

**Hitachi America, Ltd.**

# **RCU Series Regenerative Converter Unit Instruction Manual**

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NOTE: REFER ALSO TO APPLICABLE  
INVERTER INSTRUCTION MANUAL



Manual Number: HAL1057A

May 2010

After reading this manual,  
keep it handy for future  
reference.

**Hitachi America, Ltd.**

# RCU Series Regenerative Converter

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**The contents of this manual are subject to  
change without notice.  
May 2010**

## **Revision History**

Rev A, May 2010 – Miscellaneous corrections throughout. Added cooling clearance drawing.

## 1. Safety




**ONLY A COMPETENT ELECTRICIAN SHOULD CARRY OUT  
THE ELECTRICAL INSTALLATION.**



### 1.1 Warning

	<b>1</b>	Internal Components and circuit boards (except the isolated I/O terminals) carry high voltage when the <b>RCU Regenerative Converter</b> is connected to the main power supply and/or inverter DC bus. This voltage is extremely dangerous and may cause death or severe injury if you come in contact with it.
	<b>2</b>	When the <b>RCU Regenerative Converter</b> is connected to the main power, current is flowing in the AC line connection (R (L1), S (L2), T (L3)) and the inverter's DC-Link (P, N).
	<b>3</b>	The voltage on the RCU components is extremely dangerous and may cause death or severe injury if you come in contact with it.
	<b>4</b>	The control I/O terminals are isolated from the main voltage, but the relay outputs and other I/O terminals may have dangerous voltage connected even if the power is disconnected from the <b>RCU Regenerative Converter</b> .
	<b>5</b>	The installer of the <b>RCU Regenerative Converter</b> is responsible to ensure it is installed with appropriate main switches or disconnects, and appropriate power fusing.
	<b>6</b>	Spare parts and service should only be obtained through Hitachi America, Ltd.

## 1.2 Safety Instructions

	1	DO NOT make any connections when the <b>Regenerative Converter</b> is connected to the main voltage or energized inverter DC bus.
	2	DO NOT make any measurements when the <b>Regenerative Converter</b> is connected to the main voltage and energized inverter DC bus.
	3	After disconnecting the main power, wait until the cooling fan stops and the indicator goes out. Wait a further 3 minutes before doing any work on the <b>Regenerative Converter</b> connections. Do NOT open the cover during this time.
	4	DO NOT make any voltage withstand tests on any parts of the <b>Regenerative Converter</b> . Damage to the unit may result.
	6	DO NOT touch the integrated circuits or other components on the internal circuit boards. Static voltage discharge may destroy the components.
	7	Make sure that the cover of <b>RCU Regenerative Converter</b> is closed before connecting the main voltage.

### Ground

The ground terminal of **Regenerative Converter** must be connected to a proper ground. ⚡  
**Grounding of the Regenerative Converter** reduces the risk of high voltage shock, injury or death.

### Warning Symbols

Please observe special caution where the following warning symbols appear throughout this manual.



= Dangerous Voltage



= General Warning

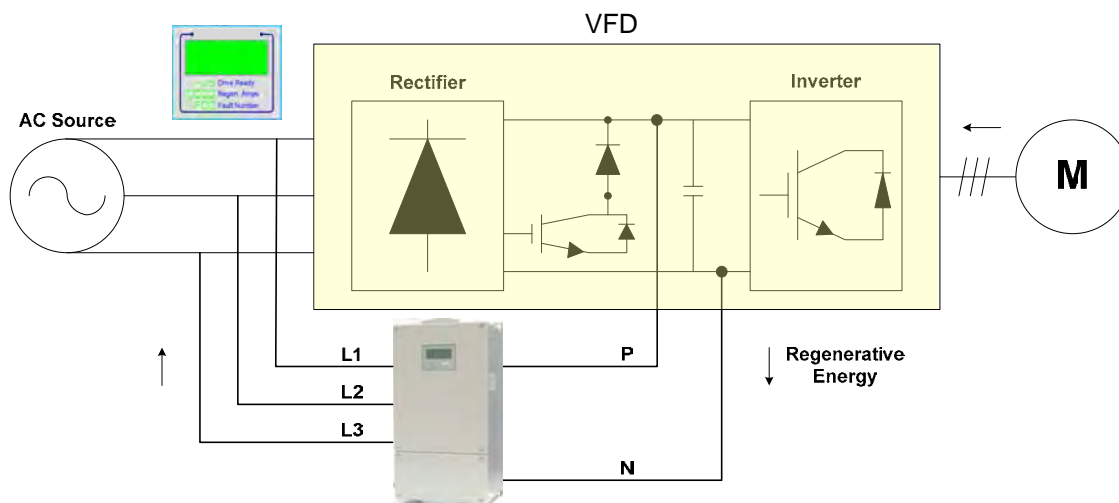
## 2. Introduction

- Vertical lifting machinery or high inertia loads like elevators, cranes, centrifugal fans and centrifuges contain potential energy and inertial energy when operating. When the motor is operated by an inverter, this energy is converted back into electrical energy when the devices decelerate, lower or stop the load. This electrical energy, called regeneration, flows back into the inverter's DC bus, causing the voltage to rise.
- Traditionally, this regenerative energy is dissipated as heat through dynamic braking resistors, and is therefore wasted.
- The RCU series Regenerative Converter can provide up to 40% energy savings, by reclaiming that regenerative energy and feeding it back into the AC supply.

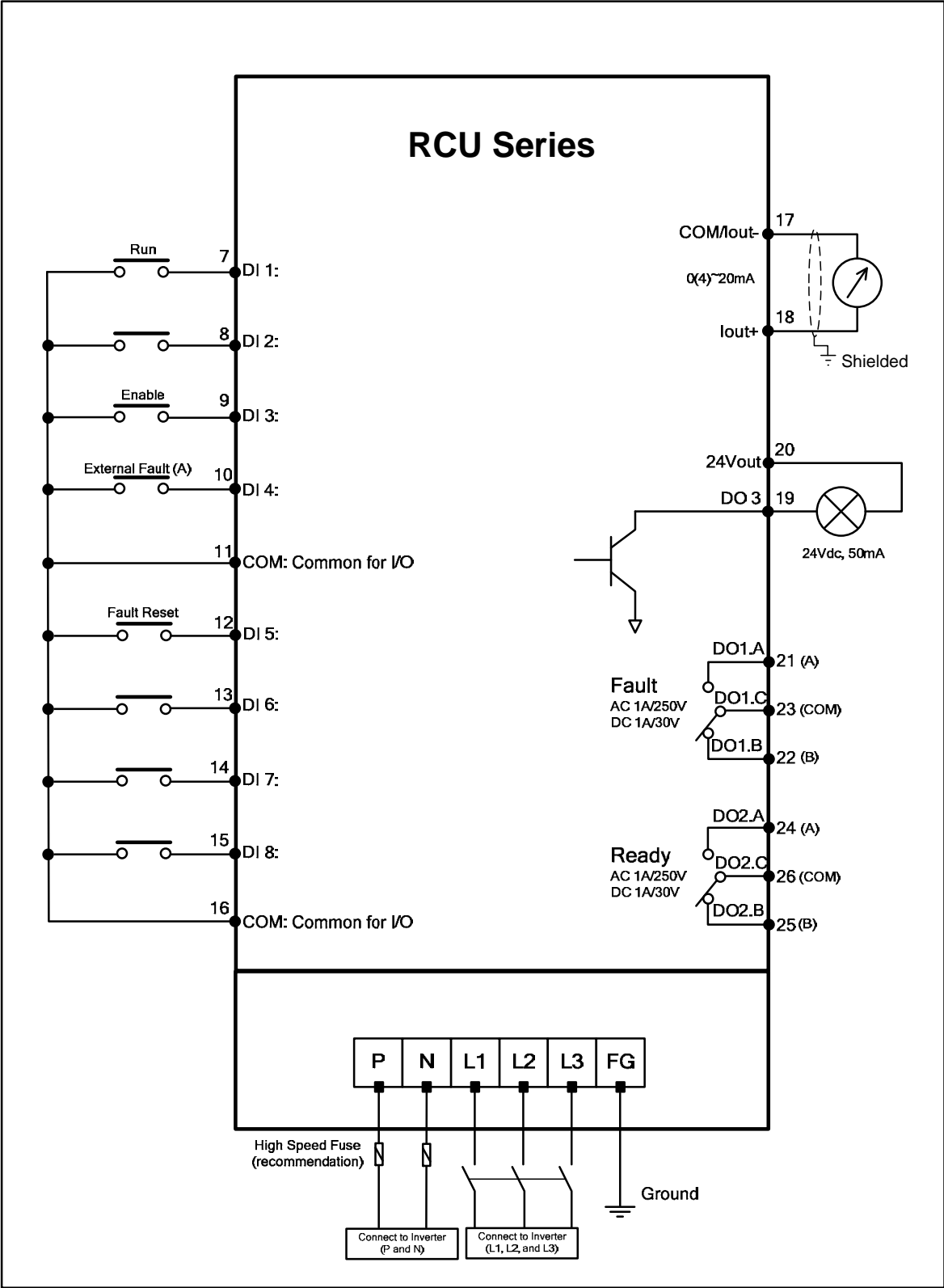
## 3. Benefits

- The RCU Regenerative Converter reduces electric power consumption by returning the otherwise wasted energy to the AC power distribution network for use by other loads.
- Because there is no heat generated by braking resistors, the capacity of air conditioning systems in the electrical room can be reduced, further reducing electric power consumption.
- Heat generated by braking resistors can cause secondary overheating problems for adjacent systems should the equipment room air conditioner system have a problem.

## 4. Main Power Connection Diagram



### 5. Power and Control Connections



## Control Terminal Functions

### Input Signals

#### 7: RUN

When RUN input is given and DC bus voltage is higher than the RCU operating voltage, regeneration is started.

#### 9: RCU ENABLE

When RCU ENABLE input is given, RCU operation is possible.

#### 10: EXTERNAL FAULT (A)

When EXTERNAL FAULT (A) input is given, the RCU cuts output power, and regenerative converter operation is stopped.

#### 12: FAULT RESET

If FAULT RESET input is given, the RCU fault condition is cleared.

#### 11, 16: COMMON

Common terminal for input signals

Note: When terminals 7, 9, and 11 are jumpered together, regenerative operation automatically starts when the inverter's DC bus voltage is above the RCU operating voltage. *These jumper wires are factory pre-installed for your convenience.*

### Output Signals

#### Fault Relay

This relay is activated when fault trip has occurred.

21 (A): Regenerative Converter error A contact (NO)

22 (B): Regenerative Converter error B contact (NC)

23 (COM): Regenerative Converter error common

#### Converter Ready Relay

This relay is activated when the regenerative converter is ready to operate.

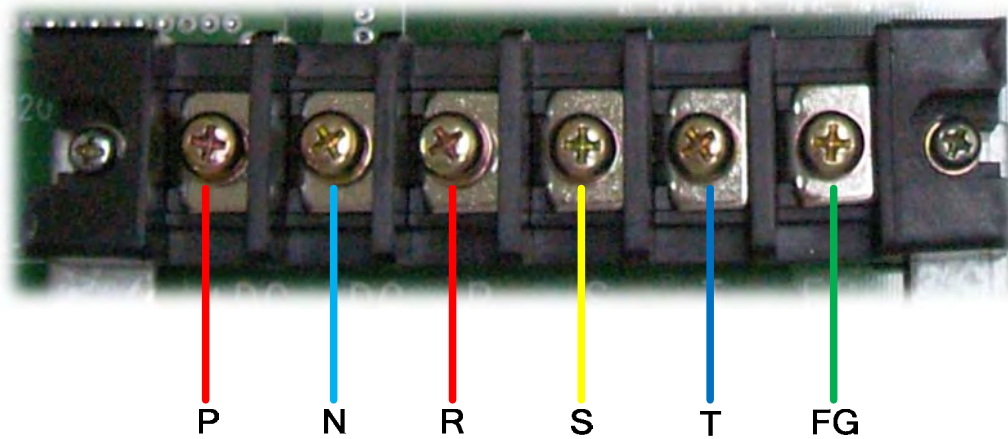
24 (A): Regenerative Converter Ready A contact (NO)

25 (B): Regenerative Converter Ready B contact (NC)

26 (COM): Regenerative Converter Ready common

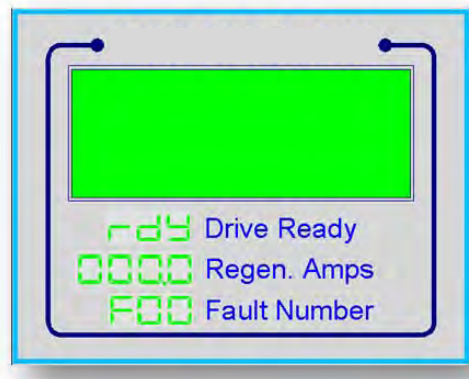


## 6. Power Wiring



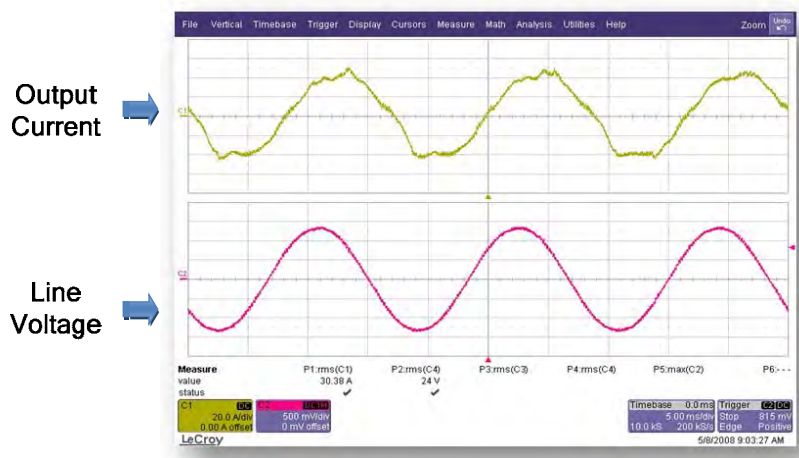
- P : DC-Link P
- N : DC-Link N
- R(L1) , S(L2), T(L3) : 3-phase main power  
(Phase sequence: Automatic recognition)
- FG : Earth

## 7. Display



- rdy (Ready) : Regenerative Converter is ready
- 000.0: Current value during regeneration (000.0A)
- F00 : Fault Code

## 8. Output Current and Line Voltage Waveforms



## 9. Electrical Specifications

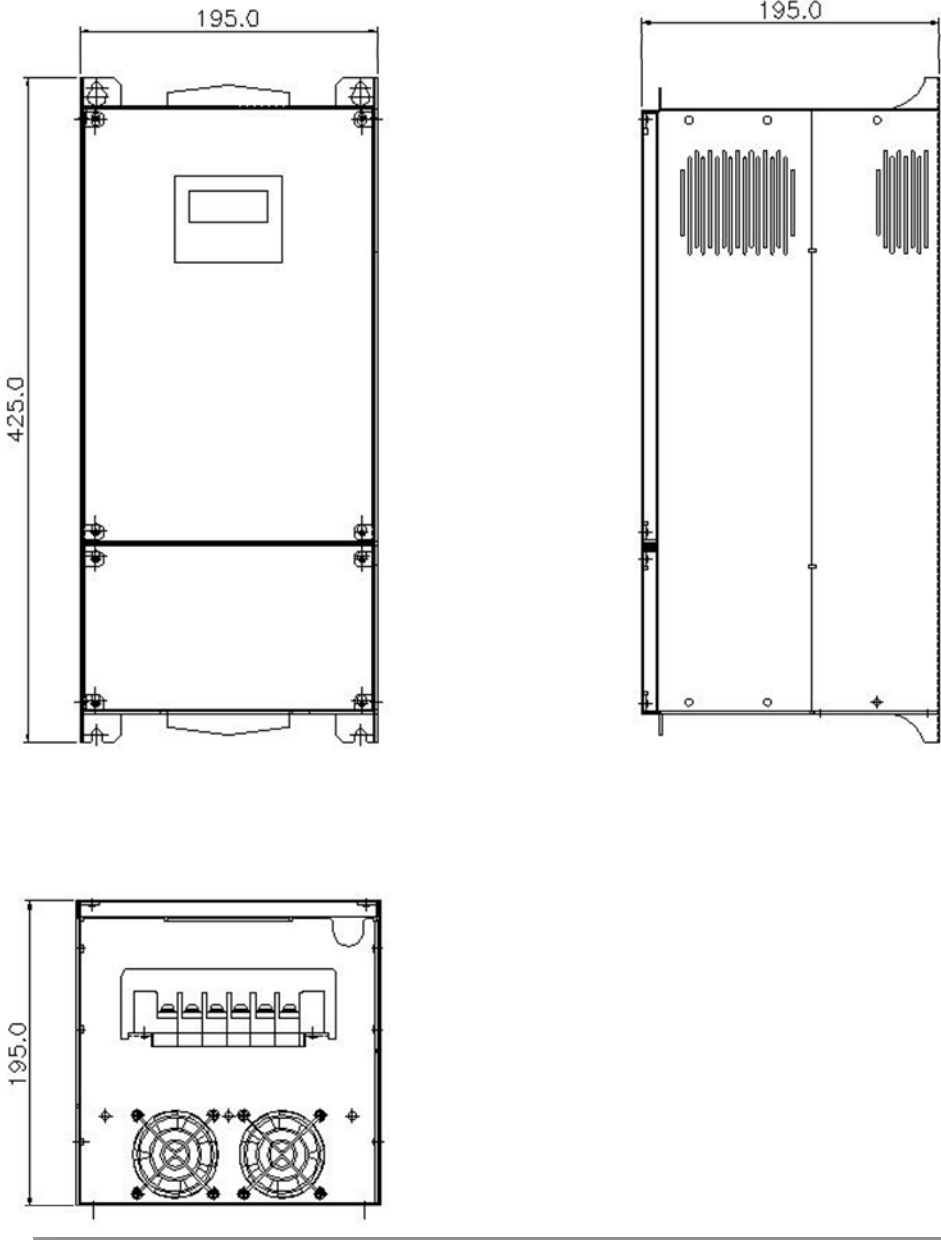
### Models

200 V Class	400 V Class	Power Rating
RCU-2011	RCU-4011	11 kW
RCU-2015	RCU-4015	15 kW
RCU-2022	RCU-4022	22 kW
	RCU-4030	30 kW

Range	200 - 230VAC / 380VAC - 460VAC
Applicable AC Power	3 Phase 200 - 230V / 380V - 460V
Frequency	50Hz/60 Hz
Efficiency	Over 95%
Operating Voltage (DC-LINK)	Automatically set by input voltage
Display and Protection	Display : ready, regenerative current, fault codes Protection : Overheat, Over current, Arm-short, Over Voltage, Low voltage, and Phase Error etc.
Filter	Built-in reactor and noise filter
Wiring	Input R, S, T / DC Bus P, N / Ground
Environmental Conditions	Operation: -10°C to 40°C Storage: -20°C to 65°C < 90% relative humidity, non-condensing

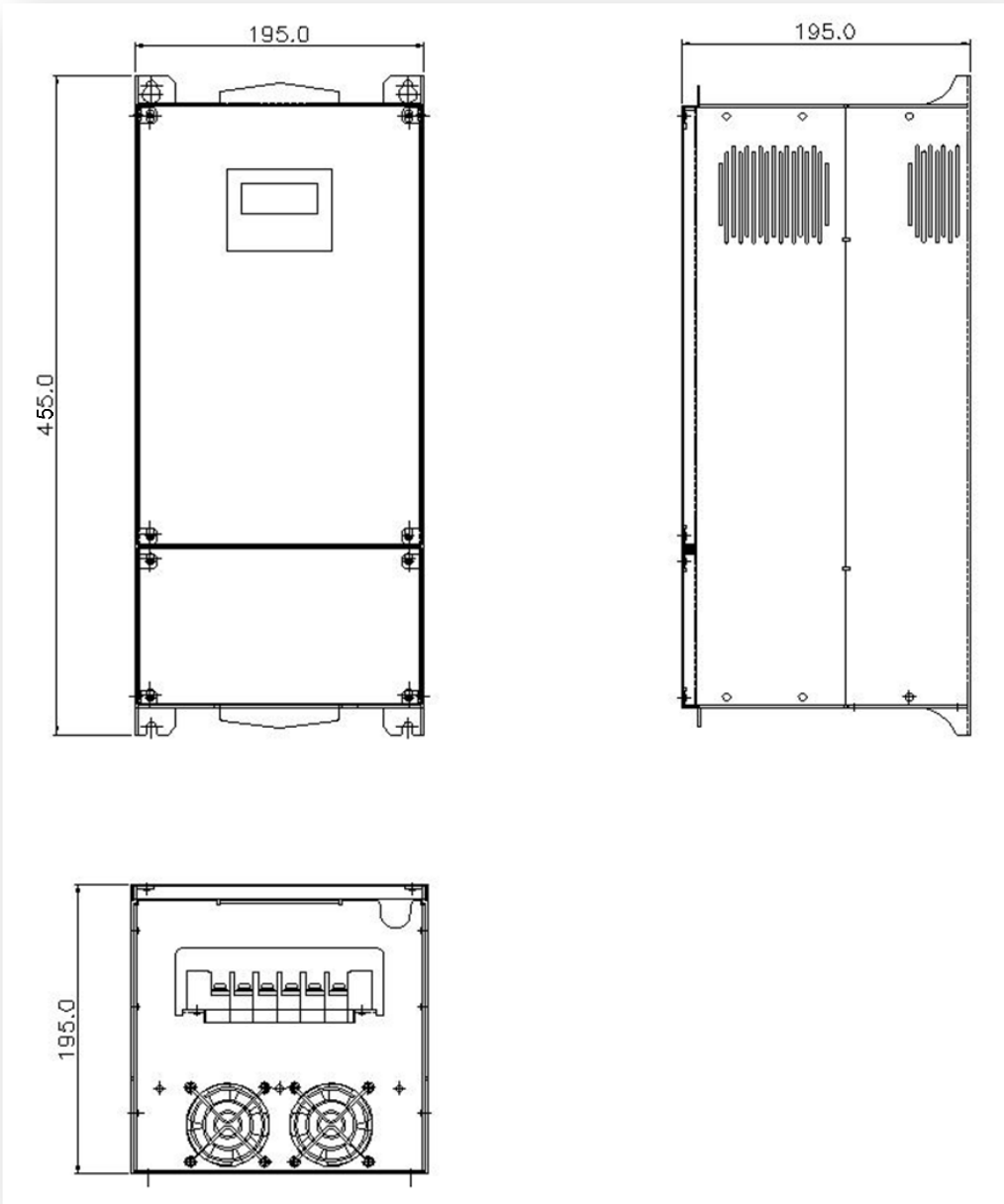
**10. Dimensions**

11 kW and 15 kW Models



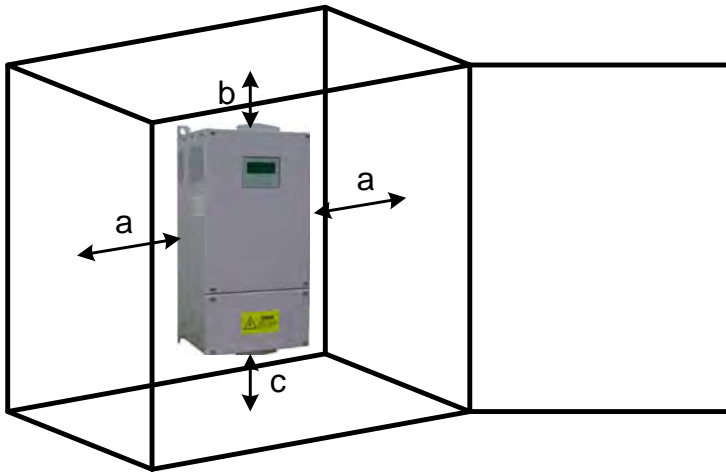
**Dimensions (cont'd)**

22 kW and 30 kW Models



### Dimension (cont'd)

Be sure to observe the mounting clearances shown below to allow adequate air flow for cooling of the units.



Distance(mm)			
a	a2*	b	c
30	10	160	80

\*a2 is the distance between adjacent RCUs