Werkstoff Service

W.S. Werkstoff Service GmbH is specialised in materials, materials testing and materials engineering.

Our accredited inspection body (ISO 17020) performs failure analysis, expert activities and conformity assessments on materials, products and processes.

Our accredited testing laboratory (ISO 17025) is specialised in materials and components testing and offers consulting on materials, material application and testing.

Our technically competent body (DIN 27201-7) operates in the field of non-destructive testing of railway components.

Our certified training centre (ISO 9001) offers qualification for non-destructive and materials testing, heat treatment and materials engineering.

We are an approved training centre of the German Society for Non-Destructive Testing (DGZfP).

TRainers

Myrjam Winning, Ph. D., Assist. Prof.
Studies in mathematics and physics at RWTH Aachen, Germany | Doctorate and postdoctoral studies at RWTH Aachen, Institute of Physical Metallurgy and Metal Physics | Research at MPI Düsseldorf, Germany and Carnegie Mellon University, Pittsburgh, USA | Head of training and lecturer at W.S. Werkstoff Service | Lecturer at RWTH Aachen

Ingo Poschmann, Ph. D.
Studies in physics at TU Dresden, Germany | Doctorate at TU Dresden, Metal Physics and X-Ray Physics | Research at TU Berlin, Germany and Concordia University Montreal, Canada | Inspector and lecturer at W.S. Werkstoff Service

Registration

Please register at www.messunsicherheit.info/en

Room booking:
Directions, a hotel overview and further information are available at www.messunsicherheit.info/en

Networking:
Use the seminar to build and maintain contacts, expand your network or discuss specific issues with colleagues.
The seminar offers time for exchanges and discussions.

Terms and conditions:
The terms of participation and withdrawal are available at www.messunsicherheit.info/en

Requirements

- Good command of the English language required
- Sound knowledge of mathematical and statistical basics strongly recommended
- Laptop will be needed for various calculation exercises (electronic files provided by W.S. Werkstoff Service)

Organisation

W.S. Werkstoff Service GmbH
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Please register at www.messunsicherheit.info/en

Get more information at www.werkstoff-service.de

Price

€ 1.950 per person plus tax. Additional participants from the same company receive a 10 % discount.
Price includes extensive training material and digital data for the calculation of measurement uncertainties.
Also included are snacks, drinks, lunch on all days, a tour of the “Zeche Zollverein” world heritage site in Essen and two group dinners.

Measurement Uncertainties for Testing and Calibration

Seminar July 21st – 23rd 2014

W.S. WERKSTOFF SERVICE GMBH
KATERNBERGER STR. 107
45327 ESSEN

WE ARE MATERIALS EXPERTS
why attend the measurement uncertainties seminar?

Measurement uncertainties (MU) are essential for validating measuring methods and results, for quality control and conformity assessments. They are not only of technical significance but also of economic and legal importance.

Detailed knowledge and consequent application of measurement uncertainties is mandatory for every testing or calibration laboratory and is not only related to accreditation.

The seminar provides ready-to-use knowledge and documents for calculating the MU of test methods and test results. The various approaches presented during the lectures and exercises will enable the attendee to apply the concept beyond the methods discussed during the seminar.

Who should attend the seminar?
- Engineers and technicians from testing or calibration labs
- Engineering companies, consulting engineers
- Assessors from certification and inspection bodies
- Individuals responsible for quality assurance
- Manufacturers of testing and measurement equipment
- People in charge of research and development

What are the benefits of the seminar?
- Detailed knowledge on the origin and identification of MU
- Tools for data evaluation by means of statistical tests
- Reliable step by step procedures for calculating MU
- Ready-to-use MU budgets for optimising measurements and test methods
- Useful techniques for compilation and assessment of calibration curves
- Introduction to MU for nondestructive testing
- Extensive course material and data files (Excel sheets) for use in the work place
- Procedures for decision making on the approval or rejection of results, products or processes

SEMINAR PROGRAMME - DAY 1 (08:30 – 17:10)

Starting with measurement uncertainties (MU):
- Origin of measurement uncertainties
- Technical, economical and legal importance
- Terminology, definitions, applicable documents

Repeating mathematics:
- Errors and error propagation
- Absolute and relative errors
- Sensitivity factors
- Combined and expanded MU

Repeating statistics:
- Population and sample
- True value, mean value, standard deviation
- Probability distributions
- Confidence level, confidence interval

Calculating uncertainties:
- Calculation of MU according to method A (GUM)
- Calculation of MU according to method B (GUM)
- MU budgets – compilation and evaluation

SEMINAR PROGRAMME - DAY 2 (08:30 – 17:10)

Analysing samples and data sets:
- Fundamentals of significance testing
- Grubbs test (analysing outliers)
- F-test (analysing variances)
- t-test (analysing mean values)
- Eₚₑ and Z-values (analysing proficiency tests)

Comparing MU and process capability:
- Measurement uncertainty for geometric control
- Process capability indicators (Cₚ, Cₚk, …)
- Relationship between uncertainty and 6σ-concept

Calculating MU of temperature measurements:
- Physical basics of infrared temperature measurement
- Identification of uncertainty components
- Compilation and evaluation of an uncertainty budget

Calculating MU for materials testing:
- Physical basics of hardness, impact and tensile testing
- Identification of uncertainty components
- Compilation and evaluation of uncertainty budgets

Calculating MU for spectrometric testing:
- Physical basics of optical emission spectrometry
- Identification of measurement uncertainties
- Compilation and evaluation of an uncertainty budget

SEMINAR PROGRAMME - DAY 3 (08:30 – 15:30)

Evaluating MU of calibration processes:
- Measurement uncertainty of a test method
- Analysis of correlated data by linear regression
- Uncertainty of slope and intercept of the calibration curve
- Performance of internal calibration

Applying MU concept to non-destructive testing (NDT):
- Identification of measurement processes in NDT
- MU and probability of detection (POD)
- Case study – evaluation of POD in ultrasonic testing

Calculating MU of NDT (ultrasonic testing):
- Physical basics of ultrasonic testing for defect evaluation
- Identification of uncertainty components
- Compilation and evaluation of an uncertainty budget

Evaluating uncertainties of NDT (surface testing):
- Physical basics of magnetic particle and penetrant testing
- Identification of MU components for the methods
- Relationship between MU and indication size