HDCA100 Series High-temperature AC-DC Power Converters

Features:

- Working temperature: ambient temperature:-55℃ ～ +175℃ and shell temperature: +185℃
- Wide input range: AC: 100~360V，Hz：0 ～ 400Hz
- Output power: 100W
- Small size: L120.0×W:28.0×H:20.0mm
- Input power factor: up to 99.3%
- Output ripple: max. 100mV, typical 50mV
- Output channels are up to three and two isolated output ground at most (12V, 15V, 18V, 24V, 36V, 48V, 72V, free combination of any two voltages)
- Conversion efficiency: typical 80%-90%
- Sealed metal casting: impact and moist resistance and electromagnetic radiation protection
- Integrated LC EMI filter
- Provide rated power without deduction at 175℃ (shell), provide 80% rated power at 185℃
- Over-heat protection at 210℃
- output short-circuited or overload cut-cut protection

Description:

HDCA series 100W high-temperature offline AC-DC power converters, specially designed for electronic equipment working in the harsh environment, can continuously work for 4,000 hours at shell temperature 150℃, for 1,000 hours at shell temperature 175℃ and for 500 hours at shell temperature 185℃. 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.

HDCA100 series 100W high-temperature AC-DC power converters use the latest thermal design and new semiconductor technology, with its output power density increasing by three times than that of the FHA100 series and the volume reduces by three times, and what's more, the most important is that its service life doubles. The designed output voltage is 12V, 15V, 18V, 24V, 36V, 48V, and 72V. The output can be either of them and combinations of any two voltages. MOUT is main output terminal and OUT1 is auxiliary output terminal. During the use, the voltage outputted from main output terminal MOUT is most stable. The main output is isolated from the auxiliary output. The output power of the main output is required to be the largest output of the two.

HDCA100 series 100W high temperature AC-DC power converters' AC input voltage range is up to AC100V ~ 420V, which is very suitable for oil logging, because the oil logging power supply cable's resistance is up to 400 ohms. If the downhole cable head voltage is generally required to be 220V AC, in order to make the module output 100W power, then 0.5A current is needed by the calculation with 90% conversion efficiency. In this case, the cable will need to consume 200V voltage, which requires at least 420V ground power supply voltage to deliver 100W power down. In the actual logging,

sometimes the load of the downhole equipment is not constant, which causes AC-DC module's input voltage to change with the change of load. As the power supply voltage cannot be frequently adjusted on the ground with the change of load, which requires AC-DC module bear an AC input of 420V in extreme conditions (with the load empty). As our previous FHA100 series uses a conventional method that results in a maximum withstand voltage of only 247V, it is not suitable for use in ever-changing oil logging situations. It can only be used in situations where the load is constant after normal operation and it needs to strictly monitor the instrument's cable-head voltage not exceeding 247V. For this reason, HDCA100 series will be the best choice for the oil logging occasions with ever-changing load.

The temperature resistance of all components adopted by HDCA100 is above +200℃. With the currently best thermal design, the temperature of elements and casing only rises by 9℃ in the condition with good heat radiation, thus it is able to steadily work at ambient temperature +175℃ for a long time. But when temperature of chip exceeds +204℃, overheat protection circuit of chip will be activated and it begins to reduce output power until zero at +210℃. When temperature lagged to +195℃, overheat protection circuit will rest and converter begins to output power again.

HDCA100 is able to work with full load when casing temperature is less than +175℃ and work with 80% of load at casing temperature +185℃. At ambient temperature +175℃, casing temperature will still reach 180℃ even if good heat radiation is adopted. For this reason, it is suggested to avoid working with full load at ambient temperature above +170℃. 80% of load at most.

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 terminal OUT decrease by 2% at most with the rise of its output power. If power outputted from auxiliary output terminal OUT is constant, their output voltage increases with the increase of power outputted from main output terminal. For this feature, the main and auxiliary output should be specified in using and selecting types. If the model is HDCA100-220S12-S24, it will output dual-way mutually isolated voltages 12V and 24V, in which 12V is from MOUT, 24V from OUT1. That is our model HDCHA100-ACINSMOUT-SOUT1.

In the course of using multi-way output, 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%. In the course of operation, 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. This fluctuation is free from consideration in general. If the output power varies between the range of rated power of less than 10% and above 70%, the higher the proportion of high and low output power, the greater the fluctuation. And the fluctuation frequency is equal to the frequency of power change. Then, the secondary filtering is thus considered to be done. If the fluctuation frequency of power is greater than 10KHz, the simple filtering is able to remove the fluctuation. 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 auxiliary output voltage accuracy requires high, the voltage requires very stable, or the voltage is less than 12V, it is better to choose our switching regulator FHB series for voltage regulation and conversion.

If the required output voltage is more than two channels, of non-isolated channels between the outputs, one channel is output by the HDCA100, and the other channels are to be converted using FHB series. If the isolated channels of output

voltage is greater than two, then the HDCA100 selects OUT1 to output 24V , 36V, 48V or 72V, and DC/DC with input of 28V (16~48V), 48V (24~72V) or 50V (36~108V) and switching regulator FHB module are connected following OUT1 for secondary conversion.

HDCA100 series uses the latest switching technology and its power factor is up to 99.3%, which greatly improves the cable capacity of transmitting current, especially for oil logging applications, in which the cable's input impedance is often as high as 200 to 400 ohms, and conventional AC -DC module's power factor is only about 60%. After connecting with the oil logging cable, the power factor of the power supply forms a passive power factor correction because of the existence of the cable input impedance, which can improve the power factor to 80%. However, in this case, in the oil logging applications, in the condition that the bottom AC-DC module outputs the same power, HDCA series' input current is 20% less than the conventional AC-DC, and because of the existence of input cable impedance, its consumption of the energy on the cable is only 66% of the conventional AC-DC module. This results in a lower ground cable-head voltage than the conventional AC-DC. This reduces the pressure on the ground power supply and the voltage of underground systems.

HDCA100 input power factor is as high as 99.3%, so its input current waveform is sine wave, which facilitates the removal of harmonic interference so as to pass a variety of EMI standard tests.

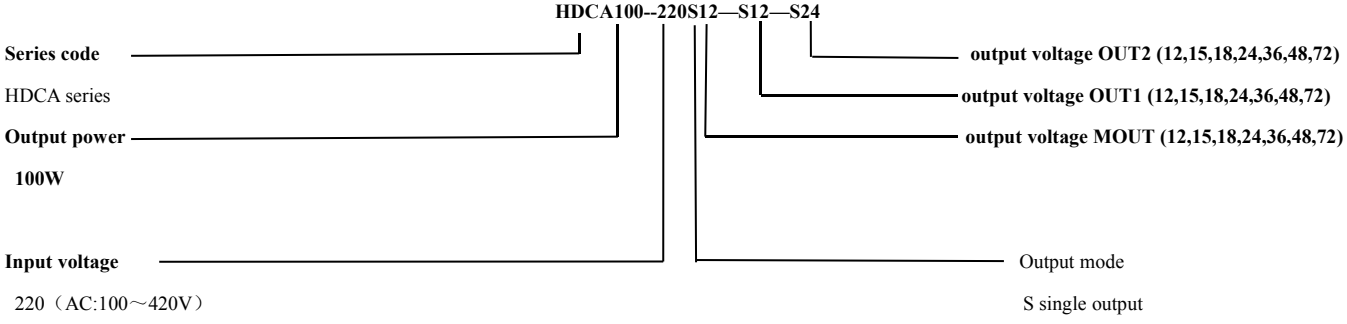
The input current of the HDCA100 is a sine wave and its frequency is the same as the frequency of the input voltage. Generally, AC-DC module's AC frequency is 50HZ or 60HZ, so the output terminal of the module needs a large capacity capacitor to filter this low-frequency sine wave fluctuation. 1W output power requires about 5UF capacitor and 100W output power requires 500UF capacitor. Such a high capacity of 200℃ capacitor costs much, but if it is placed outside the module, then only a 175 ℃ capacitor is ok, so we did not place the low-frequency filter capacitor in the HDCA100. During the use, after connecting an external low-frequency filter large-capacity capacitor to the module, 1W output power can make the output ripple less than 100MV with only a 5UF capacitor.

HDCA100 series converter contains the LC network, which can effectively reduce input current and output voltage fluctuation.

HDCA100 series converter contains 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 converter cuts off all outputs. After the over-current fault is eliminated, it automatically resumes the output voltage. If the overload duration of output is less than 01s, the converter will not act.

Key elements used for HDCA100 completely passed the factory test in accordance with the national military product quality standard. The factory test includes 24~72-hour live aging and screening under the temperature of +175℃. All finished products have experienced 8-hour full-load operation under the temperature of +175 ℃ before delivery so as to fully check the damage to the elements during the production process and hence ensure the reliability of products.

Type selection



Note: — means isolation. If it is single output, there is no –-SOUT1

Example: the model HDCA100-220S15-S36, MOUT outputs 15V and OUT1 outputs 36V

Technical data

(1) Operating temperature: -55℃ ~ +175 ℃, Max. shell temperature: +185 ℃.
(2) Input voltage: AC100~360V，
(3) Input AC frequency: 0Hz～400Hz
(4) Output voltage: up to three output channels, and two isolated output ground circuits: 12V, 15V,18V,24V,36V, 48V, 72V (free combination of any two voltages)
(5) Output ripple: Less than 100mV, typical 50mV (external connection 5uF/1W)
(6) Output power: 100W
(7) Temperature stability: Less than ±2.5% , typical ±1%
(8) Shock resistance: 25G, 0 ~ 300Hz
(9) Conversion efficiency: 80-90%
(10) Static power consumption: 1. 5 Max.
(11) Dimension: L：120.0×W：28.0×H：20.0mm
(12) Isolation voltage between input and output: 1000V
(13) Output form of voltage: lead wire

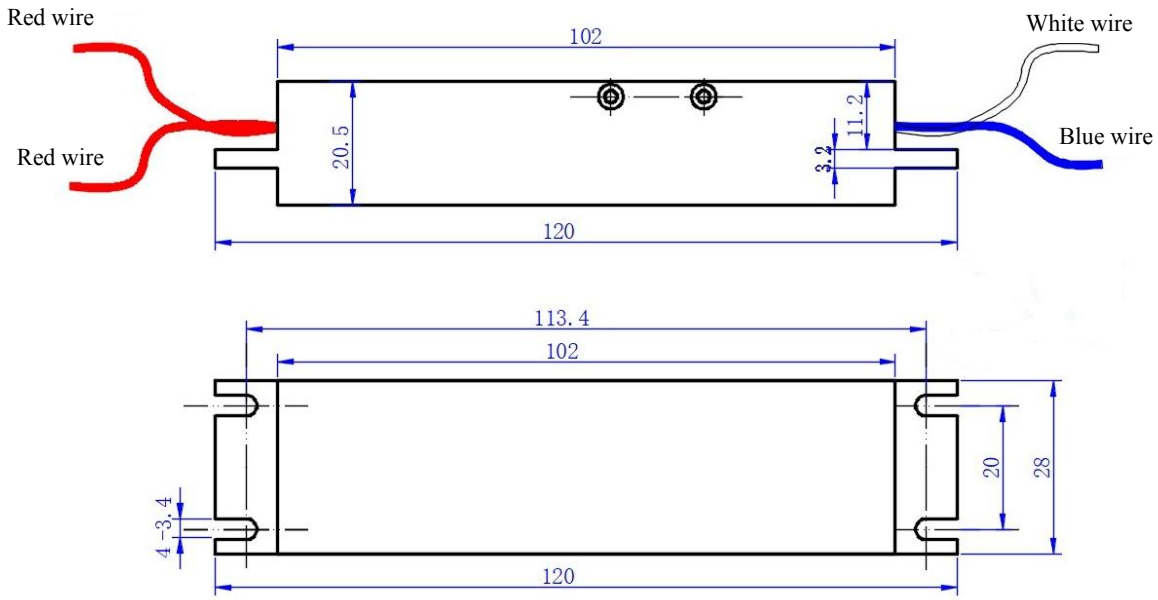
Service Requirement:

As the power converter has nearly 1W 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℃.

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 HDCA100. 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. If the ripple is still large after the internal EMI functions, it is necessary to connect input or output EMI filtering outside the converter.

Outline Diagram:

HDCA100 Outline Diagram



Note: 1、Mounting hole and mounting hole spacing dimension tolerance is ±0.1mm
2、The tolerance of external dimension is ±0.2mm

Definition of pins:

Red wire 1: AC input	Red wire 2: AC input	White wire: MOUT
Blue wire: MGND	Orange wire: +OUT1	Brown wire: -OUT1

Product performance, reliability and information are subject to change without prior notice.
July 26,2022