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## LAS-UP-VIS-IR™

### Ultra-Precision Centering Station for the Alignment & Inspection of Larger Infrared Lens Assemblies

The **LAS-UP-VIS-IR™** is a 0.5m-sized, non-contact lens alignment and inspection station designed from the ground-up for precision lens centration and tilt measurements of single element, doublet, triplet and multi-element infrared lens assemblies with radius ranging from +/- 1 mm to infinity (plano) and diameters from below 1 mm to 600 mm, including spherical, aspheric, cylindrical and parabolic surfaces. All this can be done with a single objective lens allowing for fast and easy measurement.

The core measurement technology is based on focused laser reflection (see [LAS Technology](#)). A single-mode optical fiber couples the external Laser Generation Module (LGM) to the on-tool vertically-mounted Optical Module (OM) which houses the focusing optics and large-format array camera(s). Software control of the LGM permits fast switching of wavelengths and optimization of the beam power, resulting in superior imaging of the reflected beam with sub-micron measurement precision. The design of the LGM permits up to two of three visible wavelengths (blue, green & red) and one infrared wavelength (SWIR, MWIR or LWIR).

The user friendly **CalcuLens™** Assembly software is standard to all LAS™ models and enables computer automated measurement of the alignment errors of a single lens for rapid bottom-up assembly. Extending the measurement to multi-element lens assemblies requires the optional **CalcuLens™** Inspection software thereby adding powerful inspection capability for the quality assurance of finished lens assemblies. The recent addition of **CalcuSurf-1D™** USB lever probe and profiling software to the LAS™ family of products significantly aids the ease and precision of initial setup, resulting in improved utilization during frequent lens assembly changes.

#### APPLICATIONS

- Centering of single infrared lenses
- Cementing infrared lens doublets & triplets
- Centering & bonding of multi-element infrared lens assemblies
- Alignment Inspection of infrared multi-lens assemblies (requires **CalcuLens™ Inspection**)
- Measurement of lens vertex height and air gaps (requires **CalcuLens™ Vertex**)
- Measurement of lens Radius of Curvature (requires **CalcuLens™ ROC**)
- Measurement of infrared lens and assembly beam deviation (requires **CalcuLens™ BD**)
- TIR profiling of rotationally symmetric housings and cells (requires **CalcuSurf-1D™**)

#### SYSTEM CHARACTERISTICS

- Cored granite construction on rigid passive vibration isolation stand
- Measurement of larger diameter infrared lenses and assemblies (300 mm  $\varnothing \leq$  600 mm)

- High-precision (< 50 nm runout) ø300 mm encoded rotary air bearing with integrated centration/tilt stage and vacuum through center
- Precision, motorized & encoded vertical linear stage (travel  $\leq$  2000 mm)
- High-power green (520 nm) laser, fiber coupled to Optical Module
- High-power MWIR (4.05  $\mu$ m) quantum cascade laser, fiber coupled to Optical Module
- 90 mm Working Distance (WD) broad-band (0.4  $\mu$ m – 12  $\mu$ m) objective lens with quick-attach thread for accessories
- User-friendly **CalcuLens™ Assembly** software and data reporting functions conforming to ISO standards
- Sub-micron centration accuracy in both VIS and IR

#### AVAILABLE OPTIONS

- Add Red (660 nm) or Blue (460 nm) laser
- Replace MWIR with SWIR (1.55  $\mu$ m) or LWIR (9.5  $\mu$ m) laser
- Extended vertical focusing travel 1500 mm – 2000 mm
- High-precision (< 50 nm runout) ø400 mm encoded rotary air bearing with integrated centration/tilt stage and vacuum through center
- Add motorized direct drive to manual rotary air bearing
- Extended worktable diameters Ø400 mm – Ø600 mm
- 20 mm, 30 mm, 40 mm, 150 mm & 200 mm WD broad-band objective lens adapters
- Glue dispensing and UV cure stations
- Reticle alignment accessory
- **CalcuLens™ Inspection** software for measuring alignment of multi-lens assemblies
- **CalcuLens™ Vertex** software for measurement of lens vertex height of tall lens assemblies and lens thickness and air space of shorter assemblies
- **CalcuLens™ ROC** software for measurement of lens radius of curvature
- **CalcuLens™ BD** software for measurement of lens boresight/beam deviation
- **CalcuSurf-1D™** precision USB lever probe with digital gage and real-time profiling software
- **DMI-200** Low-coherence Distance Measurement Interferometer for center thickness and air space measurement of tall lens assemblies
- **3D-SPM** Surface Profiling Module for LAS
- **ROTOwand™** for vacuum lens pick-up & handling

SYSTEM	
Dimensions (L : W : H)	1200 x 1300 x 3100 [mm]
Weight	Approx. 1250 kg
Structure	Granite base, cored granite column, heavy-duty stand
System Controller	Includes motion control, laser control, power supplies, USB interface to PC
Power Requirements	110-220V AC, 50-60 Hz, 1 phase, 2 amps (220V), 4 amps (110V)
Compressed Air Requirements	Pressure 70 PSI (5 bar), Flow 4 CF/Min (0.113 CM/Min), Humidity 40 Dew point, Filter $\pm$ 0.005 mm
MOTION (VERTICAL)	
Stage Travel (Z)	Standard: 1500 mm, Optional: 2000 mm
Encoder Resolution (Z)	0.1 $\mu$ m
Drive Type	Precision ball screw with micro-stepper
Bearing type	Precision square rail
Flatness	Approx. 1 $\mu$ m/100 mm
MOTION (ROTARY)	
Bearing Diameter	Standard: 300 mm, Optional: 400 mm
Encoder Resolution	1 arcsec
Drive Type	Standard: Manual, Optional: Direct drive
Bearing Type	Air
Axial runout/wobble	$\leq$ 50 nm
Center/Tilt Stage Diameter	Standard: 300 mm, Optional: 400 mm
Work Plate Diameter	Optional: 400 mm to 600 mm

Maximum Load Capacity	Standard: 450 Kg, Optional: 900 Kg
<b>OPTICAL MODULE</b>	
Sensing Technique	Focused Laser Reflection
Light Source	Standard VIS: Green Visible laser (520 nm) Standard IR: Mid-Wave quantum cascade laser (4.05 $\mu$ m) Optional VIS: add Red (660 nm) or Blue (460 nm) Optional IR: replace MWIR with SWIR (1.55 $\mu$ m) laser diode or LWIR (9.50 $\mu$ m) quantum cascade laser
Detector	Standard VIS: CMOS camera (1600 x 1200) Standard IR: 640x480 microbolometer for MWIR and LWIR, 640x480 InGaAs for SWIR Optional VIS: Large-Format CMOS camera (2500 x 2000)
Objective Lens	Standard: 90mm Working Distance (WD), broad-band Optional: 20 mm, 30 mm, 40 mm, 150 mm, 200 mm WD, broad-band
<b>MEASUREMENT</b>	
Surface Shape	Spherical, Aspheric, Cylindrical, Plano
Surface Radii	$\pm 1.0$ mm to infinity (Plano)
Lens diameter	1 mm to 600 mm
Tilt Accuracy	VIS: $\pm 0.25$ arcsec IR: $\pm 1$ arcsec
Centration Accuracy	VIS: $\pm 0.1$ $\mu$ m IR: $\pm 0.5$ $\mu$ m
Vertex Height Accuracy	$\pm 2.5$ $\mu$ m (with 20 mm WD objective adapter)
Radius of Curvature Accuracy	$\pm 0.05\%$ (with 30mm WD objective adapter)
Beam Deviation Accuracy	$\pm 30$ arcsec



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