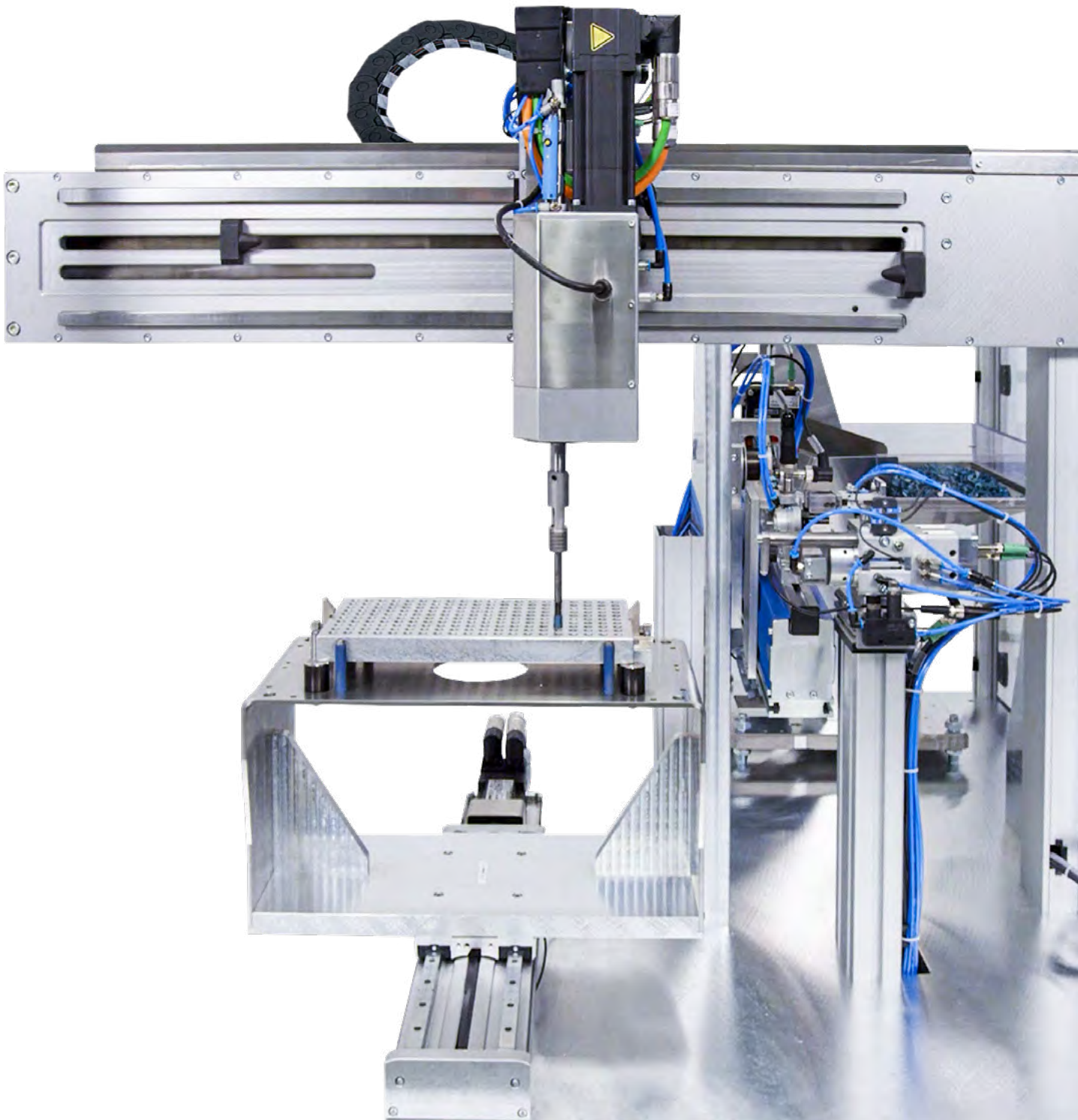


# BÖLLHOFF

## HELICOIL® Automation

System solutions in thread technology







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This icon indicates additional information  
in the form of a brochure and/or video

# Can you imagine a world without screws?

Still today, the screw is the most widely used fastening element for detachable joints. Optimised tightening methods and high-strength screws allow for continuous improvement.

Considerably higher forces can be transmitted so that the size or total number of needed screws can be reduced. However, high-strength nut threads are required for high-strength screw joints.

Our HELICOIL® thread technology is just the right choice here.

## Your advantages – an overview:

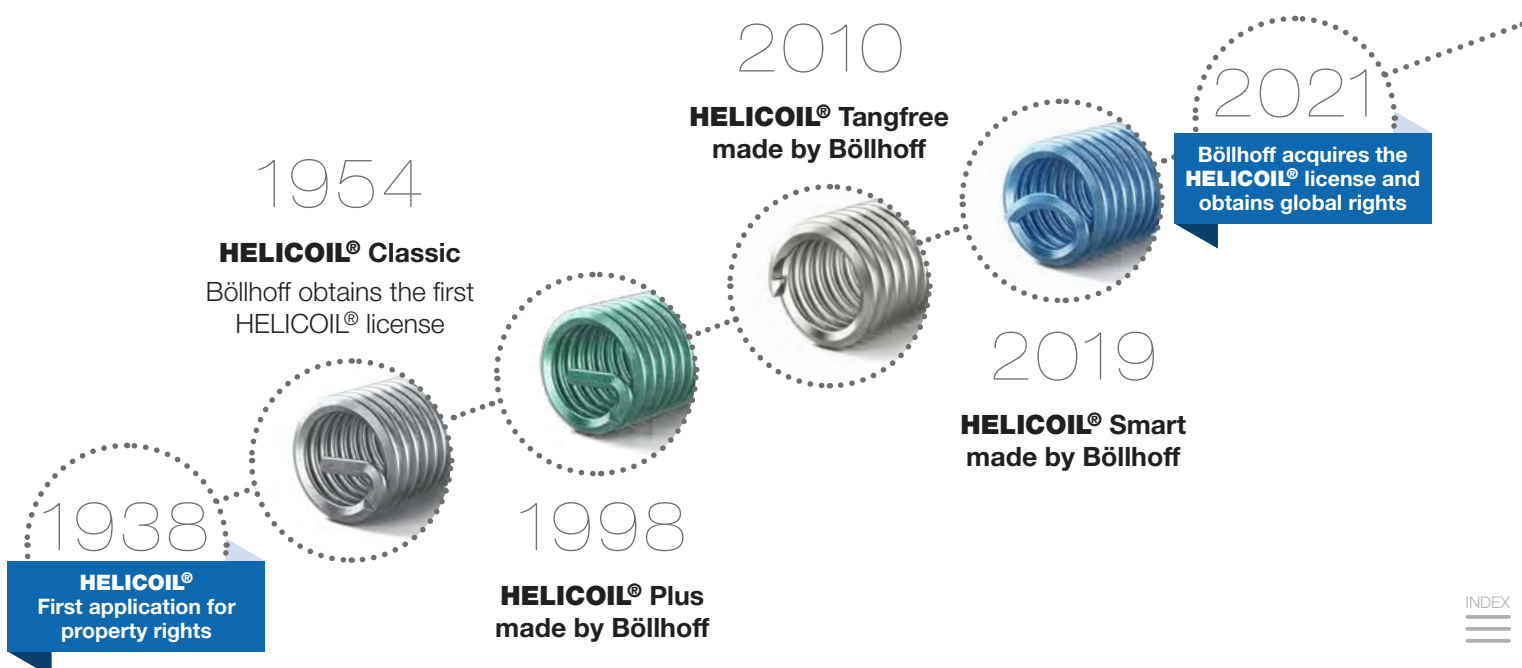
- High thread strength
- Increase in quality and value
- Wear resistance, low and constant thread friction
- High strength
- Corrosion and temperature resistance
- Cost saving
- Tight fit
- Screw loss protection – the Screwlock variant
- Part of the circular economy

## Structural component – thread reinforcement and repair

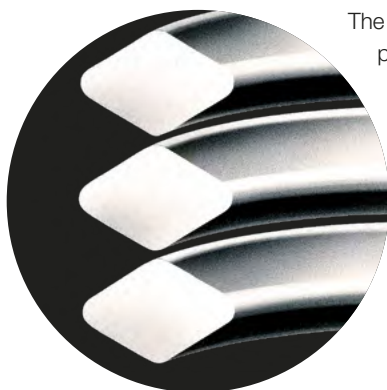
HELICOIL® stands for thread reinforcement and repair. Thread reinforcement whenever low-strength materials (e.g. aluminium, aluminium-magnesium alloys and fibre-reinforced plastics) are used. Even in the event of frequent use does the nut thread not wear out. For the development of cast components, HELICOIL® allows for miniaturisation and lightweight construction. The HELICOIL® thread insert has been tried and tested for more than 65 years and has become a renowned structural component.

HELICOIL® thread inserts have been approved for economical and permanent repair of damaged and worn out threads all over the world. Apart from the repair of valuable individual components, parts from large-scale series production that have been rejected because of faults during thread production can be rerouted into the production process.

## The **HELICOIL®** evolution







The HELICOIL® thread insert, which is made from a wire with rhombic profile, is formed into an elastic spiral. As to the Free Running version, it is a completely free running coarse thread throughout all threads.

The result is a true-to-gauge internal thread including the last thread which is in every case threadable (Smart). The thread insert produces high-strength threads transferring forces from flank to flank into the holding thread. The special thread start allows to position it like a screw and screw it in. To screw in the thread insert, only the respective installation mandrel of a similar size as a tap is required.

All stages of the HELICOIL® evolution are highly reliable; German as well as international industrial property rights have been filed.

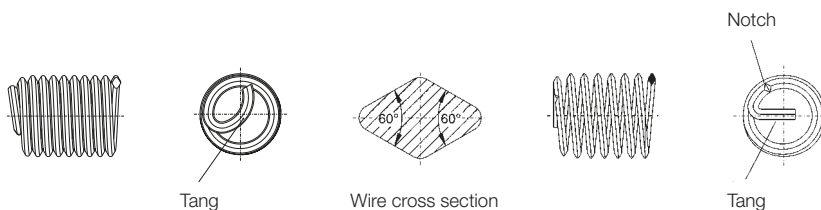
In combination with the respective installation tools, the latest innovation of the HELICOIL® technology – the HELICOIL® Smart – is a perfect addition to the HELICOIL® product family.



Defective thread



Thread repair and reinforcement with  
HELICOIL® Plus and HELICOIL® Smart



$R_m$  = min. tensile strength 1,400 N/mm<sup>2</sup> (1 N/mm<sup>2</sup> equals 1 MPa)

HV = Vickers hardness 425 HV 0.2 min.

$R_z$  = roughness depth approx. 2.5  $\mu$ m

$\mu_G$  = reduced thread friction, results in increased preload-force  $F_v$  at a constant tightening torque

$\tau_t$  = reduced torsion stress in the screw shank

# The first quantum leap in the HELICOIL® thread technology

The first main further development of the HELICOIL® thread technology is the HELICOIL® Plus from joining technology expert Böllhoff.

“Plus” stands for the special thread start compared to the HELICOIL® Classic which allows an easier installation into a holding thread. The HELICOIL® Plus is positioned and screwed in like a screw. The usually required leader cartridges are not needed anymore.

## At a glance

### VISIONARY

- The first quantum leap in the history of the HELICOIL®
- Reduced first thread
- Widest range of sizes, materials and surfaces

### EFFICIENT

- Easy and economical installation
- Lower-price installation tools
- Variants: Free Running and Screwlock

### SYSTEMATIC

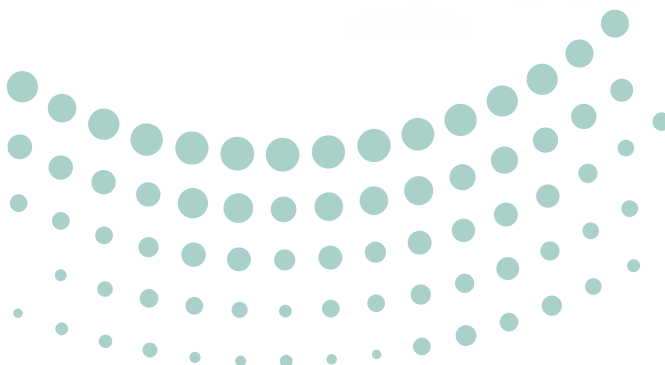
- Fastener and installation tool from a single source
- Full automation of the HELICOIL® Plus installation possible
- Short tang for blind holes

### COMPATIBLE

- Existing tools of the previous design can still be used
- Complies with national and international standards

### INNOVATIVE

- Positioning and screwing-in like a screw
- Optimum entry into the holding thread
- Easy handling



# The second quantum leap in the HELICOIL® thread technology

The new HELICOIL® Smart is a further quantum leap in the HELICOIL® thread technology. A coil thread insert with a tang which does not have to be broken off. The innovation: The installation mandrel bends it backward during spinning-off and then compresses it. This "smart" thread insert merges the advantages of the HELICOIL® Plus and the HELICOIL® Tangfree.

## At a glance:

### SMART

- Tang, yet no tang
- No tang break – no tang removal
- No risks from tangs left in the component

### EFFICIENT

- Installation times reduced by approx. 20 %
- Simplified quality assurance
- Permits blind holes of minimum depth
  - e.g. for pre-assembled subassemblies

### SYSTEMATIC

- One installation mandrel with two functions: 2 in 1
- Fastener and installation tool from a single source
- Fully automatable installation

### COMPATIBLE

- Identical specifications for HELICOIL® Smart holding threads as for the other HELICOIL® systems
- Compliant with DIN 8140

### INNOVATIVE

- Positioning and screwing-in like a screw
- Optimum entry into the holding thread
- Easy handling



## The **HELICOIL®** variants



### **HELICOIL® Smart Free Running\***

This new thread insert merges the advantages of the HELICOIL® Plus and the HELICOIL® Tangfree. Every thread of the thread insert with a precision-formed, rhombic profile is free running. The result is a true-to-gauge internal thread including the last thread which is in every case threadable. Like the HELICOIL® Plus, the HELICOIL® Smart features a special thread start so that the installation into a holding thread is easier. There is a tang, but it does not need to be broken and removed. The installation time is therefore reduced by approx. 20 %. The HELICOIL® Smart can be installed fully automated. In combination with the adapted installation tools, the new generation of the HELICOIL® technology is a perfect addition to the HELICOIL® product family.

■ Ask for separate catalogue No 0155.

### **HELICOIL® Plus Free Running\***

Every thread of the thread insert with a precision-formed, rhombic profile is free running. The result is a true-to-gauge internal thread which can be used on both sides. The dimensional stability of the ISO thread complies with DIN 13 6H and for special requirements with 4H. It also fulfils the requirements of international standards.

The advantages of the HELICOIL® Plus system are particularly apparent with respect to processing and tools and result in shorter cycle times.

■ Ask for separate catalogue No 0100.



### **HELICOIL® Plus Screwlock\***

This thread insert also features an area for screw loss protection. One or several polygonal-shaped threads clamp the flanks of the installed screw. Due to the resilient frictional locking, the prevailing torques are similar to the specifications in ISO 2320. These prevailing torques comply with the technical terms of delivery as per the requirements of international standards. However, the prevailing torques may also be adapted to the specific application. To lock HELICOIL® Plus Screwlock adjustment screws, for example, only screws of higher property classes (8.8 and higher) can be used. For high-alloyed screws, commercial lubricants must be used in compliance with the manufacturer's recommendations. The advantages of the HELICOIL® Plus system are particularly apparent with respect to processing and tools and result in shorter cycle times.

■ Ask for separate catalogue No 0100.

\* Comply with DIN 8140 standard.



# HELICOIL® installation – HELICOIL® Smart example

HELICOIL® Smart thread inserts are installed easily and economically because there are only a few basic rules to observe. There is a wide range of installation tools available to allow an efficient installation – for individual applications as well as for large-scale production. The installation phases are as follows:



## Drilling

Commercial twist drills are used. Prior to tapping, 90° countersinking and deburring. Outside diameter of the **countersink** =  $D_{HC} + 0,1 \text{ mm}$ . The countersink is barely visible on the tapped holding thread.



## Tapping

To tap the HELICOIL® Smart holding thread, system-specific original HELICOIL® taps must be used. Recommended choices for manual and machine taps are provided in our catalogue No 0100. HELICOIL® plug gauges must be used to check if a holding thread is true to gauge.



## Thread forming

Today, the chipless production of internal threads with a forming tap is an efficient manufacturing method for many materials. This also applies to the HELICOIL® Smart.

$D_{HC}$  = outside Ø of the holding thread

It can be installed with hand-held, machine installation tools.



Spinning on the HELICOIL® Smart



During screwing-in, the blade has a pull-in function



Positioning the HELICOIL® Smart at the thread start and screwing-in

The thread insert is screwed in by turning the installation mandrel or triggering the drive. The HELICOIL® Smart must be installed at least 0.25 P below the component surface to ensure the correct installation.



Extension of the blade which bends back and compresses the tang

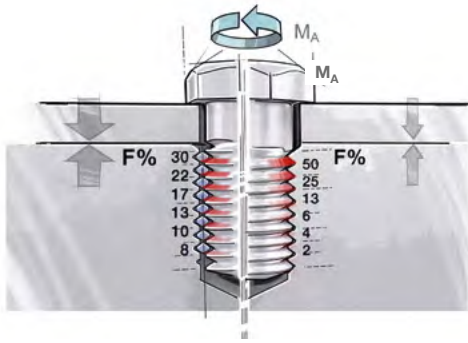


Retraction of the blade and screwing out the installation mandrel



Correct installation of the HELICOIL® Smart (0.25–0.5 x P below the component surface)

## The advantages in detail



### Strength

The elastic properties of the HELICOIL® thread insert allow a uniform load and stress distribution. The flank contact is optimal. Deficient pitches or angles are compensated over the entire length of the thread insert. The force transmission from bolt to nut thread is ideal. The quality of the screw joint is considerably increased – for static as well as dynamic operating loads.

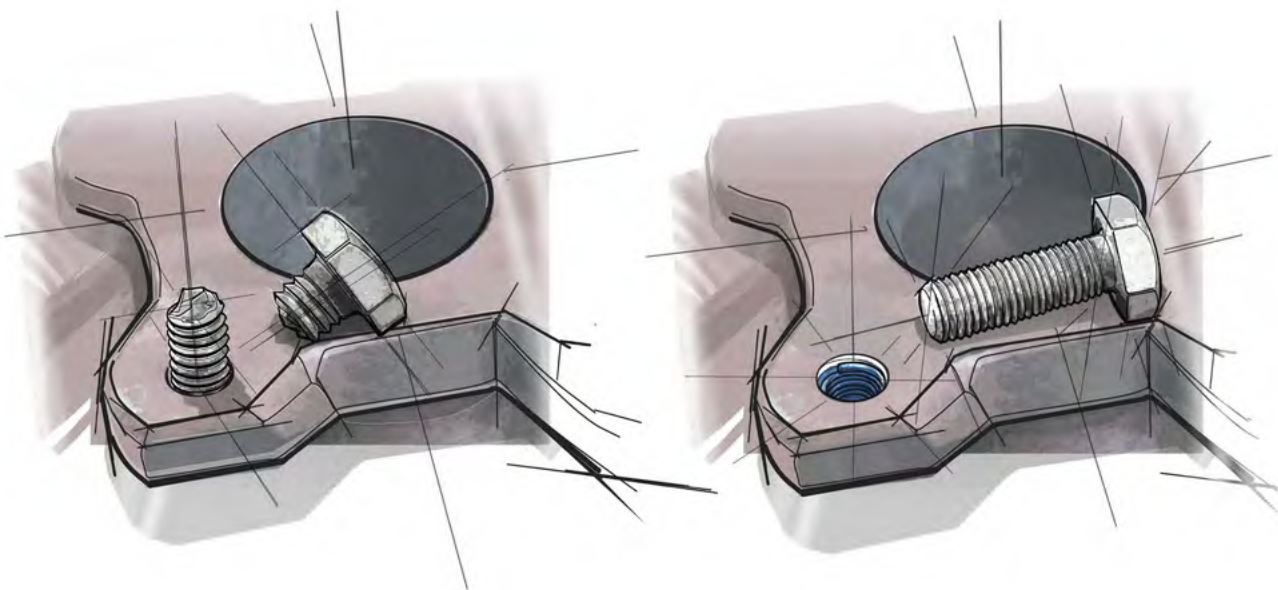
The improved distribution of the preload-force increases the fatigue strength of screws under dynamic load. That is why the HELICOIL® is also suited for high-strength holding thread materials such as steel or cast iron alloys.

### Wear resistance

HELICOIL® thread inserts are made of austenitic chrome-nickel steel (minimum tensile strength 1,400 N/mm<sup>2</sup>). The high surface quality of the nut thread ensures a high-strength, wear-resistant thread with an extremely small and constant thread friction torque. Therefore, a higher and constant preload-force is achieved for reuse at an equal tightening torque. At the same time, the utilisation of the yield point of high-strength screws is improved, while the torsion stress is considerably reduced. Compared to tapped threads, the surface roughness of the HELICOIL® is 90 % smaller.

### Corrosion and temperature resistance

The standard material of the HELICOIL® prevents the seizing of screws under environmental impact. For thermally highly stressed screw joints, there are HELICOIL® thread inserts made of nickel basis materials. The elasticity and spring force are conserved.



## The advantages in detail



### Tight fit

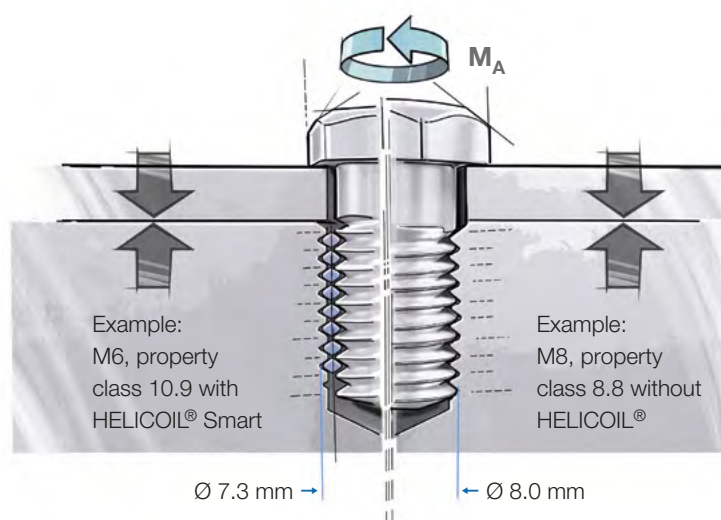
In not installed condition, the outside diameter of the HELICOIL® exceeds the holding thread size by a defined measure. In combination with the high spring force of the material, this difference in dimension causes a radial expansion and therefore a tight and zero-clearance fit in the nut thread. Additional locking elements or adhesive are therefore not required – as they usually are for fixed bushings. If you use impact wrenches, please contact us. We will be happy to advise on this.

### Friction

The thread friction as well as its dispersion range are reduced when a HELICOIL® is used. For example: If the thread friction value of a steel screw of property class 10.9 screwed into a tapped nut thread ranges between 0.12 and 0.18  $\mu\text{G}$ , this value ranges between 0.11 and 0.13  $\mu\text{G}$  if a HELICOIL® coil thread insert is used. If a torque-controlled screw tightening method is employed, the screw preload-force can be adjusted more precisely and the yield point of the screw can be utilised to a higher degree. At the same time, the preload-force to screw failure is increased by the reduced torsion stress.

### Downsizing

Engineers can choose almost any material. The HELICOIL® meets the current trend toward lightweight construction (e.g. aluminium or magnesium) because this method of thread reinforcement combines minimum space requirements and high strength. This allows the optimum use of high-strength screws also in low-strength materials. Fewer joints and smaller screw sizes save material, installation space and weight – at a high fatigue strength. Those are definite advantages of the HELICOIL® system.





# HELICOIL® system modules – automated processing



Automated screw joints with high process reliability that make maximum use of the potentials of lightweight construction. As your partner for the 360° Joining Technology, we strive to improve your competitiveness, optimise processes and allow for sustainable savings. By intertwining fastener know-how and our competence in automation, efficient solutions are created. Processing systems for the integration into automation systems as well as complete systems are available. We have the focus on your requirements.

All HELICOIL® automations – components as well as complete systems – feature a built-in control, drive and operating system with high flexibility and connectivity for linked system concepts.

Please find examples of processing systems below.

## Stationary screwdriver system

**Do you employ robot handling with a robot holding the component?**

**Do you use a rotary indexing table or transfer system?**

The solution is the stationary screwdriver system with an automatic feed of HELICOIL® thread inserts through pick-and-place or blow feed.

**The standard configurations of all systems are as follows:**

- Feeder
- Screwdriver system
- Tang break-off tool
- Operating panel

**Your advantages – an overview:**

- 100-% process monitoring (see1) on page 13)
- Suited for large-scale production
- Integration into automatic production processes



## HELICOIL® system modules – automated processing

### Automatic 3-axis system

**You need complete process monitoring of the HELICOIL® installation and do not want to use a fully automatic system for economical reasons?**

The automatic 3-axis system can be easily integrated into a manual workstation. The component to be installed is manually fixed on a holding fixture. Then, the fully automatic HELICOIL® installation is started.



#### Your advantages – an overview

- 100-% process monitoring<sup>1)</sup>
- Economical, automated production, also for a smaller number of pieces
- Low personnel occupation
- Saving potential through parallel processing of upstream and downstream installation steps
- Suited for large-scale production
- Integration into manual workstations or robot cells with a handling robot

#### <sup>1)</sup> Parameter monitoring:

- Controlled number of rotations of the installation mandrel required for screwing-in
- Check of the HELICOIL® Plus installation depth (final tang position) by means of a linear measuring system
- Power consumption of the servo motor to detect too tight holding threads not true to gauge
- For blind holes, tang break is directly queried
- For through holes, the customer issues the query indirectly
- Time window for the HELICOIL® Plus installation

## HELICOIL® system modules – automated processing

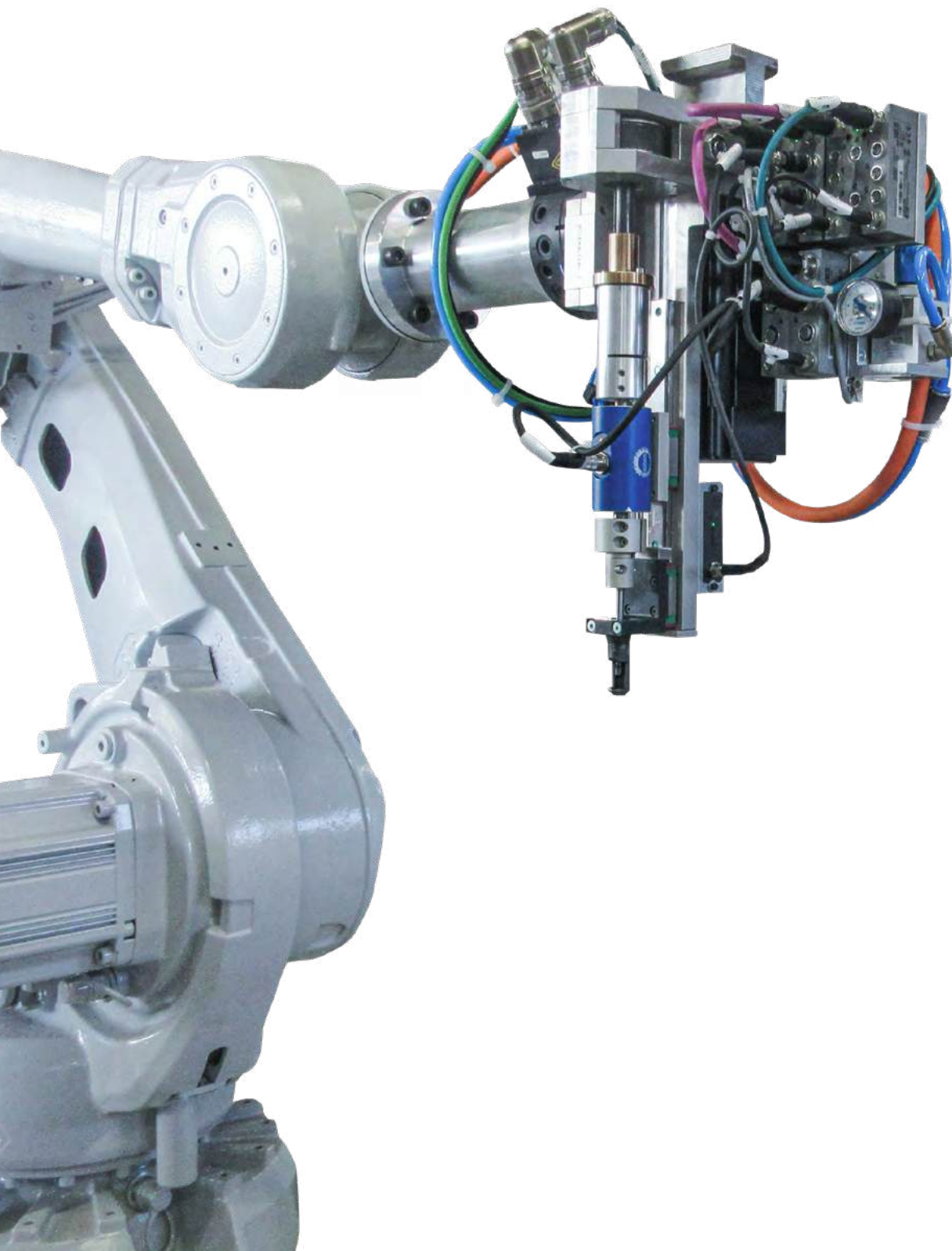
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### Screwdriver module for robot connection

**Your production is robot-aided?**

**You need a flexible production process?**

The HELICOIL® screwdriver module with a standard adapter plate to connect a robot is perfect for applications in large-scale production if you need maximum flexibility. The component is fixed in a holding fixture. The thread inserts are continuously fed by means of a pick-and-place system.





## HELICOIL® automation – feeders and pre-separation

### Blow Feed

According to the customer requirements, pick-and-place or blow feed systems are used for the automatic feed of the HELICOIL® thread inserts. Since it is a system of high economic efficiency, the fast-working blow feed system is particularly suited for large-scale productions.

Depending on the type of system, several screwdriver systems can be supplied by one separation unit through the respective switches. The screwdriver systems and the parts separation (incl. hopper system) can also be placed separately at some distance toward each other so that the system layout is very flexible.



### Anyfeeder



## Outlook: robot-coupled hand tools

### Closing the gap between power tools and full automation

Efficient combination: a robot handling system combined with our power tools to form a flexible automation system which ensures an installation process in all space and angular positions with high process reliability. The robot allows to adjust the joining positions fast and easily.

### Your advantages – an overview:

#### Efficiency

- Smaller work load on employees
- Performance of non-ergonomic tasks
- More productive time

#### Flexibility

- Fast and easy adaptation to new joining scenarios and components
- Installation in any angular position

#### Reliability

- Enhanced process monitoring by the robot
- Position detection, force-torque sensor
- Reproducible quality

#### Simplification

Full package from a single source:

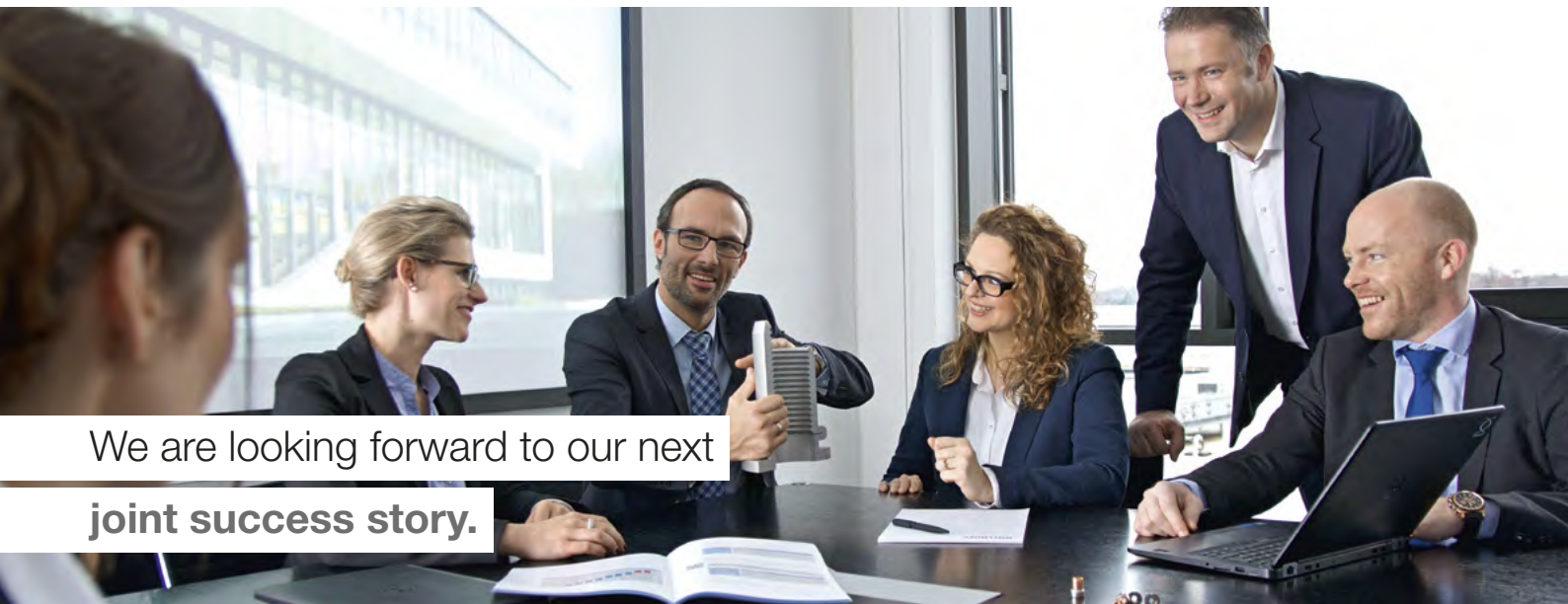
- Robot with built-in safety technology
- Installation tool
- Control system
- Installation table and installation bracket



## Innovative industries need innovative partners

As you are used to with Böllhoff, fastener and automation of the HELICOIL® thread technology come from a single source. In cooperation with our customers, adapted concepts can be elaborated – as always living our

## Passion for successful joining.



We are looking forward to our next  
**joint success story.**

### Innovation and development partner

- Modern methods, organisational forms and processes
- Trend analyses
- Research cooperations
- Open innovation
- In-house research and development
- Application engineering and consulting
- Customer-specific development parts
- Manufacture of samples and prototypes
- Value analyses

### Procurement and assembly partner

- Engineering competence thanks to in-house production
- Twelve modern production facilities worldwide
- Production methods
  - Injection moulding
  - Turning
  - Cold working
  - Wire winding
  - Mechanical and plant engineering
- Acceleration of your assembly processes
- Wide range of manual and automated assembly solutions

### Logistics and quality partner

- Supply chain solutions
- Quality management according to IATF 16949
- Quality management according to EN 9100
- Distinctive quality and environmental awareness
  - Accreditation of the in-house laboratory according to DIN EN ISO/IEC 17025
  - Certification according to DIN EN ISO 14001
- Regular audits through customers

### Distributor and service partner

- Efficient consulting, assistance and service
- Local expert specialists
- Proximity to customers thanks to global presence
- After-sales service
- Expert seminars, training and workshops
- Online seminars
- Customer in-house fairs



## Product catalogues

**HELICOIL® Smart**

The new generation of thread technology for high-strength joints  
Catalogue No 0155

<https://www.boellhoff.com/en/pdf/helicoil-smart>

**HELICOIL® Plus**

Thread technology for high-strength joints – metric threads  
Catalogue No 0100

<https://www.boellhoff.com/en/pdf/helicoil-plus>

**HELICOIL® Plus**

Thread technology for high-strength joints – imperial UNC, UNF, BSW, BSF, BSP/G, BA threads  
Catalogue No 0101

<https://www.boellhoff.com/en/pdf/helicoil-plus-imperial>

**HELICOIL® Tangfree**

The tangfree coil thread insert for high-strength threads  
– metric threads  
– imperial threads: UNC and UNF  
Catalogue No 0150

<https://www.boellhoff.com/en/pdf/helicoil-tangfree>

## Industry-specific catalogue – automotive industry

**360° Joining Technology for e-mobility**

Catalogue No 8026

<https://www.boellhoff.com/en/pdf/fastening-technology-for-e-mobility>

## Fastener videos



### HELICOIL® Plus Free Running

Thread inserts for high-strength joints – free running

<https://www.boellhoff.com/video/helicoil-plus>



### HELICOIL® Plus Screwlock

Thread inserts for high-strength joints – with screw loss protection

<https://www.boellhoff.com/video/helicoil-plus-screwlock>



### HELICOIL® Smart

The new generation of thread technology for high-strength joints

<https://www.boellhoff.com/video/helicoil-smart>



### HELICOIL® Tangfree Free Running

Tangfree thread inserts for high-strength joints – free running

<https://www.boellhoff.com/video/helicoil-tangfree>



### HELICOIL® Tangfree Screwlock

Tangfree thread insert for high-strength joints – with screw loss protection

<https://www.boellhoff.com/video/helicoil-tangfree-screwlock>

## Installation videos



### HELICOIL® Smart

P-S 408S pneumatic installation tool

<https://www.boellhoff.com/video/helicoil-smart-installation-with-p-s-408>



### HELICOIL® Plus

HELICOIL® E-PSG 256 QUICK Exchange power tool

<https://www.boellhoff.com/video/helicoil-installation-with-e-psg-256>



### HELICOIL® Smart

Thread technology for high-strength joints in automation

<https://www.boellhoff.com/video/helicoil-smart-automation>

You have any questions or a running project?  
Feel free to contact us.

Your direct link to the HELICOIL® automation expert:

[HELICOIL\\_automation@boellhoff.com](mailto:HELICOIL_automation@boellhoff.com)

# BÖLLHOFF



## **Böllhoff Group**

Innovative partner for joining technology with assembly and logistics solutions.

Find your local partner at [www.boellhoff.com](http://www.boellhoff.com) or contact us at [fat@boellhoff.com](mailto:fat@boellhoff.com).

**Passion for successful joining.**