Programmable Multi Axis Controller

CK3M

Control with nanoscale precision
Maximize your machine's performance

Performing precise linear motor drive control and nanoscale positioning, the PMAC (Programmable Multi Axis Controller) has been appreciated by manufacturers of semiconductor manufacturing equipment and other leading-edge equipment. Omron now offers a next generation motion controller CK3M that packs PMAC’s superior motion control capability, multi-vendor connectivity, and flexible development capability into its compact design. The CK3M removes constraints and barriers and maximizes your machine’s capabilities.

Rapid

[ Nano-level high-precision control ]

Ultra-fast calculation takes high-speed, high-precision control to a new dimension. Its overwhelming calculation speed boosts your machine’s precision.

Ultra-high-speed synchronous control

The CK3M delivers world-beating*1 output speeds: 50 μs/5 axes. Ultra-high-speed feedback control enables precise path control in precision machining.

*1. Omron survey as of March 2018.

Fast servo cycle time for precise path control

The CK3M receives a feedback value and generates a command value to adjust to the target value at a high speed, providing more precise path control.

Flexible

[ Optimize system configuration ]

You can freely use multi-vendor actuators and encoders, which maximizes your machine’s performance.

Advanced encoders

The capability to accept the A/B phase signals and parallel binary signals from serial data interfaces enables high-precision positioning using advanced encoders.

Various actuators

Axes can be controlled by analog Commands (DAC) and Direct PWM. The CK3M can interface with virtually any type of motor including voice coil motors and linear motors to provide precise machine operation.

EtherCAT® interface

The built-in EtherCAT® communications port is used to connect EtherCAT® slaves including servo drives, inverters, vision systems, sensors, and I/O. Flexible systems can be configured.
Capable

[Continuous development through customization]

The PMAC architecture with flexible function development capability helps you realize your ideas such as incorporation of your own algorithms.

Programming flexibility

G-Code, ANSI C, or original programming language allows you to create complex and advanced algorithms.

You can create programs to control robots that follow complex paths.

In addition to customizing standard G-Code functions, you can also incorporate your own G-Code functions.

Custom servo algorithms

Full closed loop control by servo drives can be incorporated into the controller. You can customize machine control such as vibration suppression optimized for the machine mechanism.

Easy

[Easy to use like a PLC]

Its compact design facilitates installation in the control panel. Unit connection without tools and DIN track mounting make installation and replacement more efficient.

Modular design

The modular design allows you to freely combine the CK3M with CK3W units to enable a variety of applications.

Tool-free connection & compact size

Units can be easily connected without tools. Its compact design reduces control panel size.

Approx. 1/3 volume of UMAC, saving space in control panels.

*DIN track mounting

Units can be easily mounted on a DIN track in a control system.

Approx. 1/3 volume of UMAC, saving space in control panels.

*2. CK3W-PD + CK3M-CPU + two CK3W-AX
High-precision control of precision mechanisms

Used in conjunction with advanced actuators, encoders, and precision mechanisms, the CK3M enables a wide variety of applications where both speed and accuracy are required.

Rapid
Nano-level high-precision control

Flexible
Optimize system configuration

Capable
Continuous development through customization

Easy
Easy to use like a PLC

Application

Processing/pressing machines
High-speed, high-precision processing for electric discharge machines, water jet machines, laser processing machines, grinders, and precision pressing machines
Mechanism

High-precision stage using high-resolution motor and encoder

Gantry mechanism using linear motors and encoders

Customized robot

Multi-axis mechanism requiring synchronous control

Semiconductor/FPD manufacturing/inspection machines

Extremely precise motion for exposure machines, linear coaters, dispensers, and wafer inspection machines

Robots

Complex mechanical control for machines using customized robots
Integrated development environment (IDE)
Power PMAC IDE

The Power PMAC IDE is an integrated development environment based on Microsoft® Visual Studio® that development engineers use as a development platform around the world. This IDE integrates motion programming for PMAC, motor setup and tuning, debugging, and troubleshooting. Lightweight, sophisticated GUI provides intuitive user operations, which helps you improve application development productivity.

Microsoft® Visual Studio® based integrated development environment
Assignment settings for CPU, hardware, EtherCAT®, coordinate systems, and motors can be accessed from one screen.

ANSI C or original programming language
In addition to programming in ANSI C and C-language like original programming language, G-Code can be used to write subroutines for G-Code actions.

- Easy tuning
  Autotuning facilitates tuning of motors. You can fine tune motors through intuitive operations.

- Simple setting
  Just follow the workflow to set up motors.

- Troubleshooting
  Possible solutions to your problems are suggested.

- Debugger
  It provides the Microsoft® Visual Studio® style debugger for Script PLC programs and C background programs.

- IP Protection
  IP Protection allows engineers to protect their intellectual property by encrypting script programs

An engineer can encrypt the script programs per file and pass the project on to another engineer. The engineer who takes the project can add their own logic but cannot list or view the code encrypted by another engineer. The encryption is three-level password protected: OEM builders, independent integrators, and users can share a project securely and flexibly.
Specifications

| Motion control | Max. no. of controlled axes | 24 (4 axes/axial interface unit x 4 units : 16, EtherCAT : 8) |
| Motion control period | 50 μs / 5 axes or more |
| Control method | Analog (Filtered PWM, True DAC, Pulse, Direct PWM) |

| Interface | Ethernet port, EtherCAT® port (CPU option) |

| Feedback | 3-phase, serial encoders |

| Memory | RAM | 1 GB |
| Flash | 1 GB |

| Number of connectable CK3W Units | CPU Rack | Up to four CK3W Units (or up to two CK3W-AX Units) |
| Expansion Rack | Up to four CK3W Units (or up to two CK3W-AX Units) |

System configuration

- **Software**: Power PMAC IDE
- **Hardware**:
  - **Modbus TCP**: Industrial switching hub
  - **EtherCAT**: 24 VDC
  - **Modbus TCP**: Programmable Terminal
  - **NJ/NX/NY**: Machine Automation Controller
  - **Digital I/O**: Sensor/actuator
  - **Digital/serial Sinusoidal**: Encoder
  - **DirectPWM Analog (+/-10V)**: Servomotor
  - **Switch Mode Power Supply**: S8VK-S
### PMAC Series family

#### Standard Models

<table>
<thead>
<tr>
<th>CPU Units</th>
<th>Memory capacity</th>
<th>EtherCAT® port</th>
<th>Max. no. of controlled axes via EtherCAT® port</th>
<th>Expansion</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>CK3M-CPU1</td>
<td>RAM: 1 GB</td>
<td>None</td>
<td>—</td>
<td>One expansion rack can be connected using the expansion master unit and expansion slave unit</td>
<td>CK3M-CPU101</td>
</tr>
<tr>
<td>CPU Unit*</td>
<td>Built-in flash memory: 1 GB</td>
<td>EtherCAT*: 1 port (DC sync)</td>
<td>4</td>
<td></td>
<td>CK3M-CPU111</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td>CK3M-CPU112</td>
</tr>
</tbody>
</table>

Axial Interface Units

<table>
<thead>
<tr>
<th>Product name</th>
<th>Amplitude interface</th>
<th>Encoder interface</th>
<th>Output type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axial Interface Unit</td>
<td>DirectPWM output</td>
<td>Digital quadrature encoder/serial encoder</td>
<td>NPN type</td>
<td>CK3W-AX1313N</td>
</tr>
<tr>
<td></td>
<td>DA output (Filtered PWM)</td>
<td></td>
<td></td>
<td>CK3W-AX1414N</td>
</tr>
<tr>
<td></td>
<td>DA output (True DAC)</td>
<td></td>
<td></td>
<td>CK3W-AX1515N</td>
</tr>
<tr>
<td>DirectPWM output</td>
<td>Sinusoidal encoder/serial encoder</td>
<td>PNP type</td>
<td>CK3W-AX1323N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DA output (Filtered PWM)</td>
<td></td>
<td></td>
<td>CK3W-AX1414P</td>
</tr>
<tr>
<td></td>
<td>DA output (True DAC)</td>
<td></td>
<td></td>
<td>CK3W-AX1515P</td>
</tr>
<tr>
<td>DirectPWM output</td>
<td>Sinusoidal encoder/serial encoder</td>
<td></td>
<td></td>
<td>CK3W-AX1232P</td>
</tr>
</tbody>
</table>

Power Supply Unit

<table>
<thead>
<tr>
<th>Product name</th>
<th>Specifications</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply Unit for CK3M-CPU1</td>
<td>Rated output voltage: 5 VDC / 24 VDC, maximum output current: 8 A (5 VDC)</td>
<td>CK3W-PD048</td>
</tr>
</tbody>
</table>

Digital I/O Units

<table>
<thead>
<tr>
<th>Product name</th>
<th>Number of inputs</th>
<th>Number of outputs</th>
<th>I/O type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital I/O Unit</td>
<td>16 points</td>
<td>16 points</td>
<td>NPN</td>
<td>CK3W-MD7110</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PNP</td>
<td>CK3W-MD7120</td>
</tr>
</tbody>
</table>

Analog Input Units

<table>
<thead>
<tr>
<th>Product name</th>
<th>Input range</th>
<th>Number of inputs</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input Unit</td>
<td>-10 to 10 V</td>
<td>8 points</td>
<td>CK3W-AD2100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 points</td>
<td>CK3W-AD3100</td>
</tr>
</tbody>
</table>

Expansion Master Unit and Expansion Slave Unit

<table>
<thead>
<tr>
<th>Product name</th>
<th>Function</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expansion Master Unit</td>
<td>Connect the Expansion Master Unit adjacent to the right side of the CPU Unit.</td>
<td>CK3W-EXM01</td>
</tr>
<tr>
<td>Expansion Slave Unit</td>
<td>Connect the Expansion Slave Unit adjacent to the right side of the Power Supply Unit.</td>
<td>CK3W-EXS02</td>
</tr>
<tr>
<td>Expansion cable</td>
<td>For connection between the Expansion Master Unit and the Expansion Slave Unit (0.3m)</td>
<td>CK3W-CAX003A</td>
</tr>
</tbody>
</table>

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Note: Do not use this document to operate the Unit.