

GPSS: Highly insulating DC/DC converter with 50kV insulation voltage

Particularly in the sector for medium voltage applications highly insulated auxiliary power supplies are indispensable due to high potential differences between the reference potential of power semiconductors or measuring systems and the earthing point.

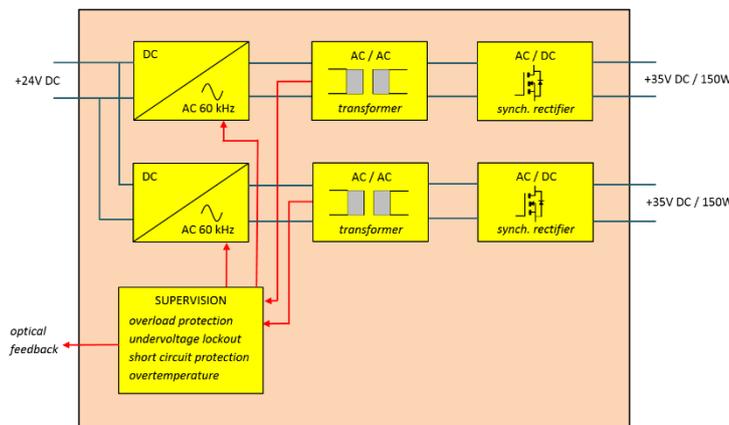


Figure 1: Structure GPSS

For applications with up to 50kV insulation voltage, the GvA Power Electronics GmbH offers a simple, flexible and compact solution. The „GvA Power Supply System“ (GPSS) is a highly insulating DC voltage source characterized by high partial discharge resistance combined with remarkable performance and efficiency.

The GPSS has a 24VDC voltage input and is equipped with two isolated output channels. Each output has a maximum power of 150W at a typical voltage of 35V. In order to ensure the high insulation voltage of 50kV, a special and long-proven material out of the insulation manufacturing is used. Thus, and in conjunction with a carefully developed housing geometry, exceptionally good insulation coordinates and high, partial discharge free operating voltages can be achieved in a confined space. In addition, an optimized, microcontroller based ZCS resonance topology ensures excellent efficiency, so that the GPSS only places very low demands on its



Figure 2: GPSS

cooling, even at nominal load. The two output channels are overload and short circuit proof. The GPSS is designed for the operation with high capacitive loads. Therefore, it is the optimal power supply system for high performance gate units, as needed for controlling GTO's or IGCT's.

Standard functions of the GPSS:

- compact design: 73 x 200 x 165mm
- two separate outputs
- continuous output: 150W per channel
- typical output voltage: 35V DC
- typical supply voltage: 24V DC
- maximum efficiency: 94%
- insulation voltage: 50kV AC
- partial discharge extinction voltage: 21kV AC (prim.-sec.)
14kV AC (sec. -sec.)
- clearances: 210mm (prim.-sec.)
165mm (sec.-sec.)

Typical applications

Typical applications of the GPSS are power supply and transmission systems that use semiconductors such as thyristors or IGBTs to convert and control electrical output power. Modern power semiconductors can switch currents of several thousand amperes at several thousand volts. Power supplies that are directly connected to the potential of the power semiconductors are required, to be able to safely operate and monitor them. But at the same time, they have to be galvanically isolated from the control or regulation system of the plant. This is exactly what the GPSS offers.

Its applications include among others:

- Driver boards, for thyristors or IGBTs, in particular for medium voltage applications, in (multiple) series connections of power semiconductors, as well as for cascaded systems and multilevel converter systems
- Measuring and sensor systems (temperature, current, voltage)
- further electrical consumers with medium voltage potential

Medium voltage applications

In order to establish the required high blocking voltages for power electronic equipment used within this sector, the series connection of semiconductors becomes mandatory. Each semiconductor is provided with its own drive unit. According to the circuit structure, these are at different potentials to earth. As a result potential differences of several thousand volts have to be handled by the insulation of the power supply. The power supplies required for the control units must have an insulation resistance that is higher than the maximum potential differences described. For such an application, the “GvA Power Supply System” was developed.

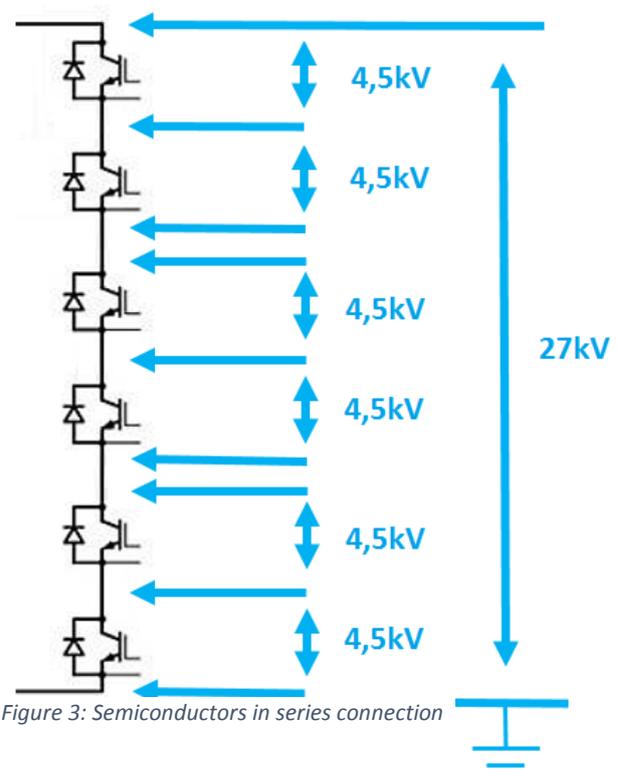


Figure 3: Semiconductors in series connection

Application examples



Figure 4: Power supply IGCT-stack

Especially in mains and high current applications thyristors are used as semiconductors. Whether in regulated rectifiers, for the soft start of three phase motors or as a replacement for mechanical medium voltage switches; the high blocking voltages of the new thyristor generations require in each case a highly insulated voltage supply of the associated ignition stages. The GPSS can take over this function due to its various possible uses in a large number of applications. Currently it is

mainly used to supply thyristor ignition stages. In addition to various IGCT stacks, the specific fields of application include pulse current switches, crowbars and various medium voltage drives.

With two galvanically isolated output channels, the GPSS provides two auxiliary power supplies, which can also fulfill different functions within one application. For example, two ignition stages or one ignition stage and one sensor system can be supplied by one device. If several GPSS are used, it is possible, depending on the required output power, to loop through their power supplies and also to link the error feedbacks.

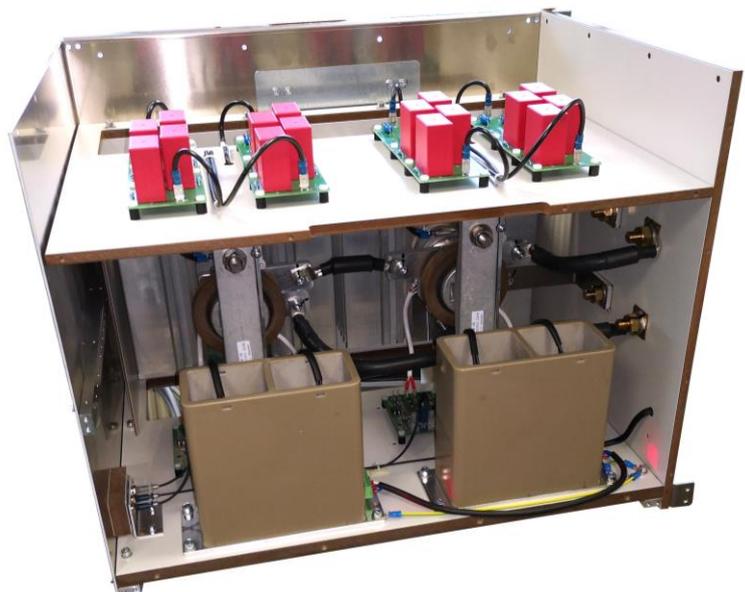


Figure 5: Power supply for a thyristor pulse current switch

Further applications

In addition to the exemplary applications, the GPSS can be installed in all electrical systems that requires highly isolated control voltages.

Amount of output channels not sufficient?

If the amount of output channels is insufficient, several GPSS can be connected in parallel on the primary side (at ground potential) and then offer 4, 6 or even more isolated outputs with high power.

For applications requiring a variety of isolated power supplies, with less power, the GvA offers a simple add-on: the Inductive Power Supply System (IPSS).* It is a DC/DC converter with 24kV isolation voltage. The IPSS consists of one base unit, which supplies several decoupling units via one current loop. These decoupling units are available with several output voltages between 12V and 24V and acts as an auxiliary power supply for various applications.



Figure 6: IPSS

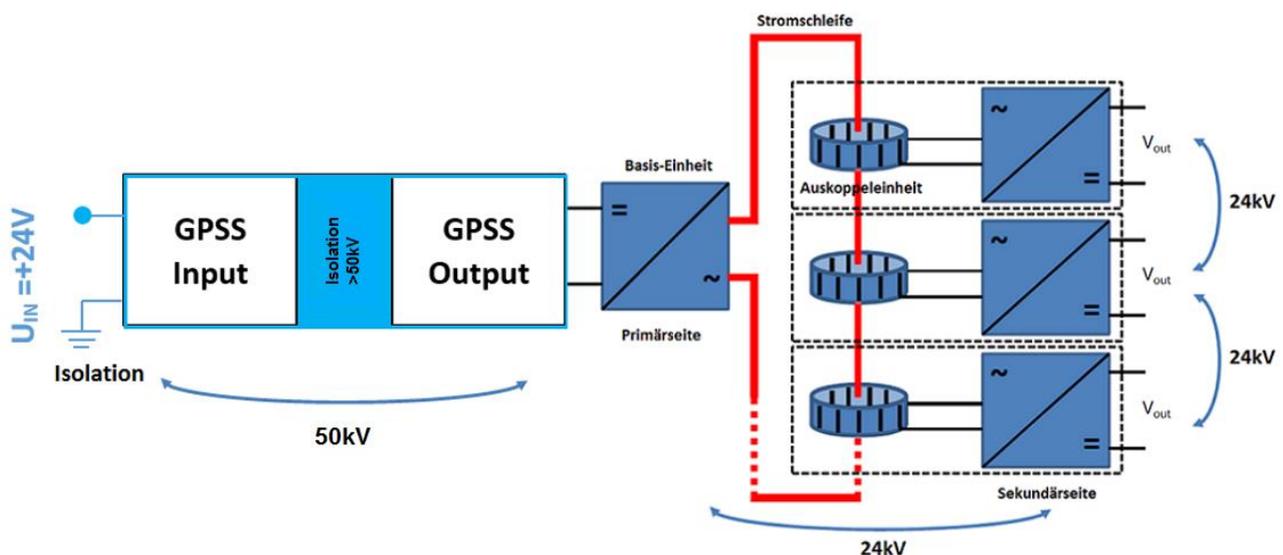


Figure 7: Extended Amount of output channels through the integration of the IPSS

If the IPSS is used to extend the GPSS, the insulation resistance of 50kV between the power amplifier and the control electronics is maintained. In addition, it results in an extended number of output channels, which each have a 24kV isolation. If lower insulation voltages are required, the IPSS can also be used independently.

IPSS and GPSS are the basic modules for reliable, cost-effective and flexible auxiliary power supply in medium-voltage systems.

We will be pleased to give you advice.