OMRON

CK3A-series Direct PWM Amplifier

CK3A-G305L/-G310L/-G320L

CSM_CK3A_DS_E_2_1

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).

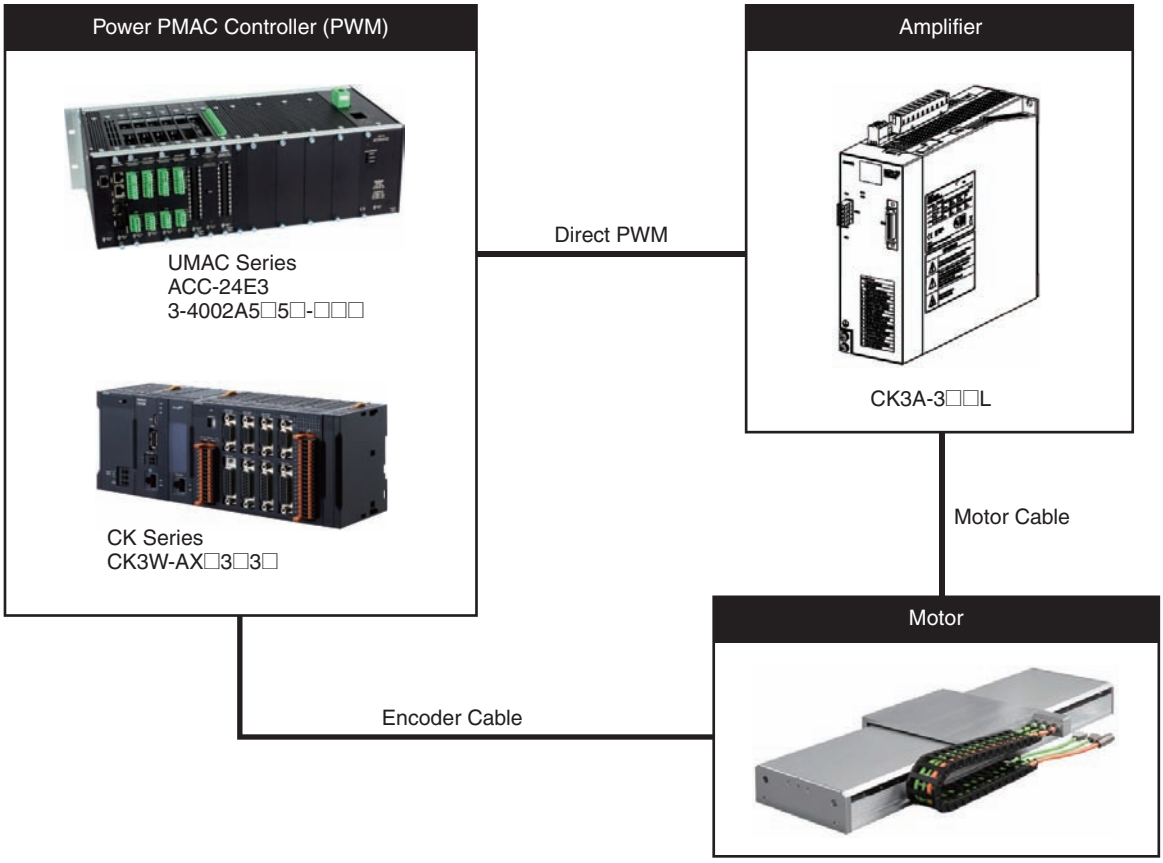
Amplifier Features

- Nano-scale linear servo positioning accuracy
- High PWM frequency - up to 20 kHz
- High resolution current sensing - 16-bit ADCs
- High speed current ADC clocking - 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 (CK3A-G305L and CK3A-G320L)

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 240 VAC 1-Phase 110 to 240 VAC 1-Phase 48VDC	5 A_{rms}	**CK3A-G305L**
	3-Phase 240 VAC 1-Phase 110 to 240 VAC	10 A_{rms}	**CK3A-G310L**
	3-Phase 240 VAC 1-Phase 240 VAC 1-Phase 100 VDC	20 A_{rms}	**CK3A-G320L**

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

Part Number	Name	Length
200-602739-036x	CABPWM-2	0.9 m (36 in)
200-602739-072x	CABPWM-4	1.8 m (72 in)
200-602739-144x	CABPWM-6	3.6 m (144 in)

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 (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
	CK3A-G320L	2.77 kg
Dimensions	CK3A-G305L	212.5 x 65.0 x 180.0 mm
	CK3A-G310L	238.0 x 90.0 x 180.0 mm
	CK3A-G320L	238.0 x 90.0 x 180.0 mm
Regulations and Standards	Conformance to EU Directives	EMC Directive: EN61800-3 second environment Low Voltage Directive: EN61800-5-1 C2 category Functional Safety: EN61800-5-2 SIL3 (STO)
	Conformance to UL Directives	UL Standards: UL 61800-5-1 CSA Standards: CSA C22.2 No. 274
	Conformance to UKCA Standards	UKCA: 2016 No. 1091 UKCA: 2016 No. 1101 EMC Directive: 2016 No. 1091 Low Voltage Directive: 2016 No. 1101 Functional Safety: 2008 No. 1597
	Conformance to KC Standards	Immunity Standard for Industrial Environments: KS C 9610-6-2 Emission Standard for Industrial Environments: KS C 9610-6-4

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	2,000 m
Pollution Degree	2

Electrical

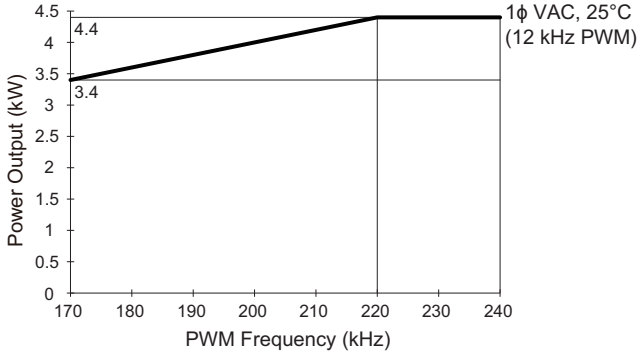
The following section details the key electrical specifications for each of the CK3A-G3□□L Amplifiers.

Item			CK3A-G305L	CK3A-G310L	CK3A-G320L
Logic power supply	Voltage		24 VDC ✻1		
	Current consumption		1.5 A		
	Inrush current		2.5 A		
	Inrush time		5 msec		
Main circuit power supply	3-Phase AC	Voltage	240 VAC ± 5 °C ✻2		
		F.L.A.	6 A_{rms}	11 A_{rms}	18 A_{rms}
		Frequency	50 / 60 Hz		
	1-Phase AC	Voltage	240 VAC ± 5% ✻2 110 VAC ± 5% ✻3		240 VAC ± 5% ✻2, ✻7
		F.L.A.	10.5 A_{rms}	19.5 A_{rms}	28 A_{rms}
		Frequency	50 / 60 Hz		
	1-Phase DC ✻4	Voltage	48 VDC ✻5	-	100 VDC ± 10% ✻6
		F.L.A	6 A	-	19 A
Output	Rated Current		5 A_{RMS}	10 A_{RMS}	20 A_{RMS}
	Maximum (peak) Current		10 A_{RMS}	20 A_{RMS}	60 A_{RMS}
	Maximum Rated Power (3-Phase AC)		1195 W	2390 W	4400 W
	Maximum Rated Power (1-Phase 240 VAC)		1195 W	2390 W	4400 W
	Maximum Rated Power (1-Phase 110 VAC)		550 W	1095 W	-
	Maximum Rated Power (1-Phase DC)		195 W	-	1600 W
	Time at Peak Current		2 sec		
PWM Interface	Current feedback resolution		16 bits		
	Maximum current ADC reading		15.735 A	31.470 A	93.844 A
	Minimum PWM deadtime		2 µsec	3 µsec	
	PWM Frequency		8 to 20 kHz		8 to 16 kHz ✻8
Shunt Resistor	Internal shunt resistor		25 Ω, 30 W	17 Ω, 80 W	17 Ω, 80 W
	External shunt resistor		20 Ω, 60 W	17 Ω, 60 W	17 Ω, 60 W

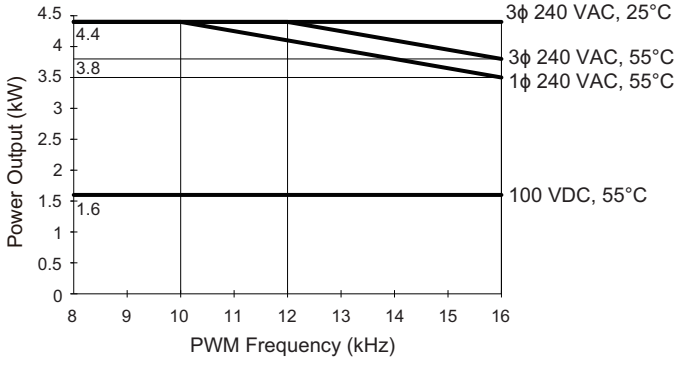
✻1. The range of acceptable variation for the Logic Power Supply input voltage is 22.0 to 26.4 VDC.
✻2. The range of acceptable variation for this Main Circuit input voltage is 170 to 252 VAC.
✻3. The range of acceptable variation for this Main Circuit input voltage is 85 to 170 VAC.
✻4. All models require the ADC Strobe Word set to operate with low voltage (1-Phase DC) main power input.
✻5. The range of acceptable variation for this Main Circuit input voltage is 44 to 60 VDC.
✻6. The range of acceptable variation for this Main Circuit input voltage is 90 to 110 VDC.
✻7. The CK3A-G320L may require derating on maximum rated power with some (1-Phase AC) Main Circuit input voltages. Refer to the diagram below showing the derating amount at 25°C.
✻8. The CK3A-G320L may require derating on maximum rated power if PWM frequency over 10 kHz is used. Refer to the diagram below showing the derating amount.

Note: 1. In addition to configuring the ADC Strobe Word, the CK3A-G310L requires a special part number and factory modification to operate with low voltage (48 VDC) main power input. Contact your local Omron representative for this option.

Power Output De-Rating by 1-Phase Input Voltage (CK3A-G320L Only)



Power Output De-Rating by PWM Frequency (CK3A-G320L Only)



Performance

Specification	Value	Notes
STO input to power drivers OFF	< 150 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	CK3A-G305L: At 200% output CK3A-G310L: At 200% output CK3A-G320L: At 300% 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 time with bus discharge ON (Discharge to less than 36 VDC)	< 2.5 sec	Forced discharge to shunt resistor
DC Bus discharge time with bus discharge OFF (Discharge to less than 36 VDC)	< 5 min	Natural discharge, CK3A-G305L
	< 5 min	Natural discharge, CK3A-G310L
	< 6 min	Natural discharge, CK3A-G320L
Current ADC clock frequency range	2.450 to 6.250 MHz	Set in Controller
Time between main circuit power cycles with bus discharge ON	1 min minimum	To prevent overloading the soft start or discharge circuitry
Time between main circuit power cycles with bus discharge OFF	10 sec minimum	To prevent overloading the soft start circuitry

Amplifier Internal Regeneration Absorption Capacity

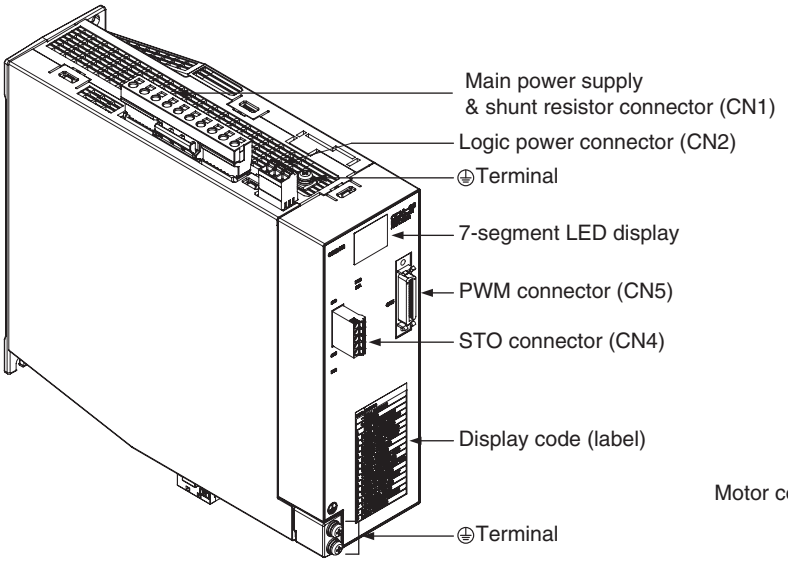
The following table shows the Amplifier power, internal shunt resistor specifications, regenerative power absorption capacity and maximum duration. These values are based on a 200VAC main power supply.

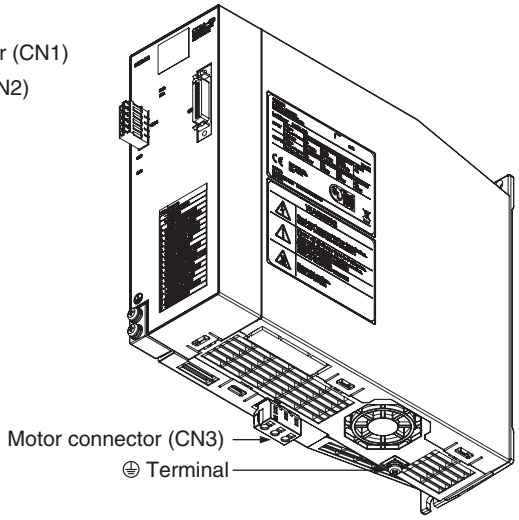
Model	CK3A-G305L	CK3A-G310L	CK3A-G320L
Rated RMS power [W]	1195 W	2390 W	4400 W
Internal shunt resistor specification	25 Ω 30 W	17 Ω 80 W	
Built-in capacitors absorption energy [J]	46 J	62 J	
Internal shunt resistor average regeneration energy [W]	18 W	32 W	
Maximum duration of continuous regeneration [sec]	2 sec	2 sec	
Minimum allowable shunt resistance [Ω]	20 Ω	15 Ω	15 Ω

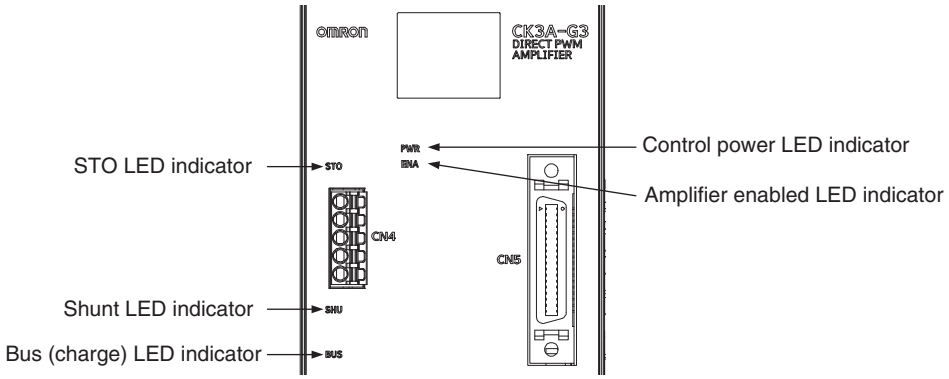
Part Names and Functions

Part Names

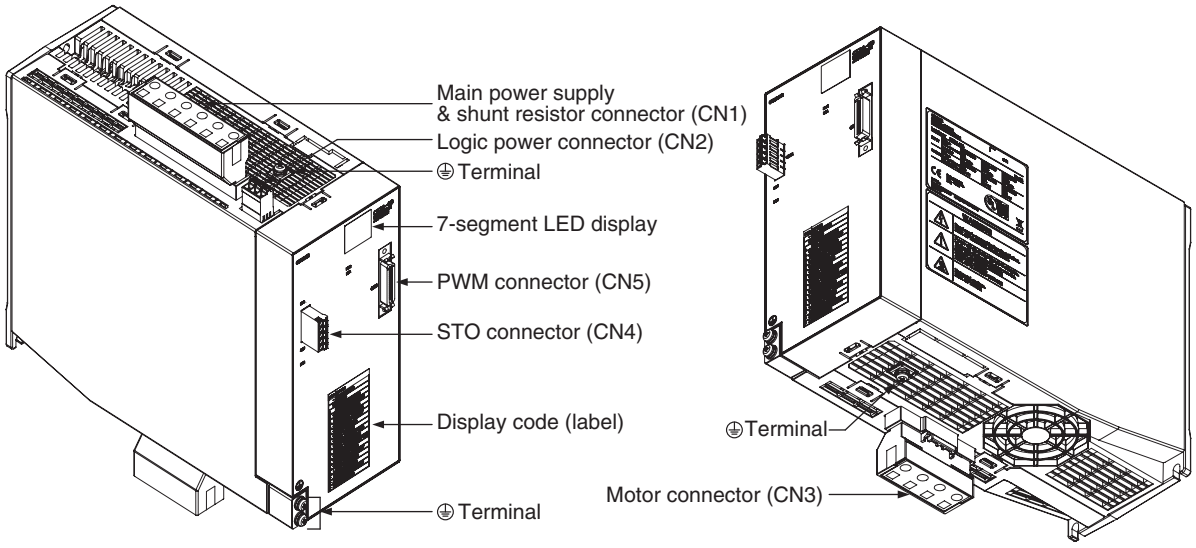
CK3A-G305L

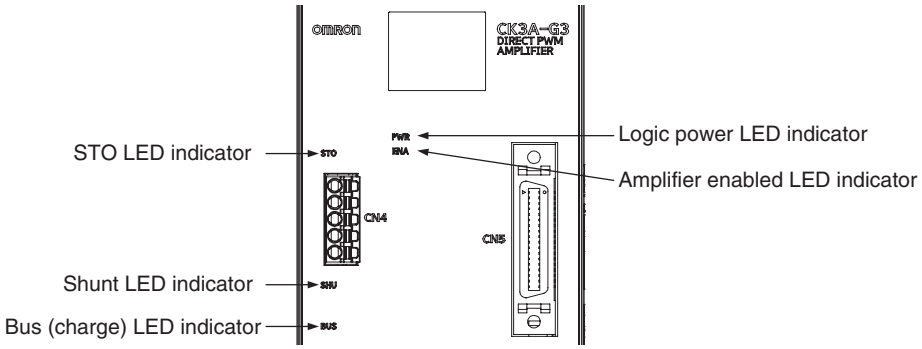






CK3A-G310L/CK3A-G320L





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	Yellow	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/CK3A-G320L (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/CK3A-G320L 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

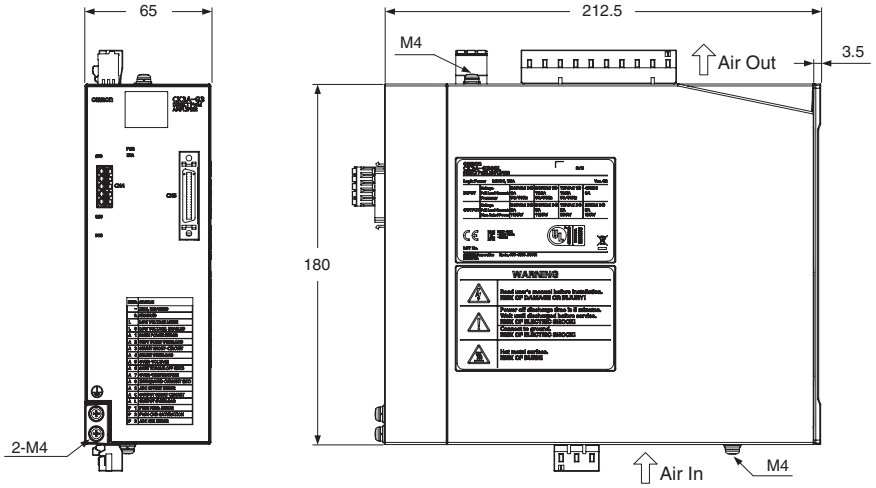
Following, are the location and number of ground ⏚ terminals of the Amplifier:

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

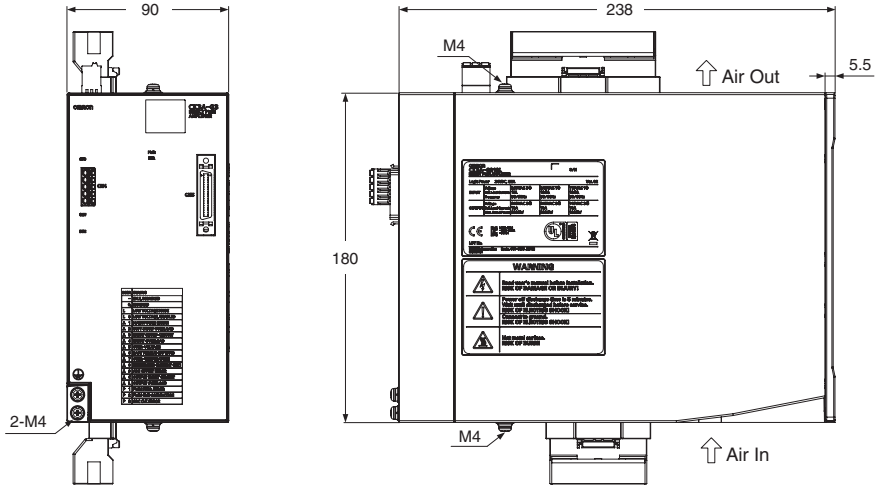
Dimensions

(Unit: mm)

CK3A-G305L

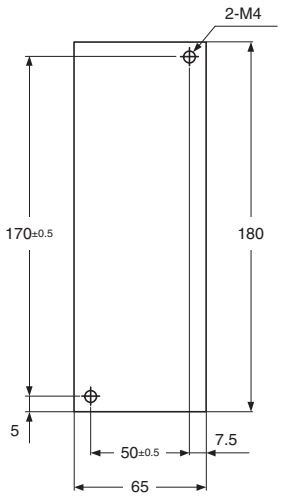


CK3A-G310L/CK3A-G320L

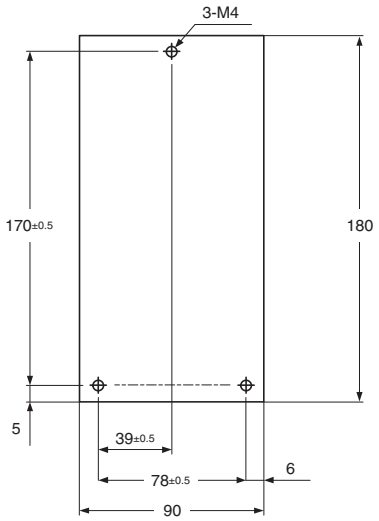


Mounting Dimensions

CK3A-G305L



CK3A-G310L/CK3A-G320L



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 • Configuration, features, and specifications • Mounting, installation and wiring • Basic software configuration • 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 • Introduction • Part names and functions • General specifications • Installation and wiring • 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 • List and description of all commands • 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 • Motor basic functions • Encoder configuration examples • Motor setup examples • 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 • 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 • Introduction • Part names and functions • General specifications • Installation and wiring

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