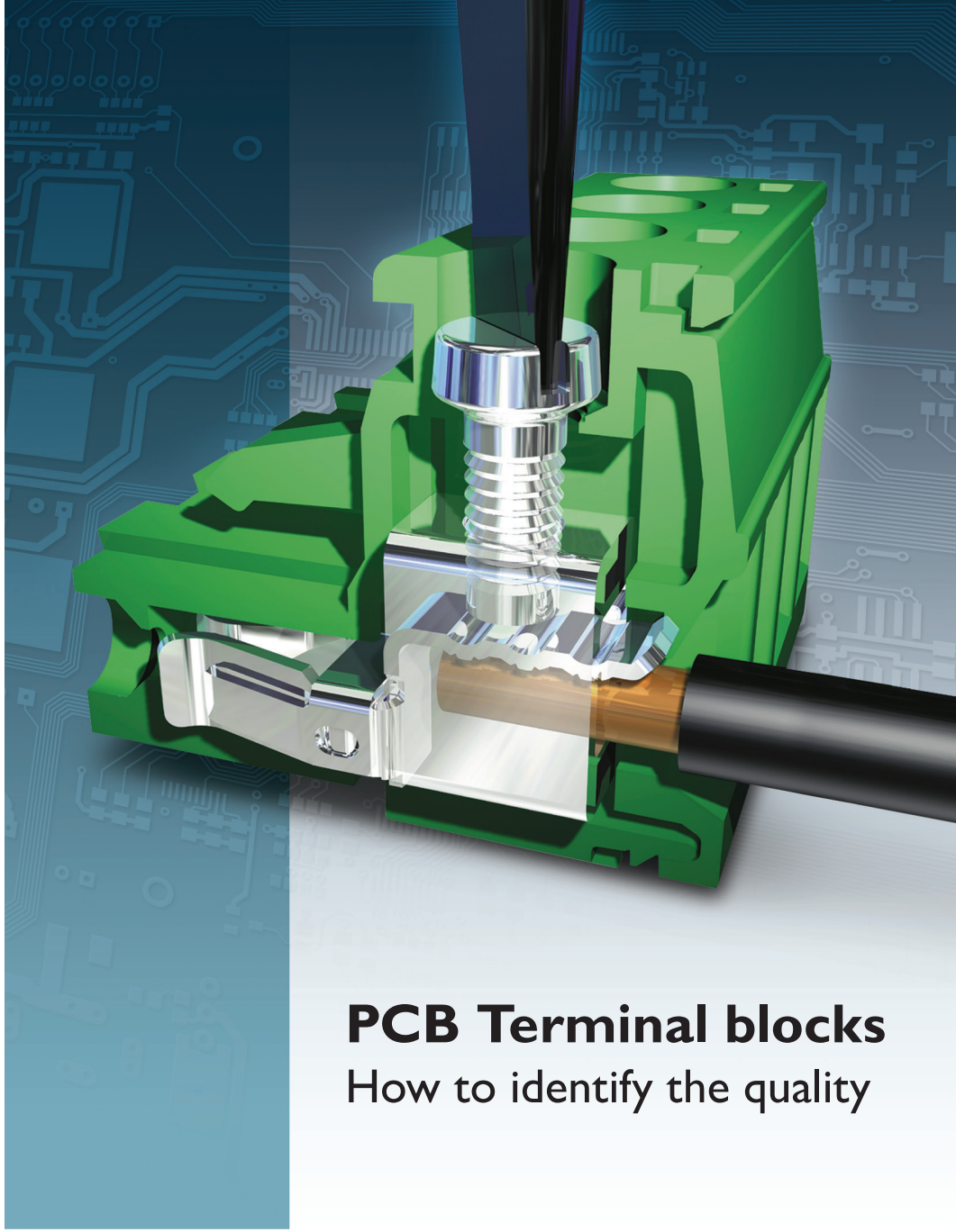


PCB Terminal blocks

How to identify the quality

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Educating yourself on what to look for
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Educating yourself on what to look for

As you begin to compare terminal blocks, be sure you make a thorough review; not all terminal blocks are created equally.

In this short overview, you'll learn how to identify potential pitfalls before you make a purchase by properly evaluating the design, materials and manufacturing quality of:

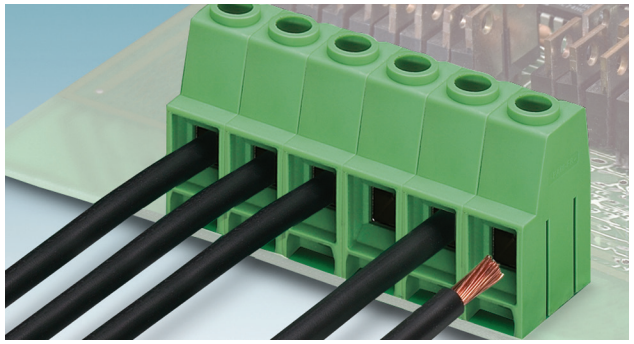
- **Molded housings**
- **Metal parts**
  - Wire cage
  - Screws
  - Pressure plates
  - Spring
  - Solder posts
  - Pin contact
  - Receptacle contact
- **Plating**
- **Assembly**

Attention to detail

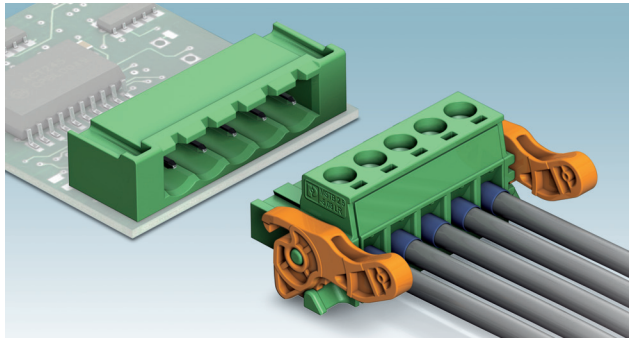
At Phoenix Contact, we understand how even the smallest of mistakes can be costly. Poor attention to detail not only causes individual parts to fail, but can also be detrimental to the overall system.

Our practices focus on every aspect of the design and manufacturing process, from the housing to the pressure plate.

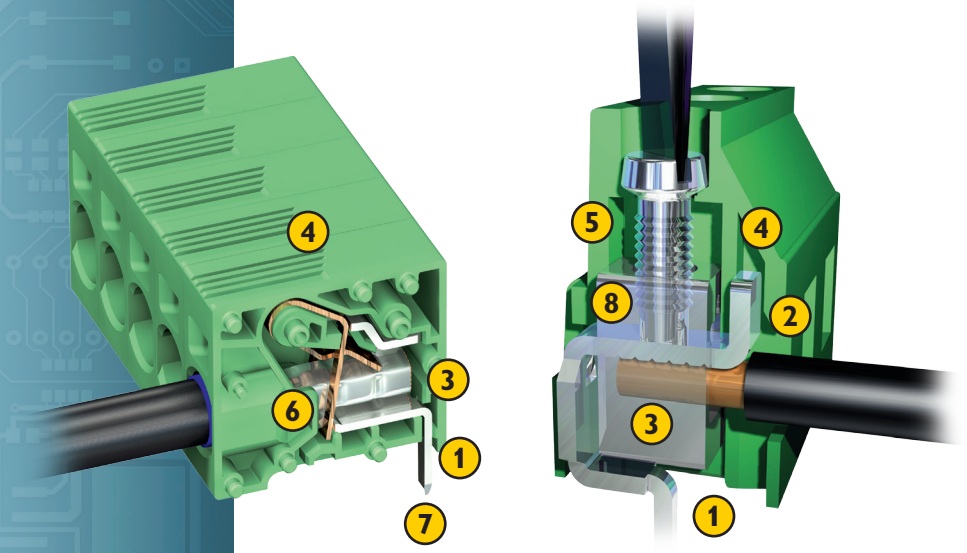
Fixed single-piece design



Pluggable two-piece design

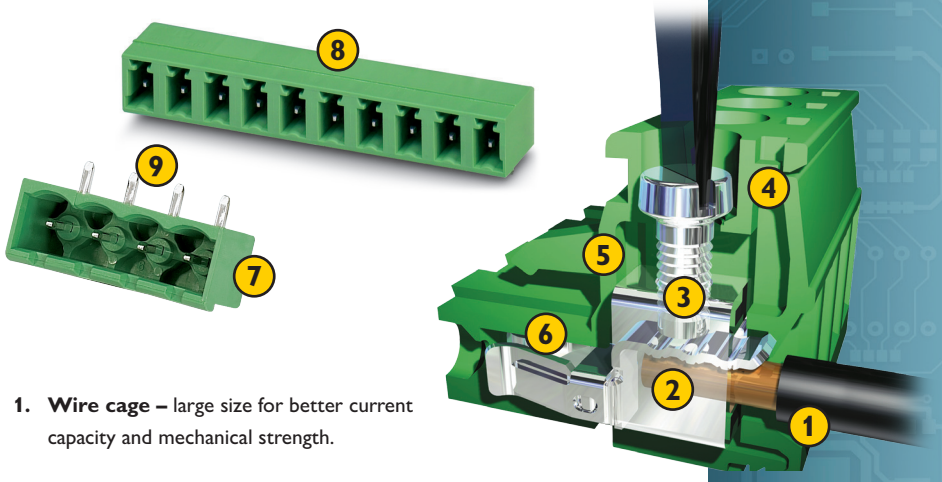


Fixed single-piece design



1. **Pin placement –** straight, evenly spaced solder pins for easy placement on PCB.
2. **Current carrying bar –** quality materials for a low-resistance current path.
3. **Quality alloys –** selected for performance, based on design. Using similar metals for equal expansion/contraction in thermal changes prevents loosening of wire termination.
4. **Housing design –** for performance and production consistency.
5. **Captive screws –** prevent screws from falling out while in the open position.
6. **Spring push-in technology –** fast wire insertion, without tools, for solid and ferruled stranded wires – the fastest termination available.
7. **Tapered pin –** improves ease of placement on the PCB by preventing contact stubbing.
8. **Reakdyn® principle –** mechanical locking of screw prevents loosening due to vibration or thermal expansion.

Pluggable two-piece design

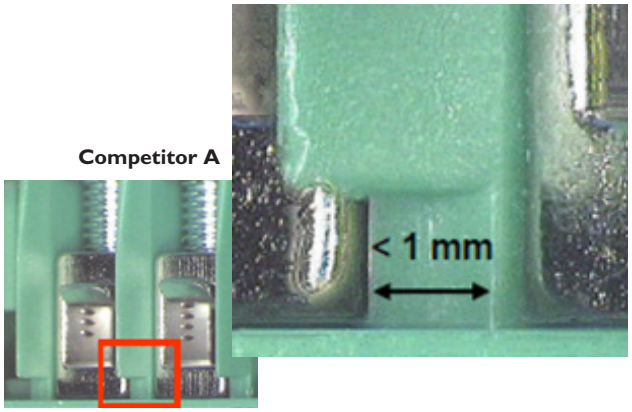


1. **Wire cage –** large size for better current capacity and mechanical strength.
2. **Pressure plate –** serrated to penetrate oxidation that may be present before wire termination. Increased wire retention is an added benefit.
3. **Reakdyn® principle –** mechanical locking of screw prevents loosening due to vibration or thermal expansion.
4. **Captive screws –** prevent screws from falling out while in the open position.
5. **Plug materials –** screw and cage made with high-quality copper alloys. Identical materials result in equal expansion and contraction during temperature changes. This prevents loosening of screws as seen in other manufacturers' products made with dissimilar metals.
6. **Superior metals –** receptacle beams provide a high conductivity level, while good spring performance assures that proper normal force is maintained over the life of the product.
7. **Header materials –** high-quality copper alloy for improved electrical characteristics. Tin plating with nickel underplate for optimal solder performance.
8. **Header housing –** designed for secure pin fit with consistent straightness of housing, providing good fit on the PCB and mating plug. Consistent key retention for positive key options.
9. **Pin alignment –** straight, for secure, no stubbing of connection at the mating face and ease of placement on the PCB at the solder posts.

Common defects – Housing design and mold build

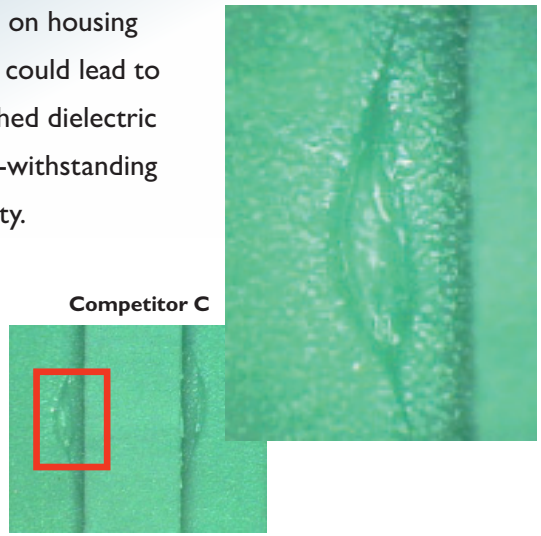
Be on the lookout for metal protruding into open spaces. This manufacturing error will create a reduction in air-space distance – a violation of UL requirements for the specified rated voltage.

Competitor A



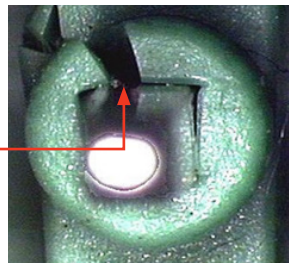
Blisters on housing surface could lead to diminished dielectric voltage-withstanding capability.

Competitor C



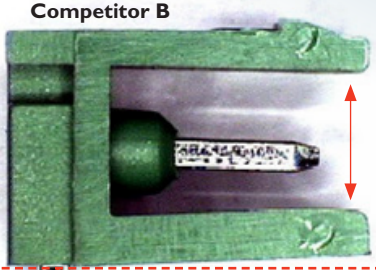
Common defects – From poor mold tool maintenance

Severe cracks resulting in loose pins.



Competitor C

Competitor B

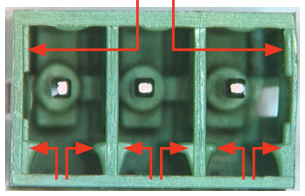


Unequal opening: too small for mating plug.

Angled pin: difficult to place on PCB.

Irregular housing: not able to sit flush on PCB.

Inconsistent wall thickness: potential broken end-wall.



Competitor B

With inconsistent key-retention features, you'll experience a loss of keying capability.

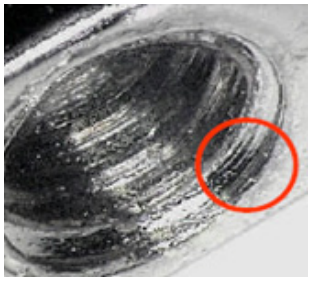
Phoenix Contact



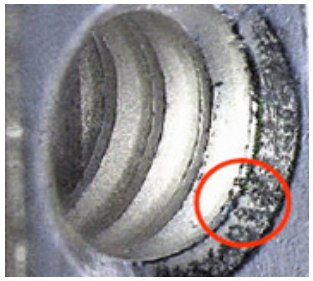
Consistent features for quality key retention.

Common defects – Faulty wire cage

Poor threading in the manufacturing process can result in bad torque readings, as well as a higher chance for screw back-out.



Competitor A



Phoenix Contact

Clearly defined threading creates a secure, longer-lasting connection.

A diminished cage design is more prone to damage at lower torque levels.



Phoenix Contact



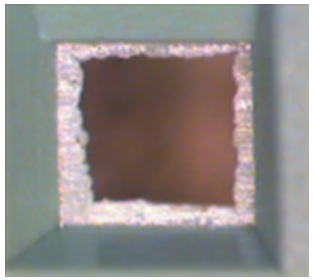
Competitor A



Competitor B

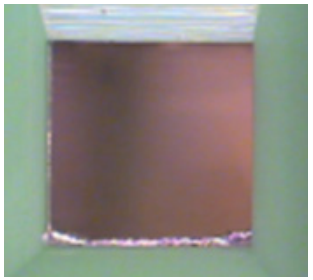
Common defects – Stamping irregularities

Competitor A housing funnel

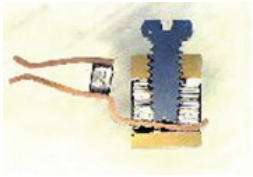


Extensive flash formation and reduced wire entry.

Phoenix Contact housing funnel



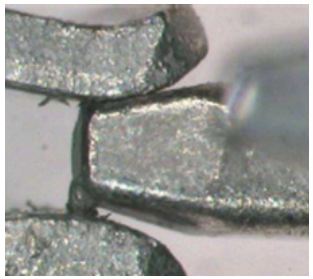
Minimal flash formation.





Competitor A

When a machined wire cage is manufactured with a rough surface, the results are inconsistent performance, resistance and diminished mechanical strength. The sharp edge on the pictured sample produced cut wire strands.



Competitor D

A tiny burr on the contact will cause damage to the plating surface.

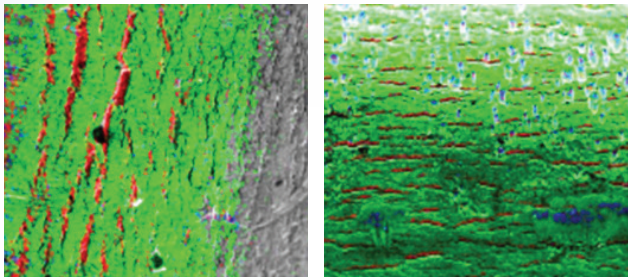
Plating issues – Poor performance

The performance of pins manufactured without nickel underplating is affected by buildup, resulting in poor solder performance.

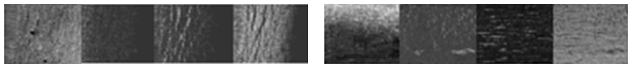


Competitor E

These two samples from an energy-dispersive X-ray (EDX) analysis illustrate the typical deficiency found in plating surfaces.



Competitor B

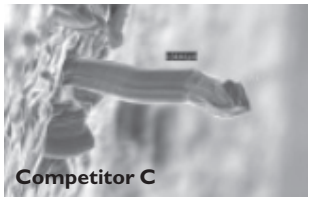


Nickel **Copper** **Tin**

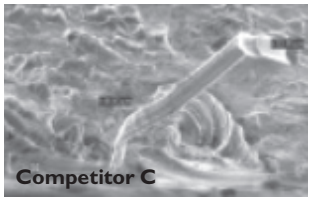
When the base material is exposed due to plating gaps, corrosion buildup can cause increased resistance.

Plating issues – Tin whiskers

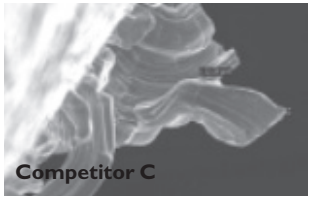
Tin whiskers can cause shorts and failures on sensitive electronic equipment. At Phoenix Contact, we place an emphasis on mitigation practices to ensure whisker-free products.



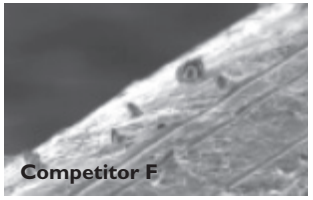
5290x magnification
Whisker with a length of 34 um on a horizontal contact pin.



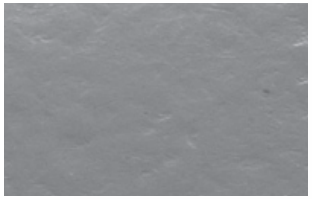
2510x magnification
Whisker with a length of 34 um on a horizontal contact pin.



4560x magnification
Whisker with a length of 34 um on a horizontal contact pin.



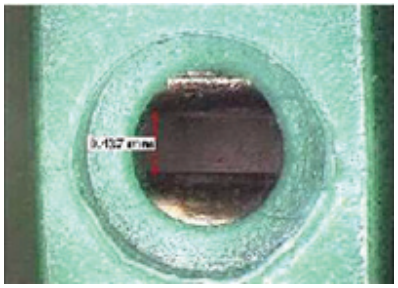
8780x magnification:
Buildup of whiskers on a contact pin.



3,000x magnification
Phoenix Contact plated surface. Whisker-free.

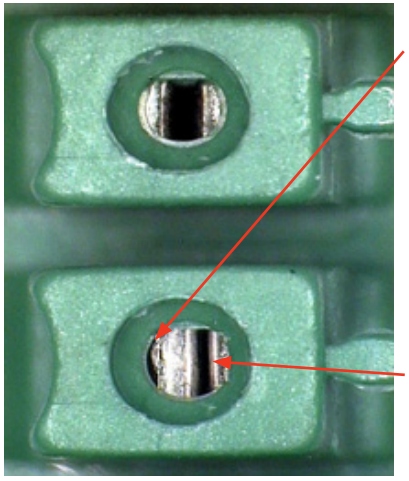
WHISKER FREE

Common defects – Assembly of plugs



Competitor C

Contact gap too wide, resulting in low contact force and high resistance.



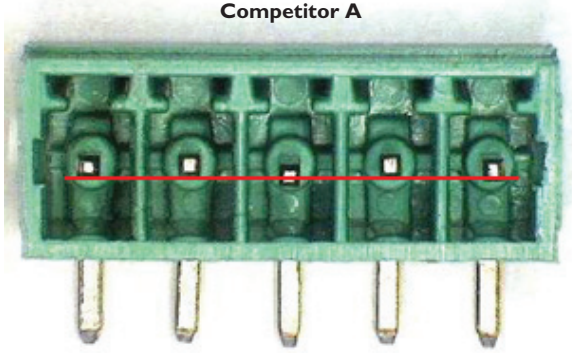
Competitor B

Off-center contact placement. Potential for pin insertion to not be in proper contact area.

Contact gap closed, resulting in potential stubbing or inability to mate.

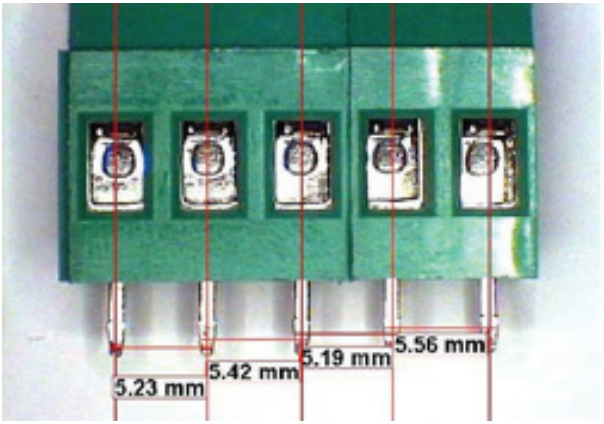
Common defects – Assembly of headers and fixed terminal blocks

Competitor A



Pins at mating face not even, resulting in potential stubbing and poor connection with high resistance.

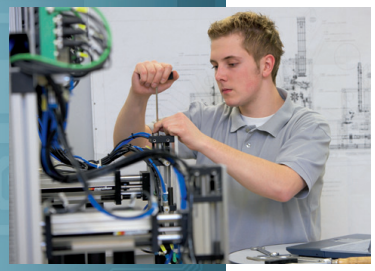
Competitor E



Pins at solder tails not even, resulting in difficult placement on the printed circuit board and loss of productivity.

Quality manufacturing

At Phoenix Contact, our products begin with the design and building of plastic and metal tools. This unique product creation involves the manufacturing of all component parts, including the punching and bending of metal parts and the molding of plastic housings. Our highly automated assembly machines are specifically engineered and equipped with the latest technology.

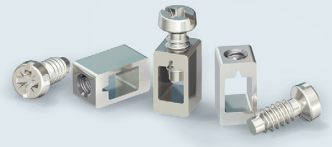


Mechanical engineering for assembly machines



Tool engineering

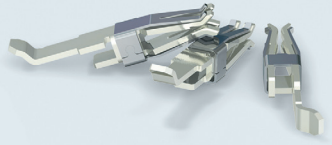
Our manufacturing expertise



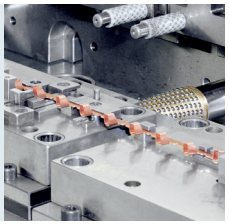
Metal-cutting production

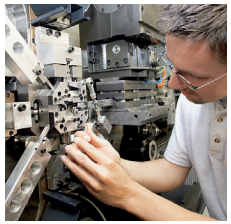


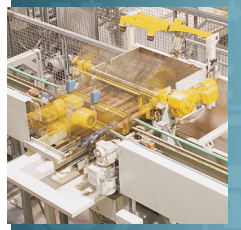




Punching and bending production

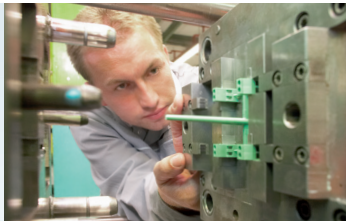




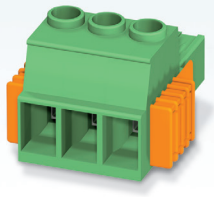




Injection-molding production







Assembly

