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5P65 - The influence of the architecture of the power system on the operational parameters of the GlidArc plasma reactor

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The GlidArc plasma reactor together with an electrical energy supply and a gas delivery circuit are inseparable elements of the plasma generation system. The plasma generated by such a system must have properties and parameters determined by the conducted plasma-chemical process. The parameters of all the elements of the system are dependent on each other, and a change of one of them forces changes of other parameters. The parameters and properties of the plasma generated are influenced by the design of the plasma reactor, the electrical parameters of the power supply system and the physical and chemical parameters of the process gases. Analysis was made of the reactor's cooperation with power supply systems using various specially designed transformer constructions and with an AC/DC/AC converter system. Transformer systems are a reliable power source, but with limited control possibilities. These are highly specialised devices developed for the needs of specific plasma reactors of one particular type and for a strictly defined plasma process. Advantages of converter systems are large regulatory possibilities. These systems can be designed as universal for a whole range of plasma reactors of a given type. Interesting possibilities are provided by the frequency regulation of the voltage supplying the plasma reactor. By changing the frequency while maintaining the voltage and current of the discharge one can influence the size of the reactor chamber space covered by the discharge and its power. The tests have shown a strong relationship between the performance characteristics of the plasma reactor and the construction of the power supply system. Clear differences occur even within the transformer systems, because the characteristics of the plasma reactor's operation are determined by the properties of their magnetic and electrical circuits (induction in the core, core material, magnetic flux dissipation, etc.).

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