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MODULAR VERSATILE IMAGING, FOCUSING & ILLUMINATION FOR VISION WITH HIGH STABILITY AND ACCURACY

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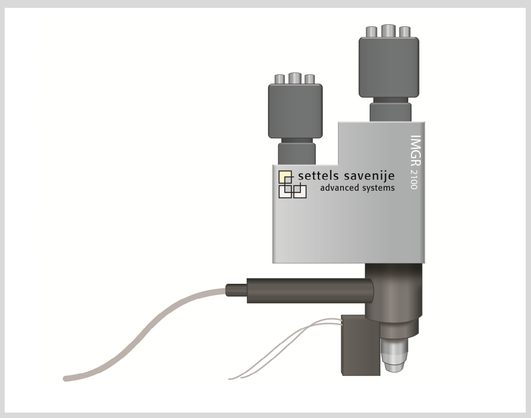
INTRODUCTION

Technological progress in the application, functionality and performance of Vision systems is tremendously. Especially in the field of image acquisition and image processing, this results in a growth in intelligent and smart systems. To support the increasingly demanding requirements for straightforward and robust integration of vision systems in machinery and equipment, SSvA developed a modular versatile imaging system for applications with high magnification levels (400x and higher).

The autofocus feature creates a convenient sharp image, even when high magnifying objective lenses are used. By combining functional modules with a compact base body and standardized compatible interfaces, configurations for a wide range of vision applications can be made in a flexible and cost efficient manner.

The iMGR-2100 modular imaging system meets the challenges in accurate and consistent, stable image quality.

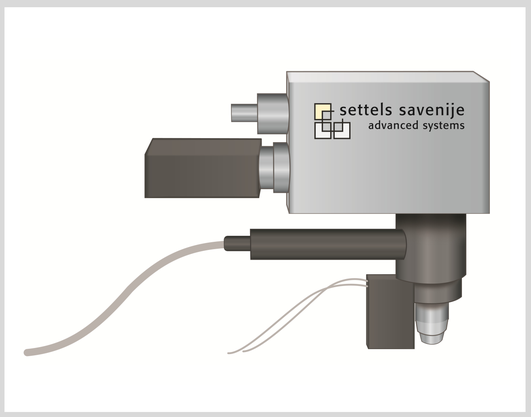


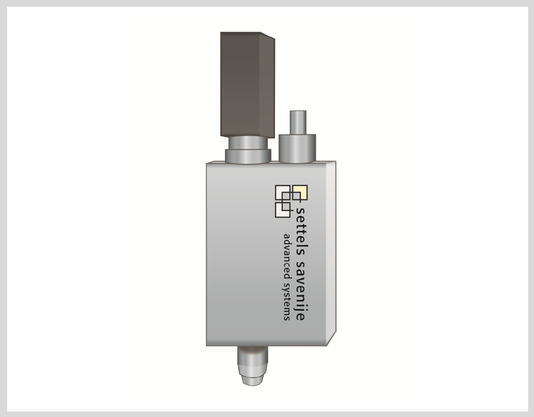
MODULAR SETUP

The iMGR-2100 system can be configured by combination or customization of different modules.

The heart of the iMGR-2100 system is the base body module. This monolithical, compact and robust body enables stable and reproducible image acquisition, even under demanding environmental and operational conditions.

The body module is equipped with interfaces for the different system modules and machine mounting. Multiple machine mounting interface possibilities enable the best suitable orientation (horizontally or vertically) of the system.



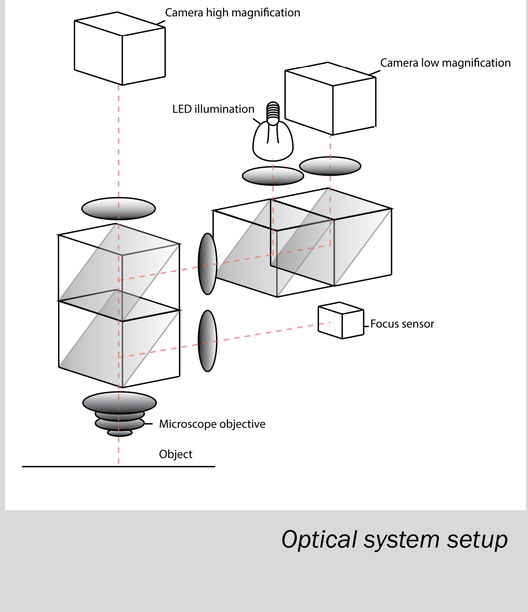


OPTICAL MODULES

For the imaging of objects, micro- and nano-structures and assemblies, surfaces textures, etc., a magnification level of >= 400x is required. The magnification factor can be configured by the selection of commercially available objective lenses, using a standard microscope interface.

Simultaneous imaging at different magnifications is possible. This enables the possibility to create an overview in combination with an image at the location of interest with higher magnification.

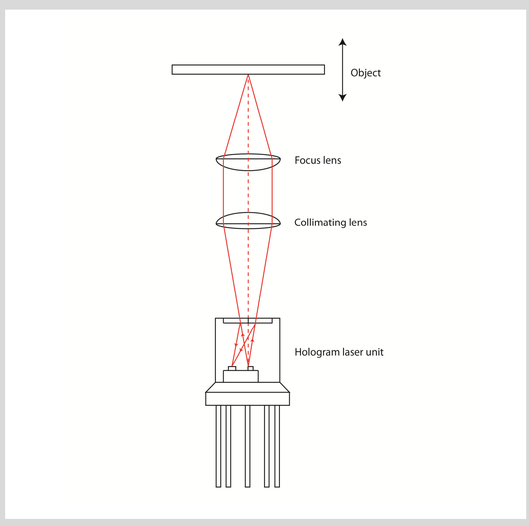
Various camera types and brands can be selected. An autofocus module can be added in between the objective lens and the base body to obtain automatically focussed images without having to move the microscope nor the object. This is very practical especially in high magnification applications with a very limited depth of focus.



Optical system setup

AUTO-FOCUS MODULE

Instant and continuous sharp and focused images can be acquired using the auto-focus module. Inspection of small details of an object requires highly magnifying imaging optics, which have a very small depth of focus. Manual or fixed focusing is not an ideal solution for these cases. In the auto-focus module, a piezo-driven stage positions the objective lens at the best focus position. The piezo-drive stage enables fast, stable and accurate manipulation over a 100 or 200 micrometer range, with an accuracy of less than 15 nm.



Focus sensor principle

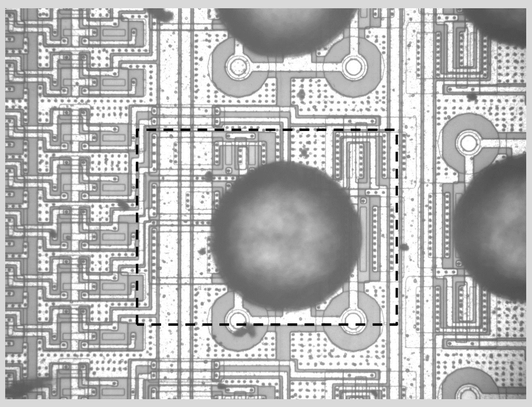
The best focus position of the acquired image is determined and maintained by an optical focus sensor, featuring a laser spot size of ~2 µm, and closed-loop feedback to the piezo actuator.

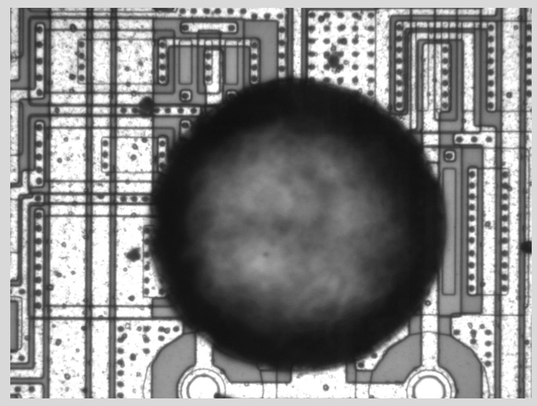
The absolute focus position can be monitored or used as a height measurement with nm-range accuracy. The laser spot can be visualized in the camera image, indicating the actual measurement and focusing position in the image. This functionality enables the system to be used as an optical and contactless measurement tool with nm-range accuracy.

The auto-focus module design is a further development based on the optical principles as used for optical disc read-out. Besides the application as focus sensor in the camera microscope, it can also be used as stand-alone optical distance measurement device. The focus sensor can be configured for a range of measurement ranges, free working distances and mechanical form-factor, to match the requirements of the application.

OVERVIEW AND HIGHER MAGNIFICATION

The combination of the optical laser displacement sensor with integrated camera image (viewfinder and navigation) is one of the most powerful applications of the iMGR-2100 system.





ILLUMINATION MODULE

The standard illumination module consists of a white LED source with adjustable optical output power. The module creates a homogenous intensity profile in the image area.

The illumination module can be customized for dedicated image analysis methods, for example by laser projection of patterns or line grids.

CONCLUSION

A modular versatile auto-focus camera microscope system is developed to support the vision applications that require highly magnified, stable and reproducible images. The auto focus module enables automatic, fast and accurate focusing of the microscope image.

The compact, robust and versatile system form factor makes it possible to integrate the system in many machine and equipment configurations.

The focus sensor can also be used as a stand-alone system.