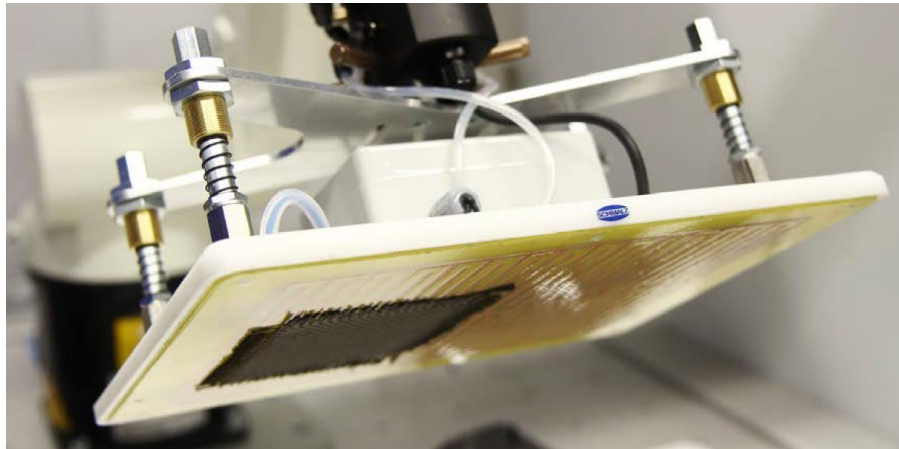


Application of electroadhesive grippers for automated handling of semi-finished composites



8th International CFK-Valley Stade Convention

25 June 2014

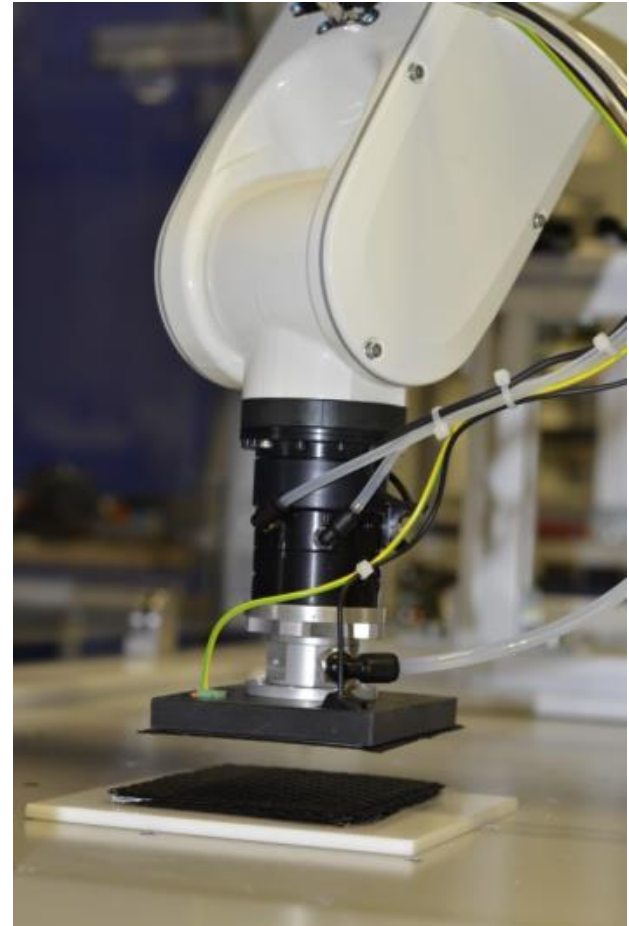
Aline Defranceski, J. Schmalz GmbH

J. Schmalz GmbH

State of the Art

Industrialization of Electroadhesive Grippers

Conclusion



Dynamic growth is our passion!

Established

1910 by Johannes Schmalz

Family owned

Dr. Kurt Schmalz, Wolfgang Schmalz



Market importance

Worldwide leading provider of automation, handling and clamping systems based on vacuum technology

Employees

Around 800 worldwide, trainee quota 14 % (Germany)
Creation of about 200 jobs in the past five years (worldwide)

Innovation indicators

About 400 patent applications and granted patents
8.5 % (of turnover) spent on research and development

Subsidiaries

In 15 countries all over the world

Certificates

DIN ISO 9001 (Quality Management) since 1994
DIN ISO 14001 (Environmental Management) since 1997
...

Products and business divisions

Vacuum Components



Vacuum Gripping Systems



Vacuum Handling Systems



Vacuum Clamping Systems



Extract of Products





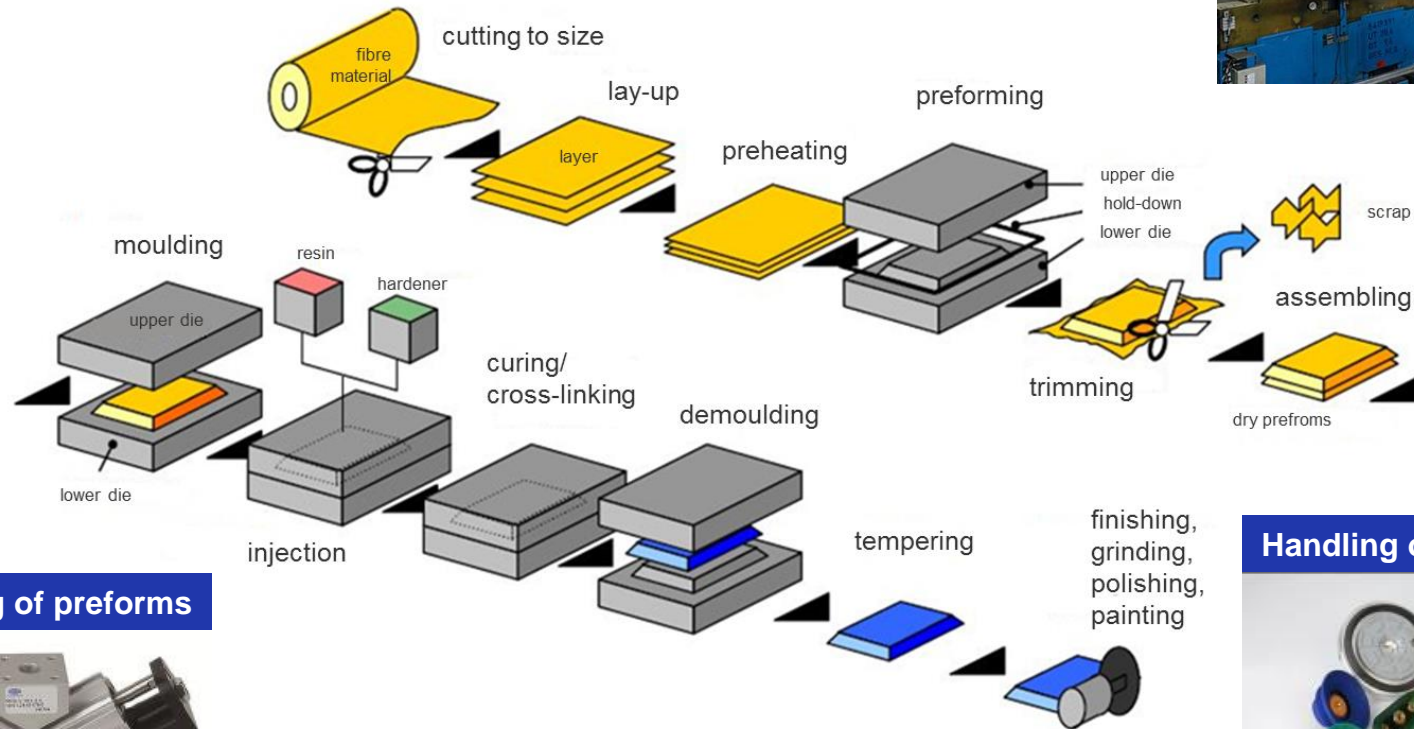
Picking parts up from cutter table



Stack Handling



Handling of preforms



Handling of preforms



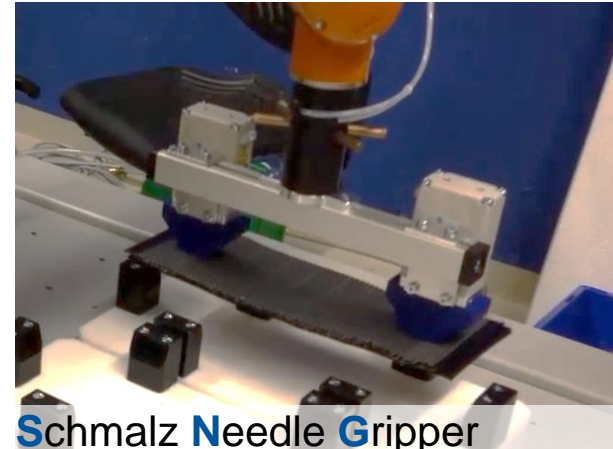
Handling of cured parts



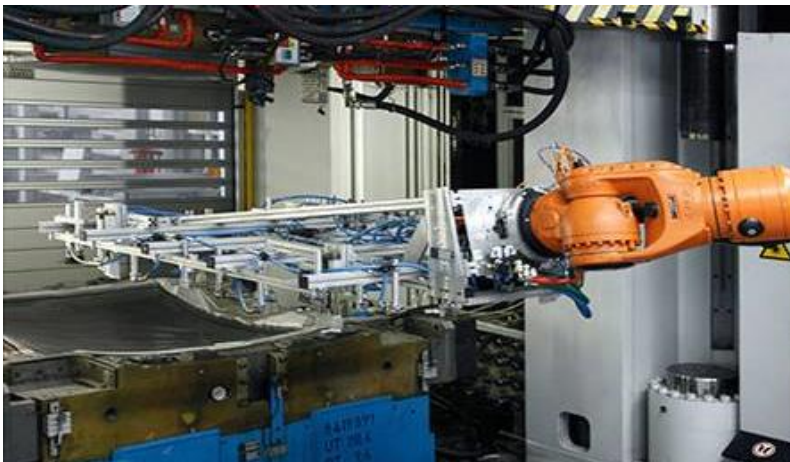
Ply Handling



Stack Handling



Insert Preforms & Remove Cured Parts



Clamping

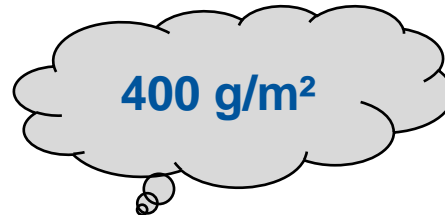


- energy efficiency

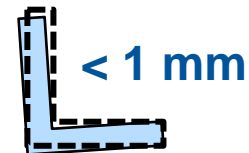
Gripper	Contact Area	Energy Consumption
SCG	5,7cm ²	~ 100 Watt
SCGe	2,5 cm ²	~ 40 Watt
ES	1 m ²	< 1Watt



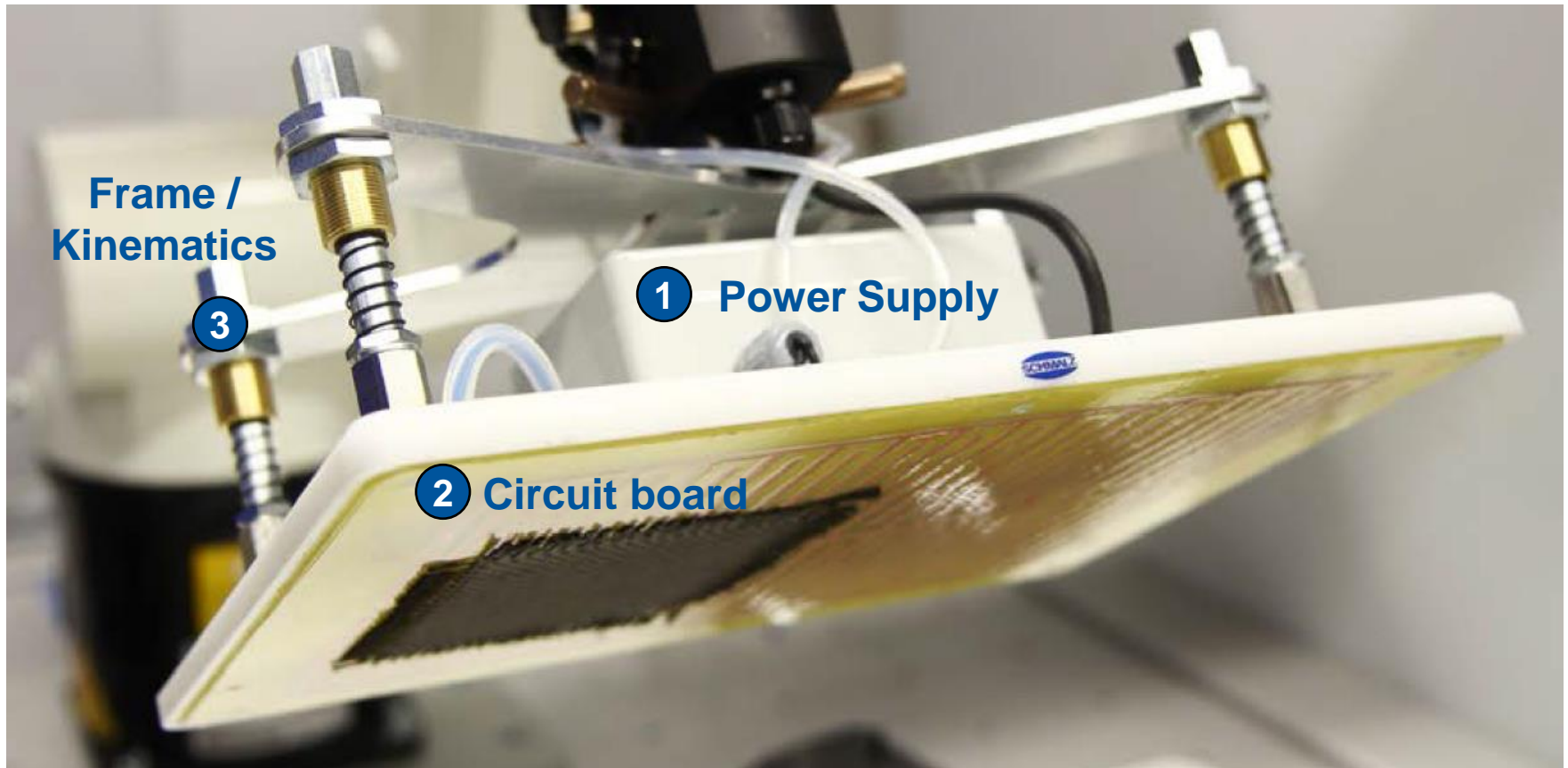
- light weight

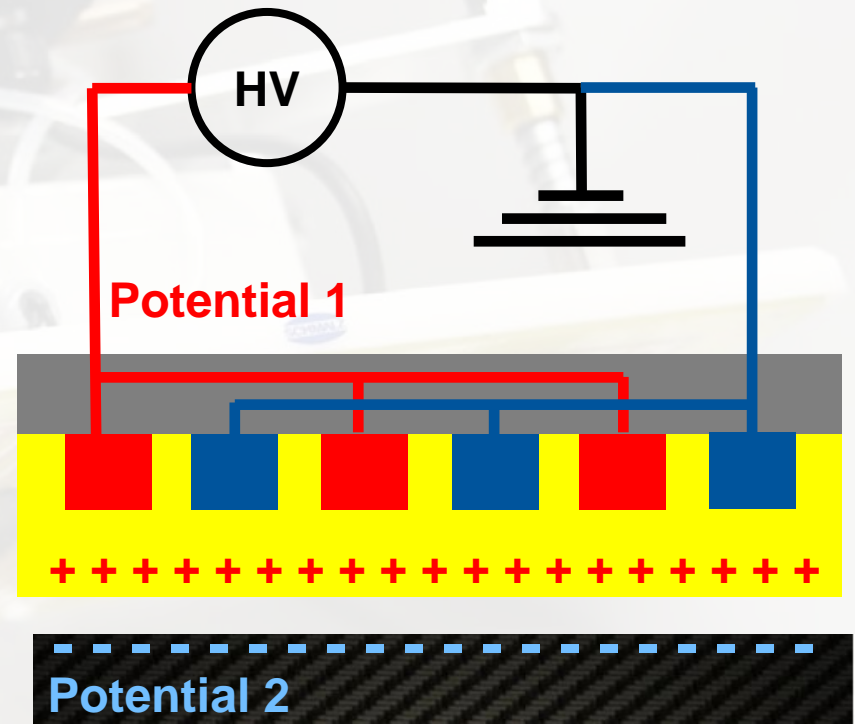
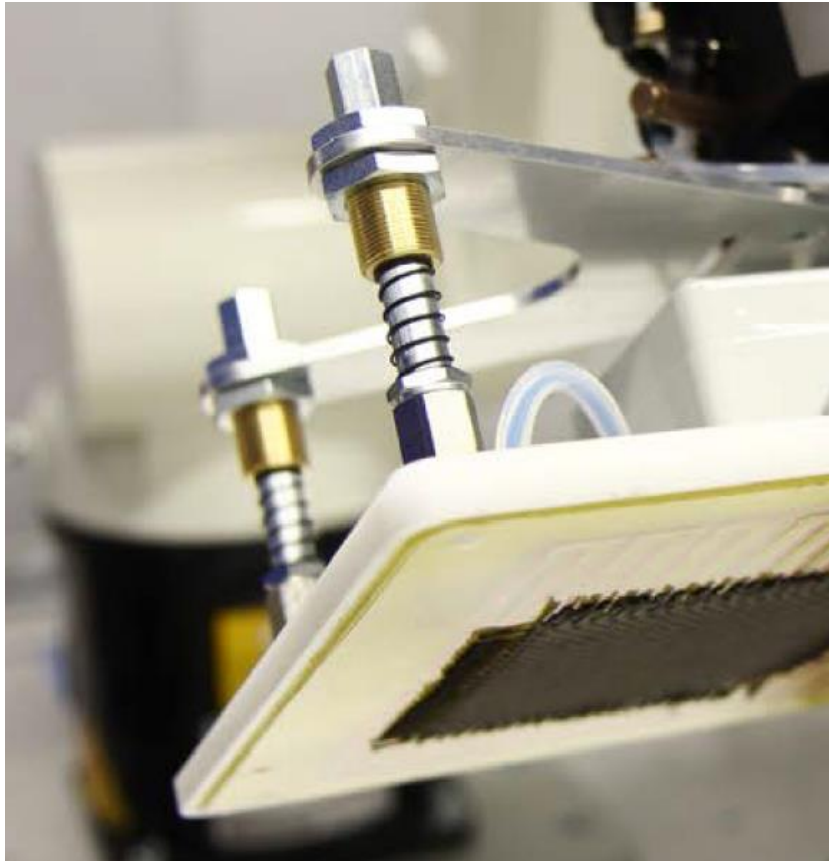


- precise handling



Cost efficiency





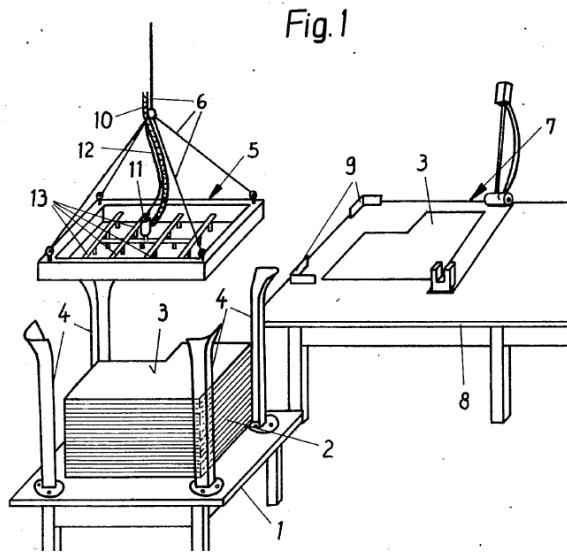


Fig. 1

Daimler DE2404863

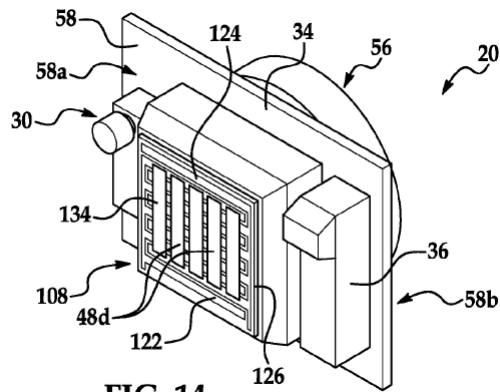


FIG. 14

Boeing WO2012177340



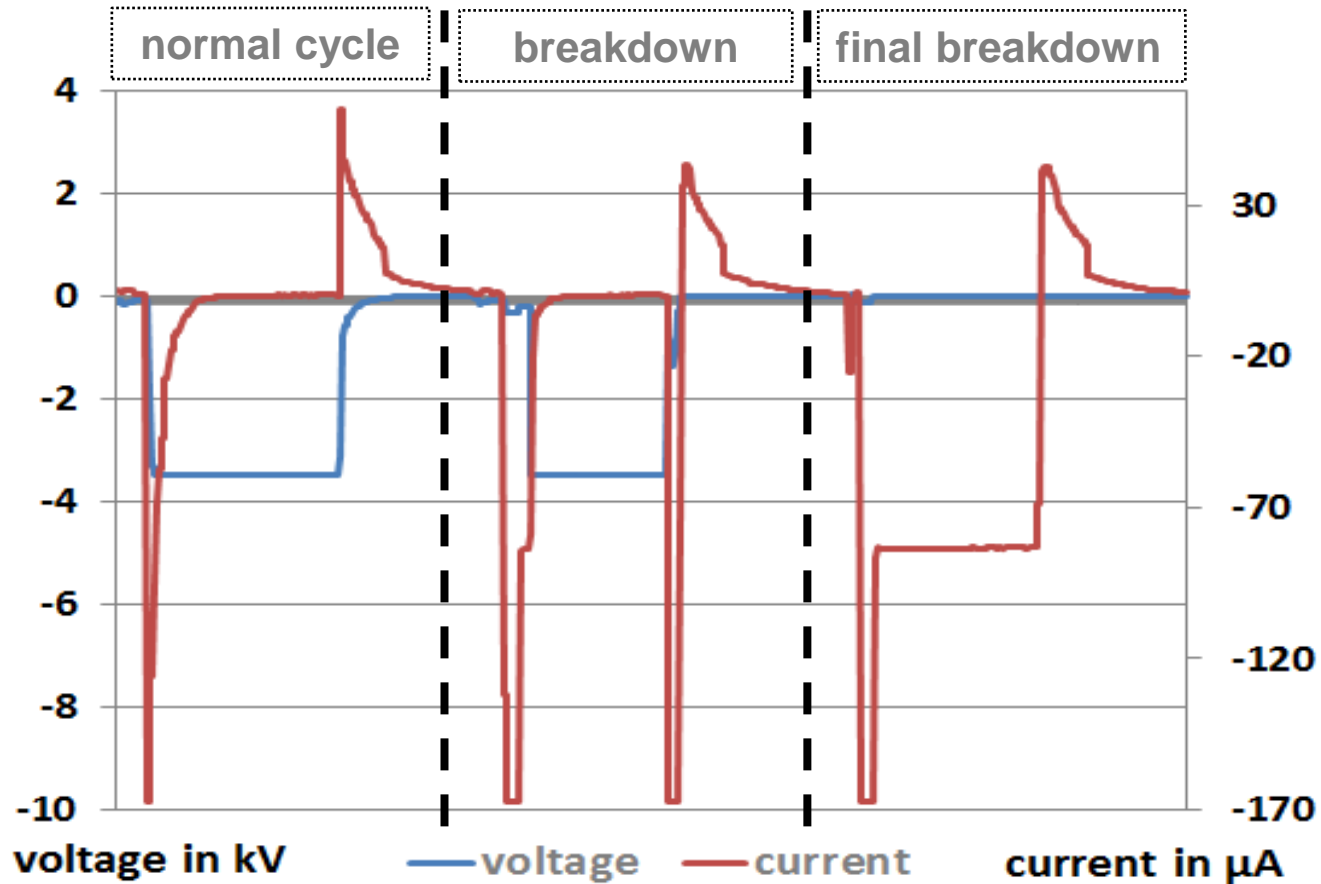
SRI / Grabit Inc.



Fraunhofer IPT

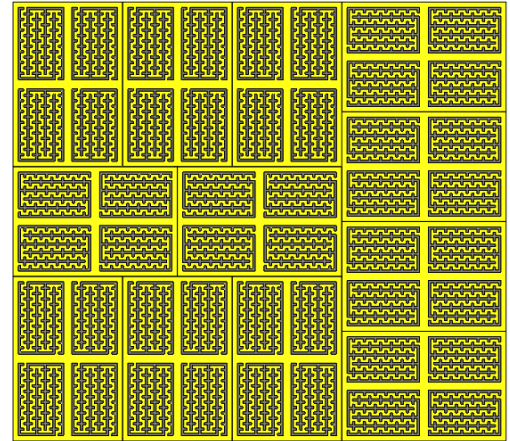
- ensure security
- determine field of handling materials
- realize process stability





- **Condition Monitoring** detects damages and breakdown
- **Grounding concept** of gripper and machine environment prevents damage in case of breakdown
- Operator should **not touch** conductive materials while handling
- Establish high voltage power supplies with support **safety critical functions**

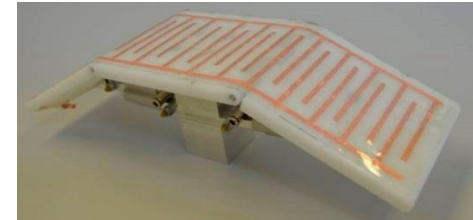
- + Full area gripper
- + Flexible area design
- + adjacent areas are controllable independently
- + low energy consumption even for huge area grippers



- High voltage switches are expensive and bulky
- To avoid many switches, custom area design is needed
- Sticking ply tend to peel

Outlook: combination of full area electroadhesive gripper and additional gripper components to ensure process stability

- + light weight area gripper ($\sim 400 \text{ g/m}^2$)
- + downsized kinematics and handling devices
- + customized shapes
- + selective control allows predictable fixing and sliding of material
- 2,5 dimensions, no stretching of gripping area

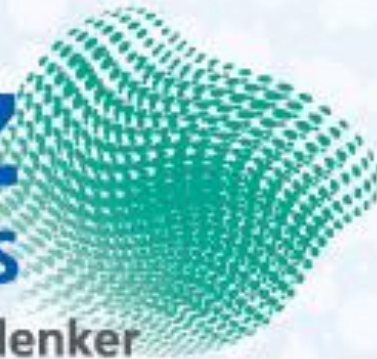


Outlook: combination of full area electroadhesive gripper and additional gripper components to ensure process stability

- **Condition monitoring** can **ensure security** of machinery and operator
- Scope of **handling materials** depends on **material characteristics**
- Potential is not exploited yet
- **Combination of common grippers** and electroadhesive full contact areas
discloses cost efficiency and process stability

Schmalz Innovationspreis

Der Wettbewerb für Vorausedenker



JETZT BEWERBEN!

www.schmalz.com/30-jahre
Einsendeschluss: 31. Juli 2014

Aline Defranceski

Pre-Development, Vacuum Components

J. Schmalz GmbH

Aacher Strasse 29

D-72293 Glatten

Tel.: +49 (0)7443 2403-163

Aline.Defranceski@schmalz.de

www.schmalz.com