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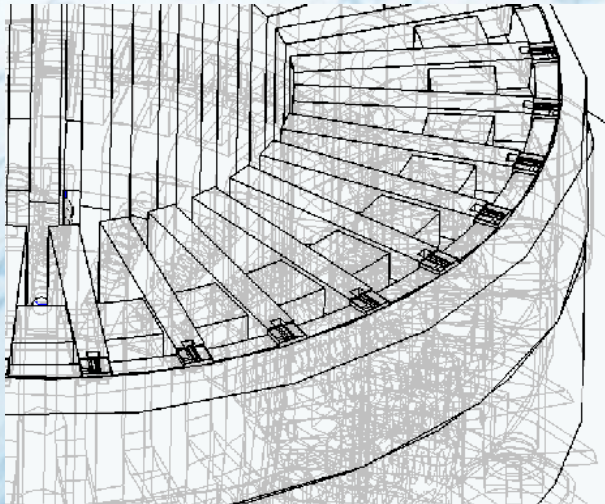
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# PROCESS ENGINEERING



KNOWING IS NOT ENOUGH,  
YOU MUST APPLY;

WANTING IS NOT ENOUGH  
YOU MUST DO.



## ENGINEERING AREAS



quipment

- PROCESSING AND ASSEMBLY
- TESTING AND MEASURING
- THERMAL TREATMENT
- MECHANICAL DESIGN
- MACHINE VISION



oftware

- PROCESS BASED CODE
- EQUIPMENT BASED CODE
- MACHINE VISION



rocess

- PROCESS TECHNOLOGIES
- MEASUREMENT TECHNOLOGIES
- SIMULATIONS

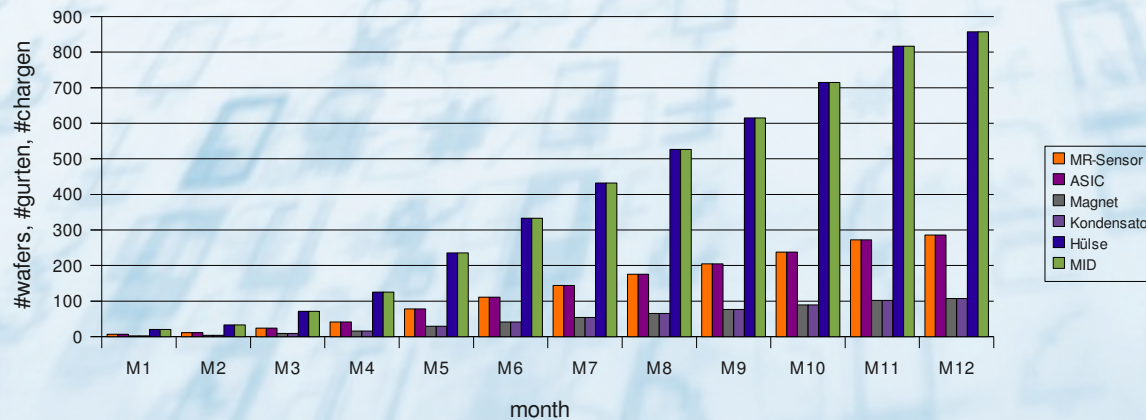


## • LINE PLANNING AND OPTIMISATION

- CYCLE TIME
- SUPPLY CHAIN MANAGEMENT
- PROCESS / EQUIPMENT PLANNING
- MATERIAL AND PROCESS DEVELOPMENT



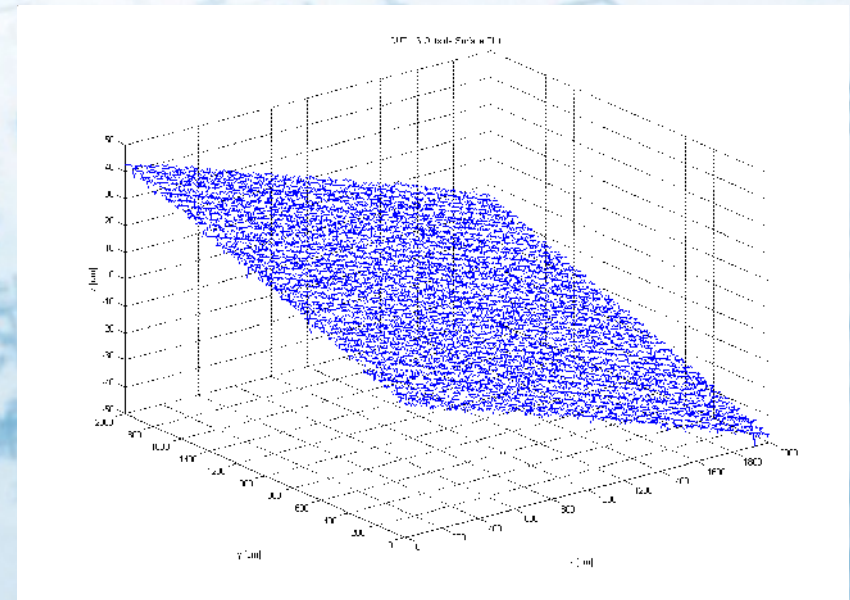
Materials





- CONTACTLESS THICKNESS MEASUREMENT OF DIFFUSE MATERIALS

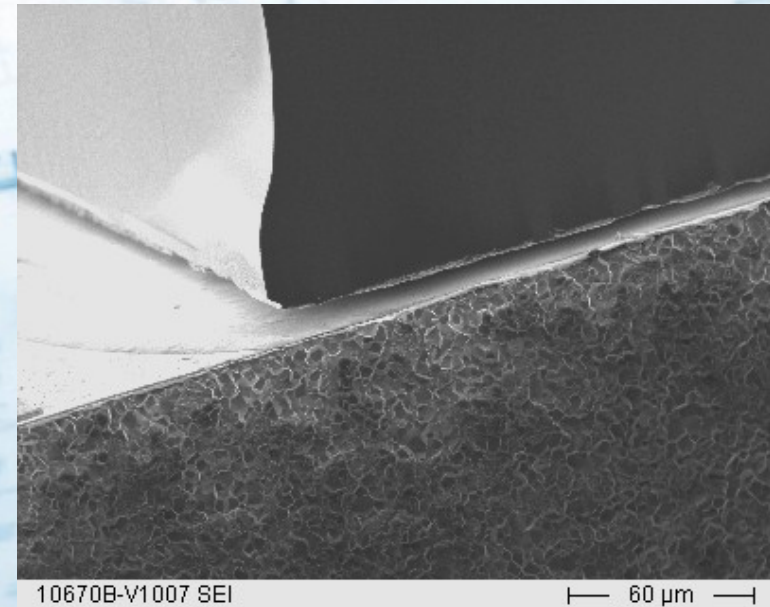
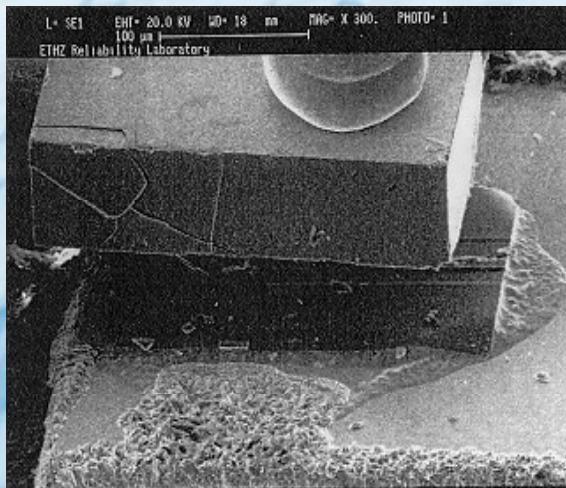
- contact-less confocal displacement measurement allows reliable and stable measurements of diffuse materials like AlN or Al<sub>2</sub>O<sub>3</sub>
- measurement accuracy: 1.5µm@3sigma with a spot diameter of 20µm
- working distance up to 20mm increases freedom of design





- THERMAL RESISTANCE MEASUREMENT MODULE

- DUT dimensions:  $300 \times (750-2200) \times 150 \mu\text{m}^3$
- thermal characterisation
- measurement accuracy:  $\pm 1\% \text{FS} @ 3\sigma$
- cycle-time: 2s





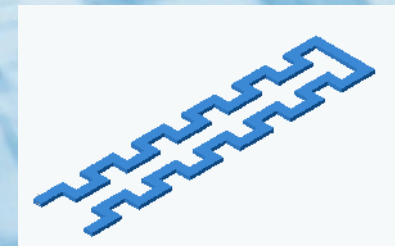
- **ERROR AND DEFECT RE-  
COGNITION ON RESISTIVE  
MEANDER STRUCTURES**

- examine influence of forced failures on resistive meander structures due to electrical current stressing
- usability estimation for optical inspection replacement



$$\Delta R_{(b,h,l)} = \left| \frac{\partial}{\partial b} R \Delta b \right| + \left| \frac{\partial}{\partial h} R \Delta h \right| + \left| \frac{\partial}{\partial l} R \Delta l \right| = \rho \left( \frac{l}{b^2 h} \Delta b + \frac{l}{bh^2} \Delta h + \frac{1}{bh} \Delta l \right)$$

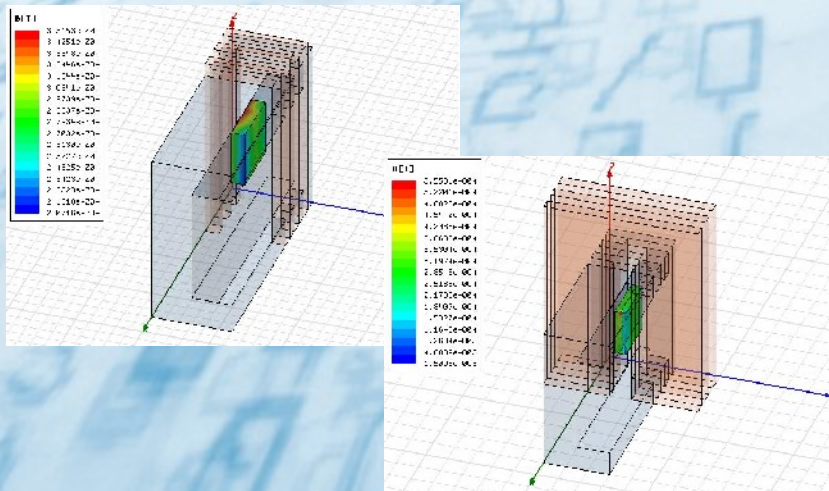
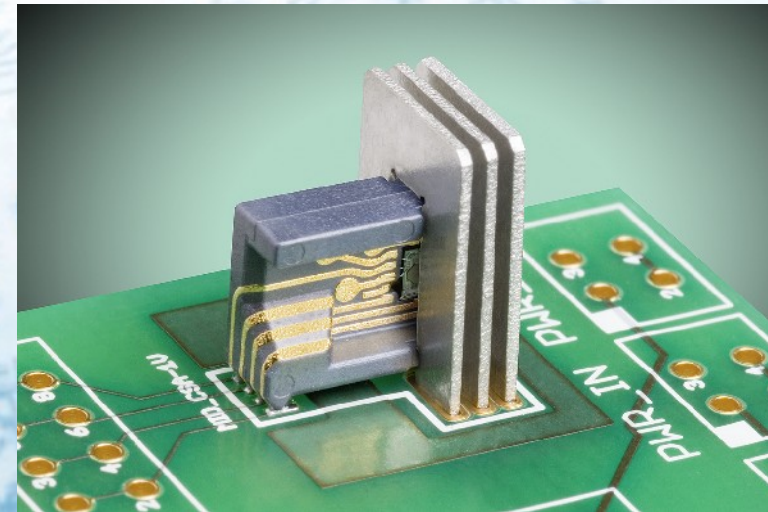
$$I_{zul} = \sqrt{\frac{c_p \delta A^2}{k \rho_{20} \alpha_T t_M} \ln \left( \frac{1 + \alpha_T (\vartheta_M - 20^\circ C)}{1 + \alpha_T (\vartheta_{20} - 20^\circ C)} \right)}$$





## • MOULDED INTERCONNECTION DEVICE FOR CURRENT SENSING APPLICATIONS

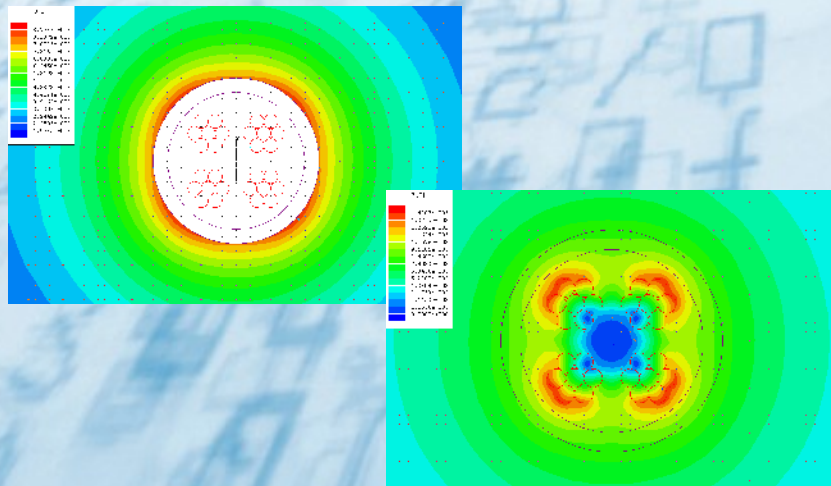
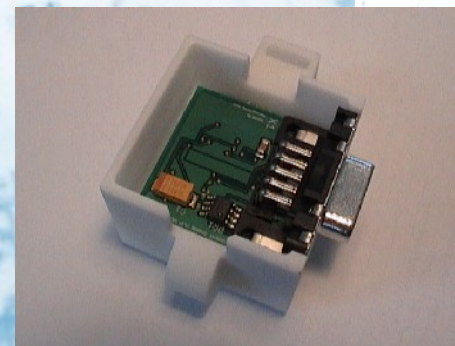
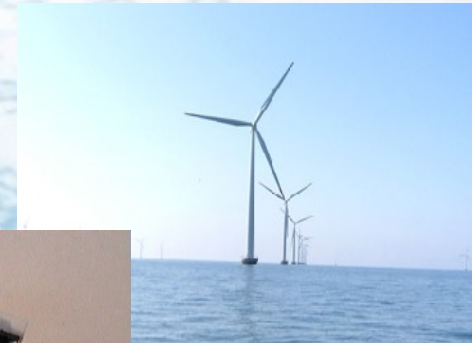
- usability estimation for future applications
- steady state and transient electromagnetic field analysis
- device characterisation and transient disturbance measurements





## • PLUGGABLE CURRENT SENSING DEVICE

- usability estimation for future wind power applications
- steady state and transient electromagnetic field analysis for accuracy prediction
- device characterisation and transient disturbance measurements

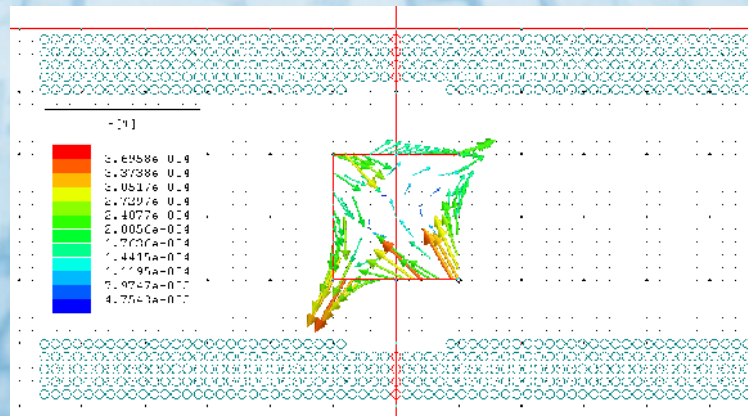
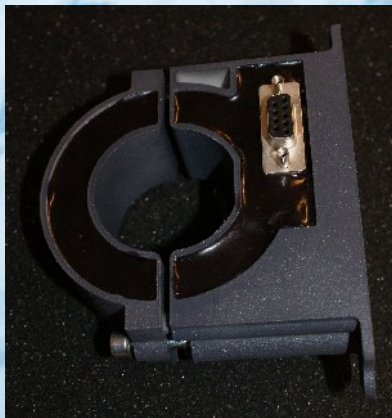
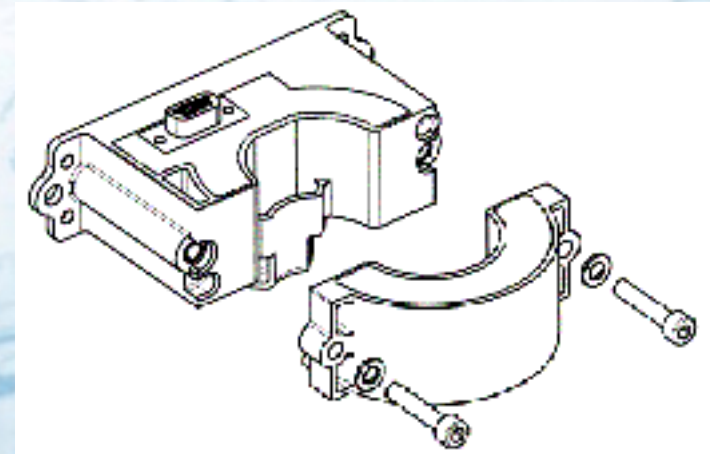


$$\vec{B}_0(\vec{r}) = \frac{\mu_0}{2\pi} \frac{\vec{I}_0 \times (\vec{r} + \vec{a})}{|\vec{r} + \vec{a}|^2} = \frac{\mu_0}{2\pi} \frac{I}{a^2 + 2ax + x^2 + y^2} \begin{pmatrix} -y \cdot \sin(\phi) \\ (a+x) \cdot \sin(\phi) \\ 0 \end{pmatrix}$$



## • HIGH CURRENT SENSING DEVICE

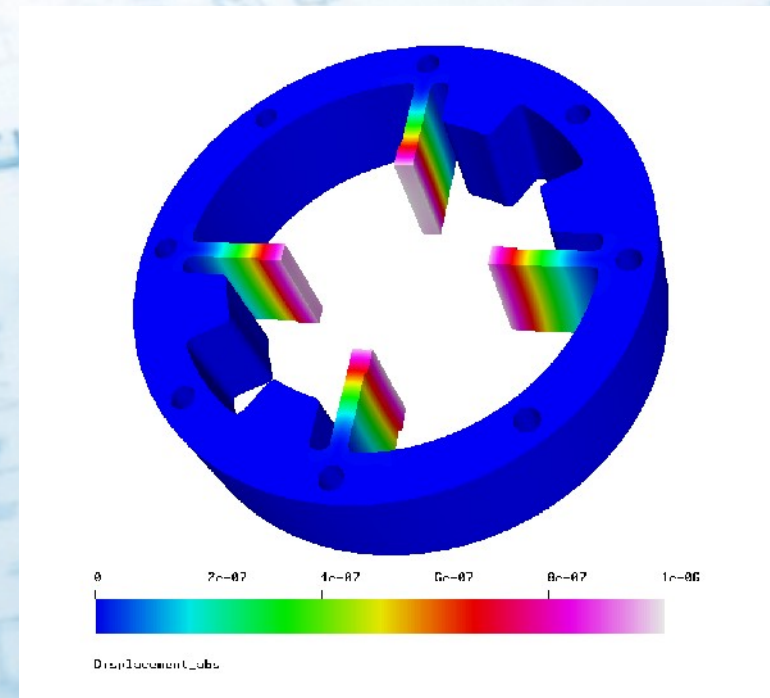
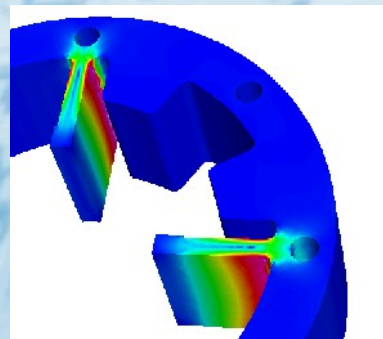
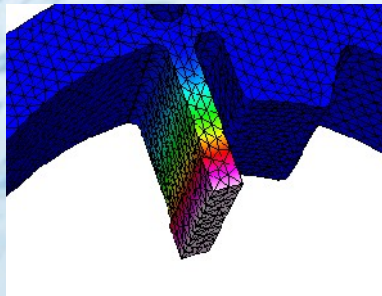
- usability estimation for future wind power applications
- steady state and transient electromagnetic field analysis for accuracy prediction
- device characterisation and transient disturbance measurements





- STRAIN GAUGE SENSING DEVICE FOR TORQUE MEASUREMENTS

- measurement range from 0-4Nm
- sensitivity of 30mV/Nm results in a resolution of 2.5mNm
- overall accuracy:  $\pm 0.1\%$  full scale value





THANK YOU FOR YOUR ATTENTION

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If you always put limits on everything you do,  
physically or anything else,  
it will spread into your work and into your life.

There are no limits. There are only plateaus, and  
you must not stay there,  
you must go beyond them.

Bruce Lee