RIVTAC® Automation P

High-speed joining
Innovative and flexible
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Innovative by tradition!

Innovative industries require innovative partners. We are specialists in the field of mechanical joining technology. We concentrate our know-how and experience in mechanical joining methods such as RIVSET® self-pierce riveting and the innovative RIVTAC® high-speed tack setting.

Our technical competence is in constant demand – as customers continue to design new products, introduce new materials and develop production processes.

The trend in the automotive industry, is to make vehicles more efficient through strict lightweight construction using alternative materials.

High-strength steels, aluminum, magnesium and plastics continue to be the targeted lightweight materials in automotive engineering. For such materials, there are a great number of new compositions as well as beneficial substitutions, for increased performance and reduction in weight. The requirements for fastening technology are evolving with these light weighting efforts.

Components which are heat-treated need to be joined with an ambient temperature process in order to maintain material properties, add these components that have only single sided accessibility, and this a combination which generates issues for traditional mechanical joining (RIVSET®). Targeting modern manufacturing concepts, Böllhoff searched for a solution that followed the RIVSET® model and was performed in a single production step (no pre-punching). Catering to mixed material joints, including high strength steels, and OEM requirements for aggressive cycle times produced our Böllhoff single-sided solution of RIVTAC®.

Your benefits

- Joining without pre-punching in case of one-sided accessibility
- Reduction of joining and cycle times < 1 second joint to joint
- Joining of high-strength materials without distortion in the component
- Flexible application for mixed joints, multiple-layer joints and hybrid joints
- Combination with adhesion technology
- Environmentally friendly workplace design: no fumes, air extraction is not necessary
- Energy saving processing

Joinings

- Strength and reliability
- Suitable for visual inspection
- Reproducible and process reliable

Industry 4.0 with the RFID chip

- Storage of all tool-relevant data such as joining parameters, number of set tacks, calibration date, construction date.
- Indication of maintenance intervals.
- Data are transferred when the setting head is docked to the control.
- When the setting head needs to be exchanged, the required information such as joining parameters can be transferred through the RFID chip so that the setting head is instantly ready to use — an economic solution.
Joining process

What is the concept behind RIVTAC® high-speed tack setting?

RIVTAC® high-speed joining is an innovative mechanical joining process utilising a tack, a nail-like auxiliary joining part, that is accelerated to a high speed and driven into the parts. The ogival point of the tack displaces material and allows for penetration into the base materials without a pre-existing hole. The displacement of the material is the key to achieving joint strength through a combination of force and forming the material to fit specially designed knurls on the tack. The top layers are held in place by the material flowing into the knurls and are held captive by the head of the tack. An important condition for this method is sufficient stiffness of the joining parts so that they can resist the penetration impulse of the tack without major deformation. High-strength materials and multiple-layer joints can also be joined without loss of performance – providing good strength characteristics.

With joining times of under a second, this process is over three times faster than self-tapping fastening. As an added bonus, RIVTAC® uses a single fastener that provides a universal solution that fits most applications.

With tack setting, Böllhoff has taken a major leap forward and further emphasised our company’s innovative strength. The tack geometry and the material composition of the fastener presented particular challenges, but at the same time, Böllhoff designers needed to accelerate the tack to the necessary speed. This resulted in a massive research effort, which fulfils current and future requirements in car body construction.
The new RIVTAC automation system allows fully automatic tack setting. It is perfectly suitable for large-scale production and provides for highest flexibility during production planning. Thanks to the modular design, the individual components have flexibility in location and placement. Maintenance is faster and easier through non-interchangeable couplings and labelling.

The components of the system

- Setting tool
  - Compact design for ideal joining point accessibility
  - Low weight
  - Pneumatically driven with drive piston and elastic, internal stop
  - Spiral feed magazines store up to 47 tacks
  - Filling level and separation monitoring
  - Limit position and position sensing
  - Robot connection with standard adapter plate (special plate on request)
  - Force and displacement sensor for optimum process monitoring
  - Real-time data processing
  - Media docking
  - RFID chip to store all tool- and process-relevant parameters

- Valve terminal
  - Fast response times due to short strokes
  - Proportional valves continuously regulate joining and feed pressure
  - Energy-optimised control of the joining tool
  - Capable of being integrated on the third robot axis

- Station
  - With a max. loading capacity of 35,000 tacks
  - Fast reloading of the joining tool
  - Simultaneous loading of two joining tools – Twin version
  - Gimbal-mounted feed rail
  - Feeding system with vibratory bowl feeder
  - Built-in compressed air service unit with air filter and pressure control sensor
  - Local terminal box incl. communication line to the power unit
  - RFID receiver to forward tool- and process-relevant parameters to the control

We also offer an optional Twin version with small space requirement which has one loading station and one control unit for two setting heads.

Source: KUKA AG
RIVTAC® Automation P – The components of the system

Control Unit

- Local hardware configuration with central controlling of machine components by BUS-system
- Embedded PC based control for the connection of a visualisation system
- Multiple interface platforms (ProfiNet, Interbus, Profibus etc.)
- Optimal space utilisation due to the integration onto the robot power unit
- Air conditioning available
- Twin version also available

Visualisation (option)

- Easy operation with an industrial touch screen
- Equipped for communication via EtherCAT
- Multi visualisation of several RIVTAC® systems
- Joining and process parameter management
- Process monitoring visualisation
- Media docking possible (USB-Port)
- Customer-specific adaptations of the visualisation also available

Software

- PLC and HMI software for control and visualisation via Ethernet
- Calibration functions such as basic calibration, in-process calibration and referencing
- Parameterisation of the individual joining points on the component
- Process monitoring module with displacement transducer and windowing incl. statistics function
- Process data transfer to a superordinate quality management system
- Mobile Link – proactive maintenance management incl. maintenance indication and machine logbook
- Wear detection for selected components
- Easy-to-use with display of help texts

Technical data

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Station approx. 570 x 1350 x 1600 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>Station with components approx. 192 kg Set tool approx. 52 kg Power and control unit approx. 65 kg Valve terminal approx. 19 kg</td>
</tr>
<tr>
<td>Compressed air</td>
<td>Compressed air supply 2 x 1/2 inch Max. air consumption (setting tool) 8 Nl/joining Max. air consumption (station) 400 L/min. Operating pressure 10 bar Working pressure 3.5 to max. 8 bar</td>
</tr>
<tr>
<td>Filtered compressed air</td>
<td>Electric supply 230 V/50 Hz, 110 V/60 Hz</td>
</tr>
<tr>
<td>Supply according to DIN ISO 8573</td>
<td>Cycle time “Start” joining process until “new start” 0.7 – 1.2 sec.</td>
</tr>
<tr>
<td>Noise emission</td>
<td>Setting tool &gt; 105 dB(A)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>At working +15°C to +40°C At stocking +10°C to +60°C</td>
</tr>
<tr>
<td>Air humidity</td>
<td>Humidity class According to DIN 40040 Annual average 75% 30 days 35% On the other days 85%</td>
</tr>
</tbody>
</table>

Compressed air supply 2 x 1/2 inch
Max. air consumption (setting tool) 8 Nl/joining
Max. air consumption (station) 400 L/min.
Operating pressure 10 bar
Working pressure 3.5 to max. 8 bar

Cycle time “Start” joining process until “new start” 0.7 – 1.2 sec.

Setting tool > 105 dB(A)

At working +15°C to +40°C
At stocking +10°C to +60°C

Humidity class According to DIN 40040
Annual average 75%
30 days 35%
On the other days 85%
Variable material combinations become increasingly important, especially during the development of innovative automobile and car body concepts. RIVTAC® is particularly suitable for joints of aluminium, steel, plastics, non-ferrous metals as well as for mixed joints, multiple-layer joints and hybrid joints of these materials.

Example material combinations in cross section

- Steel sheet / Steel sheet
- Aluminium sheet / Aluminium profile
- Aluminium sheet / Aluminium profile with adhesive

Joints:
- Aluminium (pressure cast, extruded, sheet)
- Steels
- High-strenght steels with a tensile strength up to 1,200 MPa
- Plastics and fibre-reinforced plastics (e.g. fibre glass or carbon)
- Also material combinations with magnesium, copper, films, metal mesh, wood, sandwich materials
- Joining of mixed joints, multiple-layer joints and hybrid joints of these materials
- Adhesive as a laminate layer
High-strength joints

This chart outlines the joining strength of sample material combinations under sheer and cross tension load.

The force vs displacement curves illustrate, that RIVTAC tacks provide high joining strength in many material combinations.

### Sheer load values

![Sheer load values diagram](image)

### Cross tension values

![Cross tension values diagram](image)

<table>
<thead>
<tr>
<th>Material cover sheet</th>
<th>Sheet thickness (mm)</th>
<th>Material basic material</th>
<th>Sheet thickness (mm)</th>
<th>Cross tension values (kN)</th>
<th>Sheer load values (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AlMgSi1</td>
<td>1.00</td>
<td>AlMg3</td>
<td>4.00</td>
<td>ca. 2.40</td>
<td>ca. 3.00</td>
</tr>
<tr>
<td>AlMgSi1</td>
<td>1.20</td>
<td>AlCu4MgSi</td>
<td>2.00</td>
<td>ca. 3.60</td>
<td>ca. 3.60</td>
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<tr>
<td>AlMg3</td>
<td>1.20</td>
<td>H340LAD</td>
<td>2.00</td>
<td>ca. 3.00</td>
<td>–</td>
</tr>
<tr>
<td>AlMgSi1</td>
<td>1.20</td>
<td>HX220YD</td>
<td>0.95</td>
<td>ca. 4.00</td>
<td>ca. 4.00</td>
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<tr>
<td>HX220YD</td>
<td>0.95</td>
<td>HCT600XD</td>
<td>2.00</td>
<td>ca. 6.00</td>
<td>ca. 4.00</td>
</tr>
<tr>
<td>HX220YD</td>
<td>0.95</td>
<td>DP1000</td>
<td>1.50</td>
<td>ca. 5.50</td>
<td>ca. 4.10</td>
</tr>
<tr>
<td>H340LAD</td>
<td>1.00</td>
<td>22MnB5 (UsiBor)</td>
<td>1.50</td>
<td>ca. 5.00</td>
<td>ca. 5.20</td>
</tr>
<tr>
<td>DC04</td>
<td>1.00</td>
<td>22MnB5 (UsiBor)</td>
<td>1.50</td>
<td>ca. 5.00</td>
<td>–</td>
</tr>
<tr>
<td>DC04</td>
<td>2.00</td>
<td>DC04</td>
<td>2.00</td>
<td>ca. 3.10</td>
<td>–</td>
</tr>
</tbody>
</table>

Joint **A**

HX220YD (0.95) – HCT600 (2.00)

Joint **B**

AlMg3 (1.20) – H340LAD (2.00)

Joint **C**

AlMg3 (1.20) – AlMgSi1 (4.00)
Sales

Innovation and technical development are important factors for a company’s success.

Every customer has a personal contact person who will be glad to discuss all your requirements. Our expertise and experience reflect in a worldwide distribution network.

The headquarters of this family business, which has now been in the family for four generations, is located in Bielefeld, Germany. Apart from that, Böllhoff has sales and production facilities in 24 countries. Outside these 24 countries, Böllhoff cooperates in close partnerships with representatives and merchants to serve international customers in other important industry markets.

Project management

We are satisfied whenever we can exceed your expectations.

The foundation of our competence is an efficient concept of counselling, development and support. The joint aim is to realise the technically optimal and economically most attractive solution. That is also the standard of our project management. Our project management supports you with management- and product-specific expertise.

Our personnel can look back on many years of experience in planning automation solutions for assembly systems and realise tailor-made solutions according to your requirements. We think in systems: process optimisation, cost reduction, strengthening of market positions.

Our project management stands for interdisciplinary coordination of complex activities. That means planning, controlling and monitoring in all project phases.

Design and development

In development, we focus on the design and application of production systems to process Böllhoff fasteners. We consider the process device as well as the feed technology for fasteners our core competence.

The main requirements for such systems are reproducible processes, industrial-quality availability and short process times.

The earlier we can contribute our competence, the greater the potential.

To make ideas reality, we employ modern CAD systems complying with today’s requirements in the automotive sector. Data transfer is agreed individually with each customer.
Production

Our fasteners are exclusively manufactured at Böllhoff production facilities. They are subject to most stringent quality checks in every single production step. This is the only way for Böllhoff to meet the high customer requirements. Product by product.

The manufacture of important mechanical components (know-how parts) is a main part of our manufacturing expertise. The machinery as well as our employees’ know-how concentrate on these aspects. Our know-how and machinery make us a competent partner when it comes to pre-development and development for the manufacture of prototypes and samples.

Another of our core competencies is the installation and functional testing of processing systems. All final assemblies and commissioning activities are in-house operations that are not subcontracted.

Quality

Our focus is always on sophisticated production processes and modern measurement and monitoring technology. Good quality is no coincidence, but the result of systematic planning and implementation.

You define all the technical requirements — if you wish so in cooperation with our qualified team — which are then tested for practicability. You also benefit from process reliability and the avoidance of unnecessary costs.

Our certified laboratory, which fulfils the requirements of DIN EN ISO 17025, is also there to support you.

To ensure the highest quality, we regularly take part in audits by our customers as well as accredited certifiers.

Service

We are there when you need us. 24/7.

To help you protect the value of your investment and ensure the economic efficiency of your production is what the Böllhoff Service Team specialises in. That is why we can offer you service agreements to even extend the long life of our technically advanced machines.
Apart from these 24 countries, Böllhoff supports its international customers in other important industrial markets in close partnership with agents and dealers.