

mag.x system 125

High Resolution Wide Field
Micro-Inspection System



Modular System

High resolution inspection is being used in many applications. Each application has its own requirements and constraints. In order to cater for all these diverse needs the mag.x system 125 is as modular as possible. Integration of customized elements is easy and enables a system that integrates seamlessly into the surrounding equipment.

Base units

Heart of the system is always the base unit which is available in different variations. All other components are attached to these base units. Mounting of the system to the surrounding equipment is also provided by the base unit.



Objective lenses

The optical performance of the system is mainly defined by the objective lenses. These are the components that make the mag.x system 125 really unique. All of Qioptiq's highest end technology is being used in manufacturing and testing of these lenses.

Tube lenses

System magnification and maximum sensor size are the result of the combination of tube lens and objective lens. The current selection of tube lenses



allows the use of sensors with a diagonal of up to 57 mm. All tube lenses are also telecentric on image side.

Illumination

For coaxial bright field illumination Koehler illumination optics are included that can be interfaced to light sources via optical fibers or directly to LED sources. Darkfield illumination can be added easily with an optional adapter.

Accessories

No system is complete without an array of accessories. The wide selection ranges from camera and fiber adapters to mounting accessories and also includes more advanced components for focusing and special contrasting methods. The optional Piezo Unit enables fine focusing with a range of 400µm. It can be combined with the AF base unit to build a true through-the-lens AF system. The new DIC module for the 5x lens enables differential interference contrast microscopy over a large field-of-view.



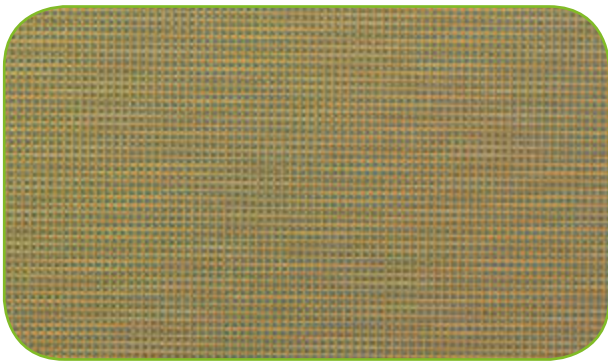
DIC module without piezo



Detail of machined aluminum image with DIC module

Applications

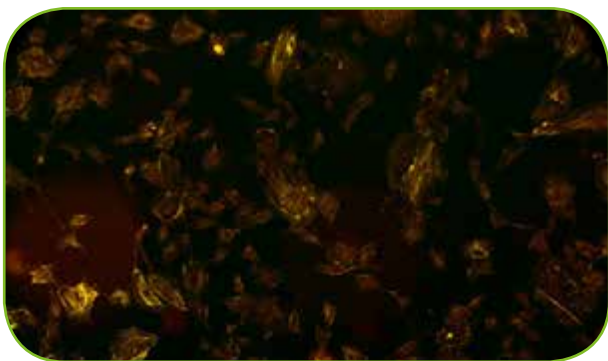
Numerous applications benefit from the versatility and the high optical performance of the mag.x system 125. The large field-of-view increases throughput of inspection installations as more object space is imaged at once and the number of images that need to be acquired to image an object in its entirety is reduced drastically – in the best case only one image is necessary by maintaining sub- μ resolution.



Color CCD sensor with 5.5 μ m pixel size

Typical applications include the inspection of large objects like

- Display panels
- Printed circuit boards
- Glass panels



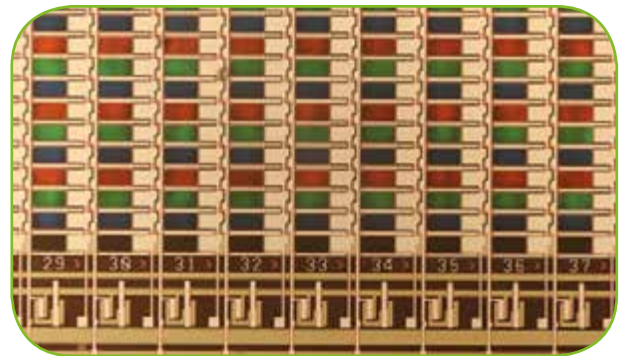
Bovine Pulmonary Artery fluorescence sample

These objects are usually inspected with line scan cameras to achieve maximum resolution and throughput. Smaller objects can often be imaged

at once or with only few images with an area scan camera. The 1.73x tube lens is specifically designed for the popular 35mm format cameras that achieve up to 50MPixel resolution. Typical applications here are

- Semiconductor inspection
- Biochip reading
- Fluorescence microscopy
- Digital pathology/histology
- High precision non-contact measurement machines
- Cleanliness of optical components

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Color TFT display

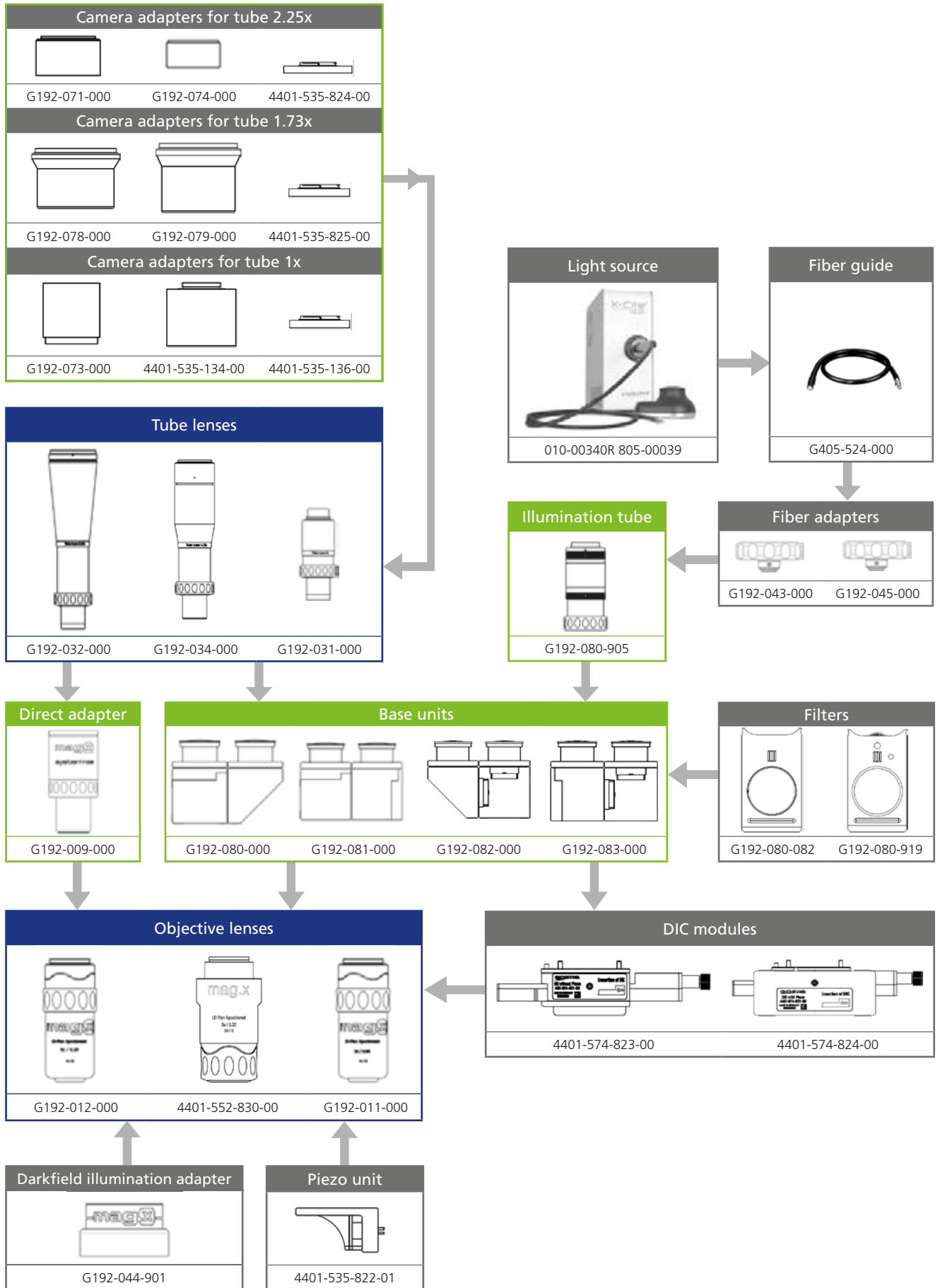
The optional DIC module expands the applications even more to transparent objects and enables visualization of changes in refractive index or thickness in materials that would not be possible to inspect otherwise.



Micro lens array in DIC mode

High Resolution Micro-Inspection System

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Order no.	Tube lenses
G192-031-000	Tube lens 1x
G192-034-000	Tube lens 1.73x
G192-032-000	Tube lens 2.25x

Order no.	Base units
G192-080-000	Compact base unit
G192-082-000	Compact base unit w/ filter
G192-081-000	Base unit AF
G192-083-000	Base unit AF w/filter
G192-009-000	Direct adapter
G192-080-905	Illumination tube 5x to be used with G192-08x-000

Order no.	Objective lenses
G192-011-000	LD-Plan Apo 2x/0.08
G192-012-000	LD-Plan Apo 5x/0.20
4401-552-830-00	LD-Plan Apo 8x/0.32

Order no.	Accessories
Filters for base unit G192-082/3-000	
G192-080-082	Dummy filter slider
G192-080-919	Filter slider incl. polarizing filter
Darkfield illumination adapter	
G192-044-901	Darkfield adapter 66mm diameter
Piezo unit for AF	
4401-535-822-01	Piezo unit to be used with G192-080-000 or G192-081-000
DIC modules for 5x lens	
4401-574-823-00	DIC module incl. Prism for use w/o piezo
4401-574-824-00	DIC module incl. Prism for use w/ piezo

Order no.	Accessories
Camera adapters	
G192-071-000	M72 Dalsa 6.56 for G192-032-000
G192-077-000	M72 Dalsa 12mm for G192-032-000
G192-074-000	M95 e2v for G192-032-000
4401-535-824-00	F-mount for G192-032-000
4401-535-133-00	M58 SVS-Vistek for G192-032-000
4401-535-135-00	M58 ISVI IC-29 for G192-032-000
G192-075-011	Finger lakes PC 65 AC for G192-032-000
G192-078-000	M72 Dalsa 6.56 for G192-034-000
G192-079-000	M72 SVS-Vistek for G192-034-000
4401-535-825-00	F-mount for G192-034-000
G192-073-000	M42 SVS-Vistek for G192-031-000
4401-535-134-00	C-mount for G192-031-000
4401-535-136-00	F-mount for G192-031-000
Light source	
010-00340R 805-00039	X-Cite 110LED w/ 5mm fiber
Liquid light guide	
G405-524-000	1m length; 5mm active diameter; Volpi connector
Fiber adapters	
G192-043-000	Fiber adapter for 9mm fiber diameter
G192-045-000	Fiber adapter for 7mm fiber diameter; to be used for G405-524-000
Mounting accessories	
G192-080-912	X95 carrier
4401-535-138-00	Mount for direct adapter

A closer look

Find additional information and download datasheets from: www.qioptiq-shop.com/en/Precision-Optics/Micro-Imaging/mag-x-system-125/



Designed for Large Sensors

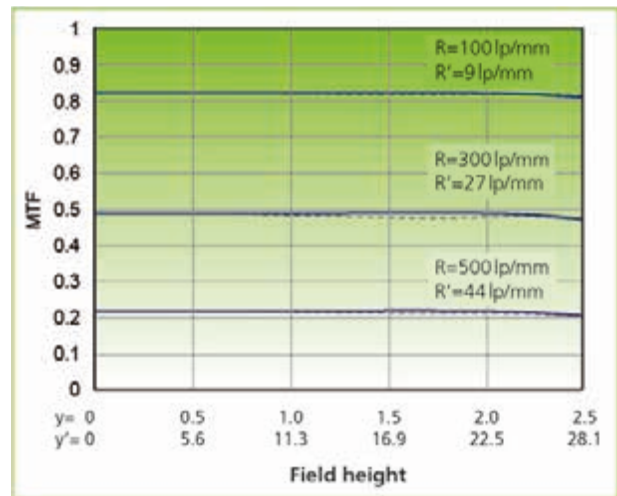
The mag.x system 125 is the first microscope system that is specifically designed for the use with large sensors to achieve true wide field imaging with high resolution. With a supported sensor diameter of 57mm popular line scan sensors like 8k TDI sensors as well as modern super high-resolution array sensors can be used. These sensors fully utilize the high optical bandwidth of the mag.x system 125 that supports up to 50MPixel sensor resolution.



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Optical Performance

Mag.x system 125 stands out from conventional microscope systems by numerical aperture (NA) values considerably higher than those of other systems. High optical quality is not only ensured on the optical axis, but also is maintained over the entire sensor format. The MTF chart below shows the polychromatic MTF versus field height. Values for object y and image heights y' are given under the horizontal axis. Note that the high contrast values close to the diffraction limit are maintained over the entire field!



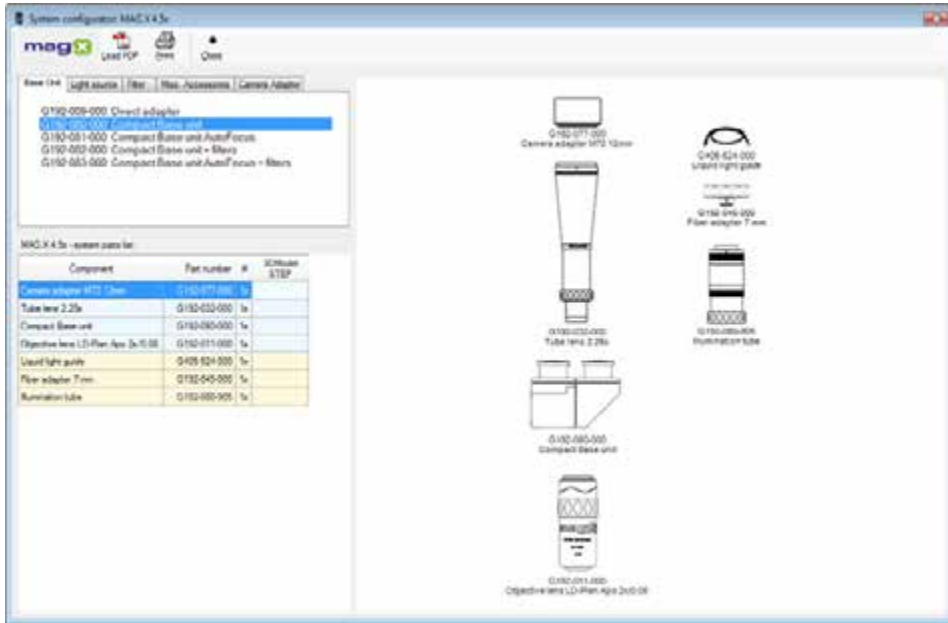
Polychromatic MTF vs. field height
LD Plan Apo 5x/0.2 + TL2.25x; $2y=5$ mm, $2y'=56.3$ mm

The complete system is chromatically corrected in the spectral range of 430–700 nm. High contrast is maintained over the entire spectrum and no refocusing is required if the illumination wavelength is changed. Multispectral imaging becomes possible without any additional focus needs.

To enable even the most demanding measurement tasks the mag.x system 125 features precise object space telecentricity to prevent flawed measurements of objects with varying height.

Configuration Made Easy: MachVis Software

The MachVis software from Qioptiq makes it easy to find the right lens for a given task and facilitates configuration of a mag.x system 125 setup considerably. Furthermore all technical data is available right away.



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MachVis download

Download for free today:
www.qioptiq.com/machvis

Specifications

Objective Plan Apochromat					Tube Lens System											
					1x				1.73x				2.25x			
					$f'_{\text{tub}} = 250 \text{ mm}$				$f'_{\text{tub}} = 432.5 \text{ mm}$				$f'_{\text{tub}} = 563 \text{ mm}$			
					$2y' = 25 \text{ mm}$				$2y' = 43.3 \text{ mm}$				$2y' = 57 \text{ mm}$			
Magn./NA	WD	f'_{obj}	δ_{obj}	R_0												
	mm	mm	μm	lp/mm	M	2y	NA'	R'_0	M	2y	NA'	R'_0	M	2y	NA'	R'_0
	mm	mm	μm	lp/mm		mm		lp/mm		mm		lp/mm		mm		lp/mm
2x/0.08	24.8	125.0	± 42.7	293	2	12.5	0.04	147	3.5	12.5	0.023	85	4.5	12.5	0.018	65
5x/0.20	13.0	50.0	± 6.8	733	5	5.0	0.04	147	8.7	5.0	0.023	85	11.25	5.0	0.018	65
8x/0.32	23.0	31.3	± 2.7	1172	8	3.1	0.04	147	13.8	3.1	0.023	85	18.0	3.1	0.018	65

NA Numerical aperture in the object space = $n \cdot \sin(\sigma)$
 WD Working distance
 f'_{obj} Focal length of the objective
 f'_{tub} Focal length of the tube lens

δ_{obj} Depth of field at 546 nm $\delta_{\text{obj}} = \pm n \cdot \lambda / (2 \cdot \text{NA}^2)$
 R'_0 Cut off frequency in image space at 546 nm
 R_0 Cut off frequency in object space at 546 nm $R_0 = (2 \cdot \text{NA}) / \lambda$
 $2y'$ Image field size (maximum detector diagonal)
 $2y$ Object field size
 M Magnification of the overall system; $M = M_{\text{obj}} \cdot M_{\text{tub}}$



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Photonics for Innovation

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