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“A 100 % secure workshop does not exist. Every layer of protection makes the job harder for an attacker.”

Oliver Herzig, Head of Software and Electrical Engineering

Cyber security on the shopfloor: what you can do today

Oliver Herzig, Head of Software and Electrical Engineering

Connected machine tools are becoming standard. You can monitor your machines and your process, and you can use the data to make the whole workflow more efficient. But the cable that connects the machine works in both directions. The same connection that brings data out of the machine also brings the machine into your network.

Behind this connection there is often an industrial PC (IPC) with an operating system, like every other computer in your company. Only this IPC stays in production for 15 years or more, and very often is never updated. For anyone who has to secure the network, this is the nightmare scenario. An attacker can use a known vulnerability of an old Windows version to get admin rights on this PC, and from there move into the rest of your company network.

This is not a theoretical risk. In the IBM X-Force Threat Intelligence Index 2026, manufacturing was the most targeted sector for the fifth year in a row, with 27.7 % of all incidents. That is more than finance and insurance with 27 %. IBM names two reasons: the complex operational technology environment (the mix of IPCs, PLCs, CNCs and other devices inside your machines) and the valuable intellectual property (your machining data and your programs). The same report also shows that exploiting vulnerabilities was the number one way attackers got in, with 40 % of all incidents. Old and unpatched systems are exactly what they are looking for.

The EU answer: the Cyber Resilience Act

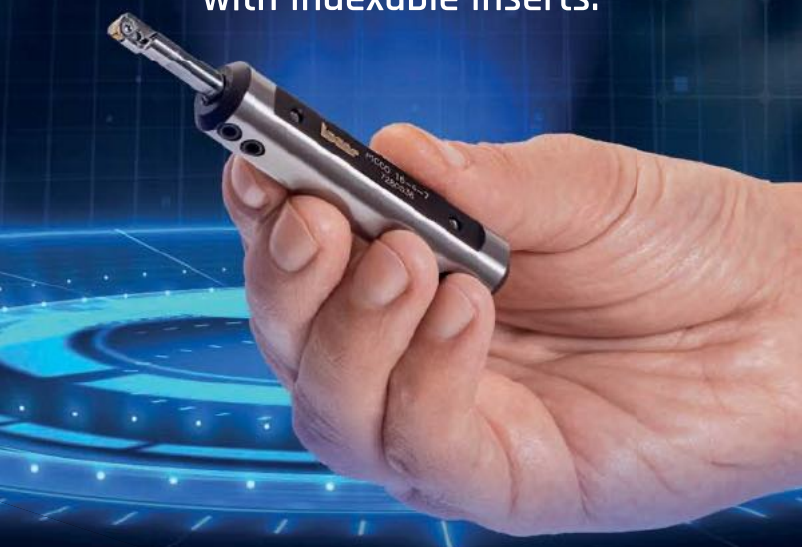
The European Union (EU) has seen this threat and answered with a regulation: the Cyber Resilience Act (Regulation 2024/2847 or CRA for short). It sets higher cyber security standards for connected products, including machine tools. Machines built under this regulation get regular security updates over their lifetimes, they come with a secure default configuration, and the internals are protected based on a cyber security risk analysis. The regulation also requires a user guidance that explains how to connect and operate the machine securely.

For you as a machine tool user in the EU this means that new machines are already secured when they arrive at your facility, and you get the information you need to connect them safely.

Full enforcement starts in December 2027. All machines you have today, and all machines you receive before that date, are not built under this regulation yet. So, it will take a few more years until this regulation improves the security level of your whole workshop.

Until then and after, what can you do to secure your shopfloor?

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1. Make a list of your machines

You can only protect what you know about. Go through the shopfloor and write down for every machine:

- *Machine name and serial number*
- *Control type and version*
- *Operating system and version, if there is an IPC*
- *Does the machine have a network connection?*
- *Which software is installed?*
- *Does the supplier have a remote connection?*

An Excel sheet is enough at the beginning. In this step you will often find a few connected machines that nobody was aware of.

2. Separate the machine network from the office network

This is a simple way to build an important security layer. Your machines should not sit in the same network as the office PCs or—and in the worst case—the guests. Put a firewall between the shopfloor network and the office network, and only allow the connections you really need. Do this in both directions.

Machines do not need direct internet access. And if they do need it, define exactly which server they are allowed to reach.

With this separation it gets much harder for an attacker to jump from one side to the other. It protects your machines, and it protects your office PCs.

3. Backups

A backup of your PCs and controls is your life insurance. You need it after an attack, and you also need it when hardware simply fails. With a backup you replace the hardware and play back the software version that was running before.

Do not store the backup on the machine. Keep it in a secure, offline location, so ransomware in your network cannot encrypt your backup as well.

And do it continuously. A four-year-old backup will probably cause problems when you install it.

Two more things that are often forgotten: Test your backups, otherwise you find out in the emergency that they do not work; and write down the procedure, so a colleague can run a backup on the machine without asking you first.

4. Get remote access under control

Remote access from your machine supplier is useful for troubleshooting and updates, and it saves travel cost. But the connection should not stay open all the time. It should only be established when it is really needed, and it should be you who opens it, not the supplier. Keep a log of who connected and when.

There are many technologies for this, and most machine tool suppliers offer a solution. If you are unsure, contact your machine tool builder.

5. USB sticks and data transfer

Many manufacturing companies still use USB sticks to transport numerical control (NC) programs. This is also the classic way that malware gets into the company or onto a machine that has no network connection at all.

If you need USB sticks, make a policy that allows only company sticks that stay in-house. Install a scanning tool on the PCs in your workplace that checks the stick before it is used.

In many cases a network share with a direct numerical control (DNC) folder is the better solution anyway. It lets you keep a history of your programs and see who changed what.

6. Clean up accounts and passwords

Look for default passwords and devices that log in with default credentials, especially when it is an admin account.

One basic principle in cyber security is that every person gets only the access they need. The operator account should only allow what the operator actually does on the machine.

Keep a list of people, their functions and their access. This gives you a good overview of the current situation. And when somebody leaves the company, you see immediately which access has to be removed.

What Tornos does

Tornos has been working actively on the CRA for over a year now, believing that the requirements of this regulation bring a real benefit for our customers. They increase the security level inside our Tornos machines, and they make the process of connecting a Tornos machine to your systems simpler and more robust.
Our Tornos' goal is to comply with this regulation in the most user-centric way.

On patching: our Tornos' Windows IPCs can be patched as long as Microsoft supports the Windows version that is installed. How long that is depends on the version. Windows 10 IoT Enterprise LTSC 2021, for example, is supported until January 2032. Use this to always secure your IPCs.

Moving to a higher Windows version often means replacing the IPC, because our Tornos' IPC suppliers deliver them with a fixed version, and an update usually costs performance.
If you are not sure which version runs on your machine, or if you need a solution for remote access, get in contact with our service.

7. What to do when you cannot patch

Many old controls cannot be updated at all. Old IPCs stay on ancient Windows versions like XP or Windows 7, and often the machine tool builder does not support them anymore.

For these machines you need to go one step further. Put the machine alone into its own virtual local area network (VLAN)—a separated part of your network—and control the traffic that goes in and out. Allow only what is really necessary, in both directions.



It's important to clearly understand what this does: The machine itself stays vulnerable. You only limit the damage if something happens. This is good practice for new machines too, but if your resources are limited, start with the outdated machines.

8. Prepare for the emergency case

Plan for emergency before it happens. Who do you call for restoring? What do you disconnect, and in which order? Where are the backups?

Write the answers on a piece of paper, print it, and make sure everyone knows where it is. It does not need to be perfect. It needs to give you guidance when you have to decide quickly and under a lot of stress.

Cyber security is a process

All these points are guidance. Cyber security is a process, not a one-time implementation. If you want to improve your level of security, you need an ongoing process and support from the top management. Do not expect to implement everything from day one.

There will never be a 100 % secure workshop. Think in layers instead. Every layer you add makes it harder for an attacker, and it raises the chance that the attacker will give up before reaching his or her goal.

Every workshop is on a different level, so general guidance is always a bit rough. If you are at the very beginning, take the first three points and get started.



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A rapidly growing company, Sorath Ortho develops high-quality medical devices in Ahmedabad, particularly for trauma and spinal surgery.

Full speed ahead to the future:

Sorath Ortho turns to Tornos

Just six years after opening a state-of-the-art, 85,000-square-foot (7,900-square-meter) manufacturing site in Ahmedabad—the largest city in the Indian state of Gujarat—contract manufacturer Sorath Ortho is poised for immense growth in the coming years, with Tornos at its side.

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A division of Sigma Surgical, founded in 1998 by brothers Jayanti Gothi and Gopal Gothi—who continue to serve the company as managing directors—Sorath Ortho counts "passion for precision" as central to its vision. With the aim of providing premium-quality medical devices to support trauma and spine surgeons—and improve their patients' lives—worldwide.

"We focus on implants and instruments to make surgeons' lives easier and more comfortable," said Sigma Surgical CEO Mehul Gothi, son of cofounder Jayanti Gothi. "From the very beginning when my father and my uncle started the business with just seven or eight people total, we have emphasized competitive pricing, extreme precision, and consistent delivery times. These factors have been the keys to our growth."

“Tornos machines’ power, precision, and accuracy make us more productive.”

Mehul Gothi,
CEO, Sigma Surgical



Manufacturing lifesaving products

And that growth is impressive: The company inaugurated its current facility only six years ago and recently began construction on a new facility with more than double its current footprint. Today, Sorath Ortho operates with about 350 employees and 84 machine tools—including a fleet of seven Tornos Swiss-type automatic lathes. The new facility is designed to accommodate around 250 machines, Mr. Gothi said.

Those Tornos machines—a Swiss DT 26, a Swiss DT 26 S for simplified components, and a Swiss GT 26, and four Swiss XT 16s for more complex surgical parts—help Sorath Ortho produce perfect surgical implants at blazing-fast speed, peerless precision, and lowest cost per piece. Moreover, they help make the company a key player in India’s position as the world’s next manufacturing hub of choice.

“Here is an example: One of our customers in Germany had been manufacturing one of its products in their own facility at a cost of around €800 per piece. That wasn’t feasible so they looked around at other countries like India, Vietnam, and China, and were quoted prices of €175 to €180 per piece,” said Gothi. “Because of our very refined and transparent policy taking into account materials, man-hours and net profit, we deliver that product at €148 per piece. Our customers appreciate our transparency, quality, and consistently on-time delivery.”

From the start, Sorath Ortho and its parent company have been laser-focused on the human aspects of their work, and customers appreciate that, too.

“We make lifesaving products which cannot fail under any circumstances. We do not exist to make money. Every product we make must be of the highest quality and cost-effectiveness because we are about improving and saving lives—not making crazy money,” he noted.

Exceeding expectations

Another Sorath Ortho hallmark is its commitment to exceeding both international regulatory standards and customers' expectations.

"So if the expectation for linear tolerances is plus/minus 100 microns, our standard is half of that," Gothi said. "We believe our own standards should be more stringent than the global standards so that we can always delivery the right product with the right precision."

To achieve that extraordinary goal, Sorath Ortho invests in superior technologies, even if that means paying more for a single machine.

"If we are looking at machine suppliers and faced with the choice of a €40,000 machine or a €120,000 machine, we will always choose the premium machine, as the technology selection criteria is always about precision output," he said.
In line with that approach, Sorath Ortho chooses Tornos.

"We know that we can rely on that capital investment for continuous, long-term, high-precision output," he said. "The same applies to our investment in our own people: When I recruit an engineer or a machine operator, they have three and a half month of training that they have to pass. Our systematic approach to in-house training extends to CAD/CAM engineers and programmers, who have 14 months of training, and our quality inspectors, who get nine months of training. We then associate their knowledge with their compensation."





Commitment to quality

But that commitment to quality doesn't stop with investing in the best-qualified people and superior technologies like Tornos' Swiss-type automatic lathes. Sorath Ortho applies a next-level delivery philosophy as well: When a surgeon requires a customized implant, Gothi's team ensures delivery within a staggering 40 or fewer hours.

"We are looking at a minimum of 85 new Tornos machines for our new facility."

Mehul Gothi,
CEO, Sigma Surgical

With a portfolio of more than 600 products, Sorath Ortho turns to Tornos for one of its "hero" implants: a 240 mm proximal femoral nail antirotation (PFNA), an intramedullary device designed to treat unstable hip fractures.

"We manufacture this product—as well as some other very specific screws—with our Tornos machines within a 25-micron tolerance," said Gothi. "We are very happy with the results we get from our Tornos machines. Our relationship with Tornos goes back about three and a half years and today, whenever Tornos comes with anything new, we always go with Tornos. Tornos machines' power, precision, and accuracy make us more productive."

Delivering added value

But the value delivered by Tornos machines doesn't end there, he explained.

"Tornos machines are quite different from other brands in terms of their precision. We see this, for example, in our tool life, which is 17 to 18 percent greater with Tornos machines. That's important because cutting tools are very expensive," he said. "These machines' rigidity and thermostability also ensure consistent quality for our products. Compared to other machines, where my team has to correct the tools once during an eight-hour shift, our Tornos machines run for around 50 hours before any correction is needed."



Tornos TISIS machine programming software is another important asset.

"TISIS shortens our setup time and our team is very happy with its features. Built-in macros mean that programming on the machine is very fast. On other machines, programming can take more than four hours, compared to one and a half hours maximum on our Tornos machines," Gothi pointed out.

Foundation for the future

With that kind of added value, it's no wonder Sorath Ortho has its eyes squarely on Tornos when it comes to populating the turning department of its new facility.

"We are looking at a minimum of 85 new Tornos machines for our new facility," he said, adding that he's a champion of Tornos technologies and he's proud to showcase his Tornos machine fleet—even to visiting competitors. "I strongly believe that when someone sees our facility and the technologies we are using, they will adopt it and become a more precise manufacturer. This, in turn, will make India more respected globally."

sorathortho.co.in




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NEW 171 MACHINING CENTER:

The essentials of high precision, *without compromise*

A new standard of efficiency for precision machining

With the commercial launch of the new 171 machining center, Bumotec takes another step forward in its innovation strategy by offering a solution that addresses the real expectations of manufacturers: more performance, more productivity, and greater profitability, with less complexity, lower resource consumption, and a smaller footprint.

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Designed according to the "MORE with LESS" concept, the 171 combines the advanced technologies that have built the brand's reputation with a pragmatic approach focused on creating value for the user. Its objective is clear: to deliver world-class machining technology with outstanding precision, repeatability, and reliability while remaining competitive in terms of investment.

A compact machine that frees up valuable production space

In today's manufacturing environments, every square meter matters. This is why the development of the 171 was driven by an ambitious requirement to reduce its footprint to just 3 m².



With an optimized weight of less than 3,300 kg, the machine achieves an exceptional balance between compactness, stability, and rigidity. Its design is based on a cast-iron structure that ensures excellent vibration absorption and sustained accuracy over time.

The result is a machine capable of delivering high-level industrial performance while occupying minimal floor space, enabling manufacturers to increase production capacity without expanding their facilities.

“The Bumotec 171 was designed with one key priority: minimizing downtime”

Maximum availability for continuous production

The 171 was designed with one key priority: minimizing downtime. Its carefully engineered ergonomics, wide access doors, and excellent visibility simplify daily setup, inspection, and maintenance operations.

The Windows-based HMI, powered by the FANUC Series 30, Model 31i-B5 Plus / 15”, simplifies programming, parameter management, and production data traceability. The machine also records all operations performed, ensuring accurate monitoring of settings and performance.

On the automation side, the 171 incorporates intelligent tool monitoring functions capable of detecting tool wear or breakage and automatically replacing the affected tool with a backup tool stored in the magazine, without interrupting production. Preventive and predictive maintenance programs further contribute to high machine availability.

Thanks to these optimizations, production changeovers and setup operations can be completed in less than 20 minutes, depending on the application.

The right balance between simplicity and performance

Manufacturers are often faced with a difficult choice between highly equipped, expensive machines and more basic solutions that may limit performance. The 171 was developed specifically to provide the perfect balance between these two extremes.

In its simultaneous 5-axis configuration, it can machine bar stock up to 32 mm in diameter and can be equipped with an optional secondary operation unit featuring two vises to further expand its application range.

As a direct successor to the expertise developed with the renowned Bumotec 191 machining centers, recognized worldwide for their precision and repeatability, the new 171 delivers a high level of performance in an exceptionally compact format.

Additional highlights include a main spindle reaching 8,000 rpm, a machining spindle capable of 40,000 rpm, an optimized work area for chip evacuation, simplified access to key machine components, and easier cleaning for operators.

An all-in-one solution to reduce setups

One of the major advantages of the 171 lies in its ability to perform complete machining from bar stock to finished part on a single machine.

Machining all six faces in one setup reduces intermediate handling, improves surface quality, and eliminates the need for additional equipment. This approach shortens production cycles, minimizes the risk of errors, and lowers manufacturing costs.

Users can save machining recipes directly within the HMI, store tooling for multiple part families, and benefit from a tool magazine offering up to 60 tool positions, including backup tools.



“7 % energy savings per part produced”

The automated jaw-changing system on both vises further simplifies batch changeovers and enhances production flexibility.

Reducing energy consumption without compromising performance

Sustainability was also a major focus during the development of the 171. Thanks to a new generation of linear motors, optimized Fanuc drives, and reduced moving masses, the machine delivers outstanding energy efficiency.

Equipped with an integrated energy-saving function, the machine automatically optimizes power consumption according to its operating mode. Depending on application conditions, this technology can generate up to 7 % energy savings per produced part while maintaining full production performance.

The reduction of compressed air requirements to 5 bar and the elimination of air/oil lubrication on the 30,000 rpm version further contribute to improved environmental efficiency.

The 171 in one sentence

Compact, precise, intelligent, and resource-efficient, the new 171 machining center embodies a new generation of production solutions: more value, more productivity, and greater simplicity for demanding high value-added manufacturers.

High value-added applications for advanced industries

In response to the growing demands of the world’s most advanced industries, the 171 offers a leading industrial and technological solution. Designed to meet the challenges of precision, miniaturization, and performance, it serves the medical technology, watchmaking and luxury goods, micromechanics, and broader high-precision manufacturing sectors.





Watchmaking and jewelry

In the watchmaking and luxury industries, it enables the manufacture of highly complex movement components, technical watch cases, precision jewelry parts, and miniaturized mechanisms incorporating noble and innovative materials.

Precision micromechanics

The capabilities of the 171 also extend to micromechanics and advanced technology sectors, supporting the production of components for high-performance connectors, sensors, optical equipment, precision measurement devices, and subassemblies for aerospace, space, and defense applications.

Its ability to machine demanding materials such as titanium and advanced-performance alloys enables manufacturers to meet the strictest requirements for mechanical strength, dimensional stability, and lightweight performance.

By combining technological excellence, material expertise, industrial flexibility, and economic competitiveness, the 171 provides a sustainable response to the current and future challenges of advanced manufacturing industries. It supports the most demanding manufacturers in developing increasingly innovative, high-performance, and miniaturized products while ensuring the highest standards of quality, traceability, and reliability.

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Its capability to produce complex parts enables the machining of sophisticated geometries with extremely tight tolerances across a wide range of materials, including steel, stainless steel, titanium, advanced high-performance alloys, non-ferrous metals, and precious metals such as gold and platinum.

Medical technology

This versatility opens the door to numerous high-value industrial applications. In the medical sector, the 171 supports the production of orthopedic implants, surgical instrument components, minimally invasive devices, bone fixation systems, as well as components for diagnostic and analytical equipment.





From left to right: Jean-Michel Vallet (Technical Manager at Precijura) and Jérôme Rech (Sales Support at Tornos Technologie France). At Precijura, Tornos machines play a major role, particularly in the production of complex technical parts.

PRECIJURA:

50 years of excellence and innovation

in precision machining

In the heart of the Jura region of France, Précijura has been built on a simple conviction: The most demanding markets help companies progress when they know how to keep moving forward. Led by Olivier Chapuis for the past 10 years, the company focuses on quality, precision, continuous modernization and a strong technology partnership with Tornos, whose machines play a central role in its manufacturing operations.

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A Jura-based company focused on complex parts

Founded five decades ago, Précijura's expertise has been built over time by working with particularly demanding customers. Today, with a workforce of 80 people, the company specializes in bar turning and machined technical components, mainly in small and medium-sized batches. Its long-standing markets speak for themselves: aeronautics, space, defense and nuclear, as well as connectors, medical technology and ground transportation.

At the head of Précijura, Chapuis draws on an industrial career forged within major groups. He has put this culture of structured industrial operations to work for a company that has continued to progress despite the crises it has faced.

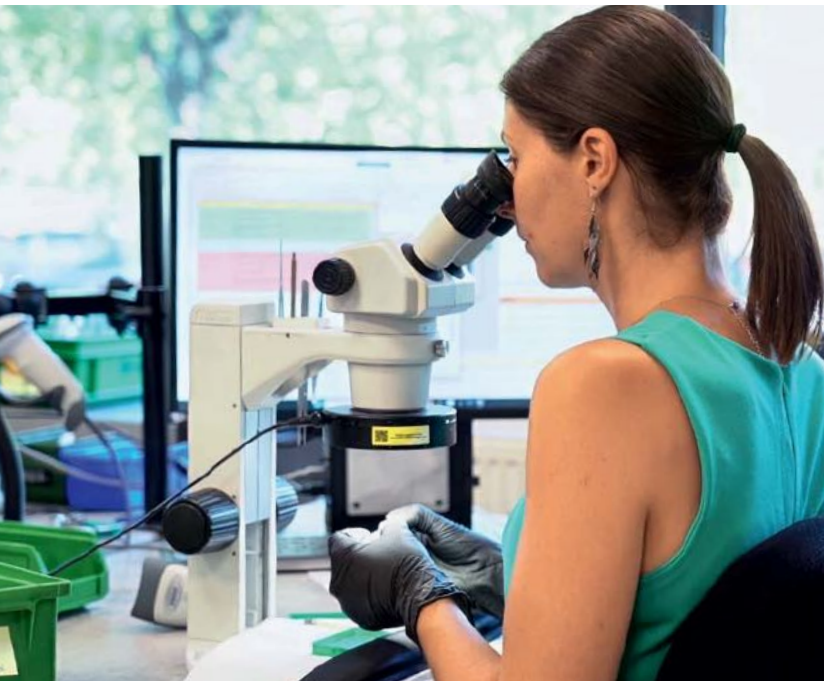
"We have, of course, experienced a few difficult years due to Covid and other crises. Nevertheless, we have always managed to hold our own and return to growth very quickly," he explained.

Précijura owes much of this growth to its positioning. The company manufactures components for demanding applications, often using difficult-to-machine materials such as nickel alloys, titanium, stainless steel, copper alloys and engineering plastics. These materials impose significant machining constraints, sometimes related to highly specific thermal or mechanical resistance requirements. Meeting them requires precise machines, fully controlled processes, rigorous inspection and a deeply rooted culture of quality.

Customer requirements as a driving force

At Précijura, high standards are more than a slogan. They begin with customer specifications and extend throughout the entire value chain.





“Having demanding customers means that we must also set high standards for our own suppliers, including Tornos,” Chapuis emphasized. This statement sums up the company’s approach: Serving critical industries requires partners capable of delivering the same level of precision, reliability and responsiveness.

These standards are also reflected in the company’s internal organization. Précijura has developed a culture of written documentation, which is essential for preserving and transferring expertise. In a profession where every setup, material and part can have its own characteristics, documentation becomes an industrial activity in its own right.

“Writing everything down enables us to ensure continuity in our expertise and to keep adding to it so that we can progress,” Chapuis explained.

Tornos accounts for almost half of the machine fleet

Tornos machines play a major role in this industrial environment.
“Tornos accounts for almost 50 % of our machine fleet, which is significant,” Chapuis noted. This substantial presence reflects a relationship that goes far beyond the simple purchase of equipment. For Précijura, a machine must be precise, productive and durable, while also evolving in line with customer needs and advances in manufacturing processes.

The technical challenges faced by the company are increasingly linked to the complexity of the materials and the severity of the requirements imposed on the parts. The machines must therefore maintain precision over time while offering the flexibility needed to adapt to a wide range of production requirements. In this context, Tornos provides a valuable technological foundation: machining performance, repeatability, the ability to produce complex parts and consistent support.

For Chapuis, however, the value of a technology partner is not limited to the installed machine. It is also measured over time, particularly when technical difficulties arise.

> “Investing in a machine fleet is not enough. We also need maintenance support to be available, and that is one of Tornos’ strengths.”
>
> **Olivier Chapuis,**
> Plant Manager



"Investing in a machine fleet is not enough. We also need maintenance support to be available, and that is one of Tornos' strengths," he stressed. For Précijura, the availability of technicians and their ability to analyze an issue on a machine axis, intervene or support the teams behind the scenes provide an important level of operational security.

Chapuis went even further: The partnership with Tornos also covers process improvement. He highlighted the machine manufacturer's ability to propose new equipment, new options and solutions for enhancing existing processes.

"You proactively recommend new equipment," he said. For a company committed to continuous improvement, this capacity for shared innovation becomes a genuine driver of competitiveness.

More than 300 improvement projects in 10 years

One of Précijura's proudest achievements is the transformation undertaken over the past decade. The company has embraced Industry 4.0, robotics and artificial intelligence. For Chapuis, this is a turning point that industrial companies can no longer afford to miss. Without this modernization, he believes, Précijura's economic performance would have been severely weakened.

This transformation was not simply a matter of making announcements. It was built project by project. "Over these 10 years, we have completed more than 300 improvement projects," he explains. Behind this figure lie investments, time, committed teams and a determination to progress beyond everyday production demands. Three hundred projects in 10 years is almost one project every 10 days. Such a pace could have exhausted the teams, but instead it appears to have established a culture of constant progress.

According to Chapuis, this momentum enabled the company to double its performance over the period. The result is not only financial or production-related. It also reflects Précijura's ability to challenge itself and modernize its machines, processes, workflows and organization.

"We must never rest on our laurels," said the company director, who sees this culture of continuous improvement as one of Précijura's most distinctive characteristics.

Robotizing and automating while keeping people at the center

The coming years will follow the same path. For Précijura, the future involves robotics on every front. This naturally includes integrating robots alongside machines, particularly for certain part-by-part operations, but also moving toward a form of intellectual automation: decision support, analysis of machine data, parameter optimization and a better understanding of production deviations.

Chapuis gave the example of a computer numerical control (CNC) system capable of generating thousands of continuously changing parameters. No operator can process such a volume of data alone. Artificial intelligence (AI) therefore becomes an assistive tool—not to replace people, but to give them access to information that was previously impossible to use. Précijura already uses integrated cameras for shape-recognition sorting operations and is working with a research laboratory in Besançon, France, on software for analysis, recommendations and decision support based on data collected from the machines.
At Précijura, this automation does not lead to an anxious view of the future. Chapuis emphasized that the objective is not to eliminate valuable workers, but to relieve operators of strenuous, repetitive or non-value-added tasks. A robot that removes chips or waste does not threaten a profession; it frees up time and energy. The approach to AI is the same: It processes what people cannot handle alone.

"People will remain at the center," Chapuis said, equipped with new information that enables them to make better, faster decisions under less pressure.

A forward-looking relationship

Précijura is moving forward with a clear belief: Industrial precision is a collective achievement. It depends on the women and men within the company, the transfer of expertise and the quality of its processes, as well as the reliability of its technology partners. In this equation, Tornos plays an essential role through the presence of its machines in Précijura's fleet, its technical support and its ability to propose useful improvements to production processes.

Discover our video report

Many challenges lie ahead: increasingly complex materials, more stringent customer requirements, robotics, data utilization and AI applied to machining. Précijura does not see them as a break with the past, but as the continuation of a journey already underway.
"We hope that Tornos will also help us move forward with all these projects," Chapuis concluded. His words capture the spirit of the partnership: demanding, practical, focused on the shop floor and built for the long term.

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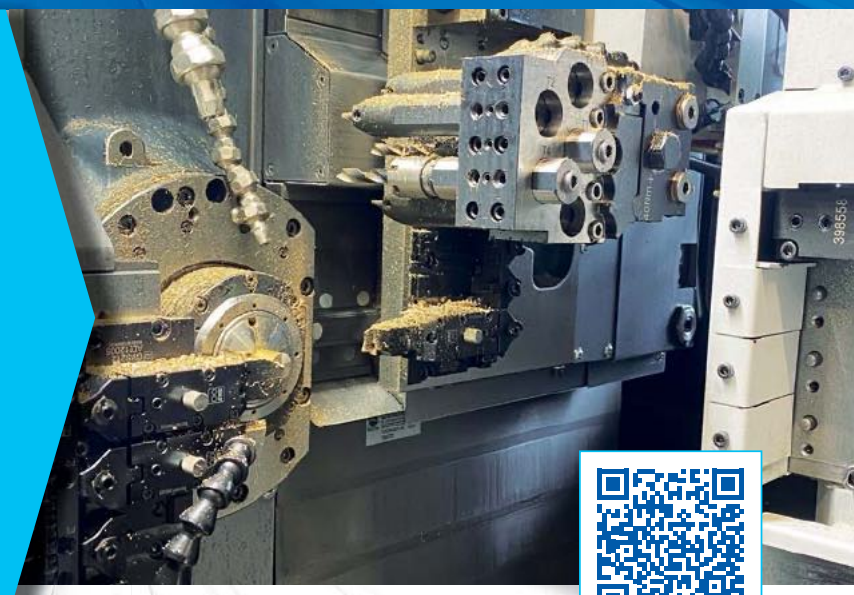
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GWS

Greater rigidity for demanding machining:

a reinforced live tool for higher performance

on Swiss DT, Swiss GT and Swiss XT

For Swiss DT, Swiss GT and Swiss XT users seeking greater productivity, Tornos presents a new reinforced live tool equipped with a REGO-FIX powRgrip PG10 collet.

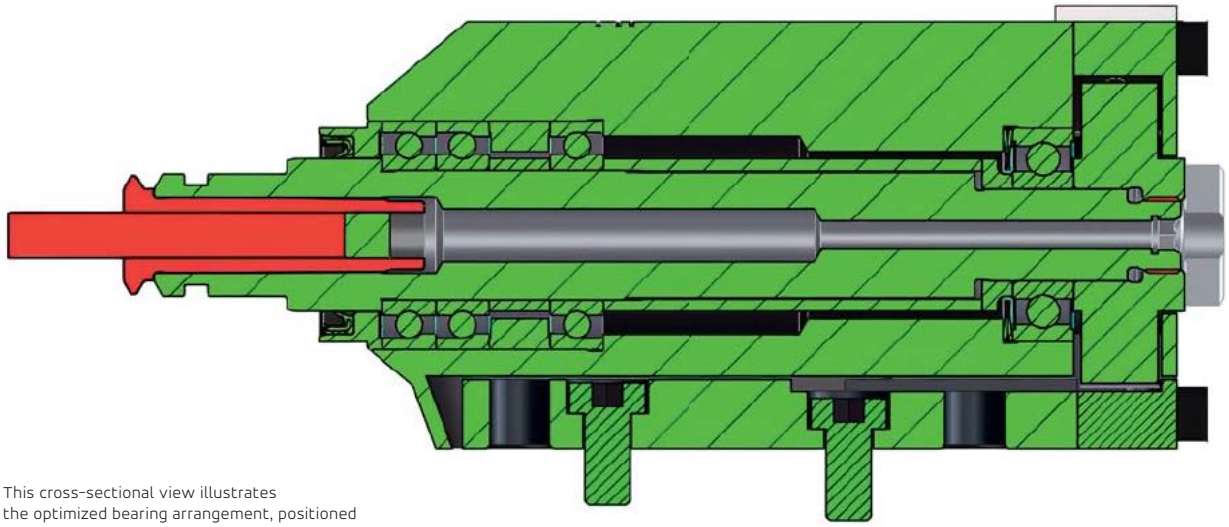
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The aim is to increase machining performance while retaining the compact design essential inside the machine. Greater rigidity, controlled concentricity and a significantly higher material removal capacity make this new development particularly suitable for the most demanding machining operations.

Up to three times greater material removal

Tests conducted in 100Cr6 steel demonstrated a material removal capacity up to three times higher than that of a standard live tool.

The feed per tooth (Fz) was increased from 0.005 mm with a standard tool to 0.015 mm with the reinforced tool, while maintaining stable, controlled performance. This improvement significantly reduces cycle times in the most demanding milling operations.



This cross-sectional view illustrates the optimized bearing arrangement, positioned as close as possible to the collet.

Rigidity redesigned from end to end

This performance improvement is based primarily on a significant increase in the overall rigidity of the system.

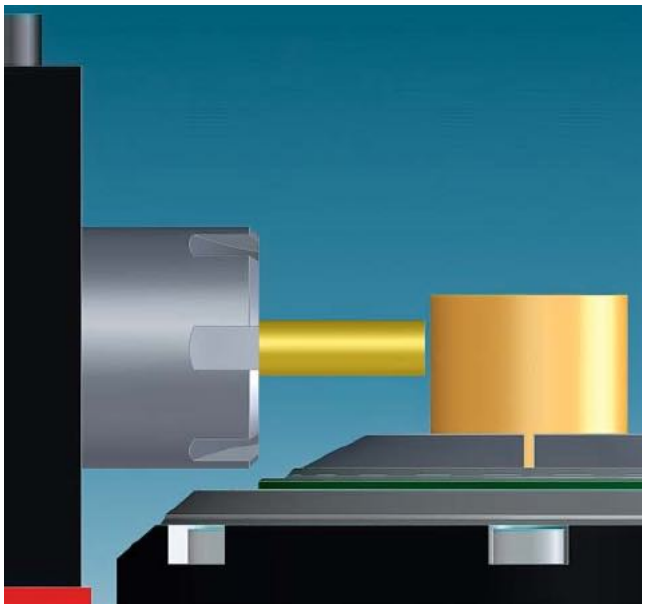
The bearings have been moved forward, as close as possible to the point where the cutting forces are applied. This new architecture increases radial rigidity by 35 %, thereby reducing deformation and vibration during machining.

The diameter of the new shaft has also been reduced for tools up to 6 mm in diameter. This geometry allows the tool to be positioned closer to the bar and enables the use of shorter cutting tools, directly contributing to greater overall rigidity.

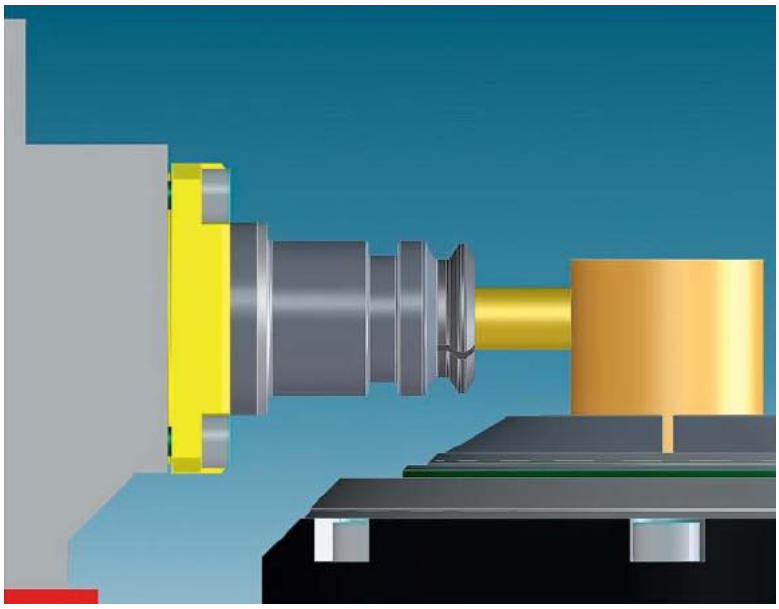
Despite these changes, the footprint remains exactly the same as that of the existing solutions. The tool-to-tool center distance remains unchanged at 38 mm.



PGU 9500 automatic clamping unit



With the ER20 collet, a longer tool is required because the size of the nut could cause a collision with the guide bush.



Thanks to the PG10 collet, the shaft length could be reduced, allowing machining closer to the bar with a shorter tool.

A REGO-FIX powRgrip PG10 collet

Another key element of this design is the integration of a REGO-FIX PG10 collet, ensuring high clamping accuracy.

This process ensures total system runout of 3 µm or less at 3xD. Such low runout distributes the cutting forces more evenly across the tool's cutting edges, limiting premature wear and improving the surface quality of the machined parts.

The use of powRgrip technology requires the toolholder to be removed when the cutting tool is replaced on the PGU assembly unit. To simplify this operation, the reinforced tool can be detached by removing a single screw. The complete toolholder can therefore be removed quickly from the PGU unit without making workshop maintenance operations more complex.

More precise repositioning

The toolholder is secured to the tool carrier by means of a dovetail rather than locating pins.

This mounting method ensures significantly more precise repositioning each time the toolholder is installed. It also makes it possible to install several reinforced tools side by side while maintaining high positioning accuracy.

Compatibility with existing tools

Compatibility with existing tools was also taken into account.
A dedicated compatibility tool allows users to continue using the standard live tools already present in their workshops. It is a standard tool with an additional machined feature that allows the reinforced tool to slide onto the dovetail.

Users can therefore integrate the reinforced tool while continuing to use their existing standard live tools.

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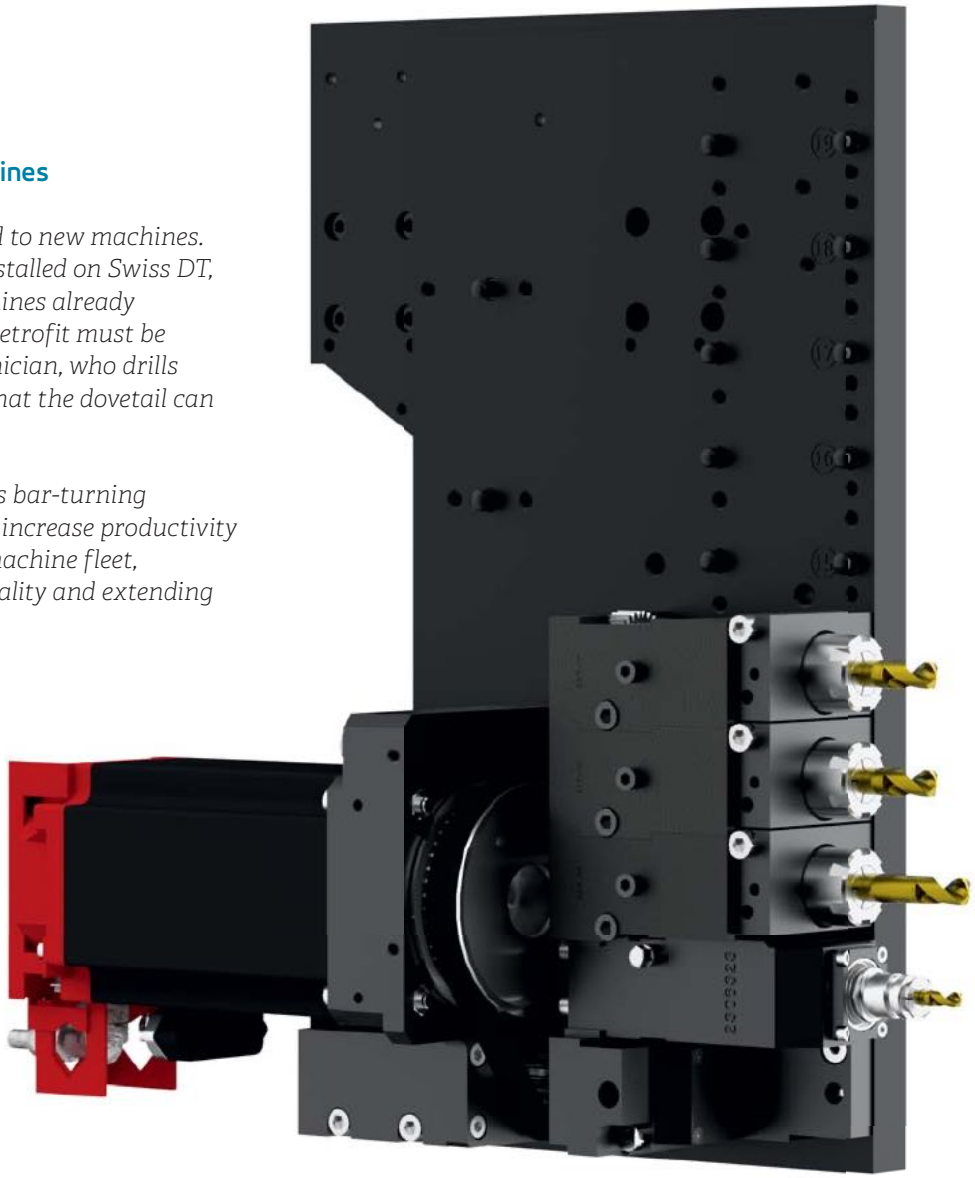
Grinding

Grinding for all models of Guide bushes, Collets, and sleeves with a diameter not exceeding 48 mm - Ø > 2.00 (Subject to evaluation)

Retrofit available for machines already in production

This innovation is not limited to new machines. The reinforced tool can be installed on Swiss DT, Swiss GT and Swiss XT machines already in production. However, the retrofit must be carried out by a Tornos technician, who drills and taps the tool carrier so that the dovetail can be mounted.

This new reinforced tool gives bar-turning specialists a practical way to increase productivity without investing in a new machine fleet, while also improving part quality and extending tool life.





To learn more or assess the potential of this tool in production contact a Tornos representative today.

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Stainless steel
ملیسا 0.5 mm
12 mm
Stainless steel
ملیسا 1.2 mm
8 mm
Stainless steel
ملیسا 0.5 mm
1.9 mm
Brass
ملیسا 1 mm
Stainless steel
8 mm
ملیسا 2 mm

Kepler Loop wins a Micron d'Or



Earning the Micron d'Or award at Micronora 2026 in Besançon, France, Tornos' Kepler Loop integrates geometric measurement directly into Tornos SwissNano machines. Its ultra-low-force probing enables miniature and fragile components to be inspected during the production cycle. By sending deviations to the CNC, it turns dimensional inspection into automatic correction, keeping production as close as possible to the target dimension.

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The recognition of Kepler Loop highlights a challenge in microtechnology: measuring difficult-to-inspect components inside the machine and then acting on the manufacturing process. In-machine measurement, extremely light contact, closed-loop correction and the collection of quality and performance data demonstrate the solution's industrial scope.

A few microns can compromise an entire batch

In precision turning, a process that initially meets specifications can gradually drift outside tolerance. Tool wear, thermal variations in the machine or workshop, dimensional variation in the material and changing cutting conditions all contribute. Deflection of slender components and geometric drift over the course of a production run add further variation.

Off-machine inspection creates a delay between the appearance of a deviation, its detection and the correction. Sampling can also interrupt the flow and make production dependent on an external inspection station. In the meantime, more parts may be machined with the same defect.

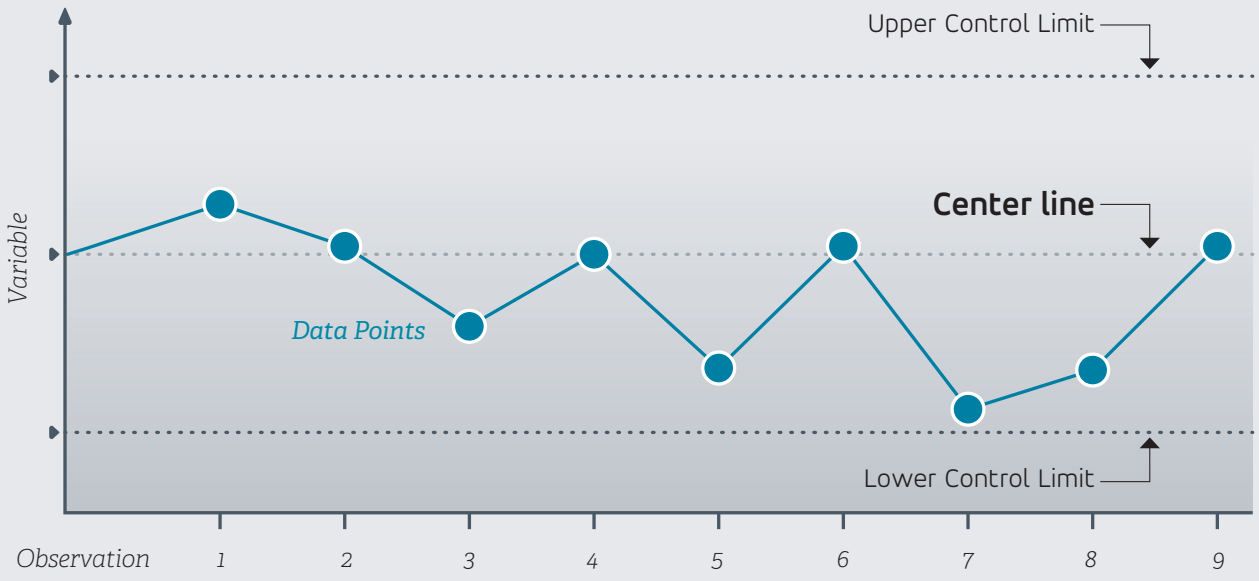
Touching the part without deflecting it

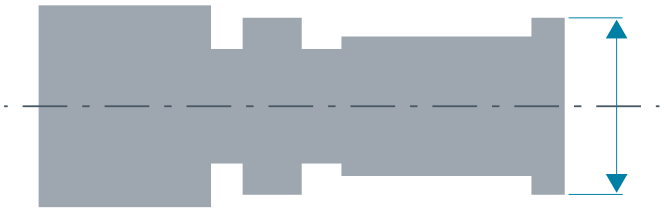
Kepler Loop uses analog probing without a return spring. It therefore avoids the threshold force that conventional mechanical probes generally need to apply before a measurement is triggered. The extremely low contact force reduces the risk of deflecting or displacing a small, thin or flexible part.

The sensor's relative movement is provided by a numerically controlled machine axis. The measurement therefore retains the axis reference, with no dedicated external actuator that could affect accuracy.
The overall accuracy of the measurement chain is better than 0.5 µm. Compact, unaffected by cutting oil and equipped with thermal compensation,

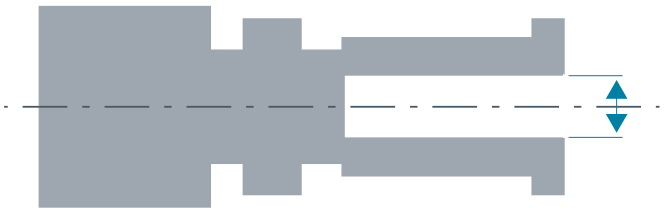
Kepler Loop at a glance

- *Available for the SwissNano range*
- *Demonstrated on the SwissNano 7*
- *Measurement-chain accuracy better than 0.5 µm*
- *Measurable outside diameters from 0.1 to 6.5 mm*
- *Measurable inside diameters from 0.5 to 6.5 mm*
- *Measurement, analysis and correction integrated into the machine*

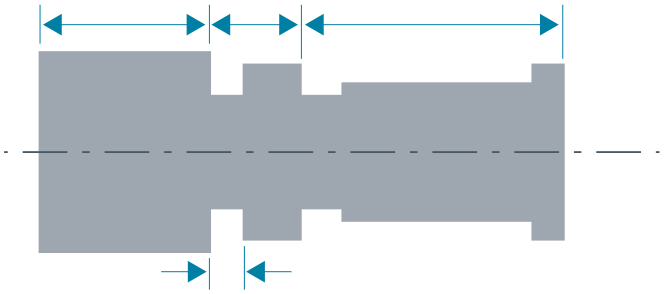




External diameters
Measurement of external diameters from 0.1 to 6.5 mm



Internal diameters
Measurement of internal diameters from 0.5 to 6.5 mm



External lengths
High-precision measurement of external lengths and grooves

the system is suitable for non-climate-controlled workshops. Optical systems provide noncontact inspection, but their cost, footprint or sensitivity to oil and burrs can make integration more difficult.

A closed measurement and correction loop

Demonstrated on the SwissNano 7 and available for the SwissNano range, Kepler Loop manages the process in four steps:

1. ***Produce:*** *The SwissNano machines the part under actual production conditions.*
2. ***Measure:*** *The sensor checks its geometry inside the machine with very low contact force.*
3. ***Analyze:*** *The values are compared with the target dimension to identify drift trends.*
4. ***Correct:*** *The CNC receives the information and automatically applies the required corrections.*

Here, "real-time correction" refers to measurement during the production cycle, with the results automatically feeding machine corrections. This loop compensates for tool wear, certain material variations and some geometric drift.

Depending on the configuration, Kepler Loop can scan a cylindricity error and help correct guide-bush clamping. It can also assist with centering tools or tool bits, detect tool breakage and stop the machine when a quality or process problem is identified.

Adapting measurement to the geometry

The stated ranges cover outside diameters from 0.1 to 6.5 mm and inside diameters from 0.5 to 6.5 mm. They also include external lengths, depths, grooves, shoulders, cylindricity errors and other accessible axial features.

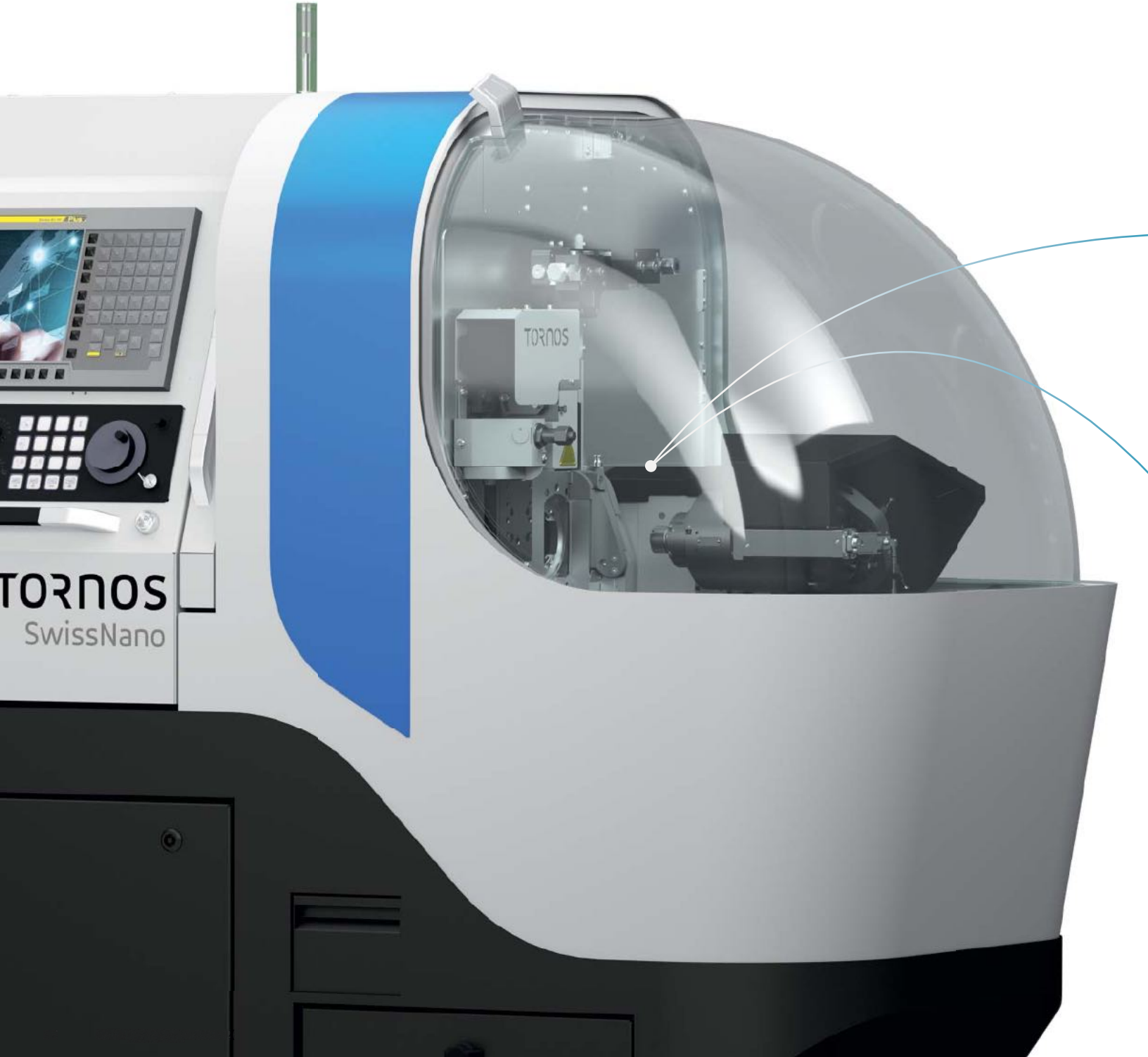
Accessibility remains decisive. Overall length can be difficult to measure when the counter spindle obscures the part during backworking or transfer. Feasibility depends on the component geometry and machine configuration.

Inspection can cover 100 % of parts or follow a statistical process control (SPC) strategy. Its frequency can be adapted to cycle time, component criticality and traceability requirements.

Benefits from maintaining the target dimension

Tornos reports a 50 % reduction in start-up time, with only one part required instead of four. Tornos reported a 50 % reduction in cutting-tool consumption, a 70 % reduction in scrap and a 50 % reduction in setup time. These performance figures are not guaranteed for every application.

The mechanisms are concrete: Approve the first part more quickly, limit manual adjustments and detect drift before an entire batch falls outside tolerance. Compensating for wear also avoids unnecessary tool changes. Staying close to the target dimension reduces reliance on corrective operator intervention.



Applications from watchmaking to medical technology

In watchmaking, slender shafts and delicate components combine functional and aesthetic requirements. In electronics and connectivity, microconnectors, contacts and pins present the challenge of small diameters. Medical and dental applications demand repeatability, dimensional stability and traceability.

Complex or fragile miniature micromechanical parts are other possible applications, especially when they are difficult to inspect. In precision automotive manufacturing, the value lies in small series-produced components that require stability, automation and quality monitoring.

Documenting production for better control

The human-machine interface (HMI) can be connected to machine signals to record measurements and their distribution, corrections, production events, settings, regrinding operations and stops. It can also track production quantities, quality information, and daily and weekly capability indicators showing the process's ability to remain within tolerance.

Depending on the measurement strategy, these data contribute to calculating availability, performance and quality, the three components of overall equipment effectiveness (OEE). Analyzing them helps link dimensional deviations to events on the shop floor.

Kepler Loop therefore points toward more autonomous, stable and traceable production in which measurement triggers action. Team expertise remains essential for selecting the dimensions to monitor, defining the inspection strategy and interpreting events. This combination of automatic correction and process knowledge gives smart production a practical foundation.

tornos.com



Winner of the 2026 Micron d'Or award in the "Intelligent Systems & Software" category, Kepler Loop integrates geometric measurement directly into Tornos SwissNano machines. Its ultra-low-force probing allows miniature and fragile components to be inspected during the production cycle.

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HUMANOID ROBOTICS: *mass production* of parts

A humanoid robot does not present the turned-parts manufacturer with the challenge of producing an exceptional component. The challenge lies in repetition. The same small gears, shafts and spacers occur dozens of times in a single robot, and every additional robot multiplies the volumes. Before being a precision challenge, this market is a production-rate challenge.

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The sector attracts attention through spectacular demonstrations. For a machining shop, however, the real interest lies elsewhere: in the bill of materials. A humanoid robot is an assembly of joints; each joint incorporates an actuator, and each actuator contains a gearbox. The components relevant to the precision machining industry are found inside these gearboxes.

Count before analyzing

The arithmetic is compelling. Three planet gears, two stages and 14 joints add up to more than 80 planet gears per robot, even before the sun gears, ring gears, shafts and pins are counted. More than 100 turned parts per robot is not an optimistic projection; it is a conservative estimate.

An architecture that multiplies part counts

A planetary gearbox distributes torque across several planet gears. It is more rigid, can withstand higher loads, offers greater efficiency and is backdrivable. This architecture is particularly well suited to turned-part production.

The requirement shaping the entire part family

The difficulty does not lie in the geometry, which remains relatively straightforward. It lies in the interaction between heat treatment and gear-tooth quality. This requirement shapes the entire part family.

The key metric remains the same

This is where the multispindle architecture comes into its own. By distributing operations across several stations working simultaneously, it significantly reduces cycle time. For a component used 100 times in each robot, every second saved is multiplied by 100 and then by the number of robots produced.

Humanoid robotics could well replicate what the automotive industry represented for several generations of turned-parts manufacturers: the emergence of production volumes capable of transforming the economics of a component. In this context, multispindle technology delivers its full range of advantages. More parts produced per square meter, fewer operators required and a significantly lower unit cost make the economic case particularly attractive when the same planet gears, shafts, pins and spacers are manufactured on a large scale.

This technology has long proved its value in the automotive industry, where competitiveness depends on the ability to manufacture millions of components

- ***A humanoid robot can contain more than 100 turned parts,*** *including numerous planet gears, shafts, pins and spacers.*
- ***The challenge is not whether the part can be produced, but whether it can be manufactured in high volumes*** *with consistent quality and at a competitive cost.*
- ***Planetary gearboxes are particularly well suited to turned-part production*** *because they require more mechanical components than harmonic-drive architectures.*
- ***Quality is established from the very first operations*** *and must be maintained throughout the process, particularly after heat treatment.*
- ***Humanoid robotics could have the same impact on turned-part production as the automotive industry:*** *volumes high enough to transform the economics of a component.*
- ***Multispindle technologies offer a particularly competitive solution*** *thanks to their high productivity, compact footprint and reduced operator requirements.*



Planetary reducer



Shaft | Carrier | Sun and planetary gears

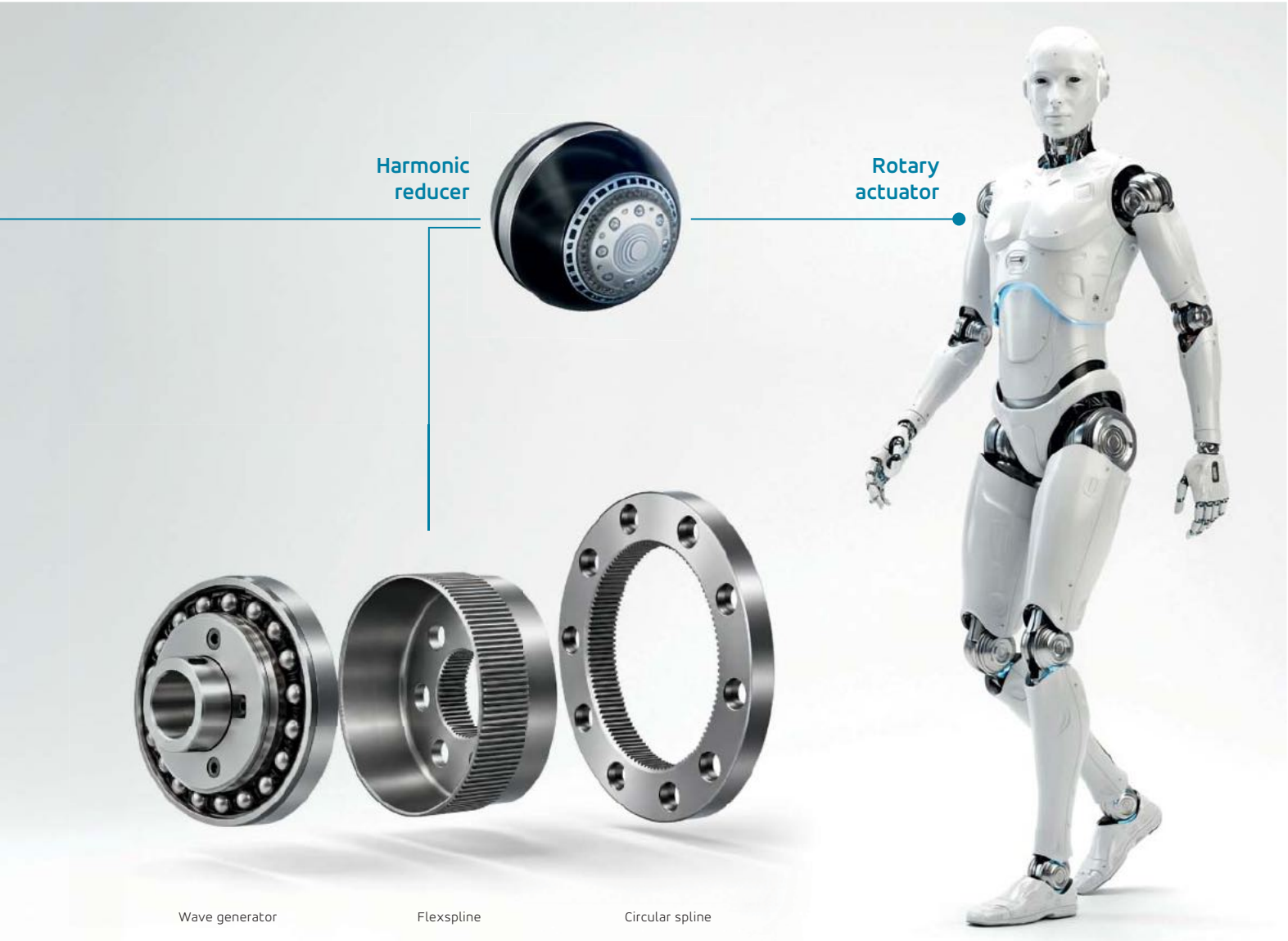
with consistent quality. Today, latest-generation multispindle machines deliver ever-higher levels of micromechanical precision, machining capability, process stability, automation and flexibility. These machines now combine precision levels historically associated with single-spindle machines with the productivity advantages of multispindle technology.

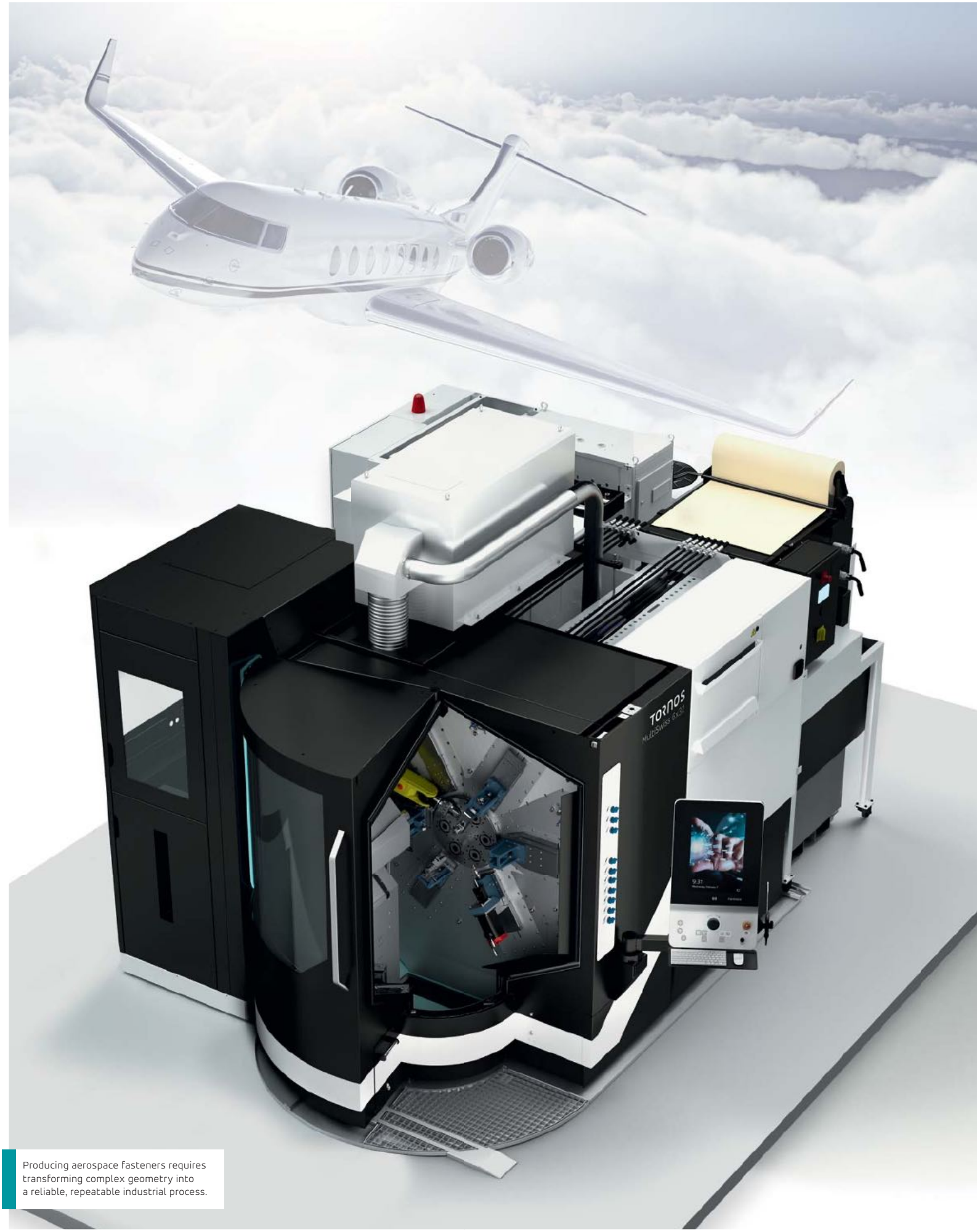
For gearbox and actuator components used in humanoid robotics, the question is therefore no longer whether multispindle machines can produce these parts, but to what extent they could become the benchmark solution once production volumes truly take off.

A family of parts to qualify

The humanoid robotics market is still taking shape. What is already clear, however, is the type of components required: small, mass-produced case-hardened gears, rotor shafts, spacers and threaded rollers. This is precisely where Tornos supports its customers: turning a market opportunity into profitable, repeatable and controlled production.

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Producing aerospace fasteners requires transforming complex geometry into a reliable, repeatable industrial process.

AEROSPACE FASTENERS: from complex part *to controlled production*

Into a few millimeters of material, an aerospace fastener packs requirements that commit its entire manufacturing route. For the bar-turning shop, the challenge is not to make the part once, but to reproduce it in series with controlled tooling, inspection and costs. Three example parts show how Tornos MultiSwiss solutions connect component geometry to an industrial organization—from feeding to inspection—capable of maintaining consistent production throughput.

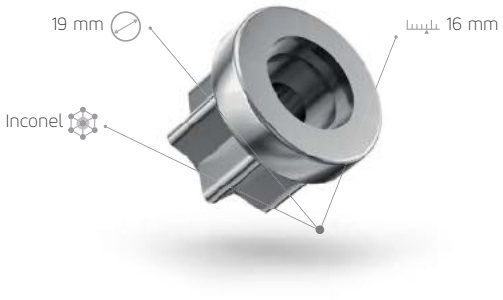
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A flanged nut, a threaded hollow body, a hexagon-head part: These geometries are familiar to any precision turning shop. Yet industrializing them calls for very different trade-offs. The material, the surfaces to be protected and tool access all shape the process route. The value of a multispindle machine is then judged by its ability to repeat that route, with conforming production and a predictable workload.

The context reinforces the stakes. Long-term air transport forecasts project more than 40,000 new aircraft by 2045, close to half of them for fleet renewal. Behind these figures lies a reality for subcontractors: durable capacity requirements on parts that tolerate no drift.

Start from the functional surfaces

Three examples run through this article: an Inconel part (19 mm in diameter, 16 mm long), a stainless-steel body (14 mm in diameter, 25 mm long), and a stainless-steel part (16 mm in diameter, 35 mm long). They feature, respectively, a flange and a lobed outer profile; internal and external threads; a hexagon head; a threaded end.



Process engineering starts with the drawing. On a threaded fastener, it's essential to identify the surfaces that bear and transmit load, those that provide location, and the geometric relationships to be preserved. Thread profile, transition radii and the condition of the load-bearing surfaces often matter as much as the main diameters. A good-looking part is no proof of conformity.

The hollow, 14 mm diameter body therefore calls for a close look at the relationship between internal and external surfaces, and at behavior under clamping. On the 35 mm part, preparing the secondary operations depends on the surfaces actually available for workholding. It is the product definition file that turns these observations into manufacturing requirements.

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Match the cut to the actual material

“Stainless steel” alone is not enough to set cutting conditions. Grade, structure and metallurgical condition all change machinability. Austenitic stainless steels typically produce long, tough chips, work-harden under the cut and promote built-up edge. The tool then works on a hardened surface, with a risk of notch wear and degraded surface finish.

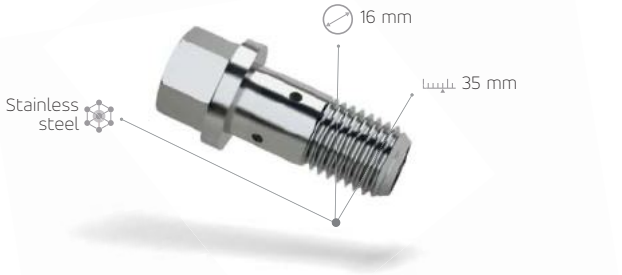


Nickel alloys impose different constraints. Their hot strength and low thermal conductivity place heavy demands on the cutting edge. Work hardening and adhesion accelerate wear. The term Inconel also covers several grades: The designation alone allows neither a choice of cutting conditions nor any knowledge of the raw material’s heat treatment condition.

Preparation therefore combines material identification with machining trials: observing edge evolution, chip formation and the dimensions obtained through to tool replacement. Cutting-tool manufacturers stress the influence of metallurgical condition and raw material production method on wear mechanisms. A roughing strategy must also leave a stock allowance suited to finishing. For the shop floor, the objective is to establish a repeatable tool life and to replace tools before any dimensional drift.

Bar or billet: an economic trade-off

The choice of raw material shapes the economics of the route. Bar makes continuous feeding straightforward and allows several part numbers to be produced



from a common supply. A near-net-shape blank reduces the volume to be removed, but introduces requirements in location, geometric variability and handling. The comparison must cover every cost item, including the raw material and the operations needed to create the clamping datums.

In bar work, MultiSwiss bar capacities are 16 mm on the MultiSwiss 6x16, 26 mm on the MultiSwiss 8x26 and 32 mm on the MultiSwiss 6x32. The finished diameter is obviously not the supply diameter: Stock allowances and blank geometry enter the calculation. These capacities guide an initial selection.

Billet work, for its part, is not a separate machine: the MultiSwiss range adapts in Chucker configuration across all three machine variants: MultiSwiss 6x16, MultiSwiss 8x26 and MultiSwiss 6x32. The shop thus covers three diameter classes without changing machine philosophy or setup know-how. On an aerospace fastener, this means reasoning from the part and its family, rather than forcing the part into the format of an available machine.

Feeding is then defined according to the billet and the target rate: vibratory bowl feeder for parts that can be oriented in bulk, robotic loading where geometry, mass or surface sensitivity demand it. The choice affects the protection of bearing surfaces, the reliability of orientation and the real autonomy of the cell—it belongs in the process study, not after it.





Workholding remains application-specific: On a hollow body, excessive pressure distorts the geometry during machining, while insufficient grip exposes the part to movement under cutting forces. The route must also allow for back operations and deburring of accessible areas, while protecting already-finished surfaces. Inspection after unclamping confirms that the part retains its characteristics.

Balance the stations to hold the rate

A multispindle machine distributes operations across several stations working simultaneously on different parts. A single part passes through these stages in sequence: Its throughput time is therefore distinct from the interval between two finished parts once the machine is at steady state. Confusing the two means comparing figures that do not describe the same reality.

The rate depends on the most demanding station, on auxiliary movements and on coordination with back operations. If a drilling operation occupies a station longer than the others, speeding up an already short operation adds nothing to overall output. Process engineering therefore looks for where to split a roughing pass, move a finishing operation or change a sequence, without losing the geometric datums. An additional operation becomes worthwhile as soon as it relieves the limiting station.

MultiSwiss spindles are independent and movable along the Z axis, with rotation conditions adaptable by position. This architecture allows the cut to be matched to successive operations. On the body with internal and external threads, the study has to articulate bore preparation, external machining and thread production according to the chosen process. Spindle count alone does not predict productivity: Productivity is built in the balancing of a workable route.

Stabilize the cut and the temperature

MultiSwiss spindles are based on hydrostatic technology. The oil film provides guidance and damps vibration during machining. On demanding parts,



this characteristic stabilizes the cut and protects surfaces—complementing, rather than replacing, correctly dimensioned workholding and a suitable tool.

Thermal regulation addresses another source of variation. Tornos controls temperature through the oil and a heat exchanger, with different cooling solutions depending on the installation. In production, the issue is holding dimensional conditions through load changes or after a stoppage. Commissioning must therefore include sequences representative of these situations, beyond first-part inspection.

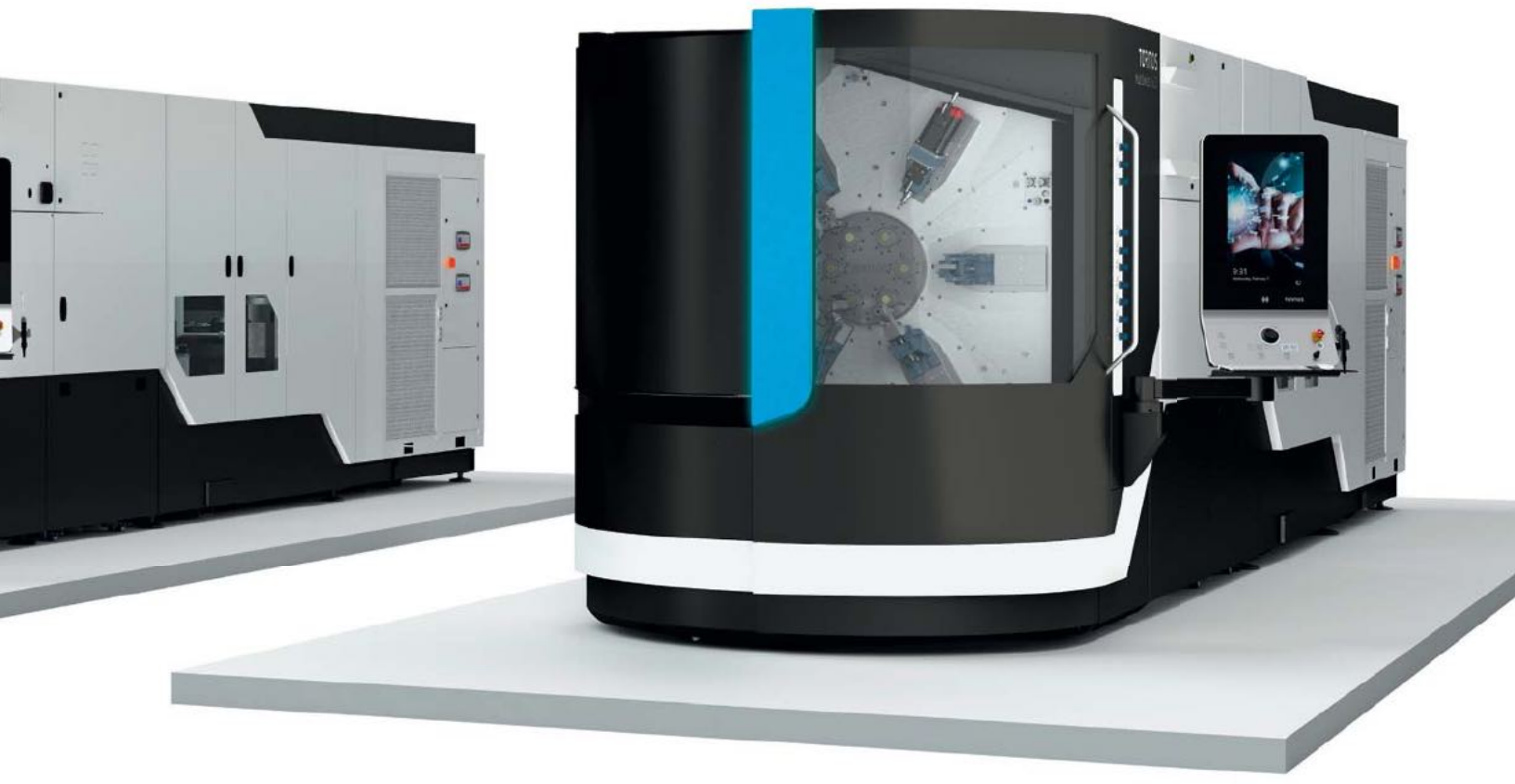
Finally, coolant must reach the cutting zone with sufficient flow. The MultiSwiss range distinguishes standard pumps from high-pressure options; selection depends on tooling, material and the chip evacuation sought. Maximum pressure is not in itself a strategy. Tornos also separates cutting oil filtration from spindle filtration: Respecting the circuits and their maintenance keeps the conditions intended for both cutting and hydrostatic operation.

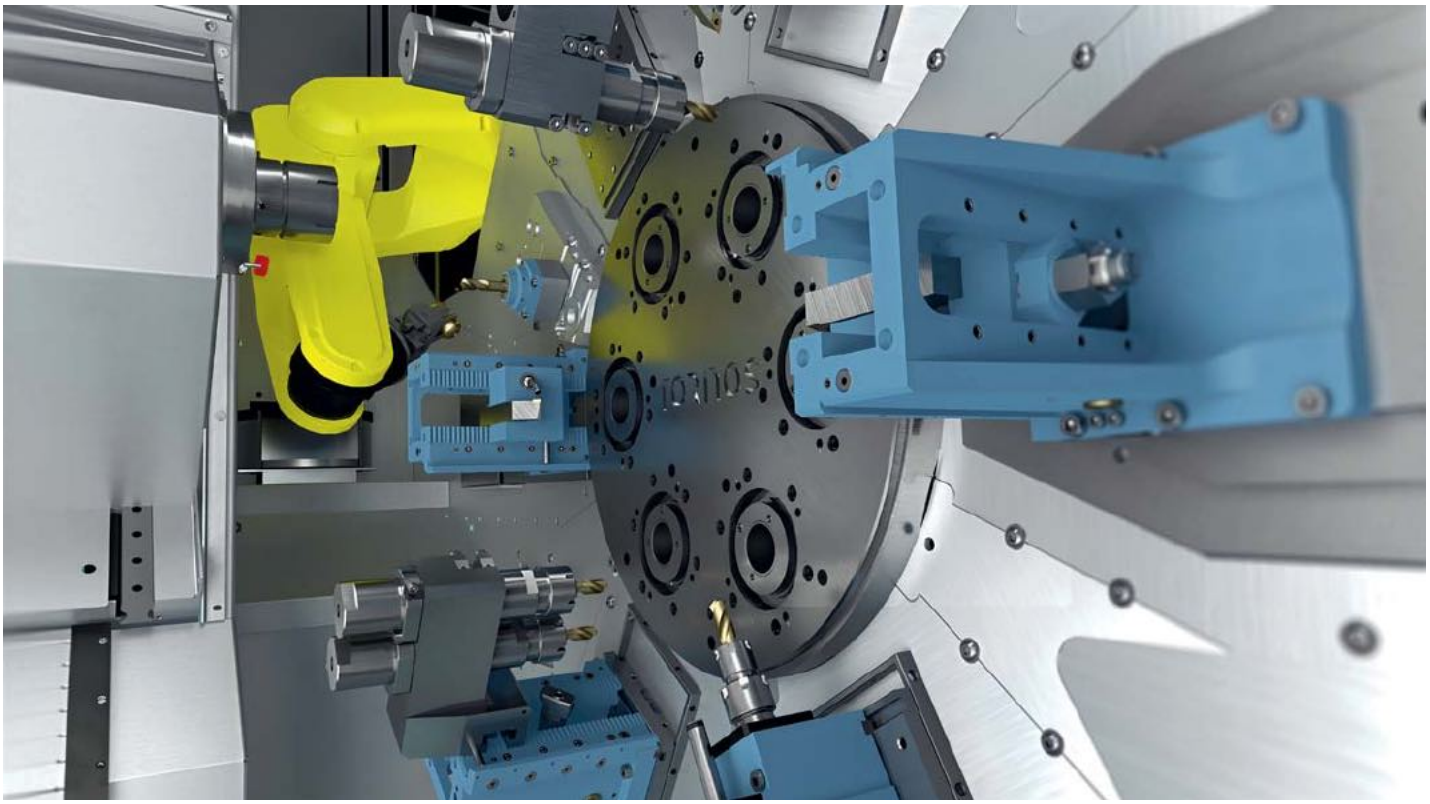
Run long without losing control

Extended production requires consistent autonomy across every function. Material reserves, chip evacuation capacity and tool life must match the target running period. On a part with a bore or an internal thread, a poorly evacuated chip disrupts the next operation. Commissioning examines the real sequences, through to part extraction and storage.

On compatible machines, Active Chip Breaker Plus (ACB Plus) technology activates a programmable chip breaker. Low-frequency oscillations of the longitudinal axes, synchronized with the spindle, briefly interrupt the cut and break up the chip. By limiting entanglement around the part or the tool, the software secures production and reduces interventions. Its settings are defined according to material, operation and machine configuration.

Handling, cleaning and measurement can be integrated into a MultiSwiss Chucker solution. These possibilities call for a precise application definition: characteristics to be measured, frequency, how a deviation is handled, and where the affected parts





go. Protecting bearing surfaces during unloading is part of the route, and the collection method is chosen according to surface sensitivity and subsequent operations.

The inspection plan links measurements to the corresponding part and batch. It specifies how to react to a drift and defines the production to be examined. Aerospace conformity is a matter of the complete industrial process—of its controls and its documentation.

The only indicator that counts: the cost of the conforming part

The useful economic indicator relates the costs incurred to the number of parts accepted within a defined scope: material, tooling, setups, machine time, interventions, inspection and outsourced operations. A nominal cycle must be set against the stoppages and quality yield observed over a representative run. This reading makes it possible to assess a change of strategy without simply shifting cost to a rework or an additional inspection.

The machine output must also be situated within the manufacturing chain. Depending on the fastener, forming, separate thread production, heat or surface treatments and additional inspections may still be required. Aerospace fastener manufacturers commonly combine these processes. Reducing machining operations does not eliminate the steps imposed by the product definition.

The MultiSwiss study can then focus on an identified part family, with its volumes and acceptance criteria. The outcome sought is a balanced route whose tooling, handling and inspection sustain the rate over time. To decide on industrialization, the shop must be able to link every technical choice to a measured effect on conforming production. That is precisely the ground on which Tornos supports its customers.

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