Flagship Project H$_2$Giga

TECHNISCHE UNIVERSITÄT DRESDEN

With funding from the:
Federal Ministry of Research, Technology and Space

HyLeiT Final Workshop

Aspects of Reliability of Electrolyzer Systems

Institute of Electrical Power Systems and High Voltage Engineering

Speaker: **Moritz Ullrich**, Michael Bruhns

With funding from the:
Federal Ministry of Research, Technology and Space

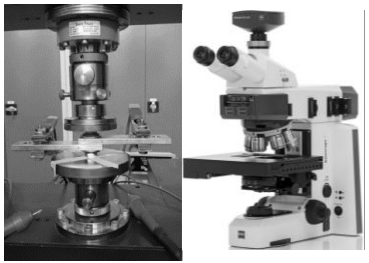
Behaviour of current-carrying connections

Design rules with generally applicable criteria for long-term stable operation of current carrying connections at operating temperatures of up to 180 °C

Selection of relevant material combinations and joining elements

Investigations of the contact behaviour of current-carrying connections

- Investigation of contact behavior through hysteresis tests
- Investigation of changes in surface roughness



Aging of current-carrying connections

- Long-term operation of the selected material combinations at relevant operating temperatures
- Investigation of the surface properties of the contact partners using a 3D microscope
- Investigation of individual aging mechanisms through selected experiments

Relation of contact force – contact behaviour

Long-term behaviour of current-carrying connections with focus on the impact of chemical reactions

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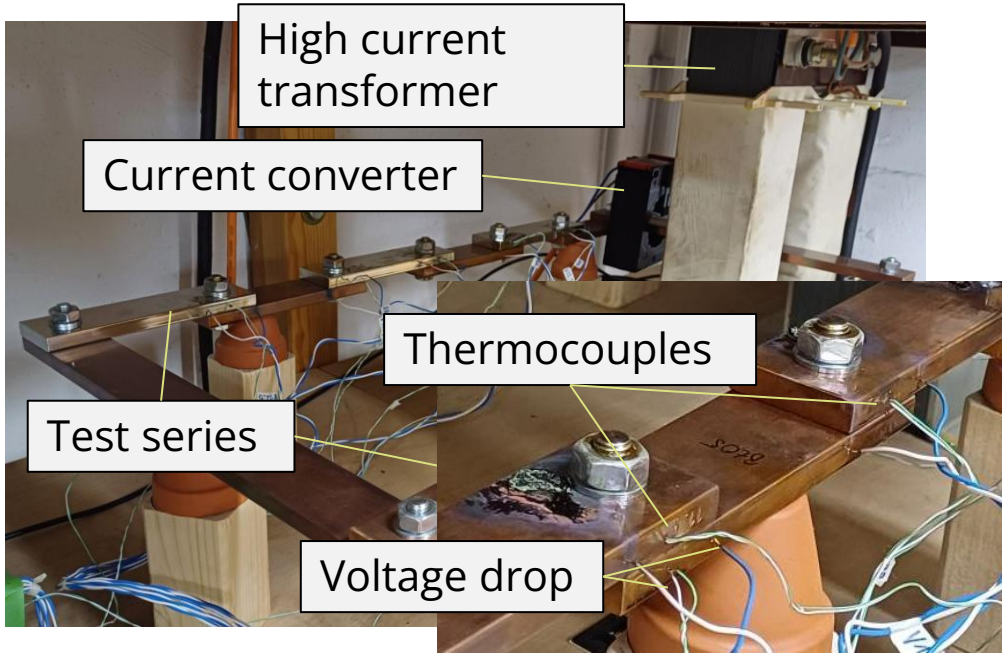
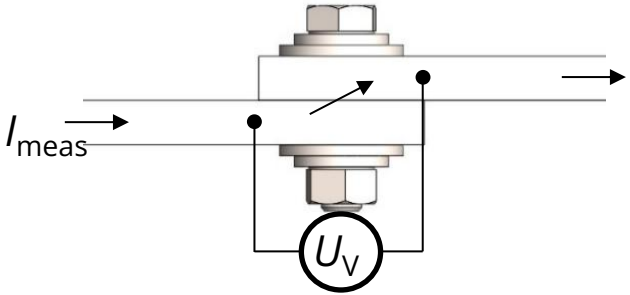
Long-term tests – test setup



MAX-II Ultrasonic-bolt-tension-meter:

Resistance measurement with four terminal sensing method:



EcoContact (Eco) 

Washer (W) 

Spring washer (SW) 

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Basic material		EN-AW-6101B-T7 (Aluminum)			Cu-ETP R240 (Copper)			
	Surface	raw	tinned	Spray-copper-plated	raw	Raw, laser-structured	tinned	nickel-plated
EN-AW-6101B-T7	Raw	180 °C (SW)			140 °C (W,Eco)		140 °C (W, Eco)	
	Tinned							160°C (SW)
								140 °C (W)
	Spray-copper-pl.			140 °C (W)	140 °C (W)			140 °C (W)
Cu-ETP R240	Raw	140 °C (W, Eco)		140 °C (W)				
	Raw, laser-structured					140 °C (W)		140 °C (W)
	tinned	140 °C (W, Eco)					140 °C (W)	
	Nickel-plated		160°C (SW)	140 °C (W)		140 °C (W)		140 °C (W)
			140°C (W)					

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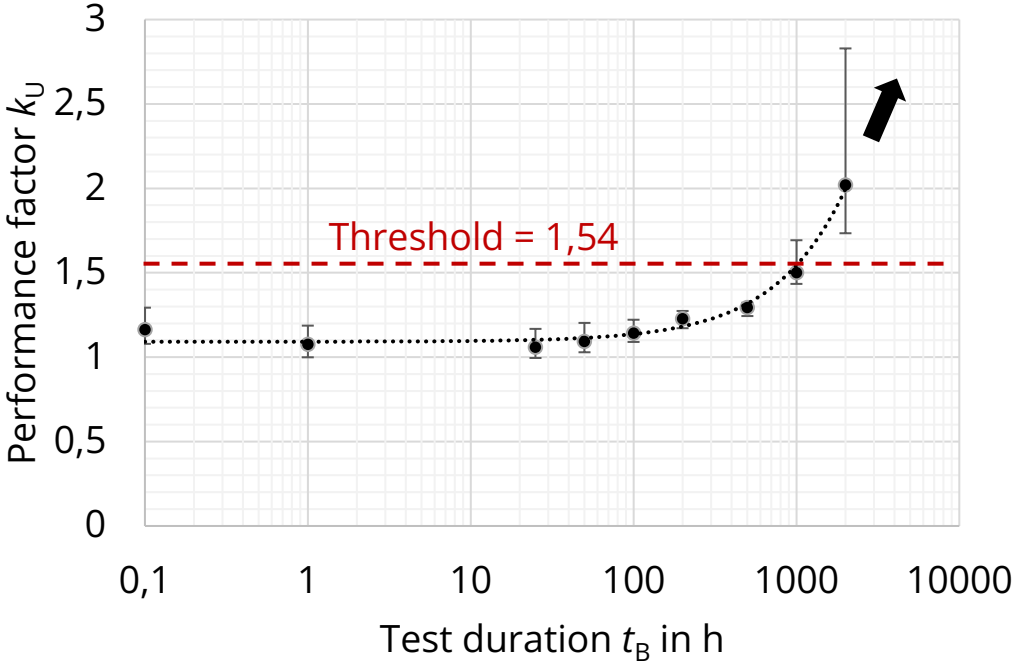
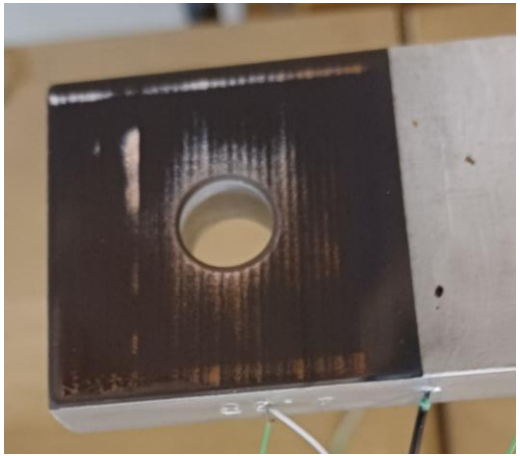
Long-term tests with Al, spray-copper-plated – Cu, nickel-plated





Oxidised contact surface of spray-copper-plated surface after 2.000 h

➡ Planned test duration: 10.000 h

Long-term stable

Not long-term stable

No comment possible at this test duration

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	Spray-copper-pl.			140 °C (W)	140 °C (W)			140 °C (W)
Cu-ETP R240	Raw	140 °C (W, Eco)		140 °C (W)				
	Raw, laser-structured					140 °C (W)		140 °C (W)
	tinned	140 °C (W, Eco)					140 °C (W)	
	Nickel-plated		160°C (SW) 140°C (W)	140 °C (W)		140 °C (W)		140 °C (W)

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