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## CK3A-series Direct PWM Amplifier

# CK3A-G305L/-G310L

CSM_CK3A_DS_E_1_2

**This servo amplifier provides ultra-low latency servo control by taking signals directly from the controller and flexibility to connect to various motors and encoders.**



CK3A-G3□□L

## Features

**Supported Motors**

The CK3A Amplifier, combined with the flexibility of Power PMAC Controller and the ability to interface with various encoder feedback devices, allows the support of the following types of Motors:

- AC/DC synchronous brushless (rotary or linear) - e.g. servo Motor.
- DC Brushed - e.g. voicecoil actuator.
- AC asynchronous - e.g. Induction Motor (contact support for setting up this type of Motor).

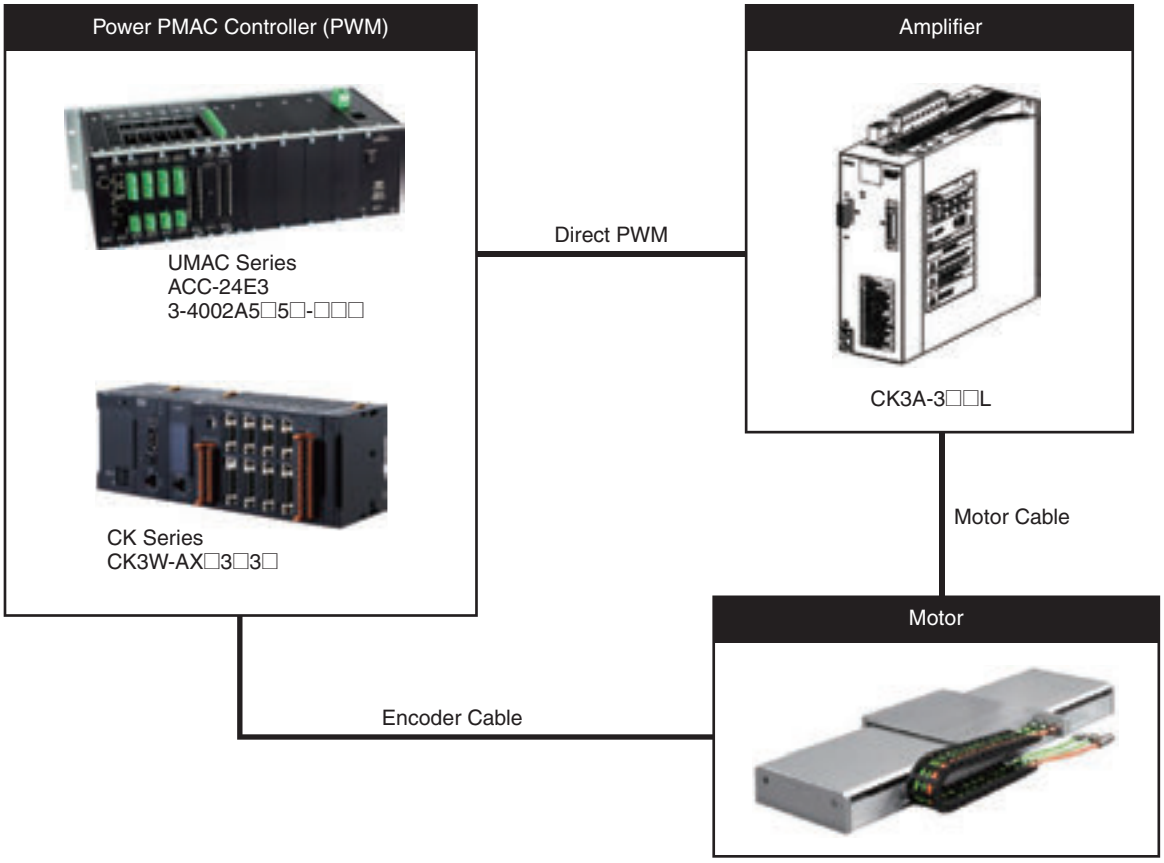
**Amplifier Features**

- Nano-scale linear servo positioning accuracy
- High PWM frequency - up to 20 kHz
- High resolution current sensing - 16-bit ADCs
- High speed current ADC sampling - up to 6.125MHz
- Dual STO inputs and status output
- Basic functions - Energy discharge, dynamic braking, fan control
- Basic Data reporting - DC bus voltage, power module temperature, firmware version
- Dual 7-segment LED status display
- Built-in or external shunt resistor
- Support of low voltage main power operation

# System Configurations

The CK3A Direct PWM Amplifier connects to the CK3M or UMAC Controller via PWM cable.

- The Motor connects directly to the CK3A Direct PWM Amplifier.
- The encoder connects directly to the Controller.



# Ordering Information

## CK3A series Direct PWM Amplifier

| Product name | Main circuit power supply | Rated Current | Model |
|---|---|---|---|
| CK3A series Direct PWM Amplifier | 3-Phase AC, 1-Phase AC, 1-Phase DC | 5 $A_{rms}$ | **CK3A-G305L** |
| | 3-Phase AC, 1-Phase AC | 10 $A_{rms}$ | **CK3A-G310L** |

**Note:** The Amplifier comes with the following accessories. Customers are responsible for procuring items other than those listed below.
- · Main Power Connector (CN1)
- · Control Power Connector (CN2)
- · Motor Connector (CN3)
- · STO Connector (CN4)

### DirectPWM Cable

| Product name | Cable length | Model |
|---|---|---|
| DirectPWM Cable | 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.

Refer to Selecting Peripheral Components in the *CK3A-series Direct PWM Amplifier User's Manual (Cat. No. O050)* for details.

## General/Mechanical

| Item | | Specification |
|---|---|---|
| Number of axes | | 1 |
| Enclosure | | Panel mount |
| Protective case | | IP20 (built into IP54 panel) |
| Grounding | | 200 V class D grounding, 100 Ω or less |
| Vibration resistance | | 10 to 60 Hz at an acceleration of 5.88 $m/s^2$ or less<br>(Not to be run continuously at the resonant frequency) |
| Air flow clearance | | Refer to installation section |
| Mounting screws tightening torque | | 1.2 Nm |
| Cooling | | Natural convection and built-in fan |
| Weight | CK3A-G305L | 1.81 kg |
| | CK3A-G310L | 2.67 kg |
| Dimensions | CK3A-G305L | 212.5 x 65.0 x 180.0 mm |
| | CK3A-G310L | 238.0 x 90.0 x 180.0 mm |
| Regulations and Standards | Conformance to EU Directives | EMC Directive: EN61800-3 second environment<br>Low Voltage Directive: EN61800-5-1 C2 category<br>Functional Safety: EN61800-5-2 SIL3 (STO) |
| | Conformance to UL Directives | UL Standards: UL 61800-5-1<br>CSA Standards: CSA C22.2 No. 274 |
| | Conformance to KC Standards | Applicable |

## Environmental

| Item | Specification |
|---|---|
| Operating ambient temperature | 0 to 55 °C |
| Operating ambient humidity | 10 to 90% RH (without condensation or icing) |
| Storage ambient temperature | -25 to 70 °C |
| Storage ambient humidity | 10 to 90% RH (without condensation or icing) |
| Operating and storage atmosphere | Must be free of corrosive gases |
| Maximum operating altitude | 1,000 m |

# Electrical

Values in parentheses indicate the range of acceptable variation. Rated values are outside of parentheses.

| Item | | | CK3A-G305L | CK3A-G310L |
|---|---|---|---|---|
| Logic power supply | Voltage | | 24 VDC (22.0 to 26.4) | |
| | Current consumption | | 1.5 A | |
| | Inrush current | | 2.5 A | |
| | Inrush time | | 5 msec | |
| Main circuit power supply | 3-Phase AC | Voltage | 240 VAC (170 to 252 VAC) | |
| | | F.L.A. | 6 $A_{rms}$ | 11 $A_{rms}$ |
| | | Frequency | 50 / 60 Hz | |
| | 1-Phase AC | Voltage | 110 to 240 VAC (85 to 252 VAC) | |
| | | F.L.A. | 10.5 $A_{rms}$ | 19.5 $A_{rms}$ |
| | | Frequency | 50 / 60 Hz | |
| | 1-Phase DC ✻1 | (Low) Voltage | 48 VDC ✻1, 3 (44 to 60 VDC) | N/A ✻2, 3 |
| | | F.L.A | 6 $A_{rms}$ | N/A |
| Output | Rated Current | | 5 $A_{RMS}$ | 10 $A_{RMS}$ |
| | Maximum (peak) Current | | 10 $A_{RMS}$ | 20 $A_{RMS}$ |
| | Maximum Rated Power (3-Phase AC) | | 1195 W | 2390 W |
| | Maximum Rated Power (1-Phase 240 VAC) | | 1195 W | 2390 W |
| | Maximum Rated Power (1-Phase 110 VAC) | | 550 W | 1095 W |
| | Maximum Rated Power (1-Phase DC) | | 195 W | N/A ✻2 |
| | Time at Peak Current | | 2 sec | |
| PWM Interface | Current feedback resolution | | 16 bits | |
| | Maximum current ADC reading | | 15.735 A | 31.470 A |
| | Minimum PWM deadtime | | 2 µsec | 3 µsec |
| | PWM Frequency | | 8 to 20 kHz | |
| Shunt Resistor | Internal shunt resistor | | 30 W | |
| | External shunt resistor | | 20 Ω, 60 W | 17 Ω, 60 W |

**✻1.** Must install low voltage short-circuit wire and set up ADC Strobe Word correctly.
**✻2.** The CK3A-G310L requires a special part number, and factory modification to operate with low voltage main power input. Contact your local Omron representative for this option.
**✻3.** The CK3A (both models) can functionally operate in the 100 to 350 VDC main supply input range without short-circuit wire or special consideration. Operation and setup are same as described in the *CK3A-series Direct PWM Amplifier User's Manual* (Cat. No. O050) however, the specifications and performance are not defined in this case.

# Performance

| Specification | Value | Notes |
|---|---|---|
| STO input to power drivers OFF | < 30 msec | |
| Overcurrent I2T to IPM OFF | < 10 msec | A8 fault |
| Phase short to IPM OFF | < 3 µsec | AC fault |
| Current loop response time | < 1 msec | 1 mH 3-Ph brushless Motor Y-winding |
| Dynamic brake relay response time | < 20 msec | Mechanical relay time constant |
| I2T time to Amplifier OFF | < 2.5 sec | At 200% output |
| Soft start time | < 650 msec | Do not enable Amplifier during soft start |
| Hold at momentary power interruption | 10 msec | 3-ph 208VAC @ rated load |
| DC bus discharge to less than < 36 VDC | < 2.5 sec | Forced discharge to shunt resistor |
| | < 5 min | Natural discharge |
| Current ADC clock frequency range | 2.450 to 6.250 MHz | Set in Controller |
| Time between main circuit power cycles | 1 min minimum | If discharge ON |
| | 10 sec minimum | If discharge OFF |

# Amplifier Internal Regeneration Absorption Capacity

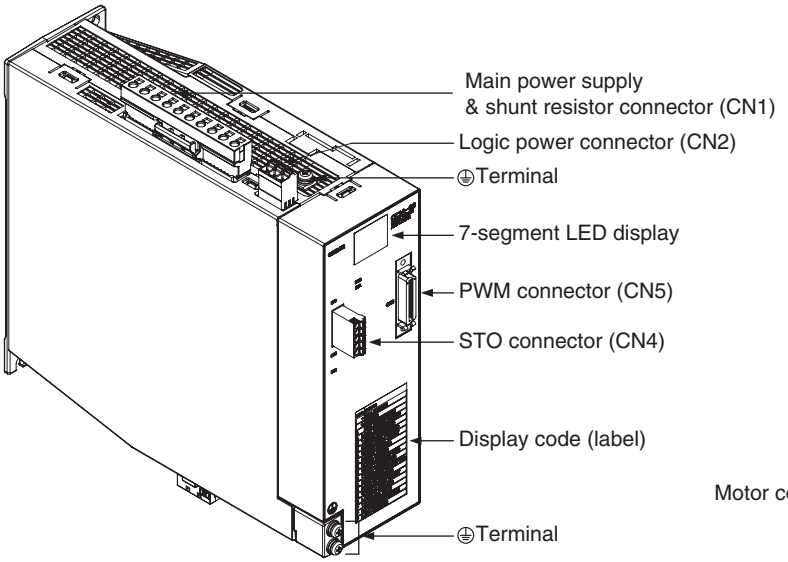
The following table shows the Amplifier power, internal shunt resistor specifications, regenerative power absorption capacity and maximum duration. These values are based on a 200VAC main power supply.

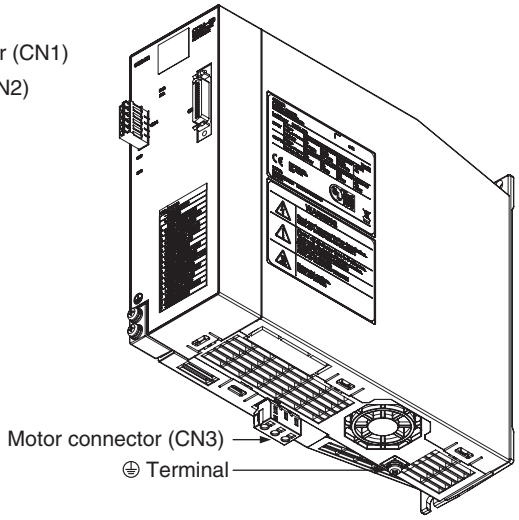
| Model | CK3A-G305L | CK3A-G310L |
|---|---|---|
| Rated RMS power [W] | 1195 W | 2390 W |
| Internal shunt resistor specification | 25 Ω 30 W | 17 Ω 80 W |
| Built-in capacitors absorption energy [J] | 46 J | 62 J |
| Internal shunt resistor average regeneration energy [W] | 18 W | 32 W |
| Maximum duration of continuous regeneration [sec] | 2 sec | 2 sec |
| Minimum allowable shunt resistance [Ω] | 20 Ω | 15 Ω |

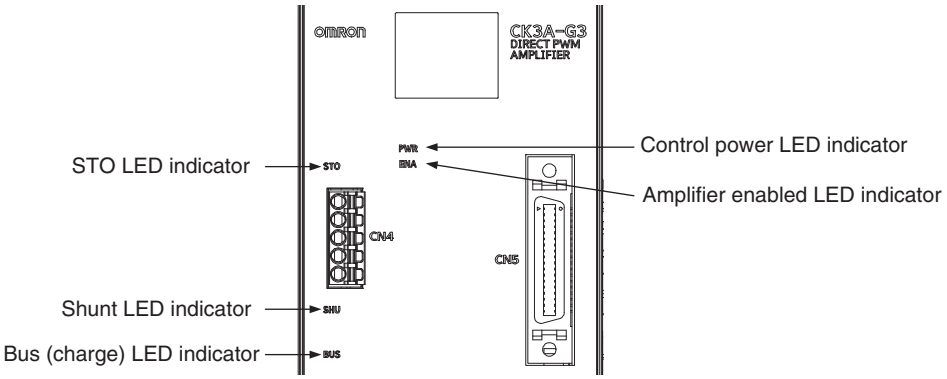
# Part Names and Functions

## Part Names

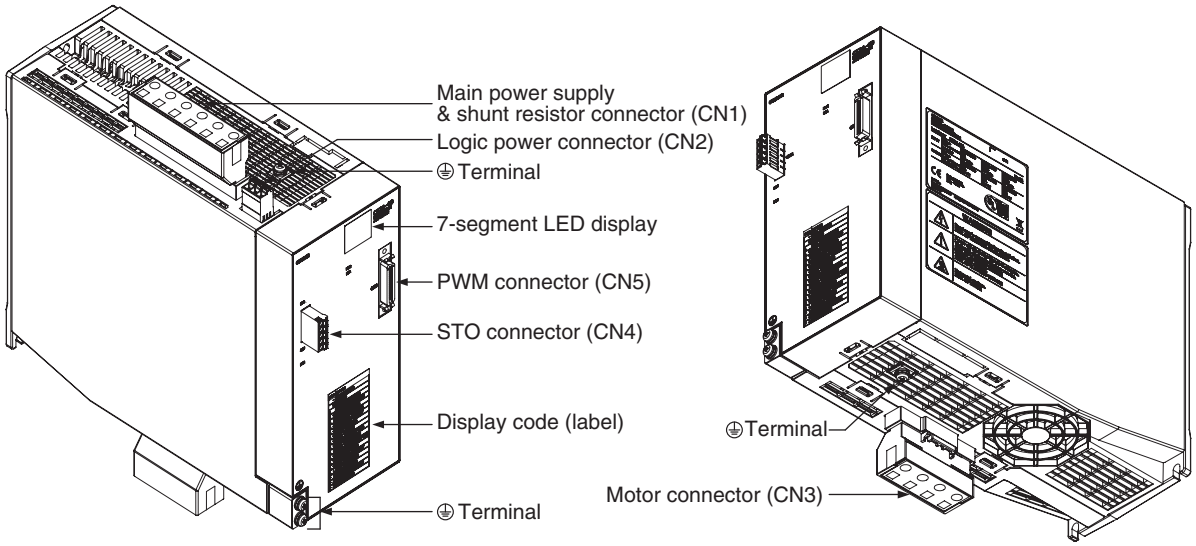
**CK3A-G305L**

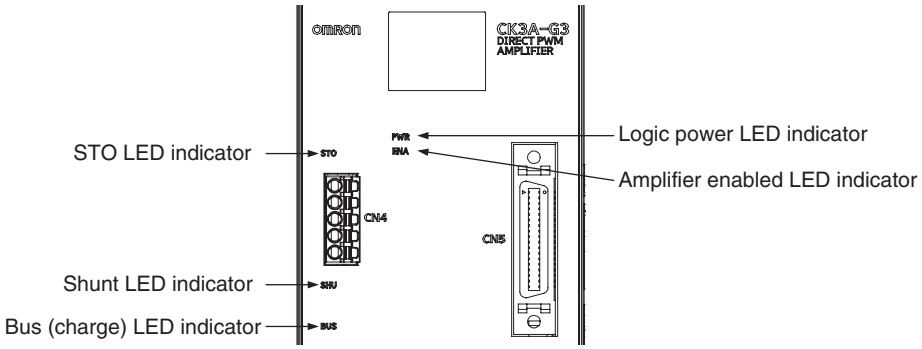


**CK3A-G310L**


Main power supply
& shunt resistor connector (CN1)
Logic power connector (CN2)
⏚ Terminal
7-segment LED display
PWM connector (CN5)
STO connector (CN4)
Display code (label)
⏚ Terminal
⏚ Terminal
Motor connector (CN3)


OMRON
CK3A-G3
DIRECT PWM
AMPLIFIER
STO LED indicator
STO
PWR
ENA
Logic power LED indicator
Amplifier enabled LED indicator
CN4
CN5
Shunt LED indicator
SHU
Bus (charge) LED indicator
BUS

# Part Functions

## Status LED Indicators

The following LED indicators are located on the front of the Amplifier:

| Name | Color | Description |
|---|---|---|
| PWR | Green | Indicates the logic power supply status |
| ENA | Green | Indicates the amplifier enabled status |
| SHU | Red | Indicates if shunt operation is active |
| STO | Red/Green | Indicates STO input status |
| BUS | Red | Indicates bus charge status |

Refer to the *CK3A-series Direct PWM Amplifier User's Manual (Cat. No. O050)* for details.

## 7-segment LED Displays

Dual 7-segment displays are located on the front of the Amplifier. These displays report Amplifier operation and error status.
On power-up, the 7-segment displays scroll through all indicators six times.



## Main Circuit and Shunt Connector (CN1)

The CN1 connector is used for the following functions:

**CK3A-G305L (10-pin)**

- Main circuit power supply connection
- Internal shunt resistor connection (by short-circuit wire), or external shunt resistor connection
- Low voltage mode (by short-circuit wire)

**CK3A-G310L (6-pin)**

- Main circuit power supply connection
- Internal shunt resistor connection (by short-circuit wire), or external shunt resistor connection

## Logic Power Supply Connector (CN2)

The CN2 connector (3-pin) is used to supply 24 VDC logic power to the Amplifier.

## Motor Connector (CN3)

The CN3 connector is used to connect the Motor to the Amplifier. It is a 3-pin connector for the CK3A-G305L model and 4-pin connector for the CK3A-G310L model.

## Safe Torque OFF Connector (CN4)

The CN4 connector (5-pin) is used to disable or connect the STO input(s), and STO status output. The short-circuit wire to disable the STO is installed on the connector from the factory.

## Direct PWM Connector (CN5)

The CN5 connector (36-pin) is used to connect the Amplifier to the Controller. This is a pre-configured cable connector.

## Ground Terminals

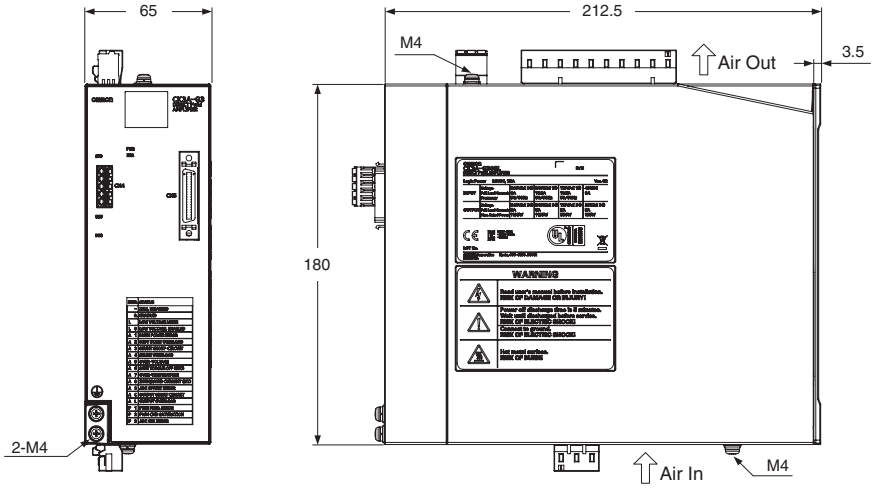
Following, are the location and number of ground ⏚ terminals of the Amplifier:

| Location | No. of Terminals | Suggested Use |
|---|---|---|
| Top | 1 | Protective earth PE of main circuit power input |
| Front | 2 | Frame Ground FG inside the control panel |
| Bottom | 1 | Frame Ground FG of Motor cable and shield |

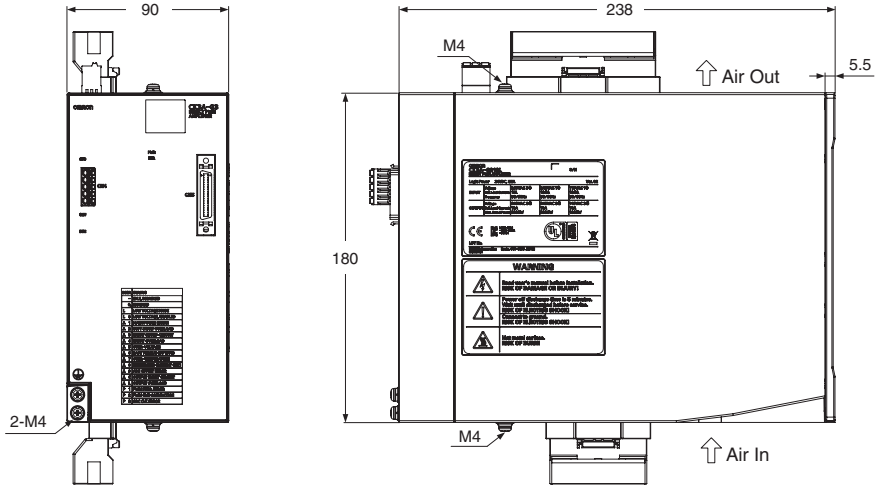
# Dimensions

(Unit: mm)

**CK3A-G305L**

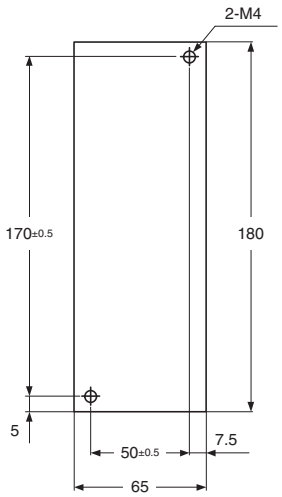



**CK3A-G310L**

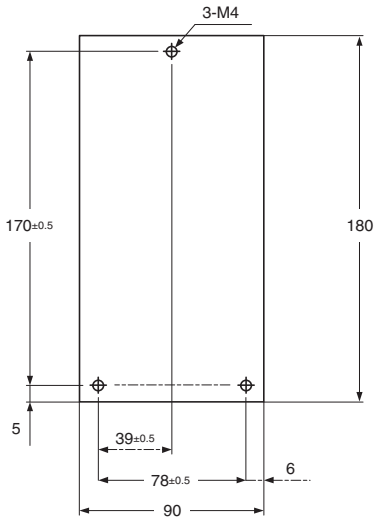


## Mounting Dimensions

**CK3A-G305L**




**CK3A-G310L**



# Related Manuals

| Manual Name | Cat. No. | Application | Description |
|---|---|---|---|
| CK3A-series Direct PWM Amplifier User's Manual | O050 | Learning about the specifications, including installation, wiring, basic software configuration, maintenance, and troubleshooting. | • Introduction to the Amplifier<br>• Configuration, features, and specifications<br>• Mounting, installation and wiring<br>• Basic software configuration<br>• Maintenance, and troubleshooting |
| CK3M-series Programmable Multi-Axis Controller Hardware User's Manual | O036 | Learning the basic specifications of the CK3M, including introductory information, design, installation, and maintenance. Mainly hardware information. | • Features and system configuration<br>• Introduction<br>• Part names and functions<br>• General specifications<br>• Installation and wiring<br>• Maintenance and inspection |
| Power PMAC Software Reference Manual | O015 | Learning the command set and structure elements of the Power PMAC Controller. | • Power PMAC Data structure<br>• List and description of all commands<br>• List and description of all ASIC, Coordinate System and Motor structure elements, including CK3M and UMAC |
| Power PMAC User's Manual | O014 | Learning the features and usage examples of the Power PMAC Controller. | • Parameter settings relevant to the Amplifier<br>• Motor basic functions<br>• Encoder configuration examples<br>• Motor setup examples<br>• Power PMAC programming examples |
| Power PMAC IDE User Manual | O016 | Learning how to use the integrated development environment IDE of the Power PMAC Controller. | • Operating procedures of the Power PMAC IDE software<br>• Configuration of the Direct PWM Amplifier using system setup |
| ACC-24E3 Hardware Reference Manual | N/A | Learning the basic specifications of the UMAC accessory ACC-24E3, including introductory information, design, installation, maintenance. | • Features and system configuration<br>• Introduction<br>• Part names and functions<br>• General specifications<br>• Installation and wiring |

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