

Advanced in automated control of dynamic laser scanning of surfaces in flying spot thermography



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1. Outline

The purpose of this work is to develop different non-destructive testing methods of defect detection and characterization purposes by automated dynamic infrared detection. More exactly, for quality control in airspace inspection, **IR lock-in thermography coupled with flying spot thermography**. The laser scanning of the surface to be investigated is performed by an assembly of galvo-mirrors. During the adjustments, the aim was to correlate the image obtained from the FLIR camera with the interactive movement of the coordinates of the reference points.

2. Preliminary results for laser scanning procedure by galvo-mirror assembly

The scanning algorithm procedure:

1. Defining the extreme coordinates in the field of view: (start x1, start y1) and (final x3, final y3)
2. Generating the calibration sequence
3. Illumination of the scanned surface in calibration mode (fig. 2)
4. Starting the scanning process (fig. 3):

$$\text{increment}x = \frac{\Delta x}{\text{esantioane}} = \frac{|start_{x1}|+|end_{x3}|}{\text{viteza}[\text{Hz}] \cdot \text{duratalinie}}$$

$$nr_{esant}y = \frac{|start_{y1}|+|end_{y3}|}{\text{increment}y}$$

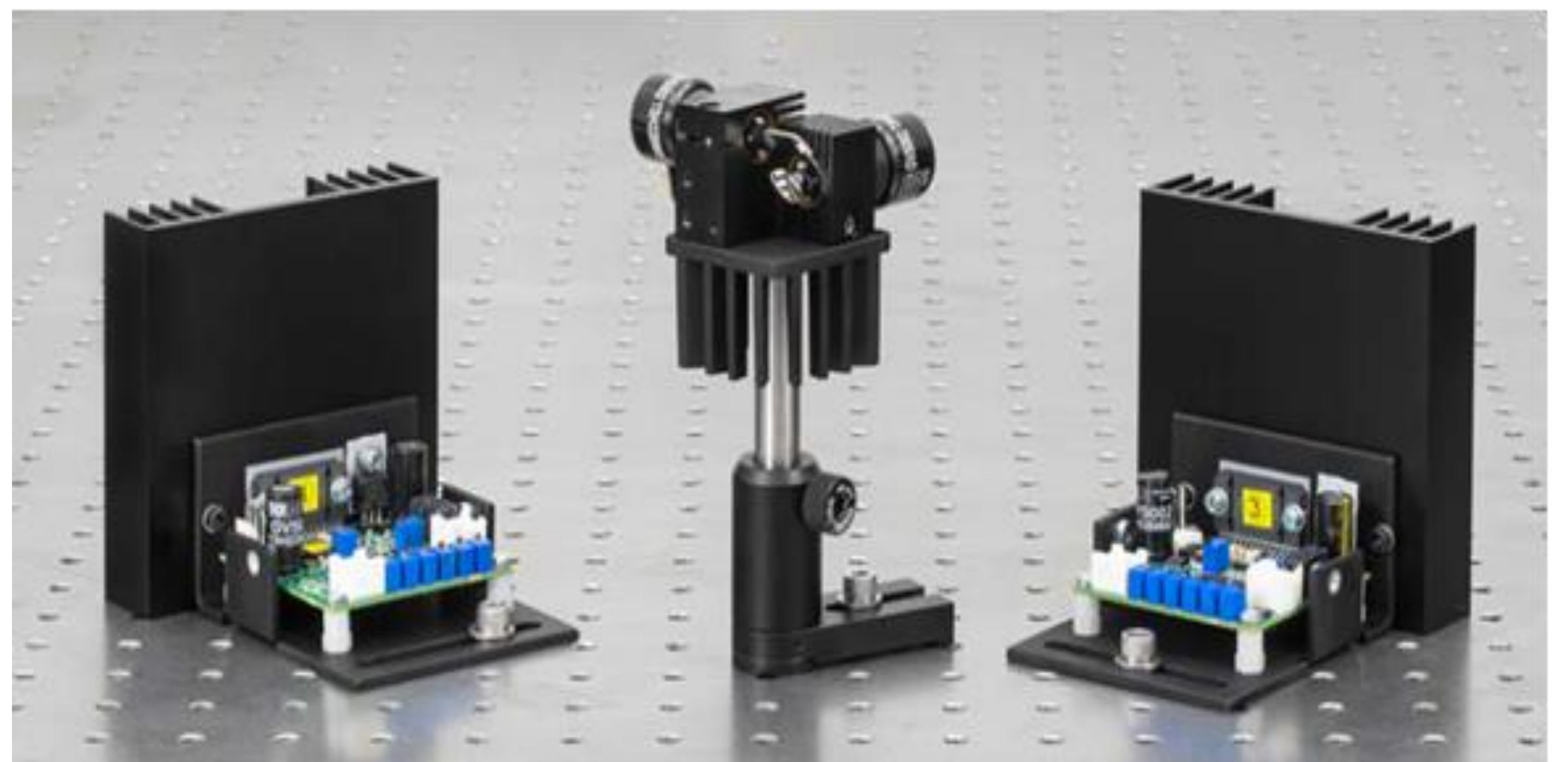


Fig. 1 - The assembly of galvo-mirrors (GV5002) for laser scanning

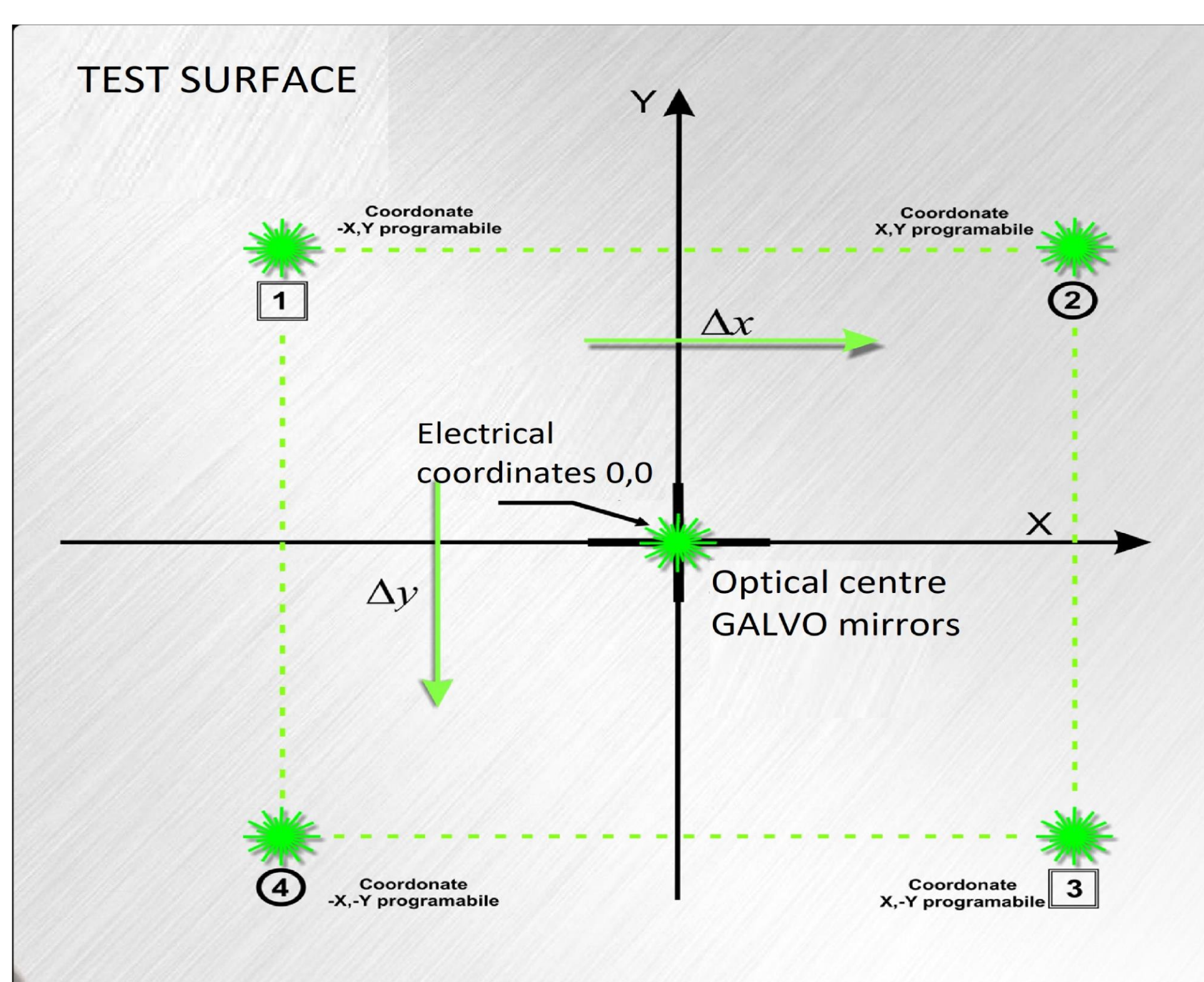


Fig. 2 - Illumination of the scanning surface in calibration mode

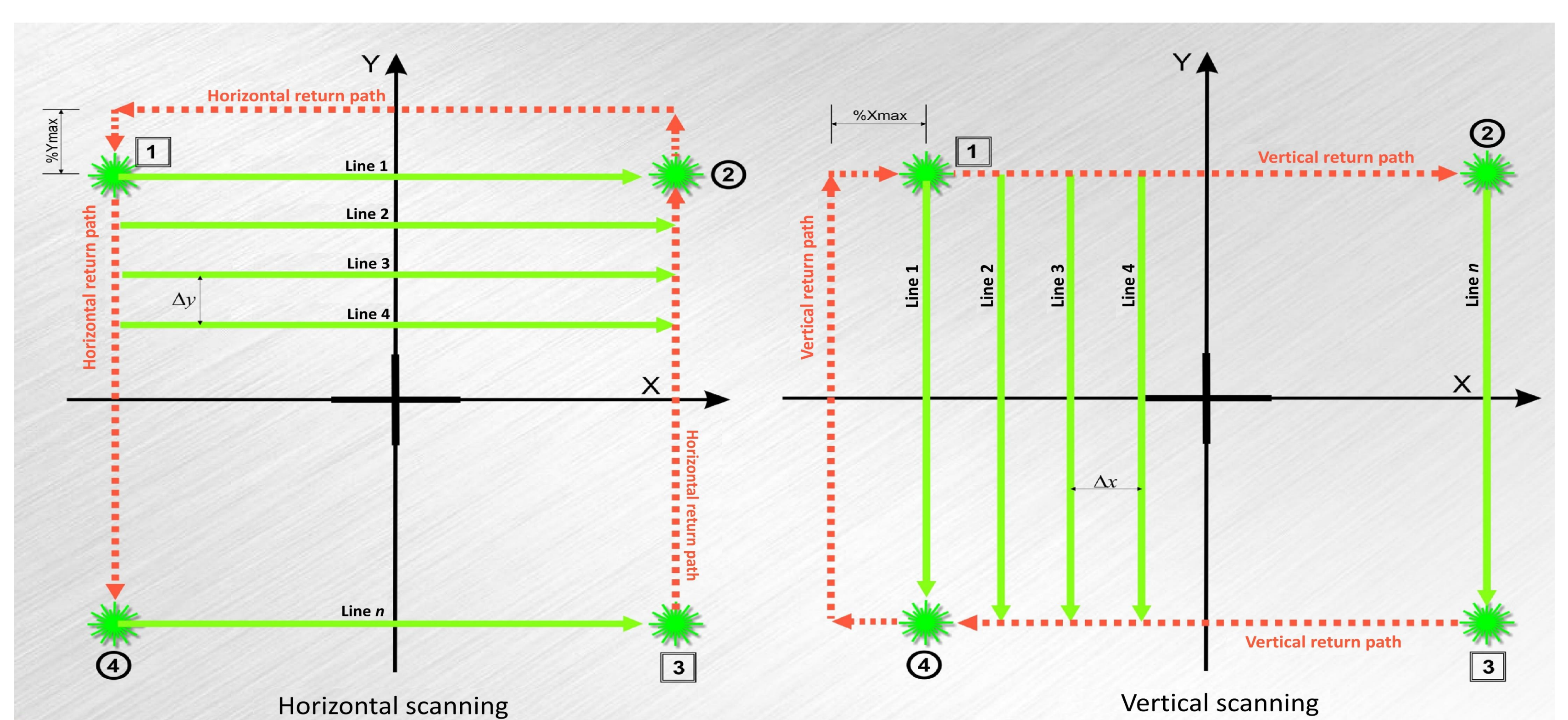


Fig. 3 - Performing the laser scanning algorithm and the return path

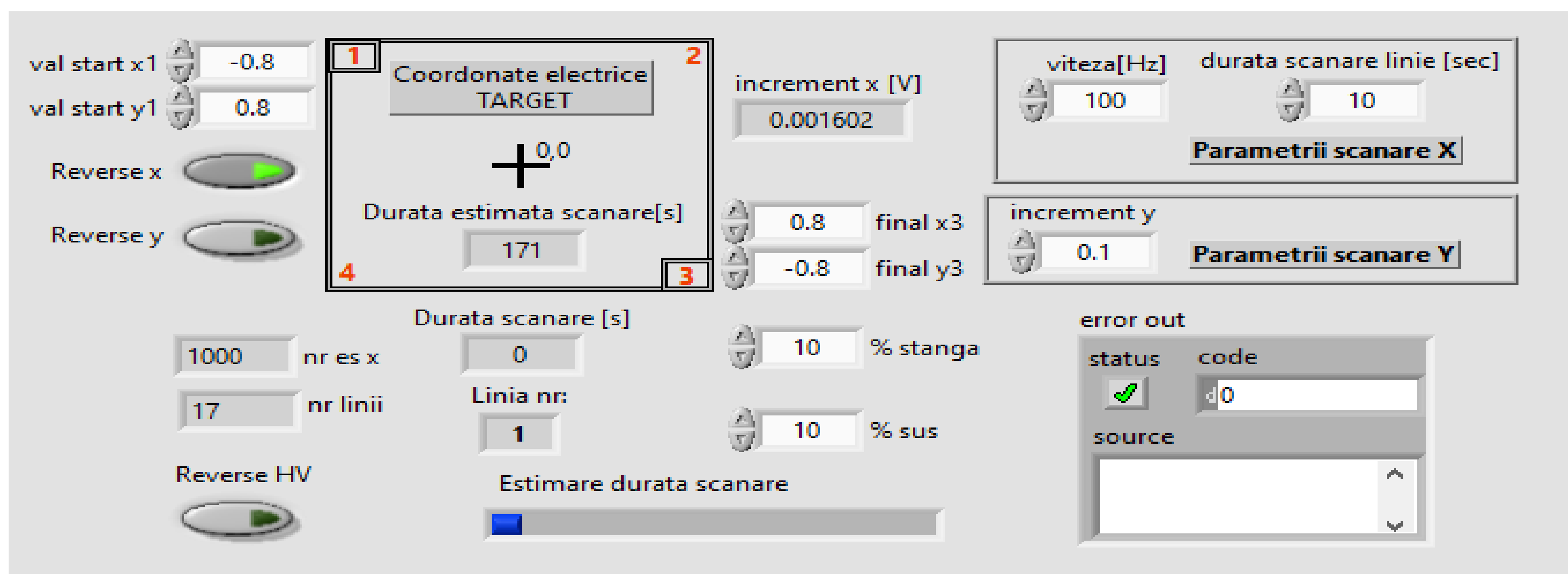


Fig. 4 - Control panel for the GV5002 galvo mirrors scanning algorithm

3. Summary

The surface scanning algorithm involved the introduction of a electrical and optical calibration procedure for the entire mechanical assembly of galvo-mirrors, along with the correct positioning of the IR camera. The automatic scanning laser algorithm together with the horizontal and vertical laser return path on the investigated surface was performed in LabView software. After entering the operational parameters, the algorithm calculates the number of samples required for the x coordinate, respectively the number of the resulting laser scan lines.