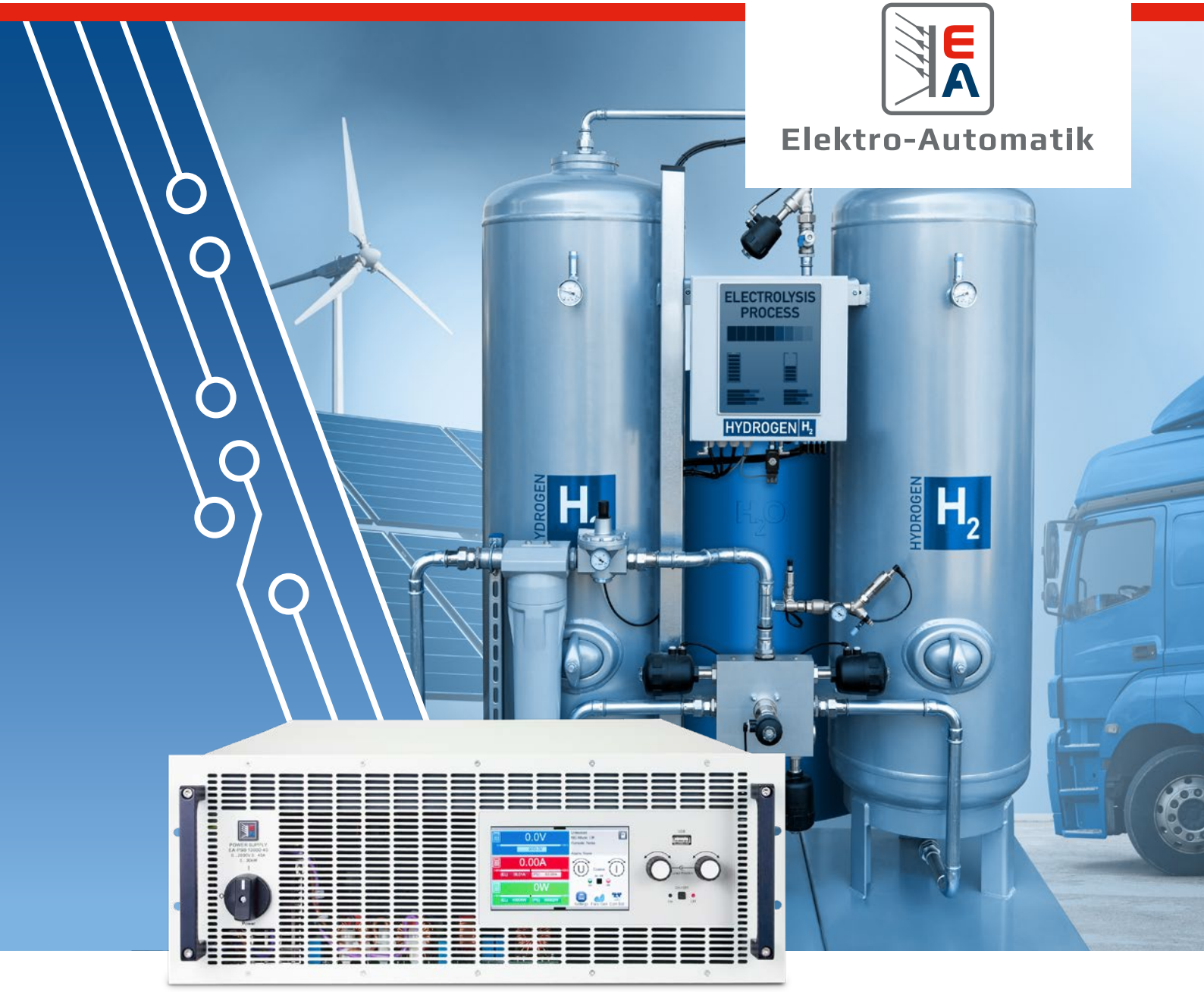
Elektro-Automatik



APPLICATION NOTE:
FACING THE IRIDIUM CHALLENGE WITH TEST EQUIPMENT FROM EA ELEKTRO-AUTOMATIK

dataTec

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HOW PROGRAMMABLE POWER SUPPLIES FROM THE EA-10000 SERIES HELP TO IMPROVE PEM ELECTROLYSER STACKS

INTRODUCTION

Hydrogen plays a crucial role in driving the green transformation process, with its potential to decarbonize a wide range of applications, from heavy-duty transportation like trucks, trains, and airplanes to diverse industrial processes such as steel production. Hydrogen can either be used directly as an energy carrier or for the production of derived substances such as green methanol or ammonia.

Electrolysis technology is used to produce green hydrogen (hydrogen without CO_2 pollution). In this process, water is split with the help of electricity into its components, hydrogen and oxygen. When the electrical energy is provided by renewable energies, like wind or solar, the produced hydrogen is created carbon neutral.

The electrolyser technologies currently utilized are the Alkaline Electrolysis (AEL), the Proton-Exchange-Membrane (PEM) Electrolysis and the Solid-Oxide-Electrolysis (SOE).

Many manufacturers currently focus on PEM technology as one of the most promising electrolyser technologies. PEM technology has several advantages like a high current density which results in a small stack while ensuring high-quality hydrogen.

According to forecasts, the demand for hydrogen produced by electrolysis will multiply in the coming years. To cope with the growth, it is necessary to increase production capacities significantly. Therefore, converting the current, rather hands-on production processes for the electrolyser stacks into fully automated production processes is necessary. Currently, PEM technology is best suited for this purpose because the cells and stacks can remain small due to the high current density. This makes PEM technology suitable for automated manufacturing.

A considerable disadvantage of the PEM technology is that it needs rare materials like platin and iridium. These materials are used for the electrodes, as the PEM technology works in an acidic environment, and such materials are necessary to avoid corrosion of the electrodes in order to achieve long-term high stability. Iridium is used at the anodes and increases the activity level of the catalysts. Currently there is no possibility to get rid of the iridium.

THE IRIDIUM ISSUE

Iridium is a rare and precious metal, and the extraction of primary material is linked to platinum mining. Less than 10 tons are mined annually, and these are already being used in other applications. If the electrolyser expansion is done mainly with PEM technology, the demand for iridium will clearly exceed the supply in the future. This will have a negative impact on the expansion speed for hydrogen produced by electrolysis. Furthermore, the capital costs of the PEM technology are high due to the use of rare materials. This may cause an iridium shortage that will drive up costs even further.

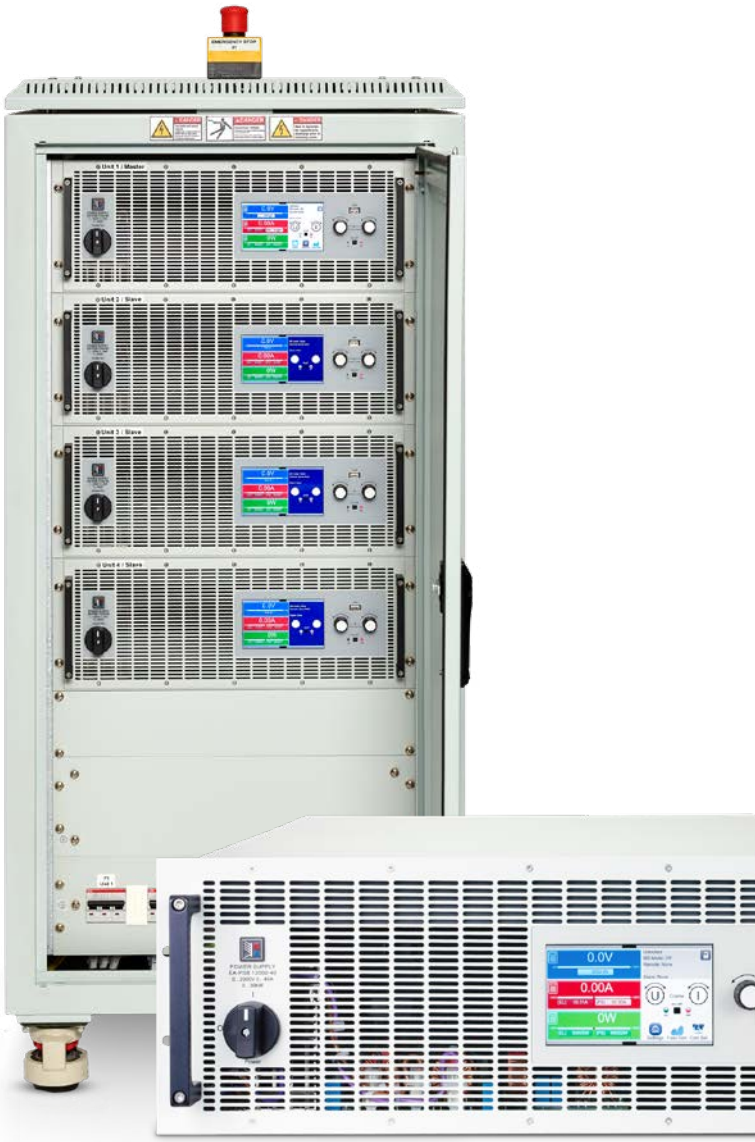
To counteract this trend, manufacturers of PEM electrolysers and PEM electrolyser stacks are working on reducing the iridium content in the cells or, if possible, not using iridium.

TEST EQUIPMENT FROM EA

Small stacks consisting of several cells are built up to test the first development steps. Once a promising solution has emerged, larger stacks will also be tested and validated.

To qualify these stacks, a programmable DC power supply is needed to provide the required voltage, current and power for the extensive tests. With power supplies from EA, various tests like functional tests or stress tests can be performed efficiently. The desired system parameters can be applied precisely and dynamically to test the developed stacks in all operating situations and analyze their durability. With the integrated autoranging functionality, it is possible to deliver full power with different settings of voltage and current to test different stack sizes with the same test set up. This reduces the amount of test equipment required and thus saves time and expenses.

Power supply systems from EA support PEM electrolyser manufacturers in developing optimized PEM electrolyser stacks. Power supplies from the EA 10000 Series are the perfect choice to improve testing quality and speed up development times. High current devices are available with up to 1000A DC in a single 4U chassis. With these high powered devices, EA makes vital contributions to the development of green technologies so that innovations can be tested and brought to market in record time. The EA-10000 series is part of EA's product portfolio covering laboratory power supplies, high power mains adaptors and electronic loads with power feedback. The scope ranges from portable devices to rack systems with 64 devices paralleled for superior performance up to 3.84 kW. With high performance criteria and a broad application spectrum, EA has established itself as a development partner in forward looking industries.



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At the headquarters in Germany in the industrial centre of North Rhine Westphalia more than 350 qualified associates, in a facility of 19000 m², research, develop and manufacture high-tech equipment for laboratory power supplies, high power mains adaptors and electronic loads with or without power feedback. The sales network includes branches in China and USA, sales office in Spain and an extensive partner network.

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