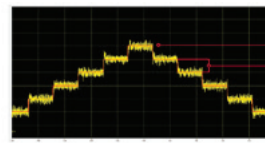# NPM*PM*

+/- 0.4nm jitter
1nm steps

EtherCAT® Dual & Single Axis NanoPWM 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

A Lower Cost of Ownership Alternative to Linear Drives

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

Uncompromised 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)

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

The NPM*PM* is a line of the most advanced 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*PM* is a slave that runs under any ACS EtherCAT masters.
A comprehensive set of software support tools are provided for module configuration, setup and tuning.

CE, UL (Pending), **STO**
EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

ACS
MOTION CONTROL

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)
Maximum cont./peak output power @ 100Vdc [W]	260/780	520/1560	790/2340	1050/3120
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 (96 recommended)			
Maximum output 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.
Current ripple frequency: 40 kHz
Current loop sampling rate: 20 kHz
Programmable Current loop bandwidth: up to 5 kHz
Commutation type: sinusoidal. Initialization with or without hall sensors
Switching method: advanced unipolar PWM
Built-in motor phases shortening relays
Protection: Over & under voltage, Over current, Over temperature, 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 - 100Vdc, recommended: 12Vdc - 96Vdc.
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 shunt activation.
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.

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: 10^8 sine periods/second^2.
Squared Sin-Cos output: Two, differential RS422.
Absolute Encoder (optional): Up to two. Smart-Abs, Panasonic, BiSS-A/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.

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 4-14mA.
STO: Two inputs, 24V ±20%. Input current: <50mA
All drives are disabled within 200mS
Registration Mark Inputs: (High Speed Position Capture): Four, 24V±20%, opto-isolated, two terminals. Input current 4-14mA.
Can be used as general purpose inputs.
General purpose output: Motor Mechanical Brake output: 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.
Can be used as general purpose output.

Analog I/O

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

EtherCAT Communication
Two ports, In and Out, RJ45 connector

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

Dimensions
257x154.9x50.9 mm³

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

Ordering Options

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	U - All, N - None, E - EnDAT 2.1(digital)/2.2, S - Smart Abs, P - Panasonic, B - BiSS-A/B/C, I - SSI, A - Sanyo ABS
Number of Absolute encoders interface	6	0	0,1,2
STO	7	Y	Y - Yes
Limit Switch Inputs	8	C	A - 5V, Source/PNP, B - 5V, Sink/NPN, C - 24V, Source/PNP D - 24V, Sink/NPN
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
Motor relays	11	N	Y - Yes, N - No
Special options	12	N	N - No
Total number of feedback channels	13	C	A - 2 (Occupies 1 controller network axes)* B - 2 (Occupies 2 controller network axes) C - 4 (Occupies 4 controller network axes) D - 4 (Occupies 2 controller network axes)*

* Available after Ver.2.30 release

Example: NPM_PM2A04N0YCBANNC

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

For the latest updates visit our website at **www.acsmotioncontrol.com**

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