LASER SCANNING SCULPTURAL SURFACES

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Abstract

This paper presents the use of laser scanning sculptural surfaces, types of measures and principles for CNC machine tools, the principles underlying these types of checks, linearity measurements, check the linearity of the laser interferometer and the ruler lights, check the linearity of the laser beam with the the maximum density, etc..

Key words: sculptural surfaces, wood, CNC, linearity measurements

INTRODUCTION

Lasers are often used to control CNC machine tools.

The types of measurements and their principles when CNC machines is known aims to systematize the application of laser cases standardized tests according to ISO, ASME, DIN, VDI (1,13,14). Basically two main principles underlying these types of checks:

-interferometry;

-beam with high density area.

MATERIAL AND METHOD

Interferometry is based on the phase difference between the incident ray and reflected, as well as the rate of 2 points.

This method is used in several types of machine tools specific checks:

- Verify the accuracy and repeatability of positioning VDI-DGQ 3441, ISO 230-2 and ASME B5.54.1992 including its correction;

- Checking straightness or flatness using a straightedge specific reflection (fig. 1) as an accessory.

The laser beam with high density area which was used in the tests on measuring geometric linearity and flatness. In this case identifies the high density soft center of the laser beam, and this forms the reference straight line (Apro, 2008).

- Check the mirror-linearity using transducer;

-Checking flatness using rotating polygonal mirror and mirror transducer.

RESULTS AND DISSCUSIONS

Measuring linearity

Linearity is measured by both methods (laser interferometer beam with high density area), in the examples below.

-Check the linearity of the laser interferometer and ruler reflectors (fig. 1)

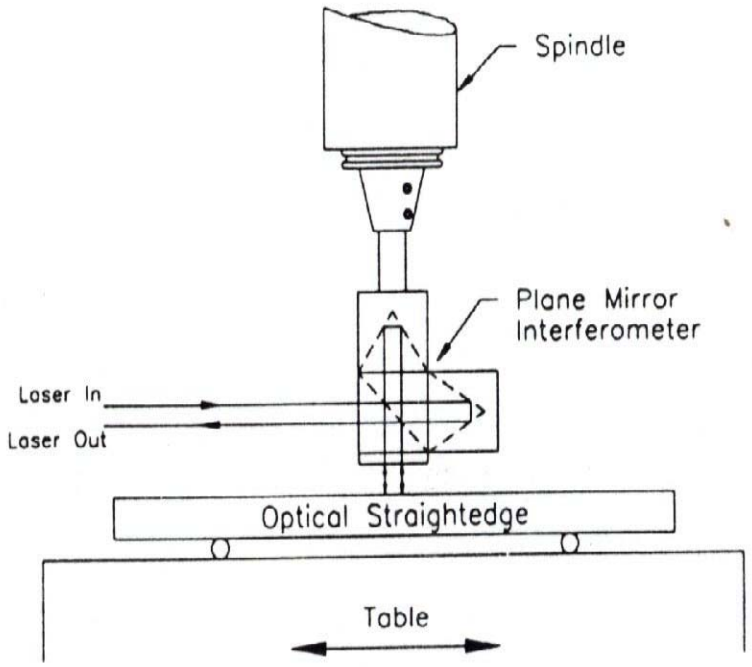

Fig. 1 – Checking linearity of laser interferometer reflectors ruler

In this case the ruler right reflectors, prisms placed on equal or equal role, does not introduce deviations, and the length of the path traveled between the incident ray and the reflected linearity guide table. When driving on the guide table insert position or shape errors that can be measured incrementally or continuously, which can be illustrated by a diagram (Ganea, 2009, 2010).

-Check the linearity of the beam with the maximum density (fig. 2)

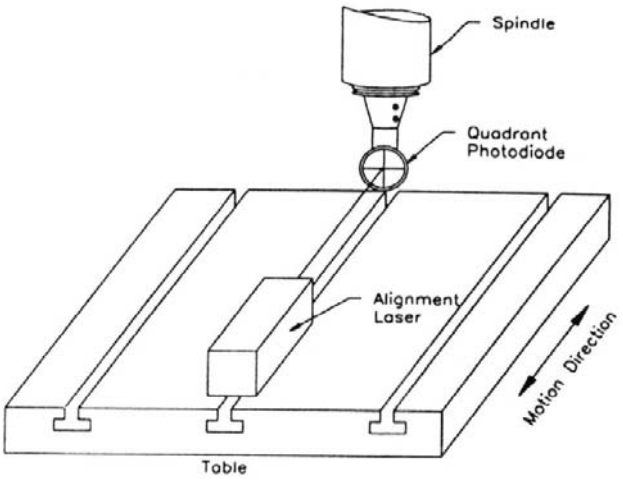

Fig. 2 – Linearity check and mirror laser beam transducers

In the case of figure 3 the laser is adjusted parallel to the guide reported to the ends of the mirror determined. Intermediate values are measured with 200 mm steps by reading the vertical deflection indicated by the PC mirror transducers.

Flatness measurement.

This can be done exploring the rows and columns of the table surface equidistant laser line, this is done either interferometer (case 1) or high density zone radius (case 2). Result of exploration lead to the erection of a 3D diagram PC, which will then indicate the maximum deviation from the ideal plane determined by the middle of the laser (the maximum density). (Ganea, 2010).

A specific method for measuring flatness is what creates the ideal reference plane through the reflection of the laser beam with a high density area pologonala rotating prism, form a "wire" red light transparent plane parallel to the table surface.

Measuring deviations from flatness of the table is then mirror the mass transducers in points scored in a balanced network of lines and columns of 200 mm standard step, and taking 3D computer mapping deviations from the ideal flat shape (Ganea et al., 2008, 2010, Horge, 2008).

Measurement tolerance for positioning and repeatability, the linear axis.

This is done with the laser interferometer with the car sitting on a

tripod and with a system of mirrors is on another road traveled successively captures the movement of the X axis, then the Y axis and Z axis respectively, (fig. 3) .

Browse mirror route is through CNC program, coupled with laser measuring system and a computer information processing, including lifting diagram form deviations from the ideal plan, according to VDI-DGQ 3441, ISO 230-2 , ASME B5.54.1992.

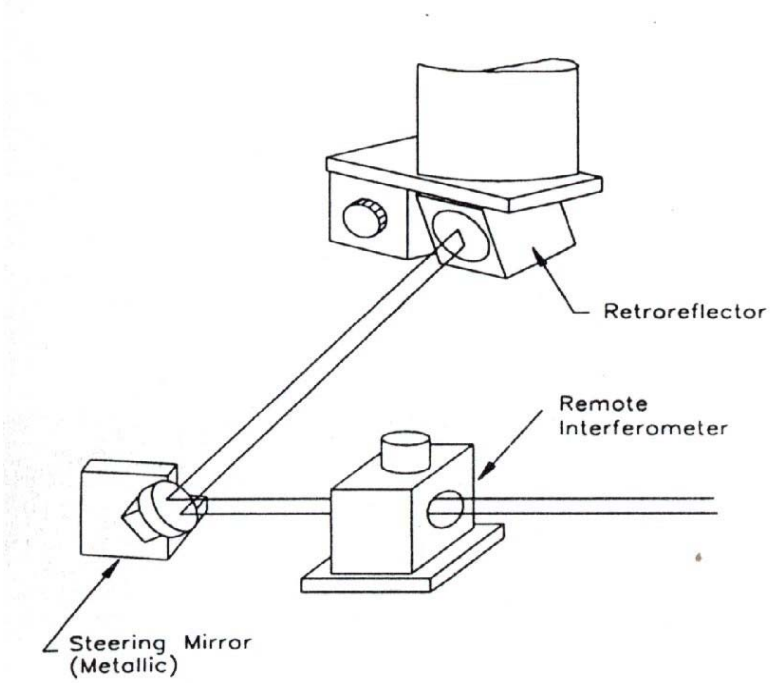

Fig. 3 – Installing laser interferometer mirrors for so that measurements can be performed on all linear axes with the same installation (the laser is placed on the ground on a tripod adjustable)

Check VDI-DGQ 3441 or ISO 230-2 does not imply the use of laser, but can be used for another accurate measurement system, as an example standard ruler optic optical reader, and reading and recording to be done manually.

If standard optical ruler, precision ruler must be max. 0.001mm, so as to ensure error diagram obtained.

This latter case allows measurement automation in a CNC program, as well as the linear axis of the car.

Ask question arises permissible limit values of the 3 parameters standardized intake standards (values in mm or arcsec) table 1:

Table 1

Permissible limit values of the 3 parameters

Class of accuracy	Tp	Rp	S
	linear shafts		
N -normal	0.02/1000	0.012/1000	0.006
P – precision	0.01/1000	0.006/1000	0.003
FP – very precise	0.006/1000	0.004/1000	0.002
	Axis of rotation		
N - Normal	10” / 360º	5” / 360º	3”
P – precision	6” / 360º	3” / 360º	2”
FP – very precise	4” / 360º	2” / 360º	1”

The allowable values are obtained after linearization correction chart entry errors.

CONCLUSIONS

This sample is part of the standard VDI-DGQ 3441, and that ISO 230-2 or ASME B5.54.1992.

Laser measurement method is optional here, as with linear axes, not necessarily laser interferometer. This means it can be used in this case another angle measurement system precisely how another laser but involve measuring and recording data manually and then processing and raising charts, all about manual.

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