

# ImageMaster® HR TempControl

Testing Image Quality from -40°C to 120°C



Many optical systems such as lenses and camera modules are used in a wide temperature range and must consistently maintain their full functionality and performance across varying temperatures. In addition to military and aerospace applications, cameras are also increasingly being used in the automotive industry as safety-critical systems whose properties must be tested and ensured across a broad temperature span.

In general, the image quality of lenses can be affected by temperature influences on the optical components and mounting materials. Crucial lens parameters such as effective focal length and flange focal length can be temperature-dependent and have an impact on the camera's focusing function.

The challenge for the optical design is to minimize the thermal effects on the optomechanical parameters by utilizing an athermal design. The ImageMaster® HR Temp Control is used to test the functionality of the athermal optical design across a wide temperature range spanning from  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ . For this purpose, the optical performance is determined for a set of parameters and the results are presented as a function of temperature ranging from  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ . In addition to determination of the MTF, the key measurement parameter is the change in both the flange focal length and effective focal length when the temperature changes.

For the measurement process, the test samples are placed in a thermal chamber, isolated from the environment via a vacuum, and tempered to various test temperatures ranging from  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ . The vacuum prevents condensation at low temperatures and the thermal chamber is designed in a way which ensures that temperature-related changes are minimized.

The ImageMaster® HR TempControl can be used for measurements in both the VIS spectrum and IR range, and the system can be easily converted from VIS to IR – thereby covering the specific requirements from various areas, including the automotive industry, development of mobile phone lenses, and the military and aerospace sectors.



## Key Features

- Thermal chamber for measurement of test samples
- Temperature range: Standard: -10°C to 120°C, Upgrade: -40°C to 120°C
- Specially developed temperature stable design including a vacuum insulation
- Compensation of temperature-related change of the measuring instrument
- Use of a vacuum to insulate and prevent humidity
- Stable mechanical design made of granite
- Easy conversion from VIS to IR
- ImageMaster MTF-LAB Software

## Measurement Parameters

The ImageMaster® HR TempControl measures the following optical parameters:

- Effective Focal Length (EFL)
- Object angle vs Image height
- EFL vs Image height
- Distortion
- MTF vs Frequency
- MTF vs Field
- MTF vs Focus
- MTF vs Focus vs Field
- Field Curvature
- Depth of Focus
- Chief Ray Angle
- Flange Focal Length (FFL)



## Technical data

Parameter	ImageMaster® HR TempControl
Temperature Range	Standard: -10°C up to 120°C Upgrade: -40°C up to 120°C
Max. off-axis angle	± 70°
Max. image height	± 25 mm
Minimum EFL of the sample	2.5 mm
Azimuth range	Non-rotatable
Wavelength	VIS: 450–750 nm / MWIR: 3-5 µm

Remark: Vacuum qualified sample is required



See the Difference

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