13.3/40A
500kHz SIN-COS encoder interface	3	0	0, 1, 2, 3, 4
10MHz SIN-COS encoder interface	4	4	0, 1, 2, 3, 4
Absolute encoders type	5	N	N - None, U - User selectable E - EnDAT 2.1 (digital)/2.2 S - Smart Abs, P - Panasonic B - BiSS-B/C, I - SSI, A - Sanyo ABS
Number of Absolute encoders interface	6	0	0, 1, 2
STO	7	Y	Y-Yes, N-No
Limit Switch Inputs	8	C	A - 5V, Source/PNP B - 5V, Sink/NPN C - 24V, Source/PNP D - 24V, Sink/NPN <sup>1</sup>
Digital Inputs	9	B	A - 5V, two-terminal B - 24V, two-terminal
Digital Outputs	10	A	A - 5V & 24V, Source/PNP B - 5V & 24V, Sink/NPN <sup>1</sup>
Motor relays	11	N	Y-Yes, N-No
Special options	12	N	N - No A - Customized for Constant Velocity following error of stages with dual-feedback, one Laser encoder / interferometer & one optical encoder Only channels 0,1 are ultra-fast. B - Customized for Constant Velocity following error of stages with dual-feedback, one Laser encoder / interferometer & one laser-scale/high res encoder. All channels are ultra-fast.
Total number of feedback channels	13	C	A - 2 (utilize 1 axis) B - 2 (utilize 2 axes) C - 4 (utilize 4 axes) D - 4 (utilize 2 axes)

<sup>1</sup>Sink/Source option requires external power supply. No Internal supply is available.

\*Contact ACS for details.

**Example: NPMpm2A04N0YCBANNC**

Field	1	2	3	4	5	6	7	8	9	10	11	12	13
PN NPMpm	2	A	0	4	N	0	Y	C	B	A	N	N	C

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