Delivering more than a Smart Material: Bending Actuators as Application-Ready Components

Dr.-Ing. Moritz Hübler

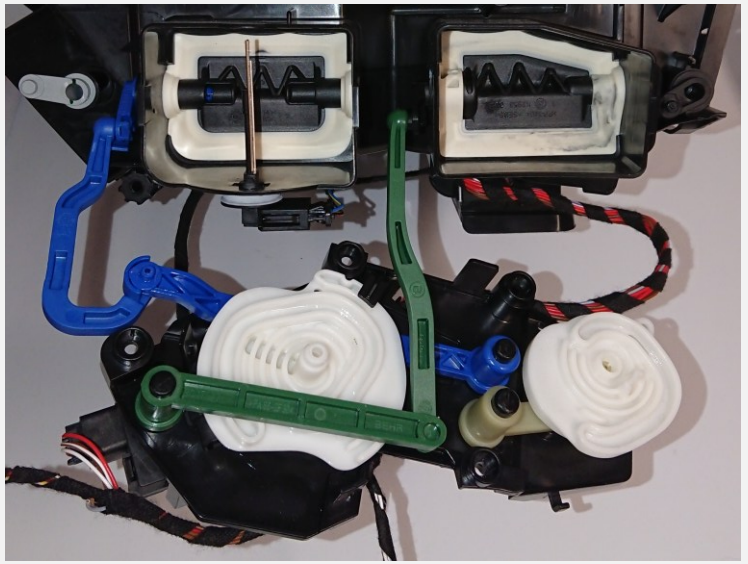
CompActive

Actuation –
General Practice using Mechanics

Front-end for the customer

Only adjusting the airflow…

Complex system behind



…needs all that!

Actuation function

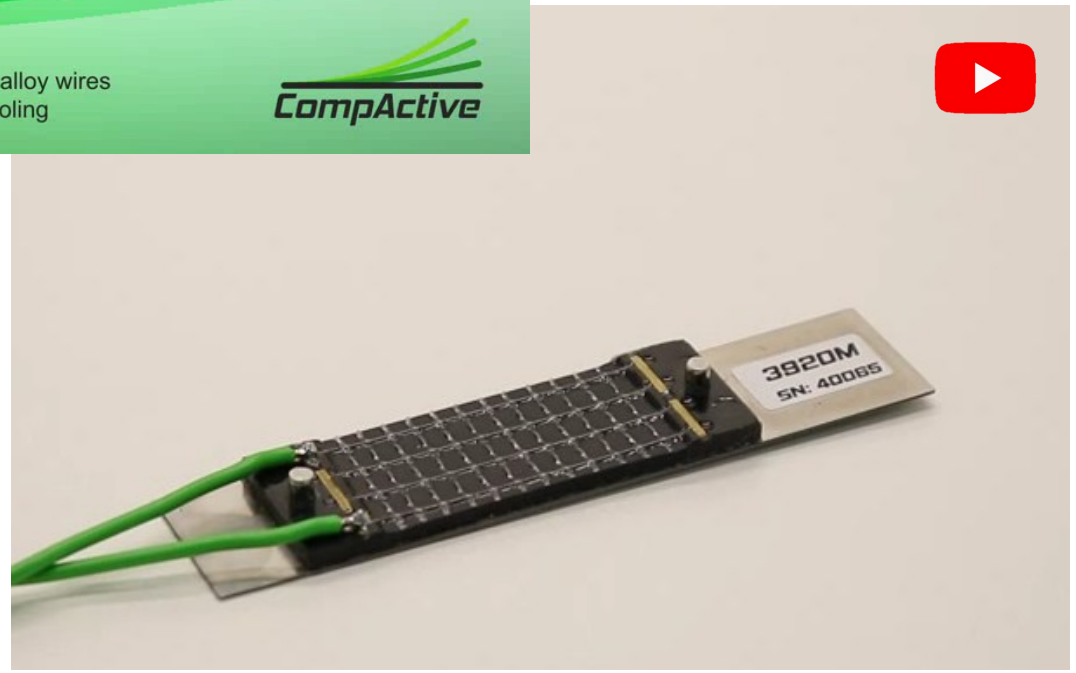
are

complex to realize

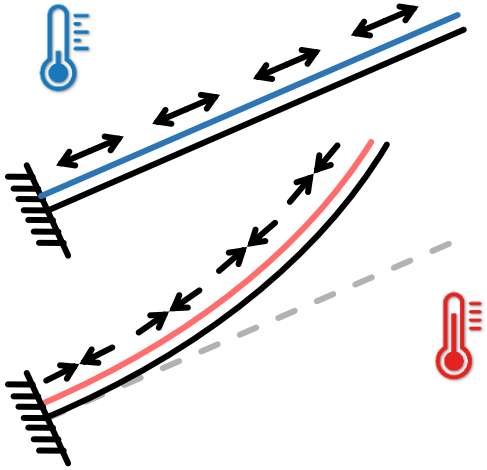
and

the possibilities are limited

Actuation – Principle of *Curve*® Bending Actuators



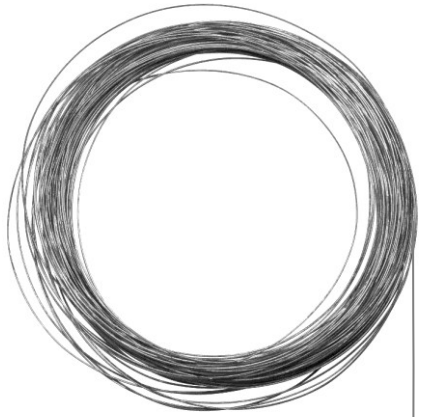
Getting rid of mechanics by integrated SMA wires



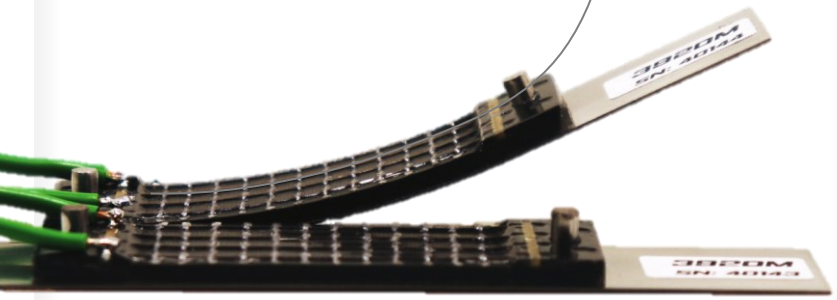
Thin and Powerful Actuators with High Deflection

From Wire to Standardized Actuator Modules for your Tailored Solution Bending Actuator

From SMA-Wire…



…to Bending Actuator



Shape Memory Alloy Wire

Contracting on heating

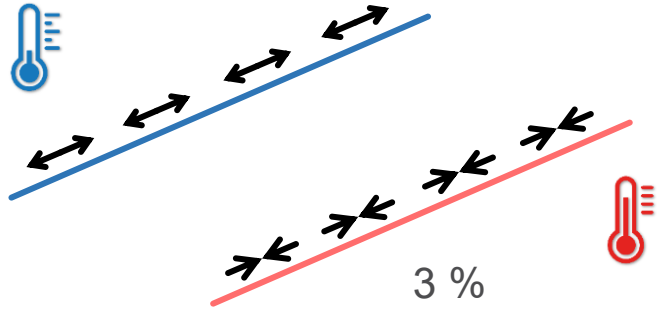
- high force
- high energy density
- small deformation

Curve® Bending Actuator by CompActive

Bending on heating

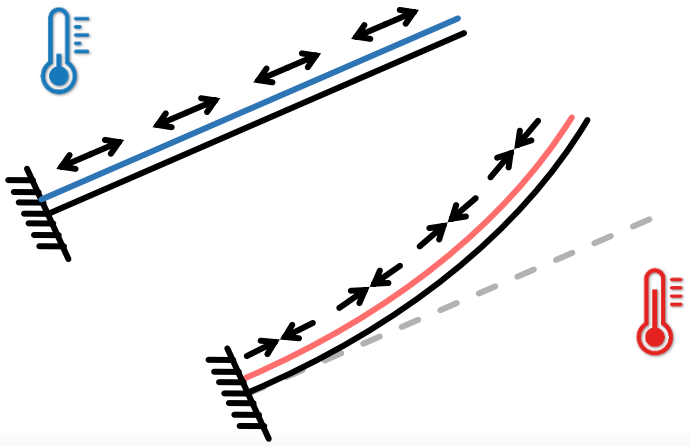
- planar structure
- integrated actuator
- high deformation

From Small Contraction…



3 % shorter

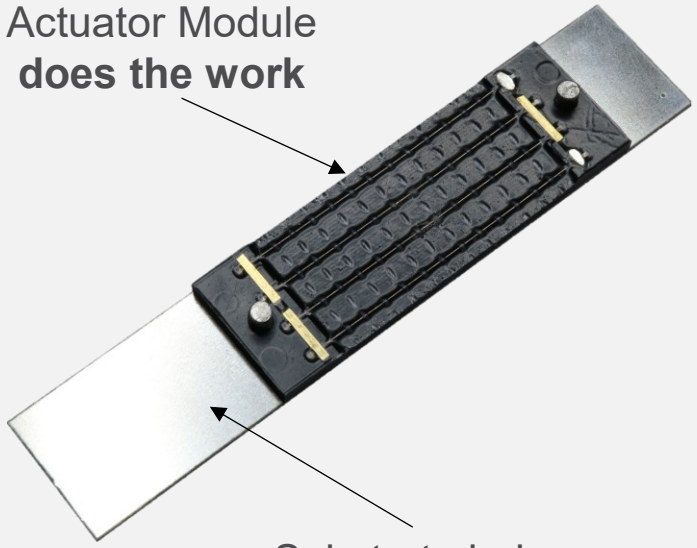
…to Significant Tip Motion



Curve® Bending Actuator

Bending Actuator

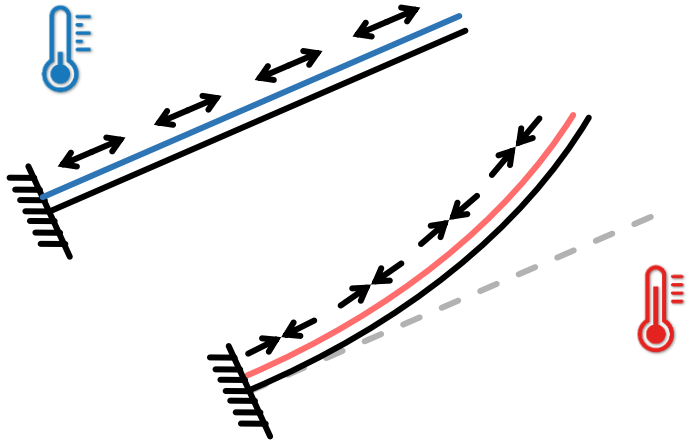
Actuator Module
does the work



Substrate below
guides it

Functional unit of actuator module mounted on steel sheet.

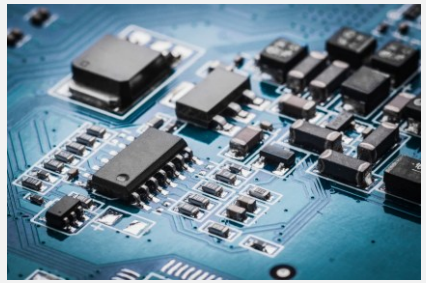
Temperatures



Curve® Actuator

Actuation start:	70 °C
Max. deflection:	110 °C
Max. temperature:	>> 180 °C

Operation mode

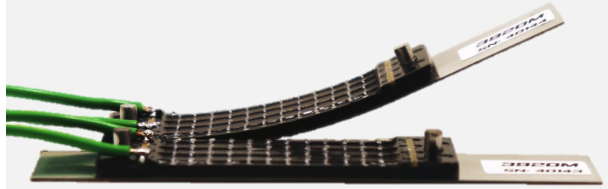


At the push of a button "plugged"
Direct heating by electricity

Autonomous "unplugged"
External heating near heat sources

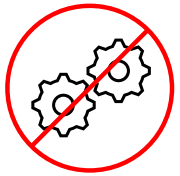
Unique Properties of Technology

Unique Properties
due to material integrated principle



- No Mechanics
- Lightweight
- Compact
- No Kinks / No Gaps
- Scalable
- No Hydraulics / Pneumatics
- No High Voltage

Special Features
by getting rid of mechanics



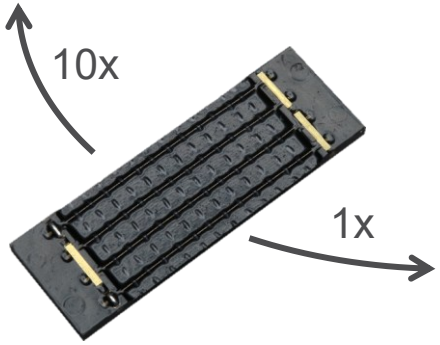
- No Risk for Blocking
- Soundless
- Continuous Movement
- Resistant to Moisture / Liquids
- Minimum Assembly Effort
- No Wear
- No Localized Load

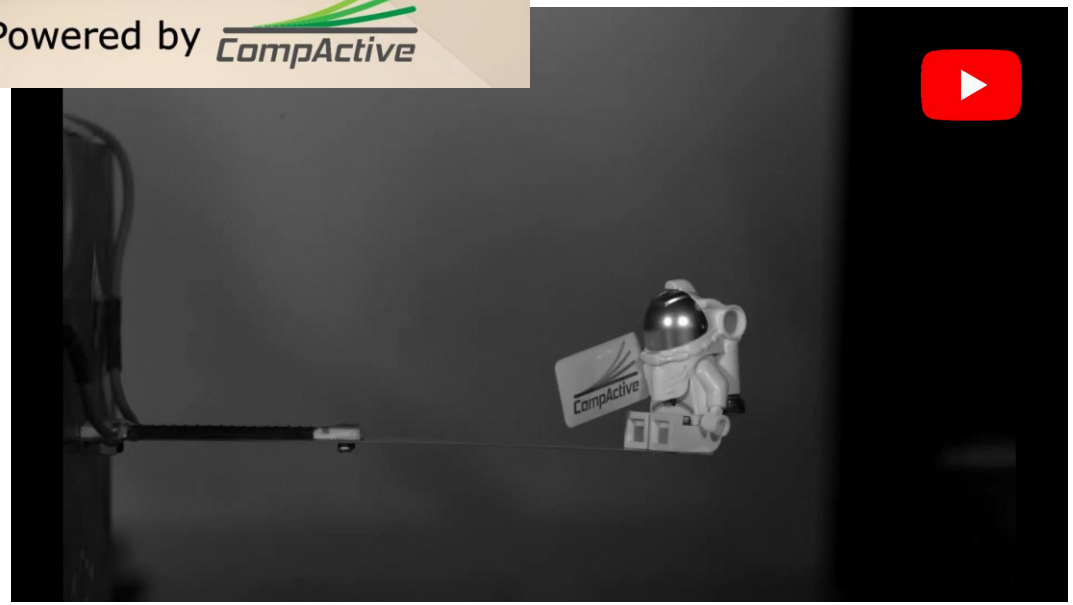
There are other possibility for sure…

- Electric motor / gear box
- Hydraulic / pneumatic cylinder
- Linear motor
- Solenoid
- SMA wire
- PZT stack

…with individual limitations!

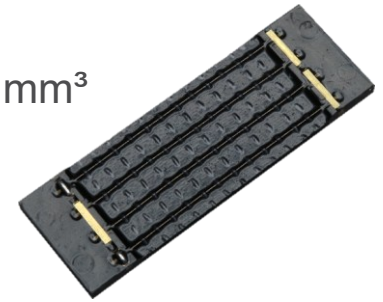
Standardized Actuator Modules for your Tailored Solution

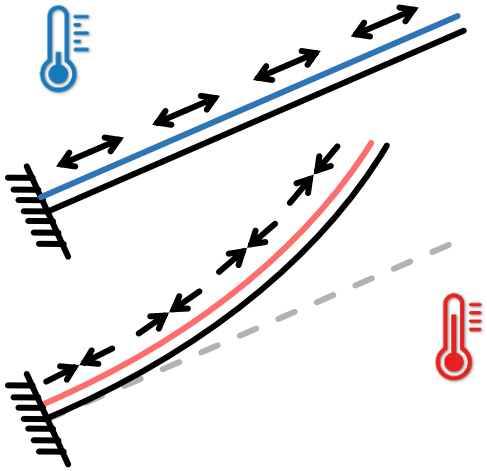




An Actuator Module

Type: 3920M
Size: 59*20*2.8 mm³
Weight: 4g





Thin and Powerful Actuators with High Deflection

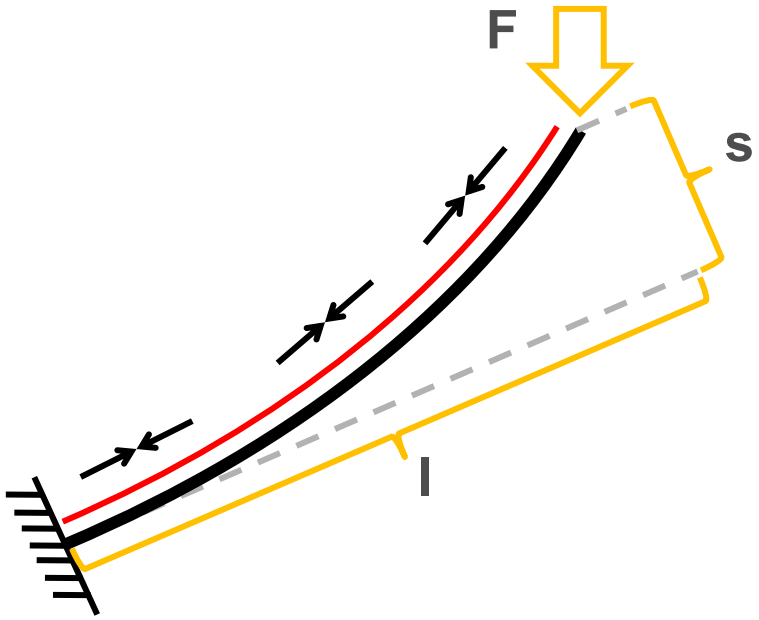
Standardized Actuator Modules for your Tailored Solution

Actuator Module

Properties:

- Size **l** * **b**
- Deflection **s**
- Load-bearing Capability **F**
- Electrical Resistance **R**

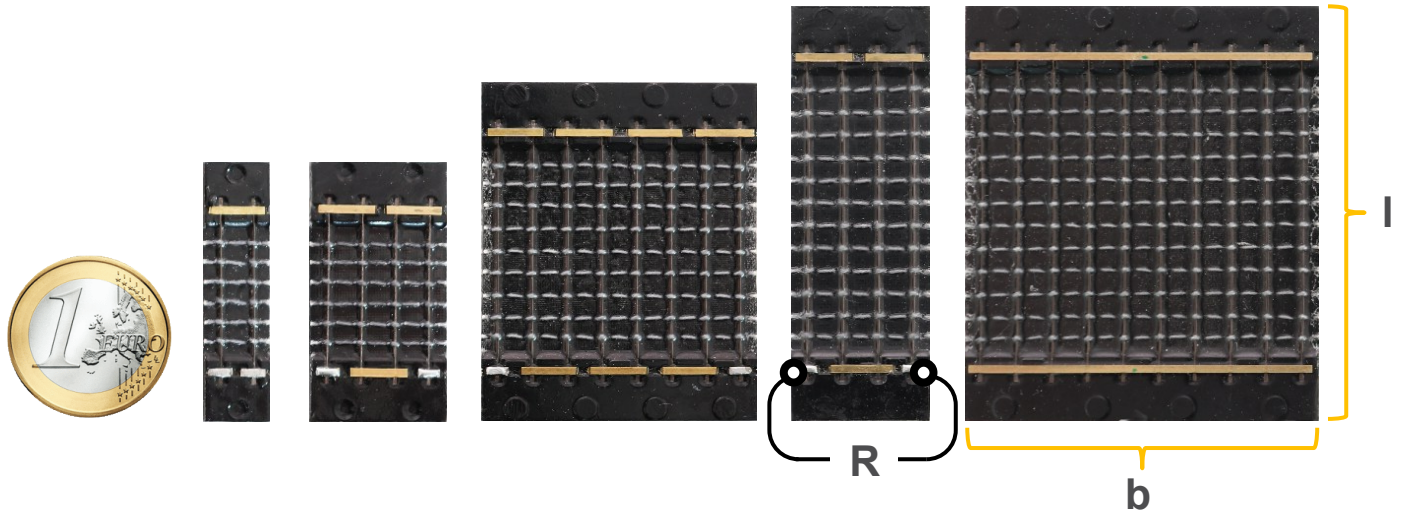
- Number of modules
- **Plugged** for electrical activation
- **Unplugged** for external heating



Possible Configurations

- Width **b**: 10/20/30/40/50 mm
- Length **l**: 39/49/59 mm
- Thickness **F/s**: 1.0-2.4 mm

Modular Solution offers 150 Configurations



Standardized Actuator Modules for your Tailored Solution

Mechanical Mounting of Actuator Module

Adhesive Film + Positive Locking

Positive Locking by
- Welding Studs / Bolts
- Rivets
- Screws
- Mounting Clips

Electrical Connection

- Soldering
- Crimping
- Welding
- Plugging in

Performance of *Curve*® Bending Actuator

CompActive

Reliability over Time

- High cycling stability by design
- Proven stability up to 1.000.000 cycles

Validated by tests

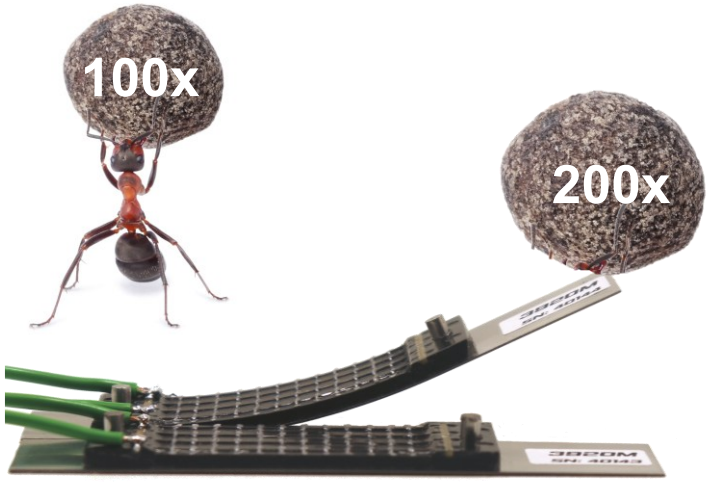
Environmental Conditions

- Controlled actuation cycles from -40 °C to 50 °C
- Able to withstand temperatures up to 180 °C

For rough conditions

Unique Combination of Rigidity and Actuation

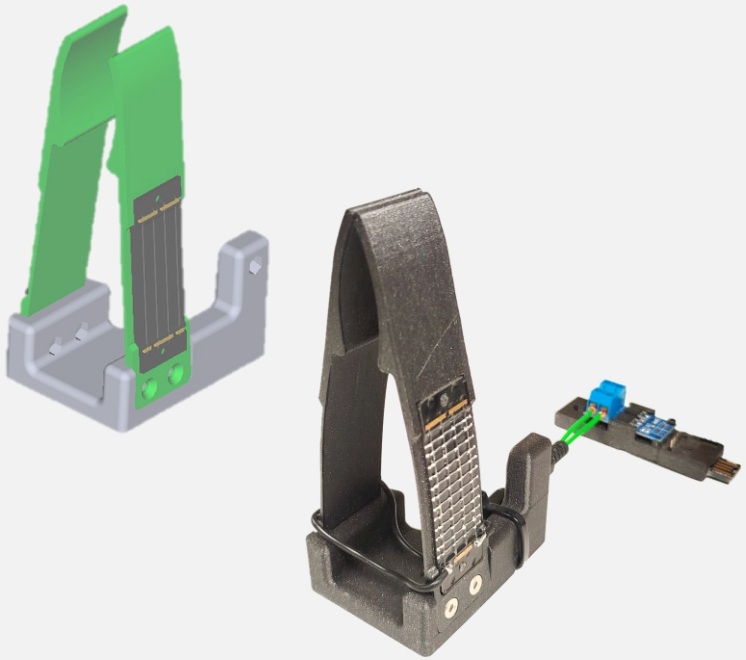
- High bending stiffness in all positions
- Lifting 3450 g at an actuator weight of 17 g



Stronger than an ant

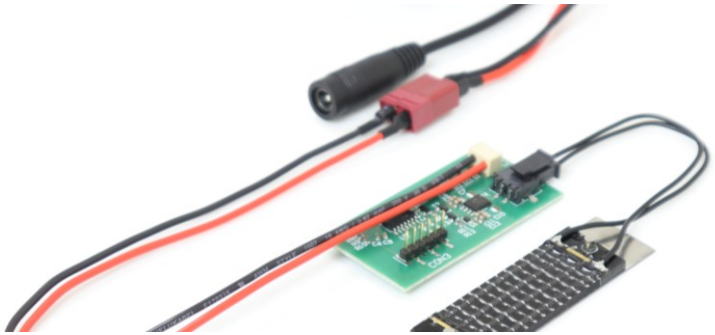
Our Support for your Series Solution

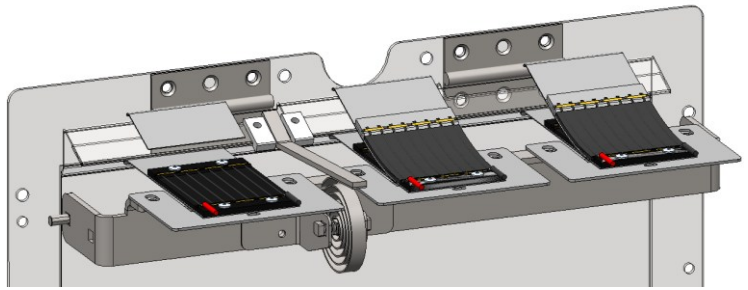
PoC



Early functional mockups to align expectations

Development





Development of functional subsystems for complex boundary conditions

Series Production

Industrial manufacturing from small batches to high-volume production

Applications Fields

Smart Railway Interior

Smart interior for public services… because we are all grateful for it!

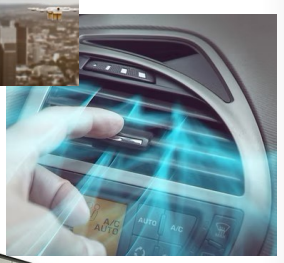
Active Aero Wheel

The market is mature: aerodynamics are essential for E-mobility!

Others

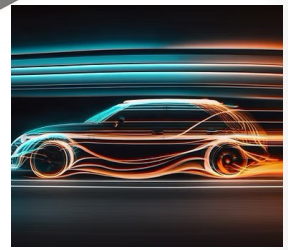
Locks

Ventilation



Gripper

Aerodynamics



There is a lot more to tap into!

Touchless Lid Opening for Railway Interior

Touchless Waste Bin Lid – Less physical contact

For passenger means
- More hygiene
- Higher comfort
- Better wellbeing

For operator means
- More appropriate use
- Reduced cleaning effort
- Enhanced cleanliness

Touchless Lid Opening for Railway Interior

Already on track – actuators in service on high-speed trains today!

No Drawbacks in Robustness

- No sensitive mechanics
- No wear, no blocking
- Manual usage / misuse safe
- Insensitive to media

No Drawbacks in Comfort

- Very fast opening
- Absolut soundless
- Smooth closing
- Compact design

Touchless Lid Opening for Railway Interior – From Individual Solution to Standard System

Combination of

- Railway Requirements
- Bending Actuator Know-how

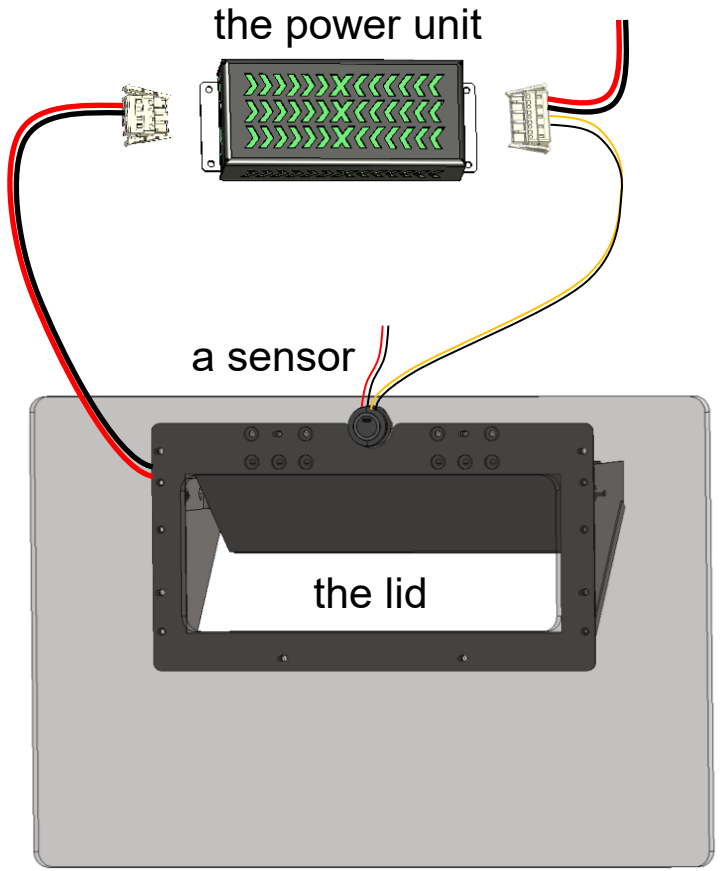
in mechanical integration and electrical control!

Result

A functional system for operators, train manufacturer, and passengers.

What matters is functionality, not the bending actuator or the SMA behind.

Schematic of System



Plug&Play Components

Active Aero Wheel – with *Curve® unplugged* Actuators

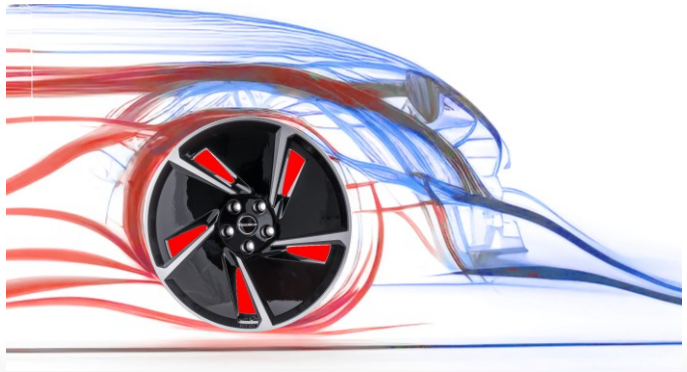
CompActive

Active Aero Wheel

Final, targeted, and simple resolution of the design conflict in the rim between:

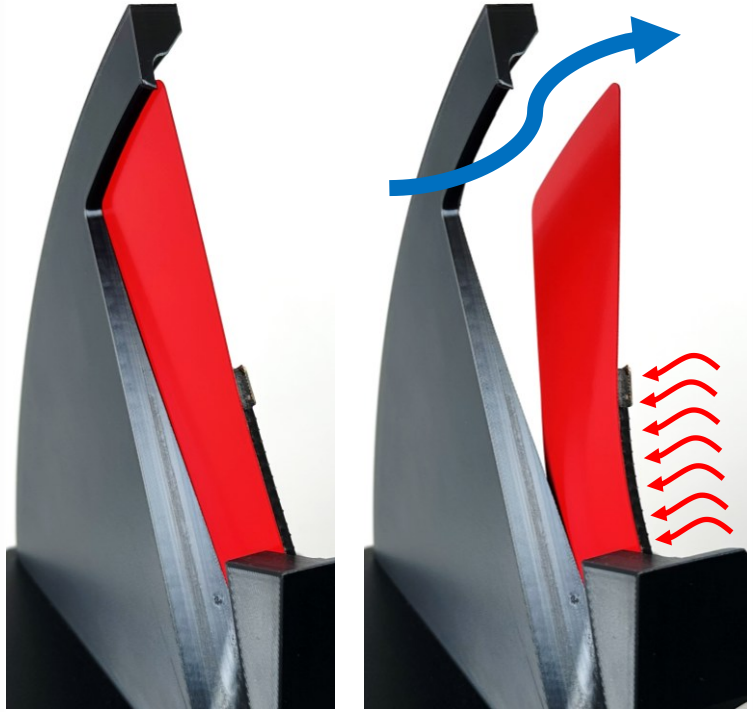
Brake cooling through air vents

Low aerodynamic drag with a closed rim



Operating Principle

Brake heat autonomously opens the vents using *Curve® unplugged* actuators



Advantages

Efficiency gains of up to 6% independent of powertrain type

Accelerations, heat, ice, salt, water, dirt… ***handles it all!***

Smart Borbet AE
planed as Showcase – used for PoC

CompActive

In cooperation with BORBET

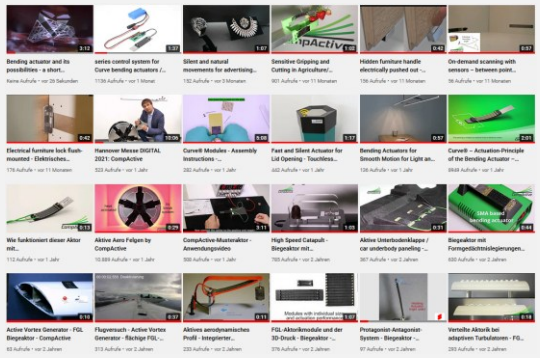
Keep it Simple

Single-Part
→ no mechanics

Heat-Driven
→ no electronics

Explore *Curve*® Bending Actuators

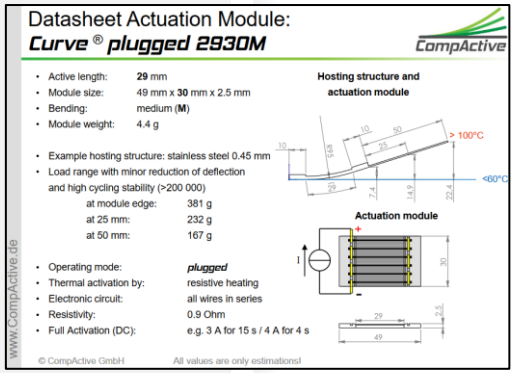
Basic information on web



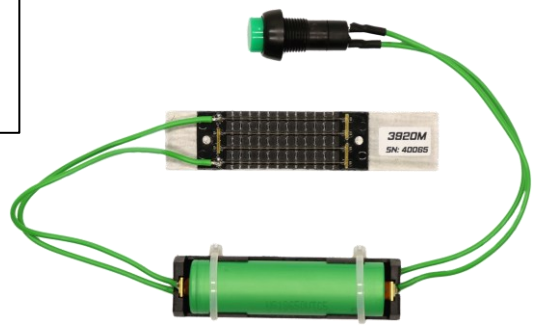
- Videos
- Datasheets
- Application concepts

…for fundamental understanding and idea generation!

Practice beats theory



- Sample Actuators
- Actuator Kits



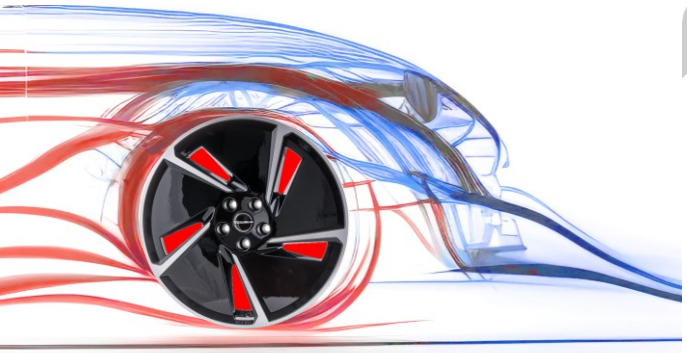
…to get a feeling for the overall behavior!

Challenge us!

- Face us with your demand and requirements!
- We deliver quick, honest feasibility feedback using *Curve*® bending actuator!
- We focus on your specific application and our ready-to-use actuators!

It's not necessary to dive deep into SMAs!

We bring Motion (in)to your Product!



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- compactive.de
- youtube.com/@compactivegmbh
- linkedin.com/company/compactive-gmbh

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