

## 2D vector scanner solutions with electromagnetic drive

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New in the portfolio of MEMS microscanners of Fraunhofer IPMS: hybrid 2D vector scanner modules with electromagnetic drive. Here, Fraunhofer IPMS builds on many years of experience in the fabrication of gimbaled, monolithic 2D MEMS scanner mirrors and combines this with existing know-how in MEMS micro-assembly technologies. These new hybrid devices consist of a mirror fabricated in bulk micromechanics technology in the clean room of Fraunhofer IPMS, a MEMS mirror, a magnet and a magnetic drive unit.

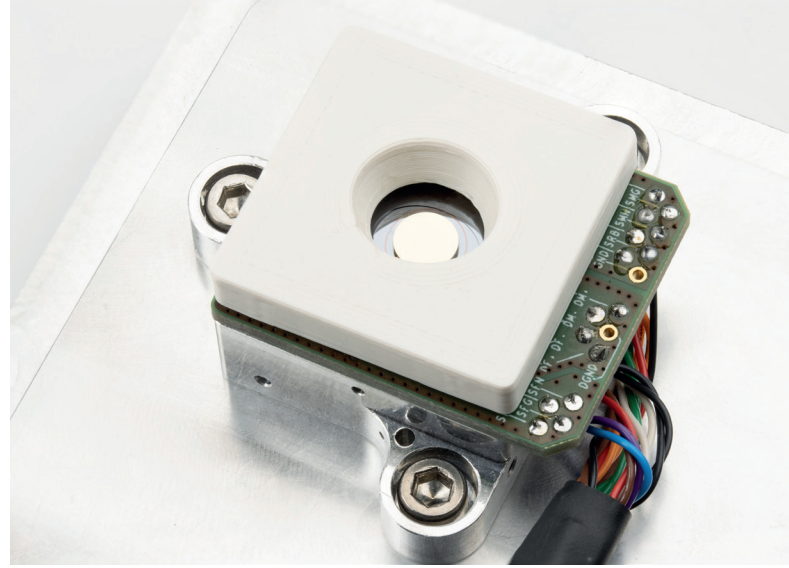
This approach significantly expands the parameter space of the previous monolithic scanners. At the same time, the established advantages of the Fraunhofer IPMS scanner

mirror technology, namely its high optical planarity and decoupling of the scan axes by means of gimbal suspension as well as the fatigue-proof nature of the suspension elements.

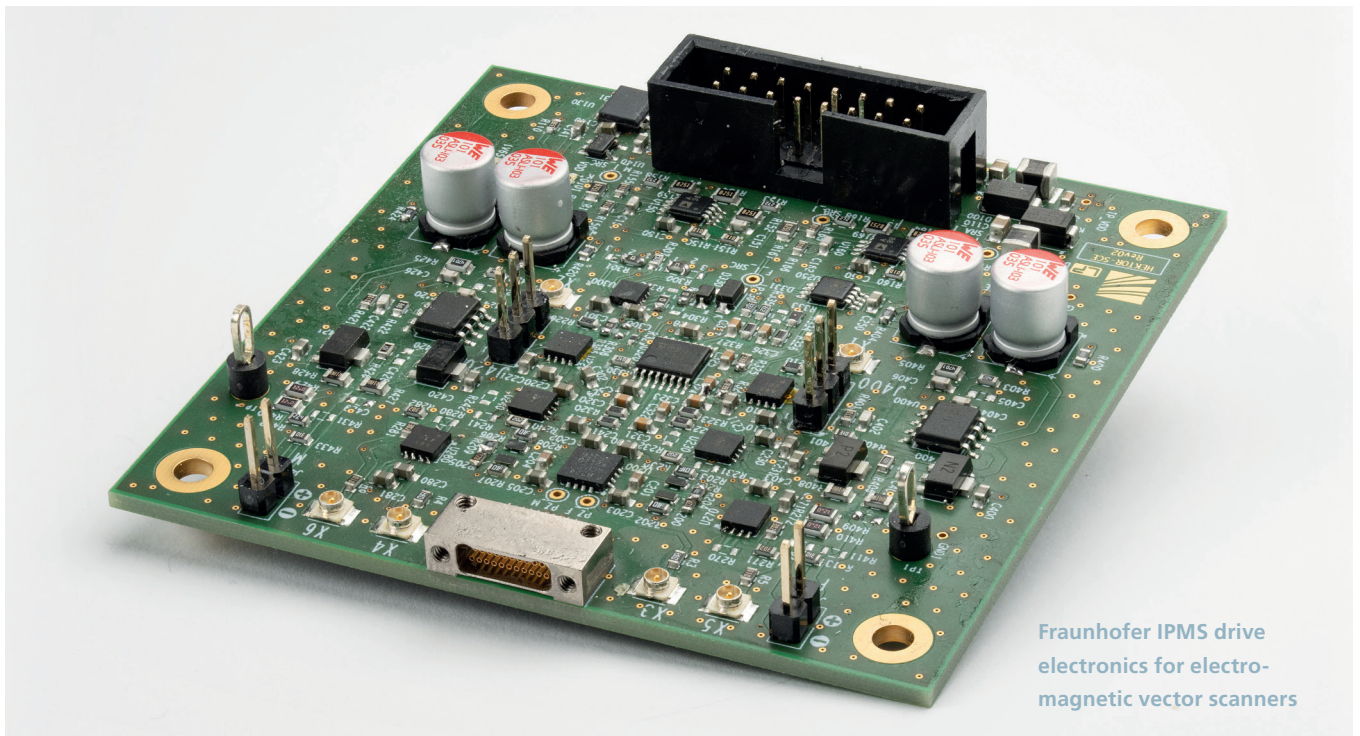
The new devices allow 2-dimensional quasi-static deflection at larger mirror apertures as well as high vectorial positioning speed. The module also provides the mirror position in the form of analog signals in order to be able to realize a controlled system. In addition, we will be happy to provide additional features such as customer-specific, highly reflective dielectric mirror coating or the manufacturing of the mirror plate as a diffraction grating.

## Parameters

Mechanical scanning range	$\geq \pm 13^\circ$
Aperture	D = 1 mm .. 10 mm
Natural frequency	120 Hz and higher
Positioning speed	100 %/s ... 1000 %/s
Drive current	approx. 20 mA/°



2D vector scanner module I2DQSEM01



Fraunhofer IPMS drive electronics for electro-magnetic vector scanners

## Operation

In order to exploit the performance of the scan module, we recommend operating the device in closed-loop control mode. The required control algorithms, which are adapted specifically to the mechanical properties of the module, were developed at Fraunhofer IPMS and can be applied to the digital control of the customer's system electronics (FPGA or microcontroller). In addition, compact control electronics, also developed at Fraunhofer IPMS, with a precise analog driver stage and input stages is also available. It can be accessed via both an analogue and a digital interface.

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