# PressFit Technology – Advantages and Disadvantages

## Disadvantages of PressFit Technology

Press-fit connections require **higher drilling precision** in the PCB compared to conventional THT soldering. In addition, the copper plating of the through-hole must be between **25 and 45 µm**. For assembly, a press-in tool is needed, consisting of a press, a suitable punch, and a support plate.

## Advantages of PressFit Technology

Thanks to the tight metallic interface between the PressFit pin and the plated through-hole, the connection provides not only **perfect electrical connection**, but also a very strong **mechanical bond**, resulting in significantly improved **vibration resistance**. Furthermore, the PCB is exposed to **no thermal stress**, unlike soldering. PCBs with a high copper content can often no longer be soldered for thermal reasons. PressFit remains the only viable solution.

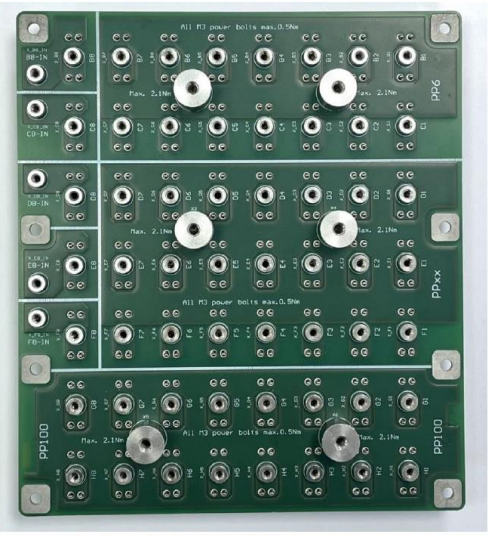
Unlike soldering, PressFit technology is also the **only gastight connection,** due to the cold-welding effect.

Another advantage is that the PCB can be assembled from both sides with PressFit contact elements.

Example of a PCB equipped with PressFit technology on both sides:

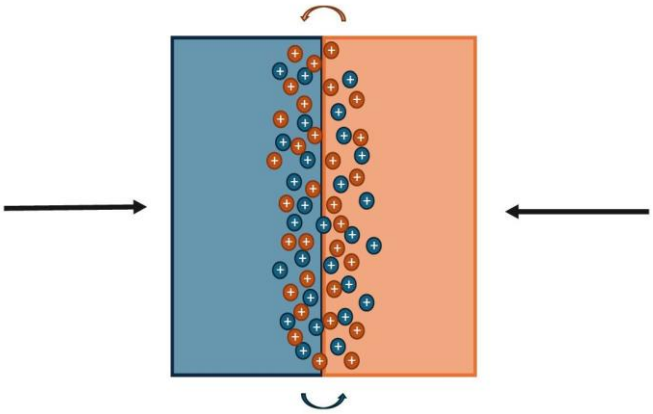
Front side with PowerFlex

Back side with PowerClamp



## Cold Welding in Press-Fit Technology

When two metals with clean surfaces are pressed together under high force, their atomic lattices interlock as **atoms migrate from one metal to the othe**r. This creates a welding at ambient temperature. **Cold welding**.



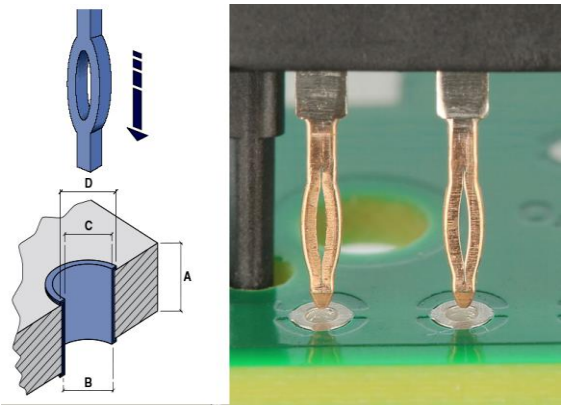
In PressFit technology, this cold welding occurs when a metallic pin is pressed into a metallic hole that is slightly smaller than the pin. Under high pressure, either the hole or the pin deforms.

## PressFit Types According to DIN EN IEC 60352-5 (Solderless Connections)

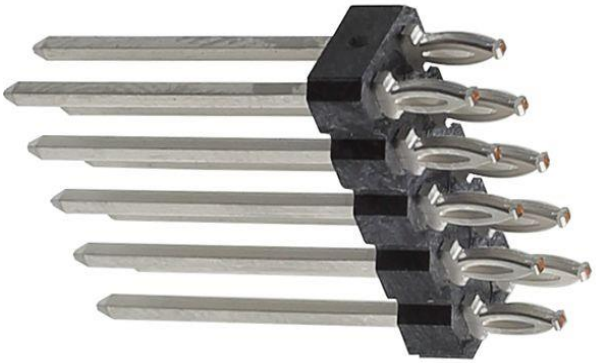
The DIN standard distinguishes between two technologies: **flexible PressFit and rigid PressFit**

## Flexible PressFit Technology

In flexible PressFit systems, the pin deforms during insertion, while the hole remains unchanged. This is only possible when the pin is sufficiently thin. Typically, these pins are punched from metal sheet with a thickness of around 0.6 mm.




A common application is multipole data connectors, such as DIN connector strips.



The geometry of these pins usually results in electrical contact at only one point inside the plated through-hole. This limits the current to approx. 1 Amp, which is sufficient for data transmission.

To enable higher currents, **BROXING** has developed a special PressFit zone.

For **BROXING** pins, the contact area inside the hole is 3 mm² for a PCB thickness of 2 mm. With a current density of 15 Amps/mm², this corresponds to a current capacity of 45 Amps. The nominal rating per pin is defined as 20 Amps

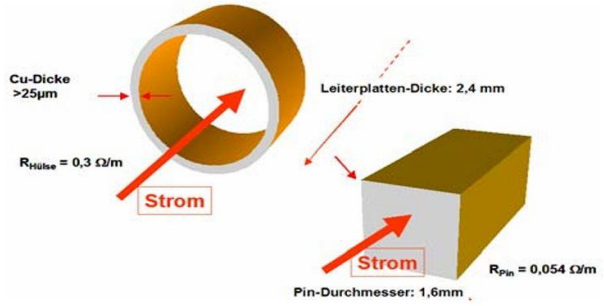
Typical applications include FastOn connectors used in automotive systems, relay sockets, connectors, and gate connections for IGBTs.

**Rigid PressFit Technology**

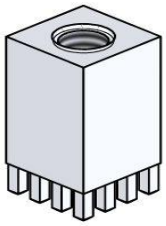
To carry higher currents, pins with greater mass are required. These can no longer be stamped from sheet metal; instead, they must be machined from solid material (turned or milled).

**Square PressFit Pins**

In the early days of PressFit technology, square pins were pressed into round holes.

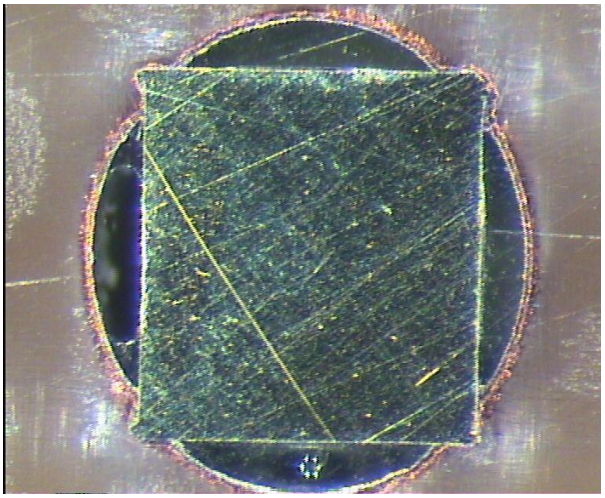



Some competitors still use this method today.

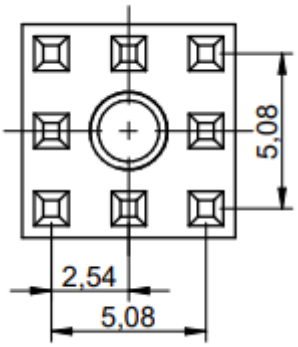


The advantage is low manufacturing cost. However, from a technical perspective, this approach has significant quality drawbacks.

The sharp edges of the pin cut into the copper plating under high force, damaging the plated through-hole. According to DIN, at least 8 µm of copper must remain after insertion — practically impossible with this method.



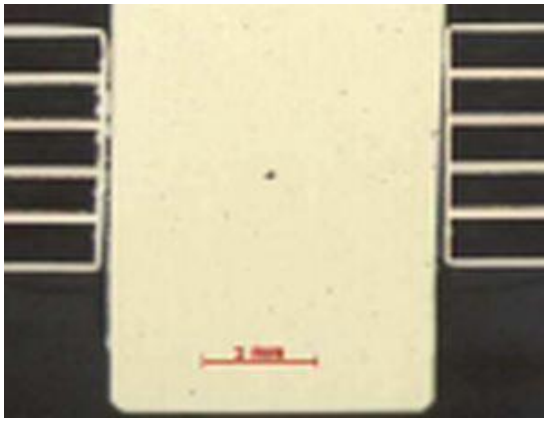
These components often have many pins whose position accuracy cannot match PCB drilling tolerances.

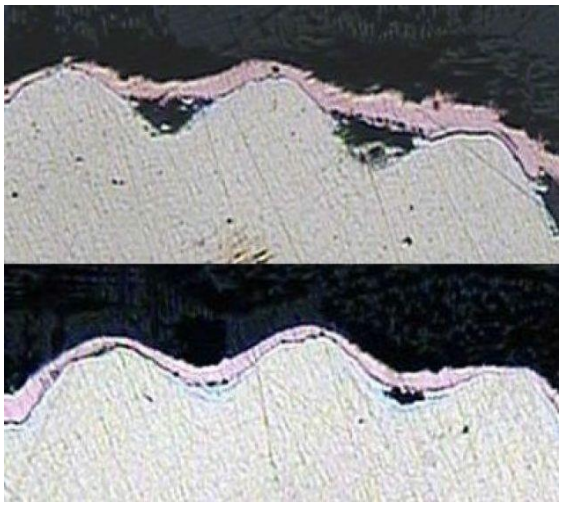



If, for example, the milling process introduces a positional deviation of ±30 µm, the copper plating may be completely cut through.

The high insertion force also causes problems in multilayer PCBs: the inner layers deform in a funnel shape around the via. DIN limits this deformation to 50 µm, but with square pins the deformation is difficult to control, increasing the risk of inner-layer separation.

**BROXING SoftPress Technology**

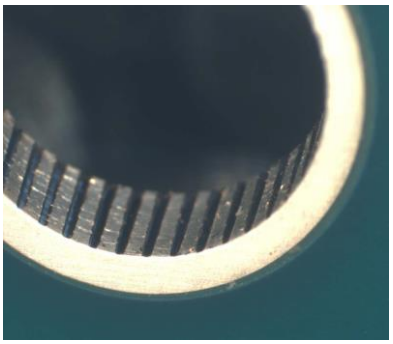




With **SoftPress,** the plated hole is no destroyed, only gently deformed. A typical PressFit pin has a diameter of 3 mm and features a 30tooth knurling. These teeth do not cut into the copper; they only deform it.

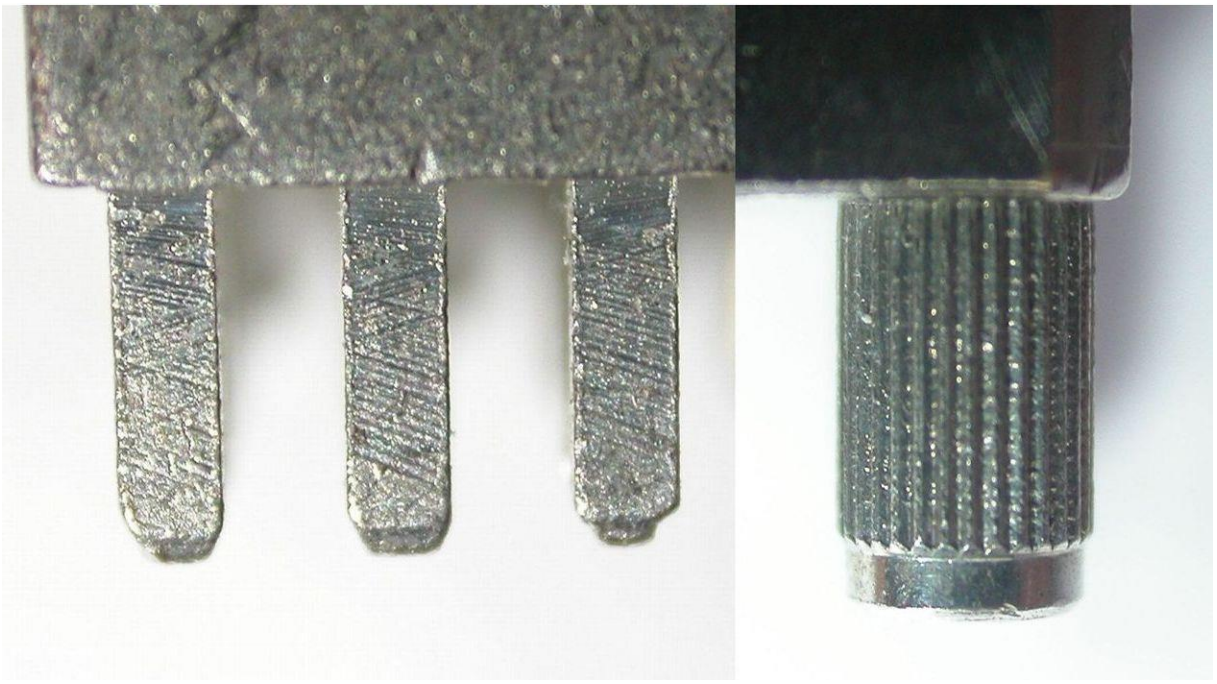
As a result, the insertion force is significantly lower than with square pins, making the process much gentler on the PCB.

The teeth have a depth of approx. 0.17 mm, with about 50% of the copper plating making contact. For a 3 mm diameter, the circumference is approx. 5 mm, which — with a PCB thickness of 2 mm — yields a contact area of 10 mm².



With a current density of 15 Amps/mm², this corresponds to a current capacity of 150 Amps per pin. In the PCB itself, the current density is approx. 50 Amps/mm². BROXING specifies a nominal rating of 50 Amps per pin on FR4. When pressed into a busbar, the nominal current increases by 50%, enabling up to 1000 Amps for a standard PowerClamp.

**Comparison: Square Pins vs. BROXING Pins**

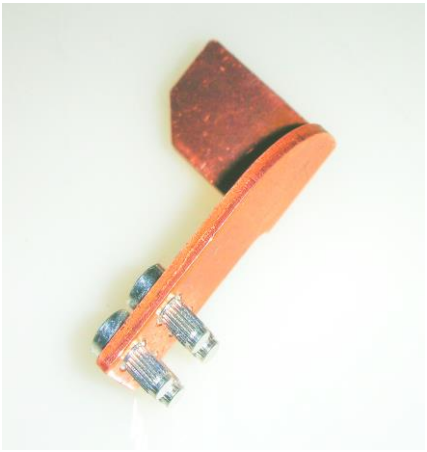


Square pins are chamfered at the bottom to ease insertion. However, this does not guarantee a perfect 90° alignment. Even a 1° tilt (89°–91°) can cut through the entire 35 µm copper plating (sin 1° × 2 mm ≈ 34 µm).

For this reason, all **BROXING** pins are equipped with a centering collar, ensuring perfectly straight insertion and preserving the copper plating.

Another advantage is that **BROXING** pins can be manufactured in different lengths, enabling press-fit connections even in PCBs up to 6 mm thick. The centering collar can also be extended for **pick-and-place assembly.**

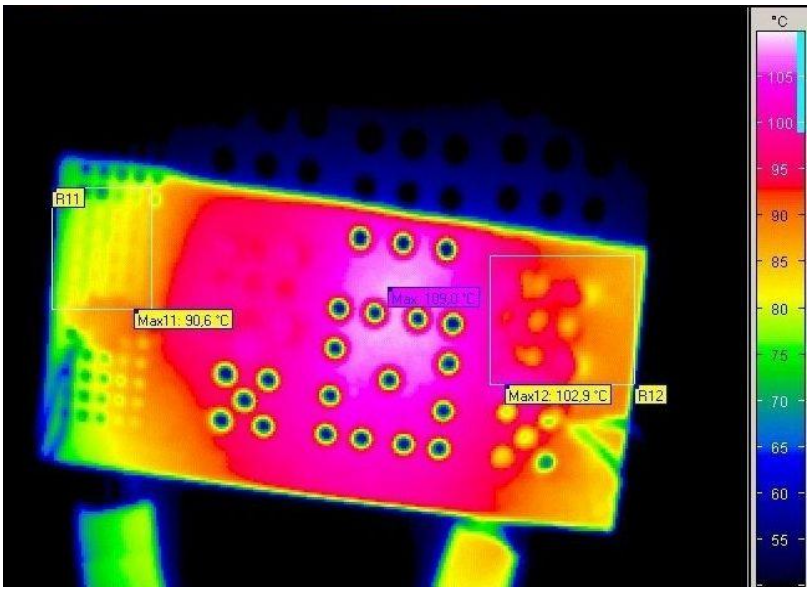
**BROXING** pins can also be pressed into busbars, which can then be pressed onto FR4 PCBs.



**Thermal Comparison: Square Pin vs. BROXING Pin**

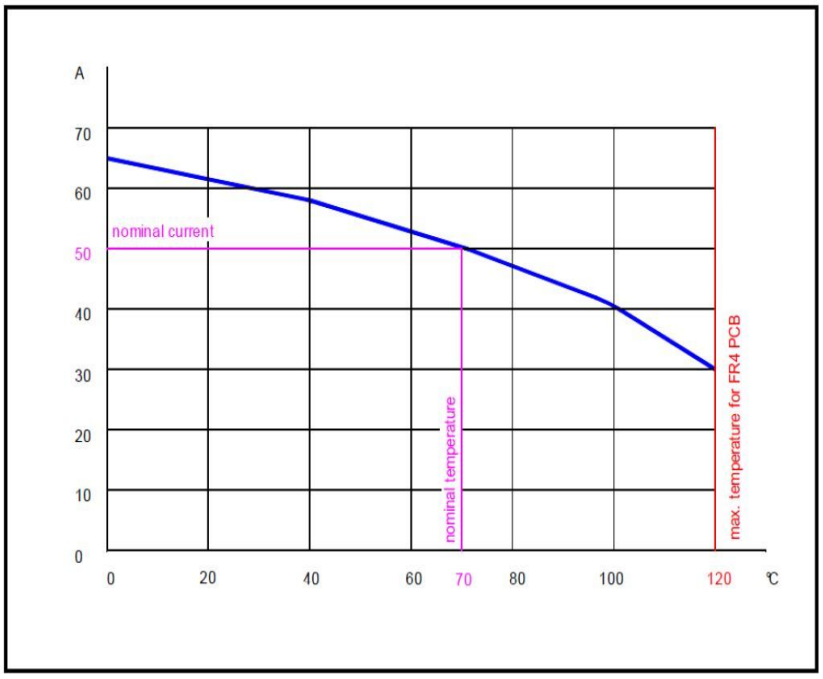
Infrared thermal analysis shows that a **BROXING** PowerClamp runs approx. **12°C warmer** than a competitor's square pin at the same current.

This is expected: the square pin contacts the plating at only four points, while the BROXING pin contacts it at 30 knurling teeth. This results in better electrical, thermal, and mechanical coupling.




The improved thermal interface allows the **BROXING** PowerClamp to act as a heat sink for the PCB.

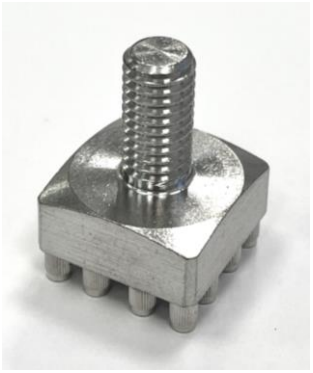
**Derating Curve of Press-Fit Pins**



## PowerClamp – PressFit Series B, N, and L

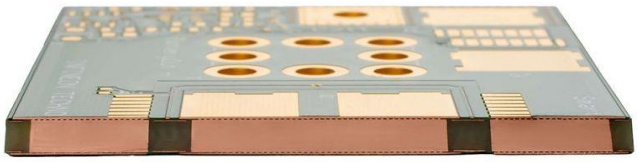
These series use 3 mm PressFit pins. Depending on the number of pins, they achieve **100–600 Amps on FR4 (2–12 pins)** and up to 1000 Amps on busbars.

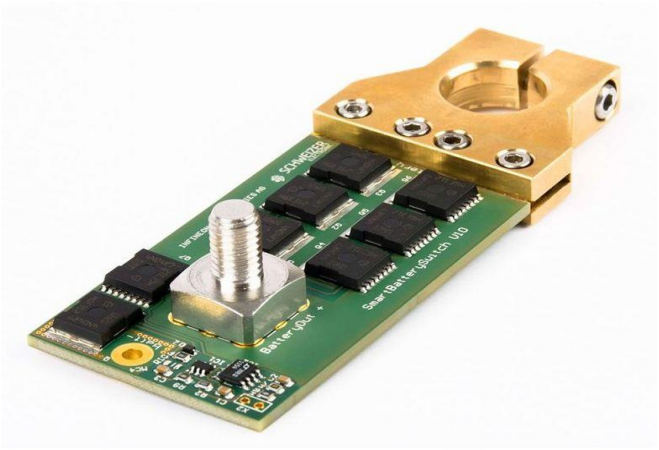
- **B-Series** (Bolt): external thread



- **L-Series:** L-shaped body with horizontal thread

- **N-Series** (Nut): cylindrical body with internal thread





Standard threads are **metric**, but **UNC** and other threads are available.

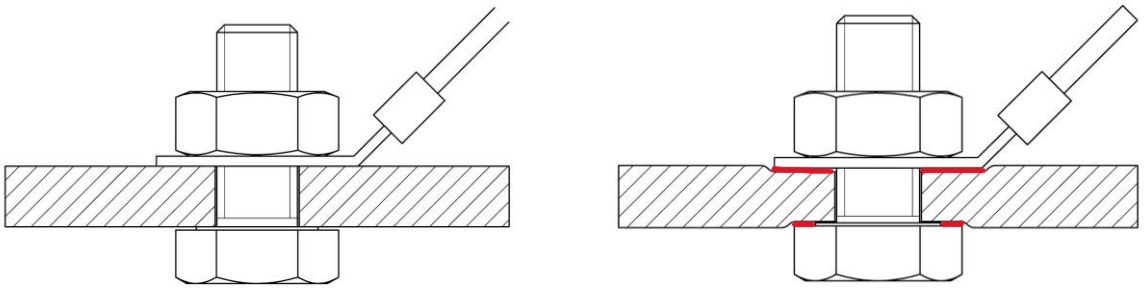
Internal threads can be equipped with **Helicoils** for aerospace applications.

## H-Series

These contact-elements are normally designed as through-holes (H = Hole), meaning no torque is applied to the PCB.

### H-Series for PCBs

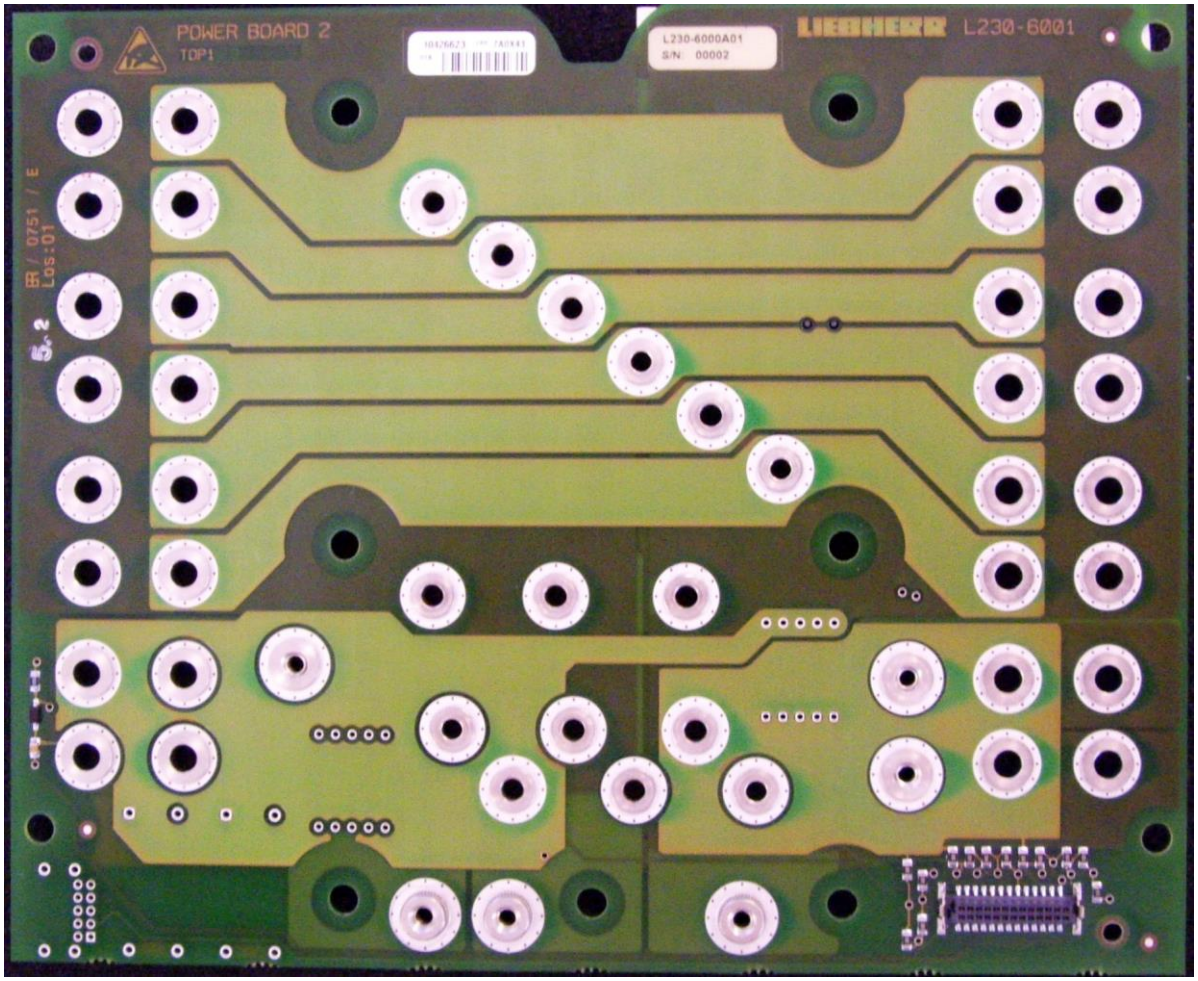
FR4 is not a solid but behaves physically like a high-viscosity fluid, meaning it is not dimensionally stable under long-term mechanical load. If an electrical screw connection is applied directly to the PCB, the FR4-material slowly deforms, causing the screw to loosen over time.



If this screw also carries current, the increasing contact resistance can lead to dangerous heating. For example, at 100 Amps and 1 mΩ, the power loss is 10 W, enough to burn the PCB.

By pressing in an H-Series spacer, no horizontal force is applied to the PCB. The screw clamps against the spacer, not the board.

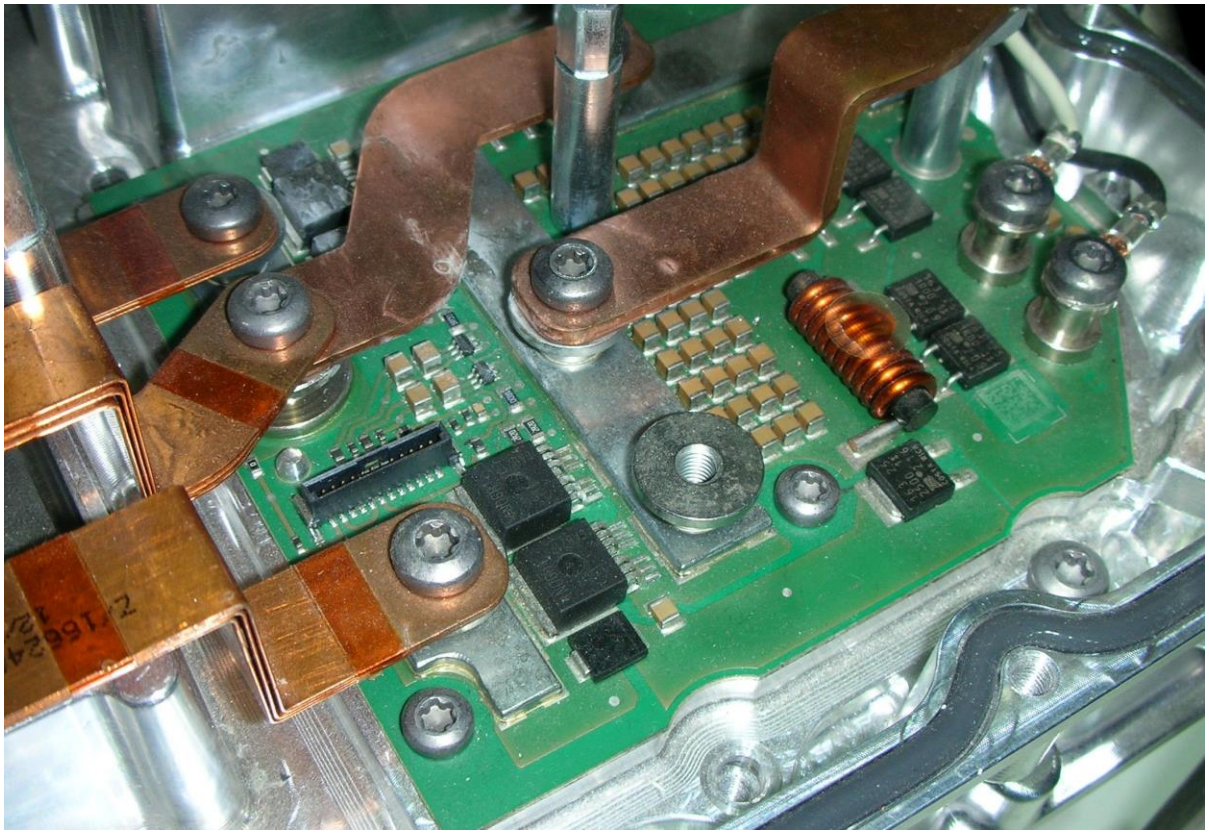
In special cases, these parts can also be supplied with internal or external threads (HN-Series, HB-Series).



**H-Series for Busbars**


These elements can also be pressed into busbars.

They are often mounted onto IMS substrates using SMT soldering. Since IMS cannot be drilled and therefore cannot use press-fit, this method enables currents up to 600 Amps.



## Conclusion on Press-Fit Technology

Press-fit is, without question, the best connection technology because it is:

- solder-free, eliminating thermal stress on the PCB;
- double-sided mountable;
- vibration-resistant, thanks to the cold welding;
- the only gas-tight connection method (cold welding);
- the only viable solution for high currents and thick-copper PCBs;
- suitable for PCBs and busbars.