NPMPC

100V/40A, PCB Mounted
NanoPWM™ 1,2-Axis EtherCAT™ Drive Module

The Ultimate Drive for the Most Demanding Positioning Applications

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

Smart Motion related I/O

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

Better Than Linear Drives

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

Uncompromising speed and resolution

- 1 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 outputs
- Position feed-forward for active vibration isolation systems
- Relays control outputs for dynamic braking
- Safe Torque Off (STO)

Smart Motion related I/O

- 4 encoder registration MARK inputs
- 2 Position Event Generator (PEG) outputs
- 2 motor brake / Relay outputs
- 4 analog inputs, 12 bit resolution, ±10V
- 4 analog outputs, 16 bit resolution, ±10V

The NPMPC 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.

The NPMPC is based on the ACS **Nano**PWM™ proprietary 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 **Servo**Boost™ 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 NPMPC is designed to be mounted on a custom carrier board. It enables customizing connectors, I/O configuration, STO and other safety function implementation.

For prototype testing and carrier board design reference it is recommended to use the NPMPM.

The NPMPC 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.

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 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 (90 recommended)			
Maximum drive voltage [Vdc]	(Vin motor) x 88%			
Maximum cont. input current [Arms]	5.2	10.6	16	21.2
Maximum heat dissipation [W] (i = no. of drives)	7 + 0.9 x i	7 + 2.1 x i	7 + 3.7 x i	7 + 5.6 x i

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.
Protection: Over and 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 to 100Vdc,
Recommended range: 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 activation.
Mating connector is not supplied.
Control Supply:
Range: 24Vdc ± 10%.
Maximum input current / power: 0.9A @ 21.6V/ 20W.
Mating connector is not supplied.
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).
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.
It is recommended to include a dedicated supply on the carrier board.

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. EnDat 2.1 (digital)/ 2.2, Smart ABS, Panasonic, BiSS-B/C, SSI, Sanyo ABS.

Digital I/O

For different I/O configurations see ordering options.
Inputs
Safety: Left & right limit inputs per axis.
Type: 24V/ source (default), single ended, opto-isolated.
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.
Outputs
Motor Mechanical Brake: Two, 24V/source (default), single ended, opto-isolated, 0.1A.
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.

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.

STO (Safe Torque Off)

Supports STO design to be implemented on the carrier board.

EtherCAT Communication

In and Out.

Environment

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

Dimensions

155 x 85 x 30 mm^3.

Weight

360 gr.

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

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	0	0, 1, 2, 3, 4
Absolute encoders type	5	N	U – User Selectable N – None 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
Limit Switch Inputs	7	C	A - 5V, Source/PNP B - 5V, Sink/NPN C - 24V, Source/PNP D - 24V, Sink/NPN[1]
Digital Inputs	8	B	A - 5V, two-terminal B - 24V, two-terminal
Digital Outputs	9	A	A – 5V & 24V, Source/PNP B – 5V & 24V, Sink/NPN[1]
Special options	10	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	11	2	A - 2 (utilize 1 axis) B - 2 (utilize 2 axes) C - 4 (utilize 4 axes) D - 4 (utilize 2 axes)

[1]Sink/Source option requires external power supply. No Internal supply is available.

Example: NPMpc2A00N0CBAN2

Field		1	2	3	4	5	6	7	8	9	10	11
PN	**NPMpc**	2	A	0	0	N	0	C	B	A	N	2