

**Various encoder interfaces and
high-speed multi-axis control
by analog commands
for precise machine operation**



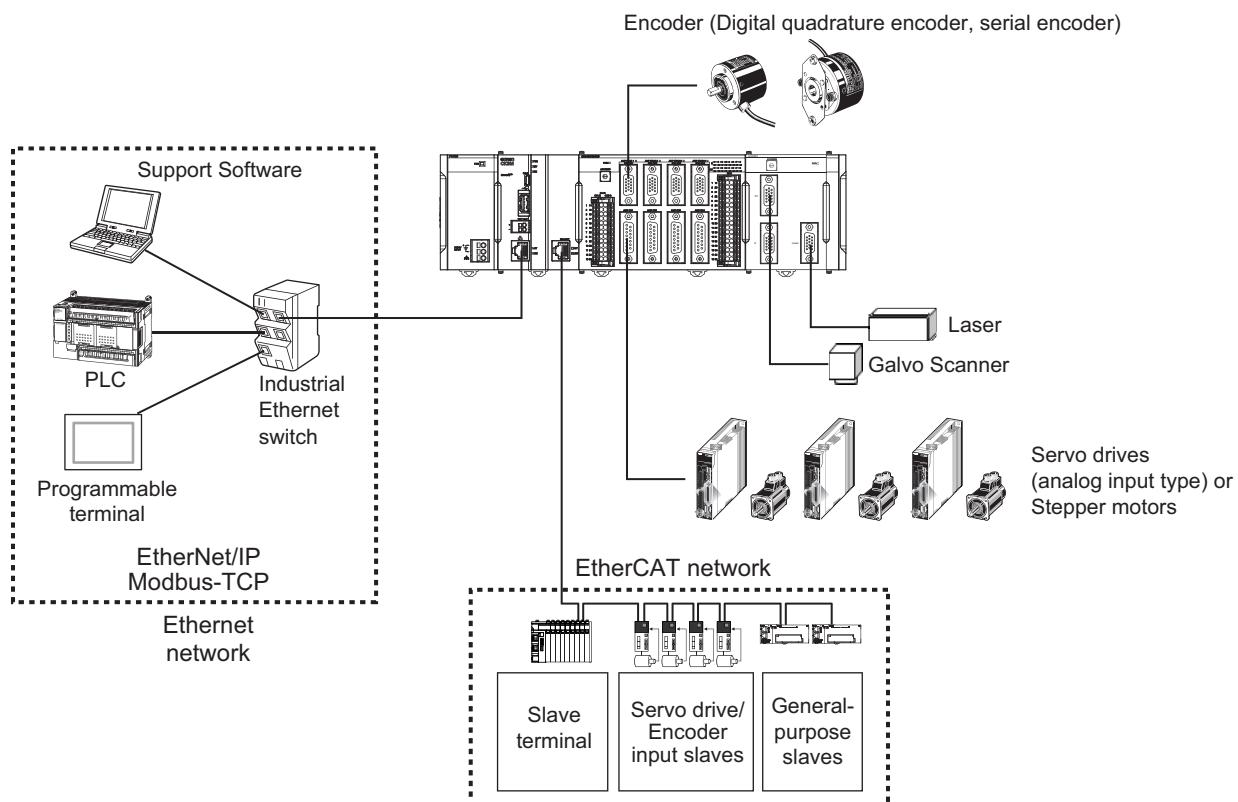
CK3W-AX□□□□□

Features

- One CK3W-AX Unit controls up to four axes
- Analog input servo drives or DirectPWM servo drives can be connected
- Digital quadrature encoders, serial encoders, and sinusoidal encoders can be connected as encoder input
- 16 digital inputs and 16 digital outputs are built in

System Configurations

Basic System Configuration



*1. You will need this unit when you use the Galvo Scanner.

CK3W Unit Configuration (CPU Rack/Expansion Rack)

The following shows the configuration of CK3W Units.

CPU Rack

The CK3W Unit configuration in the CPU Rack consists of a Power Supply Unit, CPU Unit, CK3W-AX Unit, CK3W-MD Unit, CK3W-AD Unit, CK3WECS Unit, CK3W-GC Unit, and End Cover.

Up to four CK3W Units (or up to two CK3W-AX Units) can be connected to the CPU Unit.

Expansion Rack

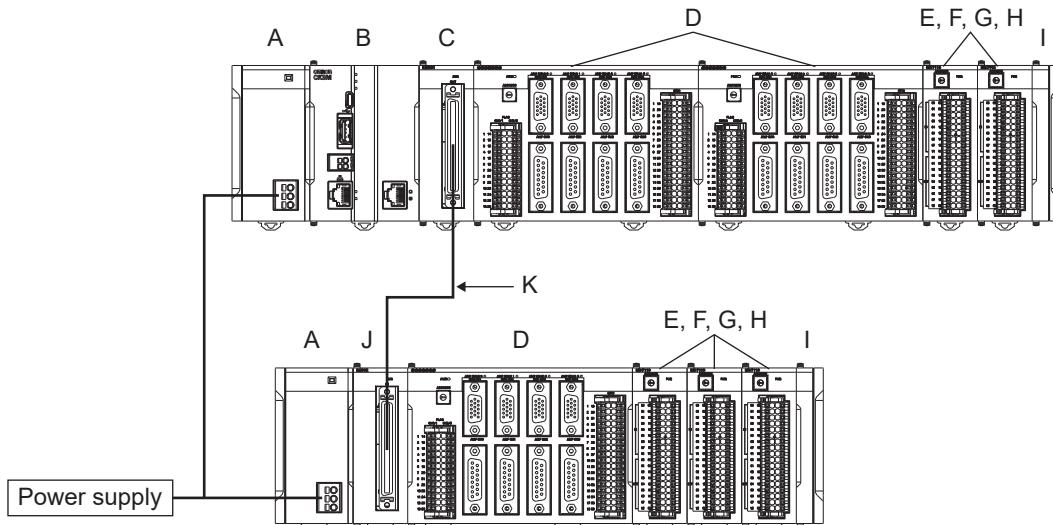
One Expansion Rack can be connected per CPU Unit.

To connect an Expansion Rack, use the Expansion Master Unit (CK3W-EXM01) and Expansion Slave Unit (CK3W-EXS02).

Up to four CK3W Units (or up to two CK3W-AX Units) can be installed to the Expansion Rack.

Connect the Expansion Master Unit (CK3W-EXM01) adjacent to the right side of the CPU Unit. Connect the Expansion Slave Unit (CK3W-EXS02) adjacent to the right side of the Power Supply Unit.

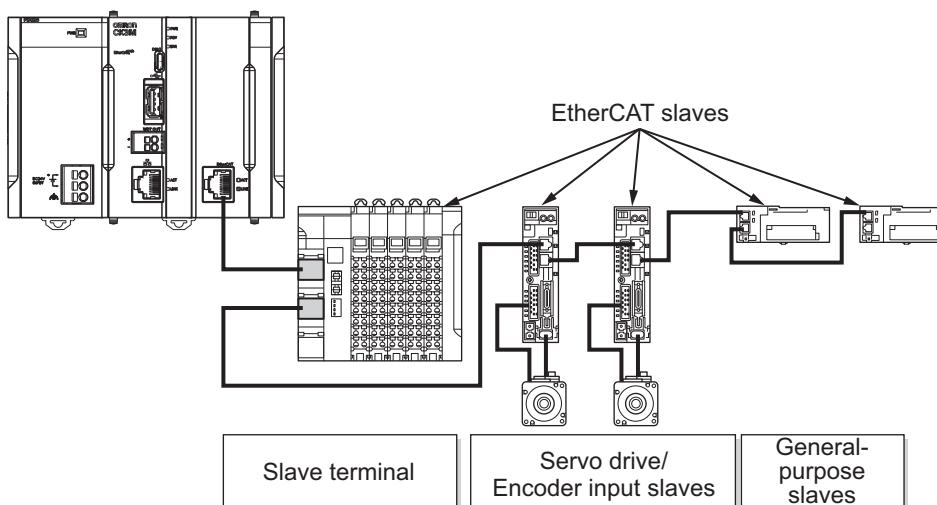
Unless the Expansion Master Unit (CK3W-EXM01) is connected adjacent to the right side of the CPU Unit, the Sys.Status register CK3WConfigErr becomes "5".



| Letter | Configuration | Remarks |
|--------|----------------------|---|
| A | Power Supply Unit | Input the 24 V power source. Always wire the CPU Rack and Expansion Rack to the same power supply. |
| B | CK3M-series CPU Unit | This is the Unit at the center of the motion control, which executes the motion program. |
| C | CK3W-EXM01 | Expansion Master Unit. Connect this Unit adjacent to the right side of the CPU Unit in the Expansion Rack. |
| D | CK3W-AX Unit | Axis Interface Unit. For axis control, connect this to a Servo Drive and encoder. |
| E | CK3W-MD Unit | Digital I/O Unit. You can add 16 digital inputs and 16 digital outputs. |
| F | CK3W-AD Unit | Analog Input Unit. You can add 4 or 8 voltage inputs. |
| G | CK3W-ECS Unit | Encoder Input Unit. You can connect four channels of the serial encoder. |
| H | CK3W-GC Unit | Laser Interface Unit. You can connect the Galvo Scanner compatible with the interface of XY2-100 or SL2-100. |
| I | End Cover | Must be connected to the right end of the CPU Rack and Expansion Rack. The CPU Unit and the Expansion Slave Unit are each provided with one End Cover. |
| J | CK3W-EXS02 | Expansion Slave Unit. Use this in the Expansion Rack. Connect this Unit adjacent to the right side of the Power Supply Unit. |
| K | Expansion cable | Use this cable to connect the Expansion Master Unit and the Expansion Slave Unit. The cable length is 30 cm. Be sure to use the CK3W-CAX003A (30 cm) cable. |

EtherCAT Network Configuration

The EtherCAT network configuration consists of a Power Supply Unit, CPU Unit, End Cover, and EtherCAT slaves. Use the built-in EtherCAT port on the CK3M-series CPU Unit to connect EtherCAT slaves.



EtherCAT is synchronized with the servo cycle of the CK3M-series CPU Unit. This enables acquisition of the I/O data of slave terminals that are synchronized with the servo cycle.

Refer to the *CK3M-series Programmable Multi-Axis Controller User's Manual Hardware* (Cat.No.O036) for information on using the NX-series EtherCAT Coupler Unit.

Ordering Information

Axial Interface Unit

The models and outline of specifications are given below.

| Product name | Amplifier interface | Encoder interface | Output type | Model |
|----------------------|--------------------------|---|-------------|--------------|
| Axial Interface Unit | DirectPWM output | Digital quadrature encoder/serial encoder | NPN type | CK3W-AX1313N |
| | DA output (Filtered PWM) | | | CK3W-AX1414N |
| | DA output (True DAC) | | | CK3W-AX1515N |
| | DirectPWM output | | | CK3W-AX2323N |
| | DirectPWM output | Digital quadrature encoder/serial encoder | PNP type | CK3W-AX1313P |
| | DA output (Filtered PWM) | | | CK3W-AX1414P |
| | DA output (True DAC) | | | CK3W-AX1515P |
| | DirectPWM output | Sinusoidal encoder/serial encoder | | CK3W-AX2323P |

Dedicated Cable for Wiring to Encoder Connector

| Type | Cable length | Model |
|--|--------------|---------------|
| For digital quadrature encoder | 3 m | CK3W-CAED03A |
| For sinusoidal encoder | 3 m | CK3W-CAEA03A |
| For serial encoder | 3 m | CK3W-CAES03A |
| For "digital quadrature encoder + UVW signal" or "digital quadrature encoder + serial encoder" | 3 m | CK3W-CAEW03A |
| For "sinusoidal encoder + UVW signal" or "sinusoidal encoder + serial encoder" | 3 m | CK3W-CAEAW03A |

Note: The encoder connection side has discrete wires. Wire in accordance with the encoder specifications.

Dedicated Cable for Wiring to Amplifier Connector

| Type | Cable length | Model |
|------------------------------|--------------|---------------|
| For FilteredPWM/TrueDAC type | 3 m | CK3W-CAA03A |
| For DirectPWM type | 0.9 m | CK3W-CAAD009A |
| | 1.8 m | CK3W-CAAD018A |
| | 3.6 m | CK3W-CAAD036A |

Note: The amplifier connection side of the CK3W-CAA03A Cable has discrete wires. Wire in accordance with the servo drive specifications.

General Specifications

This section describes the Motion Controller specifications.

| Item | | Specification |
|------------------------------|--------------------------------------|--|
| Enclosure | | Mounted in a panel |
| Grounding Method | | Ground to less than 100 Ω. |
| Operating Environment | Ambient Operating Temperature | 0 to 55°C |
| | Ambient Operating Humidity | 10% to 95% (with no condensation or icing) |
| | Atmosphere | Must be free of corrosive gases. |
| | Ambient Storage Temperature | -25 to 70°C (with no condensation or icing) |
| | Vibration Resistance | Conforms to IEC 60068-2-6. 5 to 8.4 Hz with 3.5-mm amplitude, 8.4 to 150 Hz, acceleration of 9.8 m/s ² 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total) |
| | Shock Resistance | Conforms to IEC 60068-2-27. 147 m/s ² , 3 times each in X, Y, and Z directions |
| Insulation Resistance | | 20 MΩ min. between isolated circuits (at 100 VDC) |
| Dielectric Strength | | 510 VAC between isolated circuits for 1 minute with a leakage current of 5 mA max. |
| Applicable Standards | | cULus, EU: EN 61326, RCM, KC, EAC |

Axis Interface Unit Specifications

The main specifications for axis interface are given below.

CK3W-AX1414□/-AX1515□

| Item | Specification (CK3W-) | | | | | |
|-------------------------------------|--|---|--|---------|--|--|
| | AX1414N | AX1414P | AX1515N | AX1515P | | |
| Address setting range | 0 to F | | | | | |
| Number of channels | 4 channels/Unit | | | | | |
| Encoder power supply output | 5 VDC 500 mA/channel or less However, the total output current of each Unit is 1 A or less. | | | | | |
| Digital quadrature encoder input | Input form | Line receiver input | | | | |
| | Maximum response frequency | Phases A, B, and C: 10 MHz | | | | |
| Serial encoder input | Supported protocol | Contact your OMRON representative for information on the support protocols. | | | | |
| Digital Hall sensor | | 4 points/channel (U, V, W, T) | | | | |
| OUTFlagB output | | 1 point/channel | | | | |
| Analog output | Method | FilteredPWM type | TrueDAC type | | | |
| | Number of points | 1 point/channel | 2 points/channel | | | |
| | Output range | Between DACA+/DACP+ and DACA-/DACP-: -20 to 20 V Between DACA+/DACP+ and AGND: -10 to 10 V | | | | |
| Pulse output | Output form | Line driver output | | | | |
| | Output method | Pulse output + directional output, or phase difference output | | | | |
| | Maximum output frequency | 10 MHz | | | | |
| Amp enable output | | 1 point/channel | | | | |
| Fault input | | 1 point/channel | | | | |
| Flags | Digital input | 4 points/channel (HOME, PLIM, NLIM, USER) | | | | |
| | Digital output | 1 point/channel (EQU) | | | | |
| General digital I/O | Number of points | 16 inputs, 16 outputs | | | | |
| | Internal common | NPN | PNP | NPN | | |
| Power consumption | 5 VDC: 4.5 W max. 24 VDC: 10.8 W max. | | 5 VDC: 4.5 W max. 24 VDC: 12.5 W max. | | | |
| Dimensions (height × depth × width) | 90(H)/80(D)/130(W) | | | | | |
| Weight | 520 g max. | | | | | |

CK3W-AX1313□/-AX2323□

| Item | Specification (CK3W-) | | | |
|----------------------------------|--|---|---------|---------|
| | AX1313N | AX1313P | AX2323N | AX2323P |
| Address setting range | 0 to F | | | |
| Number of channels | 4 channels/Unit | | | |
| Encoder power supply output | 5 VDC 500 mA/channel or less However, the total output current of each Unit is 1 A or less. | | | |
| Digital quadrature encoder input | Input form | Line receiver input | --- | |
| | Maximum response frequency | Phases A, B, and C: 10 MHz | --- | |
| Serial encoder input | Supported protocol | Contact your OMRON representative for information on the support protocols. | | |

CK3W Axial Interface Unit

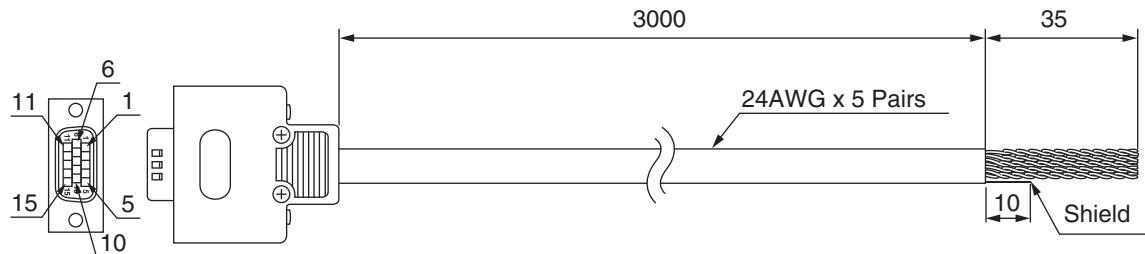
| Item | Specification (CK3W-) | | | |
|-------------------------------------|--|---|---------|----------------------|
| | AX1313N | AX1313P | AX2323N | AX2323P |
| Sinusoidal encoder input | Input signal | --- | | 1-Vpp SIN/COS signal |
| | Maximum input frequency | | | 2 MHz |
| Digital Hall sensor | 4 points/channel (U, V, W, T) | | | |
| DirectPWM output | Amplifier interface unique to Delta Tau | | | |
| Amp enable output | 1 point/channel (built into DirectPWM) | | | |
| Fault input | 1 point/channel (built into DirectPWM) | | | |
| Flags | Digital input | 4 points/channel (HOME, PLIM, NLIM, USER) | | |
| | Digital output | 1 point/channel (EQU) | | |
| General digital I/O | Number of points | 16 inputs, 16 outputs | | |
| | Internal common | NPN | PNP | NPN |
| Power consumption | 5 VDC: 3.4 W max. 24 VDC: 12.5 W max. | 5 VDC: 3.0 W max. 24 VDC: 13.1 W max. | | |
| Dimensions (height x depth x width) | 90(H)/80(D)/130(W) | | | |
| Weight | 480 g max. | 490 g max. | | |

Dedicated Cable for Wiring to Encoder Connector

The dedicated cables for wiring to the encoder connector are provided as an option.

The encoder connection side has discrete wires. Wire in accordance with the encoder specifications.

For digital quadrature encoder CK3W-CAED03A



| Type | Pin No. | Cable color | Mark | Signal |
|--------|----------|-------------|-------|-----------------------------------|
| Pair 1 | 11 | Blue | Black | Encoder Power Supply (+5 VDC) |
| | 13 | Blue | Red | Encoder Power Supply (GND) |
| Pair 2 | 1, 5 *1 | Pink | Black | Encoder A+ Serial Encoder DAT+ |
| | 6, 10 *1 | Pink | Red | Encoder A- Serial Encoder DAT- |
| Pair 3 | 2 | Green | Black | Encoder B+ |
| | 7 | Green | Red | Encoder B- |
| Pair 4 | 3 | Orange | Black | Encoder C+ |
| | 8 | Orange | Red | Encoder C- |
| Pair 5 | 15 | Gray | Black | OutFlagB |
| | 14 | Gray | Red | GND |

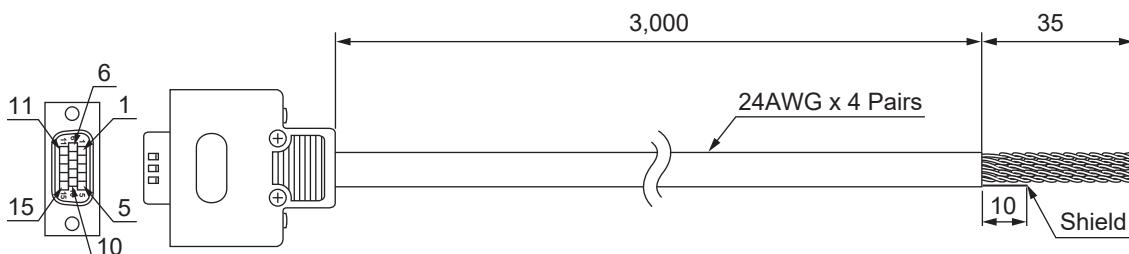
*1. In order to make a connection with the OMRON G5-series Servo Drive R88D-KT□□□, Pin 1 and Pin 5, and Pin 6 and Pin 10 are short-circuited inside the connector.

You can also connect a normal digital quadrature encoder which does not use serial encoder DAT by disabling the serial encoder.

Note: The cable shield is connected to the connector shell of the encoder connector.

When using this cable, set to *OutFlagD* = 1, and disable the serial encoder DAT terminating resistance.

For Sinusoidal Encoder

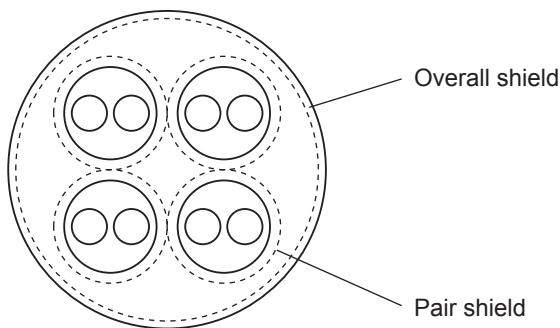


| Type | Pin No. | Cable color | Signal |
|--------|---------|-------------|-------------------------------|
| Pair 1 | 11 | Black | Encoder Power Supply (+5 VDC) |
| | 13 | Blue | Encoder Power Supply (GND) |
| Pair 2 | 1 | Black | SIN+ |
| | 6 | Red | SIN- |
| Pair 3 | 2 | Black | COS+ |
| | 7 | White | COS- |
| Pair 4 | 3 | Black | INDEX+ |
| | 8 | Green | INDEX- |

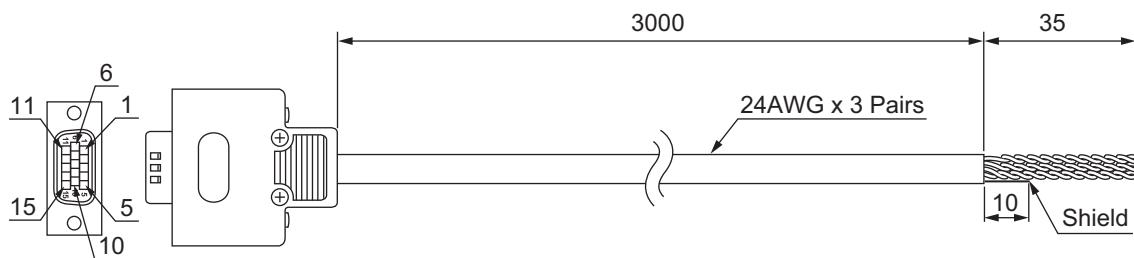
Note: The cable shield consists of an overall shield and pair shields.

The overall shield is connected to the connector shell of the encoder connector.

The pair shields are connected to the Encoder Power Supply (GND) pin.



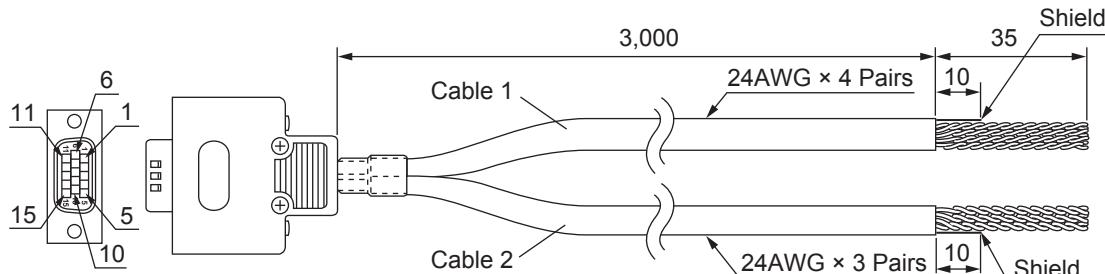
For Serial Encoder



| Type | Pin No. | Cable color | Mark | Signal |
|--------|---------|-------------|-------|-------------------------------|
| Pair 1 | 12 | Blue | Black | Encoder Power Supply (+5 VDC) |
| | 14 | Blue | Red | Encoder Power Supply (GND) |
| Pair 2 | 4 | Pink | Black | Encoder CLK+ |
| | 9 | Pink | Red | Encoder CLK- |
| Pair 3 | 5 | Green | Black | Serial Encoder DAT+ |
| | 10 | Green | Red | Serial Encoder DAT- |

Note: The cable shield is connected to the connector shell of the encoder connector.

For "Digital Quadrature Encoder + UVW Signal" or "Digital Quadrature Encoder + Serial Encoder"



Cable 1

| Type | Pin No. | Cable color | Mark | Signal |
|--------|---------|-------------|-------|-------------------------------|
| Pair 1 | 11 | Blue | Black | Encoder Power Supply (+5 VDC) |
| | 13 | Blue | Red | Encoder Power Supply (GND) |
| Pair 2 | 1 | Pink | Black | Encoder A+ |
| | 6 | Pink | Red | Encoder A- |
| Pair 3 | 2 | Green | Black | Encoder B+ |
| | 7 | Green | Red | Encoder B- |
| Pair 4 | 3 | Orange | Black | Encoder C+ |
| | 8 | Orange | Red | Encoder C- |

Note: The cable shield is connected to the connector shell of the encoder connector.

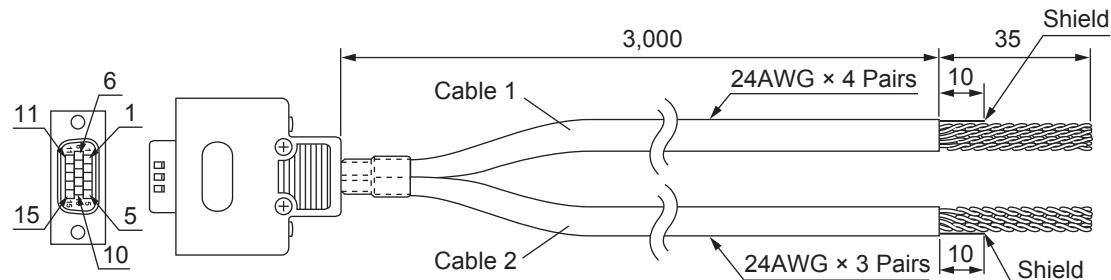
Cable 2

| Type | Pin No. | Cable color | Mark | Signal | |
|--------|---------|-------------|-------|-------------------------------|---------------------|
| | | | | U, V, W | Serial Encoder |
| Pair 1 | 12 | Blue | Black | Encoder Power Supply (+5 VDC) | |
| | 14 | Blue | Red | Encoder Power Supply (GND) | |
| Pair 2 | 4 | Pink | Black | Hall sensor U | Serial Encoder CLK+ |
| | 9 | Pink | Red | Hall sensor V | Serial Encoder CLK- |

| Type | Pin No. | Cable color | Mark | Signal | |
|--------|---------|-------------|-------|---------------|---------------------|
| | | | | U, V, W | Serial Encoder |
| Pair 3 | 5 | Green | Black | Hall sensor W | Serial Encoder DAT+ |
| | 10 | Green | Red | Hall sensor T | Serial Encoder DAT- |

Note: The cable shield is connected to the connector shell of the encoder connector.

For “Sinusoidal Encoder + UVW Signal” or “Sinusoidal Encoder + Serial Encoder”



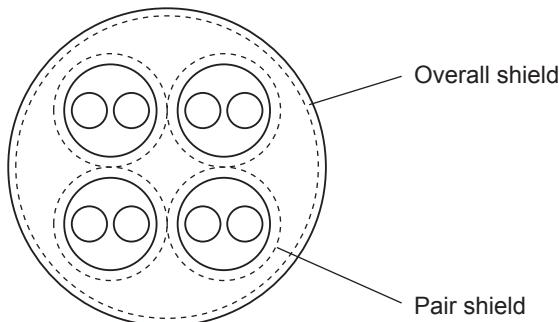
Cable 1

| Type | Pin No. | Cable color | Signal |
|--------|---------|-------------|-------------------------------|
| Pair 1 | 11 | Black | Encoder Power Supply (+5 VDC) |
| | 13 | Blue | Encoder Power Supply (GND) |
| Pair 2 | 1 | Black | SIN+ |
| | 6 | Red | SIN- |
| Pair 3 | 2 | Black | COS+ |
| | 7 | White | COS- |
| Pair 4 | 3 | Black | INDEX+ |
| | 8 | Green | INDEX- |

Note: The cable shield consists of an overall shield and pair shields.

The overall shield is connected to the connector shell of the encoder connector.

The pair shields are connected to the Encoder Power Supply (GND) pin.



Cable 2

| Type | Pin No. | Cable color | Signal | |
|--------|---------|-------------|-------------------------------|---------------------|
| | | | U, V, W | Serial Encoder |
| Pair 1 | 12 | Blue | Encoder Power Supply (+5 VDC) | |
| | 14 | White | Encoder Power Supply (GND) | |
| Pair 2 | 4 | Black | Hall sensor U | Serial Encoder CLK+ |
| | 9 | Green | Hall sensor V | Serial Encoder CLK- |
| Pair 3 | 5 | Yellow | Hall sensor W | Serial Encoder DAT+ |
| | 10 | Brown | Hall sensor T | Serial Encoder DAT- |

Note: The cable shield is connected to the connector shell of the encoder connector.

Dedicated Cable for Wiring to Amplifier Connector

For FilteredPWM/TrueDAC type

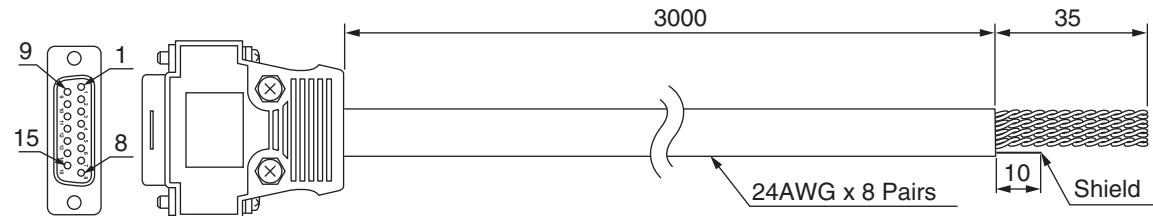
This section describes the cable used for the CK3W-AX1414□/AX1515□ Units.

The dedicated cable for wiring to the FilteredPWM/TrueDAC type amplifier connector is provided as an option.

The amplifier connection side has discrete wires. Wire in accordance with the Servo Drive specifications.

The cable model is as shown below.

| Type | Model | Length |
|------------------------------|-------------|--------|
| For FilteredPWM/TrueDAC type | CK3W-CAA03A | 3 m |



| Type | Pin No. | Cable color | Mark | Signal |
|--------|---------|-------------|-------------|----------------------|
| Pair 1 | 1 | Blue | Black 1 dot | Analog output A+ |
| | 9 | Blue | Red 1 dot | Analog output A- |
| Pair 2 | 2 | Pink | Black 1 dot | Analog output B+ |
| | 10 | Pink | Red 1 dot | Analog output B- |
| Pair 3 | 3 | Green | Black 1 dot | Analog GND |
| | 3 | Green | Red 1 dot | Analog GND |
| Pair 4 | 5 | Orange | Black 1 dot | Pulse output + |
| | 12 | Orange | Red 1 dot | Pulse output - |
| Pair 5 | 6 | Gray | Black 1 dot | Directional output + |
| | 13 | Gray | Red 1 dot | Directional output - |
| Pair 6 | | Blue | Black 2 dot | Fault input + |
| | 11 | Blue | Red 2 dot | Fault input - |
| Pair 7 | 7 | Pink | Black 2 dot | Amp enable NO |
| | 15 | Pink | Red 2 dot | Amp enable common |
| Pair 8 | 8 | Green | Black 2 dot | Amp enable NC |
| | 15 | Green | Red 2 dot | Amp enable common |

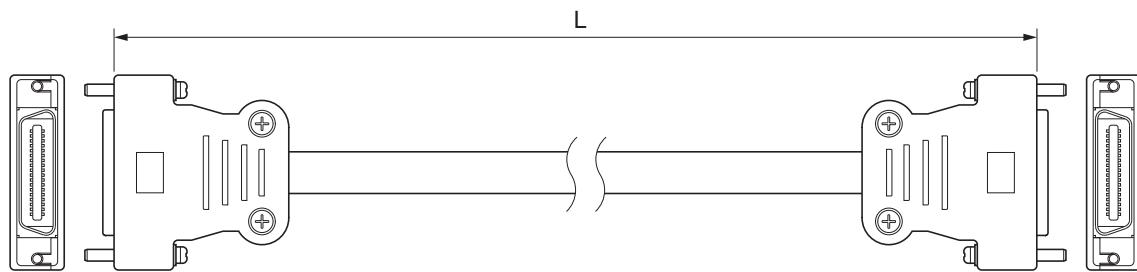
Note: The cable shield is connected to the connector shell of the amplifier connector.

For DirectPWM type

This section describes cables used for the CK3W-AX1313□/AX2323□ Units.

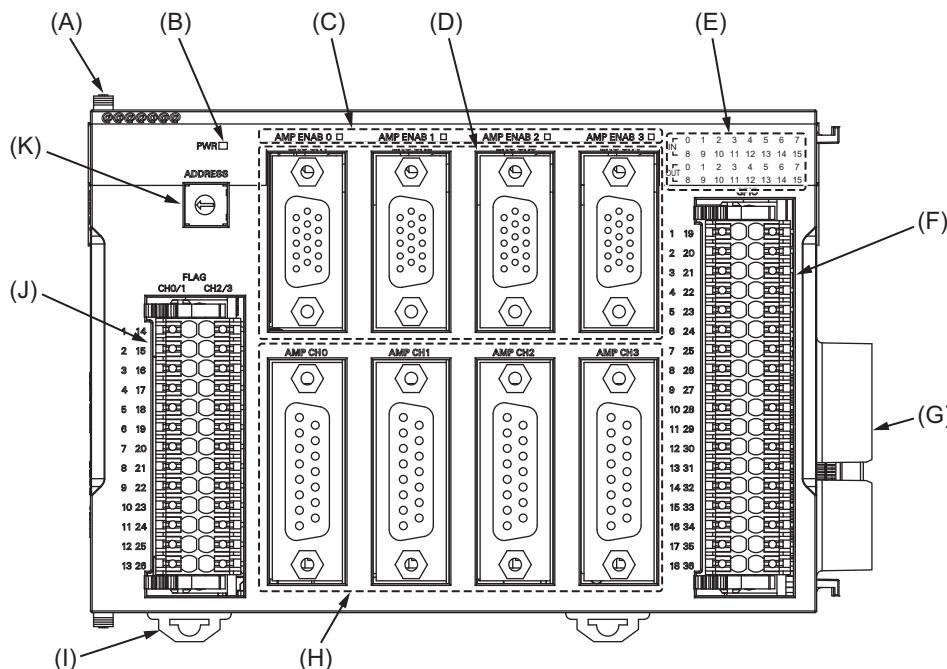
Be sure to use the following cables for the DirectPWM type amplifier connector.

| Type | Model | Length |
|--------------------|---------------|--------|
| For DirectPWM type | CK3W-CAAD009A | 0.9 m |
| | CK3W-CAAD018A | 1.8 m |
| | CK3W-CAAD036A | 3.6 m |



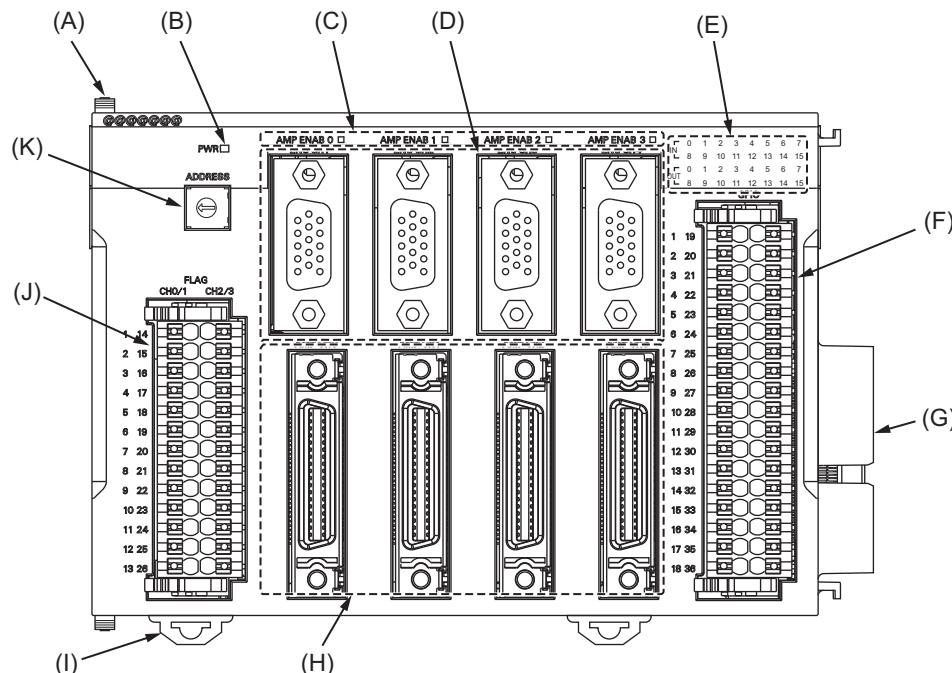
Part Names and Functions

CK3W-AX1414□-AX1515□



| Letter | Name | Function |
|--------|---|---|
| A | Slider | Holds the Units together. |
| B | Power supply status indicator | Shows the power supply status. |
| C | Amp enable status indicator | Shows the Amp enable status. |
| D | Encoder connector | Connects the encoder. |
| E | General digital input/output status indicator | Shows the general digital input/output status. |
| F | General digital I/O connection terminal block | Connects the general digital input/output. |
| G | Unit connector | Connector that connects to the Unit. |
| H | Amplifier connector | Connects the amplifier. |
| I | DIN Track mounting hook | Used to mount the Unit to a DIN Track. |
| J | Flag connection terminal block | Connects the HOME/PLIM/NLIM/USER inputs and EQU output. |
| K | Address switch | Sets the Gate3 Index. |

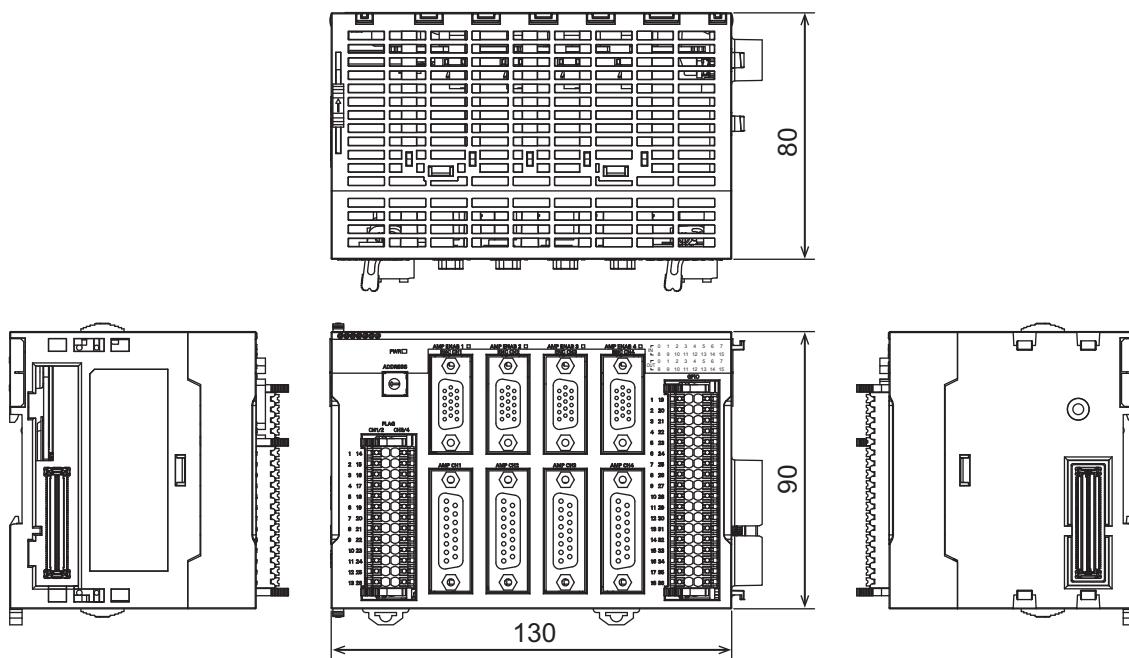
CK3W-AX1313□-AX2323□



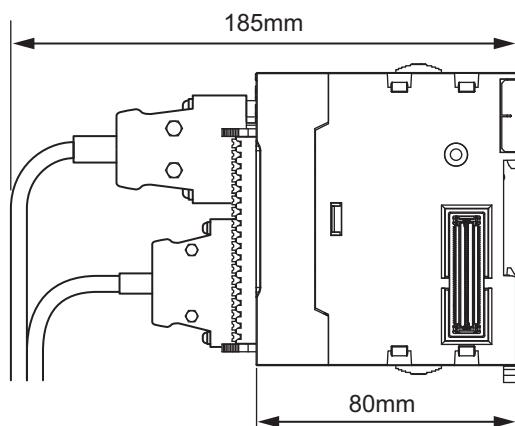
| Letter | Name | Function |
|--------|---|---|
| A | Slider | Holds the Units together. |
| B | Power supply status indicator | Shows the power supply status. |
| C | Amp enable status indicator | Shows the Amp enable status. |
| D | Encoder connector | Connects the encoder. |
| E | General digital input/output status indicator | Shows the general digital input/output status. |
| F | General digital I/O connection terminal block | Connects the general digital input/output. |
| G | Unit connector | Connector that connects to the Unit. |
| H | Amplifier connector | Connects the amplifier. |
| I | DIN Track mounting hook | Used to mount the Unit to a DIN Track. |
| J | Flag connection terminal block | Connects the HOME/PLIM/NLIM/USER inputs and EQU output. |
| K | Address switch | Sets the Gate3 Index. |

Dimensions

(Unit: mm)

Axis Interface Unit**Axis Interface Unit**

| Model | Unit width (mm) |
|--------------|-----------------|
| CK3W-AX1313N | |
| CK3W-AX1414N | |
| CK3W-AX1515N | |
| CK3W-AX2323N | |
| CK3W-AX1313P | 130 |
| CK3W-AX1414P | |
| CK3W-AX1515P | |
| CK3W-AX2323P | |

Installation Height**For CK3W-AX Unit**

Related Manuals

The following manuals are related. Use these manuals for reference. Contact your OMRON representative for information on how to procure these manuals.

| Manual name | Cat. No. | Application | Description |
|---|----------|--|---|
| CK3M-series Programmable Multi-Axis Controller Hardware User's Manual | O036 | Learning the basic specifications of the CK3M-series Programmable Multi-Axis Controller, including introductory information, design, installation, and maintenance. Mainly hardware information is provided. | An introduction to the entire system is provided along with the following information. <ul style="list-style-type: none"> • Features and system configuration • Introduction • Part names and functions • General specifications • Installation and wiring • Maintenance and inspection |
| Power PMAC User's Manual | O014 | Learning the features and usage examples of the CK3M-series Programmable Multi-Axis Controller. | The following information is provided on the CK3M-series Programmable Multi-Axis Controller. <ul style="list-style-type: none"> • Basic functions • Setup examples • Programming examples |
| Power PMAC Software Reference Manual | O015 | Learning how to program a CK3M-series Programmable Multi-Axis Controller. | The following information is provided on the CK3M-series Programmable Multi-Axis Controller. <ul style="list-style-type: none"> • Details of commands • Details of data structure |
| Power PMAC IDE User Manual | O016 | Learning how to operate Power PMAC IDE, the integrated development environment of the Controller. | Describes the operating procedures of Power PMAC IDE, and examples of how to start the system. |
| Power PMAC-NC Quick Start Manual | O017 | Briefly understanding the basic usage of Power PMAC-NC. | Describes the Quick setup procedure to run Power PMAC-NC on a desktop PC by showing some examples. |
| Power PMAC-NC .ini Configuration Manual | O018 | Configuring an application for CNC devices by using Power PMAC-NC. | Describes how to set up <i>PowerPmacNC.ini</i> , the setup data file to be loaded when Power PMAC-NC starts. |
| Power PMAC-NC Software User Manual | O019 | Learning about usage and features of Power PMAC-NC, Support Software required to use the Controller for CNC devices. | The following information is provided on Power PMAC-NC. <ul style="list-style-type: none"> • How to use the software • Features included in the software • Features that can be customized |
| Power PMAC-NC Mill G-Code Manual | O020 | Creating programs for CNC devices by using Power PMAC-NC. | Describes the basic G-code set that can be used for Power PMAC-NC, and relevant instructions. |

Terms and Conditions Agreement

Read and understand this catalog.

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranties.

(a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

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