

# Laser Doppler Displacement Meter

## MCV-5000



### OPTODYNE'S MCV-5000 Aerospace Laser Calibration

**System** is designed for a complete volumetric calibration and compensation of large 5-axis machines. Both the **static positioning errors**, the angular errors, the rotary axis errors and the **dynamic performance** can be measured. The volumetric positioning errors include 3 linear displacement errors, 6 straightness errors, and 3 squareness errors. The angular errors include pitch, yaw and roll angular errors of each axis. The rotary axis errors include the rotary A, B, and C axes of a 5-axis machine. The dynamic performance, including the **circular and non-circular** contour measurement is designed for the tuning of servo parameters, feed forward, look ahead, velocity, acceleration and mechanical vibrations.

The Aerospace Laser Calibration System uses the latest laser **vector technique** for the measurement of **volumetric positioning errors**. It is very easy to setup and operate. It is also compact, efficient and time saving. For a 5-axis machine, a motorized turntable can be used to calibrate the rotary, A, B, and C, axes. With two single-aperture laser heads, two flat-mirror targets, and fast interface cards, the circular and non-circular contours can be measured in one setup. The actual feed rate and acceleration can also be determined.

## Aerospace Laser Calibration System for Volumetric Calibration, Compensation, and Dynamic Performance of Large 5-axis Machines

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### MAJOR FEATURES AND BENEFITS

- Two **long range laser heads** with automatic, fast and synchronized data collection for the master and slave axis, pitch and yaw angular errors.
- **Single-aperture** laser head and a **flat-mirror target** for the measurement and compensation of volumetric positioning error.
- Calibrating rotary A, B, or C axes by using a **motorized turntable** and dual laser-head mounting accessories. .
- Measuring **circular** and **non-circular** contours, feed rate, acceleration, and vibrations for servo tuning or dynamic performance.
- Windows software, to collect data **automatically** or on-the-fly, and to correct the speed of light and material thermal expansion.
- Measurement is **non-contact**, the diameters of the circular contour may be varied continuously to very small diameters for the determination of servo parameters such as **loop gains**, **look-ahead**, and **feed forward**.
- Long range, compact, light weight, easy setup and alignment.
- NIST traceable laser accuracy and supporting ASME and ISO standards for quality control and maintenance.

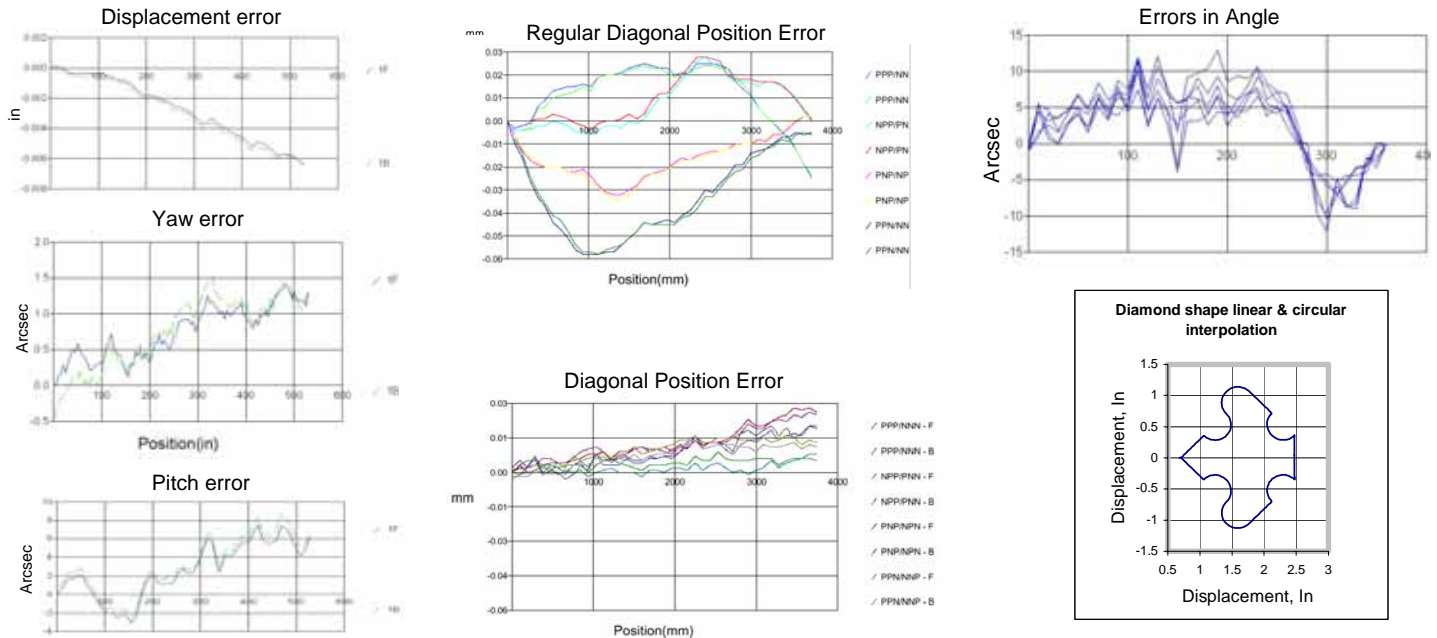


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# Specifications

The laser vector technique is a major break through in laser measurement. It is easy to setup and to operate. It is very efficient and time saving. Usually, the volumetric positioning errors, 3 displacement errors, 6 straightness errors and 3 squareness errors, in a working volume of 1 to 3 cubic meters can be measured in 2-4 hours. The volumetric positioning error compensation files can be generated automatically for most of the major controllers. Even for a large gantry machine, most of the measurements can be done in **one day** instead of **one week** by conventional interferometers. The equipment is compact and can be fitted into 2 small carrying cases. For various applications and requirements, there are 4 models **MCV-5002** to **MCV-5005** to choose from.



Linear displacement error (top), yaw angular errors (middle), and pitch angular errors (bottom) of x-axis.

Body diagonal displacement errors without compensation (top) and with volumetric compensation (bottom), a 300% improvement.

Angular errors of rotary axis (top) for MCV-5003 and MCV-5005. Non-circular contour measurement (bottom) for MCV-5004 and MCV-5005.

## MCV-5002

### Configuration:

Single aperture laser heads (2)	L109ER
Two-channel process module	P-108E
Automatic temp. & pres. correction	ICTCP
0.5" diameter retroreflectors (2)	R-102
Windows software, SD	W-5000
Optical adapters (2)	LD-69/70
4"x3"(100 mm x 75 mm) flat mirror	LD-71S
Accessories for mounting & alignment	LD-03P, LD-03, LD-14a, LD-37s, LD-58
Cable sets (2)	LD21L
Heavy-duty carrying cases (2)	LD-20D

### For MCV-5003

Automatic rotary table calibration	LD-53A
Dual-head Mounting Plate	LD-79

### For MCV-5004

PC interface cards (2)	IPC5-1000
6" (150 mm) flat mirrors (2)	LD-71
Windows software, LB,PC	W-500LB, PC

### For MCV-5005

All the above accessories

### Capability:

Laser Stability	0.1 ppm
System Accuracy	1 ppm
Angular Accuracy	+/- 2%
Linear Resolution	1 μin (0.01μm)
Angular Resolution	1 μrad (0.2")
Max Angular Sweep	+/- 10 degrees
Max Range	100 ft (30 m)
Longer range available	
Max Speed	160 in/sec (4 m/s)
Max Sampling rate	10 000 Hz

### Power:

90 to 230 VAC, 50 to 60 Hz