GHA300F, GHA500F

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GHA700F

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1 Function

1.1 Input voltage range

■The range is from AC90V to AC264V or DC130V to DC370V (please see SPECIFICATIONS for details).

■In cases that conform with safety standard, input voltage range is AC100-AC240V (50/60Hz).

■External DC fuse is required for safety reason in case of DC input.

(a) Recommended Capacity : 6.3A, slow -blow

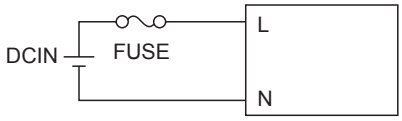


Fig.1.1 Connection method for DC input

■If input value doesn't fall within above range, a unit may not operate in accordance with specifications and/or start output voltage humting 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.

1.2 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.

■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.

■Surge current in the filter unit does not include. (0.2ms or less).

1.3 Overcurrent protection

■An overcurrent protection circuit is built-in and activated over 105% of the rated 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.

■Hiccup Operation Mode
Hiccup operation for overcurrent protection is included in a part of series. When the overcurrent protection circuit is activated and the output voltage drops to a certain extent, the output becomes hiccup so that the average current will also decrease.

1.4 Overvoltage protection

■An overvoltage protection circuit is built-in. If the overvoltage protection circuit is activated, shut down the input voltage, wait more than 3 minutes and turn on the AC input again to recover the output voltage. Recovery time varies depending on such factors as input voltage value at the time of the operation.

Remarks :
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.

1.5 Thermal protection

■Over Temperature Protection (OTP) is built in.

■If this function is in operation, turn off power, eliminate all possible causes of overheating, and drop the temperature to nomal level. Output voltage recovers after applying input voltage.
The recovery time varies depending on input voltage and load condition.
①Over rated temperature
②Poor ventilation
③Over load

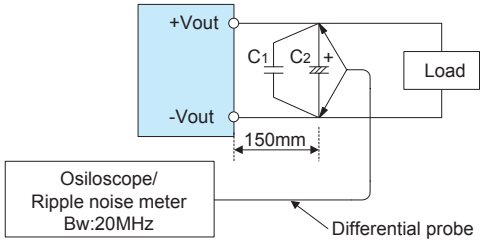
Remarks :
Please comply with recommended mounting method in section 3.1.

1.6 Output voltage adjustment range

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

1.7 Output ripple and ripple noise

■Output ripple noise may be influenced by measurement environment, measuring method Fig.1.2 is recommended.



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

Fig.1.2 Measuring method of Ripple and Ripple Noise

Remarks :
When GND cable of probe with flux of magnetic force from power supply are crossing, ripple and ripple noise might not measure correctly.
Please note the measuring environment.

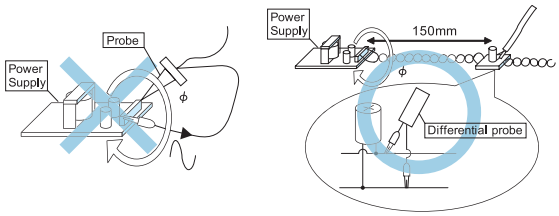


Fig.1.3 Example of measuring output ripple and ripple noise

1.8 Isolation

■For a receiving inspection, such as Hi-Pot test, gradually increase (decrease) the voltage for the start (shut down). Avoid using Hi-Pot tester with the timer because it may generate voltage a few times higher than the applied voltage, at ON/OFF of a timer.

■When you test a unit for isolation between the input and output, input and the terminal FG or between the output and the terminal FG, short-circuit between the output and the terminals RCG, PGG and AUXG.

2 Series Operation and Parallel Operation

2.1 Series Operation

■Series operation is available by connecting the outputs of two or more power supplies with the same output voltage, as shown below. Output current in series connection should be lower than the lowest rated current in each unit.

Remarks :

Please be sure to have enough cooling in case one of the power supply stops due to activation of the protection circuitry.

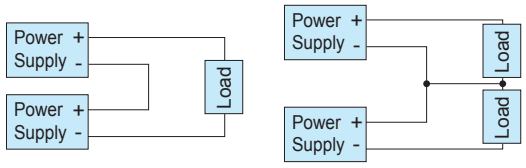


Fig.2.1 Examples of connecting in series operation

2.2 Parallel Operation

■Parallel operation

Parallel operation is possible with option "-P".

Parallel operation is not available for the standard unit, please refer to the listed options.

■Redundancy operation

Redundancy operation is available by wiring as shown below.

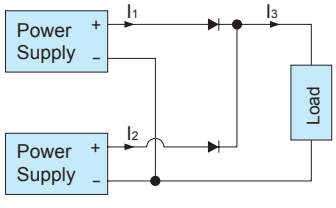


Fig.2.2 Example of redundancy operation

■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.

$I_3 \leqq$ the rated current value

Please evaluate carefuly and test for any possible failure modes.

■Hot-swap or Hot-plug is not available.

3 Temperature Measurement Point

● GHA500F

■Cooling method

Conduction cooling, forced air and convection cooling are available.

The combination of the cooling method makes mechanical design flexible.

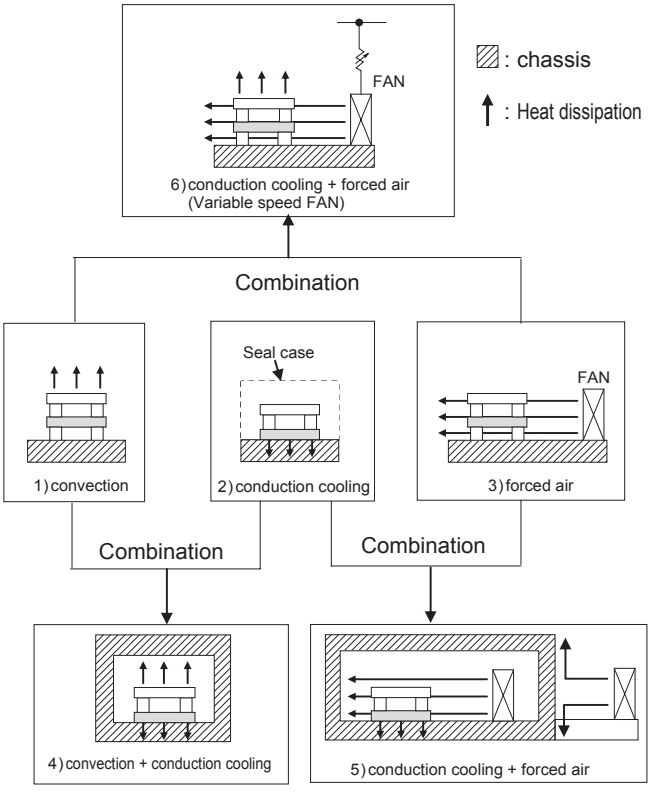


Fig.3.1 Cooling method Combination

In order to determine if the power supply operates according to our specifications, the maximum operating temperature and temperature measuring points are shown in table 3.1., for reference.

● GHA300F

■Cooling method

Both Forced air and convection cooling are available.

(Fig 3.1 1),3),6)cooling method).

Remarks:

■For proper operation of the power supply, please note the following:

・The temperature rise and heat dissipation of the converter must be considered.

・Conditions varies with environment and input voltage.

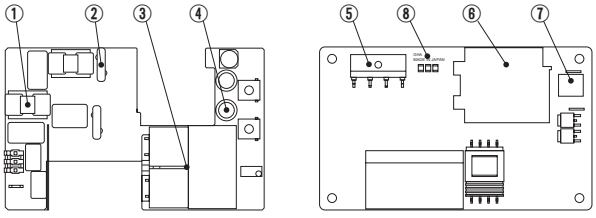
・Mounting surface will be very hot during the operation ,so please be careful not to touch the surface.

・GHA500F series can achieve the efficient heat dissipation by combining Conduction cooling and Forced air cooling. However, if the cooling fan stops due to the fan failure or other reason, Over Temperature Protection may not be activated due to the conduction cooling, and then the components temperature which are cooled by forced air (①, ②, ③ and ④ shown in table 3.1) would become high. Please ensure fail safe function of your product, and consult us for more details.

● GHA300F/500F

■Given the potential for variation between one application and another, the real test is to measure the critical components temperature rise when the power supply installed in the end-application.
For reliable and safe operation, please make sure the maximum component temperatures rise given in table 3.1 is not exceeded.
Operating at the maximum temperature rating results in 3-Years life expectancy. The actual life expectancy can be extended by reducing the ambient temperature. Please refer to section 4 for more information.

■Test Measuring points
Be aware of the conductive parts during the measurements.
Please contact us for more detail.



(a)Upper substrate (b)Lower substrate

Fig.3.2 Temperature measurement points locations

Table 3.1 Maximum operating temperature

Point	Parts name	Symbol No.	Maximum temperature[℃]		Remarks
			500F	300F	
①	Line Filter	L101	115	115	
②	Varistor	SK101	76	76	
③	Input Capacitor	C106	89	89	
④	Output Capacitor	C506	87	87	
⑤	Rectifier	SS11	120	120	case temperature
⑧	Transformer	T11	110	110	
⑦	Output Choke	L51	115	115	
⑧	Aluminum base plate	–	＊	–	

＊Operating ambient temperature derating of Conduction cooling (Fig.3.3)

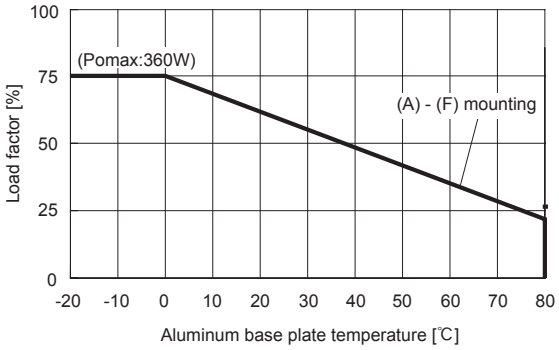


Fig.3.3 Conduction cooling derating curve (Reference value)

● GHA500F

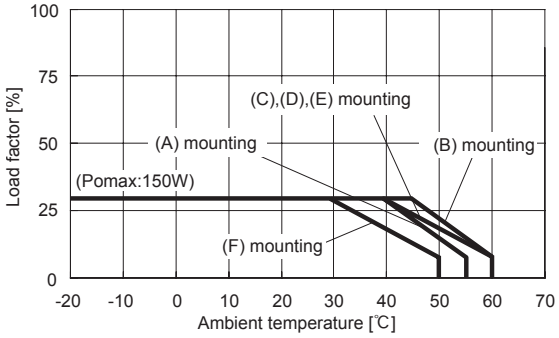


Fig.3.4 Convection cooling derating curve (Reference value)

● GHA300F

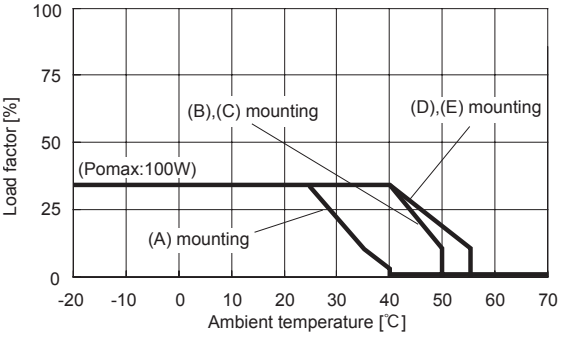


Fig.3.5 Convection cooling derating curve (Reference value)

4 Life Expectancy and Warranty

■Life Expectancy.

Table 4.1 Life Expectancy (GHA500F-□)

Cooling Method	Mounting Method	Average ambient temperature (year)	Life Expectancy	
			Io≦75%	75%<Io≦100%
Convection	A, C, D	Ta = 35℃ or less	10years or more	6years
		Ta = 40℃	7years	4years
	B	Ta = 45℃	10years or more	7years
	E	Ta = 30℃ or less	10years or more	7years
		Ta = 35℃	7years	5years
	F	Ta = 30℃	10years or more	7years
Forced air	A,B,C,D,E,F	Ta = 40℃ or less	10years or more	10years or more
		Ta = 50℃	10years or more	10years or more

Table 4.2 Life Expectancy (GHA300F-□)

Cooling Method	Mounting Method	Average ambient temperature (year)	Life Expectancy	
			Io≦75%	75%<Io≦100%
Convection	A	Ta = 30℃	10years or more	10years or more
	B, C	Ta = 45℃	10years or more	7years
	D	Ta = 45℃	10years or more	10years or more
	E	Ta = 40℃ or less	10years or more	9years
		Ta = 45℃	10years or more	6years
Forced air	A,B,C,D,E,F	Ta = 40℃ or less	10years or more	10years or more
		Ta = 50℃	10years or more	10years or more

Remarks:

Estimated life expectancy can be calculated by point temperature ③ ,④ shown in section 3.1. Please contact us for details.

■Warranty

Table 4.3 Warranty (GHA500F-□)

Cooling Method	Mounting Method	Average ambient temperature (year)	Warranty	
			Io≦75%	75%<Io≦100%
Convection	A, C, D	Ta = 35℃ or less	5years	5years
		Ta = 40℃	5years	3years
	B	Ta = 45℃	5years	5years
	E	Ta = 30℃ or less	5years	5years
		Ta = 35℃	5years	4years
	F	Ta = 30℃	5years	5years
Forced air	A,B,C,D,E,F	Ta = 40℃ or less	5years	4years
		Ta = 50℃	5years	3years

Table 4.4 Warranty (GHA300F-□)

Cooling Method	Mounting Method	Average ambient temperature (year)	Warranty	
			Io≦75%	75%<Io≦100%
Convection	A	Ta = 30℃	5years	5years
	B, C	Ta = 45℃	5years	5years
	D	Ta = 45℃	5years	5years
	E	Ta = 40℃ or less	5years	5years
		Ta = 45℃	5years	4years
Forced air	A,B,C,D,E,F	Ta = 40℃ or less	5years	4years
		Ta = 50℃	5years	3years

✻Warranty with conduction cooling is three years at the highest point of the temperature measurement.

5 Ground

■In the case of the power installation, please be sure to connect two or more Input FG and mounting hole FG with safety ground of the chassis.

6 Option and Others

6.1 Outline of options

● –J1

■Option -J1 models, the connector is J.S.T connector.

● –J2 (R3 or SNF to be combined)

■CN501 connector is changed to friction locks type.(Mfr. Molex)

● –J3

■The input connector is VH connectors (Mfr. J.S.T.) and the connector is oriented horizonatally.

■Please contact us for details about appearance.

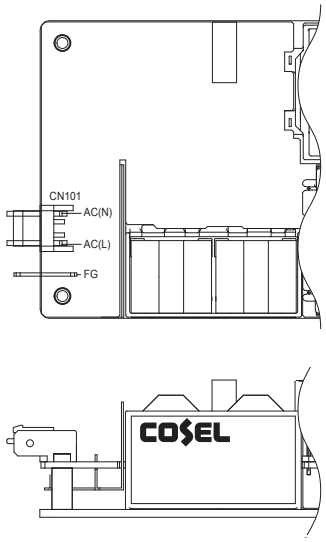


Fig.6.1 Example of option -J3

● –R3, –SNF

■The following features are included.

■Dedicated harness. Please refer to the optional parts.

■AUX1 (12V±10%* –R3 : 1.0A, –SNF : 0.5A)

- This power supply is equipped with an axuiliary low power 12V* output AUX1 which is available from CN501.
- AUX has been isolated from other circuit (input, output, FG, RC, PG).
- Do not exceed the current rating, it may causes malfunction or failure of the internal circuitry.

* GHA300F-SNF: 10V±10%

■AUX2 (5V1A)

- Output AUX2 will be generated from CN501. AUX2 (5V±5% 1.0A) can be used to power up remote control or other circuits. AUX has been isolated from other circuit (input, output, FG, RC, PG).
- Do not exceed the current rating , it may causes malfunction or failure of the internal circuitry.
- When the load currnet changes rapidly, for output stability improvement, we recommend that you connect the capacitor to the output terminal.

Table 6.1 External capacitor on the recommended capacity of AUX2

Output Voltage	recommended capacity [μF]
	GHA300/500F
5V (AUX2)	330 ~ 560

Please note that the ripple voltage of the main output may increase when the output current of AUX 2 is 0.1A or lower.

■Alarm

- Table 6.2, see Fig 6.2 the internal structure circuit explaining the operation of the PG alarm.

Table 6.2 Description of the alarm

Alarm output condition		Alarm output
PG	Or lowering of the rated output voltage, output PG, PGG from terminal when you stop. ① Output is unstable state when the overcurrent condition ② The LV alarm is not isolated from output.Therefore, make sure all connections are correct when the power supply is used to supply negative voltage or is operated in series.	Open collector method Good : Low(0-0.5V 10mA max) Bad : High or Open(40V 0.5mA max) Tr : 40V 10mA max

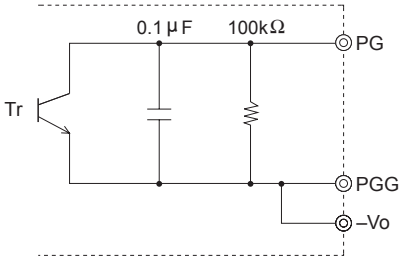


Fig.6.2 Internal circuit of PG

■Remote ON/OFF

- You can operate the remote ON/OFF function by sending signals to CN501. Please see Table 6.3 for specifications and Fig.5.3 for connecting examples.
- Remote ON/OFF circuits (RC and RCG) are isolated from input, output FG, AUX and PG.
- Please note the followings when using the remote ON/OFF function.

① -R3 turns on by drawing current to RC, –SNF turns off by drawing current to RC.

②The current flown to RC is a 5mA typ (maximum 30mA).

③If the output voltage is turned off through the remote ON/OFF circuit, 12V* AUX stops.

④If the output voltage is turned off through the remote ON/OFF circuit, PG signals turn to "High".

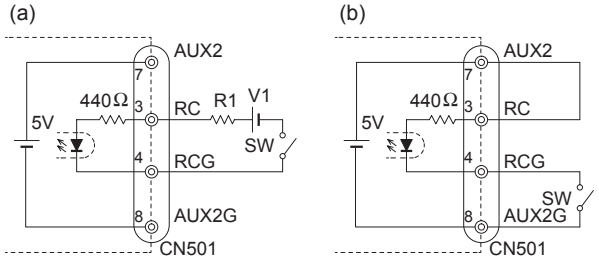
⑤If voltage or current of a value not listed in Table 6.3 is applied between RC and RCG, the output voltage may not be generated normally.

⑥Please wire carefully. If you wire wrongly, the internal components of a unit may be damaged.

* GHA300F-SNF : 10V

Table 6.3 Specifications of remote ON/OFF

Fig.6.3 RC circuit example		–R3	–SNF
SW Logic	Output on	SW close (3mA min)	SW open (0.1mA max)
	Output off	SW open (0.1mA max)	SW close (3mA min)
Optional harness		H-SN-34 or H-SN-35	



(Example V1 : 5V R1 : 270Ω)

Fig.6.3 RC circuit example

∗ 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 R1. If the output exceeds 12.5V, however, please connect the current limiting resistor R1.

To calculate a current limiting resistance value, please use the following equation.

$$R1[\Omega]=\frac{V1-(1.1+Ri\times 0.005)}{0.005} \qquad Ri=440[\Omega]$$

● –SNF

■Chassis and a cooling fan are added.

■Oil and chemical environment may cause of power supply's malfunction or failure. Please avoid operation and storage in such environments.

■Derating

It should be satisfied that derating curve depending on input voltage and on ambient temperature in "Derating". As the verification method, temperature of measurement point A should be rated temperature or less in Table 6.4.

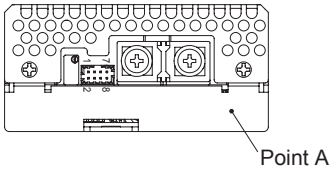


Fig.6.4 Measurement point A

Table 6.4 Rated temperature of measurement point A

Measurment	Ambient temperature	
	50℃	70℃
Point A	65℃ or less	78℃ or less

■When output current more than rated, output may shut down after 5 seconds or more. Recycle the input after 3 minutes to reset the protection.

■Maintenance of FAN

FAN life time expectancy (R(t)=90%) in Fig.6.5 is depended on measurement point temperature in Fig.6.6, which exhaust air temperature from FAN at input terminal side.

If load wires are generating heat, intake air temperature may become high. It may influence to FAN exhaust temperature. It is a notice that optical wires have to be selected for the avoidance.

When FAN stop or air volume decrease happen, power supply's output will be shut down.

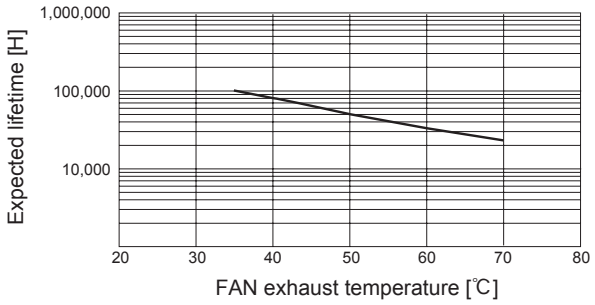


Fig.6.5 Expected life time of FAN

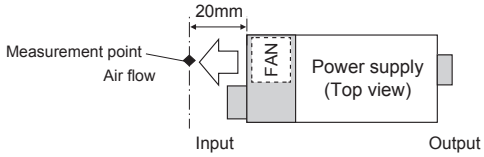
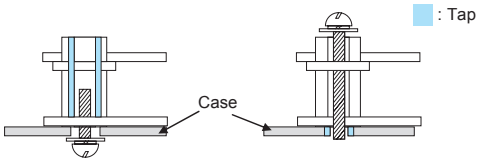


Fig.6.6 Measurement of FAN exhaust temperature

● –T3

■M3 threaded mounting hole is available as an option (–T3).



(a) T3 (Threaded mounting hole) (b) Standard (Through hole)

Fig.6.7 Screw mounting image

● –P

■Parallel operation is available (Recommended two).

■Output wattage setting is 90% per power supply of MAX OUTPUT WATTAGE.

Remarks:

- The difference of output voltage between power supply for parallel operation should be less 0.1V.
- During parallel operation, higher voltage power supply become the master in system. Depend on voltage difference between master and slave, the master power supply may recover the system's required wattage up to 90% of MAX OUTPUT WATTAGE.

  The master unit should be evaluated for heat dissipation, life expectancy and warranty period according to derating and Section4.
- Parallel operation, due to the fluctuation of load, the output voltage may be varied.

  There is a possibility that beat noise occurs due to the difference of the oscillation frequency. Please use after enough evaluation.
- Forced air cooling is required.
- Input voltage ought be AC115V or more.

6.2 Medical Isolation Grade

■GHA series fit 2MOPP

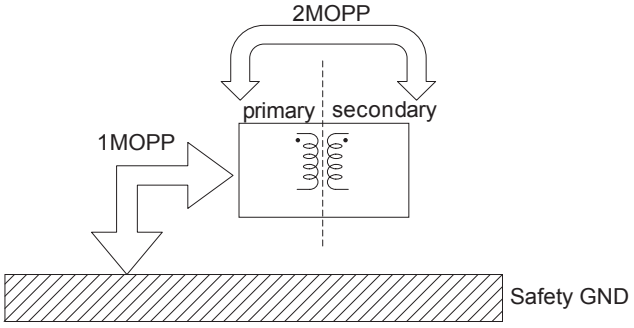


Fig.6.8 Medical Isolation Grade

6.3 Extermal capcitor on the output side

■When the load currnet changes rapidly, for output stability improvement, we recommend that you connect the capacitor to the output terminal.

Tabel 6.5 External capacity on the output recommended capacity [μF]

	Output Voltage [V]	Recommended capacity [μF]
GHA300F-12 GHA500F-12	10.8≦Vo≦13.2	2,200 to 22,000
GHA500F-15	13.5≦Vo≦16.5	2,200 to 10,000
GHA300F-24 GHA500F-24	21.6≦Vo≦26.4	3,300 to 8,800
GHA500F-30	27.0≦Vo≦31.5	3,300 to 8,800
GHA300F-48	43.2≦Vo<51.0	0 to 1,000
GHA500F-48	51.0≦Vo≦52.8	0 to 120
GHA500F-56	52.0≦Vo≦56.0	0 to 120

Remarks:

When load current changes rapidly, some specifications may not meet the spec.

Please mount power supply after enough evaluation and comply with recommended amount of capacitor. If you exceed the rated amount of capacitor, output for power supply may be stopped or power supply may be unsteable.

6.4 Others

■High voltage exist in the power supply for a few minutes after input voltage is stopped. Please pay attention to this during the maintence.

■Notes for mounting

①All Mounting holes should be tight and secured.

②Power supply should be mounted parallel to the mounting surface.

③Avoid applying mechanical stress or shock to the power supply.

■When power supply is energized or immidately after power supply stops working, power supply is still very hot, so please handle it with care.

1 Function

1.1 Input voltage range

■The range is from 85VAC to 264VAC.
In cases that conform with safety standard, input voltage range is 100VAC to 240VAC (50/60Hz).

■If input value doesn't fall within above range, a unit may not operate in accordance with specifications and/or start humting 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.

1.2 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.

■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.

■Surge current in the filter unit does not include. (0.2ms or less).

1.3 Overcurrent protection

■An overcurrent protection circuit is built-in and activated over 105% of the rated 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.

■Hiccup Operation Mode
When the output voltage drops at overcurrent, the average output current is reduced by hiccup operation of power supply.

■When the overcurrent protection continues, the output will be shut down.

■Output voltage recovers from overcurrent protection by shutting down the input voltage and waiting more than 3 minutes then turning on AC input again.

1.4 Overvoltage protection

■An overvoltage protection circuit is built-in. If the overvoltage protection circuit is activated, shut down the input voltage, wait more than 3 minutes and turn on the AC input again to recover the output voltage. Recovery time varies depending on such factors as input voltage value at the time of the operation.

Remarks :
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.

1.5 Thermal protection

■Over Temperature Protection (OTP) is built in.

■If this function is in operation, turn off power, eliminate all possible causes of overheating, and drop the temperature to nomal level.
Output voltage recovers after applying input voltage.
The recovery time varies depending on input voltage and load condition.
①Over rated temperature
②Poor ventilation
③Over load

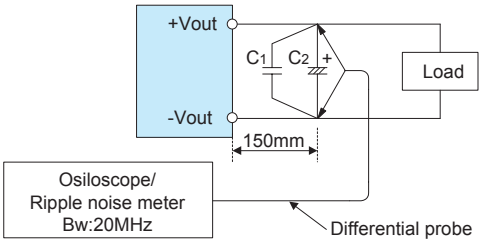
Remarks :
Please comply with recommended mounting method in section 3.

1.6 Output voltage adjustment range

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

1.7 Output ripple and ripple noise

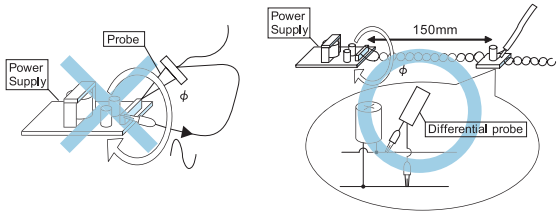
■Output ripple noise may be influenced by measurement environment, measuring method Fig.1.1 is recommended.



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

Fig.1.1 Measuring method of Ripple and Ripple Noise

Remarks :
When GND cable of probe with flux of magnetic force from power supply are crossing, ripple and ripple noise might not measure correctly.
Please note the measuring environment.



Bad example Good example

Fig.1.2 Example of measuring output ripple and ripple noise

1.8 Isolation

■For a receiving inspection, such as Hi-Pot test, gradually increase (decrease) the voltage for the start (shut down). Avoid using Hi-Pot tester with the timer because it may generate voltage a few times higher than the applied voltage, at ON/OFF of a timer.

■When you test a unit for isolation between the input and output, input and the terminal FG or between the output and the terminal FG, short-circuit between the output and the terminals RCG, PGG and AUXG.

2 Series Operation and Parallel Operation

2.1 Series Operation

■Series operation is available by connecting the outputs of two or more power supplies with the same output voltage, as shown below. Output current in series connection should be lower than the lowest rated current in each unit.

Remarks :

Please be sure to have enough cooling in case one of the power supply stops due to activation of the protection circuitry.

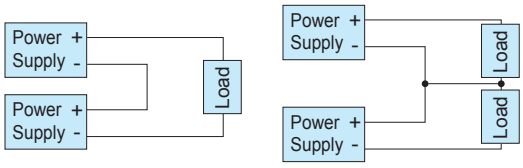


Fig.2.1 Examples of connecting in series operation

2.2 Parallel Operation

■Parallel operation is not possible.

■Redundancy operation

Redundancy operation is available by wiring as shown below.

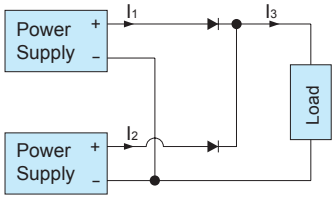


Fig.2.2 Example of redundancy operation

■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.

$I_3 \leqq$ the rated current value

Please evaluate carefuly and test for any possible failure modes.

■Hot-swap or Hot-plug is not available.

3 Temperature Measurement Point

■Cooling method

Conduction cooling, forced air and convection cooling are available.

The combination of the cooling method makes mechanical design flexible.

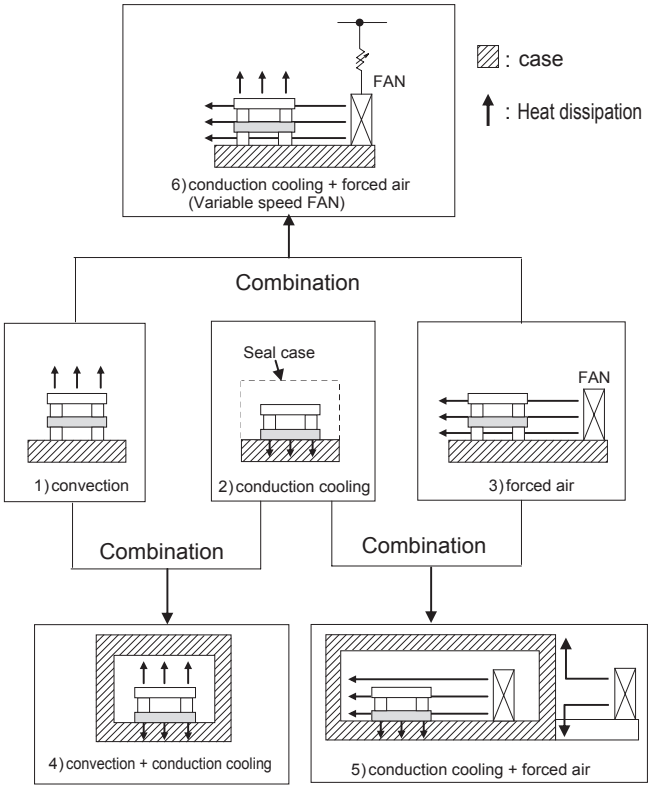


Fig.3.1 Cooling method Combination

In order to determine if the power supply operates according to our specifications, the maximum operating temperature and temperature measuring points are shown in table 3.1, for reference.

Remarks:

■For proper operation of the power supply, please note the following:

・The temperature rise and heat dissipation of the converter must be considered.

・Conditions varies with environment and input voltage.

・Mounting surface will be very hot during the operation, so please be careful not to touch the surface.

・GHA700F series can achieve the efficient heat dissipation by combining Conduction cooling and Forced air cooling. However, if the cooling fan stops due to the fan failure or other reason, Over Temperature Protection may not be activated due to the conduction cooling, and then the components temperature which are cooled by forced air would become high. Please ensure fail safe function of your product, and consult us for more details.

■Given the potential for variation between one application and another, the real test is to measure the critical components temperature rise when the power supply installed in the end-application.
For reliable and safe operation, please make sure the maximum component temperatures rise given in table 3.1 is not exceeded.
Operating at the maximum temperature rating results in 3-Years life expectancy. The actual life expectancy can be extended by reducing the ambient temperature. Please refer to section 4 for more information.

■Test Measuring points
Be aware of the conductive parts during the measurements.
Please contact us for more detail.

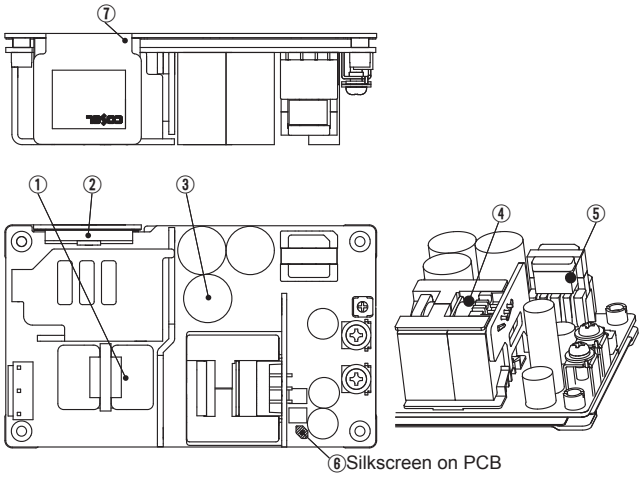


Fig.3.2 Temperature measurement points locations

Table 3.1 Maximum operating temperature

Point	Parts name	Symbol No.	Maximum temperature[℃]	Remarks
①	Line Filter	L101	90	
②	Rectifier	SS101	117	case temperature
③	Input Capacitor	C117	93(Po≦400W), 89(Po>400W)	
④	Transformer (Winding)	T201	110	
⑤	Transformer (Winding)	T301	105	
⑥	Silkscreen on PCB	-	110	
⑦	Chassis	-	80＊	

＊Operating chassis temperature derating of Conduction cooling (Fig.3.3)

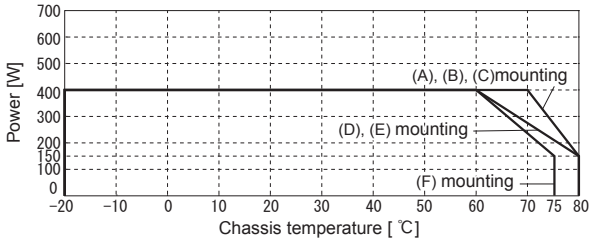


Fig.3.3 Conduction cooling derating curve (Reference value)

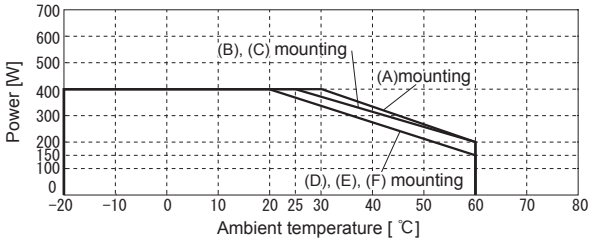


Fig.3.4 Convection cooling derating curve (Reference value)

4 Life Expectancy and Warranty

■Life Expectancy.

Table 4.1 Life Expectancy

Cooling Method	Mounting Method	Average ambient temperature (year)	Life Expectancy		
			Po≦200W	200W<Po≦300W	300W<Po≦400W
Convection	A	Ta = 30℃ or less	10years or more	10years or more	3years
		Ta = 40℃	10years or more	4years	-
		Ta = 50℃	4years	-	-
	B, C	Ta = 25℃ or less	10years or more	10years or more	3years
		Ta = 40℃	10years or more	4years	-
		Ta = 50℃	4years	-	-
	D, E, F	Ta = 20℃ or less	10years or more	10years or more	3years
		Ta = 30℃	10years or more	4years	-
		Ta = 40℃	4years	-	-

Cooling Method	Mounting Method	Average ambient temperature (year)	Life Expectancy	
			Po≦400W	400W<Po≦700W
Forced air	A, B, C, D, E, F	Ta = 40℃ or less	10years or more	10years or more
		Ta = 50℃	10years or more	10years or more

Remarks:
Estimated life expectancy can be calculated by point temperature ③ shown in section 3. Please contact us for details.

■Warranty

Table 4.2 Warranty

Cooling Method	Mounting Method	Average ambient temperature (year)	Warranty		
			Po≦200W	200W<Po≦300W	300W<Po≦400W
Convection	A	Ta = 30℃ or less	5years	5years	2years
		Ta = 40℃	5years	3years	-
		Ta = 50℃	3years	-	-
	B, C	Ta = 25℃ or less	5years	5years	2years
		Ta = 40℃	5years	3years	-
		Ta = 50℃	3years	-	-
	D, E, F	Ta = 20℃ or less	5years	5years	2years
		Ta = 30℃	5years	3years	-
		Ta = 40℃	3years	-	-

Cooling Method	Mounting Method	Average ambient temperature (year)	Warranty	
			Po≦400W	400W<Po≦700W
Forced air	A, B, C, D, E, F	Ta = 40℃ or less	5years	5years
		Ta = 50℃	5years	3years

＊Warranty with conduction cooling is three years at the highest point of the temperature measurement.

5 Ground

■When installing the power supply with your unit, ensure that the input FG terminal of CN1 or mounting hole FG is connected to safety ground of the unit.

＊It is recommended to electrically connect terminal FG and mounting hole FG to metal chassis of customer for reducing noise.

6 Option and Others

6.1 Outline of options

● -C

■Option -C models have coated internal PCB for better moisture resistance.

● -E

■The option E is for IEC Class Ⅱ equipment by providing additional insulation external to the power supply.

■The differences between the option E models and the standard models are shown below.

Table 6.1 Option E type

	GHA700F-□-EJ1
Conducted Noise	Complies with FCC-A, VCCI-A, CISPR32-A, EN55011-A, EN55032-A
ISOLATION	INPUT - FG : N/A OUTPUT-FG : N/A

■AC voltage exist on the primary side. Therefore, in order to prevent electric shock, or to meet the leakage current requirements of the safety standard, you need to ensure the proper insolation distance.

■During use, keep the distance between d1 & d2 for to insulate between component and metal case, use the insulated spacer of 6mm or more between d2. If it is less than d1 & d2, insert the insulation sheet between power supply and metal case.

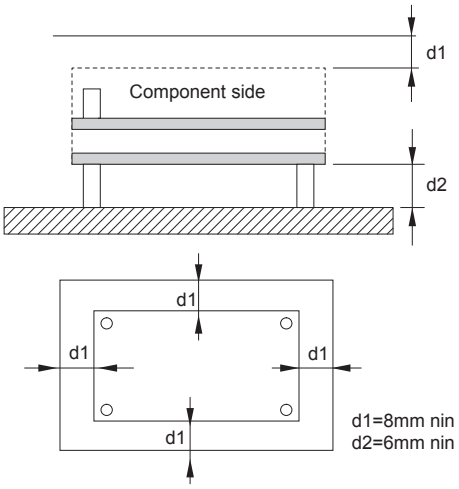


Fig.6.1 Installation method(GHA700F-□-EJ1)

● –R3

■The following features are included.

■Dedicated harness. Please refer to the optional parts.

■AUX1 (12V±10% Convection : 0.4A, Conduction cooling, Forced air : 1.0A)

・This power supply is equipped with an axuiliary low power 12V output AUX1 which is available from CN2.

・AUX has been isolated from other circuit (input, output, FG, RC, PG).

・Do not exceed the current rating, it may causes malfunction or failure of the internal circuitry.

■AUX2 (5V Convection : 0.4A, Conduction cooling, Forced air : 1.0A)

・Output AUX2 will be generated from CN2. AUX2 (5V±5% 1.0A) can be used to power up remote control or other circuits.
AUX has been isolated from other circuit (input, output, FG, RC, PG).

・Do not exceed the current rating , it may causes malfunction or failure of the internal circuitry.

・When the load currnet changes rapidly, for output stability improvement, we recommend that you connect the capacitor to the output terminal.

Table 6.2 External capacitor on the recommended capacity of AUX2

Output Voltage	recommended capacity [μF]
	GHA700F
5V (AUX2)	0 ~ 270

■Alarm

・Table 6.3, see Fig 6.2 the internal structure circuit explaining the operation of the PG alarm.

Table 6.3 Description of the alarm

Alarm output condition		Alarm output
PG	Or lowering of the rated output voltage, output PG, PGG from terminal when you stop. ① Output is unstable state when the overcurrent condition ② The LV alarm is not isolated from output.Therefore, make sure all connections are correct when the power supply is used to supply negative voltage or is operated in series.	Open collector method Good : Low(0-0.5V 10mA max) Bad : High or Open(40V 0.5mA max) Tr : 40V 10mA max

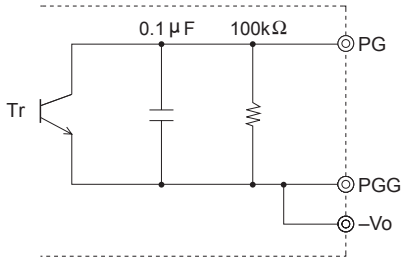


Fig.6.2 Internal circuit of PG

■Remote ON/OFF

・You can operate the remote ON/OFF function by sending signals to CN2. Please see Table 6.4 for specifications and Fig.6.3 for connecting examples.

・Remote ON/OFF circuits (RC and RCG) are isolated from input, output FG, AUX and PG.

・Please note the followings when using the remote ON/OFF function.

① -R3 turns on by drawing current to RC.

②The current flown to RC is a 5mA typ (maximum 25mA).

③If the output voltage is turned off through the remote ON/OFF circuit, AUX1 (12V) stops.

④If the output voltage is turned off through the remote ON/OFF circuit, PG signals turn to "High".

⑤If voltage or current of a value not listed in Table 6.4 is applied between RC and RCG, the output voltage may not be generated normally.

⑥Please wire carefully. If you wire wrongly, the internal components of a unit may be damaged.

Table 6.4 Specifications of remote ON/OFF

Fig.6.3 RC circuit example		–R3
SW Logic	Output on	SW close (3mA min)
	Output off	SW open (0.1mA max)
Optional harness		H-SN-79

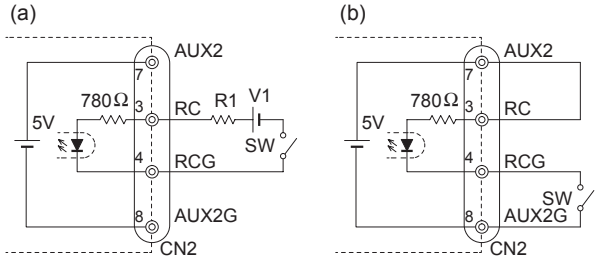


Fig.6.3 RC circuit example

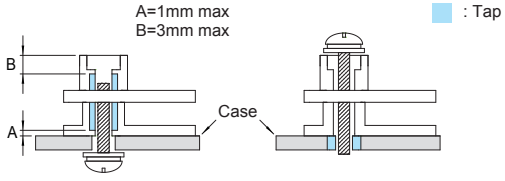
∗ If the output of an external power supply is within the range of 4.5 - 12.5V, you do not need a current limiting resistor R1. If the output exceeds 12.5V, however, please connect the current limiting resistor R1.

To calculate a current limiting resistance value, please use the following equation.

$$R1[\Omega]=\frac{V1-(1.1+Ri\times 0.005)}{0.005} \qquad Ri=780[\Omega]$$

● –T3

■M3 threaded mounting hole is available as an option T3.



(a) T3 (Threaded mounting hole) (b) Standard (Through hole)

Fig.6.4 Screw mounting image

● –U1

■By connecting the external capacitor unit CR-HUT (optional parts) to CN3, Hold-up time is extendable.

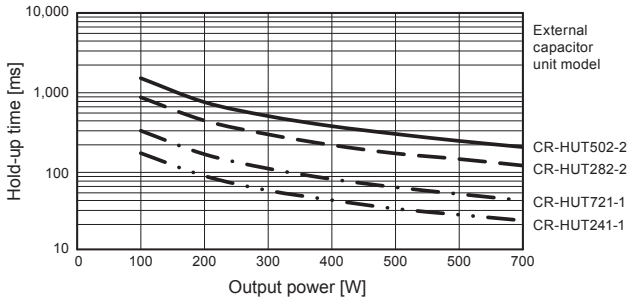


Fig.6.5 Hold-up time by GHA700F-□-J1U1 (Reference data)

■A unit can operate under the input voltage dip with derating. Table 6.5 shows the the output power.

Tabel 6.5 Output power for IEC60601-1-2 Criteria A

Voltage dip	Duration [ms]	Output Power
100VAC → 0VAC	20	Po ≦ 610W
100VAC → 40VAC	100	Po ≦ 280W (CR-HUT241-1)
		Po ≦ 420W (CR-HUT721-1)
		Po ≦ 610W (CR-HUT282-2)
		Po ≦ 610W (CR-HUT502-2)
100VAC → 70VAC	500	Po ≦ 610W
240VAC → 0VAC	20	Po ≦ 700W
240VAC → 0VAC	100	Po ≦ 700W
240VAC → 0VAC	500	Po ≦ 700W

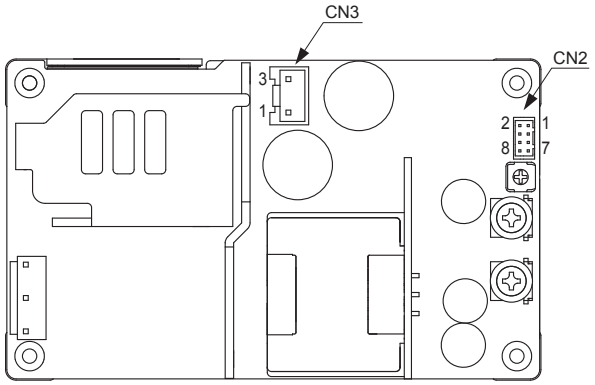


Fig.6.6 CN2, CN3 locations (GHA700F-□-J1U1)

Table 6.6 Pin assignments of CN2, CN3 (GHA700F-□-J1U1)

<CN2>

Pin No.	Function
1	NC
2	NC
3	ALM :ALARM
4	ALMG :ALARM (GND)
5	NC
6	NC
7	NC
8	NC

<CN3>

Pin No.	Function
1	VC(-)
2	
3	VC(+)

＊Pin No.2 is NC at CN3.

＊Do not connect anything to an NC pins.

＊Pin No.6 is not isolated from the main output circuit.
Do not let the output wires get close to the Pin No.6.

Table 6.7 Mating connector and terminal (GHA700F-□-J1U1)

Connector		Mating connector	Terminal	Mfr
CN2	B8B-PHDSS	PHDR-08VS	SPHD-002T-P0.5 (AWG28-24) SPHD-001T-P0.5 (AWG26-22)	J.S.T.
CN3	BH2P3-VH-1	VHR-3N	SVH-21T-P1.1 (AWG22-18) SVH-41T-P1.1 (AWG20-16)	

■Connection method

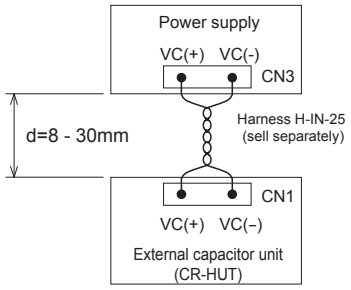


Fig.6.7 Connection method

●Caution

- Distance between the external capacitor unit and power supply unit must be secured more than 8mm.
- It must be 30mm or less, since the noise is generated from the wire which connects the external capacitor unit and power supply. It is necessary to twist the wire as short as possible.
- It is necessary to use wires which are rated for voltage of 600V or more.
- It must be used with the external capacitor unit (CR-HUT).
- For more information about the external capacitor unit and harness (H-IN-25), please refer to the optional parts page.

■This specification can output alarm at AC input drop.
When line voltage is low, the alarm outputs from CN2. The signal output period might vary depending on input and load conditions. Please evaluate thoroughly.

Table 6.8 Description of the alarm (GHA700F-□-J1U1)

Alarm output condition		Alarm output
ALM	The ALM signal turns to "High" when output can not be maintained by AC input drop.	Open collector method Good:Low (0.5V max at 1.5mA) Bad :High or Open 40V 1.5mA max

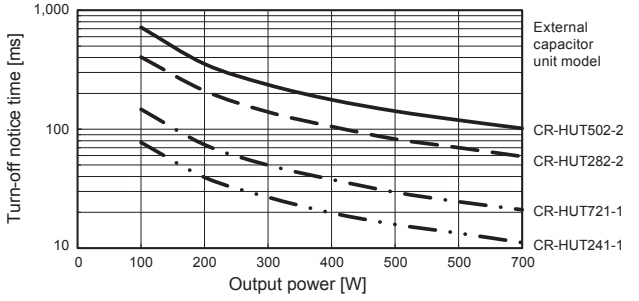


Fig.6.8 Turn-off notice time by GHA700F-□-J1U1 (Reference data)

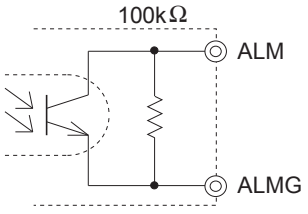


Fig.6.9 Internal circuit of alarm

- Circuit of the alarm is isolated from input, output and FG.

6.2 Medical Isolation Grade

■GHA700F fit 2MOPP
■Type BF

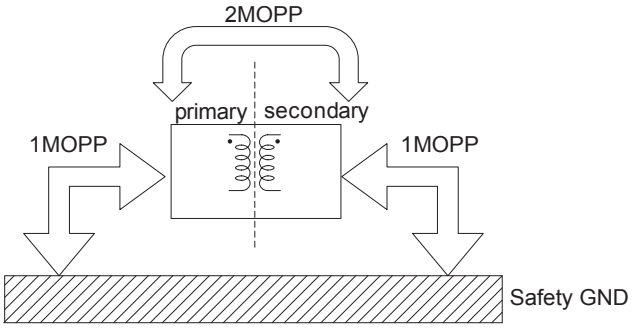


Fig.6.10 Medical Isolation Grade

6.3 Extermal capcitor on the output side

■When the load currnet changes rapidly, for output stability improvement, we recommend that you connect the capacitor to the output terminal.

Tabel 6.9 External capacity on the output recommended capacity [μF]

Model	Output Voltage [V]	Recommended capacity [μF]
GHA700F-24	22.8≦Vo≦26.4	0 to 1,800
GHA700F-30	28.5≦Vo≦33.0	0 to 1,200
GHA700F-48	45.6≦Vo≦52.8	0 to 330
GHA700F-56	53.2≦Vo≦61.6	0 to 270

Remarks:

When load current changes rapidly, some specifications may not meet the spec.

Please mount power supply after enough evaluation and comply with recommended amount of capacitor. If you exceed the rated amount of capacitor, output for power supply may be stopped or power supply may be unsteable.

6.4 Others

■High voltage exist in the power supply for a few minutes after input voltage is stopped. Please pay attention to this during the maintence.

■Notes for mounting

①All Mounting holes should be tight and secured.
②Power supply should be mounted parallel to the mounting surface.
③Avoid applying mechanical stress or shock to the power supply.

■When power supply is energized or immidately after power supply stops working, power supply is still very hot, so please handle it with care.