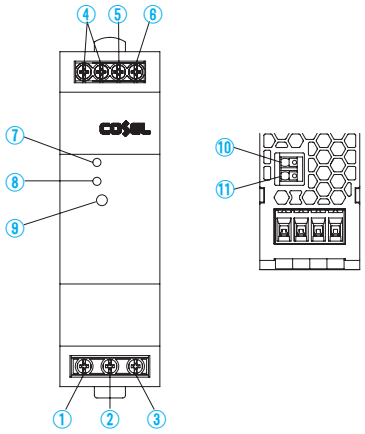
Basic Characteristics Data

Model	Circuit method	Switching frequency [kHz]	Input current [A] ✻1	Rated input fuse	Inrush current protection circuit	PCB/Pattern			Series/Parallel operation availability	
						Material	Single sided	Double sided	Series operation	Parallel operation
KHEA120F	Active filter	60 ～ 550	1.2	250V 5A	Thermistor	FR-4		Yes	Yes	No
KHNA120F	LLC resonant converter	45 ～ 350								
KHEA240F	Active filter	60 ～ 550	2.3	250V 8A	SCR	FR-4		Yes	Yes	No
KHNA240F	LLC resonant converter	45 ～ 350								

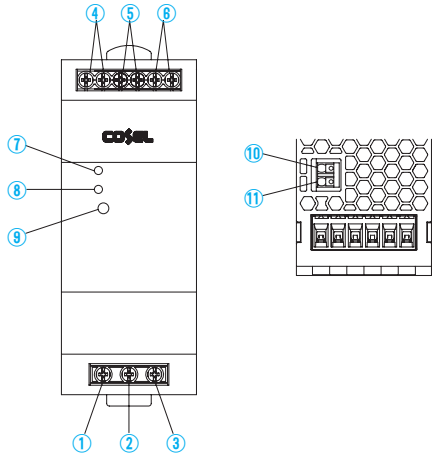
✻1 The value of input current is at ACIN 115V and 100%.

1 Terminal Blocks

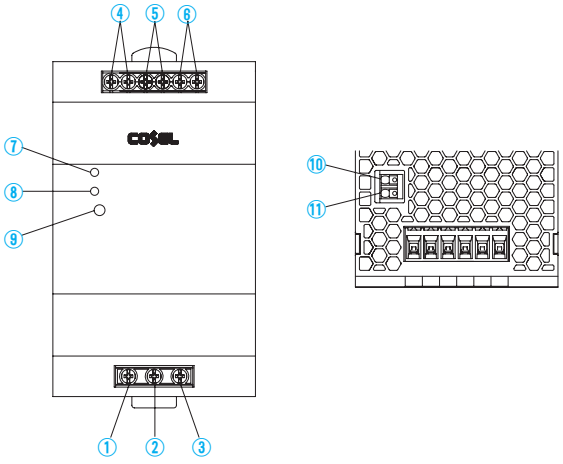
● KHEA120F



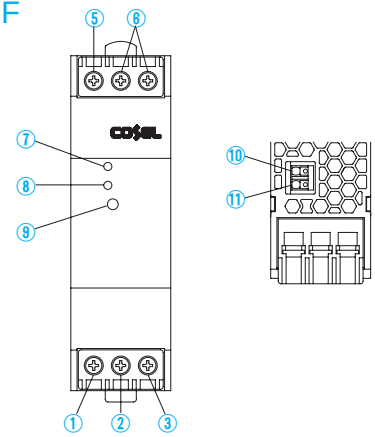
● KHEA240F



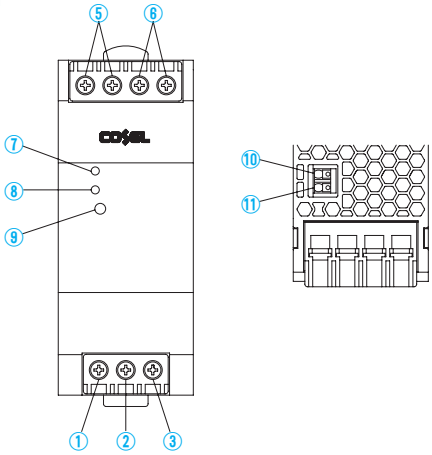
● KHEA480F



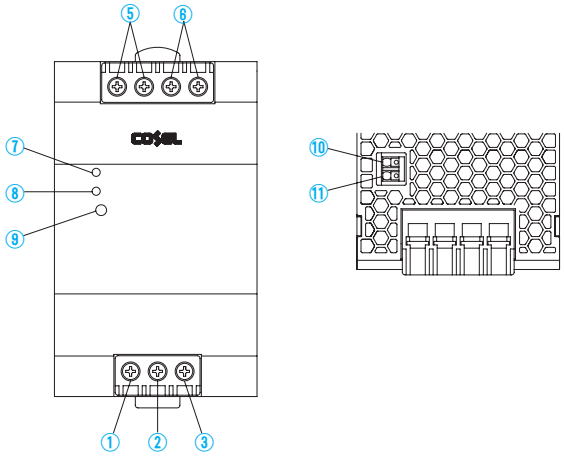
● KHNA120F



● KHNA240F



● KHNA480F



Terminal Number	Terminal Name	Function
①	PE	Protective earth Terminal
②	AC (N)	Input Terminals
③	AC (L)	
④	DC_OK	Output voltage confirmation(relay contact)
⑤	+VOUT	+Output Terminals
⑥	−VOUT	−Output Terminals
⑦	ALARM	LED Alarm for lowered output voltage
⑧	DC_OK	LED for output voltage confirmation
⑨	TRM	Adjustment of output voltage
⑩	+RC	Remote ON/OFF Terminals
⑪	−RC	

2 Functions

2.1 Input Voltage Range

■Input voltage range of the power supplies is from AC85V to AC264V or DC (please see SPECIFICATIONS for details).

■To comply with safety standards, input voltage range is AC100-AC240V (50/60Hz).

■If input value doesn't fall within above range, a unit may not operate in accordance with specifications and/or start hunting or fail.
If you need to apply a square waveform input voltage, which is commonly used in UPS and inverters, please contact us.

■When the input voltage changes suddenly, the output voltage accuracy might exceed the specification. Please contact us.

2.2 Inrush Current Limiting

■An inrush current limiting circuit is built-in.

■If you need to use a switch on the input side, please select one that can withstand an input inrush current.

● KHEA120F, KHNA120F

■Thermistor is used in the inrush current limiting circuit. When you turn the power ON/OFF repeatedly within a short period of time, please have enough intervals so that a power supply cools down before being turned on.

● KHEA240F, KHNA240F, KHEA480F, KHNA480F

■Thyristor technique is used in the inrush current limiting circuit.
When you turn the power ON/OFF repeatedly within a short period of time, please have enough intervals so that the inrush current limiting circuit becomes operative.

■When the switch of the input is turned on, the primary inrush current and secondary inrush current will be generated because the thyristor technique is used for the inrush current limiting circuit.

2.3 Overcurrent Protection

■An overcurrent protection circuit is built-in and activated at 101% of the peak current. A unit automatically recovers when a fault condition is removed. Please do not use a unit in short circuit and/or under an overcurrent condition.

■Intermittent Operation Mode
When the overcurrent protection circuit is activated and the outputvoltage drops to a certain extent, the output becomes intermittent so that the average current will also decrease.

2.4 Peakcurrent Protection

■Peakcurrent protection is built-in (refer to Instruction Manual 3 for Peak loading).
If this function comes into effect, the output is shut down.
A few seconds later, A unit automatically recovers.
But if the overcurrent condition has not been released, the output will stop again (intermittent Operation Mode).

✻The recovery time varies depending on input voltage and load condition.

2.5 Overvoltage Protection

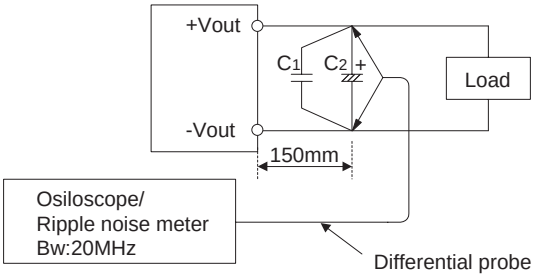
■An overvoltage protection circuit is built-in.
A unit automatically recovers when the fault condition is removed.
Note :
Please avoid applying a voltage exceeding the rated voltage to an output terminal. Doing so may cause a power supply to malfunction or fail. If you cannot avoid doing so, for example, if you need to operate a motor, etc., please install an external diode on the output terminal to protect the unit.

2.6 Thermal Protection

■A thermal protection circuit is built-in.
The thermal protection circuit may be activated under the following conditions and shut down the output.
①When a temperature continue to exceed the values determined by the derating curve.
②When a current exceeding the rated current is applied.
③When convection stops.
④When peak load is applied in conditions other than those shown in Section 3.
A unit automatically recovers when the fault condition is removed.

2.7 Output ripple and ripple noise

■Output ripple noise may be influenced by measurement environment, measuring method fig 2.1 is recommended.



C1:Film capacitor 0.1μF
C2:Aluminum electrolytic capacitor 22 μF

Fig 2.1 Measuring method of Ripple and Ripple Noise

2.8 Remote ON/OFF

■You can reduce the standby power by Remote ON/OFF.
To do so, connect an external DC power supply and apply a voltage to a remote ON/OFF connector.

Table 2.1 Remote ON/OFF Specifications

ON/OFF logic	Between +RC and -RC	Output voltage
Negative	L level (0 to 0.5V) or open	ON
	H level (4.5 to 12.5V)	OFF

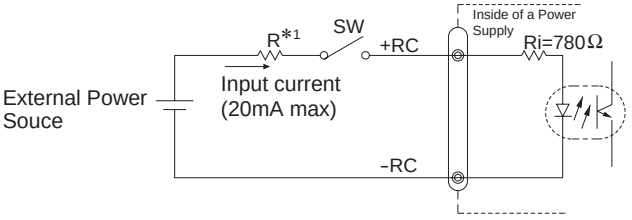


Fig.2.2 Example of use with remote ON/OFF

∗1 If the output of an external power supply is within the range of 4.5 - 12.5V, you do not need a current limiting resistor R. If the output exceeds 12.5V, however, please connect the current limiting resistor R.
To calculate a current limiting resistance value, please use the following equation.

$$R\ [\Omega] = \frac{Vcc-(1.1+Ri\times 0.005)}{0.005}$$

■Please wire carefully. If you wire wrongly, the internal components of a unit may be damaged.
■Remote ON/OFF circuits (+RC and -RC) are isolated from input, output and PE.
■Restart time is 750 ms max .

2.9 Output Voltage Adjustment Range

■To increase an output voltage, turn a built-in potentiometer clockwise. To decrease the output voltage, turn it counterclockwise.

2.10 Isolation

■When you run a Hi-Pot test as receiving inspection, gradually increase the voltage to start. When you shut down, decrease the voltage gradually by using a dial. Please avoid a Hi-Pot tester with a timer because, when the timer is turned ON or OFF, it may generate a voltage a few times higher than the applied voltage.

2.11 Signal Output

■Functions of LED indicators and signal output in the form of relay contact are shown below. LED indicators and signal output in the form of relay contact are signals to check the presence/absence of voltage at the output terminal of a power supply. The timing of signals might be vary depending on input and load conditions. Please make sure enough evaluation.

Table 2.2 Description of the signal output

Signal Output	Normal	Output is decreasing
DC_OK (LED: Green)	ON	OFF
ALARM (LED: Red)	OFF	ON
DC_OK (Relay Contact) ∗	Short	Open

Caution on signal outputs :

■Please be careful. Time it takes for signals to be output vary depending on models and conditions.
∗DC_OK signal (relay contact) is built in KHEA series. This circuit is insulated from other circuits (input and output circuits).

3 Peak Current

■The units can generate the peak current under the following conditions.
・t1≦5sec
・Ip≦Rated peak current
・Iave≦Rated current
・Duty= $\frac{t1}{t1+t2}\times 100\ [\%] \leqq 35\%$

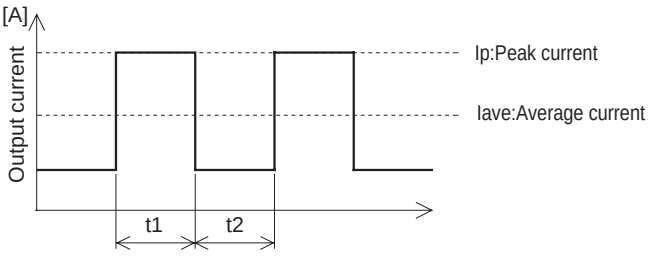


Fig.3.1 Peak current

4 Series/Parallel Operation

4.1 Series Operation

■You can use a power supply in series operation. The output current in series operation should be lower than the rated current of a power supply with the lowest rated current among the power supplies that are serially connected. Please make sure that no current exceeding the rated current flows into a power supply.

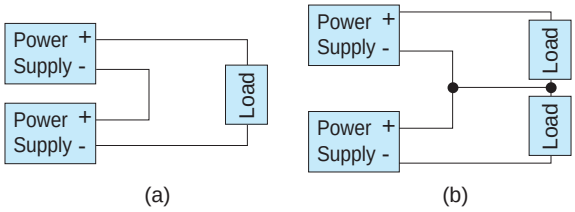


Fig.4.1 Examples of connecting in series operation

4.2 Parallel Operation

■There is no current balance function.
When operating in parallel, such as diode-OR, please use on the output voltage was adjusted enough to balance the current.
Exceeds the rated output current, the output is shut down.

■Redundancy operation is available by wiring as shown below.

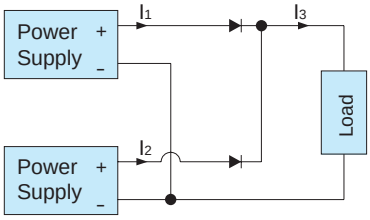


Fig.4.2 Example of connecting in redundancy operation

Even a slight difference in output voltage can affect the balance between the values of I_1 and I_2.
Please make sure that the value of I_3 does not exceed the rated current of a power supply.

$I_3 \leqq$ rated current value

5 Assembling and Installation Method

5.1 Installation Mounting methods

■Below shows mounting orientation.
If install other then standard mounting orientation (A), please fix the power supply for withstand the impact and vibration.

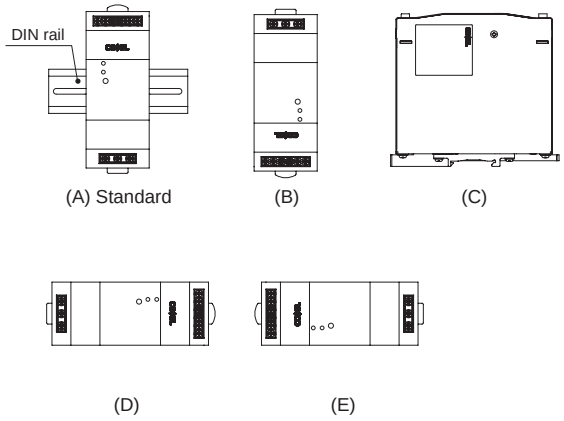


Fig 5.1 Mounting orientation

■When you mount a power supply on a DIN rail, have the area marked A catch one side of the rail and push the unit to the direction of B. To remove the power supply from the rail, either push down the area marked C or insert a tool such as driver to the area marked D and pull the unit apart from the rail.
When you couldn't remove the unit easily, push down the area marked C while lightly pushing the unit to the direction of E.

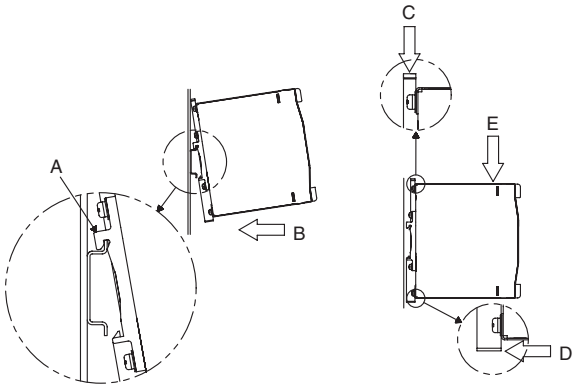


Fig 5.2 Installation method

■Please have clearance of at least 25mm above and below the unit to avoid heat accumulation. If multiple units are used side by side, please place them at least 15mm apart from each other.

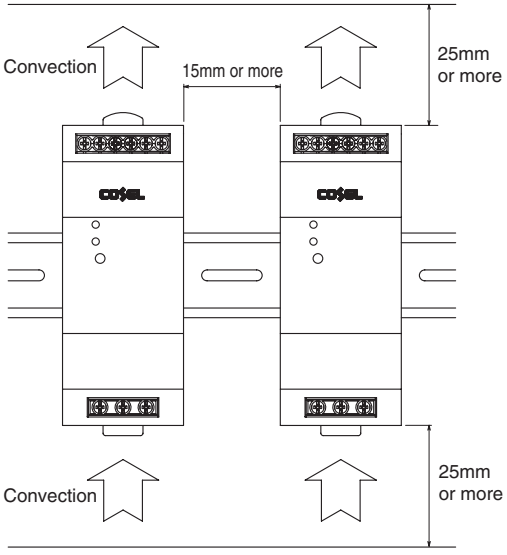


Fig 5.3 Installation clearance

5.2 Derating

■The operative ambient temperature as different by input voltage. Derating curve is shown below.

■In the hatched area,the specification of Ripple,Ripple Noise is different from other area.

■Derating Curve (Convection)

● KHEA120F, KHNA120F

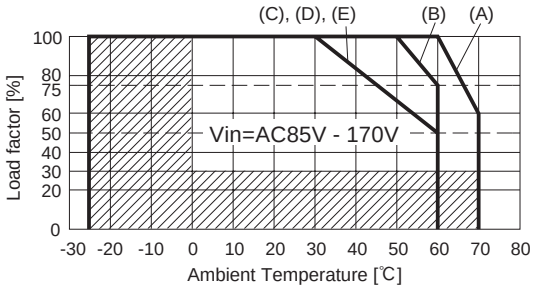


Fig.5.4 Derating curve depend on ambient temperature

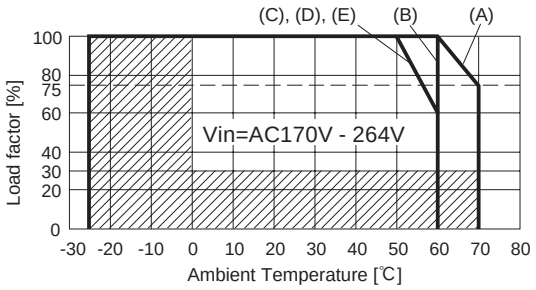


Fig.5.5 Derating curve depend on ambient temperature

● KHEA240F, KHNA240F

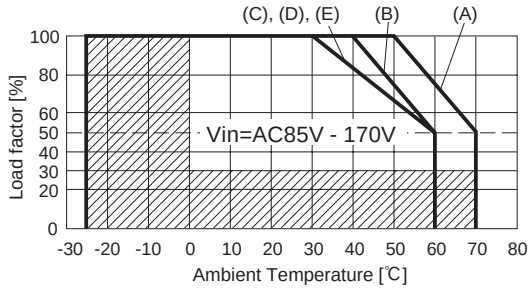


Fig.5.6 Derating curve depend on ambient temperature

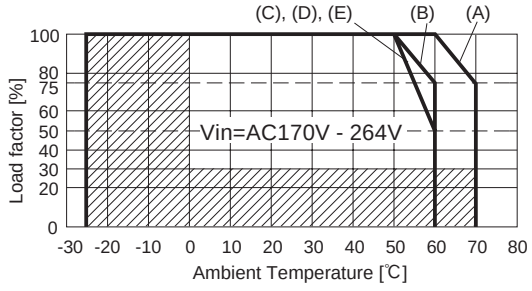


Fig.5.7 Derating curve depend on ambient temperature

■Ambient temperature indicates the temperature of the inlet of of the air.

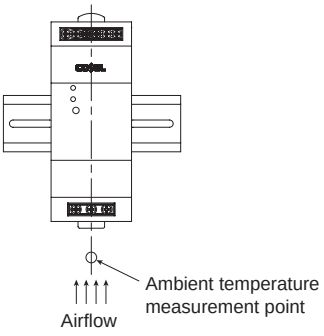


Fig.5.8 Ambient temperaturemeasurement point

■Derating Curve (Forced air)

● KHEA120F, KHNA120F

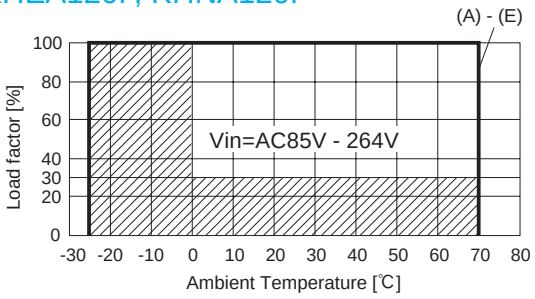


Fig.5.9 Derating curve depend on ambient temperature

● KHEA240F, KHNA240F

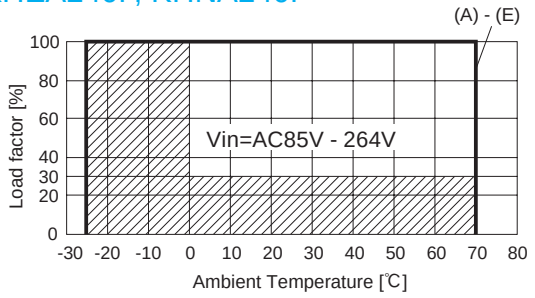


Fig.5.10 Derating curve depend on ambient temperature

■Temperature of Forced air

Use the temperature measurement point as shown in Fig 5.11.

Please use at the temperature does not exceed the values in Table 5.1.

Please also make sure that the ambient temperature does not exceed 70℃.

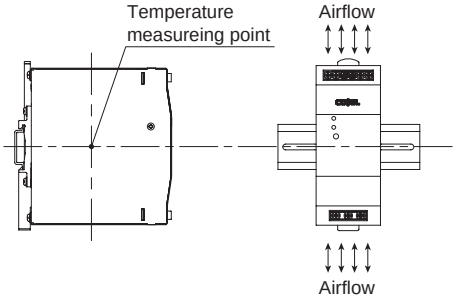


Fig.5.11 Temperature measurement point (Forced air)

Table 5.1 Specified temperature of the measurement point

No.	Model	temperature measurement point
1	KHEA120F, KHNA120F	75℃
2	KHEA240F, KHNA240F	80℃

5.3 Expectancy life and warranty

■Expectancy Life.

Table 5.2 Expectancy Life (KHEA120F, KHNA120F)

Mounting method	Cooling method	Input voltage	Average ambient temperature (year)	Expectancy Life	
				Load factor Io≦75%	Load factor 75%<Io≦100%
A	Convection	AC85 - 170V	Ta = 50℃ or less	10years	8years
			Ta = 60℃	8years	3years
		AC170 - 264V	Ta = 50℃ or less	10years	6years
			Ta = 60℃	5years	4years
B	Convection	AC85 - 170V	Ta = 40℃ or less	10years	10years
			Ta = 50℃	8years	5years
		AC170 - 264V	Ta = 40℃ or less	10years	10years
			Ta = 50℃	8years	5years
C	Convection	AC85 - 170V	Ta = 20℃ or less	10years	10years
			Ta = 30℃	10years	10years
		AC170 - 264V	Ta = 40℃ or less	10years	10years
			Ta = 50℃	5years	3years
D	Convection	AC85 - 170V	Ta = 20℃ or less	10years	10years
			Ta = 30℃	10years	8years
		AC170 - 264V	Ta = 40℃ or less	10years	8years
			Ta = 50℃	5years	3years
E	Convection	AC85 - 170V	Ta = 20℃ or less	10years	10years
			Ta = 30℃	10years	8years
		AC170 - 264V	Ta = 40℃ or less	10years	10years
			Ta = 50℃	5years	3years
A,B,C,D and E	Forced air	AC85 - 264V	Ta = 70℃	5years	3years

Table 5.3 Expectancy Life (KHEA240F, KHNA240F)

Mounting method	Cooling method	Input voltage	Average ambient temperature (year)	Expectancy Life	
				Load factor Io≦75%	Load factor 75%<Io≦100%
A	Convection	AC85 - 170V	Ta = 40℃ or less	10years	6years
			Ta = 50℃	5years	3years
		AC170 - 264V	Ta = 50℃ or less	10years	6years
			Ta = 60℃	5years	3years
B	Convection	AC85 - 170V	Ta = 30℃ or less	10years	10years
			Ta = 40℃	10years	8years
		AC170 - 264V	Ta = 40℃ or less	10years	10years
			Ta = 50℃	10years	6years
C	Convection	AC85 - 170V	Ta = 20℃ or less	10years	10years
			Ta = 30℃	10years	8years
		AC170 - 264V	Ta = 40℃ or less	10years	8years
			Ta = 50℃	6years	3years
D and E	Convection	AC85 - 170V	Ta = 20℃ or less	10years	10years
			Ta = 30℃	10years	5years
		AC170 - 264V	Ta = 40℃ or less	10years	6years
			Ta = 50℃	5years	3years
A,B,C,D and E	Forced air	AC85 - 264V	Ta = 70℃	5years	3years

■Warranty

Table 5.4 Warranty (KHEA120F, KHNA120F)

Mounting method	Cooling method	Input voltage	Average ambient temperature (year)	Warranty term	
				Load factor Io≦75%	Load factor 75%<Io≦100%
A	Convection	AC85 - 170V	Ta = 50℃ or less	5years	5years
			Ta = 60℃	5years	3years
		AC170 - 264V	Ta = 50℃ or less	5years	5years
			Ta = 60℃	5years	4years
B	Convection	AC85 - 170V	Ta = 40℃ or less	5years	5years
			Ta = 50℃	5years	5years
		AC170 - 264V	Ta = 40℃ or less	5years	5years
			Ta = 50℃	5years	5years
C,D and E	Convection	AC85 - 170V	Ta = 20℃ or less	5years	5years
			Ta = 30℃	5years	5years
		AC170 - 264V	Ta = 40℃ or less	5years	5years
			Ta = 50℃	5years	3years
A,B,C,D and E	Forced air	AC85 - 264V	Ta = 70℃	5years	3years

Table 5.5 Warranty (KHEA240F, KHNA240F)

Mounting method	Cooling method	Input voltage	Average ambient temperature (year)	Warranty term	
				Load factor Io≦75%	Load factor 75%<Io≦100%
A	Convection	AC85 - 170V	Ta = 40℃ or less	5years	5years
			Ta = 50℃	5years	3years
		AC170 - 264V	Ta = 50℃ or less	5years	5years
			Ta = 60℃	5years	3years
B	Convection	AC85 - 170V	Ta = 30℃ or less	5years	5years
			Ta = 40℃	5years	5years
		AC170 - 264V	Ta = 40℃ or less	5years	5years
			Ta = 50℃	5years	5years
C,D and E	Convection	AC85 - 170V	Ta = 20℃ or less	5years	5years
			Ta = 30℃	5years	5years
		AC170 - 264V	Ta = 40℃ or less	5years	5years
			Ta = 50℃	5years	3years
A,B,C,D and E	Forced air	AC85 - 264V	Ta = 70℃	5years	3years

5.4 Applicable Electric Cable

Only use the electric cable that exists in Table 5.6.

Table 5.6 Applicable Wire

	Input terminals	Output terminals	RC terminals
Solid wire	Diameter 0.5 mm to 2.6 mm (AWG.24 to AWG.10)		Diameter 0.5 mm to 1.3 mm (AWG.24 to AWG.16)
Stranded wire	0.2mm^2 to 5.2mm^2 (AWG.24 to AWG.10) Conductor diameter more than 0.18mm		0.2 mm^2 to 1.5 mm^2 (AWG.24 to AWG.16)
Sheath strip length	8mm		8mm

✻Input termianls, Output terminals are applicable to KHEA series. RC Terminals is applicable to KHEA and KHNA series.

6 Option

6.1 Outline of option

● -C

・Option -C units have coated internal PCB for better moisture resistance.

● -N2

・Option -N2 units have attachment with screw mounting instead of DIN rail mounting.
Mounting holes pitch are shown in Table 6.1.

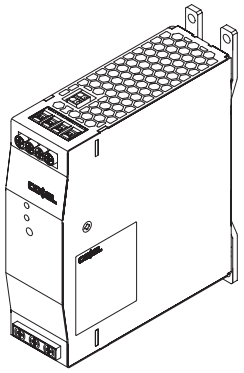


Fig.6.1 Image of option -N2

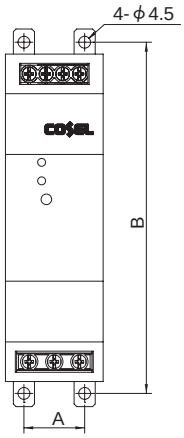


Fig.6.2 Mounting place (screw holes)

Table 6.1 Mounting holes pitch

No.	Model	A	B
1	KHEA120F, KHNA120F	23mm	133mm
2	KHEA240F, KHNA240F	34mm	133mm