

## FHAG 20 Series High Temperature AC-DC Power Converters

### Features

- : Working temperature: ambient temperature:  $-55^{\circ}\text{C} \sim +175^{\circ}\text{C}$  and shell temperature:  $+185^{\circ}\text{C}$
- : Output power: 20W
- : Size: L84.0×W33.0×H16.0mm
- : Multiple output channel and isolated with each other  
(One, two, three and four channels 3.3V, 5V, 9V, 12V, 15V, 24V, 36V, 48V)
- : Output ripple: max. 100mV, typical 50mV
- : Conversion efficiency: typical 75%-80%
- : Input range: AC:70~150V, 85~247V, 120~247V
- : Sealed metal casting: Impact and moist resistance and electromagnetic radiation protection
- : Working frequency: 66.6KHz
- : Integrated LC EMI filter
- : Provide rated power without deduction at  $175^{\circ}\text{C}$  (shell), provide 80% rated power at  $185^{\circ}\text{C}$
- : Over-heat protection at  $210^{\circ}\text{C}$
- : Output short-circuited or overload cut-cut protection

### Introduction

FHAG20 series 20W high-temperature AC-DC power converters, specially designed for electronic equipment working in the harsh environment, can continuously work for 3,000 hours at shell temperature  $150^{\circ}\text{C}$ , and for 500 hours at shell temperature  $185^{\circ}\text{C}$ . With features of being resistant to high temperature, impact and humidity, it is particularly suitable for being used as power supply system for petroleum prospecting logging tool, petroleum drilling instrument, geophysical detecting instrument, vehicles, telecommunication, network infrastructures, enterprise and high-performance calculation, etc.

FHAG20 has three input options for selection including AC7V ~ 150V (frequency 0HZ-400Hz), AC85V ~ 247V(frequency 0HZ-400Hz), and AC120V ~ 247V(frequency 0HZ-400Hz). It is able to provide single-way, dual-way, three-way or four-way outputs of fixed voltage. The outputs are isolated from each other. They are allowed to be connected to form output combinations of different types as per requirement in actual use. Within the entire temperature range and conversion between full load and no-load, the output voltage fluctuation is within 2%.

The output voltages designed for FHAG20 series 20W high-temperature DC-DC power converters include 3.3V, 5V, 7V, 9V, 12V, 15V, 24V, 36V and 48V. The output can be either of them and combinations of any two voltages. MOUT is main output terminal and OUT1, OUT2 and OUT3 are auxiliary output terminals. During the actual use, the voltage outputted from main output terminal MOUT is most stable. The voltage and ripple wave outputted from main output terminal do not vary with the variation of itself and power of auxiliary output voltage. In the condition that power outputted from main output terminal is constant, the voltage of auxiliary output terminals OUT1, OUT2 and OUT3 decreases with the rise of its output power. If power outputted from auxiliary output terminals OUT, OUT2 and OUT3 is constant, their output voltage increases with the increase of power outputted from main output terminal. For this feature, the main output should be defined in using and selecting types. For example, if the model is FHAG20-220S12-S15-S36-S12, it will output four-way mutually isolated voltages 5V,15V, 36V and 12V, where 5V is from MOUT, 24V from OUT1, 36V from OUT2 and 12V from OUT3. That is our model FHAG20- ACINSMOUT-SOUT1-SOUT2-SOUT3.

In the use of multi-way-output module, if the power of an output (main or auxiliary) dynamically changes, it will cause

the auxiliary output voltage to fluctuate accordingly. If the fluctuation is greater than 50mA, measures must be taken. The voltage fluctuation above 50mA appears when output power varies between the rated power of above 10% and below 70%. The fluctuation increases along with the rise of proportion of high and low output power. The fluctuation frequency is equal to the frequency of power variation. At this time, the secondary filtering is thus considered. If the fluctuation frequency of power is less than 10KHz, there will be trouble in filtering. Then it is necessary to reduce the number of output ways of main converter and add secondary DC/DC converter to re-convert additional voltage. If the fluctuation frequency of power is greater than 10KHz, the simple filtering is able to remove the fluctuation.

During use, when an output power (main or auxiliary) varies between the rated power of above 10% and below 70%, its voltage fluctuation generally is less than 50mV and this fluctuation can be neglected in general.

Our design concept is that if the voltage required to be input is above four ways, FHAG20 series power converters will use OUT3 to output 24V, 36V or 48V. After OUT3, the DC/DC power converters outputting 28V (16-48V) or 48V (24-72V) can be connected for secondary conversion.

For this module with wide input voltage range of 85V to 247V, it is only able to output 10W power if the input voltage is lower than 120V, and it will output 20W power when the input voltage is higher than 120V.

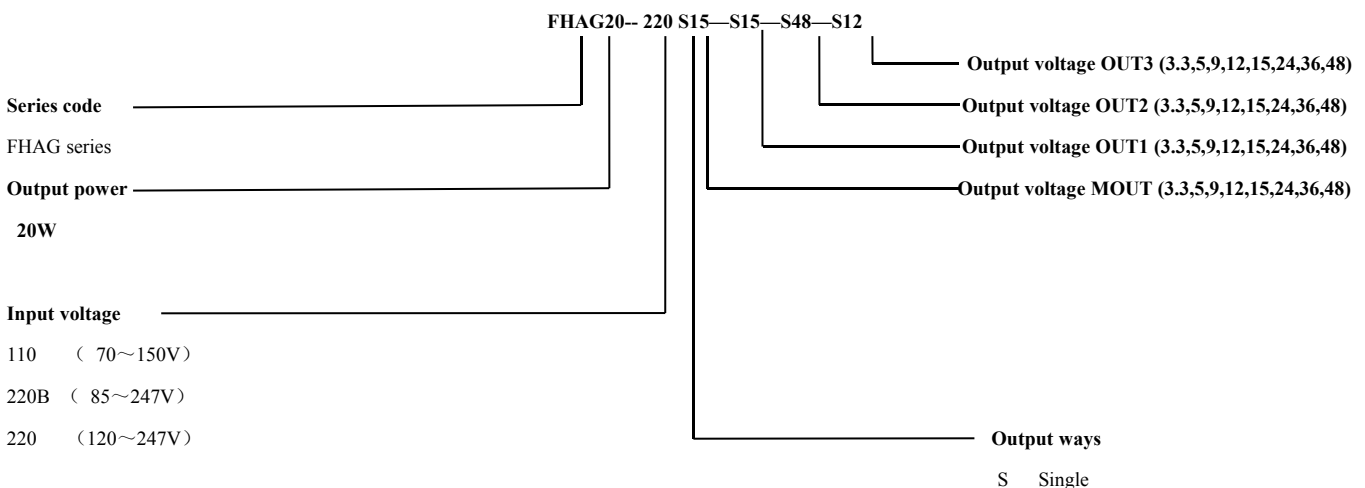
The working frequency adopted by FHAG20 series power converters is 66.6KHz, which can pass various EMI standard tests. In the condition without adding any filtering, its output voltage ripple is less than 50mV. The temperature stability of frequency within the entire range of temperature is  $\pm 8\%$ .

FHAG20 series power converters contain a LC network, which can effectively reduce the fluctuation of input current and output voltage.

FHAG20 series power converters contain the output short circuit and overload automatic turn-off circuit. When the output lasts for 0.1s and exceeds 120% of the rated output power, the converters will cut off all outputs. After the over-current fault is eliminated, it will automatically resume the output voltage. If the overload duration of output is less than 01s, the converter will not act.

Key components used for FHAG20 series power converters completely pass the in-factory test in accordance with the national military product quality standard, including live aging for 24-72 hours under the temperature of +175°C. All finished products have experienced full-load operation for 8 hours under the temperature of +185 °C before delivery so as to fully check the damage to the components during the production process and hence ensure the reliability of products.

### Type Selection



NOTE: “—” in model refers to the meaning of isolation. For single-way output, there is no—SOUT1—SOUT2—SOUT3; for dual-way output, there is no -- SOUT2-SOUT3, and for three-way output, there is —SOUT3.

### Technical Parameters

- (1) Working temperature:  $-55^{\circ}\text{C} \sim +175^{\circ}\text{C}$ , Max. shell temperature:  $+185^{\circ}\text{C}$ .
- (2) Input voltage: AC70~150V, AC85~247V and AC120~247V
- (3) Input AC frequency: 0Hz~ 400Hz
- (4) Output voltage: Single, dual-way, three-way or four-way free combination of 3.3V, 5V,7V, 9V,12V, 24V, 36V and 48V
- (5) Output ripple: Less than 50mV, typical 50mV
- (6) Output power: 20W
- (7) Temperature stability: Less than  $\pm 2.5\%$ , typical  $\pm 1\%$
- (8) Shock resistance: 25G, 0 ~ 300Hz
- (9) Conversion efficiency: 75-80%
- (10) Static power consumption: 0.8Max.
- (11) Dimension: L84.0×W33.0×H16.0mm
- (12) Isolation voltage between input and output or between outputs: 1000V

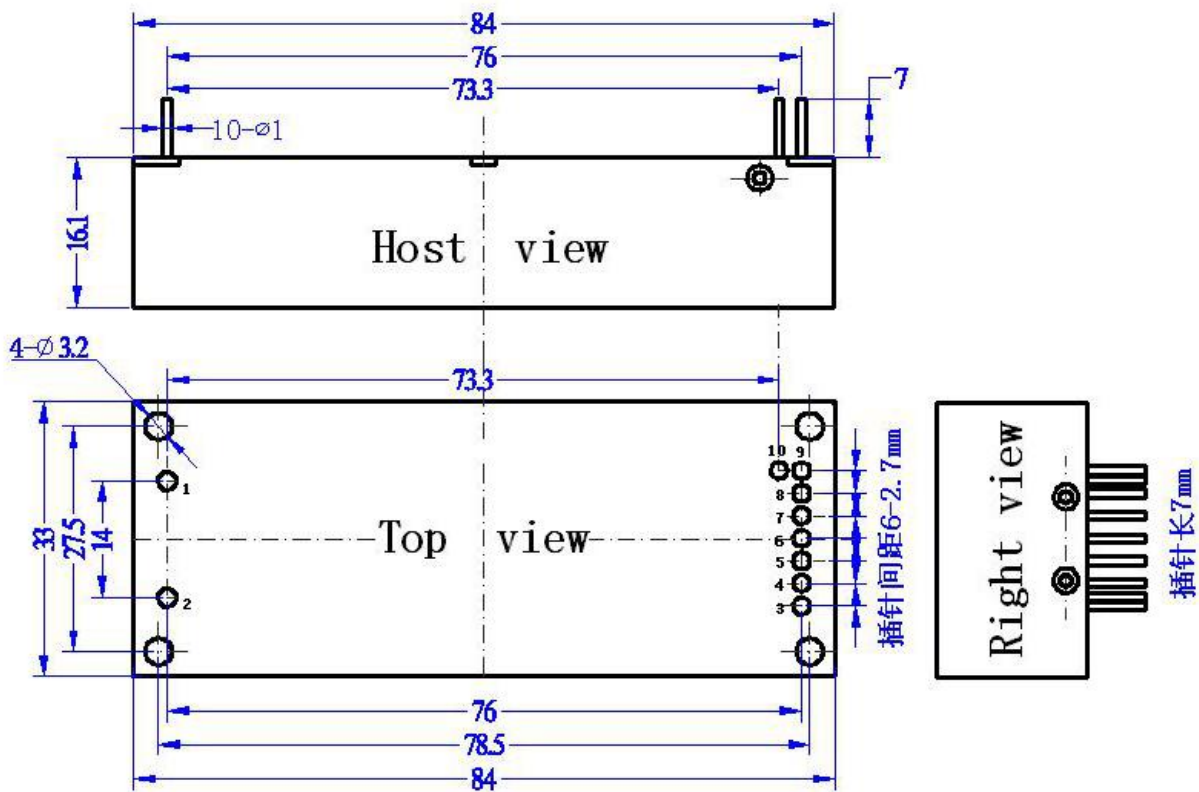
### Service Requirement

As the power converter has nearly 5W power consumption under the condition of full-load operation and its size are small, good medium is necessary to be added between the shell of the power converter and the radiator so as to ensure the temperature of the converter shell to be less than  $185^{\circ}\text{C}$ .

The shell of the converter is isolated from the input and output. During the use, the converter is usually mounted on instrument or its framework with the framework as a radiator. If the ripple cannot be filtered with capacitance or LC network, then this ripple is electro-magnetic interference (EMI). Thus, an EMI filtering converter is necessary to be added to input and output terminals of FHAG20. To function properly, the shell of filtering converter should be suspended not to connect with radiator, input and output ground wires. If it is connected to either of them, EMI filtering converter will not function properly. As we have added EMI network to input and output terminals inside converter, so long as the shell is suspended, it will function. If the ripple is still large, it is needed to externally connect input or output EMI filter outside the shell. To suspend shell, it usually puts heat-conducting pad, ceramics backing or silicon rubber pad between the shell and radiator.

Outline View

FHAG20外型示意图



Definition of Lead Wires

Pin No.	Single output	Dual-way output	Three-way output	Four-way output
1	AC input 1	AC input 1	AC input 1	AC input 1
2	AC input 2	AC input 2	AC input 2	AC input 2
3	MGND	GND1	GND2	GND3
4	MGND	GND1	OUT2	OUT3
5	MGND	OUT1	GND1	GND2
6	MGND	OUT1	OUT1	OUT2
7	MOUT	MGND	MGND	GND1
8	MOUT	MGND	MGND	OUT1
9	MOUT	MOUT	MOUT	MGND
10	MOUT	MOUT	MOUT	MOUT

Product performance, reliability and information are subject to change without prior notice.

March 23, 2018