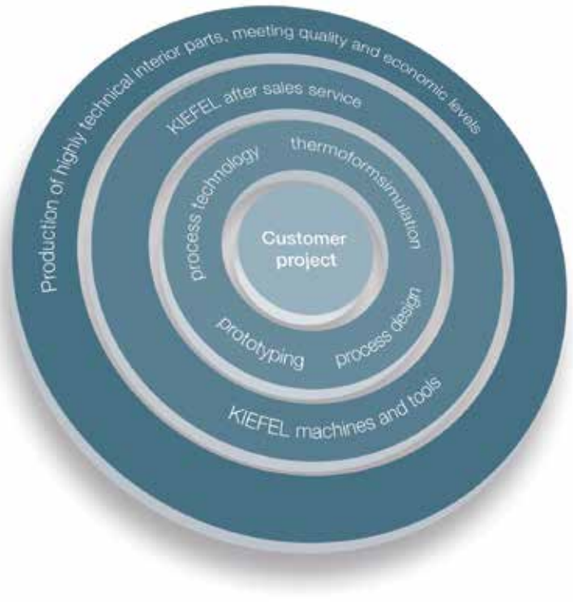


MACHINES AND TECHNOLOGIES FOR THE **AUTOMOTIVE INDUSTRY**



The Partner of the Automotive Industry

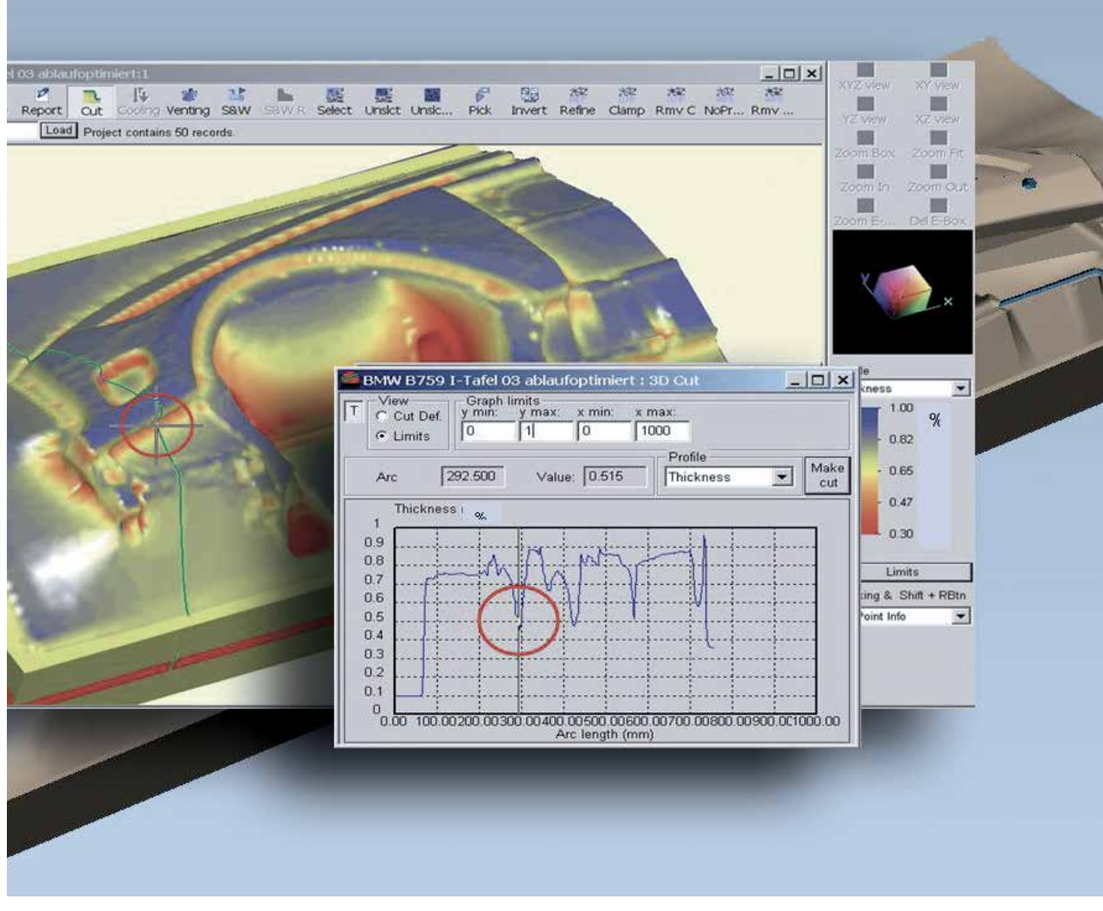
- **Individual solutions:** KIEFEL is one of the international market leaders wherever the processing of plastics for the automotive industry is concerned. Working in close cooperation with customers, we design and provide complete solutions for the production of interior trim components.
- **Outstanding knowhow:** Our strength lies in our complete understanding of the processing technologies involved. Our engineering capabilities and our experience as producers of industrial machines based on a history spanning more than 50 years.
- **Maximum quality:** In addition to the development of fundamental principles for plastic processing technology, our research labs work with the customer – starting at the prototype phase – to develop manufacturing techniques. While prototype components are produced for pre-production vehicles, this knowledge is then transfered using KIEFEL machines and tools for production – delivering components that meet the highest quality specifications of automotive manufacturers, with the very best in functionality, aesthetic appeal and texture.



KIEFEL Machines and Tools

- Vacuum laminating
- Vacuum forming
- In-Mould-Graining IMG and IMG L
- Press-laminating
- Edge-folding
- Riveting, ASC-technology and Ultrasonic
- High-frequency welding
- Slush moulding
- Specialities





KIEFEL - From Design to Series Production

In order to fulfill the demanding requirements of the automotive industry KIEFEL always needs to be looking to the future. All processes require the need to be absolutely reliable and fully tested. Starting with consulting during the phase of early production design, process development and prototyping, KIEFEL is a full-service-supplier for the processing of film and textile materials.

KIEFEL‘s Technical Lab Center:

For all processes KIEFEL has a wide range of lab-machines. Combined with the know-how and long term experience of KIEFEL’s engineers all processes can be approved in our technical center.

Thermoformsimulation T‘-SIM

T’–SIM is one module in the entire process of the machine and tool machinery development for interior parts.
KIEFEL is one of the pioneering companies using this technology. KIEFEL developed the first T’-SIM analysis in 1998 and since 2005 KIEFEL has provided numerous T’-SIM analysis’ of automotive interiors parts. But the result of the T’-SIM analysis is only as good as the experience and the process knowledge of the engineer.

Your benefits:

- Feasibility analysis and risk assessment during the design phase of the interior part
- Fast and cost effective comparison of various thermoforming concepts and selection of the best and cost efficient variant or technology
- Cost effective process for optimization for prototype and series tools
- Matching and optimization of the clearance of bordering parts in a early project status





Vacuum Thermoforming Machines





KIEFEL, one of the pioneers in the thermoforming machinery industry started to produce thermoforming machines in the early sixties.

Based on this long term experience all KIEFEL thermoforming machines have the latest technical development.

Strong machine design, high precision and long production viability.

Using the latest generation of high dynamic servo drives combined with individually adjustable quartz-heaters and energy efficient centrifugal cooling blowers a high rate of energy-efficiency of KIEFEL thermoforming machines is assured. KIEFEL takes its responsibility to minimize the CO^2-emission and to lower the total power consumption for ecological part production over the entire lifetime of the machine.



Single Station Thermoforming Machines

KL-Series

- **Field of applications**
  Vacuum forming for laminating of interior parts with low production volume (cycle time 100-120 sec.):

  - Door main carrier, door upper, map pockets, armrests
  - Center consoles
  - Instrument panels

- **Available machine configurations**
  - Usage of film sheets
  - Usage of film roll material
  - Double upper table

- **Machine options**
  - Hot-melt package
  - In-Mould-Graining (IMG) package
  - Film unwinding system with manual film inlet and cross-cutting attachment
  - Table-in-table-function for top table
  - Additional top table for contour punching
  - Additional pyrometers









Inline Vacuum Thermoforming Machines

KLS-Series

- **Field of applications**

  Vacuum laminating or forming of interior parts with high production volume (cycle time 40-60 sec.) like:

  - Door main carrier, door upper, map pockets, armrests
  - Center consoles
  - Instrument panels

- **Available machine configurations**

  - 4-up rotary upper table
  - 2-up rotary lower table with closed and sealed pre blow box
  - Single upper table
  - Single lower table

- **Machine options**

  - Infrared pre-heating of substrates
  - Hot-melt package
  - In-Mould-Graining (IMG) package
  - Package for the processing of 2-coloured film
  - Split chain rail system, reduced film consumption (patent KIEFEL)
  - TEPEO2-package
  - Film storage unit for continuous production during tool change
  - Automatic part-handling (loading and unloading)
  - Software-package for minimized film feeder in case of film fault (reduction of film consumption)

KLV-Series

- **Field of applications**

  Vacuum laminating or forming machine, especially for Instrument panels with high production volume (cycle time 60-80 sec.); double cavity tool is possible.

- **Available machine configurations**

  - Tilting lower table for ergonomic loading and unloading of parts
  - Single upper table
  - Double upper table

- **Machine options**

  - Usage of film sheet material
  - Hot-melt package
  - In-Mould-Graining package
  - TEPEO2-package
  - Software-package for minimized film feeder in case of film fault (reduction of film consumption)

Press-Laminating Technology

KEK-Series

For press laminating of textile, carpets, artificial leather, and real leather KIEFEL offers a huge range of press laminating machines to meet the individual customer requirements and cycle time.

Depending on the selected glue system also a robot system for glue application can be integrated.

By using a combined tool, the press-laminating process can be combined with edge-folding technology.





- **Product line:**
  - Single station press laminating machines
  - Flex-base press laminating machines
  - Rotary press laminating machines

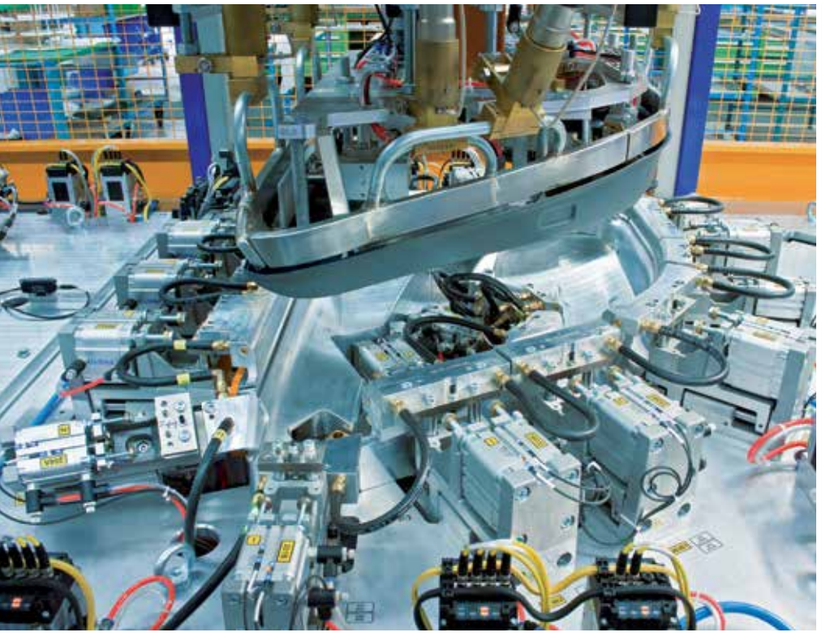
- **Field of applications:**
  - Door inserts, armrests, map pocket
  - A, B, C, D – pillars
  - Instrument panels

- **Machine options:**
  - Groove laminating technology
  - Glue application, e.g. PUR Hot-melt by a robot system
  - Combination with edge-folding process



Edge Folding Technology

KU-Series







Subsequent to the laminating-, back-injected- or back-pressing-process the interior parts need to be edge-folded in certain areas. Based on the required production cycle time, KIEFEL offers a wide range and highly developed edge-folding technology through the use of standardized edge-folding units in different sizes.

Product line:

- Single station edge-folding machines
- Single station Multi Master edge-folding machines
- Inline edge-folding machines

In combination with the individual control system by BUS-System with AS-I (**A**ctor **S**ensor **I**nterface) –Technology, the motion sequence of the individual edge-folding sliders is adjustable.

Using this technology offers the opportunity for high quality edge-folding results in sharp corners of the part.

Product Lines in Detail





Single-station machines

- **Applications**
  Edge-folding of interior parts with low to middle production volumes (cycle time 50-70 sec.).

Multi Master machines

KIEFEL's Multi Master edge-folding machine concept allows changing of various edge-folding tools according to the production volumes of the previous process, e.g. vacuum laminating.

The edge-folding tool itself will be installed on a tool change-cart. This cart will also be used as the storage system, when the edge-folding tool is not in production. Automatic docking of pneumatic connections and manual docking of the cooling water and electricity supply allows for a short tool change time.

Machine options

- **Empty nest concept**
  With the so-called empty nest concept the handling-time of the operator and the total machine cycle-time is minimized.
- **Movable tool areas**
  By using movable areas different model versions can be edge-folded in the same tool set, e.g. rear door with and without sunblind.

Inline machines

- **Applications**
  Edge-folding of interior parts with high production volume (cycle time 40-50 sec.).

In addition, this machine concept allows for a separate loading station with the possibility to make repeatable pre-cuts and triangle cuts of the film in sharp corners as well as implementation of cutting devices, e.g. for a puddle-light or a door close mechanism.

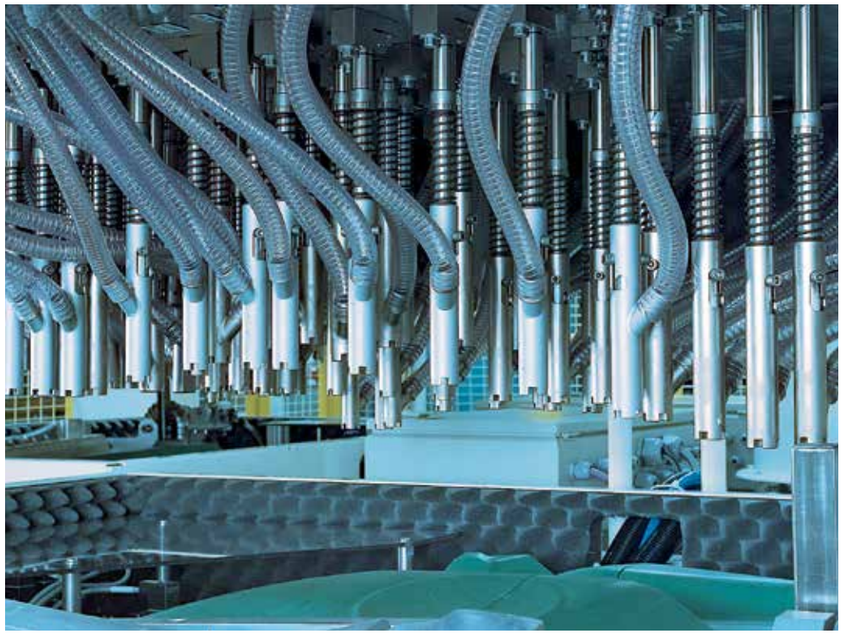
ASC-Riveting Process

KIEFEL patented process and design since 2004
KEN-Series

ASC (**A**ir-**S**upported-**C**ontact) riveting, a process developed and patented by KIEFEL, combines all the advantages of the riveting processes for thermoplastic materials that have existed to date.

- **Product line:**
  - Single station machines in different sizes
  - Rotary machines
  - Inline machines
- **Materials:**
  - PP, ABS, PC/ABS, PA HCPP
- **Machine options:**

  Single or 2-tier level sliding table
  Automatic unloading to the rear side
  Integration of US-welding technology
- **Applications:**
  - Door panels
  - Instrument panels
  - Pillar liners
  - Centre consoles
  - bumpers







Advantages of the KIEFEL ASC-Technology

- Short system start up time, approx. 20 sec.
- Low power consumption (only approx. 1,6 W per riveting pin)
  - Heating only the riveting unit
  - Cooling by high efficiency radial blowers
  - Movement of the shuttle table by servo motor technology
- High quality level of the riveted pins
  - Integrated clamping mechanism per staking point
  - High tensile / pull strength
  - Reduced marking on the A-surface
  - Individually adjustable riveting temperatures to adjust for different materials
  - Sensors to monitor and control temperature range prior, during and after the riveting
- Easy to maintain replacement features

High-Frequency Welding Technology



High-frequency welding is one of the original technologies used by KIEFEL.
This technology, together with the corresponding machinery engineering, has undergone continuous further development and improvement over recent decades.

- **Available machine configurations:**
  - Single station machines
  - Sliding and double sliding machines
  - Turn table machine
- **Applications:**
  - Door and side-trim elements (two-one)
  - Individual parts of an instrument panel (two-one)
  - Textile insert (HF lamination)
  - Map pockets (HF lamination)
  - Reinforced-section welding on floor carpets
  - Sun visors
  - Sound-insulating mats
  - Special applications





Tool Technology

As a partner of the automotive industry our mission is to deliver the whole value chain for production of high quality interior parts.

One main milestone is beside the machine manufacturing itself to deliver also all the corresponding tool sets.

The experience of KIEFEL design and process engineers is based on multitude number of project over decades.

This allows KIEFEL in any cases an optimal and economical design of the tool sets.

- **KIEFEL tool technology:**

  - Vacuum-Laminating tools
  - Vacuum-Forming tools
  - In-Mould-Graining tools (IMG and IMGL)
  - Press-laminating tools
  - Edge-folding tools
  - HF-welding tools
  - Textile insert (HF lamination)









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KIEFEL is a world leader when it comes to the design and manufacture of machines used to process plastic film materials. The company offers core expertise in the fields of forming and joining technologies. As a supplier to reputable manufacturers in various sectors, KIEFEL GmbH services customers in the automotive, medical technology, refrigerator and packaging industries. The headquarters of KIEFEL GmbH is in Freilassing/Germany. The company also runs its own network of sales and service centres in the United States, France, the Netherlands, Russia, China, Brazil, Indonesia and India, and is represented by sales partners in more than 60 countries worldwide. KIEFEL GmbH is a member of the German Brückner Group, a worldwide leading supplier of plastics machinery.

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