

hybrid joining.

Thermal direct joining of metal with plastic

The hyJOIN® joining technology enables quick and reliable metal-thermoplastic joining without the need of any additional material. Both spot and media-tight joints can be produced.

- Stable connection without additional material
- Smart alternative to adhesive bonding
- Joining complex components within seconds
- Geometric flexibility through exchangeable heating modules
- Monitoring of all relevant process parameters in automated assembly production

hyJOIN® Functional principle



0

Part preparation

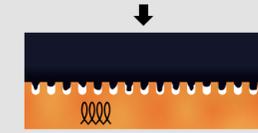
In a previous process, the metal is pretreated at the contact point (roughening, activating, coating).



1

Part fixation

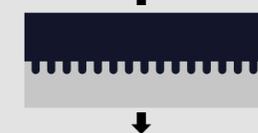
The components are placed into contact with each other in the joining area.



2

Short-time heating

A heating tool applies eddy currents to heat the metal-surface in the joining area so that the plastic melts at the boundary layer and wets the metal surface.



3

Cooling and opening

After finishing the heating sequence, the connection cools very quickly due to self-quenching in the metal or active cooling. The component is immediately capable of bearing loads.



**KIST +
ESCHERICH**

Tested material combinations

All thermoplastics (unreinforced, short, continuous fiber-reinforced with glass/carbon fibers):

- Polyamide (PA6, 6.6, 12)
- Polypropylene (PP)
- Polyethylene (PE)
- Polyphenylene sulfide (PPS)
- Polyaryletherketone (PAEK)
- Polyoxymethylene (POM)
- Polycarbonate (PC)
- Thermoplastic polyurethane (TPU)

Metal alloys, extruded, cast and wrought alloys as well as 3D printed parts; with/without anti-corrosion coatings:

- Aluminium
- Titanium
- Steel
- Magnesium

Service portfolio

- Advice on the design of the joining zone
- Verification of the joinability of the material combinations
- Design and manufacturing of the joining tool including temperature field simulation
- Process evaluation & pilot production
- Design and manufacturing of production machines

Applications

- Production of hybrid components for lightweight applications
- Media-tight sealing of metal and plastic housings
- Assembly technology for fixing fasteners to body and large structures
- Assembly of plugs, sockets, handles and flange elements



Your products in focus

Visit our hyJOIN® TECH Center in Dresden for initial sampling and the production of prototypes. Our experienced application engineers look forward to finding the best solution for your application with you. In our well-equipped laboratories, we connect your product with our hyJOIN technology and analyze the results directly in the live session.

Product portfolio

Hybrid joining systems for integration



coreJOIN

Metal-plastic joining tool for machine integration

- Flexible integration into fully automated assembly lines
- Press module that can be variably positioned in space
- Suitable for production of complex components
- Enables customisation of the production line

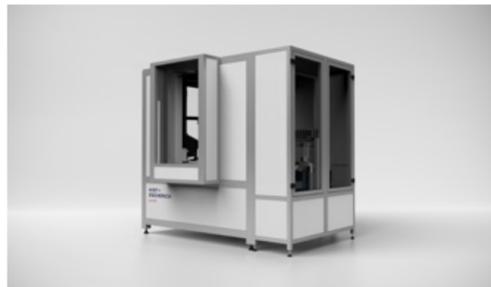
Hybrid joining machines



varioJOIN

Semi-automatic device for thermal direct joining of metal with plastic

- Maximum flexibility thanks to manual system equipping
- Process automation ensures high quality
- Easy and quick convertibility for various joining tasks
- Suitable for customised parts and medium series production



giroJOIN

Rotary transfer machine for thermal direct joining of metal with plastic

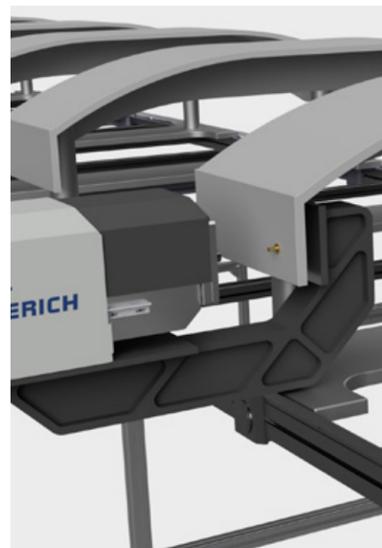
- Parallel implementation of the process steps within one machine
- Shortest cycle times and maximum productivity
- Loading and unloading takes place in different ways depending on the degree of automation
- Suitable for medium and large series production



atroJOIN

Robot cell for thermal direct joining of metal with plastic

- Coupled with a precise and fast pick & place system
- Easy convertibility to various joining tasks
- Used for complex component geometries
- Suitable for medium and large series production



hyJOIN® in practice

Building hybrid assemblies for optimising thermal management

Initial situation

An optimised heat dissipation in energy storages (e.g. batteries) and power electronics ensures high efficiency, longer service life and thus a more stable product performance. Cooling elements made of aluminium quickly remove excess heat. If they are encircled on the back by a cooling liquid flow, heat can be removed quite efficiently. This requires the media tight connection of the cooling enclosure to the aluminium heat sink.

Our solution

A compact design as well as cost-effective manufacturing of the cooling elements can be achieved by joining the aluminium component with a plastic injection moulding part, using thermal direct joining by hyJOIN® technology. Previously required screws and additional seals can be omitted because the connection is strong and leak-proof. In addition, flange widths and material thicknesses can be minimised, further reducing weight and creating space. In addition to the new degrees of freedom that come with the assemblies' design, the hyJOIN® joining technology offered by KIST + ESCHERICH is ideally suited for automated production due to its intelligent process steering and control. This makes it possible to produce cooling elements at a lower cost and to maintain high process reliability.

Assembly processes for the interior area in vehicles and airplanes

Initial situation

If a component is to be attached to larger metallic structures, this is often done by adding drilled holes or inserts and subsequently screwing on or attaching weld studs. If the structures are made of a fibre-reinforced plastic, drilled holes or inserts will greatly weaken the strength of the structure. Conventional stud welding methods cannot be used either. For this reason, the fixing and mounting elements are typically bonded with an adhesive. The high cost of cleaning the joining areas, the application of adhesives, and the long curing times justified the development of new mounting solutions.

Our solution

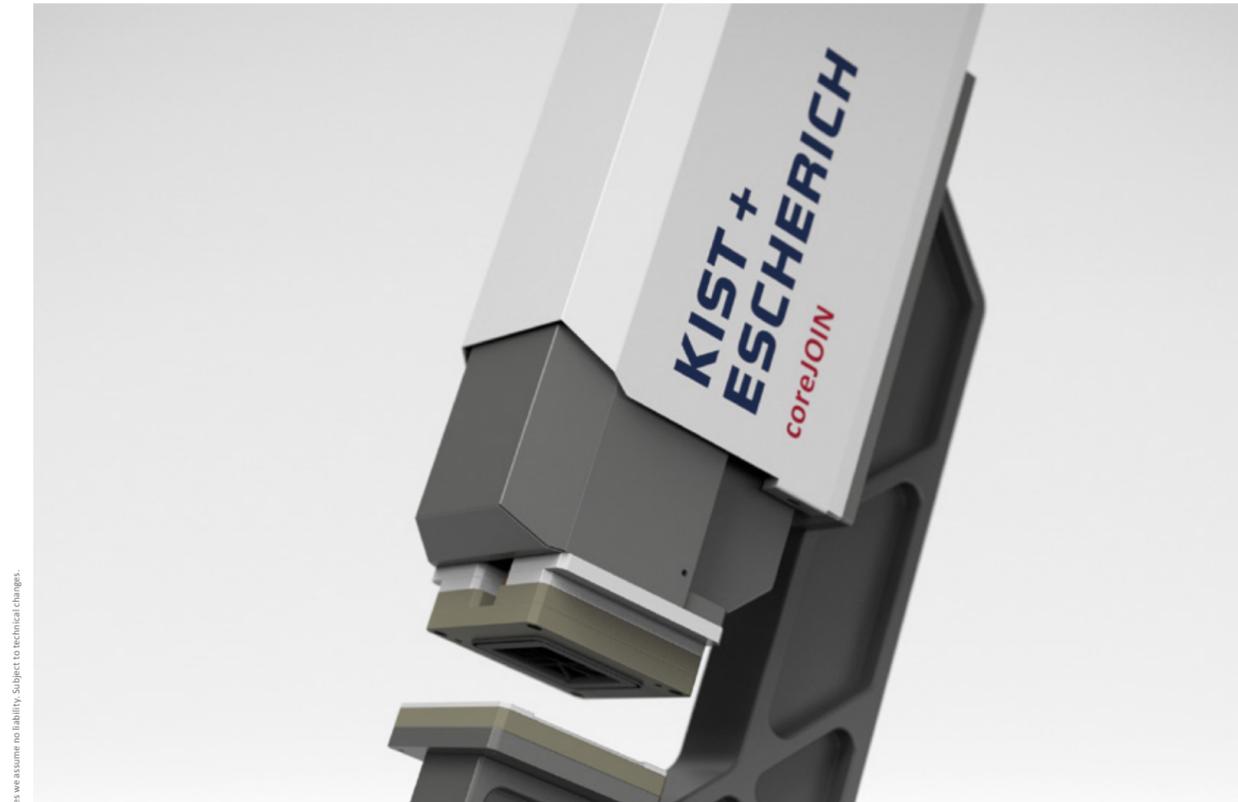
Fixing and connecting elements to structures made of fibre-reinforced plastic can be done quickly and reliably using the hyJOIN® joining technology. The joining tool presses the metallic mounting element onto the structure and simultaneously heats it via inductive eddy currents. The resulting connection, created in 2–5 seconds, can be stressed immediately after process completion. To ensure sufficient flexibility, the hyJOIN® tool can be positioned with a robot. Depending on the type and stiffness of the structure, it is possible to work with or without a counter brace, as in the case with spot welding pliers.

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**KIST +
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static control. cleaning systems. hybrid joining.



hyJOIN® – Thermal direct joining

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