0) GENERAL

BROXING supplies contact elements to conduct currents up to 600 A to printed circuit boards. Depending on the current intensity, different technologies are applied.

CONTACT ELEMENTS AND TECHNOLOGIES:

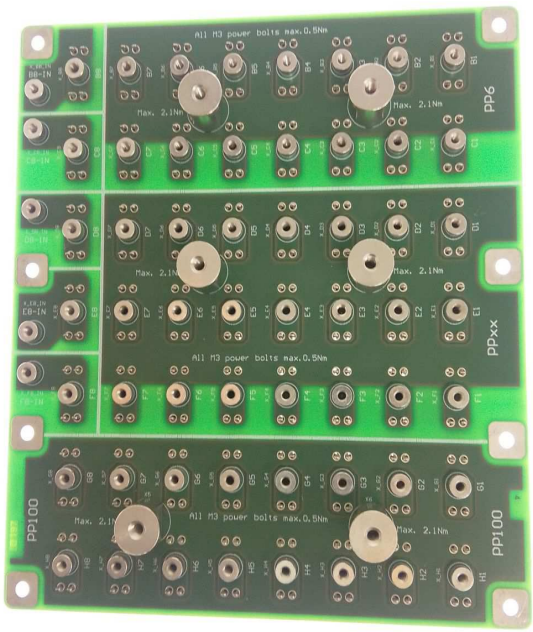
1. 10 – 150 A in THT soldering technology
2. 10 – 600 A in SMD soldering technology
3. Press-fit technology (rigid and flexible)
4. Up to 1000 A in busbar technology
5. PowerBoards
6. BroxAlloy

www.broxing.com/Documents/Presentations/codico_vortrag_en.pdf

Example of a PCB equipped with press-fit technology on both sides:

Front side with PowerFlex

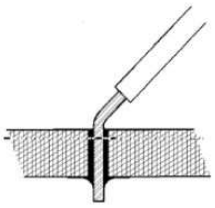
Back side with PowerClamp



1) THT Soldering Technology (up to 150 A)

Wire Connection:

The simplest way to conduct current into a PCB is through manual soldering of a wire.



wire solder joint

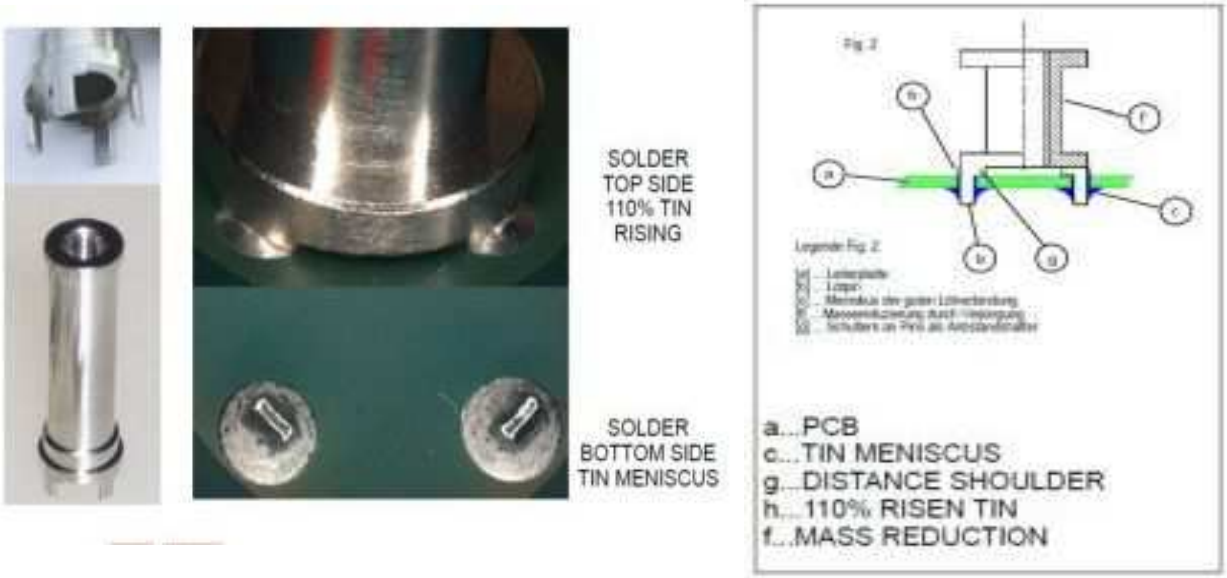
Advantages:

- Low material costs

Disadvantages:

- Manual processing, making it expensive
- Non-detachable connection
- Limited current capacity

BOXING PowerClamps

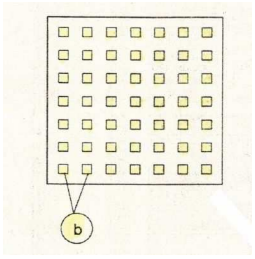


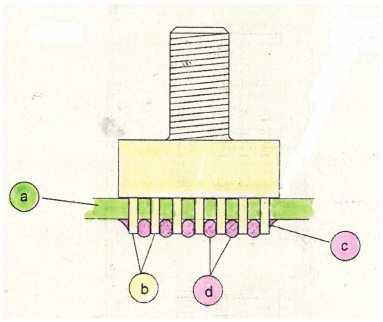
To ensure soldering quality, the solder must rise at least 75% within the PCB hole.
The PowerClamp has solder pins positioned around its perimeter, allowing for controlled solder ascent.Zur Sicherung der Lötqualität muss das Lötzinn mindestens 75% in der Bohrung der Leiterplatte hochsteigen.

Additionally, the shoulder on the pins keeps the PowerClamp slightly elevated from the PCB, functioning as a thermal trap that minimizes heat loss during the soldering process.

Comparison with competitor's square pins:

Since solder pins are not visible after soldering, it is impossible to verify if the solder has risen to the required level. Additionally, the close placement of the pins prevents meniscus formation. The high mass required for heating increases the likelihood of cold solder joints.





Since solder pins are not visible after soldering, it is impossible to verify if the solder has risen to the required level. Additionally, the close placement of the pins prevents meniscus formation. The high mass required for heating increases the likelihood of cold solder joints.
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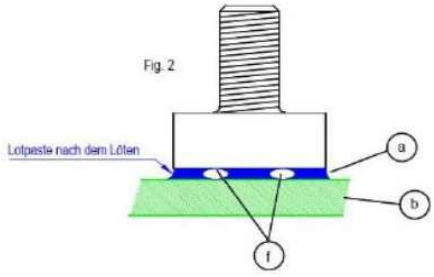
PowerClamps for THT soldering are available in various shapes and current capacities.

All contact elements are refined with BroxAlloy (see Section 6).

Disadvantage of THT soldering: The PCB experiences significant thermal stress.

2) SMT Soldering Technology (up to 600 A)

In SMT soldering, solder paste containing tin and flux is applied to the PCB. The flux evaporates during the soldering process, creating gas bubbles (voids) that reduce adhesion.



a...SOLDER CREAM
b...PCB
f...VOIDS

To prevent this, PowerClamps are equipped with **degassing channels** to guide gas away.

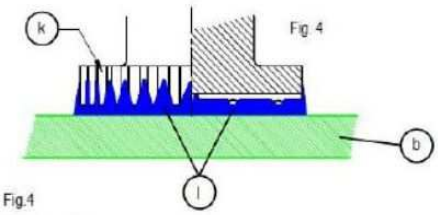


Fig.4
b...PCB
k...TIN RISING IN GROOVES
l... TIN

Additionally, PowerClamps have **knurled surfaces** that allow solder to rise via capillary action, increasing breakaway torque.

Since contact elements are exposed to high temperatures, traditional tin-plated surfaces may melt. BROXING PowerClamps are refined with BroxAlloy, which has a melting point of **910°C**, preventing surface degradation (see Section 6).

SMT PowerClamps are supplied in bulk or taped packaging.

PowerClamps for SMT soldering are available in various shapes and current capacities.

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As can be seen in the picture, they can also be delivered as busbars with pressed contacts.

Advantages of SMT soldering vs. THT soldering:

- Easily automated
- Mounted on IMS PCB without drilling requirements
- Possibility to solder busbars for increased current (up to 600 A)

3) PRESS-FIT TECHNOLOGY (up to 600/1000 A)

Advantages over soldering technology:

- Perfect contact due to cold welding
- Higher current capacity
- Vibration resistance
- No thermal stress on the PCB
- Possible double-sided PCB assembly

Disadvantages compared to soldering technology:

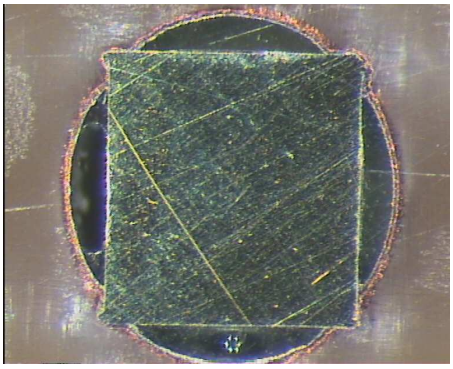
- Requires tighter tolerances for metallized PCB holes
- Additional tooling required for pressing
- Additional manufacturing process

According to DIN standard EN-60552-5, a distinction is made between rigid and flexible pressfit techniques.

- **Flexible press-fit:** The pin deforms inside the metallized hole, while the hole retains its shape. Usually manufactured via stamping (max. 0.8mm thick), limiting current to 10A - up to 20A for BROXING (see at „PowerFlex“).
- **Rigid press-fit:** The pin remains unchanged, and the hole adapts to its shape.

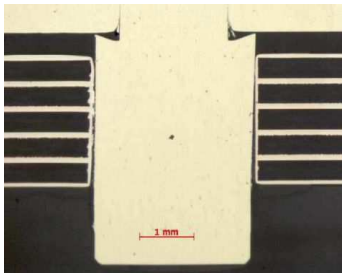
3.1) PowerClamps with rigid Pins

According to the DIN specification, there must be a residual layer thickness of 8µ between the pin and the metalization of the hole. This is practically not feasible with square pins.



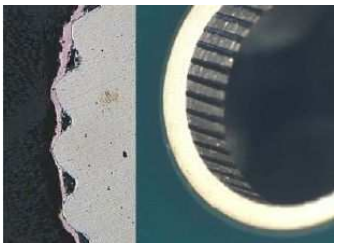
For this reason, the BROXING PowerClamps have a knurled circumference. This results in the metallized hole being only slightly deformed, thus requiring less pressing force.

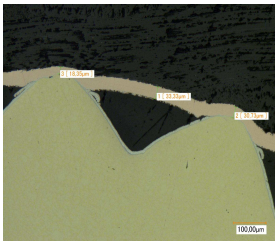
Due to the significantly larger contact area, a greater current transmission is also possible (20A per 1mm pin diameter).
Another requirement of the DIN standard EN 60352-5 is that the inner and outer layers of the LP may only be deformed up to a maximum of 50µ. This is not possible with a square pin due to the high pressing force.



In the BROXING pressing technology, the layers are not bent through.

With the BROXING press-fit pins, the effort required is significantly lower, which prevents the inner layers from deforming (see photo).





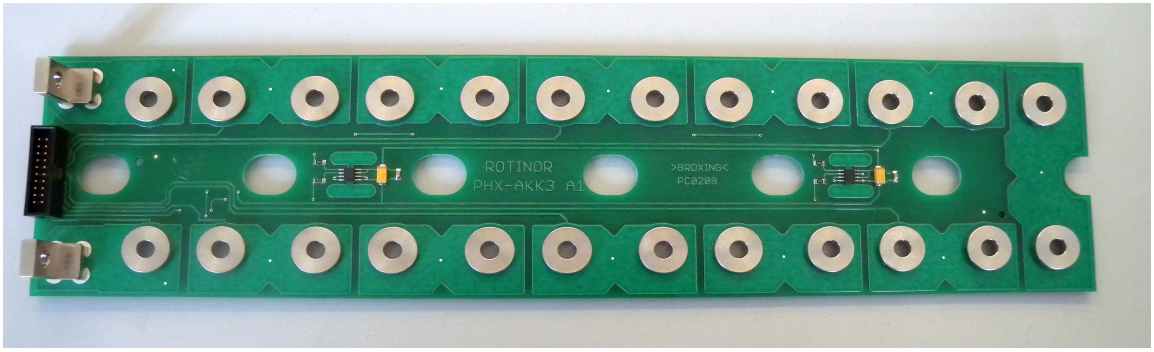
Different versions of BROXING PowerClamps are available depending on current requirements and threading specifications (B, N, and L series)

EXAMPLES OF THE PRODUCTION SPECTRUM FROM THE >BROXING< PRESSFIT SERIES

Pressfit H-Serie*s*

Since the PCB is not a solid body, but a liquid with very high viscosity, the PCB deforms over time and with changes in temperature. Therefore, a direct screw connection cannot be made with the PCB, as the PCB yields under the screw pressure. This causes the transition contact between the ÜCB and the cable lug to be enlarged, which results in the PCB being strongly heated due to the power loss. The heating can lead to the burning of the PCB. See Ohm's Law $I^2xR=P$. For example, 100 A x 1 mOhm = 10 W power loss at the contact.

For this purpose, the BROXING delivery program includes the H series in a variety of designs. The H contact element is pressed into the circuit board. This means that no forces are applied directly to the PCB, but are absorbed by the contact element. These contact elements also serve the function of spacers.

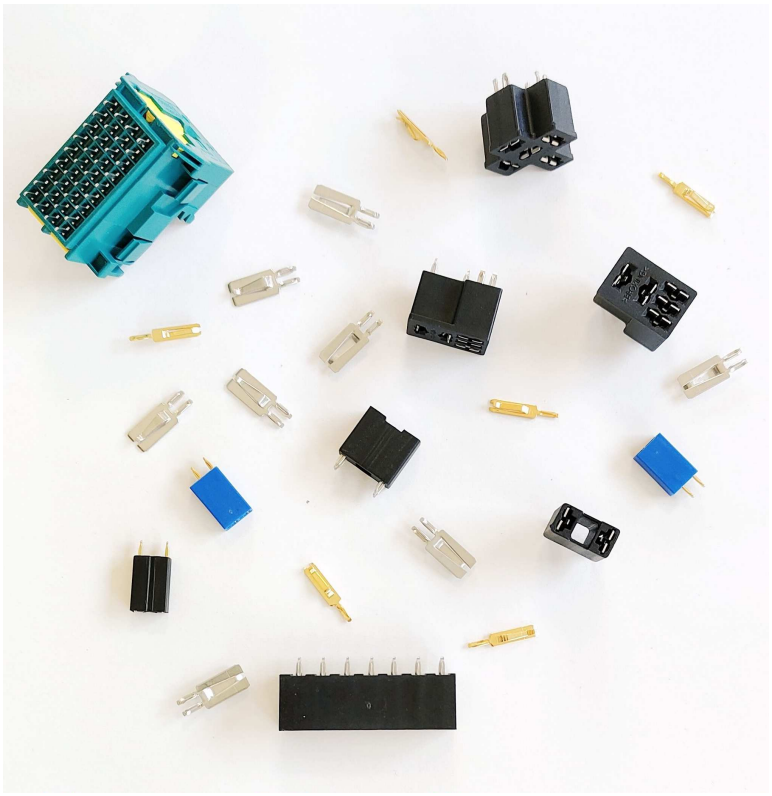


3.2) Kontaktelemente mit flexibler Einpresstechnik (PowerFlex)

These contact elements are punched from 0.8mm thick sheet metal. The most common applications are 6.35 mm and 2.8mm Faston contacts. These contacts are installed in various housings and, for example, relay sockets for automotive applications or gate connectors for IGBTs.

Section of the flexible pin
of the PowerFlex contact

Examples of PowerFlex applications

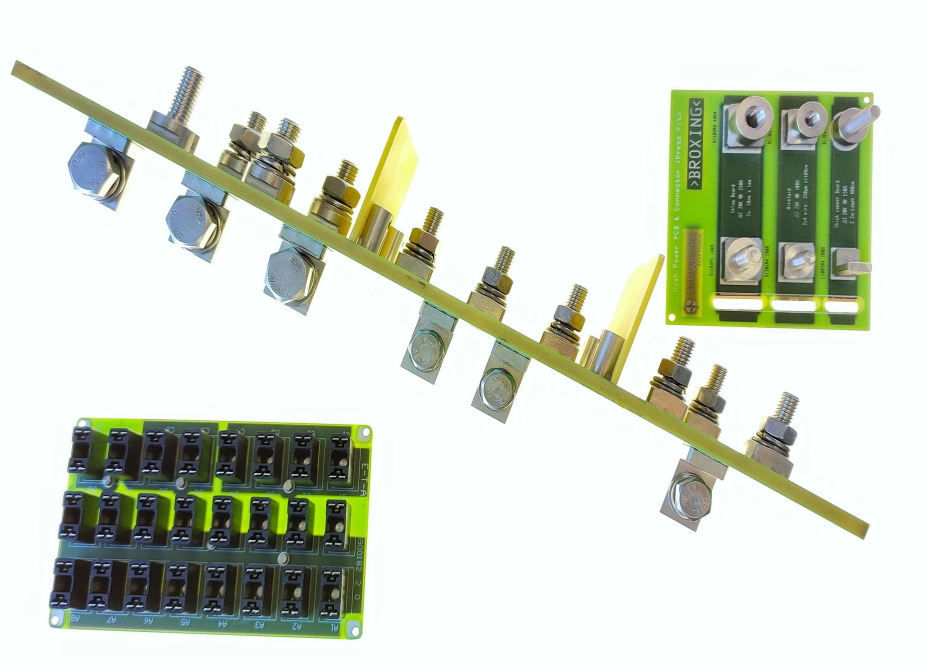


4) BUSBARS

BROXING manufactures custom busbars from **copper, brass, or aluminum** to meet specific customer requirements.

5) POWERBOARDS

Upon request, BROXING assembles contact elements and busbars onto PCBs using both **press-fit and soldering technologies**.



6) BROXALLOY

All contact elements and busbars are refined with **BroxAlloy**, a **nickel- and lead-free** alloy composed of three metals.

With a hardness of 650 HV, BroxAlloy is as durable as nickel while being corrosion-resistant like gold. See photos after salt test in comparison with a tin-plated contact element from the competitor.

Bevor the saltwater-test

after the saltwater-test

BroxAlloy has a melting point of **910°C**, preventing deterioration during SMT reflow soldering.

melted contact surface
at tinned contact

perfect contact-surface after soldering
with BroxAlloy galvanization