

## Step-up converters

The step-up converters are very similar to the DC/DC converters of series "C", except that the step-up converters sense the voltage across the load which is the total of the battery voltage and the voltage added by the step-up converter. The step-up converter can not reduce the voltage being applied to its input. Therefore, the load should be specified for the maximum battery voltage.

### For output voltage stabilization

The output voltage of an e.g. battery charger with parallel connected battery varies substantially with the charging condition of the battery. For many applications, however, the load circuit requires a better stabilized voltage. Frequently used methods for reducing the voltage variation are e.g. "voltage dropping diodes". A more economical solution is given by switch mode step-up converters. These are DC/DC converters supplied from the battery with the output connected in series to the battery. Due to the circuit configuration, the output of a step-up converter is not isolated from the input supply (battery).



## Circuit diagrams

**Step-up converter with common positive line**

*standard version*

The following circuit diagram shows a step-up converter which can be grounded on the positive side. The voltage will be added at the negative side and the positive line is common for input and output.

**Step-up converter with common negative line**

*optional version*

The following circuit diagram shows a step-up converter which can be grounded on the negative side. The voltage will be added at the positive side and the negative line is common for input and output.

**Parallel operation of step-up converters**

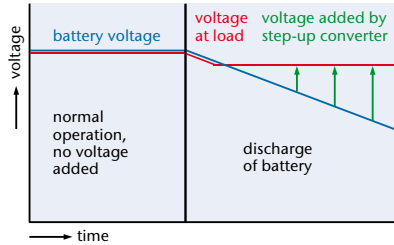
For more power or redundancy step-up converters may be connected in parallel with active current sharing, individually protected by fuses at the input and decoupling diodes or fuses at the output. Such systems have already been realized for 2,000 Amps.

**Individual load supply**

For applications that require individually stabilized voltages across the loads, the step-converters will be connected as shown in the following diagram and may be of different power ratings.

## Operation diagram

- During normal operation no voltage needs to be added and the converter runs with a minimum of power losses. The voltage at the load is slightly reduced as the current flows through the bypass diode. The bypass diode also allows for replacement of the step-up converter and should therefore be installed externally.
- During battery discharge the converter adds the voltage that is needed to maintain the required output voltage level.
- The maximum voltage to be added is normally less than 20% of the total voltage. Therefore, the step-up converter needs to be designed for 20% of the through-power, only.



Example:

- Input: 40 – 56VDC (battery)
- Output: 0 – 10VDC (step-up voltage)  
output voltage regulated to 50V during discharge of battery

## Create your step-up converter

Each DC/DC converter can be modified to be a step-up converter:

- calculate the output power of the step-up converter: max. voltage to be added x max. load current
- choose the suitable "C" series & re-name the model as "E" ...

▶ 5.6kW		▶ 7.5kW						
Input VDC							Output VDC	
80–160 VDC	Output Amps	160–320 VDC	320–380 <sup>1)</sup> VDC	320–640 VDC	450–800 VDC	Output Amps	Adj.	Range
C 5353	350	C 5373	C 5383 Z	C 5373 G	C 5373 K	350	15	14– 16
C 5354	216	C 5374	C 5384 Z	C 5374 G	C 5374 K	288	24	23– 26
C 5355	187	C 5375	C 5385 Z	C 5375 G	C 5375 K	250	28	26– 30
C 5359	102	C 5379	C 5389 Z	C 5379 G	C 5379 K	136	48	45– 55
C 5356	83	C 5376	C 5386 Z	C 5376 G	C 5376 K	110	60	58– 68
C 5357	43	C 5377	C 5387 Z	C 5377 G	C 5377 K	58	110	100– 130
C 5357 J	28	C 5377 J	C 5387 ZJ	C 5377 GJ	C 5377 KJ	38	200	190– 200
C 5358	22.5	C 5378	C 5388 Z	C 5378 G	C 5378 K	30	220	200– 250
C 5358 J	14	C 5378 J	C 5388 ZJ	C 5378 GJ	C 5378 KJ	19	400	380– 400

Example:



### Step-up Converters

▶ 5.6kW		▶ 7.5kW						
Input VDC (battery voltage)							Output VDC	
80–160 VDC	Output Amps	160–320 VDC	320–380 <sup>1)</sup> VDC	320–640 VDC	450–800 VDC	Output Amps	Voltage at load regulated to	Step-up voltage
E 5353	350	E 5373	E 5383 Z	E 5373 G	E 5373 K	350	depending on input voltage	0– 16
E 5354	216	E 5374	E 5384 Z	E 5374 G	E 5374 K	288		0– 26
E 5355	187	E 5375	E 5385 Z	E 5375 G	E 5375 K	250		0– 30
E 5359	102	E 5379	E 5389 Z	E 5379 G	E 5379 K	136		0– 55
E 5356	83	E 5376	E 5386 Z	E 5376 G	E 5376 K	110		0– 68
E 5357	43	E 5377	E 5387 Z	E 5377 G	E 5377 K	58		0– 130
E 5357 J	28	E 5377 J	E 5387 ZJ	E 5377 GJ	E 5377 KJ	38		0– 200
E 5358	22.5	E 5378	E 5388 Z	E 5378 G	E 5378 K	30		0– 250
E 5358 J	14	E 5378 J	E 5388 ZJ	E 5378 GJ	E 5378 KJ	19		0– 400