

**Poster session I: Wednesday 31st
May 2017, 14:30 - 15:45**
**Poster session II: Thursday 1st
June 2017, 11:00 - 12:30**

Poster Number	Session 1: Precision Machine Development
P1.01	<p>Study on protection performance of grinding wheel safety guard against the soft and brittle abrasive projectile Akinori Yui¹, Takuya Fukui¹ and Takayuki Kitajima¹ <i>¹Mechanical Systems Engineering, National Defense Academy, Japan</i></p> <p>Design of mechanically-optimised lattice structures for vibration isolation Wahyudin P. Syam¹, Wu Jianwei², Bo Zhao², Ian Maskery³, Richard Leach¹ <i>¹Manufacturing Metrology Team, Faculty of Engineering, The University of Nottingham, NG7 2RD, UK</i> <i>²Ultra Precision Optoelectronic Instrumentation Engineering Center, Harbin Institute of Technology, 150001, China</i> <i>³Centre for Additive Manufacturing, Faculty of Engineering, The University of Nottingham, NG7 2RD, UK</i></p>
P1.02	
P1.03	<p>Distortion of precision assemblies caused by bolted joints Byron Knapp, Dave Arneson, Dan Oss <i>Professional Instruments Company, Hopkins, Minnesota, USA</i></p>

Characterizing precision cutting process by workpiece integrated printed thermocouples

Gerrit Dumstorff¹, Melanie Willert²,
Oltmann Riemer², Walter Lang¹

P1.04

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²Laboratory for Precision Machining (LFM), Badgasteiner Str. 2, 28359 Bremen, Germany, University of Bremen

Analysis of geometrical errors in measurement data of ultraprecision-turned standards for roughness measurements

P1.05

Rudolf Meeß, Dorothee Hüser, Lena Jung-Albrecht

Physikalisch-Technische

Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany

Design of an axially-actuated rotary stage for an ultra-precision machine tool

P1.06

Niels Bosmans¹, Iwan Sanjaya

Awaluddin¹, Dominiek Reynaerts¹

¹KU Leuven, Department of

Mechanical Engineering, Division

PMA, Heverlee, Belgium, member of Flanders Make

(www.flandersmake.be)

- P1.07** **Performance analysis of laser measuring system for an ultra-precision 2D-stage**
Lucía Díaz-Pérez¹, Marta Torralba²,
José A. Albajez¹, José A. Yagüe-
Fabra¹
*¹ISA, Universidad de Zaragoza,
Zaragoza, Spain*
*²Centro Universitario de la Defensa,
Zaragoza, Spain*
- P1.08** **Recent Results for Length, Form and Gear Measurement on a New CMM Design for Precision Engineering**
Ralf Bernhardt, Dietrich Imkamp,
Konrad Werner, Alessandro Gabbia,
Klaus Bendzulla, Roman Gross¹
*¹Carl Zeiss Industrielle Messtechnik
GmbH, ZEISS Gruppe, 73446
Oberkochen, Germany*
- P1.09** **Design of a 5-DOF flexure based passive gripper**
Varan Gupta¹, Jitendra Prasad
Khatait¹
*¹Indian Institute of Technology Delhi,
INDIA, 110016*
- P1.10** **The design of a new comparator for form and diameter measurements (KOLD)** Christian Hesse¹, Otto Jusko¹,
Rainer Ziegenbein², Burkhard
Söhne², Michael Staats², and
Joachim Hägele- Görlitz²
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Physikalisch-Technische
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Germany*
*²R&D Dept., Mahr GmbH, Göttingen,
Germany*

Development of on-machine measurement for ultra-precision machining

P1.11 Duo Li¹, Xiangqian Jiang¹, Liam Blunt¹, Zhen Tong¹, James Williamson¹, Christian Young¹
¹University of Huddersfield, Huddersfield, UK

Thermal Analysis of a novel five-axis machine tool using measuring probe and R-test procedure

P1.12 Christian Brecher, Jan Behrens, Michel Klatte, Tae Hun Lee, Filippos Tzanetos
Fraunhofer Institute for Production Technology IPT, Steinbachstrasse 17 52074 Aachen, Germany

Development and performance evaluation of desktop machine tool

P1.13 Satoshi IINO¹, Serenn SATO¹, Yoshitaka MORIMOTO¹, Ryo HIRONO², Naohiko SUZUKI², Yoshiyuki KANEKO²
*¹Kanazawa institute of technology
²TAKAMAZ Machinery Co.Ltd*

Recent results of micro geometry measurements using Werth 3D Fibre Probe

P1.14 Jakob Schlie¹, Michael Neugebauer¹
¹Physikalisch-Technische Bundesanstalt (PTB), 38116 Braunschweig, Germany

**Nanopositioning and
Nanomeasuring Machine NPMM-200
– sub-nanometre resolution and
highest accuracy in extended
macroscopic working areas**

E Manske¹, G Jäger¹, T Hausotte², A.
Müller¹ and F. Balzer³

P1.15

*¹Institute of Process Measurement
and Sensor Technology, Technische
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Erlangen, Germany*

*³Hexagon Metrology GmbH,
Siegfried-Hiepe-Straße 2-12, 35578
Wetzlar, Germany*

**Introducing a new design of 3dof
parallel micro-manipulator**

Ali Rugbani¹ and Kristiaan Schreve²

P1.16

*¹Cape Peninsula University of
Technology, Department of
Mechanical Engineering, 7535 Cape
Town, South Africa*

*²Stellenbosch University,
Department of Mechanical and
Mechatronic Engineering, 7600
Stellenbosch, South Africa*

**Redundant parallel positioning
table device with linear dof**

P1.17

Gheorghe Olea, Norman Huber
*HUBER Diffraction and Positioning
GmbH & Co.KG*

High pressure and high temperature aqueous environment atomic force microscope

M. B. Carlson¹, A. H. Slocum², M. P. Short¹

P1.18

¹Department of Nuclear Engineering, Massachusetts Institute of Technology, USA ²Department of Mechanical Engineering, Massachusetts Institute of Technology

Session 2: Advances in Precision Engineering and Nanotechnologies

Dicing by “Crack-and-Fracture” – Novel separation method for MEMS substrates

P2.01

Manuel Stompe¹, Marc Christopher Wurz¹

Institute for Micro Production Technology, Garbsen, Germany

Efficient manufacturing of large scale structured 3D forming tools through combination of short and ultra-short-pulsed laser processing

P2.02

Andreas Brenner¹, Christian Fornaroli¹, Arnold Gillner¹

¹Fraunhofer-Institute for Laser Technology, Germany

Issues in validation of friction in the nanometric domain

Marko Perčić¹, Saša Zelenika¹ and Ervin Kamenar¹

P2.03

¹University of Rijeka, Faculty of Engineering & Centre for Micro and Nano Sciences and Technologies, Vukovarska 58, 51000 Rijeka, CROATIA

Large stroke ultra-precision planar stage based on compliant mechanisms with polynomial flexure hinge design

Philipp Gräser¹, Sebastian Linß², Felix Harfensteller¹, Lena Zentner², René Theska¹

P2.04

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Department of Mechanical
Engineering*

*¹Institute of Design and Precision
Engineering, Precision Engineering
Group*

²Mechanism Technology Group

Research on key technology for processing high precision aluminium mirror with combined polishing method

Hao Hu¹, Yifan Dai¹, Feng Shi¹, Ci Song¹, Guipeng Tie¹

P2.05

*¹School of Mechatronic Engineering
and Automation, National University
of Defense Technology, Changsha,
China 410073*

**The Hybrid Machining of Ceramic:
The choice of production stage**

A.Demarbaix¹, E. Rivière -
Lorphèvre¹, F. Ducobu¹, E. Filippi¹,
F. Petit²

P2.06

*¹University of Mons, Faculty of
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*²Research and Technological Support
Department BCRC-INISMa (member
of EMRA), Av. Gouverneur Cornez 4,
7000 Mons (Belgium)*

- A contribution to the development of multiaxial nanopositioning machines**
P2.07 Ralf Schienbein, René Theska
Precision Engineering Group, Department of Mechanical Engineering, Technische Universität Ilmenau, Germany
- Key techniques in Controllable Compliant Manufacturing (CCM) of nano-precision off-axis aspheric optics**
P2.08 Ci Song¹, Yifan Dai¹, Feng Shi¹, Hao Hu¹, Guipeng Tie¹
¹School of Mechatronic Engineering and Automation, National University of Defense Technology, Changsha, China 410073
- Influence of tool geometry on single-crystal CaF₂ in an ultra-precision machining**
P2.09 Yuta Mizumoto¹, Hikaru Amano¹, Mika Fuchida², Takasumi Tanabe², Yasuhiro Kakinuma¹
¹Department of System Design Engineering, Faculty of Science and Technology, Keio University, 3-14-1 Hiyoshi, Kohoku-ku, Yokohama 223-8522, Japan
²Department of Electronics and Electrical Engineering, Faculty of Science and Technology, Keio University, 3-14-1 Hiyoshi, Kohoku-ku, Yokohama 223-8522, Japan
- Study of Surface Integrity in Micro-groove Cutting of Anisotropic Material**
P2.10 Hiroyuki Kodama¹, Koichi Okuda¹, Yuji Kishi¹
¹University of Hyogo, Graduate School of Engineering, Japan

- P2.11** **Integration of a confocal microscope in a desktop machine tool for in situ process control**
Martin Bohley¹, Christopher Müller¹, Benjamin Kirsch¹, Jan C. Aurich¹
¹University of Kaiserslautern; Institute for Manufacturing Technology and Production Systems
- P2.12** **Effect of air blow pressure in ultrasonic vibration cutting of steel using PCD tools**
Xinquan Zhang¹, Deng Hui¹, Kui Liu¹, Hao Wang²
¹Singapore Institute of Manufacturing Technology, Singapore
²National University of Singapore, Singapore
- P2.13** **Diamond Micro Chiseling of retroreflective arrays on curved surfaces**
Timo Dörgeloh¹, Lars Schönemann¹, Oltmann Riemer¹, Ekkard Brinksmeier¹
¹Laboratory for Precision Machining LFM – University of Bremen, Germany
- P2.14** **The isostatic 3-body problem: a complete solution**
Johan Kruis^{1,2}, Florent Cosandier¹, François Barrot¹, Ilan Vardi², Simon Henein²
¹CSEM (Centre Suisse d'Électronique et Microtechnique)
²EPFL (École Polytechnique Fédérale de Lausanne)

- Determination of material properties by evaluation of machinability in multi-scale precision turning**
P2.15 A. Beinhauer, C. Heinzl, O. Riemer
Laboratory for Precision Machining (LFM), Foundation Institute of Materials Science (IWT), MAPEX Center for Materials and Processes, University of Bremen, Germany
- Control concept to minimize the settling time for a point-to-point motion of a single-axis piezo-actuated nanopositioning system with a displacement amplification mechanism.**
P2.16 Aditya Suryadi Tan¹, Thomas Sattel¹ and Michael Koschig²
¹Technische Universität Ilmenau, Germany
²piezosystem Jena GmbH
- Investigation of various graphene fillers for improving properties of thermoplastic polymers**
P2.17 Jan Edelmann¹, Mirko Albrecht², Henning Zeidler³, Michael Gehde², Andreas Schubert^{1,3}
¹Fraunhofer Institute for Machine Tools and Forming Technology IWU, Chemnitz, Germany
²Chemnitz University of Technology, Chair in Plastics, Chemnitz, Germany
³Chemnitz University of Technology, Chair in Micromanufacturing Technology, Chemnitz, Germany
- Effect of helical scan grinding with small diameter cBN wheel for hardened steel**
P2.18 Manabu Iwai¹, Kiyoshi Suzuki²
¹Toyama Prefectural University
²K.Suzuki New R & D Office

- P2.19** **Nano micro-scratch machining by atomic force microscope (AFM) for investigating fundamental characteristics of polishing**
Shinsuke Matsui¹ and Ken-noshin Kimura¹
¹Chiba Institute of Technology
- P2.20** **Fabrication of micro/nanostructures as SERS substrates with the feed-back controlled normal force**
Jingran Zhang^{1,2}, Yongda Yan^{1,2}, Jianxiong Cai^{1,2}, Peng Miao³
¹The State Key Laboratory of Robotics and Systems, Robotics Institute, Harbin Institute of Technology, Harbin 150080
²Center for Precision Engineering, Harbin Institute of Technology, Harbin, Heilongjiang 150001, P.R. China
³School of Chemistry and Chemical Engineering, Harbin Institute of Technology, Harbin, Heilongjiang 150001, P.R. China
- P2.21** **An investigation into the creep-deformation behavior of KDP crystals using nanoindentation at room temperature**
Ning Hou¹, Yong Zhang¹
¹School of Mechatronics Engineering, The Harbin Institute of Technology, Harbin 150001, China
- P2.22** **A novel rotational air bearing axis for the manufacturing of ultra-small micro end mills**
Christopher Müller¹, Martin Bohley¹, Benjamin Kirsch¹, Jan C. Aurich¹
¹University of Kaiserslautern; Institute for Manufacturing Technology and Production Systems

- P2.23** **Design and Fabrication of an Ultrasonic Waveguide with Micro-channels**
Hyunse Kim, Euisu Lim and Jong-Kweon Park
Extreme Mechanical Engineering Research Division, Korea Institute of Machinery and Materials, 171 Jang-Dong, Yuseong-Gu, Daejeon, 305-343, Republic of Korea
- P2.24** **Preparation of surface micro-structured coarse - grained diamond wheels based on high efficiency mechanical conditioning and pico second pulsed laser machining**
Mingtao Wu, Bing Guo, Qingliang Zhao
Center for Precision Engineering, School of Mechatronics Engineering, Harbin Institute of Technology, Harbin 150001, China
- P2.25** **A note on electromagnetic gravity compensation actuators based on soft electro-permanent magnets for adjustable reluctance force**
Thorsten Hübner¹, Oliver Radler¹, Tom Ströhla¹, Thomas Sattel¹, Jasper Wesselingh², Alexander Vogler², Dirk Eicher²
¹Technische Universität Ilmenau, Germany
²Zeiss AG, Germany
- P2.26** **Ultra-precise position and vibration analyses using Fabry-Pérot interferometry**
Thomas Ch. Hirschmann¹
¹attocube systems AG, Munich, Germany

Micro-milling tool wear monitoring through a novel method for burrs evaluation

P2.27 Fabrizio Medeossi¹, Marco Sorgato¹, Enrico Savio¹, Stefania Bruschi¹
¹Dept. of Industrial Engineering, University of Padova, Via Venezia 1, 35131 Padova, Italy

Nanoimprint process for arrayed waveguide grating patterns in silicon photonics

P2.28 Geehong Kim¹, Hyungjun Lim¹, Keebong Choi¹, Soongeun Kwon¹, and Jaejong Lee¹
¹Korea Institute of Machinery and Materials, 156 Gajeongbuk-Ro, Yuseong-gu, Daejeon 34103, Republic of Korea

Planarization of SiC and oxide surfaces by using Catalyst-Referred Etching with water

P2.29 Pho Van Bui¹, Ai Isohashi¹, Daisetsu Toh¹, Satoshi Matsuyama¹, Kouji Inagaki¹, Yasuhisa Sano¹, and Kazuto Yamauchi^{1,2}
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²Research Center for Ultra-Precision Science and Technology, Graduate School of Engineering, Osaka University, Osaka, Japan

Session 3: Non-Mechanical Manufacturing Processes

- P3.01** **Fabrication of microlens array mold by indentation method with height control of the indenter**
Hideo Takino¹, Kouta Suzuki¹,
Ryosuke Uchiki¹, and Takumi Ueno¹
¹Chiba Institute of Technology, Japan
- P3.02** **Simultaneous self-assembly of particles and cellulose nanofibers aiming at fiber- reinforced particle monolayer structure**
Nobuyuki Moronuk¹ and Saki Matsuo¹
¹Tokyo Metropolitan University
- P3.03** **Manufacturing of CVD diamond micro-end mills with electrical discharge machining**
E. Uhlmann^{1, 2}, D. Oberschmidt¹, M. Polte², J. Polte², T.-M. Schimmelpfennig¹, J. Börnstein¹
¹Fraunhofer Institute for Production Systems and Design Technology IPK, Germany
²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany

Dry-EDM milling of micro-scale features with high speed rotating tungsten tube electrodes

E. Uhlmann^{1,2}, I. Perfilov², T.-M. Schimmelpfennig¹, L. Schweitzer¹, S. Yabroudi²

P3.04

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RF network parameter investigation of the plasma delivery system used for Plasma Figuring

Nan Yu¹, Renaud Jourdain¹, Mustapha Gourma², Paul Shore³

P3.05

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³Loxham Precision Ltd, UK

Machining a small hole to polycrystalline diamond by ultrasonic vibration EDM

Shinichi NINOMIYA¹, Fumio KOGA¹, Manabu IWAI², Kiyoshi SUZUKI³

P3.06

¹Nippon Institute of Technology

²Toyama Prefectural University

³K. Suzuki New R& D Office

Manufacturing of surface microstructures by two-stage laser ablation

Philipp Steinert¹, Mike Zinecker¹, Andreas Schubert¹

P3.07

¹Professorship Micromanufacturing Technology, Faculty of Mechanical Engineering, Chemnitz University of Technology, 09107 Chemnitz, Germany

- P3.08** **Multi-wire EDM slicing of semiconductors with group power supplying method**
Yasuhiro Okamoto¹, Takayuki Ikeda¹, Haruya Kurihara², Akira Okada¹, Masataka Kido²
¹Nontraditional Machining Laboratory, Okayama University
²Makino Milling Machine Co. Ltd
- P3.09** **Application of Laser Scanning as a Pre-machining metrology technique in Jet-ECM**
Matin Yahyavi Zanjani¹, Henning Zeidler¹, André Martin¹, Andreas Schubert^{1,2}
¹Professorship Micromanufacturing Technology, Faculty of Mechanical Engineering, Technische Universität Chemnitz, 09107 Chemnitz, Germany
²Fraunhofer Institute for Machine Tools and Forming Technology, 09126 Chemnitz, Germany
- P3.10** **Micro-structuring of single crystal diamond by ultrasonic assisted friction polishing**
Christian Robert, Oltmann Riemer, Ekkard Brinksmeier
Laboratory for Precision Machining LFM, MAPEX Center for Materials and Processes, University of Bremen, Bad gasteiner Str. 2, 28359 Bremen, Germany
- P3.11** **Influence of tool material and electrolyte on characteristics of Wire ECM with raised low-level voltage**
Makoto OGINO¹, Wataru NATSU²
^{1,2}Tokyo University of Agriculture and Technology

Performance analysis of laser structured surfaces like-honing

Rodrigo L. Stoeterau¹, Neimar S. Silveira², Milton S. F. Lima³, Gilmar Batalha¹

P3.12

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Analysis of voltage and current during the Plasma electrolytic Polishing of stainless steel

Ajeet Singh Rajput¹, Henning Zeidle^{1,2}, Andreas Schubert¹

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Observation of phenomenon in gap area during micro hole drilling with micro EDM

Guodong Li¹, Wataru Natsu², Zuyuan Yu³

P3.14

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Removal of subsurface damage of 4H-SiC wafer by plasma assisted polishing

- P3.15** Kentaro Tsujiuchi¹, Chika Kageyama¹, Katsuyoshi Endo¹ and Kazuya Yamamura¹
¹Research Center for Ultra-precision Science and Technology, Graduate School of Engineering, Osaka University, Japan

Effect of tool coated with conductive and non-conductive layer on micro-EDM characteristic of Ni based X alloy

- P3.16** Maxim Lu¹, Asma Perveen², M.P. Jahan³
^{1,2}Nazarbayev University, ³Miami University

Session 4: Mechanical Manufacturing Processes

Wear detection of brass bond diamond grinding wheel by spectral coherence of grinding forces

- P4.01** Bin Dong, Christian Vogt, Rolf Rascher
Laboratory of Optical Engineering, Technische Hochschule Deggendorf, Edlmairstraße 6 & 8, 94469 Deggendorf, German

Setting errors compensation of a workpiece located by industrial robots

- P4.02** Keiichi Nakamoto¹, Ren Kitakawa¹, Yoshimi Takeuchi²
¹Tokyo University of Agriculture and Technology, Japan ²Chubu University, Japan

- P4.03** **Endless diamond wire saw for monocrystalline silicon cutting**
Ricardo Knoblauch¹, Claudio Abilio da Silveira¹, Walter Lindolfo Weingaertner¹, Fabio Antonio Xavier¹, Konrad Wegener²
¹Universidade Federal de Santa Catarina, Mechanical Engineering Department, Trindade, 88010-970 Florianópolis SC, Brazil
²Institute of Machine Tools and Manufacturing, ETH Zurich, Tannenstrasse 3, 8092 Zurich, Switzerland
- P4.04** **Characterising Damages of the Main Pressing and Heat Transferring Element within the Hybrid Contact Laser Sintering Process**
Tobias Montag¹, Jens Wulfsberg¹
¹Helmut-Schmidt-University, University of the Federal Armed Forces Hamburg
- P4.05** **Ultra-precision grinding of polycrystalline transparent ceramics**
Thomas Bletek¹, Olaf Dambon¹, Fritz Klocke¹
¹Fraunhofer-Institute for Production Technology IPT, Steinbachstr. 17, 52074 Aachen, Germany
- P4.06** **Chatter Attenuation of Five-axis CNC Machining by Eddy Current Damping**
Yiqing Yang, Mashhood Asad Butt
School of Mechanical Engineering and Automation, Beihang University, Beijing, 100191, China

Liquid covered micro-milling

E. Uhlmann^{1,2}, D. Oberschmidt¹, M. Polte², J. Polte²

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P4.07

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Cutting forces while machining

STAVAX ESU with binderless-cBN

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P4.08

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Real-Time Estimation of Machining Error Caused by Vibrations of End Mill using Indirect Methods

Kenji Shimana¹, Eiji Kondo², Takumi Chifu³, Shinichi Yoshimitsu¹ and Yuya Kobaru¹

P4.09

¹Department of Electronic Control Engineering, National Institute of Technology, Kagoshima College, Japan

²Graduate School of Science and Engineering, Kagoshima University, Japan

³Kotobuki Paper Co.Ltd., Japan

- P4.10** **Monitoring of Tool Behavior in End-milling Under Different Cutting Conditions Using Projection Image**
Shinichi Yoshimitsu¹, Daiki Iwashita²,
Kenji Shimana¹, Yuya Kobaru¹,
Shunichi Yamashita¹
*¹National Institute of Technology,
Kagoshima College, Japan*
²Makino Milling Machine Co., Ltd
- P4.11** **Analysis of mould design affecting the filling behaviour of an injection moulded micro part**
Antonio Luca, Oltmann Riemer, Carla Flosky
*Laboratory for Precision Machining,
University of Bremen, Germany*
- P4.12** **An investigation into finite element modelling of micro machining of nano Mg/SiC metal matrix composites**
Xiangyu Teng¹, Dehong Huo¹,
Wanqun Chen^{1,2}
*¹School of Mechanical and Systems Engineering, Newcastle University,
Newcastle upon Tyne, NE1 7RU, UK*
*²Centre for Precision Engineering,
Harbin Institute of Technology,
Harbin, 150001, People's Republic of China*
- P4.13** **Mass production for micro end mills**
Berend Denkena², Marc Wurz¹, Thilo Grove², Abdelhamid Bouabid²,
Esmail Asadi¹
¹Institute for Micro Production Technology, Garbsen, Germany
²Institute for Production Engineering and Machine Tools, Garbsen, Germany

- P4.14 Behavioral analysis of tool deflections during micro-end milling**
Hiroo Shizuka¹, Katsuhiko Sakai¹, Takumi Kaneko¹ and Mikiyoshi Nakajima¹
¹Shizuoka University, 3-5-1 Johoku Naka-ku Hamamatsu Shizuoka 432-8561 Japan
- P4.15 Cutting force reduction mechanism of lead-free brass cutting by measuring several different tool materials**
Ryo Nakazawa¹, Hiroo Shizuka¹, Katsuhiko Sakai¹
¹Shizuoka University, 3-5-1 Johoku Naka-ku Hamamatsu Shizuoka 432-8561 Japan
- P4.16 Manufacturing of substrates for curved deterministic areal roughness standards**
Rudolf Meeß¹, Matthias Hemmleb², Thorsten Dziomba¹, André Felgner¹, Ulrich Neuschaefer-Rube¹
*¹Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, 38116 Braunschweig, Germany
²m2c calibration, Alt Nowawes 83a, 14482 Potsdam, Germany*
- P4.17 The surface properties of a roll mould according to the fluid jet polishing conditions**
Tae-Jin Je^{1, 2}, Ji-Young Jeong^{1,2}, Kyu-Min Lee¹, Eun-chae Jeon^{1,2}
*¹Dept. of NanoManufacturing Technology, Korea Institute of Machinery and Materials(KIMM), Korea
²Dept. of NanoMechatronics, University of Science & Technology(UST), Korea*

Droplet removal from PVD-coated micro-milling tools with the immersed tumbling process

E. Uhlmann^{1,2}, Y. Kuche², D. Oberschmidt¹, J. Polte²

P4.18

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Characterization of smearing patterns in ball nose end milling process

F.Biondani¹, G.Bissacco¹, H.N.Hansen¹

P4.19

¹Department of Mechanical Engineering, Technical University of Denmark

Investigation on cutting mechanism in vibration assisted micro milling

Wanqun Chen^{1,2}, Dehong Huo¹, Jack Hale¹

P4.20

¹School of Mechanical and Systems Engineering, Newcastle Upon Tyne, NE1 7RU, United Kingdom ²Center for Precision Engineering, Harbin Institute of Technology, Harbin, 150001, People's Republic of China

Wear behaviour of diamond coated micro-milling tools during micro machining

E. Uhlmann^{1,2}, Y. Kuche², D. Oberschmidt¹, J. Polte²

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P4.22 **Fundamental study of magnetic polishing for Ti-alloy by use of machining centre**
Tatsuya Furuki¹, Toshiki Hirogaki²
and Eiichi Aoyama²
¹Gifu University, ²Doshisha University

P4.23 **Micro-machining of Monocrystalline Silicon with Improved Edge Quality**
Zi Jie Choong¹, Dehong Huo¹, Patrick Degenaar², Anthony O'Neill²
¹School of Mechanical and Systems Engineering, Newcastle University, Newcastle Upon Tyne, NE1 7RU, United Kingdom
²School of Electrical and Electronic Engineering, Newcastle University, Newcastle Upon Tyne, NE1 7RU, United Kingdom

P4.24 **A Computational Fluid Dynamics Approach for Chip Evacuation Optimization in Deep Hole Drilling**
K.S. Woon¹, G.L. Tnay²
¹Department of Mechanical Engineering, National University of Singapore, 10 Kent Ridge Crescent, Singapore 119260
²Machining Technology, Singapore Institute of Manufacturing Technology, 71 Nanyang Drive, Singapore 638075

Ultraprecision cutting of silicon carbide using micro milling tool made of single crystalline diamond

W. Asai¹, H. Suzuki¹, M. Okada¹, Y. Itoh², K. Fujii²

P4.25

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²NS Tool Co., Ltd., 2-11, Matsuzakadaira, Taiwa, Kurokawa, Miyagi, Japan

Study on scribing characteristics of wafer with precision of ground scribing wheel

Yusuke AKIYAMA¹, Mutsumi OKADA¹, Yuki MASUDA¹, Hirofumi SUZUKI¹, Toshio FUKUNISHI², Yoshiyuki ASAI², Noriyuki OGASAWARA², Kazuma IIZAWA², Naoko TOMEI²

P4.26

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Development of precision polishing machine based on parallel-kinematic system

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CFRP surface finishing using ceramic brush

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- Investigation of critical edge radius effect for the variation of ultra-precision machining results of difficult-to-cut materials**
- P4.29** M. Azizur Rahman, S. Raj Selvaraja, M. Rahman, A. Senthil Kumar
Department of Mechanical Engineering, National University of Singapore, S117576
- Development of localized compressive hydrostatic stress-assisted cutting method – Examination by molecular dynamics simulation and microcutting experiment**
- P4.30** Jun Shimizu¹, Takeyuki Yamamoto¹, Hiroataka Ojima¹, Teppei Onuki¹, Libo Zhou¹ and Keito Uezaki²
¹*College of Engineering, Ibaraki University, 4-12-1 Nakanarusawa, Hitachi 316-8511, Japan*
²*Graduate School of Science and Engineering, Ibaraki University, 4-12-1 Nakanarusawa, Hitachi 316-8511, Japan*
- Modeling surface generation in ultra-precision grinding based on the surface topography of grinding wheel**
- P4.31** Chengyang Zhao¹, Chi Fai Cheung¹, Shanshan Chen^{1,2}, and Zhongchen Cao¹
¹*Partner State Key Laboratory of Ultraprecision Machining Technology, Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong*
²*School of Mechatronics Engineering, Harbin Institute of Technology, Harbin 150001, China*

- P4.32** **Thermal effect on brittle–ductile transition in CaF₂ single crystals**
Akshay Chaudhari, Yan Jin Lee, Hao Wang, A. Senthil Kumar
Department of Mechanical Engineering, National University of Singapore, EA-07-08, 9 Engineering Drive 1, Singapore 117575
- P4.33** **Simulation of surface morphology and roughness during helical milling**
Yanling Tian^{1,2}, Yudong Zhou¹, Fujun Wang¹, Yunpeng Liu¹, Dawei Zhang¹
¹*Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, Tianjin 300072, China*
²*School of Engineering, University of Warwick, Coventry CV4 7AL, UK*
- P4.34** **Simulation and experiments for micro/nano channel scratching**
Zhiyong Guo¹, Yanling Tian^{1,2}, Dawei Zhang¹, Xianping Liu², Bijan Shirinzadeh³
¹*Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, Tianjin 300072, China*
²*School of Engineering, University of Warwick, Coventry CV4 7AL, UK*
³*Department of Mechanical and Aerospace Engineering, Monash University, Clayton 3800, Australia*
- P4.35** **Honing with a new tooling concept – defined cutting edges coated with CVD-Diamond**
K. Dröder¹, H.-W. Hoffmeister¹, S. Baron¹
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- P4.36** **Simulation of surface morphology and roughness during helical milling**
Yanling Tian^{1,2}, Yudong Zhou¹, Fujun Wang¹, Yunpeng Liu¹, Dawei Zhang¹
¹Key Laboratory of Mechanism Theory and Equipment Design of Ministry of Education, Tianjin University, Tianjin 300072, China
²School of Engineering, University of Warwick, Coventry CV4 7AL, UK
- P4.37** **The effect of stress on shear dilatation and cutting force during nanometric machining of amorphous alloys**
Yan Zhao¹, TongtongLi¹, Yan Zhang¹, Jiachun Wang¹, DehongHuo²
¹School of Mechanical Engineering, Yanshan University, Qinhuangdao, 066004, China
²School of Mechanical and Systems Engineering, Newcastle University, Newcastle Upon Tyne, NE1 7RU, UK
- P4.38** **A mathematical explanation for the grinding marks in cross and parallel grinding**
Yongcheng Pan, Qingliang Zhao, Bing Guo
Center for Precision Engineering, School of Mechatronics Engineering, Harbin Institute of Technology, Harbin 150001, China
- P4.39** **Inner centering in parting line area of injection mould using side locks**
Rasoul Mahshid¹, Hans Nørgaard Hansen¹
¹Technical University of Denmark, Department of Mechanical Engineering, Lyngby, Denmark

- P4.40** **The feasibility study of using a kinematic for 6-degrees tool holder in single point diamond turning**
W. Yuan¹, W.B. Lee¹, C.Y. Chan¹ and L.H. Li¹
¹The State Key Laboratory of Ultraprecision Machining Technology, Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hong Kong
- P4.41** **Influence of dielectric fluid and tool electrode choice on micro-EDMed nitinol surface integrity**
James W. Mwangi¹, Henning Zeidler¹, Thomas Berger¹, Andreas Schubert¹
¹Technische Universität Chemnitz, Micromanufacturing Technology, 09107 Chemnitz, Germany
- P4.42** **Subsurface structure defects beneath fracture area of reaction-bonded silicon carbide in ultra-precision grinding**
Feihu Zhang¹, Zhipeng Li¹, Xichun Luo²
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²Department of Design, Manufacture and Engineering Management, Faculty of Engineering, University of Strathclyde, UK

Process chain for fabrication of anisotropic optical functional surfaces on polymer components

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A full factorial numerical investigation and validation of precision end milling process for hardened tool steel

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A method to recognize the contact area of tool-workpiece on the diamond cutting tool

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Zhihui Xia

P4.45

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**Study on the critical chip thickness
in microcutting SiC single crystals**

P4.46

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Alexander Wolf, Oltmann Riemer
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**Modeling and simulating of high
chromium alloy based on Molecular
Dynamics**

P4.47

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Renke Kang
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Non-traditional machining of
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**3D Finite Element Modelling of
Drilling Process of Al2024-T3 Alloy
with solid tooling and Experimental
Validation**

P4.48

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Session 5: Revision of SI

Quantitative surface analysis on ^{28}Si -spheres for the redefinition of the kilogram

- P5.01** Edyta Beyer¹, Erik Darlatt², Rolf Fliegau², Frank Härtig¹, Michael Kolbe², Matthias Müller¹
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A displacement interferometer for the calibration of the silicon lattice parameter

- P5.02** Christoph Weichert¹, Paul Köchert¹, Susanne Quabis¹, Jens Flügge¹
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Session 6: Metrology

Measurement models for evaluation of uncertainty of coordinate measurements

- P6.01** Wojciech Płowucha¹, Paweł Rosner¹
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A reference measurement system for roundwood based on fringe projection

- P6.02** Keck C and Schödel R
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- Effect of process parameters on dimensional accuracy of fiber-reinforced thin-walled micro moulded part**
P6.03 Jitendra Rathore^{1,2}, Davide Masato¹, Marco Sorgato¹, Giovanni Lucchetta¹, Simone Carmignato²
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²Department of Management and Engineering, University of Padova, Vicenza (Italy)
- Press hardening tool integrated thin film temperature sensor**
P6.04 F. Dencker¹, A. Schlenkrich¹, M. C. Wurz¹
¹Institute for Micro Production Technology, Leibniz Universitaet Hannover, Garbsen, Germany, dencker@impt.uni-hannover.de
- A bottom-up approach for traceable nano dimensional metrology**
P6.05 Gaoliang Dai¹, Jens Fluegge¹, Harald Bosse¹, Ronald Dixon²
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²National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD 20899-8212
- Roundness measurements of concave spherical surface using an AFM probe system**
P6.06 Zhuanzhuan Cen¹, Jingran Zhang¹, Xuesen Zhao¹, Tao Sun¹
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Towards metrological computed tomography at METAS

Benjamin A. Bircher, Felix Meli, Alain Küng, Rudolf Thalmann

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Laser confocal microscope noise evaluation on injection compression moulded (ICM) transparent polymer Fresnel lenses

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The synthesis and metrology of colloidal semiconductor nanocrystals

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Nanometrology (LENA) | Langer
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P6.10 **A portable Large Range Small Angle Generator (LRSAG) for precise calibration of autocollimators**
Tanfer Yandayan
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P6.11 **In situ strain measurement during a grinding process using a sensor-integrated workpiece**
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²Foundation Institute for Materials Science (IWT), MAPEX Center for Materials and Processes, University of Bremen, Bremen, Germany

P6.12 **Concept of metrological reference surfaces for asphere and freeform metrology**
Michael Schulz¹, Ines Fortmeier¹, David Sommer¹, Gernot Blobel^{1,2}
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P6.13 **Electromagnetic interference and capacitive distance measurements on machine tools**
Sebastian Böhl¹, Matthias Meier¹, Konrad Wegener¹
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Monitoring of the thermal deformations on polymer parts using a vision system

- P6.14** G. Dalla Costa, D. González-Madruga, L. De Chiffre
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Demands for nanoradian angle metrology and performance requirements on autocollimators

- P6.15** Tanfer Yandayan¹ and Ralf Geckeler²
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Bringing metrology to high-speed atomic force microscopy (HS-AFM)

- P6.16** Andrew Yacoot¹, Loren Picco², Oliver Payton², Herve Dongmo¹, Freddie Russell-Pavier^{2,1}, Petr Klapetek³
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- Experimental investigation on the influence of detector misalignment on X-ray CT measurement accuracy**
Valentina Aloisi¹, Simone Carmignato¹, Joseph Schlecht², Eric Ferley², Enrico Savio³
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²NorthStar Imaging, Inc., Rogers, MN, USA
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- How to qualify wafer thermal conditioning at milli-Kelvin resolution?**
Marnix Tas¹, Roland Hanegraaf¹, Herman Verbeek¹, Willem Dijkstra²
¹Sioux CCM (www.siox.eu), commissioned by VDL ETG (www.vdletg.com)
²VDL ETG (www.vdletg.com)
- Strain measurements of cylinder magnetostrictive samples by interferometer readings**
R. Bellotti¹, P. Mei², G.B. Picotto¹, M. Santiano¹, M. Zucca¹
¹INRIM – Istituto Nazionale di Ricerca Metrologica
²Politecnico di Torino – Dipartimento Energia

**Experimental investigation on
multi-material gap measurements
by computed
tomography using a dedicated
reference standard**

P6.20

Petr Hermanek¹, Fabrício Borges de Oliveira², Simone Carmignato¹, Markus Bartscher², Enrico Savio³
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**Dynamics modeling of CMM
probing systems**

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Fabrizio Pollastri, Alessandro Balsamo, Andrea Egidi and Gian Bartolo Picotto

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Results from an interlaboratory comparison of areal surface texture parameter extraction from X-ray computed tomography of additively manufactured parts

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A comparative study of curvature-based registration methods for dimensional metrology

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- P6.24** **Unrolled 3D confocal measurements of turning parts**
Carlos Bermudez¹, Aitor Matilla¹,
Jordi Mariné¹, David Martínez¹,
Cristina Cadevall¹, Roger Artigas¹
¹Sensofar Tech SL
- P6.25** **Deformation mechanism of lonsdaleite based on molecular dynamics analysis of nanoindentation**
Hiroaki Tanaka, Shoichi Shimada
Osaka Electro-Communication University, Japan
- P6.26** **Characterizing the material mechanical properties inside small holes**
Min Xu, Uwe Brand, Ludger Koenders
Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, D-38116 Braunschweig, Germany
- P6.27** **Surface roughness study on mirror finish surface products using patterned area illumination method**
Shaowei Fu^{1,2}, Fang Cheng² and David Lee Butler^{1,2}
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An approach to the assessment of cam form

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**Pico litre volume measurement
with a laser focus sensor on the
nano measuring machine NMM-1**

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and Sensor Technology*

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**Integral and traceable evaluation of
three-dimensional thread
measurements**

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Wedmann¹, Martin Stein¹

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**Ageing of roughness artefacts -
impact on the measurement results**

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**On machine measurement of
freeform optics fabricated by
dynamic servo turning**

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P6.32

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**Modelling uncertainty associated
with comparative coordinate
measurement
through analysis of variance
techniques**

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**Current trends and limitations in
the primary realisation of the
length**

René Schödel, Katharina Rau, Karl
Meiners-Hagen, and Florian
Pollinger

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Contribution to the mechanical enhancement of load cells in precision weighing technology by means of advanced adjustment strategies

- P6.35** Maximilian Darnieder¹, Rafael R. Marangoni², René Theska¹, Thomas Fröhlich¹, Ilko Rahneberg²
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Profiler tip characterization using a precision sphere

- P6.36** Peter Thomsen-Schmidt
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A laser based multilateration system for measurement of low-slope surfaces

- P6.37** James Norman, Xavier Tonnellier, Paul Morantz
Precision Engineering Institute, Cranfield University (United Kingdom)

High-resolution, high-speed inline optical topography measurement system for laser micro-machining process control

K.G.P. Folkersma¹, L.A.Woldering²,
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Session 7: Mechatronics & Control

Integrated design of controller and JDC by a constrained H_2 optimization algorithm

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P7.01

Data-Based tuning of the reduced order inverse system model in a 3-DOF control structure with application to tray indexing

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P7.02

Disturbance Compensation by Set-Point Alteration for Improved Tracking Performance

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Lateral Vibration Control Using Real-time Motion State and Hybrid (MR-Pneumatic) Isolation Systems

HyungTae Kim, AnMok Jeong, HyoYoung Kim, JongWook An, CheolHo Kim and KyungChan Jin¹

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Feasibility study on nano tracking control of axial displacement of spindle using hydrostatic thrust bearings

Yohichi Nakao¹, Yasumasa Yamada¹ and Akio Hayashi¹

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Development of a high bandwidth XY stage for vibration-assisted milling

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Low-dimensional time-discrete models for high dynamic machine tools

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Experimental investigation of an electromagnetic linear guide for ultra-precision high performance machining

P7.08

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- P7.09** **Microscopic behaviour of
ultraprecision positioning
mechanism driven by ball screw
with external axial load**
Shigeo Fukada¹, Soichiro Koike¹
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- P7.10** **Levitation characteristics of an
actuator in a non-contact
mechatronic system**
Akihiro Torii¹, Kento Tanaka¹, Suguru
Mototani¹, Kae Doki¹
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- P7.11** **Architecture Design for Advanced
Motion Control**
Ir. Wilco Pancras¹
¹Bosch- Rexroth, DC- A/EAN
- P7.12** **Damping of transient vibrations of
head on top of flexible column of
milling machine using
electromagnetic hybrid dynamic
vibration absorber**
Eiji KONDO¹, Taishi NISHIMURA¹ and
Daisuke TABUCHI¹
¹Kagoshima University
- P7.13** **Positioning of a 3-DOF inchworm
stage with optical navigation**
Akihiro Torii¹, Yuta Mitsuyoshi¹,
Suguru Mototani¹, Kae Doki¹
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**Improved Artificial Vision Algorithm
in a 2 Positioning System operated
under feedback control in
micromachining**

P7.14 O.de Francisco Ortiz¹, H.T. Sánchez
Reinoso²,
M. Estrems Amestoy³, J.Carrero-
Blanco⁴
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**ITRS roadmap is pushing wafer
handling to milli-Kelvin
performance**

P7.15 Marnix Tas¹, Joeri Lof², Niels de
Kleijn³, Willem Dijkstra⁴,
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**Addressing Source-Induced
Structural Vibrations in an
Interventional X-ray System**

P7.16 J.A.W. van Pinxteren¹, J.P.M.B.
Vermeulen¹, R.J.A. van Loon²,
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The Performance Potential of Superconducting Linear and Planar Motors

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J.P.M.B. Vermeulen¹, J.W. Jansen²,
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Fabrication of the lens array mould with embossing type surface by using a fast tool servo with large displacement up to hundreds of micro meter

P7.18

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Efficient Wavelet-based Discriminant Measure for Surface Defect Detection on Steel Plate

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P7.19

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- P7.20** **Magnetically levitated linear drive with repulsive magnetic guidance and nearly zero power emission**
Markus Raab¹, Wolfgang Schinköthe¹
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- P7.21** **Inertial vibration cancellation for floor fields and stiff machine pedestals**
Bank S, Rijkers R, van Seggelen J and Bakker B
Servaas bank, Ronald Rijkers, Johan van Seggelen and Bernhard Bakker, all work for MECAL High-tech / Systems
- P7.22** **Development of actively compensated ultra-precision hybrid machining system**
Seung-Kook Ro¹, Gyungho Khim¹, Jong-Won Yun¹, Tae-Bum Seo², Tae-Jo Ko³ & Jong-Kweon Park¹
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Determination of efficiency of orthodontic treatment by using engineering tools

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E-beam sterilization of microstructures in titanium surfaces for medical implants

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P8.02

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Dimensional control in pre-sintered Zirconia machining for Double Pivot Micro Bearings of blood pumps

Mariana Maria Aparecida Pinto Hernandes¹, Joaquim Antonio Ferreira da Rocha¹, Michele

P8.03

Aparecida Saito¹, Sérgio Yoshinobu Araki¹, Pamela Silva¹, Rodrigo Lima Stoeterau², Eduardo Guy Perpetuo Bock¹

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Textured layer of titanium oxide in titanium pure to endothelialize ventricular assist devices

P8.04 Rosa Corrêa Leoncio de Sá^{1,3}, Rodrigo Lima Stoeterau², Evandro Drigo¹, Bruno Utiyama¹, Jeison Fonseca¹, Edir Leal¹, Tarcísio Leão³, Mariana Hermandes³, Aron Andrade¹, Eduardo Guy Perpétuo Bock³

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Microstructure and tribology regarding precision studies of micro-sintered ceramic bearings for Ventricular Assist Devices

P8.05 Sergio Yoshinobu Araki^{1,2}, Rodrigo Lima Stoeterau³, Pâmela Catherine Florentino da Silva¹, Michele Aparecida Saito¹, José Ricardo Corrêa de Sousa Sobrinho¹, Antônio Luiz Marques Júnior¹, Douglas Fontainha de Sousa¹, Eduardo Guy Perpétuo Bock¹, Antônio Celso Fonseca de Arruda²

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Assembly analysis of titanium dental implants using X-ray computed tomography

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P8.06

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Prototype for optical applications that microscopically affect the cancer cell diagnosis in biological sciences

Breno Yuzo Tachibana Nishida¹, Gustavo Alonso Pereira², Evandro Drigo³, Marcello Fonseca⁴, Roberto Baginski Batista Santos⁴, Marcilei Aparecida Guazzelli Silveira⁴, Eduardo Guy Perpétuo Bock¹

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Session 9: Replication and Additive Manufacturing

Replication quality assessment and uncertainty evaluation of a polymer precision injection moulded component

- P9.01** Federico Baruffi¹, Matteo Calaon¹, Guido Tosello¹, Hans N. Hansen¹, Manfred Prantl², Nathan Miller³
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²Alicona Imaging GmbH, Raaba, Austria
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Reproducibility of 3D printed structures

- P9.02** Gorana Baršić¹, Ana Pilipović², Marko Katić³
^{1,2,3}Faculty of Mechanical Engineering and Naval Architecture, Ivana Lučića 5, 10000 Zagreb, Croatia

Measurement of in-mould shear rates by x-ray particle image velocimetry

- P9.03** E. Uhlmann^{1,2}, C. Hein¹, D. Oberschmidt¹
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²Institute for Machine Tools and Factory Management IWF, Technische Universität Berlin, Germany

Effects of process temperature in the high speed, mask-less, precision laser deposition of micro-tungsten tracks on silicon, copper and stainless-steel

P9.04

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William O'Neill¹

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University of Cambridge*

**Micro Injection Molding Polimeric
Difraction Grating**

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Enhancing CT porosity measurements on metal additive manufactured parts

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Feasibility study on integrated process/product quality assurance framework for precision injection moulding based on vibration monitoring

Nikolaos Giannakas¹, Rene Gammelby¹, Guido Tosello¹, Dmitri Tcherniak², Yang Zhang¹

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A comparison of reflectance properties on polymer

F. Regi¹, D.Li¹, Y. Zhang¹, J.B. Nielsen², M.H. Madsen³, G. Tosello¹, J. R. Frisvad², H.Aanæs²

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**Investigation of process parameters
influence on flash formation in
injection moulding of polymer
micro features through design of
experiments**

P9.09

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