

PROCEEDING OF THE FOURTH INTERNATIONAL SYMPOSIUM ON  
**MEASUREMENT TECHNOLOGY  
AND INTELLIGENT INSTRUMENTS**

held in Miskolc-Lillafüred, Hungary  
Sept. 2–4, 1998

*Edited by*

D. Sc. Illés DUDÁS  
*Professor, Head of Department of Production Engineering  
UNIVERSITY of MISKOLC*

*Associate Editors*

Dr. Gyula VARGA, PH. D. *Associate Professor*  
Dr. Miklós BERTA, C. Sc. *Associate Professor*  
*Department of Production Engineering  
UNIVERSITY of MISKOLC*

*Organized by*

**The International Committee on  
Measurements and Instrumentation: ICMI  
and  
Department of Production Engineering  
University of Miskolc: UM**

*Co-organized by*

**Hungarian Academy of Sciences (MTA)  
International Measurement Confederation (IMEKO)  
Engineering Scientific Society (GTE)  
National Committee for Technological Development (OMFB)  
International Institution for Production Engineering  
Research (CIRP)**



**Springer**

# CONTENTS

	Pages
<b>Prof. Dr. I. Dudás, Dr. Gy. Varga: Preface</b> .....	XV
<b>Prof. Z. Li: Congratulations for the Success of ISMTII '98</b> (Huazhong University of Science and Technology, China).....	1
<b>Prof. Dr. G. Nárai-Szabó: Greeting to ISMTII '98</b> (Hungarian Academy of Sciences, Hungary).....	2
<b>Prof. Dr. L. Besenyei: Welcoming Address</b> (Rector of the University of Miskolc, Hungary).....	3

## Plenary Papers

<b>Dr. M. Sawabe :Problems on the Standard Temperature in Industrial Measurement</b> (MITUTOYO Ltd., Japan).....	4
<b>Prof. Dr. P. H. Osanna : Newest Developments in Metrology</b> (Vienna University of Technology, Austria).....	10
<b>Prof. Dr. K. J. Stout, X.Q. Jiang, L. Blunt : Surface Characterisation Its History And</b> Future (University of Huddersfield, United Kingdom).....	14

## Metrology of Physical Quantities

<b>„Correlation Function of Modulated Signals Using Undersampling Methods”</b> V. Hans (University of Essen, Germany) G. Poppen.....	23
<b>„Compatibility Studies of Different Methods of Measurement in the Nanometer Range”</b> M. Dietzsch (Chemnitz University of Technology, Germany) M. Hattori, C. Tsutsumi, C. Pertuch.....	26
<b>„Peculiarities of Forming Wheel Cross Profile in Grinding Process”</b> A. I. Grabchenko (Kharkov State Polytechnic University, Ukraine), V.L. Dobroskok.....	35
<b>„Development of Active Squeeze Air Bearing Using Oscillation of Piezoelectric Actuators”</b> H. Isobe (Nagaoka University of Technology, Japan) Kyusojin, I. Dudás .....	38
<b>„A Study on Temperature and Distortion Measurement of Ship Plate for Heat-Bending Process”</b> H. C. Kuo (National Cheng Kung University, China), L.J. Wu, Y.-S. Kuo.....	44
<b>„Adhesion Measurement of Hard Coatings to Cutting Edges on the Base of Amplitude of Vibration Acceleration Signal”</b> M. Kupczyk (Poznan University of Technology, Poland).....	52

**„Intelligent Active Optical Fiber Voltage Transformer”**

S. Luo (Huazhong University of Science and Technology, China) Y. Xu, M. Ye..... 56

**In-process Measurements, Non contact Measurements**

**„The application of Control Systems for Measurement and Data Acquisition in Workshop Conditions”**

M. Szafarczyk (Warsaw University of Technology, Poland), L. Slazak..... 61

**„Computer Aided Measuring for Shaft Rotating Accuracy of High Speed Lathe”**

C. K. Chen (National Cheng-Kung University, China), S. C. Wu..... 67

**„Computer Aided Measuring of Rotating Shaft Roundness Error for High Speed Machine Tool”**

W. F. Chen (FAR-EAST College, Taiwan, China), S. W. Lin, S. C. Wu..... 73

**„On-site composition analysis by laser ablation and ICP spectrometry”**

T. Hino (NKK, Japan), T. Akiyoshi, S. Kobayashi..... 79

**„The Research and Design On-Line Meter in Power System with an Application of Intelligent Electrical Parameters”**

L. Leshan (Huazhong University of Science and Technology, China), W. Ming, Lin Zhan..... 84

**„Evaluation of cylindrical error about the rotating spindle of machine tool”**

C. Y. Lo (National Huwei Institute of Technology, Taiwan, China), S. C. Wu..... 89

**„Measuring Methods for Determination of Disturbances in the Electrical Networks”**

T. Szarka (University of Miskolc, Hungary), A. Váradi..... 95

**„Acceptance tests of the computerised high-current system”**

Z. Dmochowski (Bialystok Technikal University, Poland)..... 100

**Metrology of Physical Quantities**

**„Sensor Integration, State and Situation Recognition, Learning in Intelligent Manufacturing”**

109

L. Monostori (Computer and Automation Reseach Inst., Hungarian Academy of Sciences)....

**„Measurement of Silicion Surface, removed by AFM in Atomic Scale”**

Y. Samitsu (OKAMOTOT MACHINE TOOL WORKS, LTD, Japan )..... 116

**„Development of a Silicon Wafer Surface Defects Measurement System Based on Laser Scattered Defect Pattern”**

S. Takahashi (Osaka University, Japan) T. Miyoshi, Y. Takaya..... 120

<b>„Influence which an Environment Temperature, Heat Transfer Coefficient and Radiation Give to a Measurement Accuracy”</b>	
I. Tanabe (Nagaoka University of Technology, Japan) M. Kuroda.....	126
<b>„The study on the error separation technique for the position errors between datums in the Cylindricity Measurement of Large Scale Workpieces”</b>	
J. Tan (Harbin Institute of Technology, China), W. Zhao, P. Jin.....	132
<b>„The Geometrical shapes, Form errors, of Ballized holes”</b>	
K. H. Wang (University of Birmingham, United Kingdom) L. A. Blunt, D. Walton, T. G. King, K. J. Stout.....	136
<b>„Study on Modal Test of Tires”</b>	
L. H. Yam (The Hong Kong Polytechnic University, China) D. H. Guan, Y. Y. Li.....	144
<b>„A New Accurate Calculation Method of Mechanical Part Thermal Deformation in Precision Measurement”</b>	
F. Yeitai (Hefei University of Technology, China) H. Qiangxian, H. Quisheng.....	150
<b>„The Analysis and Calculation of Temperature Influence on Grating Measuring System”</b>	
F. Yeitai (Hefei University of Technology, China) S. W. Lin.....	155
<b>„CO<sub>2</sub> Laser Cutting Process Diagnostics On the Basis of Optical Emissions ”</b>	
R. Keszte (Technical University of Budapest, Hungary) S. Schubert, M. Schultz, J. Takács....	158

## **Multi Dimensional Measuring Technique**

<b>„Wavelet Framework Representation For Surface Analysis”</b>	165
X. Q. Jiang (The University of Huddersfield, United Kingdom), L. Blunt, K. J. Stout.....	
<b>„A Calibration Target for Large Scale Measuring Instruments”</b>	
R. Furutani (Tokyo Denki University, Japan), K. Kamahora.....	173
<b>„An Antivibration Surface Profile Measurement System”</b>	
Y. Gao (Hong Kong University of Science and Technology, China), Z. Wang.....	177
<b>„Study on the accuracy of the 3D measurement system with double source light-sectioning ”</b>	
S. L. Huang (Chongqing University, China), X. L. Wang, Z. He, W. M. Chen.....	182
<b>„Conversion of GD&amp;T Into VD&amp;T”</b>	
Z. Humienny (Warsaw University of Technology, Poland), S. Bialas.....	188
<b>„Development of the Laser trapping Probe for the Three Dimensional Coordinate Measurement of Micro Parts”</b>	
Y. Takaya (Osaka University, Japan), S. Tsuji, H. Shimizu, S. Takahashi, T. Miyoshi.....	196

<b>„3D Inspection of Isolated Surfaces”</b>	
S. Ye (Tianjin University, China), Y. Qiu, X. Li, Y. Liu.....	204
<b>„Measurement of Worm Gearing for 3D Measuring Machine”</b>	
I. Dudás (University of Miskolc, Hungary), K.Bányai.....	207
<b>„Intelligent Confirmation and Management of Measuring Equipment with Flexible Testing Intervals”</b>	
M. N. Durakbasa (Vienna University of Technology, Wien, Austria).....	212

## **Transducers, Smart Sensors**

<b>„Interrogation Strategies for Use With Gas and Odour Sensors”</b>	
P. A. Payne (University of Manchester Institute of Science and Technology, United Kingdom) M. E. H. Amrani, R. M. Dowdeswell, K. C. Persaud.....	217
<b>„A New Type Transistor Laser Rotating-Angle Sensor”</b>	
T. Dewu (Liaoning Engineering and Technology University, China) X. Zhongning.....	222
<b>„Smart System for Dynamic Control of Amorphous Wires Annealing Process”</b>	
H. Chiriac (National Institute of Research & Development for Technical Physics, Romania) C. S. Marinescu.....	225
<b>„Smart Sensors for Health Monitoring of Civil Infrastructures”</b>	
S. L. Huang (Chongqing University, China) W.M. Chen, Y.M. Wen.....	228
<b>„A New Laser Displacement Probe with Multi-Receiver Detectors”</b>	
S. J. Lee (Yuan-Ze University, China) Y. C. Cheng, M.Y.Chung.....	237
<b>„Time Domain Demultiplexing for Bragg Grating Sensor System Using Ga As Switches”</b>	
S. J. Xiao (City University, United Kingdom) J. Kemp, R. Ashoori, A.W.Palmer, K.T.V.Grattan.....	243

## **Intelligent Instruments**

<b>„Transients in Adaptive and Reconfigurable Measuring Channels”</b>	
G. Péceli (Technical University of Budapest, Hungary) T.Kovács házy.....	247
<b>„The New Intelligent Instrument for Measuring Driving Accuracy of Gear Drive Train”</b>	
S. Qin (Chongqing University, China).....	253
<b>„Efficient Rasterized Offset Computation for Tactile Digitization”</b>	
K. Weinert (University of Dortmund, Germany) H. Müller, F. Albersmann, J. Mehnen.....	258

<b>„Phase-Shifting Fringe Analysis for LD Wavelength-Scanning Interferometer”</b>	
J.I. Kato (The Institute of Physical and Chemical Research (RIKEN), Japan) I. Yamaguchi.....	265
<b>„The Concept of An Intelligent Measuring And Diagnostic System for Analysis of Form Deviations”</b>	
S. Zebrowska-Lucyk (Warsaw University of Technology, Poland).....	273
<b>„Diagnosing the Interactions of Machine – Tool System Upon the Surface Geometrical Structure on Basis of the Spectral Analysis”</b>	
A. Boryczko (Technical University of Gdansk, Poland) M. Feld.....	279

## **Optical Measurement, Automatic Measurement**

<b>„A Study on Straightness Error Precision Measurement with Non-diffracting Beam”</b>	
Li Zhu (Huazhong University of Science and Technology, China) Z. Qing, K. C. Fan, Xu Zhengao.....	285
<b>“A Laser Straightness Measurement System Using Optical Fiber and Modulation Techniques”</b>	
K. C. Fan (National Taiwan University, Taiwan, China), Y. Zhao.....	289
<b>„Some Aspects of Intelligent Metrology”</b>	
S. Kiyono (Tohoku University, Japan).....	295
<b>„Noncontact Caliper for Dimension Measurements Using Optical Fiber Sensors”</b>	
S. Y. Lee (National Cheng Kung University, China), Y. L. Lo.....	301
<b>„Application of Photoplasticity for Modelling of Metal Forming”</b>	
S. Nagy (University of Miskolc, Hungary).....	305
<b>„Production-Oriented Workpiece Inspection”</b>	
H. G. Kagerl (Otto-von Guericke University of Magdeburg, Germany) S. Wengler.....	311
<b>„Study on Some Sources of Type "A" Uncertainty in Roughness Instrument Calibration”</b>	
S. Z. Zahwi (National Institute for Standards, Egypt) A. M. Mekawi.....	315

## **Measurements in Material Science**

<b>“Length and Real-time Displacement Measurement Using Regular Crystalline Lattice and Scanning Tunneling Microscope”</b>	
M. Aketagawa (Nagaoka University of Technology, Japan), K. Takada, N. Takeshima, Y. Minao, Y. Nakayama, Y. Uda.....	323
<b>„Special Requirements of the Determination of Trace Impurities in High Purity Metals by Sequential ICP-AES without Preliminary Separation or Enrichment”</b>	
O. Bánhidi (METALCONTROL Ltd., Hungary).....	331

<b>„Research Scene to Examine Mechanical Strength of Coatings on Metallic Substrate”</b>	
Gy. Czél (University of Miskolc, Hungary) M. Baán, P. Makk, Cs. Raffay, J. Fancsali, D. Janovszky.....	335
<b>„Measuring of Fatigue Crack Growth Rate on Elevated Temperature, Reliability of Determinated Features”</b>	
K. Kovács (METALCONTROL Ltd., Hungary) L. Tóth, Gy. Nagy, P. Rózsahegyí.....	339
<b>„Application of a Magnetic and Electric Emission Measurement Techniques in Fracture Mechanics Testing”</b>	
Gy. B. Lenkey (Bay Zoltán Applied Research Foundation, Hungary).....	344
<b>„Microwave Method of Paint Coating Adhesion Measurement”</b>	
O. Ljashchuk (Institute of the National Academy of Sciences of Ukraine, Ukraine).....	350
<b>„Wear Measurement and Qualificiation of CBN Grinding Wheels”</b>	
I. Pap (University of Miskolc, Hungary) K. Gyáni.....	355
<b>„Measurement Techniques in Local Approach to Fracture”</b>	
M. Zrilic (University of Belgrade, Yugoslavia), M. Rakin, S. Sedmak, A. Sedmak.....	358
<b>„Evaluation of Crack Coustics, a New Approach”</b>	
I. Ajtonyi (University of Miskolc, Hungary) L. Czap.....	362

## Quality Control, Standards

<b>„Integrated Quality Control”</b>	
T. Pfeifer (RWTH, Aachen), R. Freudenberg, L. Wiegers.....	365
<b>“Integrated Information Infrastructure for Total Quality Management”</b>	
F. Erdélyi (University of Miskolc, Hungary) T. Tóth .....	371
<b>„Influence of Gauging Errors on Effectiveness of Statistical Process Control (SPC)”</b>	
J. Gawlik (Cracow University of Technology, Poland) J. Rewilak.....	379
<b>„Influence of Measuring Equipment Quality to Quality Assurance on Workpiece”</b>	
J. Kopac (University Ljubljana, Slovenija) J. Jurkovic, E. Domagradjian.....	383
<b>„Textile Machinery Quality Improvement by Reengineering of Manufacturing Processes”</b>	
J. Szadkowski (Technical University of Łódź in Bielsko Biala, Poland) J. Stadnicki, S. Plonka.....	386
<b>„Quality, Conformity and Quality Management of Testing Laboratories”</b>	
G. E. Veress (University of Veszprém, Hungary) K. Kovács.....	391

## Machine Vision, Measurement for Robotics

<b>„The Study of Image Enhancement Based on The Grey System Theory”</b>	
M. L. Huang (National Central University, China) K. L. Wen, J. H. Wu.....	395
<b>„Vision Systems for Mechanical Metrology”</b>	
A. Bruzzone (University of Genova D.I.P., Italy) F. Mora, P. M. Lonardo.....	398
<b>„Generating Method of Larger Focal Depth”</b>	
Z. Li. (Huazhong University of Science and Technology, China) Z. Liping, Z. Bin.....	405
<b>„Trainable Automata for Machine Vision”</b>	
E. Mühlenfeld (Technical University of Clausthal, Germany).....	409
<b>„The Study of Half-tone Coding Technology”</b>	
X. Zhongning (Liaoning Engineering and Technology University, China) D. Tingjian, W. Yuxia, Y. Jianhua.....	415

## Signal Processing, Artificial Intelligence for Measurement

<b>„Analysis of Detector Signal When Scanning the Cylindrical Objects With Focused Laser Beam”</b>	
R. Jablonski (Warsaw University of Technology, Poland) P. Fotowicz.....	421
<b>„The SOM Based Data Mining in Hot Rolling”</b>	
L. Cser (Bay Zoltán Institute of Logistics & Prod. Systems, Hungary), A. S. Korhonen, O. Simula, J. Larkiola, J. Ahola.....	426
<b>„Searching the Measuring Points for a Rule Surface”</b>	
Z. C. Lin (National Taiwan University of Sciences and Technology, Taiwan, China) Q. Y. Liu.....	433
<b>„The Instrument of Wavelet Transform for Signal Processing”</b>	
S. Qin (Chongqing University, China).....	441
<b>„Precision in 2D Video Camera Measurements”</b>	
A. Del Taglia (University of Florence, Italy) S. Filippini.....	448
<b>„2D Automatic Inspection Through Artificial Vision”</b>	
A. Del Taglia (University of Florence, Italy) S. Filippini.....	453
<b>„Signal Processing and Control Strategies for the Efficient Monitoring of Manufacturing”</b>	
T. Szalay (Technical University of Budapest, Hungary) O. Hernandez, M. Horváth.....	458



## Others

<b>„The Modern Measuring Technique as the Device of Effective Quality Assurance of the Machine Production”</b>	
I. Dudás (University of Miskolc, Hungary) F. Lierath.....	465
<b>„Laboratory and Industrial Measuring and Computer Methods for the Determination of Dynamical Features of Material Handling Machines”</b>	
J. Cselényi (University of Miskolc, Hungary) J. Németh, L. Pap.....	474
<b>„Measurement of Tribological Properties of Mononitrides and Compound Coatings Obtained by Arc-Plasma Method”</b>	
M. Kupczyk (Poznan University of Technology, Poland) K. Wieczorowski.....	484
<b>„Measurement Applied at the Experiments of Environmentally Clean Drilling Manufacturing Operations”</b>	
I. Dudás (University of Miskolc, Hungary), I. Tolvaj, Gy. Varga, T. Csermely.....	487
<b>„Instrumental Evaluation of Wood Quality of World Architectural Monuments”</b>	
M. Kisternaya (Karelian Research Centre, Russian Academy of Sciences, Russia) V. Kozlov...	493
<b>„Vibration Analysis of Drilling Tools”</b>	
I. Dudás (University of Miskolc, Hungary) T. Csermely.....	499
<b>List of ICMI Council Members 1998.....</b>	<b>504</b>
<b>ISMTII '98 Symposium Programme.....</b>	<b>510</b>
<b>Authors' Index.....</b>	<b>524</b>