MP4U

8-Axis Modular EtherCAT Master Controller and Drive Module

> Three controller functional types:

> > **Drive controller:** An EtherCAT multi-axis drive subsystem under an ACS EtherCAT master controller

> > **Motion controller and EtherCAT master:** An EtherCAT master controller with up to 8 integrated drives

> > **Motion controller and EtherCAT master and an EtherCAT node:** Both an EtherCAT DS402 drive subsystem under any EtherCAT master controller and an EtherCAT master controller with integrated drives

> High performance and economical type of drives

> > *NanoPWM*™ drives for nanometer level jitter and following errors

> > PWM for less demanding axes

> Wide range of current and voltage

> > Current: 3.3/10A to 13.3/40A (cont/peak)

> > Voltage: 48Vdc and 96Vdc

> 1.6 kW and 3.2 kW power supply with AC input

> > 96Vdc/32A

> > 48Vdc/32A or 48Vdc/ 64A

> > Both 96Vdc/32A and 48Vdc/32A

> Safe Torque Off (STO) option

> All connectors are located on the back of the enclosure

> Built-in fans with air flow from the front to the back of the enclosure

> ACS field proven robustness and reliability

The MP4U is an 8-axis modular EtherCAT master controller and drive module that enables the user to tailor the specific drive for each axis. Different drives can be selected for each pair of axes as well as the power supplies. Two types of drive module can be specified: The *NanoPWM*™ (NPM3U) drives for the highest performance of position jitter and following error demanding axes, and the more economical PWM (UDM3U) drives for the less demanding axis. Each module (two or one axis) can be specified for 3.3/10A (cont/peak) to 13.3/40A and can be connected to either 96Vdc or 48Vdc. The power supply is made of one or two plug-in modules, each fed by a single phase AC input and generating 48Vdc/32A output. The system can be ordered with one supply module providing 48Vdc/32A or two modules, connected either in parallel and providing 48Vdc/64A, or connected in series and thus providing 96Vdc/32A as well as 48V/32A. For each of the four drive modules it can be specified by which voltage it is fed (when both 48Vdc and 96Vdc voltages are available). Each drive is available with optional motor shortening relays, absolute encoder, as well as 500kHz SIN-COS encoder interfaces. The *NanoPWM*™ is also available with a 10MHz SIN-COS encoder interface for laser type encoders. STO is an option that is specified for either none or for all drives.

The basic configuration consists of a power management module, which includes a logic supply that is fed by a dedicated AC input connector, and a regeneration module.

The user can select the power supply configuration, the type of each of the four drive modules, its current and which voltage (48Vdc or 96Vdc) to feed it and a motion controller and EtherCAT master. Consult ACS for availability.

2-axis drive module	Regeneration module	Power supply module	Power management module	Motion controller module

Dimensions
19" Enclosure

Height [mm]	260 (6U)
Width [mm]	
With no ears	440
With ears	483
Depth [mm]	
Without handles	266
With handles	306

Weight [Kg]
4-axes: 11.8
8-axes: 13.3

EtherCAT® Communication
To connect to an ACS motion controller
Two ports: In and Out, 100 Mbit/sec, RJ45 connector

Accessories
PN MP4U-ACC1: 4-axes mating connectors kit
PN MP4U-Acc2: 8-axes mating conenctors kit

In-Position Technologies

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

ACS MOTION CONTROL

Plug-in Modules

Controller

Working as drive controller
Internal motion controller operates as an EtherCAT node and is managed by an external ACS EtherCAT master
The controller will do the following hardware setup identification functions:
> Number of power supply modules
> Power supply configuration
> Number and type of NPM/UDM3U drive modules
For this ordering option choose Motion Controller = No

Working as a motion controller and EtherCAT master
Controls the built in and all ACS EtherCAT network modules

Working as a motion controller and EtherCAT master and an EtherCAT node
Controls the built in and all ACS EtherCAT network modules
Controls non ACS Modules
ACS qualified drives and I/O modules made by other vendors
Refer to ACS web site for an updated list of other vendor's supported modules www.acsmotioncontrol.com/downloads
Other vendor's drives supported mode is Cyclic Synchronous Position (CSP)
Additional modes are supported by some drives

MPU
RAM - 1GB
Flash - 512MB
EtherCAT cycle rates: 1,2,4,5kHz (depends on the number of axes)

Drive Modules · Regeneration Module · Power Supplies · Power Management Module · Motion Controller

EtherCAT Ports
Communication with an External EtherCAT Master:
EtherCAT In & EtherCAT Out, RJ45 connectors
DS402 protocol (if built-in brdige feature is selected)
As an EtherCAT Master:
EtherCAT In & EtherCAT Out, RJ45 connectors
NetworkBoost™ (optional) - Automatic network failure detection and recovery using ring topology and redundancy
Additional Host Communication Ports
Serial: two RS-232. Up to 115,200 bps
Ethernet: One,100/1000 Mbs

Power Management

The MP4U is fed by two separate AC inputs.
DRIVE SUPPLY to feed the selected drive supplies and CONTROL SUPPLY to feed the built-in 24V control supply.
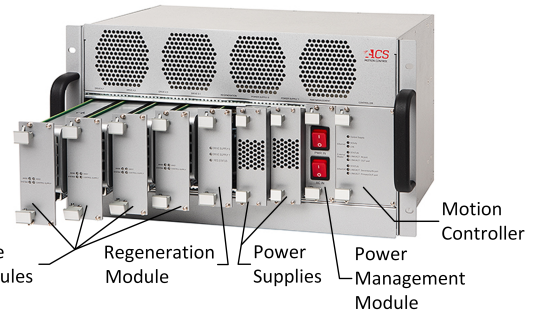**Drive Supply**
100 to 240Vac, single-phase, 50-60Hz
Control Supply
100 to 240Vac, single phase, 50-60Hz

Motor Power Supply

> 48V/32A
> 48V/64A
> 96V/32A
> Both 96Vdc/32A and 48Vdc/32A

Feature	Description			
Input voltage range [Vrms] Single-phase	100 -240			
Input frequency, nominal [Hz]	50 -60			
Configuration	48Vdc / 32A	48Vdc / 64A	96Vdc / 32A	48Vdc & 96Vdc
Minimum continuous/peak output voltage [Vdc]	46.14 / 45.54	46.14 / 45.54	93.18 / 92.58	46.14 / 45.54 & 93.18 / 92.58
Maximum continuous/peak output current @100Vac supply [Adc]	15.13 / 24	30.29 / 48	15.13 / 2	Total not to exceed 15.13 / 24A
Maximum continuous/peak output current @240Vac supply [Adc]	32 / 32	64 / 64	32 / 32	Total not to exceed 32 32
Maximum continuous/peak input current @100 Vac supply [Arms]	16 / 25.83			
Maximum continuous/peak input current @240 Vac supply [Arms]	13.97 / 13.97			
Efficiency [%] with 100Vac input	90 - 92			
Efficiency [%] with 240Vac input	93 - 95			
Maximum continuous/peak output power with 100Vac input [W]	1410 / 2222			
Maximum continuous/peak output power with 240Vac input [W]	2962 / 2962			
Maximum continuous/peak input power with 100Vac input [VA]	1600 / 2583			
Regeneration circuit	Regeneration control with built-in regeneration resistor, 12Ω, 100W, 1.5KW peak Protection Over temperature for the built-in regeneration resistor Regeneration resistor short circuit			
Certification	CE (EMC, Safety) and UL, Pending RoHS compliant			

Regeneration

Regeneration control circuit with built-in regeneration 12Ω/100W resistor
An external regeneration resistor with high power can be connected. It must be with a minimum 12Ω resistance
The circuit is short circuit and over-temperature protected

ACS MOTION CONTROL

Drive

Each plug-in drive module includes one or two identical drives. Both high performance *NanoPWM*™ drives (NPM3U) as well as PWM economical (UDM3U) are available. When both 96Vdc and 48Vdc are present, then it can be specified for each plug-in module by which voltage it is fed.

Per drive	NPM3U / UDM3U drive module			
Number or axes	1 or 2			
Drive voltage input range [Vdc]	48 or 96			
Continuous / peak current Sine amplitude [A]	3.3/10	6.6/20	10/30	13.3/40
Maximum continuous / peak output power per axis @48Vdc [W]	111/317	222/633	336/950	447/1266
Maximum continuous / peak output power per axis @96Vdc [W]	229/675	459/1350	695/2025	924/2700
Maximum continuous / peak output voltage 48Vdc drive supply [Vrms]	27.47/25.85			
Maximum continuous / peak output voltage 96Vdc drive supply [Vrms]	56.74/55.12			
Peak current time [sec]	1			
Minimum load inductance at 96Vdc [µH]	50			
Per module				
Drive voltage input range [Vdc]	48 or 96			
Continuous / peak current Sine amplitude [A]	3.3/10	6.6/20	10/30	13.3/40
Maximum continuous input current per plug-in drive module (i=1 or 2 number of drives) [Arms]	i x 2.5	i x 4.9	i x 7.5	i x 10.0
Maximum heat dissipation per plug-in drive module (i=1 or 2 number of drives) [W]	7 + i x 0.9	7 + i x 2.1	7 + i x 3.7	7 + i x 5.6
Maximum heat dissipation by the drive supply per plug-in drive module (i = 1 or 2 number of drives) [W]	i x 12	i x 24	i x 37	i x 49
Maximum total output power continuous / peak with 100Vac input (all axes operating) [W]	1371/2144 @ 48Vdc drive supply 1395/2201 @ 96Vdc drive supply			
Maximum total output power continuous / peak with 240Vac input (all axes operating) [W]	2931/2931 @ 48Vdc drive supply 2931/2931 @ 96Vdc drive supply			

Drives
Up to 4 3U plug-in drive modules can be installed in a MP4U enclosure
Up to 8 drives with two drives per one 3U plug-in driver module
The two motor drives on a 3U drive module must drive the same type of motor
Type: three-phase bridge
Switching method: Advanced unipolar PWM
Protections: Short current, over current, over temperature, over voltage, under voltage
Built-in motor phase shortening relays (optional): disconnects the motor phases from the drive and shortens the phases of the motor

Digital I/O
Limit inputs
One left and one right limit per aixs
Single-ended, 5/24V, sink/source*
Default: 24V, source, Opto-isolated, Input current: 4-14mA
MARK / General Purpose Inputs
Two per axis (one primary and one secondary)
Two terminals, 5/24V*, opto-isolated, Default: 24V
Can be used as general purpose digital input
Motor Brake / General Purpose Outputs
One per axis, Opto-isolated, 0.1A per output
Single-ended, 5/24V, sink/source*, Default: 24V, source
Protection: short circuit
PEG (Position Event Generation) / General Purpose Outputs
One per axis, PEG Pulse or PEG State
Differential, RS-422
Max. rate: RS422: 10MHz
Programmable pulse width: 26nSec - 1.75msec
Can be used as general purpose outputs

STO (optional)
Two inputs, 24Vdc, 2A supply output for the external drives
Standards (NPM3U): IEC61800-5-2:2016, EN 62061:2005 , EN ISO 13849-1:2008

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
The following feedback types are supported:
Incremental Digital Encoder
Two per axis (one primary and one secondary), AqB,I and Clk/Dir,I
RS-422
Maximum input frequency: 50 million encoder counts/ sec
Protections: Encoder error, not connected
Incremental Analog SIN-COS Encoder (optional)
Two per axis (one primary and one secondary)
1Vptp, analog differential, 16-bit resolution
Maximum speed – NPM3U: two options: 500kHz or 10MHz
                            – UDM3U: 500kHz
Protections: Encoder error, not connected
Squared SIN-COS output
One per axis, RS-422
Sharing pins with the corresponding incremental primary incremental encoder
Absolute Encoder (optional)
One per axis, RS-485
Type: EnDat 2.2 & 2.1 digital only, Smart-Abs, Panasonic, Biss-A/B/C, SSI, Sanyo Denki ABS
Hall inputs
One set of three per axis, 5V, source, isolated
Input current: <7mA

Analog I/O
Inputs: Four per drive module, ±10V, differential, 12 bit resolution, maximum input frequency 1KHz
Outputs: Four per drive module, ±10V, differential, 16 bit resolution

*Contact ACS for ordering options for the different configurations.

ACS
MOTION CONTROL

A Complete System Tailored to Your Exact Needs

Contact ACS to order from the options specified in the table that follows.

Component / Feature	Options
Motion Controller	Y - Yes, N - No
Number of axes	A - 2, B - 4, C - 8, D - 16, E - 32, F - 64
ServoBoost™, number of axis supported	N - 0, A - 4, B - 8, C - 12, P - 60, Q - 64
Number of ACSPL+ buffers	A - 10, B - 16, C - 32, D - 64
Maximum MPU cycle rate (kHz)	1kHz (64 axes), 2kHz (up to 32 axes), 4kHz (up to 16 axes), 5kHz (up to 8 axes)
NetworkBoost™, Flexible configuration	N - None, A - NetworkBoost, B - Flexible configuration, C - Both
Input shaping	Y - Yes, N - No
EtherCAT master to master bridge	Y - Yes, N - No
G-Code	Y - Yes, N - No
STO	Y - Yes, N - No
Limit switches	A - 5V, Source/PNP B - 5V, Sink/NPN C - 24V, Source/PNP D - 24V, Sink/NPN
Digital Inputs	A - 5V, Two terminal B - 24V, Two terminal
Digital Outputs	A - Source/PNP, 5V & 24V B - Sink/NPN, 5V & 24V
Power supply	A - 48V, 32A, B - 48V, 64A, C - 96V, 32A, D - 96V & 48V

> 📌 For each drive slot 1, 2, 3, 4,
> select from all of the available feature options that follow.

Drive module	N - None, U - UDM, P - NPM
Number of drives	1, 2
Current	A - 3.3/10A, B - 6.6/20A, C - 10/30A, D - 13.3/40A
Connected voltage	A - 48V, B - 96V
500kHz SIN-COS encoder interface	For UDM: 0, 1, 2 For NPM: 0, 1, 2, 3, 4
10MHz SIN-COS encoder interface	For UDM: 0 For NPM: 0, 1, 2, 3, 4
Absolute encoders type	N - None, U - User selectable, E - Endat 2.2 & 2.1 digital only, S - Smart Abs, P - Panasonic, B - BISS-A/B/C, I - SSI, A - Sanyo ABS
Number of absolute encoders interface	0, 1, 2
Motor relays	Y - Yes, N - No

In-Position Technologies

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

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