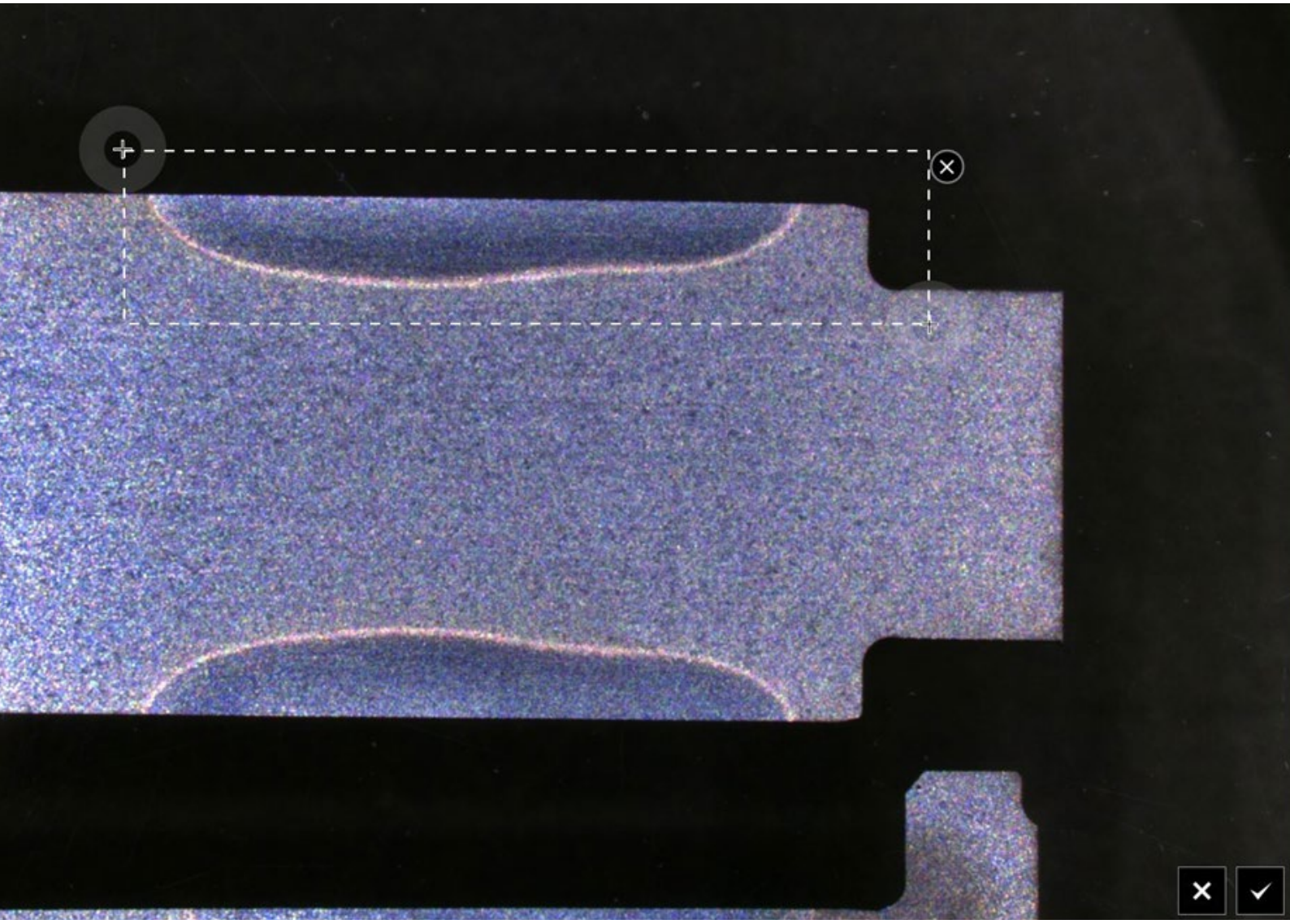

Smarter Analysis of Hardened Zones

Faster Hardness Profile Testing Using ZEISS Smartzoom 5

We make it visible.

Smarter Analysis of Hardened Zones

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The quality of inductively hardened zones of rotor shafts is usually analyzed with the help of optical light microscopy. The established definition for their optical measurement requires that four parameters are measured for each of the four curing zones of every component, and then two parameters that determine the position of the grinding are added. The digital microscope Smartzoom 5 offers additional benefits compared to conventional light microscopy for these recurring investigations. The integration of the so called template function, which allows recognition of the same objects, in the recording of macros leads to significant time savings. Furthermore the analyses and micrographs taken are of consistent quality and are more or less independent of the operator.

Introduction

The quality control of components often involves time consuming, light microscopic routine examinations of the components, which also requires staff with microscopic expertise for high-quality results. The ease of use, combined with the supervisor-operator-concept of the digital microscope Smartzoom 5, greatly improves the workflow of these routine investigations and enables employees without expertise in microscopy to carry out the analyses after only a short introduction to the process.

On the example of inductively hardened rotor shafts, this application note highlights the advantages of Smartzoom 5 for recurring light microscopic investigations. The supervisors generate macros, – so called jobs – and determine the necessary steps of the analysis as well as the microscope settings (e.g. objective, magnification, mode of illumination). Using the stored jobs, the operators can control the hardening zones in a defined and efficient way without the risk of neglecting one of the measured pieces of data needed to define the zones. The output data is reproducible and of consistent quality.

Generating the Job

The supervisor creates a job for controlling the inductively hardened zones of rotor shafts, the recurring investigation therefore becomes more time efficient and the output data is independent of the operator. The geometric parameters of two components that are imbedded in one polished section can be measured in one run. The supervisor performs the first examination; the job is automatically recorded in the background. In the first step an overview image of the sample (map) is made with the built-in overview camera (Figure 1a).

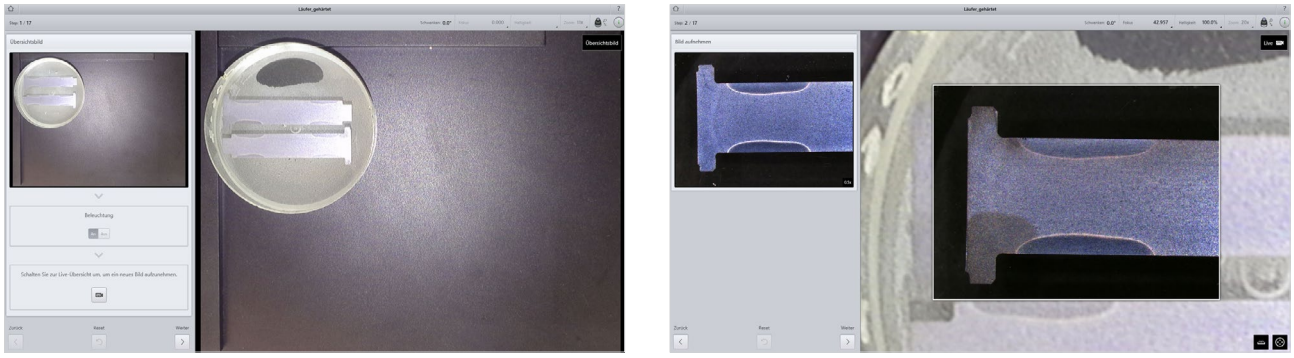

Figure 1 *a) Positioning of the sample, generating the overview (map); b) Approaching the position, taking the micrograph followed by object recognition for facilitated measurement.*

The first position that should be studied is chosen by clicking the desired position on the map, the microscope table heads for that position (Figure 1b). To generate the template with the help of the repetitive object tool, the first inductively hardened zone is marked (Figure 2a) and, with the measurement tool, distance lines for measuring the hardening parameters are annotated (Figure 2b). Similar hardening zones that should be measured are automatically recognized after manually approaching the next position with suitable magnification; however the grabbing points of the distance lines must be adjusted to the measured zone.

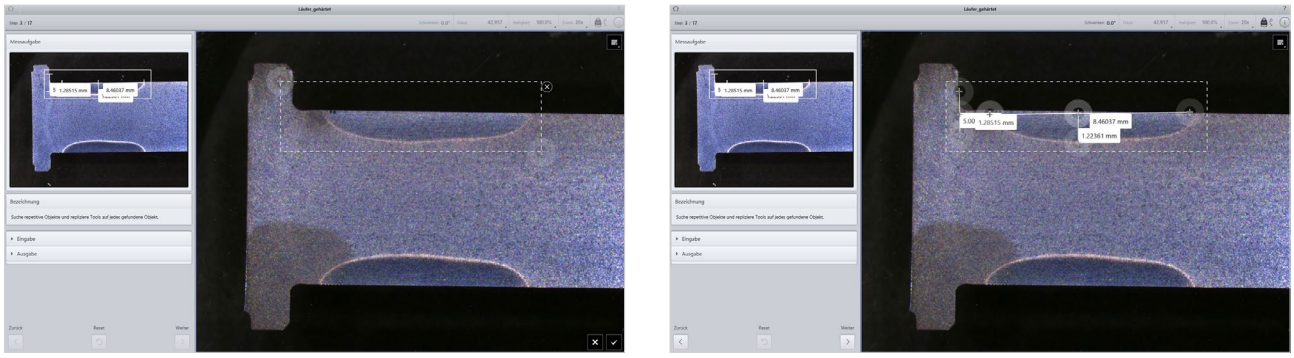

Figure 2 *a) Definition of the repetitive object; b) Inserting the measurement tools, the distance lines have to be manually adapted.*

If the automatic object recognition fails, the object can be manually selected (Figure 3a), likewise the starting points of the distance lines for measuring (Figure 3b). In the next step, the specification dimension of the grinding position is measured (Figure 4a). The remaining three positions on the grindings are manually approached; object recognition occurs automatically (Figure 4b).

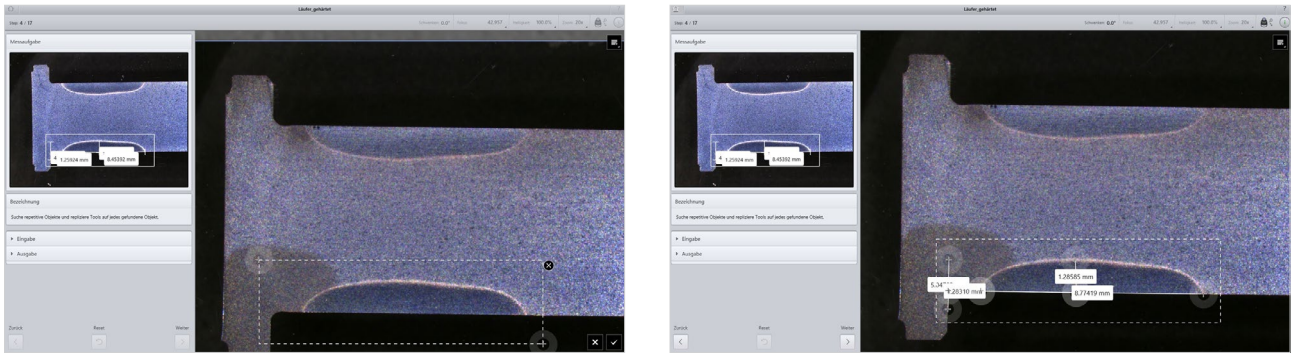

Figure 3 *a) The Object position can be manually selected if object recognition fails; b) Adapting the starting points of the distance lines for measuring the hardening parameters.*

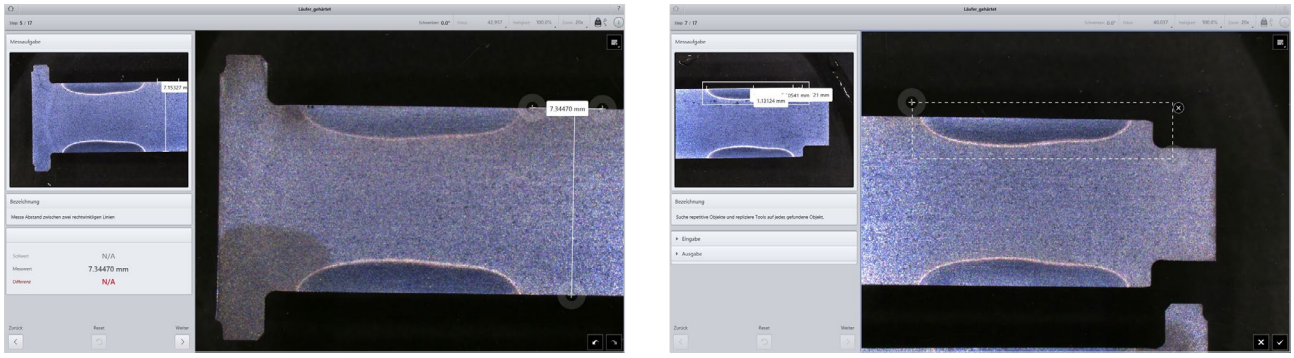

Figure 4 *a) Measuring the specification dimension of the grinding position; b) Second position, successful object recognition.*

Operating the Job

The measurement wizard stepwise guides the operator through the examination. First the sample should be arranged as shown in the map (Figure 1a). Subsequently the microscope table consecutively approaches the positions that should be checked. The operator is asked in each case to take the micrograph with the settings defined by the supervisor (Figure 1b). The object recognition, with annotated distance lines, is carried out automatically; the operator has to control both and in the case of failures, correct them. At the end of the job, the specific report, which consists of the micrographs and measurement results, appears automatically and can be saved.

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