balticFuelCells GmbH

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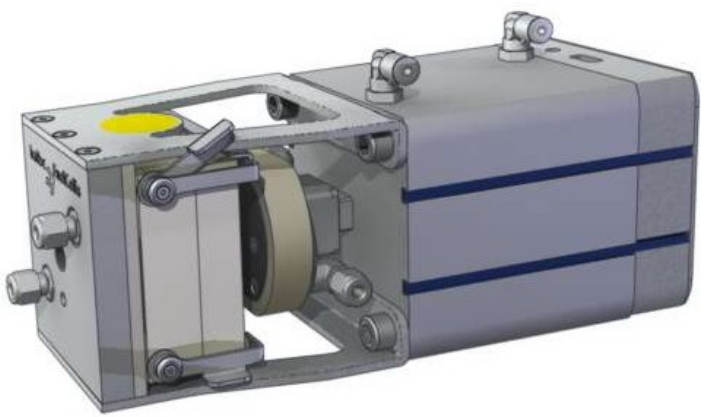
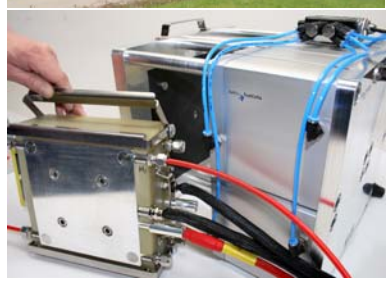
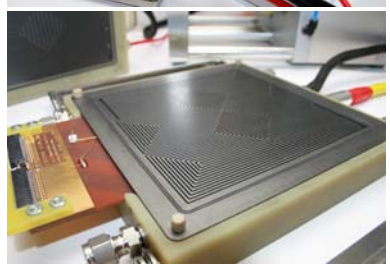
GERMANY

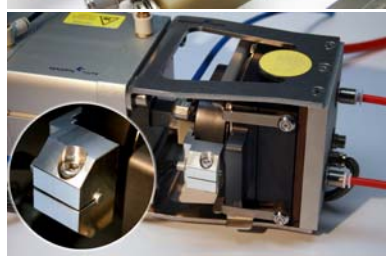
quality assurance with
quickCONNECTfixture

- qCf FC25/100 V 1.1
- qCf FC50/125 V 1.1









QA with conventional Test_Fuel_Cells:

- disassembly / assembly is time-consuming
- high risk of mistakes in assembly
- no regulation/control of impact pressure
- pressure impact on active cell area depends on

  - thickness of MEA/CCM
    GDLs
    CCBs
  - flat sealing
  - torque on screws

what about reproducibility?

all advantages of the qCf concept at a glance

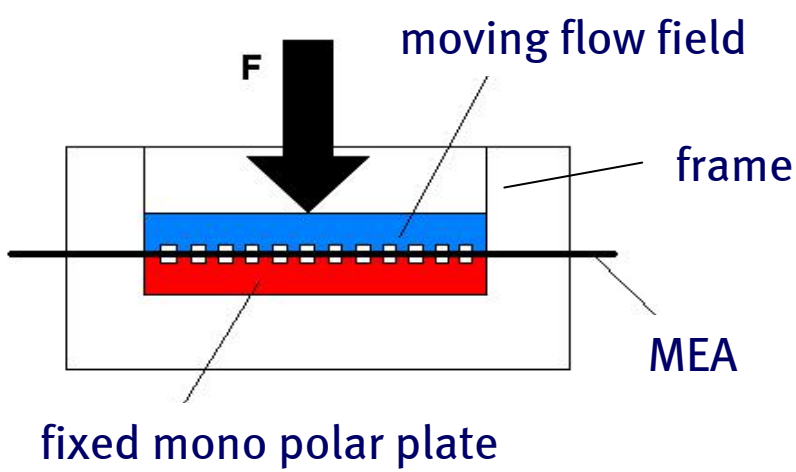
baltic FuelCells GmbH

feature	conventional test fuel cells	*quickCONNECTfixture*
adjustable contact pressure	○	✓
direct pressure impact on active fuel cell area	○	✓
operation up to 180°C	○	✓
no tools needed for exchange of specimen	○	✓
dismounting and mounting in less than one minute	○	✓
suitable for strong demands in quality assurance	○	✓
no decoupling of electrical or media supplies when dismounting	○	✓
optional equipment available	○	✓
online/in-situ thickness measurement (compression rate)	○	✓
easy exchange of flow fields	○	✓
adoption custom design	○	✓

principle of *quickCONNECTfixture qCf*

the idea

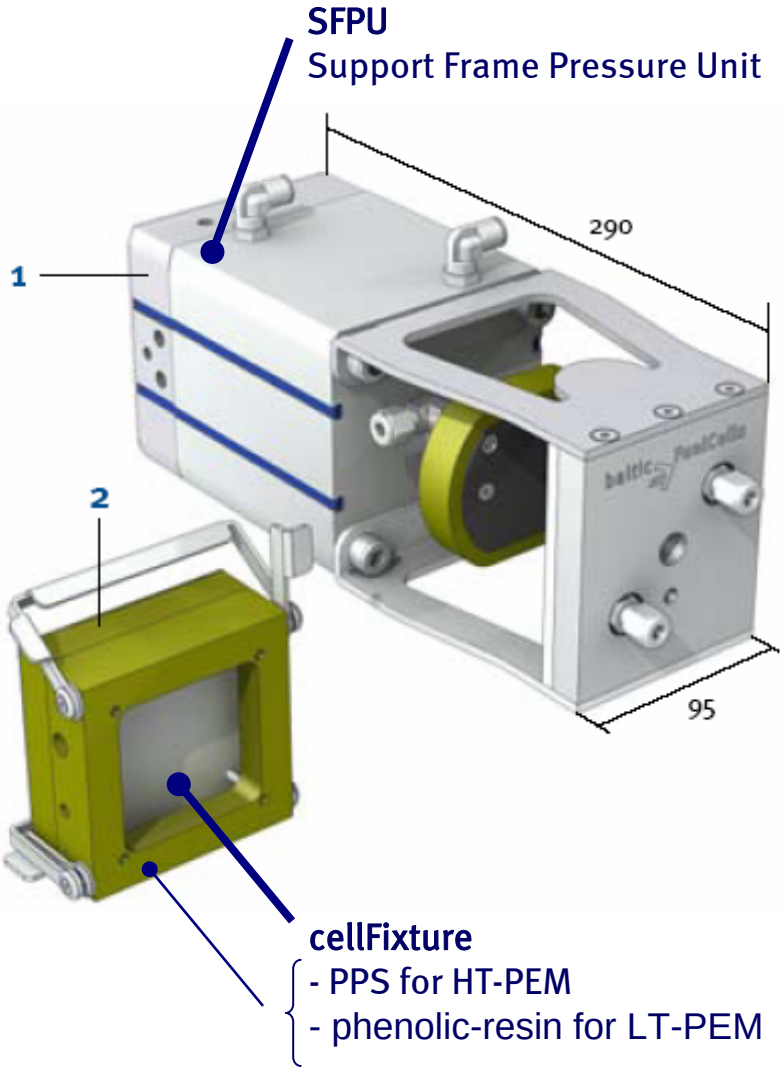
→ **design of a novel cell concept**
for the reproducible
characterisation of all internal
Fuel Cell components
(CCMs, MEAs, GDLs,
CCBs, flowfields, etc.)

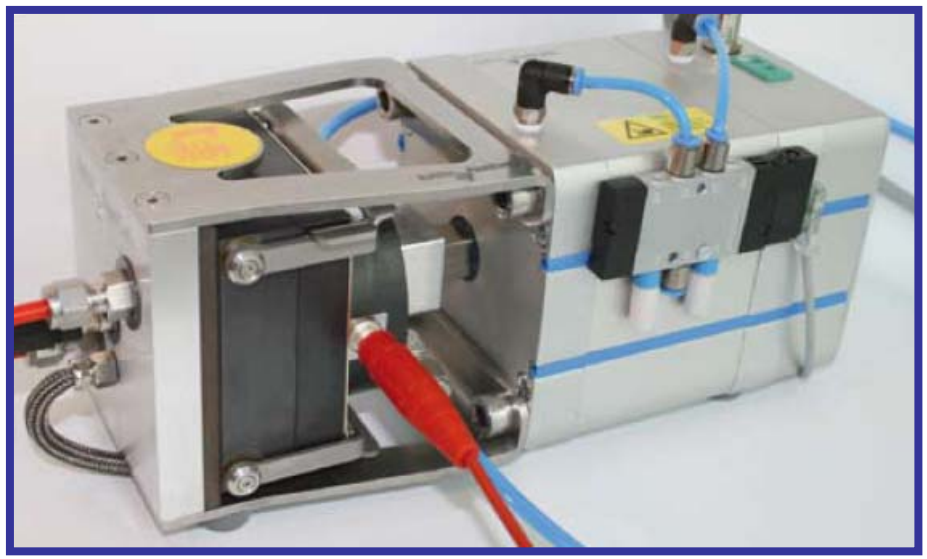


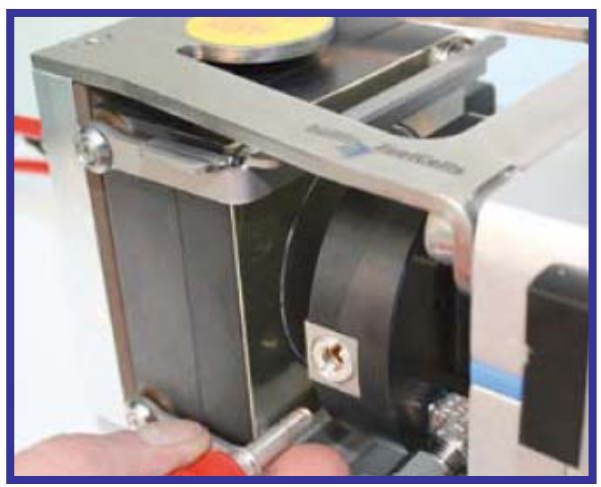
- adjustable pressure impact on the active Fuel Cell area (directly regulated by pneumatic actuator)
- independent of flat sealing and overall thickness of internal FC-components
- quick and tool-less assembly of cellFixture and installation to SFPU
- simple changing and verifying of different flowfields geometries

fully reproducible results for use in labs and QA!

cellFixture & SFPU

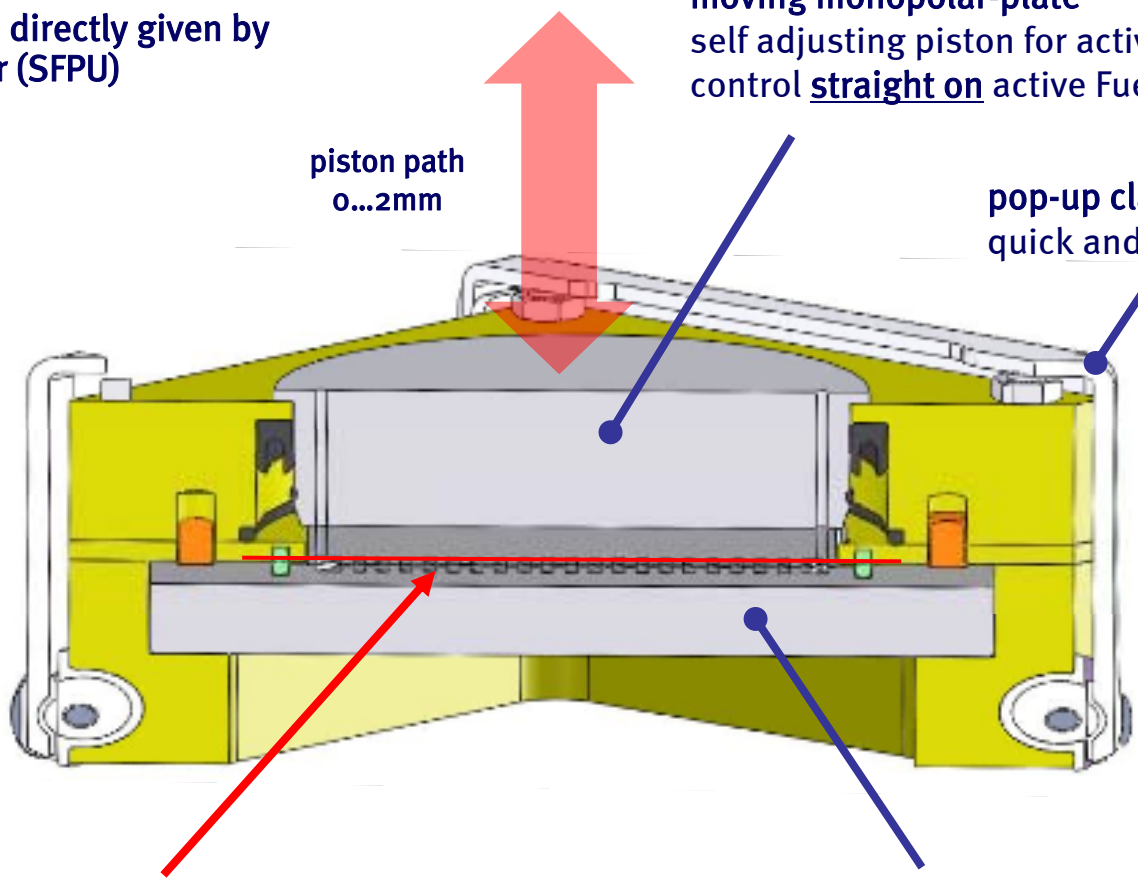






cellFixture cF cross-section & principle

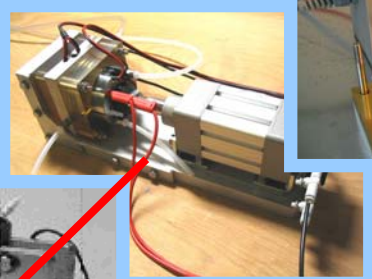
- advanced sealing concept allows adjustment of moving monopolar-plate
- contact pressure is directly given by pneumatic actuator (SFPU)

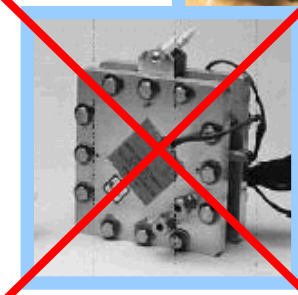


the evolution of *qCf*

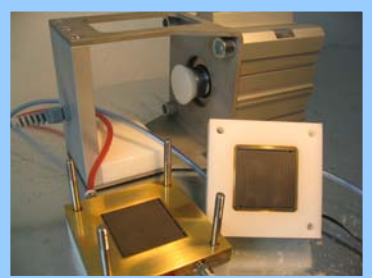
- July 2007: GEN 1.1 qCf 25/125
- October 2007: GEN 1.1 qCf 50/125

beginning
diploma thesis
@ HIAT
2002/2003

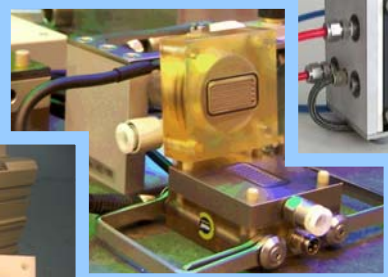




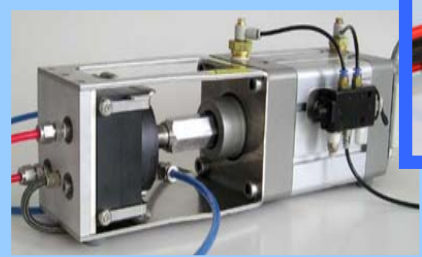
2nd stage
material improvm.



3rd stage
operation comfort
→ Gen_0



4th stage
quickCONNECTfixture
→ Gen_0.1



5th stage
quickCONNECTfixture
series production
→Gen_1.0
launched @ HMI'2007

state of the art
- not suitable for reproducible characterizations and QA!

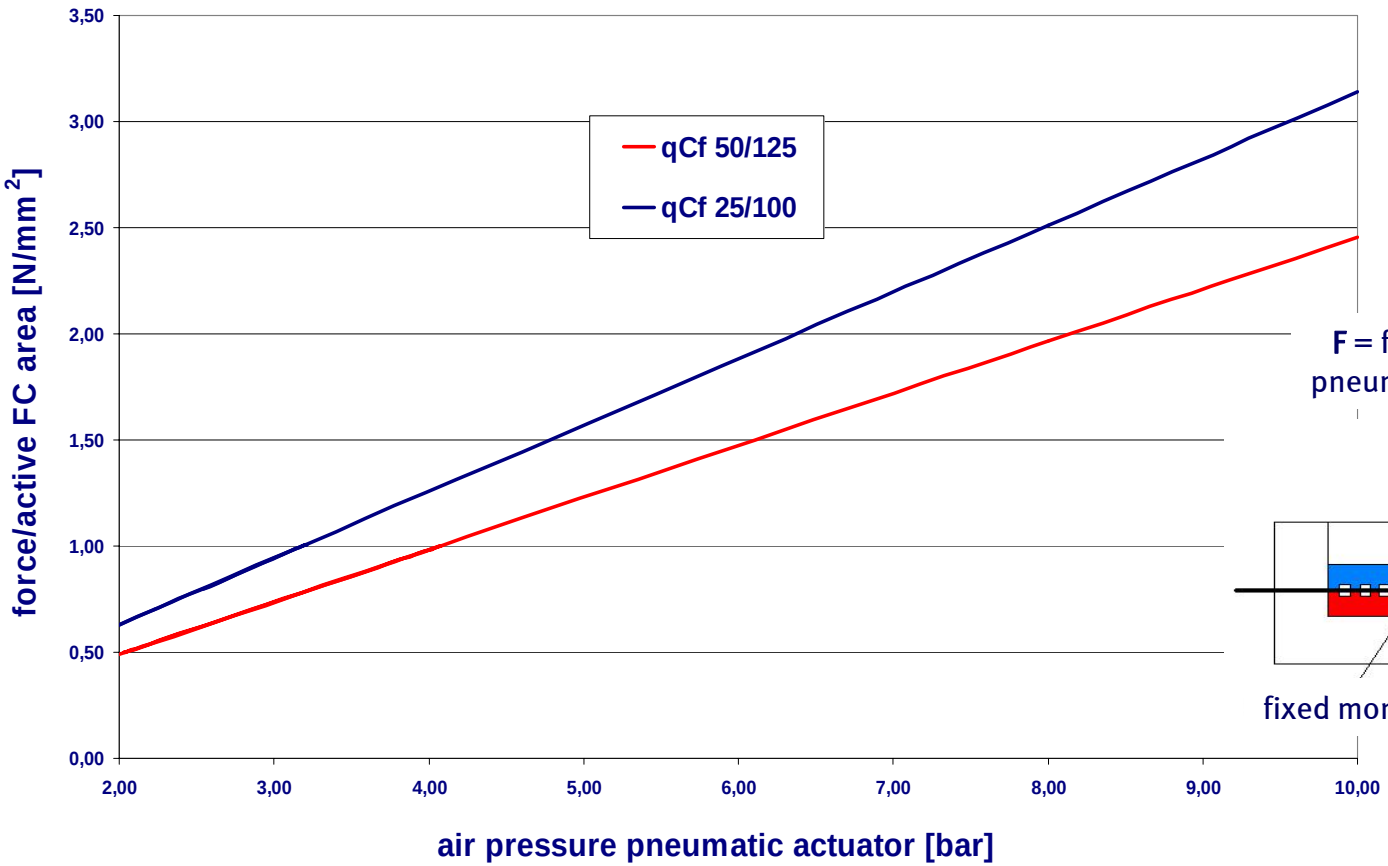
- 400 mm
- 11 kg
- 160 W heating
- hand operated piston valve

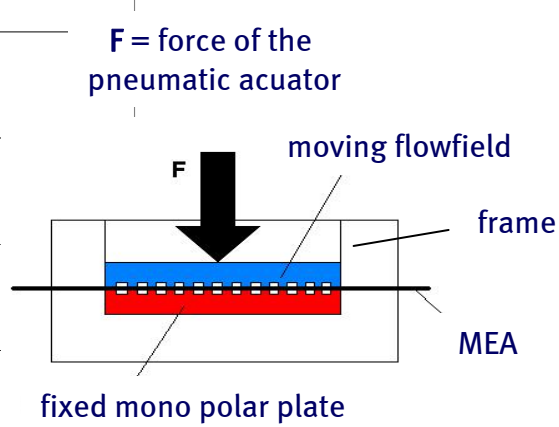
- 290 mm
- 5,9 kg
- 200 W heating
- electrical valve
- extra low ohmic resitance
- gold plated plates

>.. 20th century | 2004 | 2005 | 2006 | 2007

impact pressure on active area

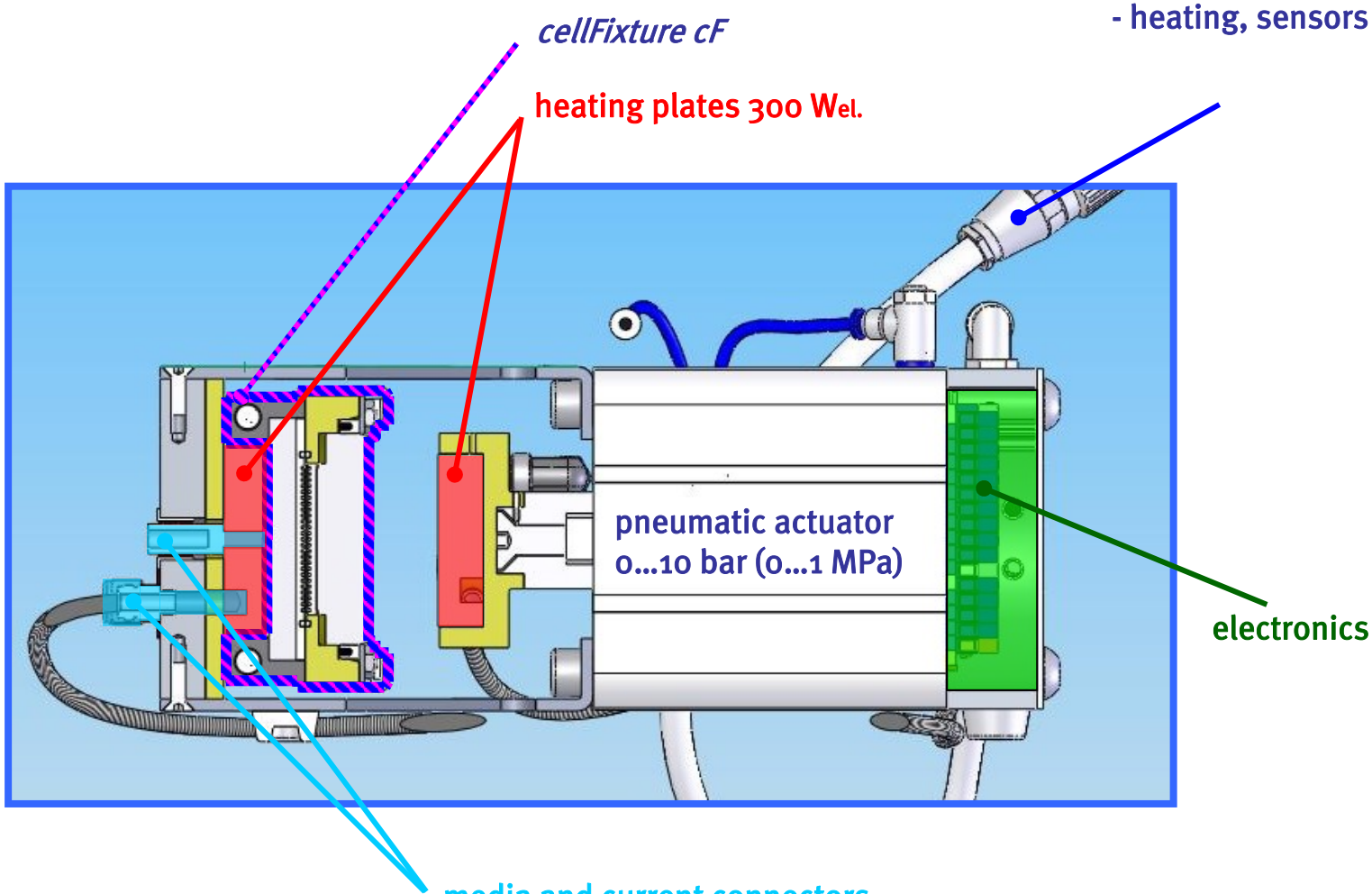
Control of impact pressure on active FC area by adjusting the air pressure of the pneumatic actuator!



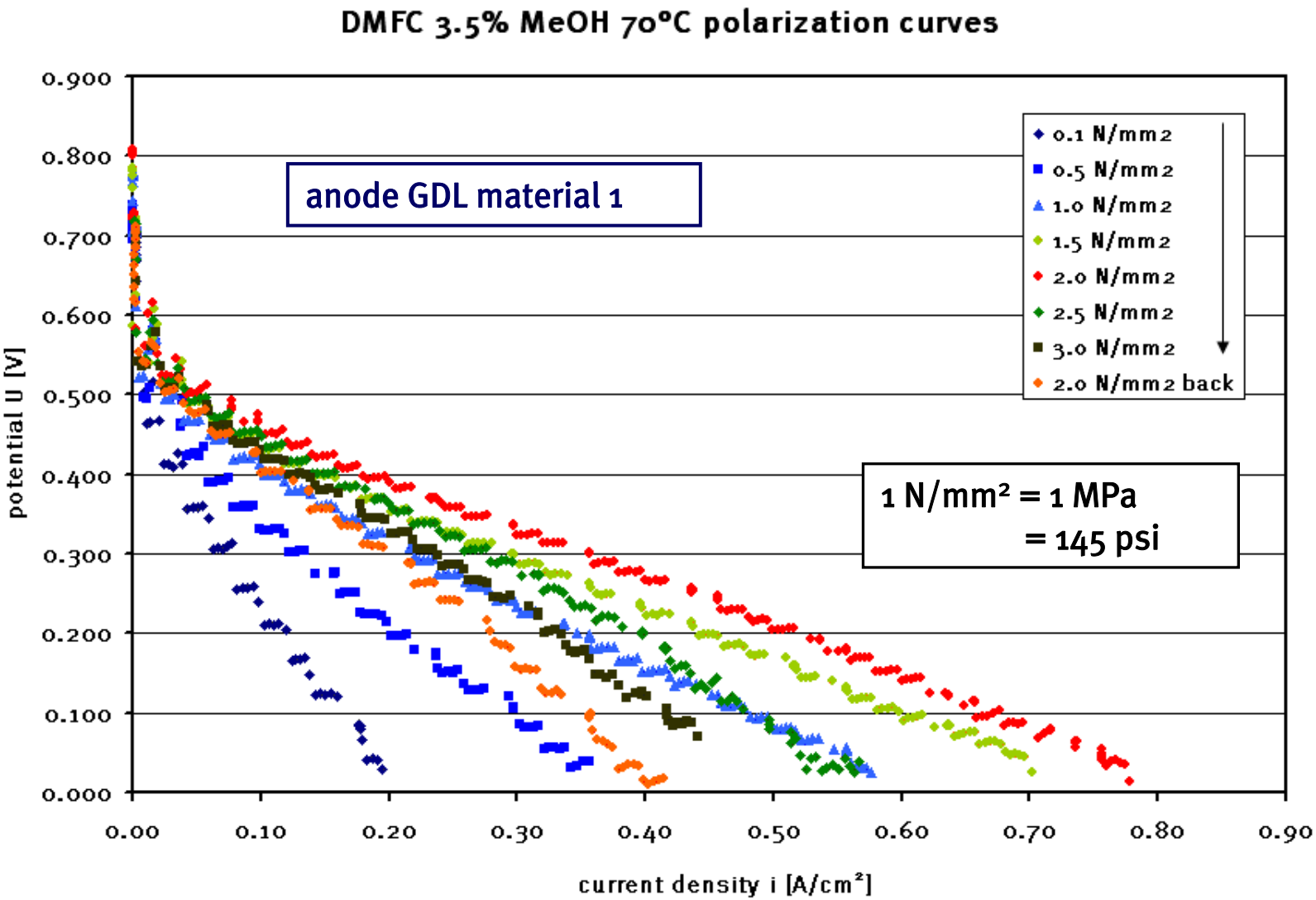


quickCONNECTfixture qCf

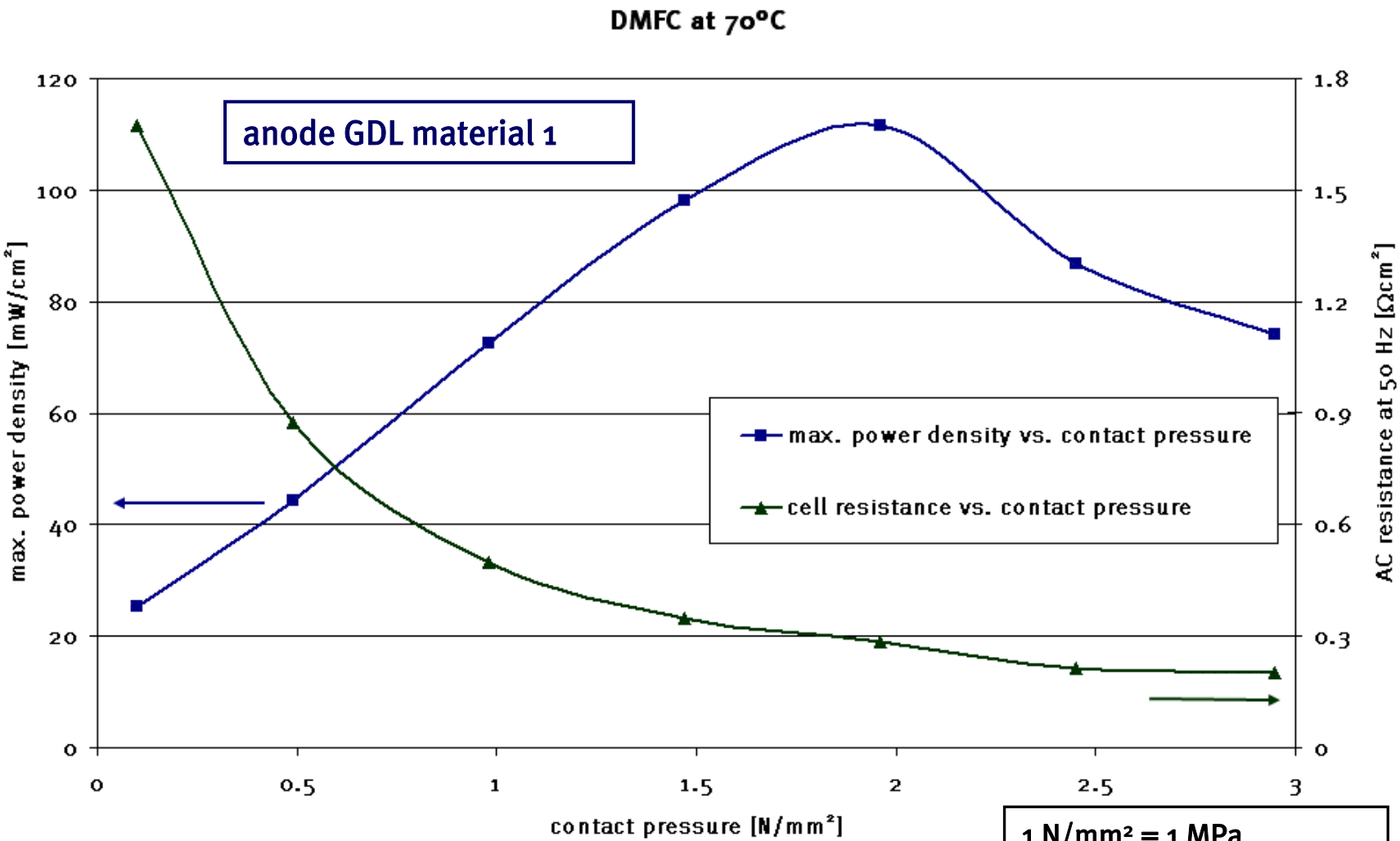
overview and cross section of qCf



results with *qCF FC25/100*



results with *qCF FC25/100*

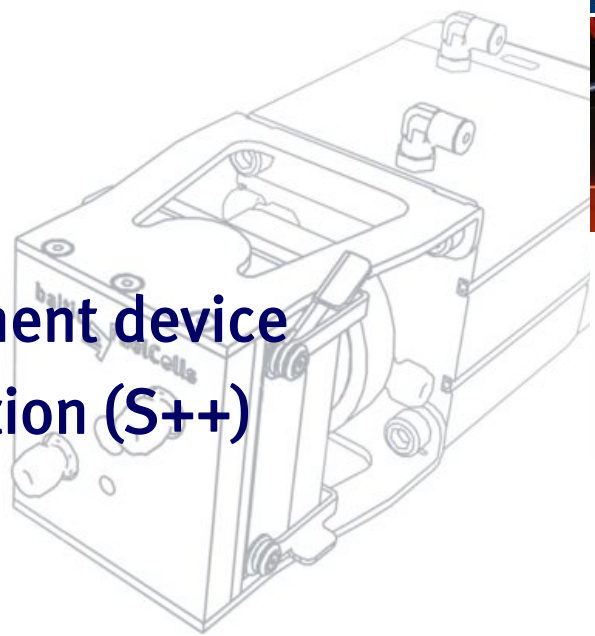


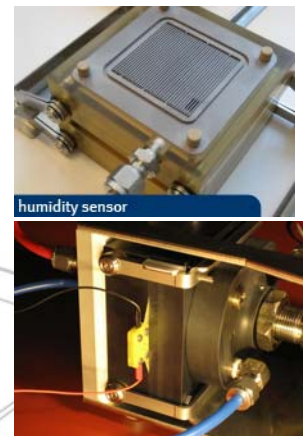
1 N/mm² = 1 MPa
= 145 psi

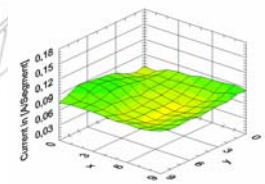
optional equipment OE

for *quickCONNECTfixture qCf FC25/100*

- HS_humidity sensor
- TCU_temperature control unit
- DHRE_Pt reference electrode
- CMD_compression measurement device
- CDD_current density distribution (S++)





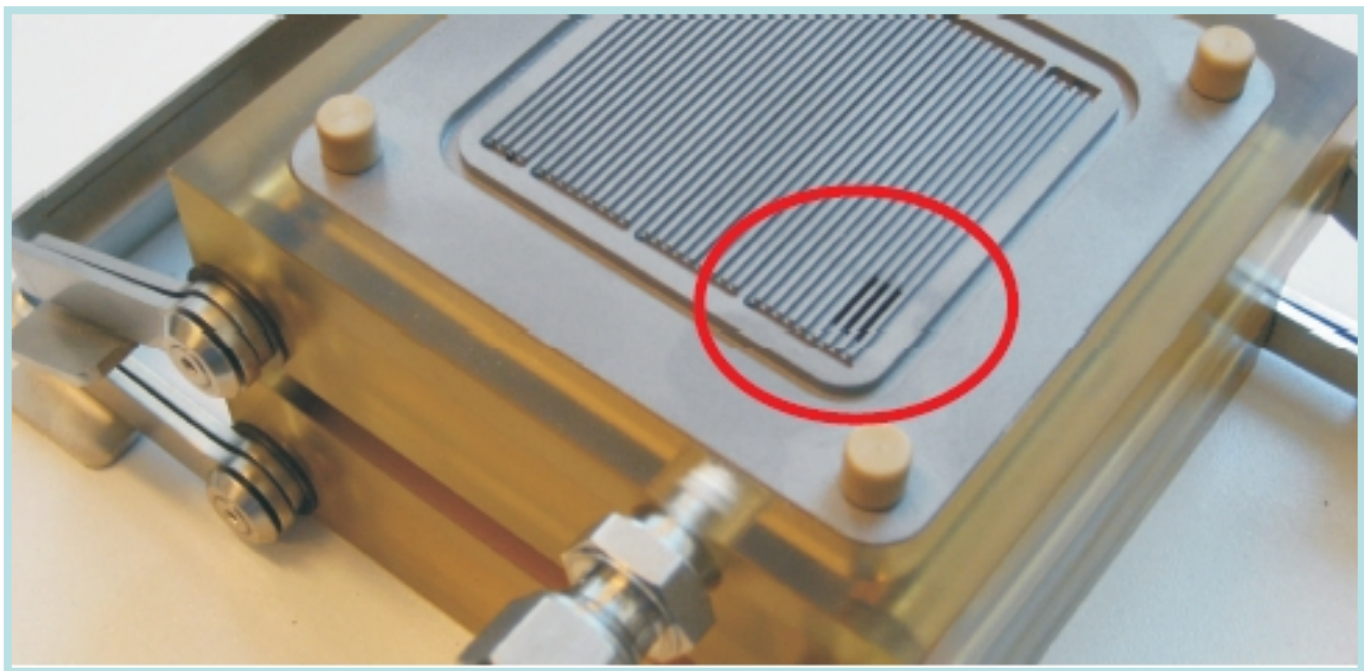


OE - HS

Integration of a

humidity sensor (capacitive)

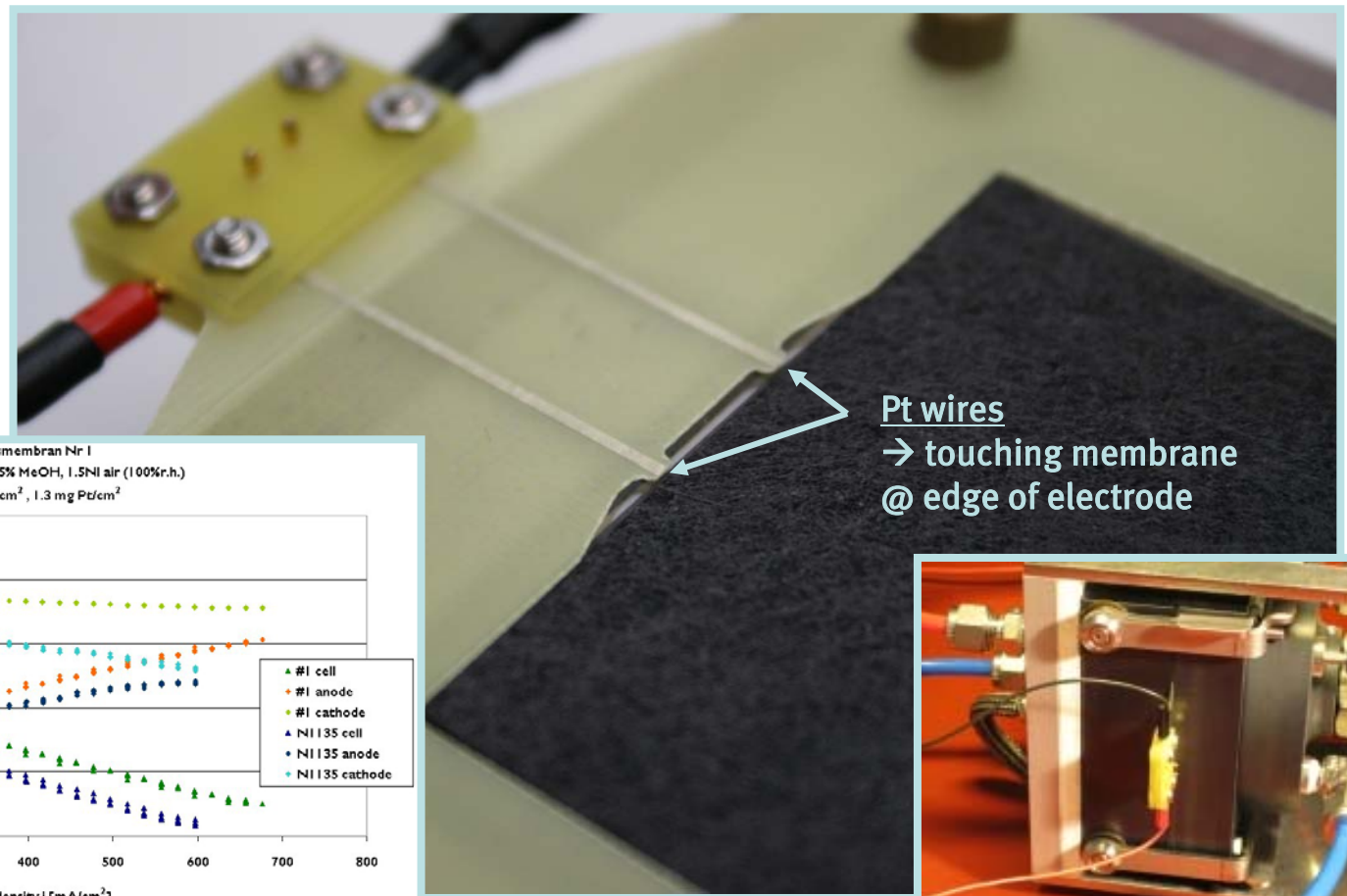
in the channel ground of the flow field

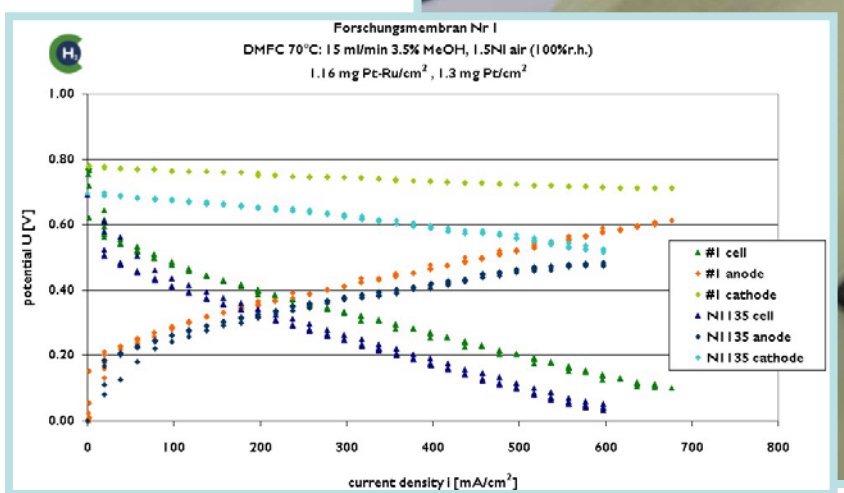


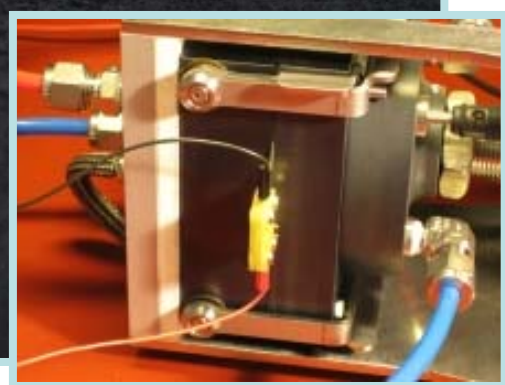
OE - DHRE

Dynamic
Hydrogen
Reference
Electrode

- over potentials of anode and cathode
- simple installation on cathode side as additional layer (t: 0,2 mm)





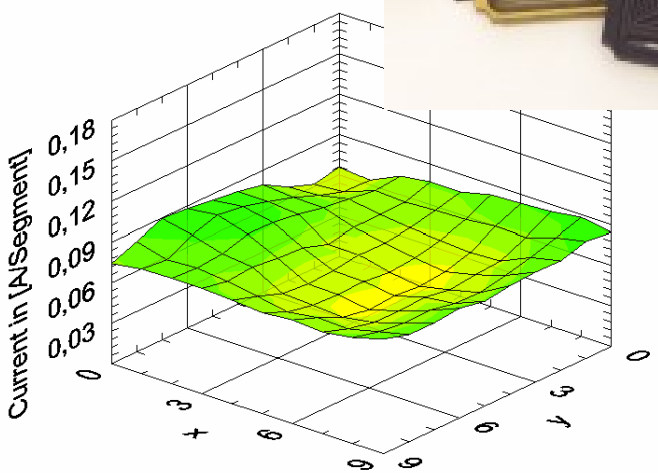


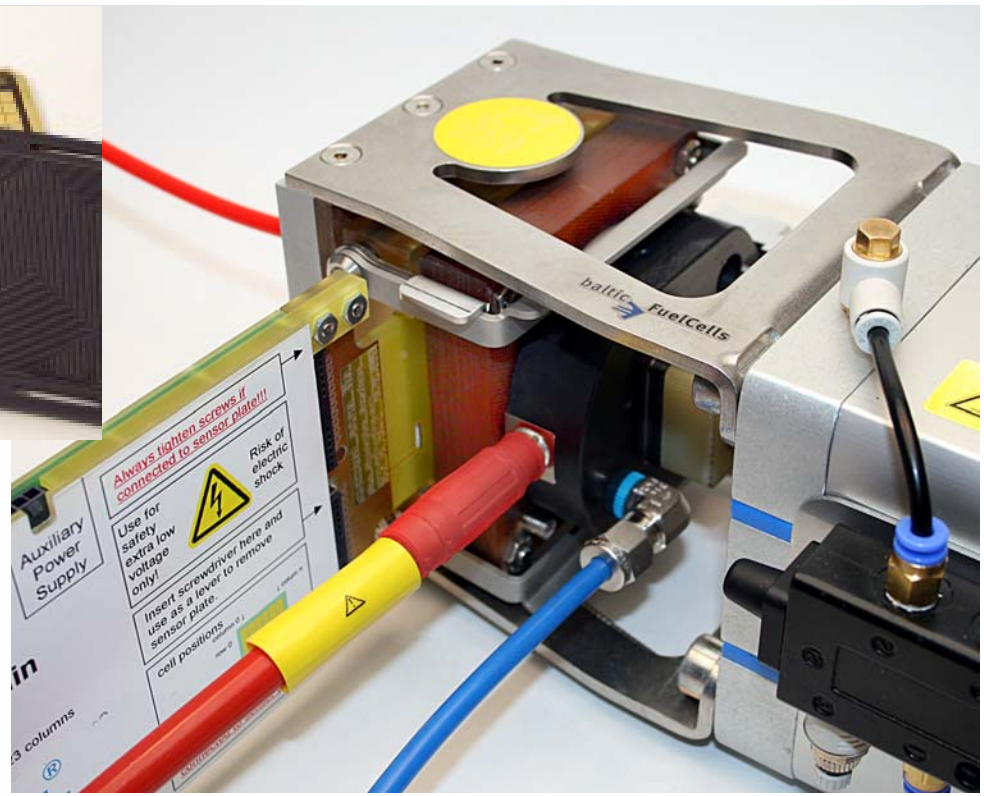
OE - CDD

integration of a

Current Density Distribution measurement

Current
Scan
Lin (S++)

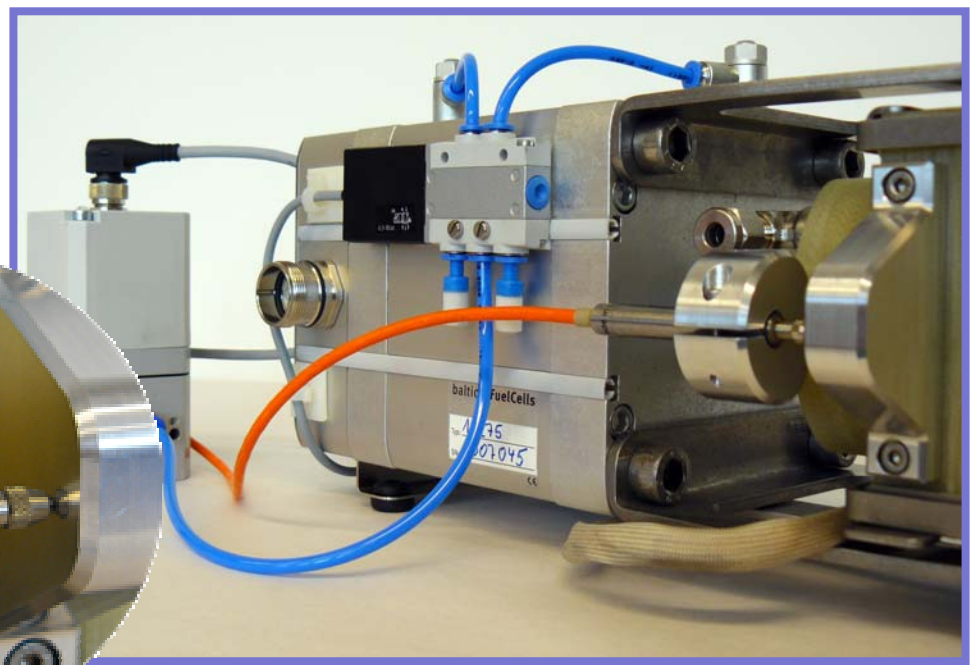




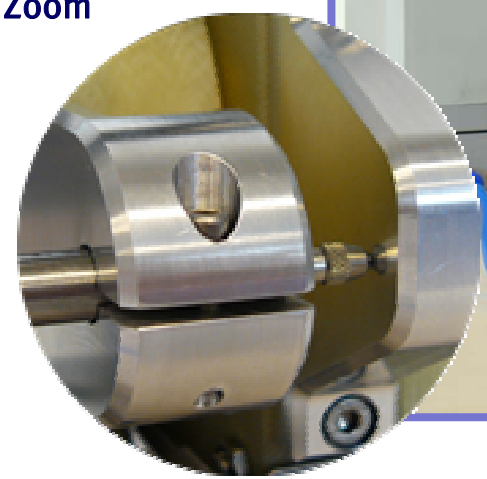
OE - CMD

compression measurement device CMD

- Compression [%, µm] = f (F; pressure)
- Change of thickness = f(t) with constant or adjusted pressure impact
- for determination of thinning-effects of membranes (Res.: < 1 µm)

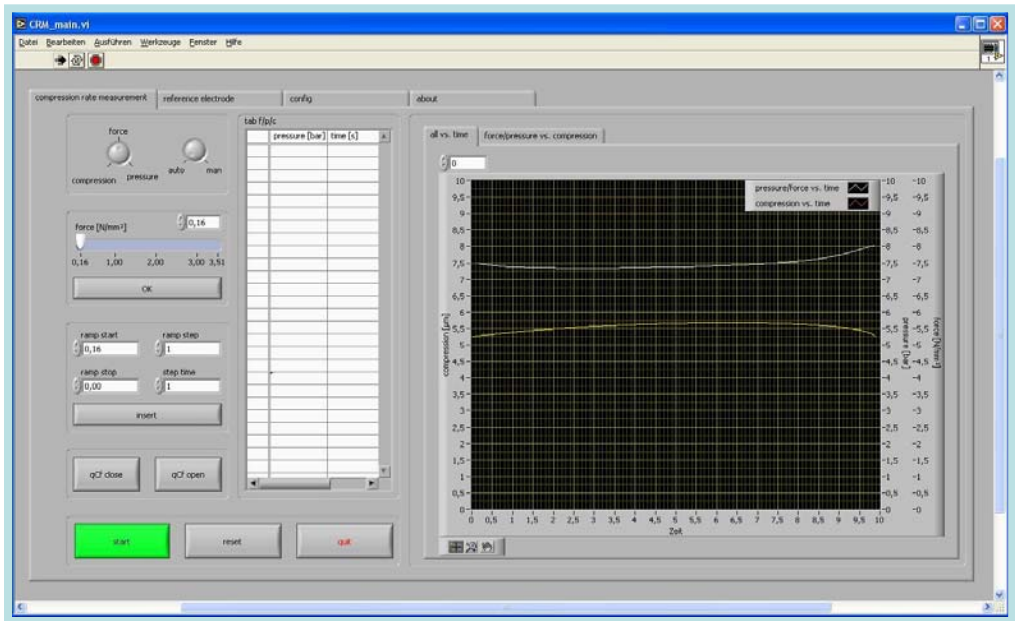


Zoom



electrically controlled precision pressure regulator

OE CMD screenshots of CMD qCf software

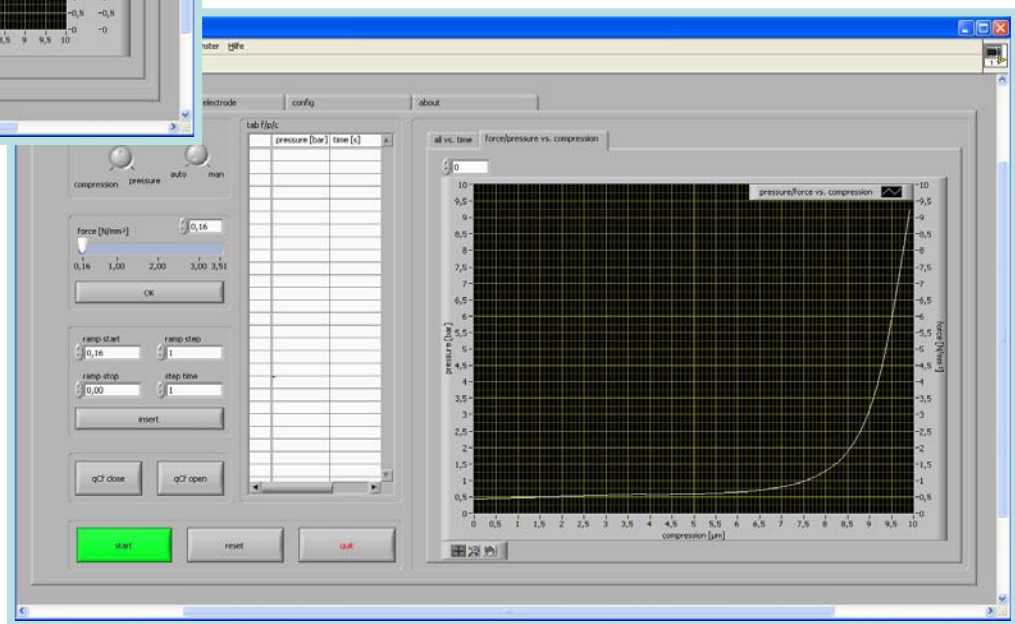


Software environment included in the CMD-package!

Modi#1:

compression & force vs. Time

[% or N / sec.]

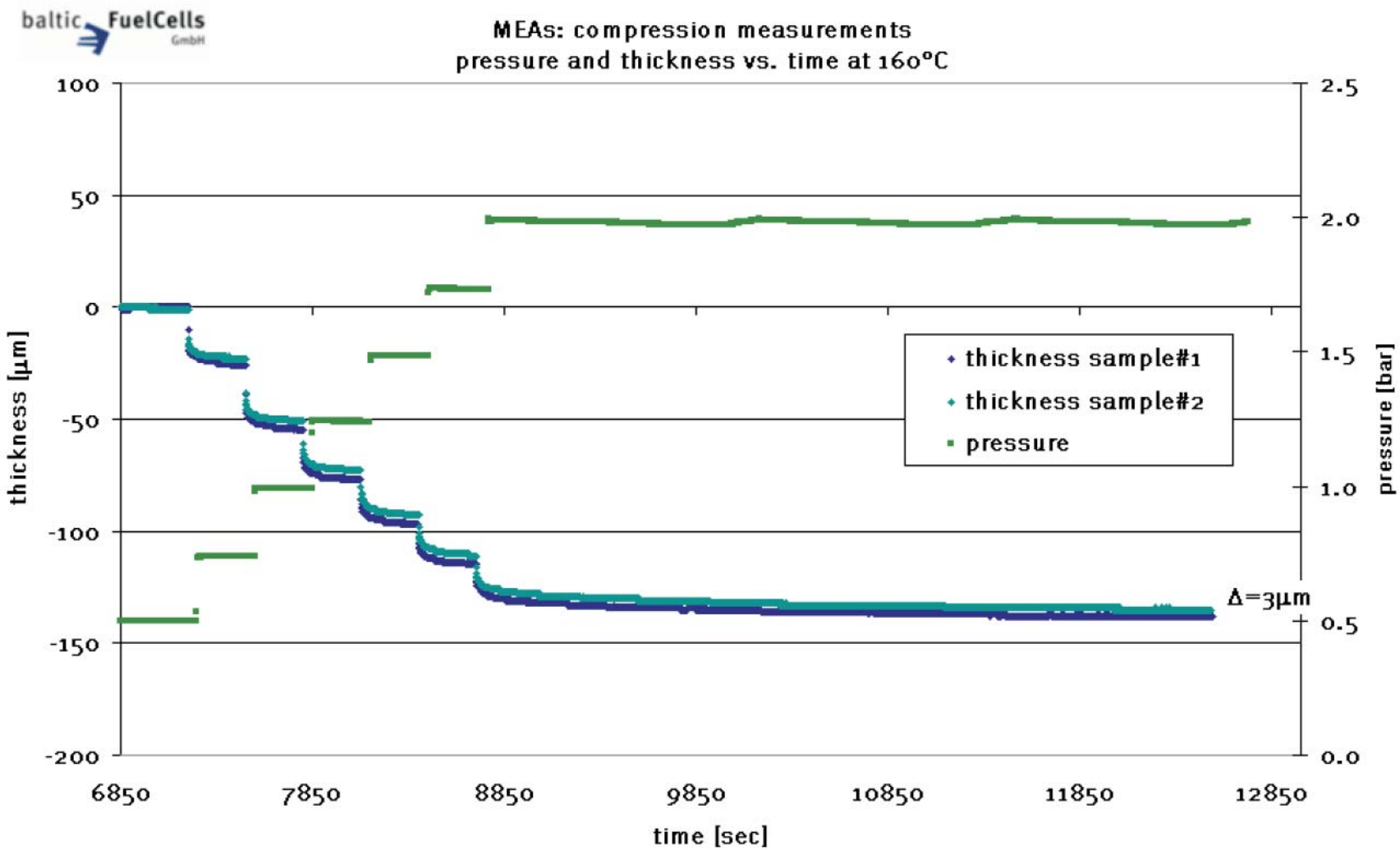


Modi#2:

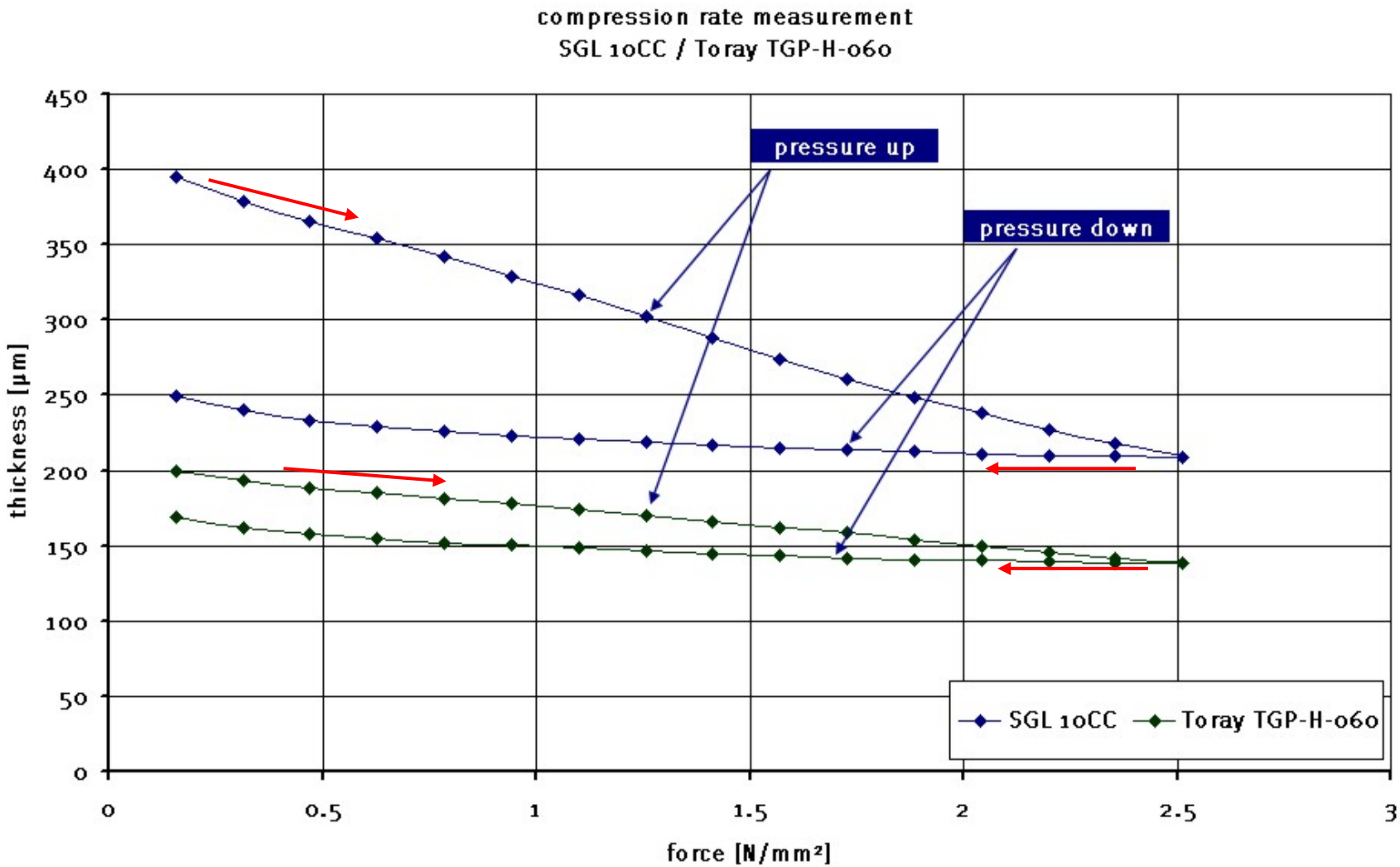
compression vs. Force

[µm / N/mm² or. bar]

OE CMD in-situ measurements → MEA-characterisation

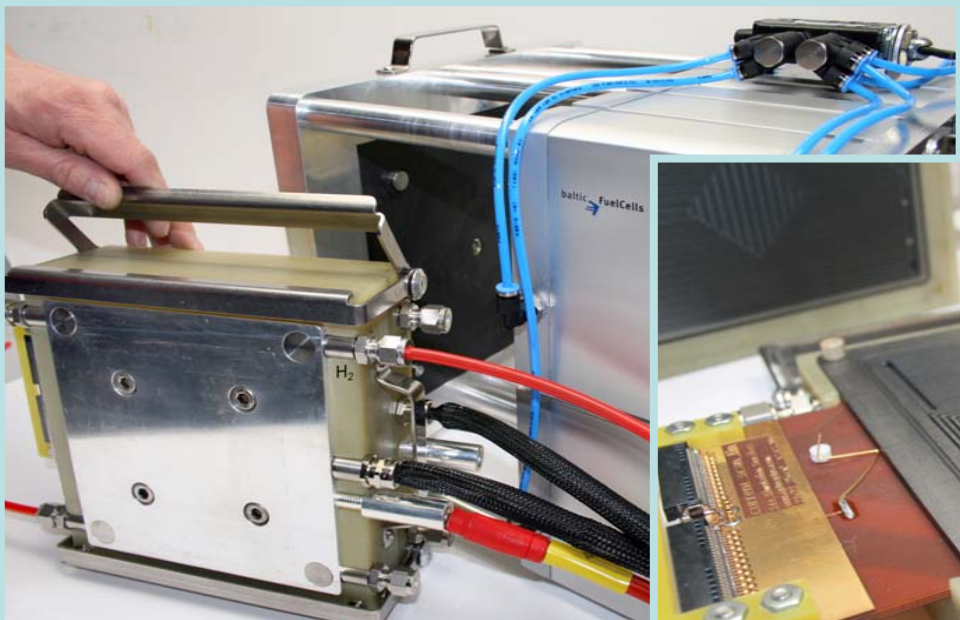


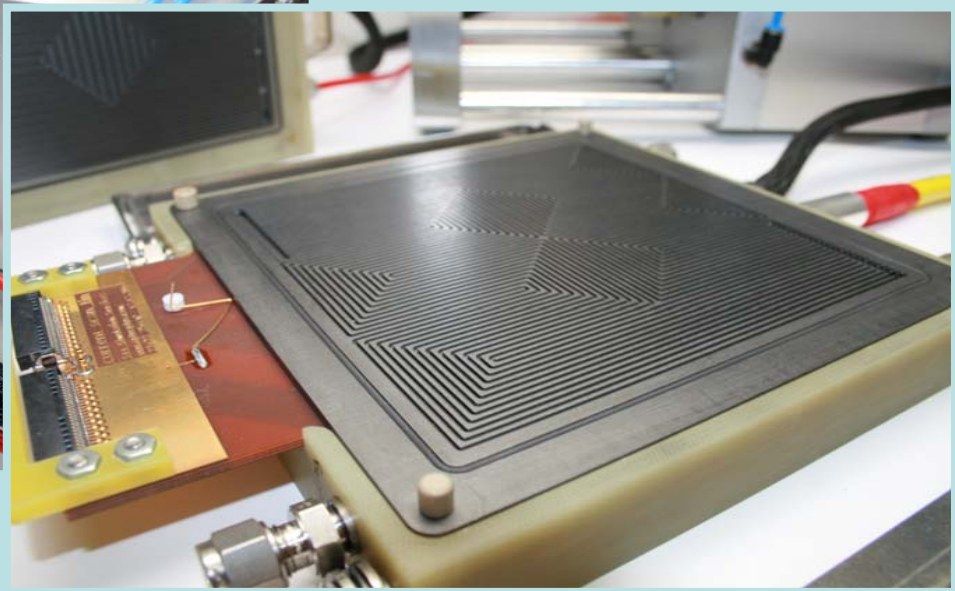
OE CMD in-situ measurements → GDL-characterisation



custom design CD and engineering

- standard cell areas 25 and 50 cm² FC-area with CD-flowfields
- customised qCf with 2 … 268 cm² active area realised
- qCf-specific: liquid cooling/heating; integration of humidity sensors
- QA-specific: consulting in test bench questions and QA opportunities





Thank you for your attention!
For further questions, please do not hesitate to get in contact with our team…

www.balticfuelcells.de