Introduction

Optical scanning is a well known and widely spread technique to collect data, to measure 3D topologies, to project images or to scan the lights’ spectral components across a single detector. Micro mechanical scanning mirrors offer a high degree of miniaturization, high scan frequencies, high mechanical robustness and the potential for low cost manufacturing at high volumes. MEMS scanners are very promising especially for small and portable systems. The development and fabrication of customer-specific scanning mirrors has been a well established process at the Fraunhofer IPMS for many years. Our areas of expertise cover MEMS fabrication in state-of-the-art clean room facilities as well as system solution development.

The integration of each individual MEMS scanner design depends on the particular application and requires a number of different development stages from the bare chip to the ready to use module. The MEMS system integration requires a thorough understanding of the micro scanning mirrors and of the application, and thus requires personnel and long training periods in most cases.

Based on its competence in system integration of micro scanner devices Fraunhofer IPMS realized in cooperation with the Carinthian Tech Research AG (CTR) / Austria the 1D micro scanner module LDC. Its modular platform approach was developed to bridge the gap between the supply of bare MEMS dies and the final system integration in the customer application enabling a drastic enhancement of the short term availability of OEM-capable customized MEMS solutions. The
application-specific MEMS scanner system
LDC is based on a modular approach where
several prefabricated components can be
flexibly combined to meet our customer's
demands. All processes and components
are also compatible with large-scale fabrica-
tion, which allows cutting down large-scale
production times and development efforts.
The LDC platform can be used with MEMS
selected from the Fraunhofer IPMS VarioS®
platform and thus is an ideal complement
to VarioS®.

System Description
The complete modular system platform
LDC consists of:

**Scanning head**, with
- Micro scanner device (customers choice
  from IPMS-VarioS®, other available IPMS-
  MEMS devices or customized MEMS design
  fabricated at Fraunhofer IPMS)
- Chip carrier with housing and front
  optics
- Optoelectronic position sensor
  for deflection control

**Driving electronics board** generating all
necessary signals and voltages, communica-
tion via
- SPI interface
- Digital output ports
  (MEMS-drive synchronous signals)

**Software package**
- Graphical user interface for function
  control and amplitude setting
- C#-API
  and DLL for usage with customer's software

**SPI interface adaptor**

**Power supply and connection cables**

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### MEMS Scanner

**Parameter** | **VarioS** | **IPMS pre-developed**
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Scanning frequency | Hz | 1000 ... 50,000 | 250 25,000
Amplitude (mech.) | ° | 5 ... 30 | 15 10
Mirror diameter | mm | 1 ... 3 | 1.5 1.2
Driving voltage | V | 15 ... 200 | 15 140
Dimensions of scanner chip | mm² | 5.37 × 4.54 | 3.5 × 2.8 4.1 × 2.7

◊ VarioS®: see Scanner Configurator of
Fraunhofer IPMS,
www.micro-mirrors.com