

DC – DC CONVERTER 2000W 100-400VDC Input / 24VDC Output

Code prod. : 30x57092.00

Jan, 11th 2005



MES DEA s.a. - Service -

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Change record:

Changes to the document.

Version	Date	Chapter	Description	Name	Signature
1.0			Preliminary	-	
1.1			Preliminary	-	
1.2	11-01-2005	All	General review	DC2/24/190a	P.M.



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1 Introduction:

Electric vehicles normally use low voltage service batteries (12, 24, 48VDC) to supply the board instrumentation. The easier system to charge and aid the board battery is to connect in parallel a power supply with an appropriate output voltage. The biggest power source on the vehicles are normally the traction batteries with an higher voltage, so we have to reduce an high DC voltage to a lower DC voltage. This is the MES-DEA DC/DC converter object.

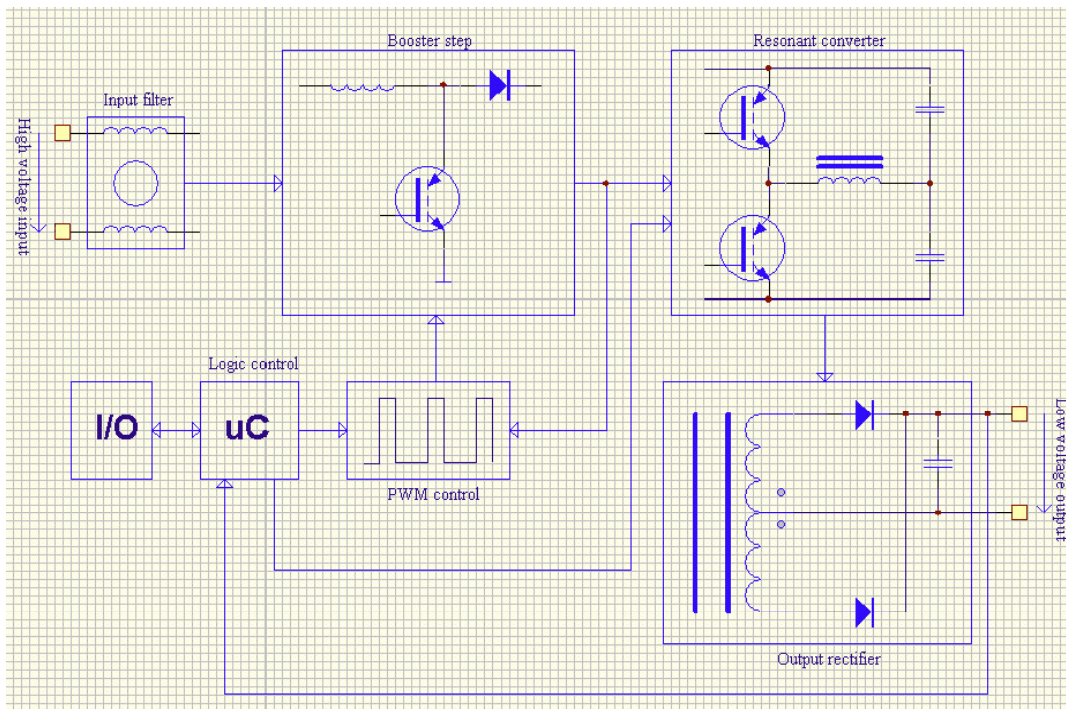
This product has a good power output and a large input voltage range and it's proper for electric bus or medium-large vehicles. The output voltage is set to charge 24V batteries. The circuit design gives an high efficiency (higher than 90%) and a logic control gives safety use. It has an input voltage, an output current and a temperature control to protect the converter; a short circuit protection is also implemented on the control.

If more power is needed, several modules can be connected in parallel without additional controls. You must specify it in the order, so we can set and test together the modules.

The converter has an input enable to turn it on and off when desired and a logic fault control output. The input enable, the output fault, the high voltage input and the low voltage output have a galvanic insulation.

Converter block diagram:

The following draw shows the converter electrical blocks.



2 Technical ratings:

Warning!

Hazardous voltages are accessible on the printed circuit boards. In case of damages or technical operations, please disconnect the DC-DC and call MES-DEA. Only authorized personnel can operate on the converter.

Parts	2000W converter
Working input voltage range	From 100VDC to 400 VDC *1
Min. input voltage @ full power	190V *1
Output voltage (with 50Ω charge)	28.8VDC
Output voltage (full power)@ $U_{in}=200VDC$	~27VDC
Max. rms input current	13A
Max. continuous output current	75A *2
Inrush current	150A @ $U_{in}=400V$; 60A @ $U_{in}=200V$
U_{ripple} rms @ 75A _{Output current}	650mV rms
Internal input fuses	1x20A F / 600V
External output fuses	100A FF for semiconductor protection *3
Output impedance (off-mode)	>10k ohm
Control interface	Enable control, Fault control
IP degree	IP54, except the fan
Parallel connection	Permitted on request*4
Reverse polarity protection	No
Over-temperature protection	Yes *5
Cooling system	By FAN model Papst Multifan 4314 24V or equivalent mounted on the heat sink, automatically controlled
Efficiency @ full power	>90%

Notes:

***1:** the converter can supply at full-power with an input voltage above 190VDC; if the input voltage goes under 190VDC, the converter can supply a limited power and the output voltage decreases (due to internal input impedance). If the input voltage goes above 400VDC or under 100Vdc the converter turns itself off, when the input voltage will return in the right window it tries to restart after few seconds.

With a 50Ω output load, the output voltage is fixed to 28.8V; if the input voltage at full power is above 190V, the output voltage is ~27V.

***2:** the converter could sink an over-current from ~75A to ~80A for 60 sec or an over-current peak > 80A for 200msec (in these cases the signal output blinks), over these time conditions it turns itself off for 5 sec. Than it tries to restart for the second time. If the overcharge persists, it turns itself off (5 sec) and it does again

continually the preceding procedure (in this situation it's possible to reset the converter by switching OFF and ON the ENABLE signal).
If an output short-circuit happens, the converter turns itself off for 1.5 min and then it tries to restart again until the ENABLE signal is ON. During the 1.5 min off-time is it possible to reset the converter by taking off the high voltage input.

***3: External fuses (we recommend a "100A LET Bussmann" fuse for each DC/DC output) should be mounted 1.5m maximum far from the converter to protect it and the 24V battery against short circuits.**

***4:** It's possible to connect more converters in parallel to increase the power but you must require this option on the order. In this case the converters will be calibrated and tested together.

A label will be glued on each converter; it shows the DC/DC serial numbers tested in parallel.

N.B. In parallel configuration, the high voltage inputs, the low voltage outputs and the enable signals must be connected in the same pair potential points.

***5:** The FAN is electronically controlled, the internal logic turns it on and off when desired (with signal ENABLE ON). An over-temperature condition turns the converter off. It restarts when the temperature will go under an internal threshold. It needs ~30mm of air-distance over the fan and enough space to clear out the hot air from the radiator.

For a good operation the ambient temperature does not exceed 50°C.

***6:** The power output becomes active after 10sec maximum from the ENABLE presence.

Warranty:

This product has one year-old warranty. In case of special contracts the warranty duration can be modified.

3 Connections and installation notes:

Warning: please disconnect high voltage sources before connecting the converter and watch out to the cables polarity and color, a reversal connection breaks some internal parts.

The following table shows the cables reference.

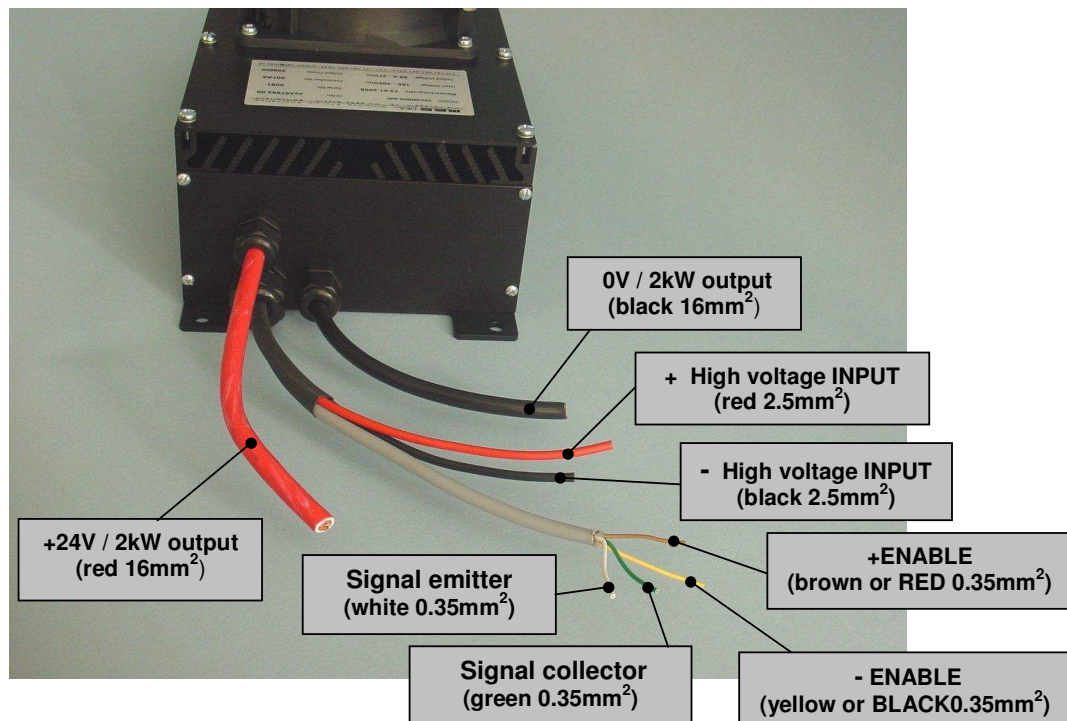
Connection	Color	Section
INPUT +	RED	2.5mm ²
INPUT -	BLACK	2.5mm ²
OUTPUT+	RED	16mm ²
OUTPUT -	BLACK	16mm ²
Enable +	BROWN or RED	0.35mm ²
Enable -	YELLOW or BLACK	0.35mm ²
Fault collector	GREEN	0.35mm ²
Fault emitter	WHITE	0.35mm ²

The connections must be done with an appropriate junction to ensure a good electrical and mechanical contact and to prevent overheating or electrical arcs.

Cables should be short and with a suitable section to minimize voltage drop and resistive heating. **+24V output** and **0V output** should be nearby wired along the same line to minimize radiations.

The converter has an high output stand by resistance (>1MΩ) so it can be always directly connected to the low voltage battery, without risk to discharge it.

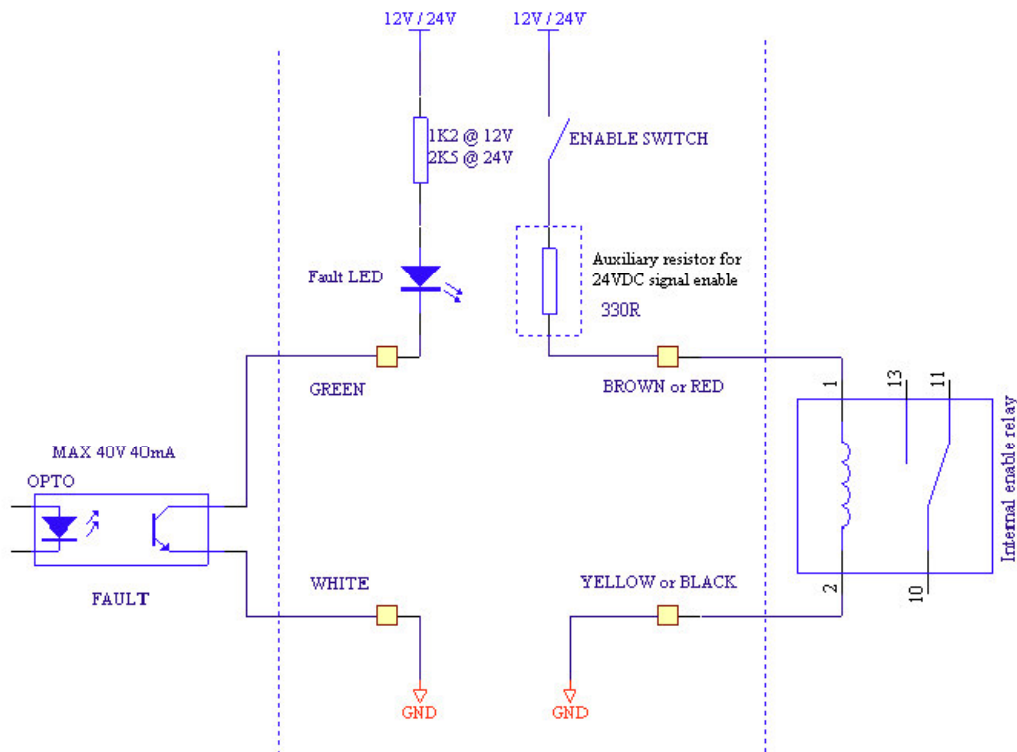
The following picture shows the I/O connections:



Enable signal notes:

- The ENABLE SIGNAL level must be **12V ±2V** (on the relay coil); is possible to choose to activate the coil by a pull-up or pull-down system because this input is totally insulated between other electrical potentials. It is possible to drive the relay with an higher voltage signal by connecting a resistor in series to the coil: the coil has a 330Ω impedance so on calculate the additional resistor for the desired signal level. (By using a 24V signal enable people must connect a 330R-1W or 2x680R/-1/2W in series to the relay coil).

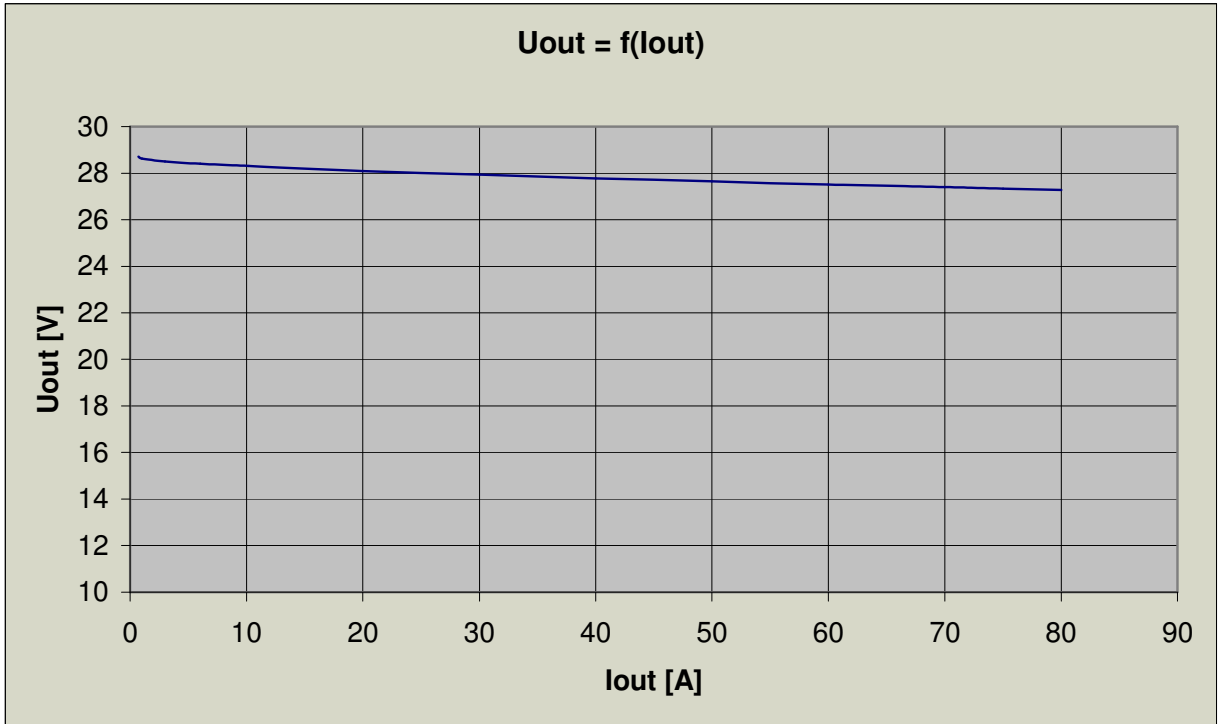
The draw above shows a signals connection example.

EXAMPLE OF CONNECTIONS**Mounting notes:**

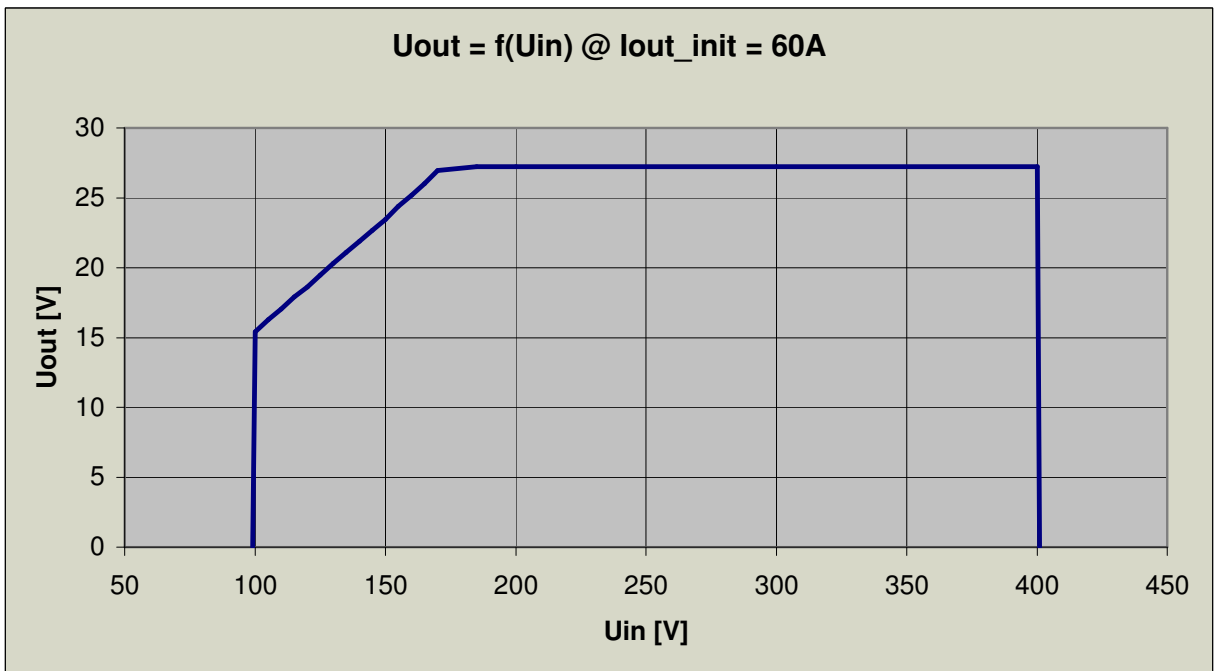
- The converter must be mounted far of water sources.
- It needs ~30mm of air-distance over the fan and enough space to clear out the hot air from the radiator.
The ambient temperature does not exceed 50°C.
- **WARNING, fixing screws must not penetrate the box, please use the four special eyelets to fix the converter. (We recommend to use M6 screws)**

4 Measurements and diagrams:

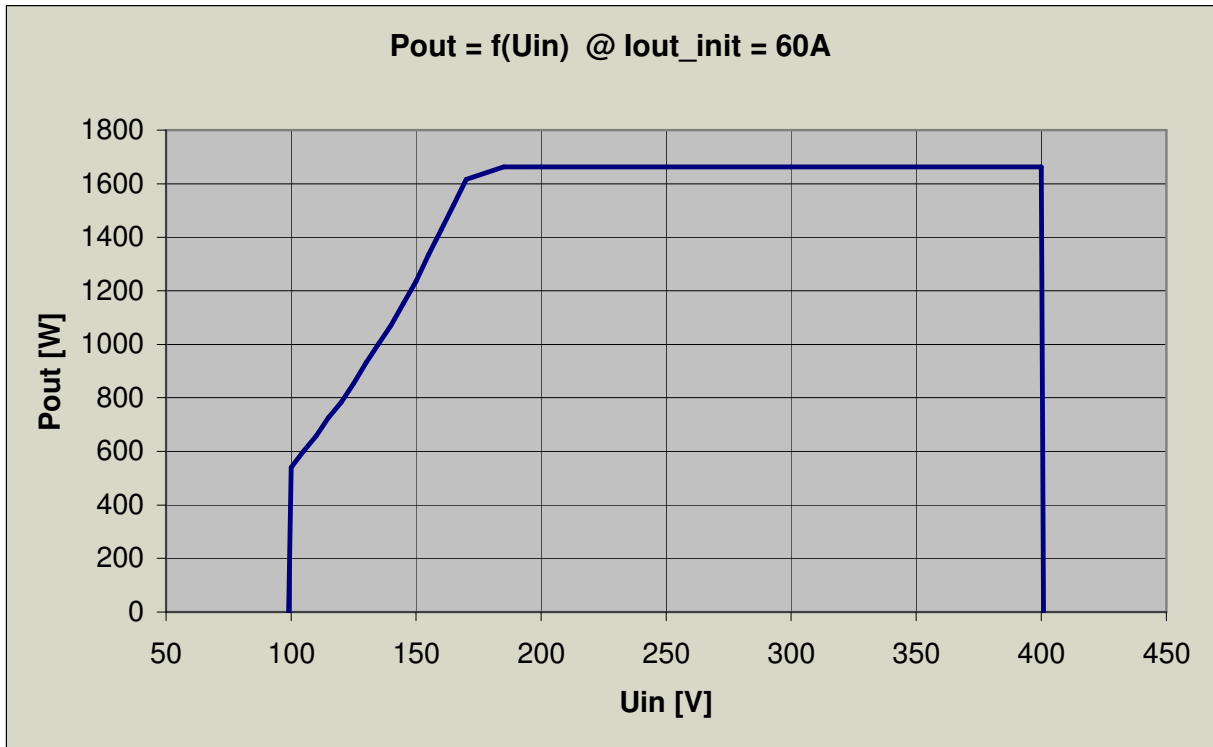
The following diagrams describe the single module converter characteristics.



Output linearity

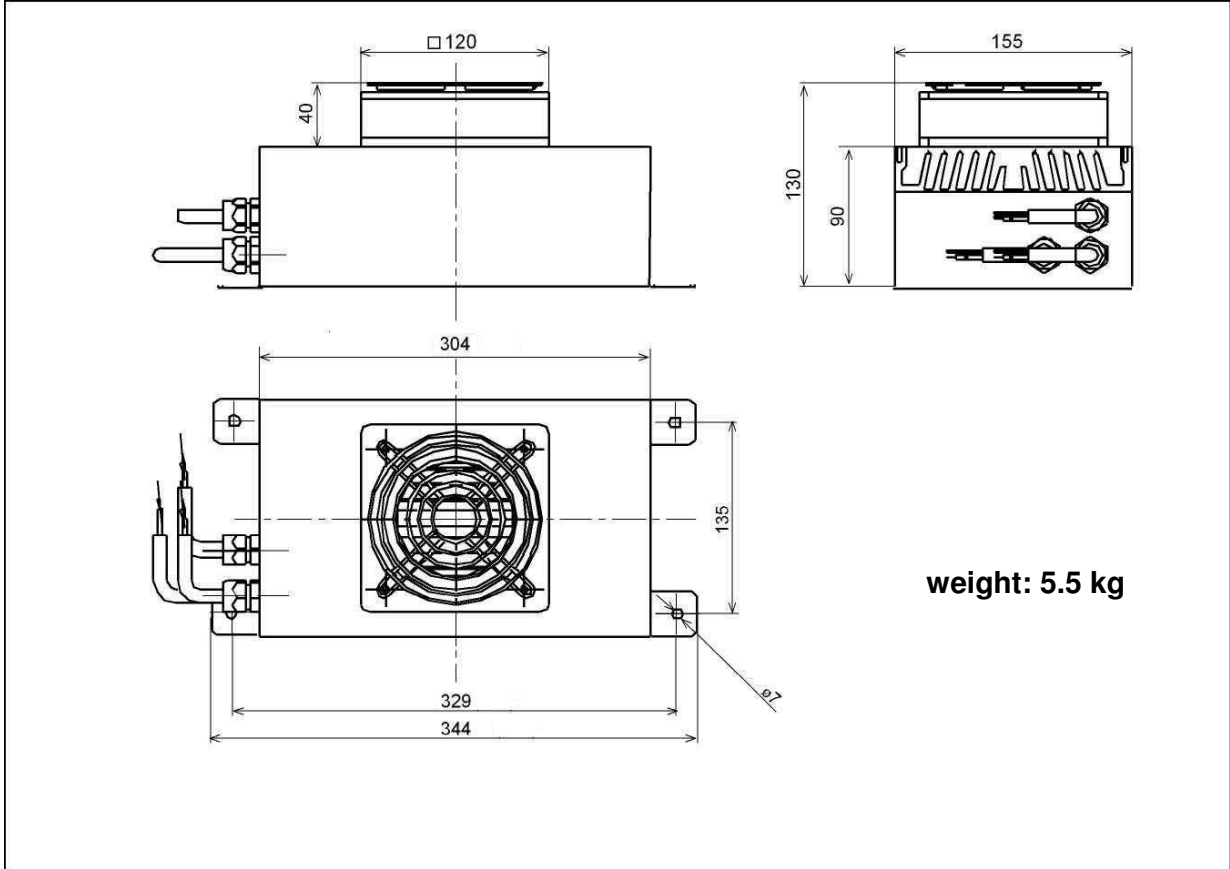


Characteristic with 60A output load



Characteristic with 60A output load

5 Mechanical drawings :



6 Maintenance and services:

The DC/DC converter does not require regular maintenance.
In case of fault, it's highly recommended to send the damaged unit together with a fault description and operating conditions to

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