



2-day technical program on

# GUM - GUIDE TO EXPRESSION OF UNCERTAINTY IN MEASUREMENT



This two-day program will provide the overview, interpretation and implementation of measurement uncertainty studies of a measurement instrument. Measurement uncertainty is needed when we do measuring equipment calibration to ascertain the appropriateness and suitability of a measurement instrument.

In order to make a valid and concrete conclusion to fulfill today's demanding technical and ISO requirements, correct measurement data is a crucial factor to ensure appropriate and proper results.

Coupled with the application of statistics, components of uncertainty can be established and appropriate corrective actions can be carried out to improve the measurement instrument. This is particularly important for calibration laboratories where standard readings are being determined.

This program focuses on the **understanding of Measurement Uncertainty as needed by today's industrial standard and quality system**. We need to apply the GUM (Guide to the Expression of Uncertainty in Measurements) guide in studying, analyzing, determine and reporting our gauges/measurement instrument's uncertainty. This will help us to decide how to **invest effectively** in selecting the most appropriate measurement instrument for our company to **fulfill customer requirements**.

DATE

21 - 22 April 2010

VENUE

Grand Millennium Hotel  
Kuala Lumpur

TIME

9am-5pm

*Basic statistical background &  
scientific calculator required*

**AFTER ATTENDING THIS PROGRAM,  
PARTICIPANTS WILL BE ABLE TO:**

- Interpret uncertainty reports published by calibration laboratories for their calibrated equipments
- Apply the uncertainty budget to decide their equipment uncertainty, if they calibrate their own measurement equipment
- Develop action items for unacceptable measurement equipments based on the uncertainty results
- Select the appropriate measurement instrument for their product / process measurement in an economical and effective way
- Allocate the appropriate measurement instrument for various product/ process measurement based on quality and customer requirements
- Derived a cost effective way to do calibration
- Improve measurement integrity
- Eliminate customer complaints due to discrepancies in measurement

**DAY ONE**

**DEFINITION OF UNCERTAINTY**

- Introduction to GUM Guide
- Uncertainty Evaluation
  - Type A & Type B
- Types of Measurement Errors and their Implication
- Discussion on Definition of
  - Uncertainty
  - Traceability
  - Confidence Interval
  - Test Accuracy Ratio

- # Workshop: Calculation on Measurement Errors Using Simple Statistical Techniques

**TYPE A UNCERTAINTY EVALUATION**

- Mean & Standard Deviation
- When to Use Type A Uncertainty
  - Application Examples
  - Calculation on Sample Data and Result Interpretation

**TYPE B UNCERTAINTY EVALUATION**

- Various Types of Distribution
  - Normal, Rectangle, Triangle
- When to Use Type B Uncertainty
- Situation When Certain Assumption can be Made
- Application Examples
- Situation to Apply the Right Distribution
  - Examples and Exercises
- Worked Examples on the Relevant Calculation

**COMBINING UNCERTAINTY  
MEASUREMENT**

- Measurement Equation
- Composite Uncertainty
  - From the Calibrator
  - Environment
  - Any Other Influencing Factors
  - Deriving the Uncertainty Budget Matrix
  - Establish the Composite Uncertainty
- Source of Uncertainty
- Uncertainty Budget Matrix and Application
- Meaning of Uncertainty Results
- # Real Case Exercises

**DAY TWO**

**EXPANDED UNCERTAINTY AND COVERAGE  
FACTOR**

- Presentation of uncertainty results
- Interpretation of Standard Uncertainty Reports
- # Case Studies
- # Real Life Application K Factor Coverage and Implication to Measurements

## **INTERPRETATION OF UNCERTAINTY OF MEASUREMENT CERTIFICATES**

- GUM Guide Reference
  - Application of Uncertainty to the Product Specification Requirements
  - Tolerance Calculation
  - Use of Uncertainty to Accept or Reject a Gauge
- # Case Studies

## **PRACTICAL EXERCISE ON UNCERTAINTY EXERCISES**

- Association and Regression Analysis for Data Integrity
    - Practical Case Analysis
  - Deciding Calibration Interval
  - ISO17025 Requirements
  - Guideline to Establish your Verification Procedures
- # Example and Real Life Cases

## ***THIS PROGRAM WILL BE OF VALUE TO***

- Managers and Executives in engineering, experimental science, laboratories, pharmacology, research and all who need to make sound decisions based on data and facts
- Measurement equipment calibration engineers and managers
- Lab or equipment personnel involved in calibration
- Personnel in charge of ISO9001: 2008 or TS16949:2009
- Engineers involved in measurement and tool room
- Quality, production and measurement groups
- Those who are involved in works that require understanding in measurement accuracy and precision

## ***METHODOLOGY***

This program is structured with many references to real life examples. It focuses on **application of knowledge** and **practical exercises**. It is also supported by discussions at the conclusion of each session to help participants grasp the complete concept. Templates used for calibration developed by the trainer over the years of services will be shared to facilitate measurement uncertainty computation.

## ***LEARNING PARTNER***

**MR SIM LAM THONG** (TQC & TPM, Calibration and ISO17025 Consultant) brings to this program 25 years of vigorous involvement in TQC/TPM activities, statistical application, calibration and measurement system studies and set up.

He has hands-on experience in setting up a calibration laboratory to fulfill ISO 17025 requirements and working towards obtaining certification.

Companies that he has coached and achieved successful results include Matsushita Electronics Motors, Minebea Electronics Motor, Tai Kwang Yokohama Battery, LKT group of companies etc. Result obtained include the establishment of calibration and measurement system for the above companies.

Mr Sim is currently the TQC/TPM, Calibration and Measurement Consultant for Shin Etsu Handotai (Shah Alam), Osram, On Semi, Agilent, Samsung Corning, Unisem, Linear Semiconductor, Tessa Plastics (Shanghai), Renesas and Seagate Penang. Areas covered include total productive maintenance (TPM) which resulted in the savings of millions of dollars from this operation efficiency improvement, TQC, measurement uncertainty & calibration laboratory set up and implementation, statistical application for 6 Sigma and continuous improvement.

He holds a B.Sc. Ed. (Hons.) (Mathematics/Physics) and M. Sc. (Taguchi Experimentation).

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21 & 22 APRIL 2010, GRAND MILLENNIUM HOTEL, KUALA LUMPUR

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### HOW TO REGISTER

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The Ampwalk, 218 Jalan Ampang, 50450 Kuala Lumpur

### FEES

The full Registration Fee includes cost of all sessions, luncheon, coffee/tea & documentation.

1 Person	Group fee per person for 3 or more* (from the same company)
RM2595	RM2295 (Min Savings of RM900)

\* Terms and conditions apply.

**Cancellations, Refunds & Transfers:** A full refund will be promptly made for all written cancellations 3 weeks before the meeting. Thereafter, cancellations are not refundable. A substitute may be made at any time.

### PAYMENT

#### By Telegraphic Transfer

ACCOUNT NAME:  
**Centre for Management Technology Sdn Bhd**  
A/C No : **3 - 0903390 - 12**  
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### CERTIFICATE OF COMPLETION

A Certificate of Completion will be awarded upon successful completion of each course. This serves as evidence of your personal and professional commitment to you career.

### COURSE TIMING

Registration: 8.30 am, Course Begins: 9.00 am, Morning Coffee: 10.30 am, Lunch: 1.00 pm to 2.00 pm, Tea Break: 3:30 pm, Course Ends: 5.00 pm

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