

## Press release V / 2016

# Highly-dynamic scanner mirrors easier to control

**For a flexible and a rapid material laser processing highly-dynamic galvanometer mirrors are used similarly as in laser shows. These are supposed to reach preferably high velocities and accelerations and to be rapidly controllable. With a special electronic system developed by the Fraunhofer Institute IWS Dresden, the so called module ESL2-100, it is possible to control the galvanometer directly by the machine control system. This allows a holistic interlinking to the main control system, which simplifies considerably the control procedure. In addition, for the implementation of a laser process a plurality of scanner mirrors can be applied simultaneously.**

These highly-dynamic galvanometer scanners are applied in remote laser cutting or in remote laser welding processes, for example, to achieve a rapid and flexible motion of the laser beam. In such applications the communication between the scanners and the superordinate machine control system has been carried out so far generally by a digital interface. For the integration of the galvanometer axes immediately into the machine control system Fraunhofer IWS Dresden has developed a special module, the so called ESL2-100 module. Thereby, all scanners participating in one and the same process task can be controlled via one field bus system (EtherCAT). Thus, a consistent, real-time capable and synchronous communication between the motion axes and the superordinate system is possible. Based on the flexibility of the field bus system the participating galvanometer scanners can be distributed in a variable order and can be scaled.

### **Advantages of the Fraunhofer IWS module ESL2-100:**

- control of scanners of different manufacturers
- implementation of different bus cycles by application of up to three different types of interpolation (linear, cubic, spline)
- fine interpolation step towards the output tact of the galvanometer scanner (10  $\mu$ s)
- an oversampling functions for the transmission of process data in whole numbers of the bus cycle tact
- periodic transmission of status values (such as the temperature of the galvanometer scanner or an enabling signal) for the evaluation of the superordinate machine control
- consideration of the optical imaging features of the processing systems and application of an image correction (transmission of the correction data via a SD card)

One application example for the usage of the module ESL2-100 developed by Fraunhofer IWS represents the laser processing of grain-oriented electrical steel. By rapid moving laser beams thermal stresses are induced into the band material at coil speeds of up to 150 m/min. This leads to a reduction of the core losses in the core material for power and distribution transformers in the range of 10-15 %, which increases the transmission efficiency for electric power. In the industrial application developed by Fraunhofer IWS up to 12 galvanometer scanners can be applied within one processing system. The application of the ESL2-100 modules allows in this case adjusting the process parameters, particularly

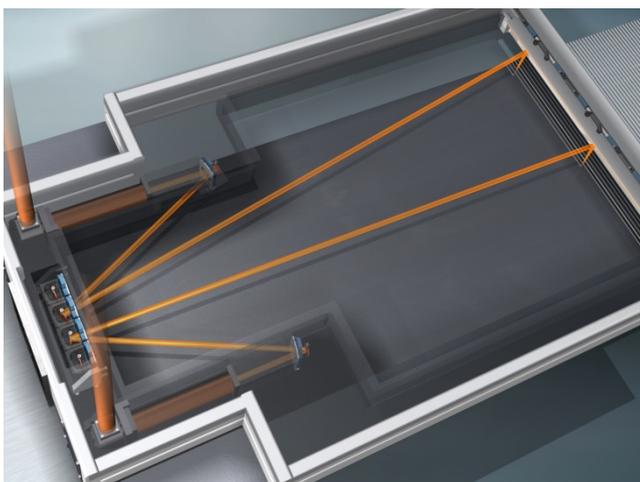
the motion path of the galvanometer scanner, depending on the coil speed and the process conditions.

A further application example is presented by the laser remote processing of carbon-fiber-compounds with extremely diverse absorption characteristics such as CFPR and GRP. For this purpose, a multi-wavelength optical (MWO) system combining the advantages of the CO<sub>2</sub> laser with the ones of the fiber laser has been developed at Fraunhofer IWS Dresden. This MWO system consists of an x-y galvanometer scanner and two z-axes and allows an independent adjustment of the focus of each laser beam in dependence on the lateral position. To achieve this, two ESL2-100 modules have been combined. The first module carries out the function of an interface to the x-y motion system, whereas the second takes on the control of both z-axes.

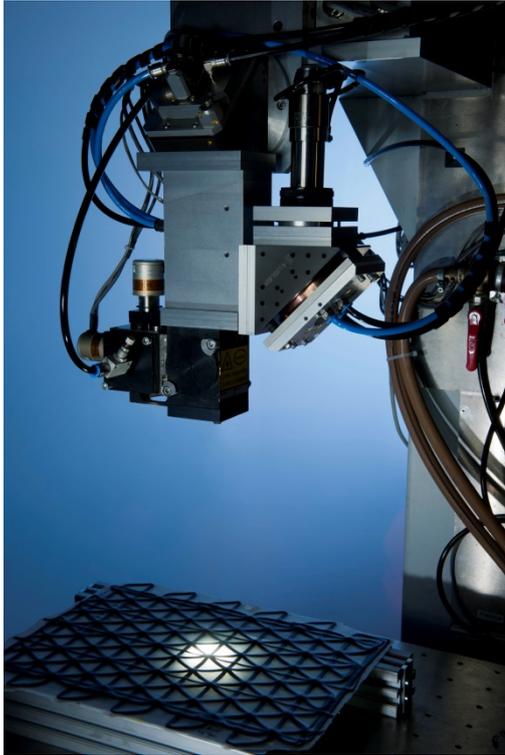
**Visit us at the Hannover Trade Fair Industry (25.-29.4.2016) in hall 17, stand C18.**



The module ESL2-100 for digital control of galvanometer scanners via EtherCAT.  
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Principle of the optical construction (lasertronic® SAO x.x/6D) for laser processing of grain-oriented electrical steel by the usage of two redundant optical paths (orange lines = laser beams)  
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Multi-Wavelength Optics (MWO) for cutting of isogrid structures consisting of CFRP and GRP compounds  
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