

STAMPING TECHNOLOGY



OUR PRODUCTION FACILITIES

Pressing force:	up to 250 t
Installation frame:	up to 3,000 mm
Speeds:	up to 1,500 strokes/min.
Sheet thickness:	up to 5 mm
Sheet width:	up to 330 mm
Product quality:	Use of test cells for 100% inspection during production
Technical cleanliness :	Cleaning of strip goods and bulk goods on a per-per basis and testing via ink test

**OUR ULTRA-MODERN MACHINERY
INCLUDES 30 AUTOMATIC PUNCHING
PRESSES FROM THE MANUFACTURERS
BRUDERER AND HAULICK+ROOS**





KLEINER: AN INNOVATIVE STAMPING TECHNOLOGY COMPANY WITH OVER 38 YEARS OF EXPERIENCE

KLEINER has been offering you high-precision solutions for a wide range of products in the stamping technology sector for many years. The product portfolio ranges from micro-stamped parts and snap domes to assembled stamping grids, which replace the classic printed circuit board in many areas. In the field of renewable energies and electromobility, for example, KLEINER offers solutions for high-current contacting in photovoltaic systems, hybrid or electric vehicles.

By developing and manufacturing its own punching tools, KLEINER has extensive technical expertise to support your products from product development to series production. As a reliable partner, we guarantee you smooth production.

GET TO KNOW OUR DIVERSE PRODUCT PORTFOLIO!



CONTACT PARTS & CONNECTORS

MATERIAL

- Stainless steel
- Cu materials
- Clad strips

SURFACE

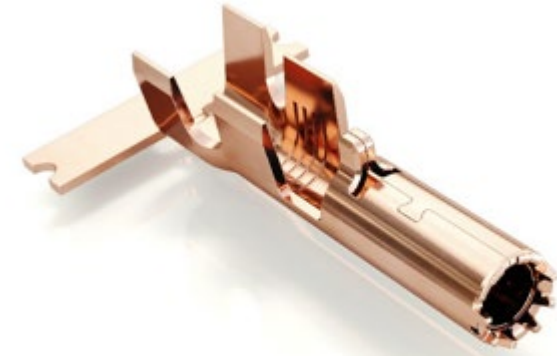
- Sn
- Ni
- Precious metal

OUTPUT

Up to 600 strokes/min

TECHNOLOGY

- Flat/bent on the belt
- Bulk goods
- Cleaning
- Packaging in trays

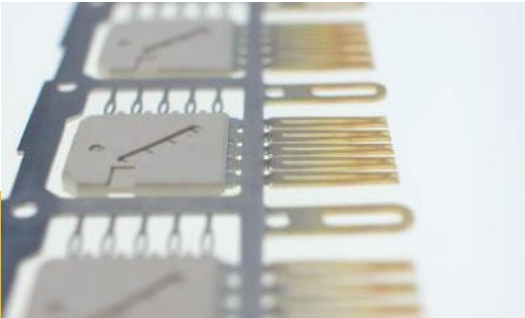
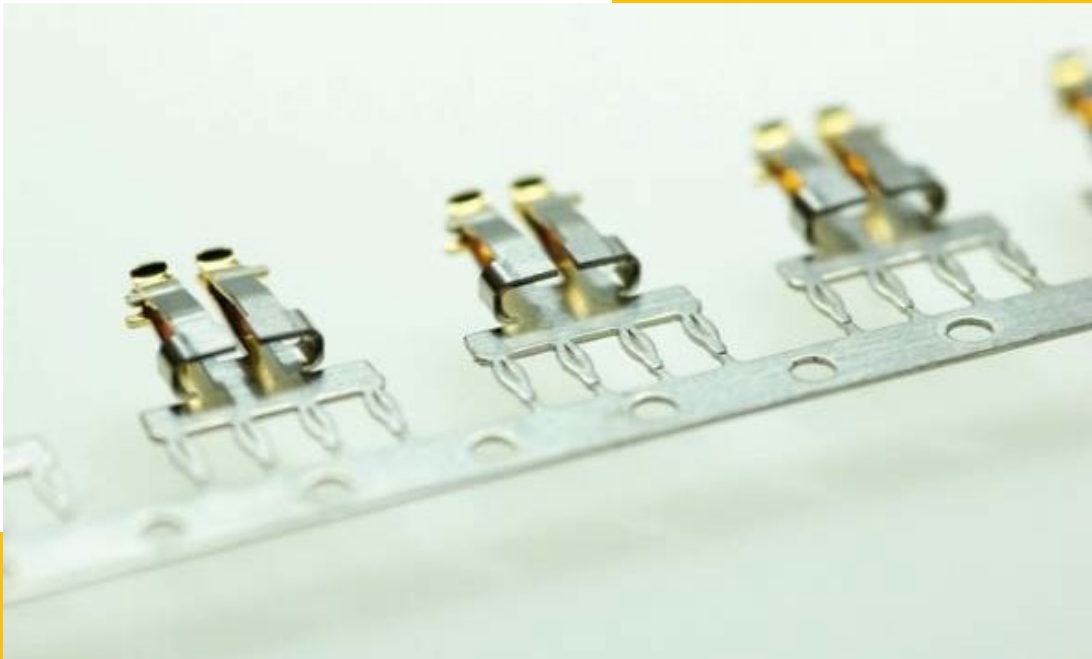
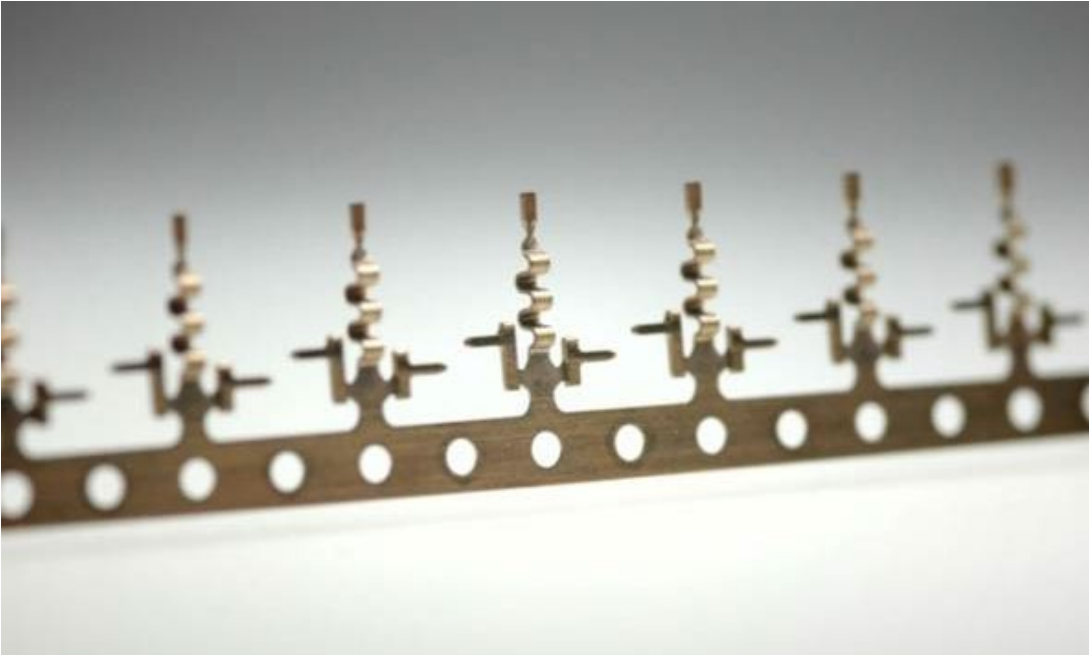


These plugs are mainly used in auxiliary units such as electrical heating systems, air conditioning systems, DC/DC converters and for charging batteries.



HV fuses for PDUs (Power Distribution Units) are used in electric vehicles.

CONTACT PARTS & CONNECTORS





Capacitor assembly as energy storage for industrial trucks



Charging plug for electric vehicles



Power contact plug from the vehicle electrical system to the battery. The design allows contact to be made from three sides. A slat holds the plug in place.

OTHER CONTACTS FOR HIGH-CURRENT APPLICATIONS



STAMPED, DRAWN AND BENT PARTS

MATERIAL

- Cu materials
- Stainless steel
- Steel
- Soft iron

SURFACE

- Roll clad strip (AlSi)
- Precious metal
- Sn, Zn, Ni

OUTPUT

depending on the size of the parts

TECHNOLOGY

- Flat/bent on the belt
- Single part production
- Combs
- Magazines

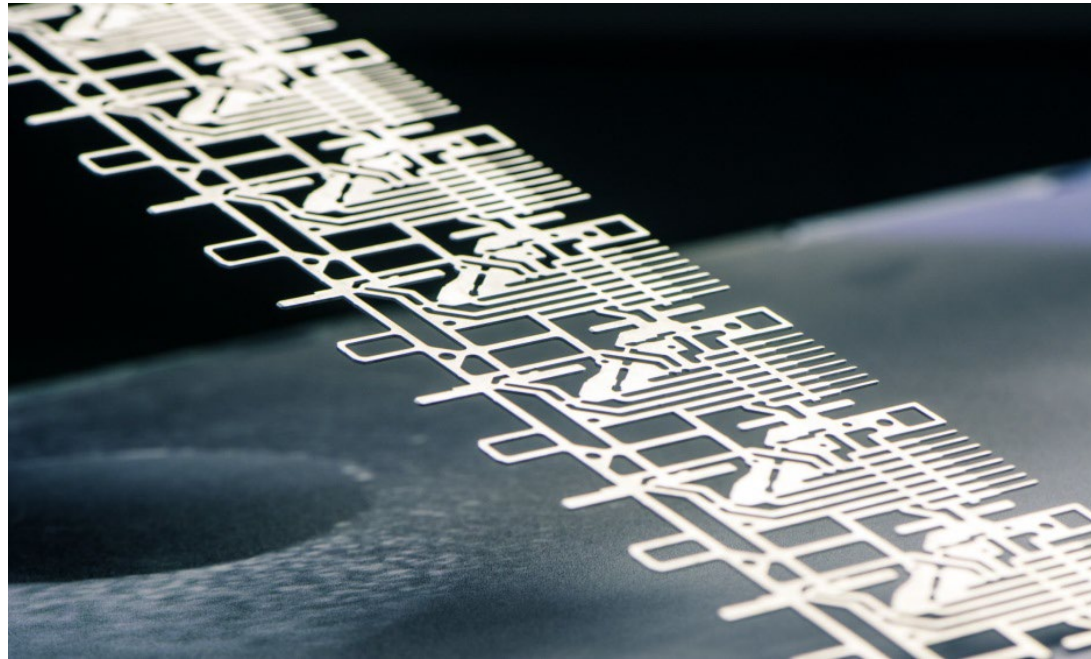


Shielding plate used for charging batteries in electric vehicles up to 450 kWh. Enables a safe current transmission of 420 A.



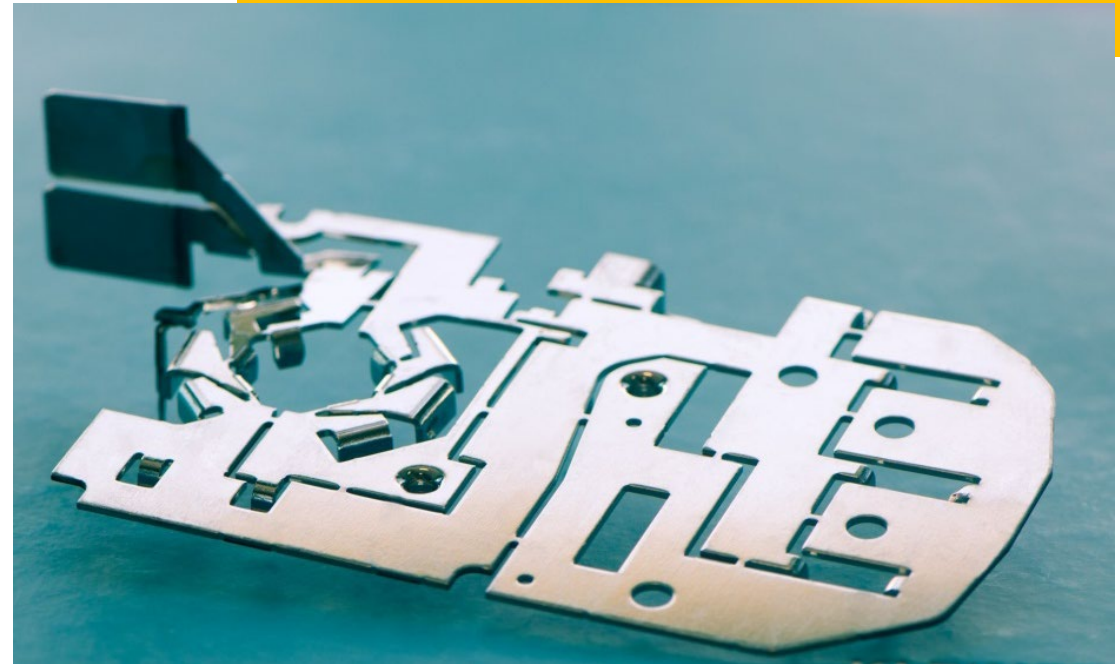
Used on cables as EMC shielding

STANDING GRID



Camera monitoring 100%
inspection of conveyor
belt goods

"Specialty": Bond parts





CONTACTS WITH PRESS-FIT ZONES (ELOPIN®)

MATERIAL

All common

SURFACE

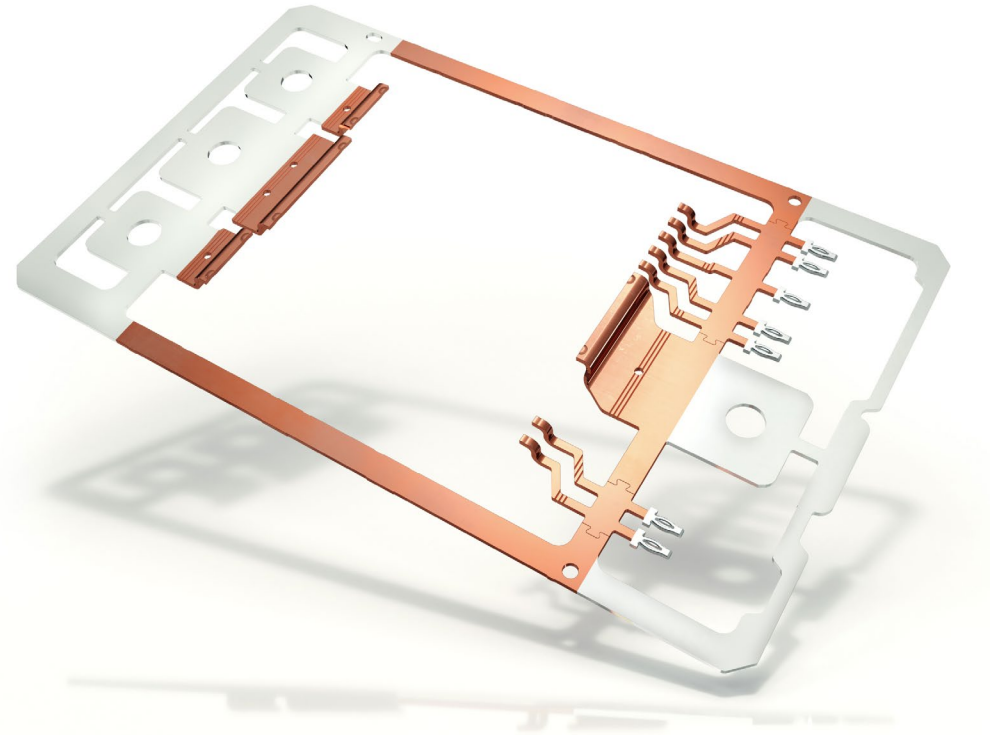
- Sn
- Ni
- Precious metal

OUTPUT

- Up to 700 strokes/min. embossed
- Up to 1000 strokes/min. cut

TECHNOLOGY

- Flat/curved on the belt
- Press-fit zone cut or embossed

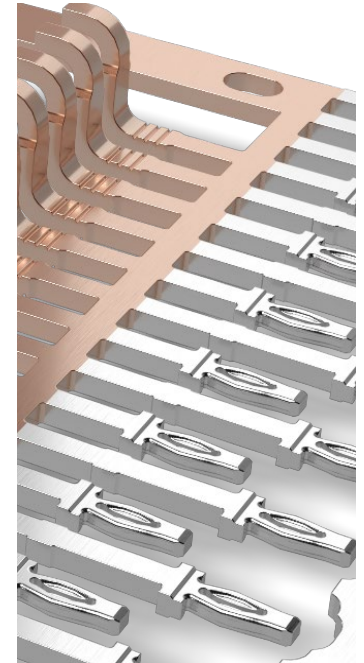


2in1: Thanks to the development of a universal tool, this punching grid can be used to produce different contact variants, for example. This means that both selectively refined solder pins and selectively coated press-fit zones can be fed in.



DER ELOPIN®: OUR SIZES

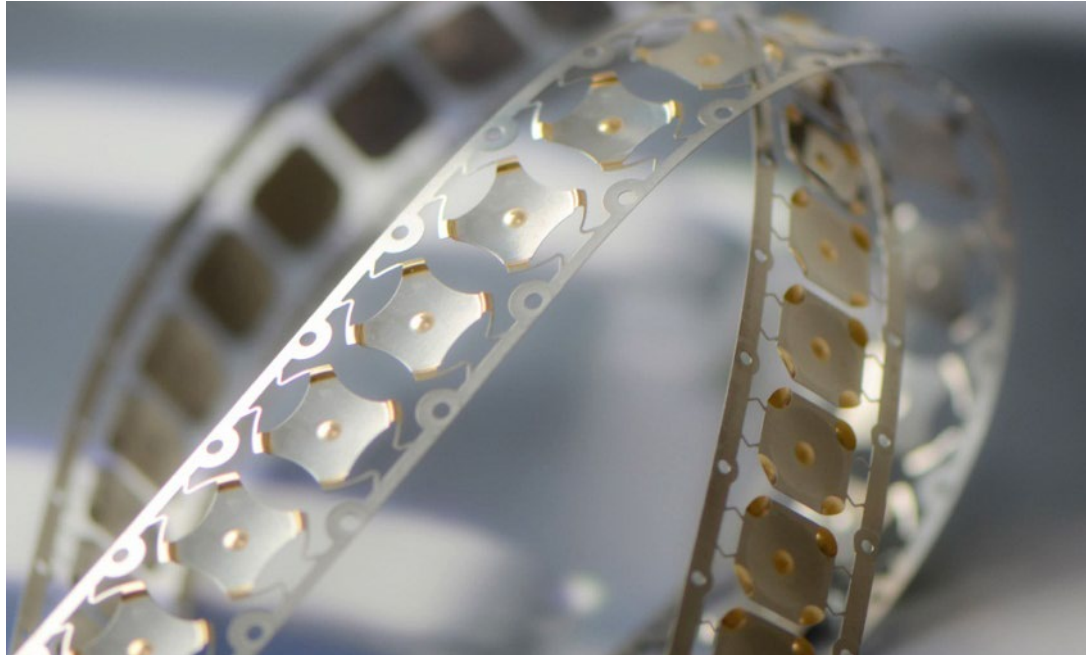
EloPin® Contact name	Strip thickness of the zone [mm]	Printed circuit board end hole [Ø / mm]	Printed circuit board thickness [min / mm]
04-06	0,40	0,60	1,00
06-10	0,60	1,00	1,00
08-145	0,80	1,45	1,50
08-16	0,80	1,60	1,50



THE ADVANTAGES AT A GLANCE

- Low stress on the plated-through holes including the connected conductor tracks
- For engine compartment applications in the temperature range from -40 degrees to 150 degrees
- Cost-effective assembly of PCBs on both sides
- Reliable, gas-tight connection

SNAP DOMES



Fields of application:
Electrical engineering,
automotive, medical
technology
"Specialty": with LED and spot
gold coating

Material:
Stainless steel, CuBe, Cu
materials

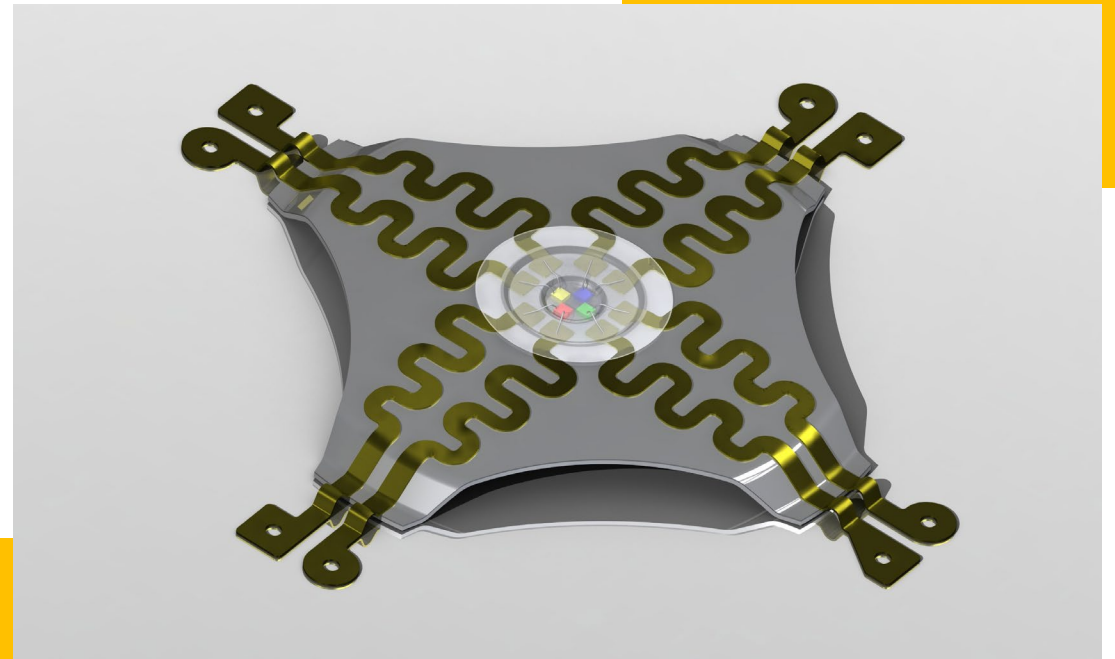
Surface finish:
Precious metal, Teflon,
lacquer, ceramic

Technology: Strip goods,
individual parts

Output: up to 600
strokes/min

Dimensions:
Ø 5 mm - 40 mm
2 mm x 4 mm to
50 mm x 100 mm

Actuating force:
0.5N - 200N





CASE STUDY: SNAP DISK KICK-DOWN

TASK:

Development of a customized snap disk with kick-down function for the electronic gas pedal pedal

SOLUTION:

Increase in possible switching cycles due to field experience with existing series parts or OEM requirement for increased handling reliability

GOAL:

Significantly higher switching cycles



MICRO PARTS



Fields of application:
Medical technology,
automotive,
telecommunications

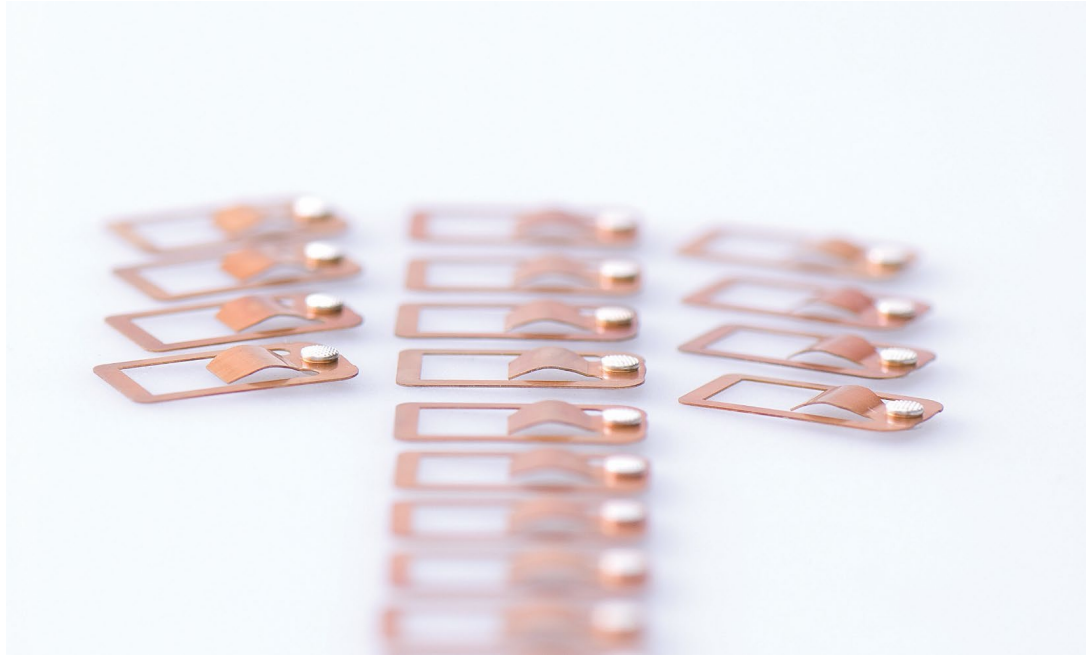
Material:
Cu materials, stainless steel
Surface finish:
Sn, Ni, precious metal

Technology:
flat/bent on the belt; single
part production; bulk goods

Output:
up to 600 strokes/min.



SPRINGS



Fields of application:
Switch technology,
automotive, electrical
engineering

Material:
Stainless steel; CuBe

Surface finish:
Sn, Ni, precious metal

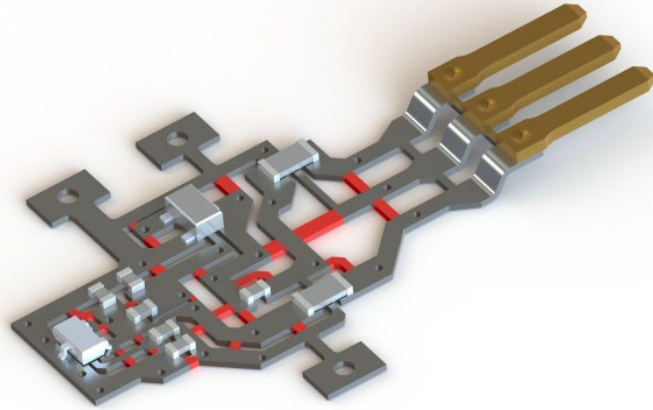
Technology:
flat/curved on the belt; bulk
material

Output: up to 800
strokes/min

Other:
Springs with rivet (wire feed)



PUNCHING GRID TECHNOLOGY



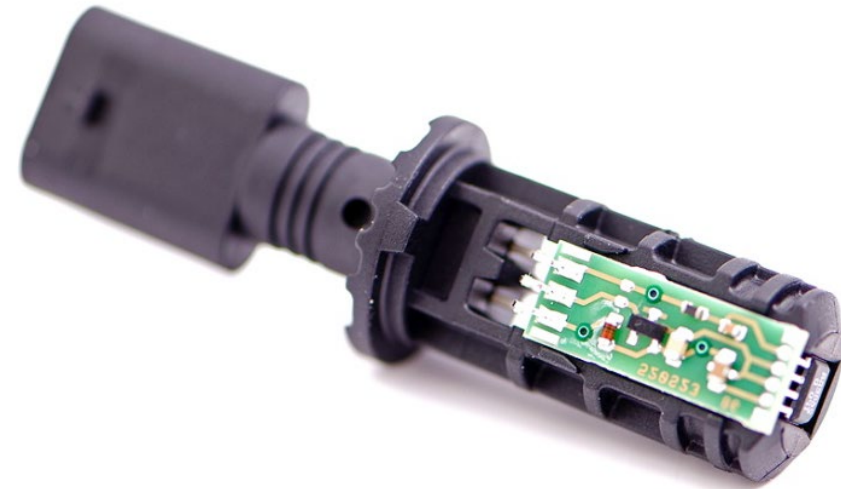
Use of different materials
(Cu, Al alloys)

Improved thermal
management, e.g. for light-
emitting diodes

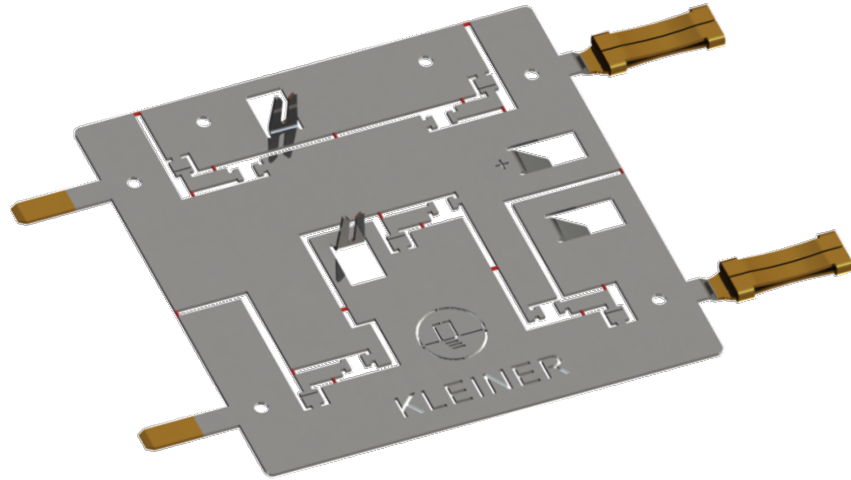
Possibility to reduce costs

PCB and connectors are
created in a single work step
Reduction of the component
size

Reduction of electrical
interfaces through direct
integration of electrical
components and plug
connections



K3X: KLEINER-CONNECTOR LIGHT MODULE



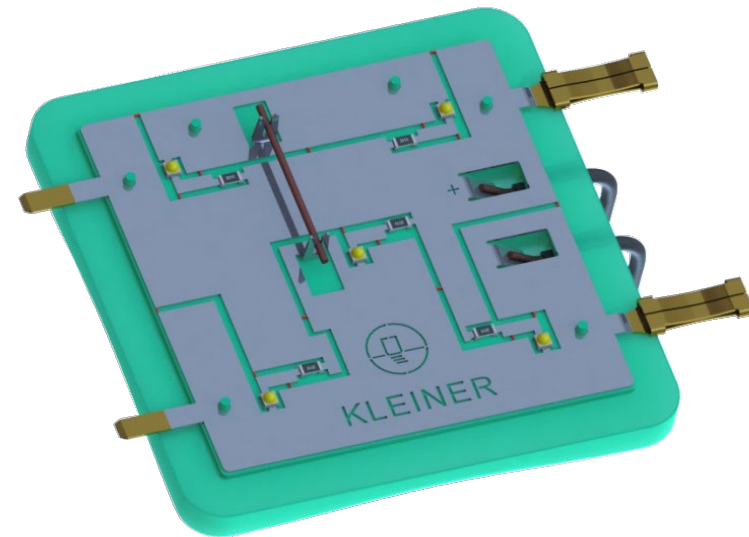
Can be used in temperatures
up to 200°C

Heat is drawn off by the
leadframe

3D-forms after assembly
possible

Integration of the connection
technology directly in the
leadframe

Multi-layer design possible
EMC-protection will be
attached directly





BUSBARS

MATERIAL

Copper/aluminum and aluminum alloys

SURFACE

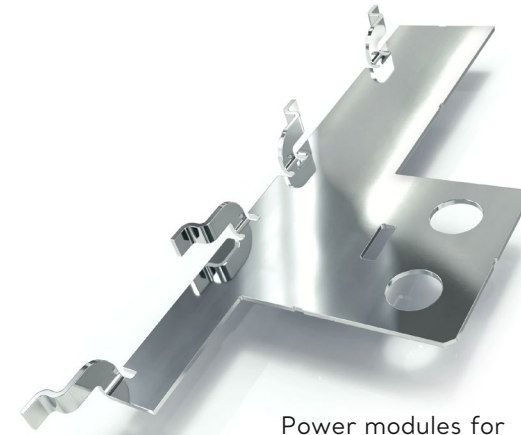
- Coatings selective/all sides Ni; Sn; Ag
- Coating thickness <math>< 10 \mu\text{m}</math>
- Strip electroplating up to 2mm thickness and 180mm width
- Rack electroplating up to 400mm busbar length

TECHNOLOGIE

- Thicknesses up to 5mm
- Belt width up to 320mm

ADVANTAGES

- Copper alloys for the best current conductivity
- Individual insulation for space-saving insulation possible for almost any application



Power modules for renewable energies such as wind power and solar energy.



E-booster for Porsche Taycan



BUSBARS WITH FOIL INSULATION

INTERLAYER FILM NOT ADHESIVE

The insulation between the conductive busbars is achieved by inserting a stable interlayer foil.

- + Simple application
- + Non-adhesive film
- + Very scalable
- + Compact/slim design

FOIL-BONDED SINGLE-/DOUBLE-SIDED ADHESIVE

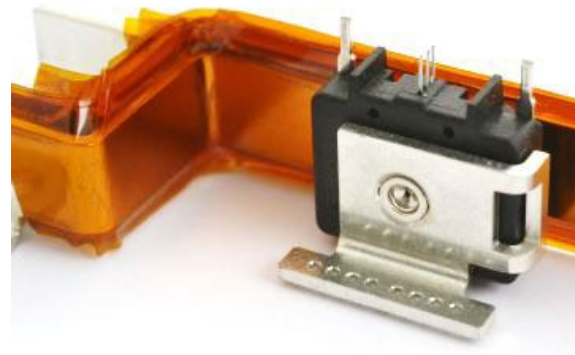
Sheathed laminated busbars - butt-glued, connected with adhesive film on both sides to form a uniform structure/assembly.

- + All-round insulation protection provided
- + Compact/slim design

FILM BONDED ON ONE/TWO SIDES HEAT-ACTIVATED ADHESIVE

Sheathed laminated busbars - impact-bonded under pressure and temperature, bonded with adhesive film on both sides to form a uniform structure/assembly.

- + All-round insulation protection provided
- + Compact/slim design
- + scalable





INSULATED BUSBARS WITH 3D-CLIP

USE

Insulated busbars with 3D-printed clips are used in various industries.

These include electronics, the automotive industry, new energy such as e-mobility, photovoltaics and many more.

AREA OF APPLICATION

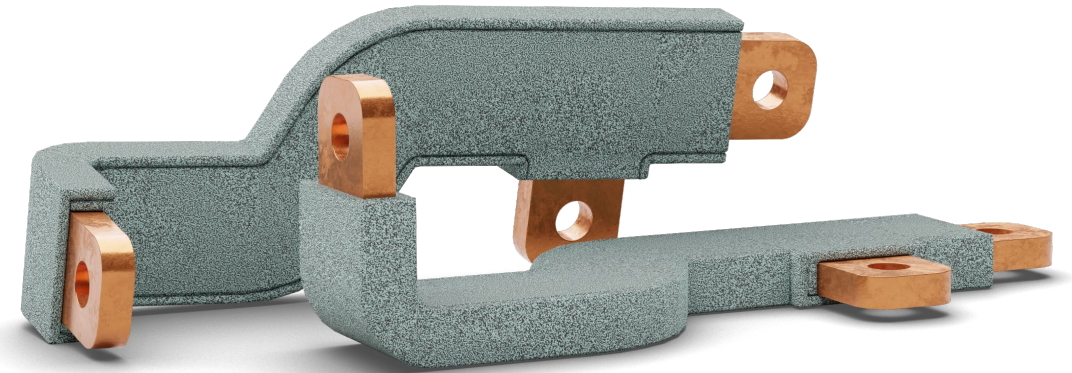
- Can be used well for initial functional samples or small series due to fast prototype development
- Suitable for complex geometries

MATERIAL

- 3D printing material: PA12
- Temperature resistance: 130 °C
- Materials with flame protection can be used

ADVANTAGES

- Fully automatic placement of insulation clips possible
- High degree of flexibility
- Consistent insulation thickness in structures with multiple components
- Additional support/holding structure can be implemented



FURTHER INSULATION OPTIONS



POWDER COATING

The insulation/powder coating is applied to the conductor rails in the frame using an electrostatic spraying process and annealed.

- + All-round insulation protection provided
- + Approval for electrical insulation of the epoxy powder in accordance with UL746 B; UL 1446 or E35075
- + Can be used up to 130°C

IMMERSION INSULATION

The PVC molecules dissolved in the PVC dipping paste are gradually deposited on the hot surface of the parts to be coated.

- + All-round insulation protection provided
- + Suitable for complex geometries
- + Well scalable



Coated busbars in blister packaging



FLEXIBLE BUSBARS

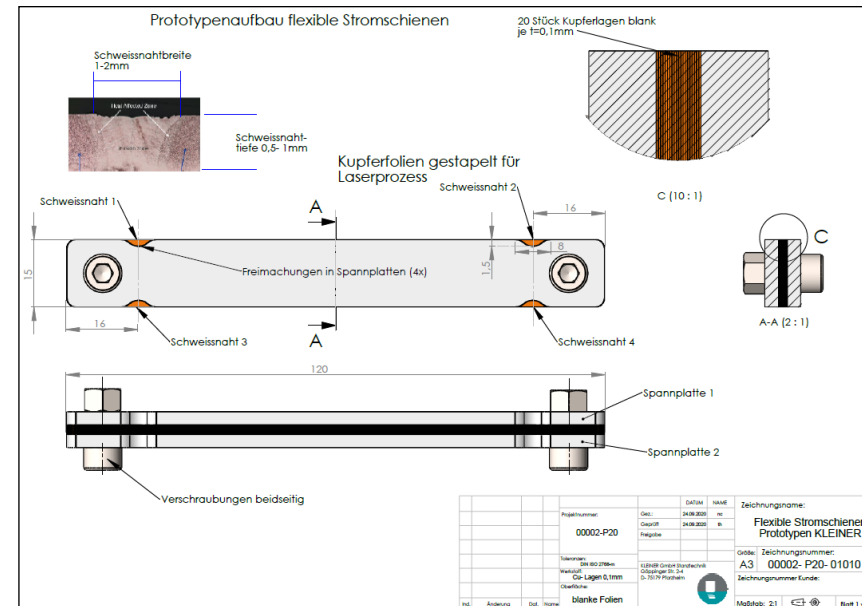
If there is a lot of vibration during the transmission of electrical current, as is the case in electromobility, a high degree of mechanical flexibility is required. This is where the use of highly flexible busbars pays off. These consist of several individually stacked copper laminations with a thickness of 0.1 to 0.5 mm.

KLEINER supports you in product development and offers you customized solutions for optimum power transmission.



WE IMPLEMENT YOUR REQUIREMENTS IN ALL PROCESS STEPS OF DEVELOPMENT AND PRODUCTION:

- ▶ Prototype development
- ▶ Punching of copper foils
- ▶ Stacking the copper foils
- ▶ One-sided fastening
- ▶ Moving the bends
- ▶ Pruning
- ▶ Fasten the remaining side





ASSEMBLY PRODUCTION

Cleaning, mechanical assembly and fully automatic film bonding of stamped parts are firmly established series processes for us. Plastic or silicone parts are integrated and delivered as fully tested assemblies.

MATERIAL

- CU-materials
- Aluminum

COATING

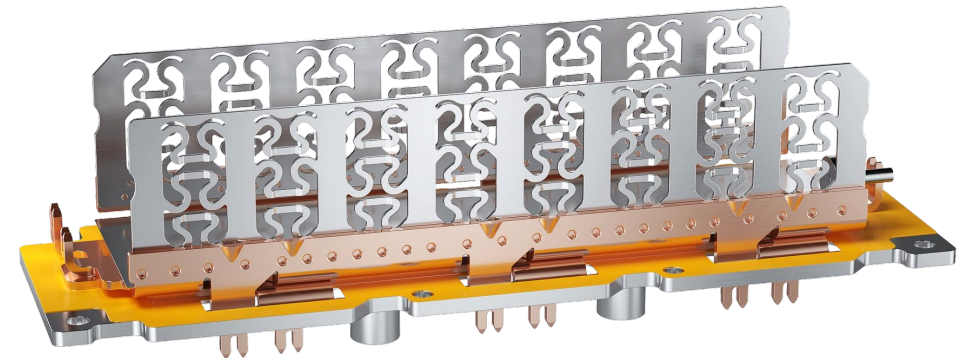
- Various foils
- Tinned

USE

Inverter module for holding the DC link capacitor

ADVANTAGES

- Foil insulation with thermal conduction
- Stacks for connection to condenser
- Semi-automatic assembly of the complete module with foil laminate and electrical testing, HV and PD testing





CASE STUDY: E-MOBILITY ASSEMBLY GROUP

TASK:

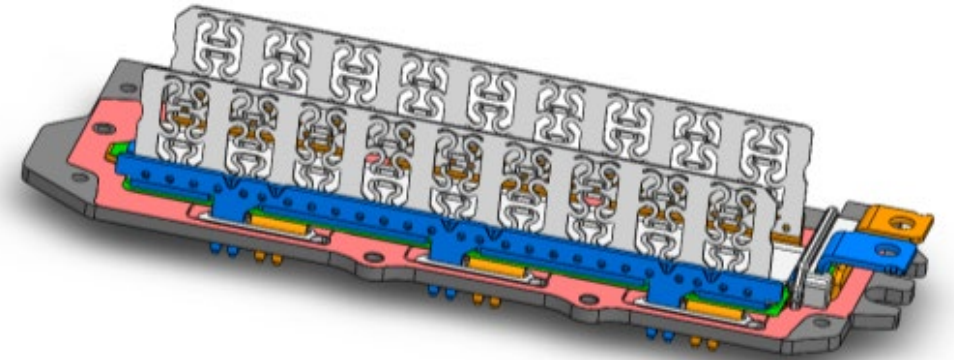
Latest generation inverter, predecessor module with aborted foco connections on load change (field failure).

SOLUTION:

Interdisciplinary revision of the metal assembly →
Connection in omega form. Test series with additional stamped welding areas for design validation

RESULT:

Significant increase in load cases. Series production successfully launched. Semi-automatic production with fully automatic testing of HV & TE



YOUR CONTACT TO US

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