

# Metallographic Laboratory

– Analysis of the structure and properties of metals



Based on our analysis of your materials you know if you have received the specified quality or why it failed.

## The function of the Metallographic Laboratory

The microstructure influencing the properties of metals is analysed in samples prepared by the Metallographic Laboratory to determine, e.g.:

- Microstructure type, homogeneity and grain size
- Degree of deformation and heat treatment condition
- Deviating surface conditions, e.g. carburisation or decarburisation
- Surface coatings: structure and thickness
- Weld seams: location, structure and microstructure
- Determination of crack type and fracture mode
- Slag inclusions: types, amount and distribution
- Hardness and hardness distribution.

## Most important activities

Sample analysis as part of production control for industry, microstructural analysis in research projects, and failure analysis are highly important tasks for the laboratory.

At request, we also offer routine preparation and measurements for industry, accompanied by consultancy from our metallurgists and experts at corrosion or welding.

## Macro and Micro structures

Many manufacturers need to know the macro and microstructures of their workpieces; typical examples are surface coated or surface hardened pieces. Fusion penetration and profiles are crucial characteristics in a weld seam, and the hardness of the various zones of a weld seam are also vital when determining the quality of a weld.



### Traceable documentation

Microstructural characterisation and hardness measurements may be performed according to current standards that allow for traceable documentation, e.g. for certified quality systems.

### Documentation of test results

In research into processes that change the material structure, e.g. welding processes, metallographic testing is necessary to document test results clearly and fully.

### Failure analysis

Failure analysis require analyses of the materials involved. Characterisation of crack types, fracture mode and any microscopic signs of corrosion are vital when the idea is to find the damage or failure cause. By failure we mean cases when a component no longer fulfils its purpose. Only by knowing the damage cause is it possible to prevent recurrences.

### Sampling

It is essential that samples be taken in the right place and in the right manner. We provide guidance if clients wish to cut out their own samples for analysis.

### Preparing samples for analysis

Material samples must be prepared for testing. The methods of preparation used depend on the type of material and the purpose of the test. The Laboratory has advanced grinding and polishing equipment used for preparation of samples through a stepwise process to the final condition. To visualise the structure details we use etching agents selected to match the metal alloy in question and the details we wish to analyse. Our experience and an extensive reference library help us choose the right etching agent and procedure.



### Structural analysis

In the analysis and measurements of a samples microstructure elements, light optical metal microscopes are used; typically magnifications up to 1000 times are used. Greater magnification is possible in our scanning electron microscope: In principle it is possible to obtain magnifications of up to 400,000 times, but in practice a magnification of 10-15,000 is wholly sufficient. Light-optical microscopes are suitable for routine quantification of most microstructural details.

### Hardness measurement

Hardness can be measured according to various current standards such as Brinell, Vickers or Rockwell C. Thin pieces or coatings and microstructural details can also be measured with a microhardness tester typically using the Vickers 15g to 1kg method. With automated equipment it is possible to map the hardness spreading in the material with unambiguously traceability in the tested object.

The laboratory is accredited by DANAK for both hardness measurements and metallographic testing.

### Further information

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