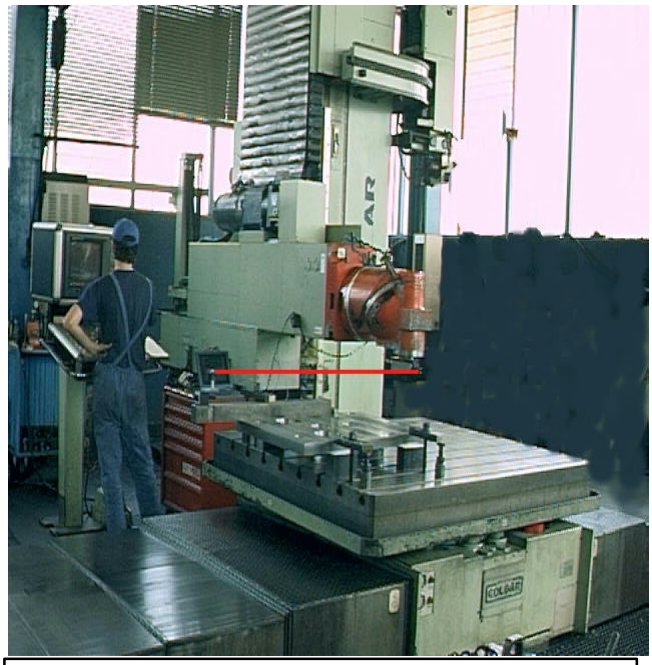
OPTODYNE Europe.

Application Notes **AP1104**

Calibration of CNC Machines by a machine tool operator.

I, What is the problem



Operator makes machine calibration before to cut. The MCV 500 laser head is mounted on the machine instead of the cutting tool and the reflective target is mounted on the moving table.

For machine tool calibration or compensation file generation, a laser interferometer can be used. However, conventional laser interferometers are bulky and difficult to set up. For example, two large optical components need to be aligned with the laser head, and a heavy tripod is needed to support the laser head. For many of today's CNC Machining Centers there are enclosures surrounding the machining area and there is no room for the large laser head and tripod inside the enclosure. This requires the operator to mount the laser head outside of the enclosure. Also, several large carrying cases are needed for the laser system, it is expensive to ship and difficult to carry for field services. Furthermore, extensive training and experience is needed for the use of the laser interferometer. It is rather difficult for a machine tool operator to use the conventional laser interferometer.

II, How MCV-500 solves the problem

Conventional laser interferometers are based on the Michaelson interferometer. There are two laser beams, the output beam and the return beam, which are parallel but displaced about 1", as shown in Fig. 1. Hence, large optics are required. Also, the alignment is critical, 3 elements have to be aligned co-axially. The laser head is large and heavy, and a heavy tripod is needed to support the laser head.

The single-aperture MCV-500 laser system is based on laser Dopplermetry. The laser head is very compact (2" x 2" x 8.5") and is completed with stabilization circuits, electro-optics, and photo-detectors. As shown in Fig. 1, the output beam and the return beam share the same aperture. Hence large optics are not required. Since there are only two elements to be aligned, the alignment is not as difficult.

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The compact size and lightweight of the laser head and optics allows the operator to mount the components to the machine directly with magnetic bases without the use of a tripod. Also, there is no need to dismantle the protective machine enclosure.

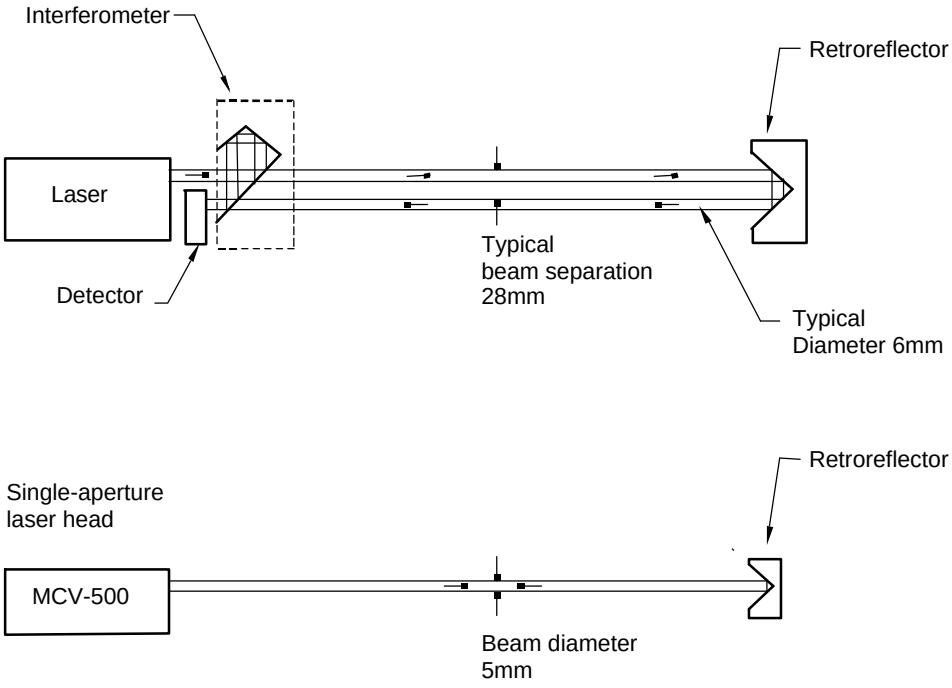
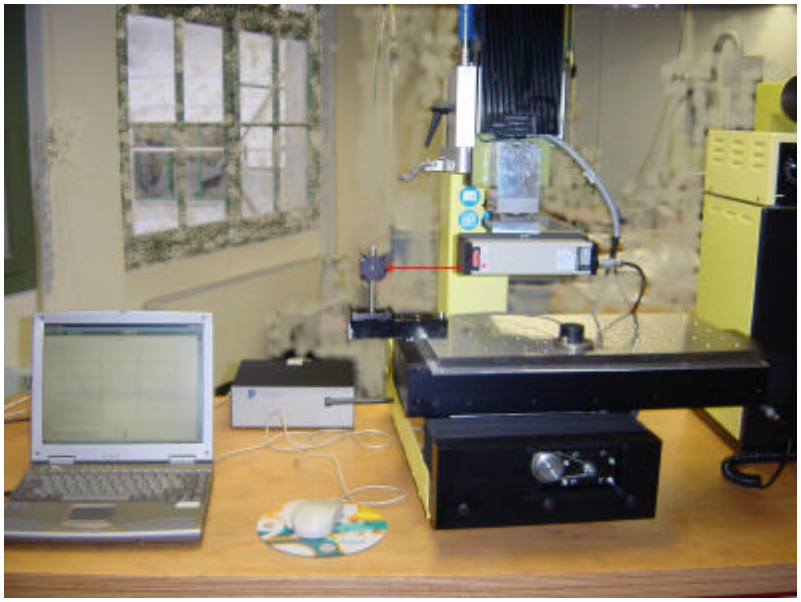


Fig. 1 A comparison of a laser interferometer and a single-aperture Laser Doppler system

II, How it works

All the components of the MCV-500 are compact and small; they can easily be mounted directly on the machine reducing overall setup and calibration time. The Windows™ based data collection and analysis software is simple to operate. Hence any machine tool operator can use the MCV-500 to calibrate the machine with minimum training.



Machine Calibration system MCV 500 mounted on a little dimensions machine, it is possible to see the temperature sensor positioned on the table. the material thermal expansion will be automatically compensated.

The MCV-500 is a complete calibration system with air temperature, barometric pressure, and material temperature sensors to compensate any environmental and temperature changes. The laser stability is 0.1 PPM and the system accuracy is 1 PPM. It is calibrated and traceable to N.I.S.T. The range of the measurement is very large, up to 50-ft. (15m) and the maximum speed is up to 200 ips (300 m/minutes), for use with high-speed machines.

IV, Need more information

Call Optodyne or your local representative.

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