OPTODYNE
Laser Metrology S.r.l.

MAJOR ADVANTAGES OF THE OPTODYNE SYSTEM

There are numerous advantages that the Optodyne laser system has over our major competition. These advantages are not in any order and each potential will perceive them differently.

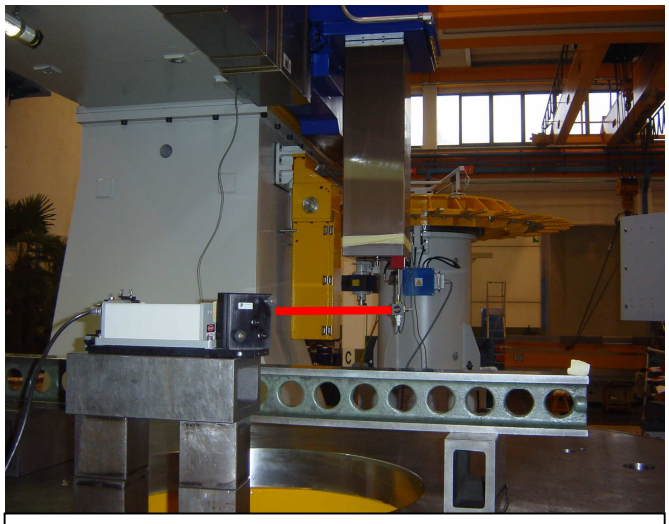
SIZE & OPTICS:

Convenzional interferometer system are large and bulky. They require numerous different optics and other hardware for the various measurements. The minimun number of cases required to transport the system is two, one case for the laser system and a second for the tripos. As additional measurement capabilities are added additional cases must also be added.
The compact size of the Optodyne system will be evident to most people. Also because of the technology the number of optics for each measurement has been reduced.
Also without a tripod the system can be mounted directly on the machine eliminating the need to remove or disassemble machining enclosures.

Measure of pitch error in a machine tool, behind covers without to dismount it, made with LICS 100A

This is a major advange to people that are going to use system for field service. The compact size reduces or eliminates shipping costs and allows the user to check the system as luggage without an additional charge for weight or number of pieces.

EASE OF USE:

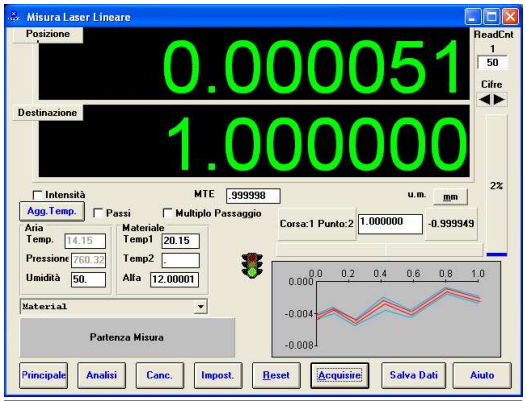


Positioning and Straightness with MCV4000

In the past, companies that had laser systems usually had a laser expert. This person was normally the only one in the shop that new how to setup and run the laser. With the Optodyne system the setup and software is enough easy to learn that with a minimal amount of training anyone can use the system. The MCV-500 for instance can be setup with little or no training as long as the user has a working knowledge of the computer without any formal training. For the larger system it is recommended that the customer purchase the optional training to familiarize themselves with the various setups and software options.

SOFTWARE:

Optodyne has offered and supported Windows™ software for almost eight years. The Windows™ software is easy to use; with only two windows per measurement; sub-screens are not a problem. Easy to decipher commands allow the operator to move around the screens without problems. A complete help file is also available anytime during the measurement.



Software display with real time graphic

COMPUTER INTERFACE:

Miniature Spark Erosion, with MCV500

The calibration systems have two different interfaces, the USB port for the static calibrations and a PCMCIA card interface for the new Laser/Ballbar system. The Laser/Ballbar can collect that our major competition.

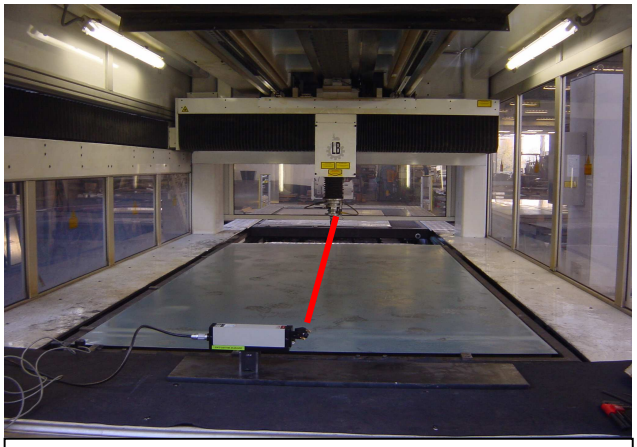
QUICK SETUP TIMES:

Conventional interferometer system are normally very time consuming to setup while the Optodyne system can be setup in a matter of minutes. Also with the dual beam feature the operator can collect linear, angular, and straightness data simultaneously. This is not reduces the number of runs required to collect the data it also eliminates different setups for the different measurements.

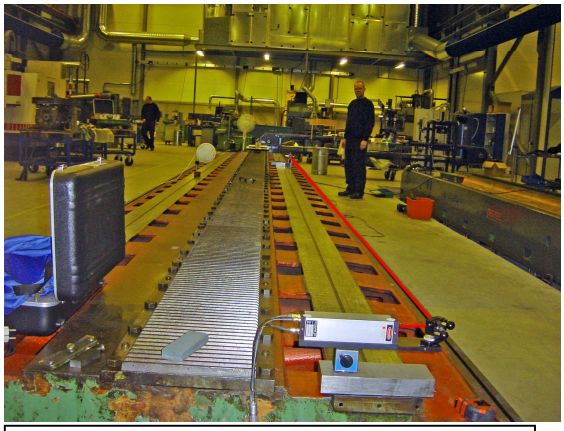
Simultaneous: Positioning, Pitch angle, and Straightness on CMM with MCV2002

SYSTEM RANGE:

Range is not normally an issue but again there are limitations with conventional interferometer systems. Competitor's system have ranges up to 80 meters. The Optodyne system has ranger up to 100meters



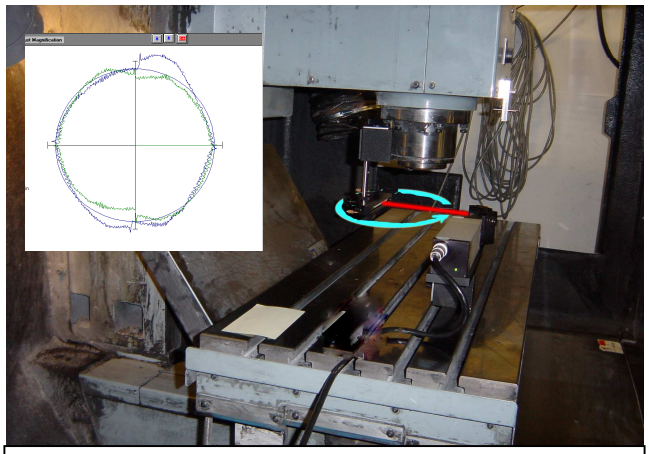
Laser cutting machine with MCV 3500 Positioning, straightness and squareness



Retrofitting: Scraping of guideway, straightness measurement with MCV3500

SYSTEM SPEED:

Much of the newer technology is focusing on high speed machining, machines are available with speeds in excess of 1,5m per second. Interferometers are limited to a maximum speed of 1 m per second.
The MCV system has a maximum speed of 5 m/s per second while the other calibration system can measure at speeds up to 1m/s.



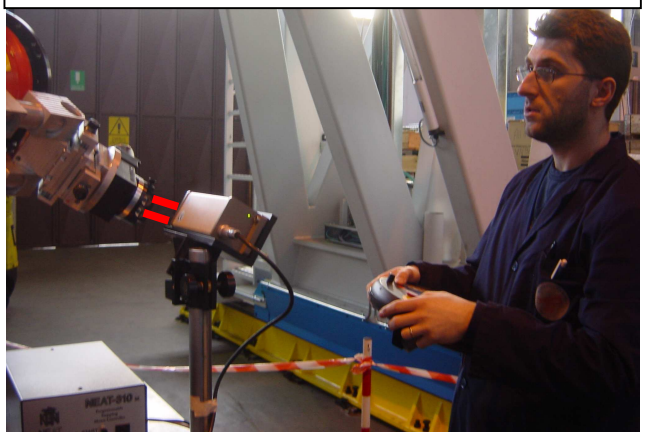
Dynamic coordination or Laser/Ballbar with LB 500

ROTARY TABLE CALIBRATION:

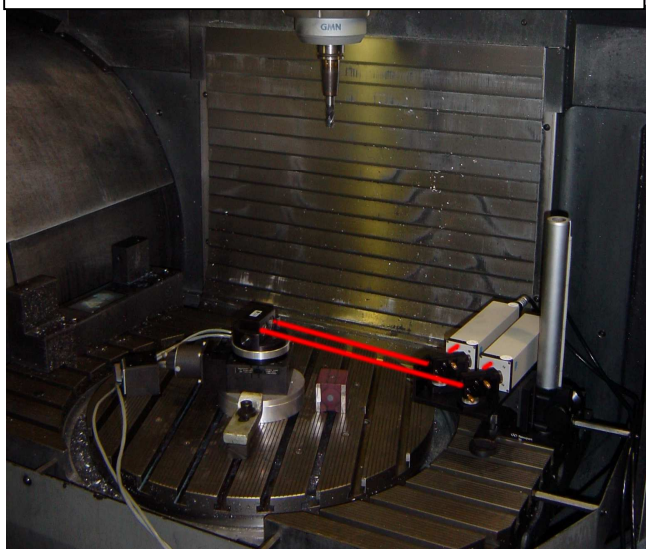
Conventional techniques to calibrate a rotary table are based on the comparative method. Usually, a reference rotary table with a Hirth coupling (a rotary calibrator) is used in conjunction with a laser interferometer angular measurement system. The accuracy of the calibration is limited by the accuracy of the reference rotary table. An accurate reference table with a Hirth coupling is very expensive, heavy and must be calibrated independent of the laser system.

The LDDM dual-beam laser system can measure both linear displacement and angular displacement simultaneously. This addictional information enables the dual-beam laser system to calculate the center of rotation and the beam separation. The errors caused by run-out, wobble, parallelism and non-coaxial, can also minimized. Hence the rotary table can be calibrated directly without the need of a reference rotary table with a Hirth coupling.

Rorary Axis on CMM head with MCV2002+RT100



Rotary Table Angular Positioning error with MCV 5005 Aerospace Package

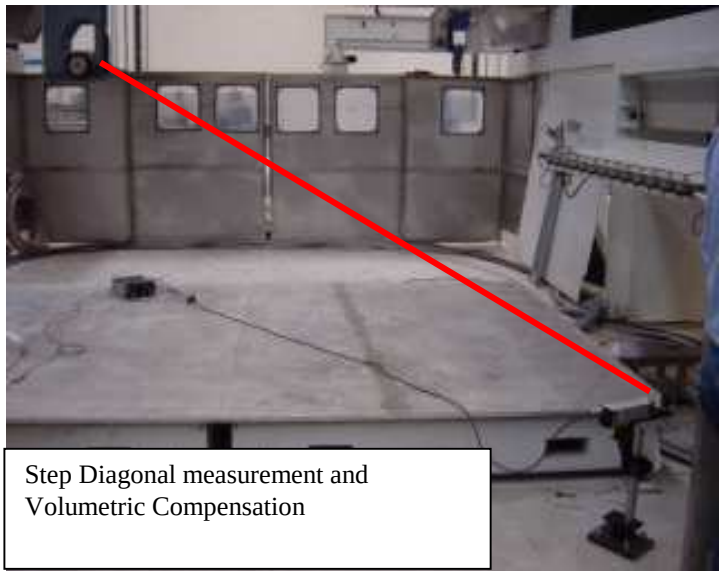


DIAGONAL MEASUREMENT ISO 230-6

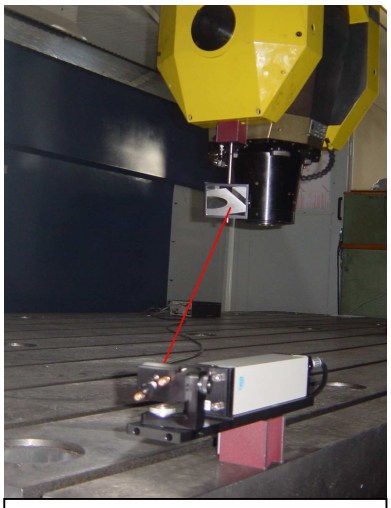
In order to obtain a better positioning error in a machine tool it is important the volumetric error measurement, that includes the linear positioning errors, the geometrical errors of straightness and perpendicularity of all the three axes and the non rigid body errors the sag errors and thermal deformation The diagonal measurement of the machine body is recommended by the international standards like ISO 230-6 ed ASME B5.54, for a rapid evaluation of the volumetric error. This is possible because the diagonal measurement is sensible to all the error components.
With the Optodyne systems the diagonal measurement is fast and easy, few tenth of minutes instead of hours with the traditional systems.

VECTOR METHOD FOR THE VOLUMETRIC COMPENSATION

With the diagonal measurement all the errors are combined but is impossible to separate any single error source. With the patented Vector method by Optodyne it is possible to measure 12 separate errors after the measurement of 4 diagonal measurement done at sequential steps. The XY and z axes are moved one a time and after every movement the position is collected. Twelve measurements but only four laser alignments. The calculated errors are 3 for each Cartesian axis: linear position, vertical and horizontal straight, and 3 squareness errors, total 12 errors that allow the



Step Diagonal measurement and Volumetric Compensation



Molds for aeronautic field, MCV 500 + SD500

software to automatically compile the volumetric compensation tables. It is make possible because of the single coaxial beam that allow the use of special optics.

N.I.S.T TRACEABILITY:

Other interferometer systems offer N.I.S.T. tractability through various standards that are maintained in-house or through other international laboratories located offshore.

At Optodyne our tractability is maintained directly through N.I.S.T., systems are calibrated on a regular basis and then those systems are used as our in-house standard for calibrating other systems. Optodyne specifies an accuracy of 1PPM and a stability of 0.1PPM, calibration reports have found the system accuracy to be as good as 0.2PPM and the stability as good as 0.002 PM. The system is maintained at Optodyne's Compton, CA facility, reducing lead-time for re-calibration of systems.

PRICE:

List pricing on laser systems doesn't seem to mean much these days. If the competition finds out that Optodyne is being considered as a supplier they will usually reduce their pricing or offer what seems to be a unlimited supply of demo units. The optics used in the system are also less expensive thus reducing the cost throughout the life of the system.