

POWER SUPPLIES FOR A MULTI-VOLTAGE CAR GRID

Application Note

Our Product

The SYSKON Power Supplies from GOSSEN METRAWATT:
Equipped with an Auto-Range Output





Industry / Special Field

Multi Voltage Car Grid

Application

The number of electrical consumers within a car has been constantly increasing for the last decades and there is no end in sight. Quite the contrary, the increase rate seems to be rising at a faster level. A number of examples should visualize the development of the car grid:

- Electric window elevators
- Seat Heating
- Electric steering support
- Amount of car lights
- Infotainment
- Electric trunk opener

Since the voltage level has been kept at 12V that means the currents running through the grid are getting higher and higher – especially seeing such high-energy consumers as seat heating. This development obviously leads to bigger diameters of the grid wires.

At the same time the **car industry faces more and more requirements** in terms of environmental friendliness – less fuel consumption and reduction of raw material use. Thus the weight of a car is a key factor in addressing the aforementioned parameters. A reduction of weight seems to be crucial to reach or maintain conformity with the current regulations and laws.

In this tension field between customers who value new developments in terms of “Easy Driving” and official requirements/regulations/laws the car manufacturers are looking for ways to address this challenge.

The **solution** which is currently introduced by many car manufacturers is the step-by step introduction of the **new car grid voltage level of 48V**.

Advantages:

- The cable diameters can be reduced
- Other, lighter materials such as aluminum can be used

Disadvantages:

- Car grid components such as control units and consumers need to be re-designed to work with 48V

With this mix of market requirements and advantages/disadvantages the logical solution is a step-by-step re-design of car components for the 48V grid. At first the high energy consumers such as the steering support are adapted to the 48V level followed by the less and less energy consuming components.

This procedure will lead to a transitional period with different energy consumers running on different voltage levels within one car grid connected by DC/DC converters.

That means that manufacturers and suppliers have to work with at least 2 different voltage levels and since many of them are also active in the truck market the 24V grid must be added as well.

This leads to new and significant changes in the validation/testing process since the testing voltage will be much more differentiated in the future. Since the energy which the single electric components require remains nearly unchanged this leads to the fact that at the same energy level different voltage/current combinations are necessary to provide to the electric components depending on the voltage level there are designed for.

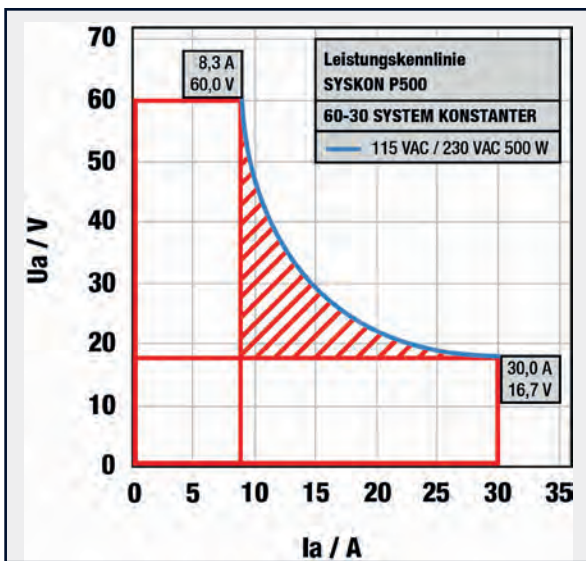
If – for example – a control unit was drawing 480W in the 12V car grid and is now redesigned to run in the 48V car grid it most likely will still draw a similar amount of energy – only the current will be reduced due to the higher voltage level:

12V Grid:
 $480\text{ W} / 12\text{ V} = 40\text{ A}$

48V Grid:
 $480\text{ W} / 48\text{ V} = 10\text{ A}$

Since adjustable regulated DC power supplies are used in nearly all of the test / validating applications, the requirements mentioned above need to be covered by them.

A **solution** which is incorporated in **High-End power supplies** is the so-called **Auto-Range Output**. With this kind of output coverage of many different voltage/current combinations is possible at nominal output power. To illustrate the functionality the following graph shows the difference between a power supply with Auto-Range Output in comparison to power supplies with rectangular power outputs where the nominal power is only available with 1 voltage / current combination:
As the graph illustrates even 2 power supplies with a rectangular output do not cover the same range of V/I combinations as the Auto-Range power supply.



This leads to a **huge advantage** in the field of testing/validating. Most important:

- Reduction of investment
- Less space necessary in test rig
- Flexibility in usage
- Reduction of hands-on training
- Peace of mind for future developments

If the facts above are taken into consideration the investment decision for a certain power supply has more to it than the price tag. In many cases the **total cost of ownership** show that a power supply with Auto-Range output turns out to be below the one for a unit with rectangular output. Especially in connection with the **current developments in the field of electric car grids** an **Auto-Range power supply** is often the **better solution**.

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