



**MACHINE  
TOOLS  
THE ROAD  
AHEAD**





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# INTRODUCTION

The Machine Tool industry has always prided itself on innovation and pushing the boundaries of machine tool performance. However, market forces, new technologies and new ways of meeting customer demands are forcing a reset. Industry 4.0, the IoT, digitisation, connectivity and big data are just a few of the themes that have come to preoccupy the manufacturing industry as a whole, not just the machine tool building sector. But what does it all mean? According to Henrik von Scheel, the ‘father of Industry 4.0’, or the Fourth Industrial revolution as it’s sometimes coined,

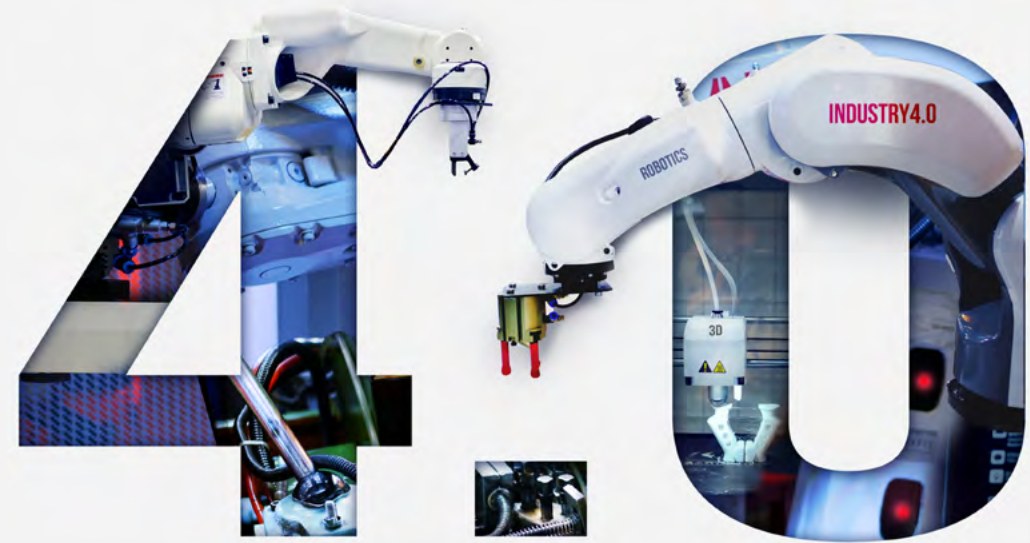
“It’s the biggest structural change of the past 250 years — a transformation of scale, scope and complexity unlike anything humankind has experienced before.”<sup>1</sup>

Combining the digital, physical and virtual worlds creates unparalleled opportunities for growth and productivity while reframing the competitive landscape with smart products and new service models. Production systems stand to become as much as 35% faster and 30% more efficient through Industry 4.0 capabilities, according to von Scheel, enabling “mass customisation” — the ability to create tailored products at high speed and on a scale never before possible.

In other words, the benefits of Industry 4.0 are multidirectional, extending out to the end customer as well as deeply into manufacturing operations and across the value chain.

“It’s about creating the next generation of operational excellence,” says von Scheel, “with smart automation, connectivity and operational alignment, transforming the design, manufacturing and servicing of products and productions systems. What will come out of all of this are connected ecosystems. We’re seeing that already. And companies that take advantage of them will gain a competitive edge.”

It’s a riveting and thought-provoking summary of the future and one that is resonating with machine tool builders. Change is happening. The view of Ralf Reines, an engineering consultant at VDW, (the German Machine Tool Manufacturers’ Association) is that “the introduction of digital technologies is now transforming the machine tool domain. The development of green machine tools that minimise energy use, eliminate waste and reduce environmental pollution is critical to the ongoing sustainable development of manufacturing.”<sup>2</sup>



1. Accelerating Industry 4.0, Nokia, December 15, 2023

2. Daniel Allen, Machine Tool Innovation Boosts Manufacturing Process Sustainability, DirectIndustry e-magazine, September 5, 2019



# AXIS OF STRENGTH

This dynamic environment, framed by Industry 4.0, is also having a subsequent impact on the supply side, those companies that provide the all-important components to the machine tool builders. If machine tools are to move to the next level of performance, of flexibility, of integration, incorporating technologies like machine learning to optimise machine operation, then component parts must be able to contribute to this paradigm shift.



**DAVID CLARK, APPLICATION ENGINEERING MANAGER, INDUSTRIAL BUSINESS UNIT, AT GATES, OBSERVES THAT ATTITUDES AMONG MACHINE TOOL BUILDERS ARE CHANGING AS THE IMPACT OF THE FOURTH INDUSTRIAL REVOLUTION MAKES ITSELF FELT.**

“

As machine tool builders consider the implications of this wave of new technology, how to adopt it, integrate it, then this has had a knock-on effect. They are now more receptive to solutions that previously were never entertained. Those solutions must complement or even accelerate the shift to building machine tools that meet the increasing demands and needs of customers and end users.

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“What we are seeing is a response to their customers, the end users who are trying to make their machining operations as efficient as possible. This might incorporate a greater focus on sustainability – less energy used, less waste, recycling of cutting fluids and machining materials – or lower total cost of ownership through monitoring of wearing parts and scheduled replacement or using more efficient motors.

As a provider of power transmission and fluid power solutions, we have worked together with machine tool building customers to meet the challenges they face. Whether it's replacing an alternative spindle drive with a belt drive option or using advanced composite materials in belt drives to ensure rigidity and accuracy in cutting and shaping processes, we find solutions that optimise the performance of the machine tool being developed.

Similarly with the adoption of high-pressure hydraulic systems and the move towards more compact machine tools, we are able to formulate hydraulic hose and coupling solutions that address these challenges.

However, what really drives a successful outcome with the many solutions available to us, is early engagement in the design process with the machine tool builder. Ultimately, this cements better mutual understanding, shortens the design cycle, reduces cost because there is little or no rework, and produces a customised application that is ready for implementation.”





# DESIGNED BY ENGINEERS, FOR ENGINEERS

At Gates, we are engineers too. Engineering is in our DNA. For more than 110 years we have been pioneering materials science for industries globally. It's progress that we can bring to machine tool manufacturers. Our expertise, knowledge and experience deliver practical, performance solutions that boost the efficiency and reliability of your machines.

**BUILDING SUCCESS, TOGETHER.  
HOW DO WE KNOW WHAT YOU NEED?  
BECAUSE WE THINK LIKE YOU DO.**

Like you, we are passionate about detail, the small things, yet we appreciate the bigger picture. Microns matter, so does the longevity and reliability of the machine tool you make. It's a level of detail, married to an objective commercial view, that only the best machine tools deserve when they leave your factory gates.

We realise that the smallest component deserves as much attention and scrutiny as the bigger picture. That's why we engage with you as engineer to engineer, a peer-to-peer relationship, set on achieving your goals in as practicable timeframe as possible, using the very latest design tools to formulate the answers to your challenges.

We share a common language, understand what's important to you, what will make a difference and what will not. An approach, an attitude, a belief that drive us to make not just marginal gains, but significant progress whatever the application.

Ultimately, we work together to produce a better outcome for your customer – eliminating downtime, increasing productivity, reducing manufacturing costs and optimising profitability.

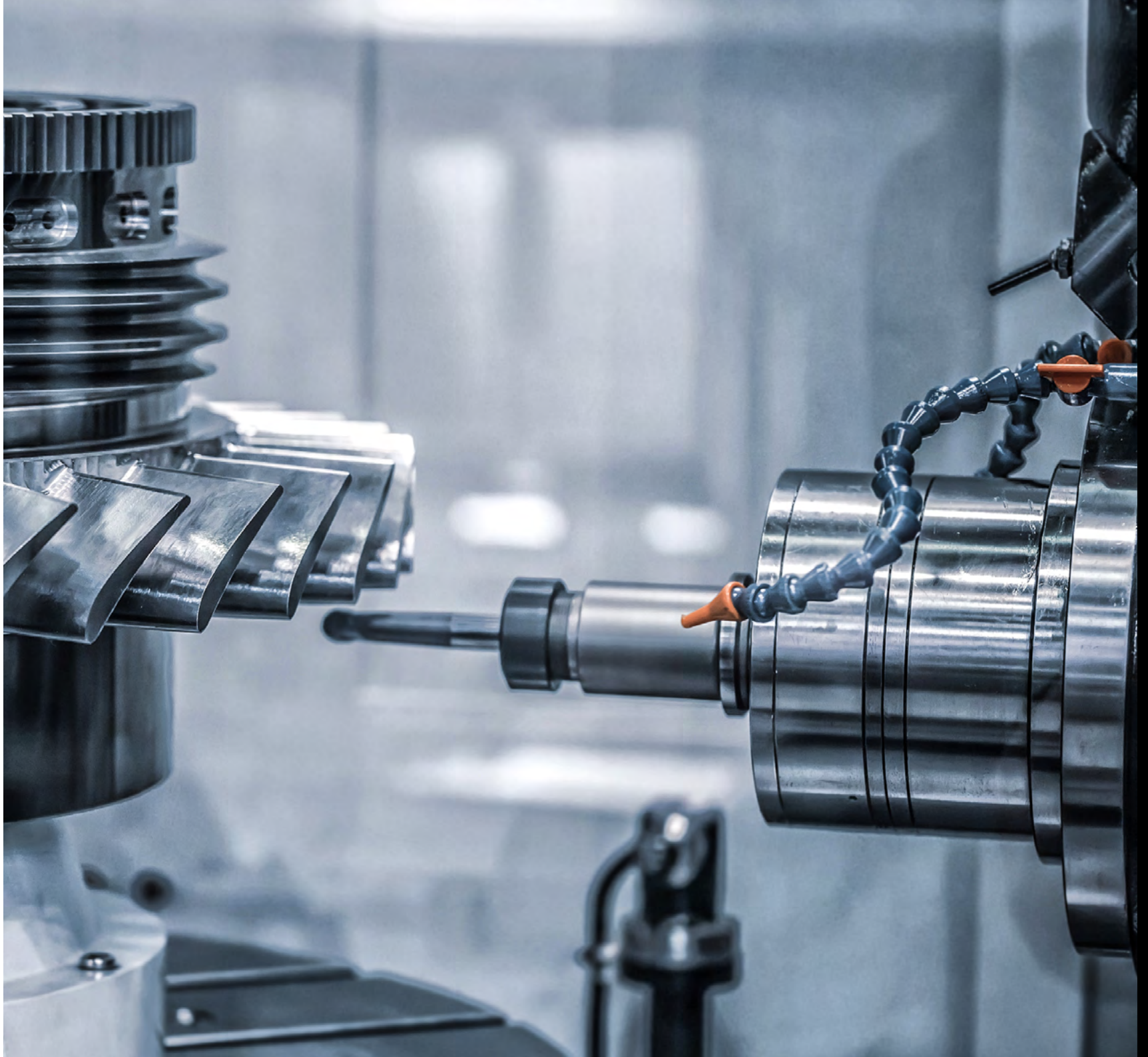




# PRODUCTS TO POWER MACHINE TOOL DEVELOPMENT

WHEN WE TALK TO YOU, WE DON'T ONLY BRING OUR KNOWLEDGE AND EXPERTISE, WE BRING AN ARRAY OF THE VERY LATEST FLUID POWER AND POWER TRANSMISSION PRODUCTS.

Whatever your requirements, whatever your goals, whatever your challenges, the range of Gates fluid power and power transmission options can deliver the answers. Either independently or working together this extensive range can support you in achieving your targets. Allowing you to build compact machines with improved reliability, greater durability, increased uptime and less maintenance, all of which contribute to a lower total cost of ownership (TCO) for your customers.



# BELTS & HOSES



## SYNCHRONOUS BELTS

Cutting-edge belt technology that is exceptionally durable and eliminates re-tensioning and lubrication. Abrasion-resistant and chemical-resistant, these innovative belts provide a cleaner and more compact drive solution with high power capacity making them ideal for machine tool applications.



## THERMOPLASTIC POLYURETHANE BELTS (TPU)

Available in various pitches, constructions, and tooth shapes, these high-strength belts are suitable for synchronised conveying, transportation, pulling, and lifting applications. With countless customisation options, they offer solutions across the machine tool spectrum. Gates TPU belts provide long-lasting power transmission, timing and linear solutions for demanding environments.



## V-BELTS

Exceptional performance, compact design, reduced maintenance costs and longer service life make these robust, high-load capacity belts the perfect solution for machine tools requiring high performance and smooth operation in limited space. Suitable for bench-type milling machines, lathe drives, wood/metal working machine spindle drives and computer peripheral equipment, V-belts bring significant cost savings and improved design flexibility across a multitude of industrial applications.



## FLUID POWER

Hydraulic hose assemblies that are lighter, stronger, and more flexible than conventional hose assemblies. Engineered to meet ever more demanding application challenges, they exceed multiple industry requirements and set new standards for hydraulic hoses and couplings.

Tube fittings that deliver exceptional reliability and safety in extreme conditions. Continuous testing, system validation, and “made in Germany” quality ensures that these products not only meet, but exceed, performance specifications, making them exceptionally durable and reliable, even in critical applications.



# ENGINEERING EXCELLENCE IN THE ERA OF INDUSTRY 4.0

THE MACHINE TOOL INDUSTRY IS UNDERGOING SIGNIFICANT TRANSFORMATION, INFLUENCED BY FACTORS LIKE INDUSTRY 4.0 AND MARKET DYNAMICS SUCH AS THE SHORTAGE OF SKILLED LABOUR, AND A GROWING EMPHASIS ON SUSTAINABILITY.

Machining Transformation comprises three areas: process integration, automation and digital transformation, all of which, either individually or collectively, influence the way new machine tools are conceived and manufactured.

CNC machines are becoming smarter. Front of mind for application designers is reduced downtime, optimised tools, predicting cutting tool wear, using cutting force models, maintaining machines, monitoring operations, predicting surface quality, and estimating energy usage. Machine manufacturers are exploring and developing machine learning applications to provide customers with equipment that meets their needs and offers a genuine competitive advantage. In addition, a machine tool that learns, predicts its own wear and maintenance schedules and relies on less human intervention is part of the solution to a shrinking skilled labour market.

There's also a strong environmental theme. As reported in DirectIndustry e-magazine by analyst Hicham Dhouibi: It's not just greenwashing; the machine tool industry is really striving for a greener future. This involves reducing CO<sub>2</sub> emissions, recycling, and optimising energy use. Energy optimisation includes systems that automatically shut down when not in use, unlike the constant power-on mode of the past. Energy recovery, similar to Formula One, is also being explored, where braking energy is captured. Recycling efforts focus on cutting fluids and machining materials. To address unwanted emissions, there's a push for more efficient motors and shorter process times. The idea is to accelerate processes, which, in turn, reduces energy consumption and carbon after emission.<sup>3</sup>

Additive manufacturing, or 3D printing, is also being embraced as a way of producing parts in a more sustainable way. Techniques such as laser technology solidify powder, which is reusable, resulting in a lower

carbon footprint. Less material is used, leading to reduced carbon emissions. In additive manufacturing, this translates to both a low carbon footprint in production and, in the manufactured product, reduced weight, making it more sustainable.

As the machine tool building market changes, so does Gates. Our power transmission and fluid power ranges have evolved to better meet the needs of the industry. For example, the use of advanced materials offering high strength increase overall belt efficiency, crucial for ensuring rigidity and accuracy in cutting and shaping processes. Our roller chain-to-belt replacement strategies are an effective way of not only improving machine tool performance but also reducing service and maintenance intervals, thereby increasing overall productivity. Our hoses are more flexible for faster and more ergonomic installation, allowing a smaller machine footprint while our 1-piece MegaCrimp™ coupling boosts equipment uptime by eliminating couplings leaks.

3. Hicham Dhouibi, Sustainability, Digitization, Additive Manufacturing: Insights From Our Industry Expert's Return From EMO Hannover, DirectIndustry e-magazine, October 3, 2023



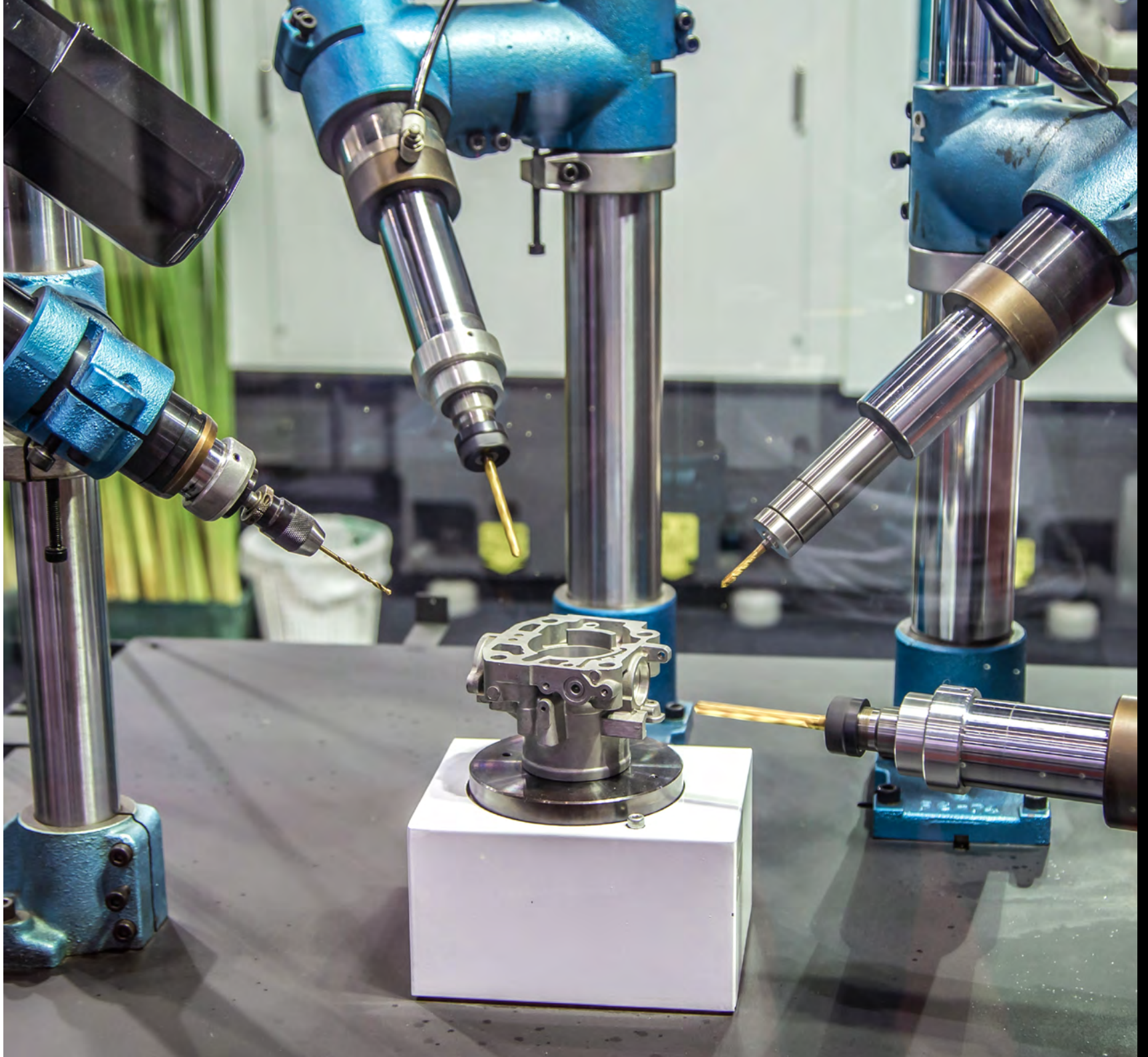
# MEETING CHALLENGES, PROVIDING SOLUTIONS

Every challenge brings an opportunity to do things smarter, to build in innovation and to take machine tool performance to the next level. Whether it's an increase in uptime, reduced maintenance or lower total cost of ownership there's a Gates product that can help. Our advanced Power Transmission, TPU Polyurethane belts and Fluid Power portfolio can match specific requirements either individually or as a complete system. All solutions are configured and assembled with you in mind, and our engineers are on hand to help pinpoint the exact belt or hydraulic hose that you need, right when you need it.

We continually innovate in materials science and dedicated custom engineering support to produce real-time results for all your machine tool design needs. As the world changes, synchronous belt technology is changing with it. We are offering improvements in manufacturing efficiency, productivity and helping to increase your customer's bottom line.

Faster, smaller, quicker, safer, and more sustainable – Gates products guarantee 100% reliability for milling, grinding, planing and cutting applications. It's advanced synchronous belt performance that was previously deemed impossible.

Where improvements in accuracy and positioning are required, where minimum maintenance is a must-have, where quieter operation is desired, and where reliability and repeatability are at the core of machine tool efficiency and productivity, the Gates belt range fits the bill.







### POLY CHAIN® CARBON™ VOLT™

A synchronous design renowned for its durability

- Improved shock load and fatigue resistance carbon fibre tensile cords provide increased strength and length stability in both high torque and low-speed drives.
- Cleaner, more compact drive solution – offers zero maintenance and less downtime with no stretch. No re-tensioning. No oil lubrication. EVER.
- Lighter, less noise, and longer lasting – 96% lighter than roller chain and quieter operational output for improved employee ergonomics and a better work environment. Plus, enhanced efficiency of Poly Chain belts means they last up to three times longer than roller chain drives with less maintenance and downtime than any other solution.



### POWERGRIP™ GT3

Premium rubber synchronous belt with optimised GT tooth profile

A technically advanced timing belt that meets a wide variety of machine tool applications. Available as standard stock product in 2MGT, 3MGT and 5MGT pitches make it the ideal for high-precision servomotor and multi-axis transmissions.

- Transmits 50% more power than previous generations of PowerGrip™ belts
- Suitable for new drive designs as well as a direct replacement for existing drives
- High positioning accuracy with improved tooth jump resistance
- Compatible with and used on GT type pulleys
- Cost-effective, long-lasting and virtually maintenance free
- Easy drive design using Gates DesignPower belt design software



### POWERGRIP™ GT4

Synchronous power for every application

Expertly designed with you in mind – advanced high-torque synchronous belt for a broad range of industrial applications.

- Engineered with advanced materials science – delivering highest power-carrying capacity and widest temperature range capability (-40 °C to 120 °C) of any belt in its class
- Improved performance in automation applications – reducing drive width with narrow belt – ideal for tight installation
- Less weight, less noise, lower cost – improved ergonomics and no metal-on-metal clatter, and with no re-tensioning or lubrication you can eliminate maintenance costs throughout the life of the belt





## MACHINE TOOL PROJECT BELTS

### SPECIALIST BELT CONCEPTS FOR X-Y POSITIONING DRIVE

Project specific belt construction offers a blend of versatility and precision. Engineered with multiple profiles to cater to specific customer requirements, making it a standout choice in the market with an extended service life and an expansive temperature range.

With unparalleled positioning accuracy, the optimised tooth form featured in this innovative belt elevates the precision of X-Y positioning drives with enhanced repeatability, supported by a carbon tensile member ensuring both length stability and flexibility.



## QUAD-POWER™ 4

### HEAVY DUTY RAW EDGE, MOULDED NOTCH, NARROW SECTION V-BELT

By using innovative minimal-stretch cord technology, Gates Quad-Power 4 bandless V-belts are free of maintenance. Unlike conventional belts, the Quad-Power 4 V-belt does not suffer from severe tension decay in the first hours after installation. So, no run-in period nor any re-tensioning are required.

This new generation of service free EPDM belts are designed to extend product lifetime eliminating costly downtime for re-tensioning, repair and replacement.



## MICRO-V®

### MULTI-RIBBED BELT

Gates Micro-V belts ensure outstanding performance on any industrial multi-ribbed drive. They cover a multitude of industrial applications and are suitable for industrial drives in washing machines, textile machines, vacuum cleaners, lawn mowers, machine tools, medical equipment and many more.

The full line of Micro-V belt products includes slabs in several widths as well as single belts in PJ, PK, PL and PM sections, perfectly matching customer requirements. Both slabs and belts can be manufactured in a great variety of number of ribs.





## POLYFLEX™

### POLYURETHANE V-BELT

This compact and strong belt with nominal top width from 3mm to 11mm transmits more power and allows high speed ratios. Polyflex is suited for extremely small diameter pulleys and very compact drives with high rotational speeds. Ideal for use on machines and machine tools requiring high performance and smooth operation in limited space such as bench-type milling machines, lathe drives, woodworking and metalworking machine spindle drives.



## PREDATOR™

### DESIGNED TO TAKE ON THE TOUGHEST APPLICATIONS

Predator belts are the markets' leading heavy-duty V-belts. The stronger than steel extra heavy-duty belt construction is designed to handle high horsepower motors, frequent shock loads, high heat and the harshest operating environments in extremely demanding applications. They provide extraordinarily high impact strength, capacity and wear resistance.

Predator belts aramid tensile cord construction is pound-for-pound stronger than steel, so they can handle up to 2.2 times more horsepower than standard V-belts. This enables more compact drive design, which reduces overall weight and wear on other drive components. Engineered as OE quality replacement belts, Predator is designed for heavy-duty applications exposed to pulsating loads or heavy shock loads, such as wood processing.



## SYNCHRO-POWER™ LINEAR

### TIMING BELTS

Gates TPU (thermoplastic polyurethane) linear timing belts are manufactured in standard roll lengths in different pitches, constructions and tooth shapes. The wide range of various designs offers the exact solution for nearly every application. Linear belts are available as roll stock, open-ended (long length), pre-punched or endless welded belts.



## MEGASYS™ MXT™

### OPTIMISED PERFORMANCE, EXTRAORDINARY DURABILITY

MXT offers a hydraulic solution that is lighter, stronger, and more flexible. Made with strong, high-performance reinforcement and high-quality, abrasion-resistant rubber, MXT is a universally applicable premium product offering performance above industry standards.

Its diversified application allows you to consolidate inventory while giving you exactly the hose you need when you need it.



## MEGASYS™ MEGACRIMP™

### A LEAK-PROOF SEAL THAT'S TRULY INNOVATIVE

It's what's inside the MegaCrimp coupling that makes it perform so well: the C-insert allows usage with different hose constructions and wall thicknesses. In addition, the C-insert ensures an even distribution of crimping forces to form a concentric seal.

MegaCrimp also simplifies your inventory requirements since one size can accommodate many different hose ODs, on both one- and two-wire braid hoses.



## TUBE FITTINGS

### ENGINEERED TO EXCEED EXPECTATIONS

Gates Tube Fittings according to DIN EN ISO 8434-1 and DIN 2353 are important pressure transmission components for a wide range of machine tool applications.



# WE NEVER STOP SUPPORTING

WHEN YOU CHOOSE GATES TO POWER YOUR MACHINE TOOL,  
YOU DON'T JUST GET OUR PRODUCTS.

Our 'designed by engineers for engineers' approach ensures each application is tailored to meet your specific requirements by our experts who work with your design engineers, at no extra charge, to assist with the selection, implementation and commissioning of components. Because we think like you do, we understand your needs and bring the most reliable and efficient solutions available to the table. You can also access two powerful Gates tools to enable quicker and more accurate specification of components.



# POWER TRANSMISSION DESIGN TOOL

## DESIGN POWER

GATES DESIGN POWER IS AN ADVANCED DIGITAL TOOLKIT THAT ENABLES YOU TO WORK COLLABORATIVELY WITH OUR INTERNAL EXPERTS TO RAPIDLY DESIGN THE MOST ACCURATE AND ROBUST APPLICATION-SPECIFIC DRIVE SYSTEMS.

Featuring a state-of-the-art knowledge base and the most sophisticated belt performance models, it automatically syncs your specific design parameters with the latest catalogue of products, so you can determine every potential application solution, without wasting any time or money. Additional features include:

- Estimation of energy savings of a synchronous belt drive compared to a V-belt drive
- Estimation of cost savings of replacing roller chain with a Poly Chain belt drive
- Ability to determine belt installation tension, pull, and power transmission capacity
- Create and track multiple design derivatives

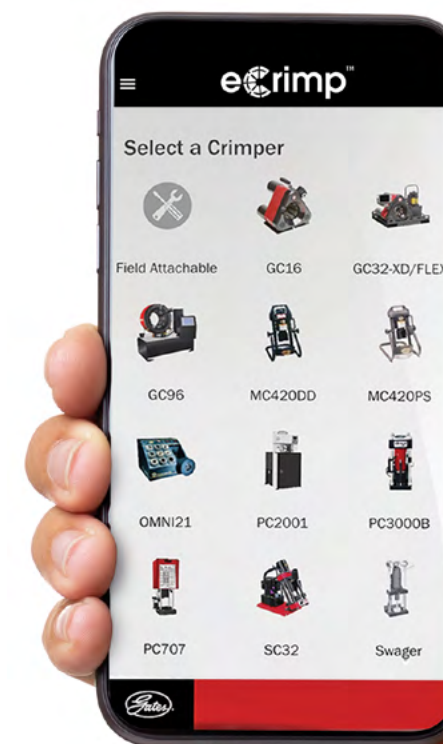
# FLUID POWER DIGITAL CRIMPING DATABASE



CRIMPING YOUR HYDRAULIC AND INDUSTRIAL HOSE ASSEMBLIES TO THE EXACT SPECIFICATIONS IS ESSENTIAL FOR YOUR MACHINE TOOL'S SAFETY, UPTIME, AND SUSTAINED PERFORMANCE.

The Gates eCrimp app gives access to qualified crimp specifications with the latest updates and new details. Whether working in extreme environments, or controlled conditions, this application gives you dynamic search capability. Searches can be narrowed by hose, coupling or size, and access up-to-date crimp specifications for your Gates hydraulic and industrial hoses and assemblies in the eCrimp database.

- Change location, units, and language to fit your needs
- Always have the latest updates and new details with real time updates
- Download specs for areas without data connections with offline capability
- Quickly access your most common hose-coupling combinations
- Eliminate errors with visual identification with our library of images for product verification





# WORK WITH GATES

WE KNOW A GOOD WORKING RELATIONSHIP IS NOT JUST ABOUT PRODUCT OR THE ENGINEER-TO-ENGINEER DIALOGUE, IT GOES DEEPER THAN THAT. IDEAS AND SOLUTIONS WILL NOT MATERIALISE IF PRODUCTS ARE NOT AVAILABLE, AND YOUR CONFIDENCE IN US WILL SUFFER IF WARRANTIES ARE INSUFFICIENT.

That's why at Gates, we believe in working with customers' purchasers and buyers to fully understand the scope of the requisition, ensure seamless delivery of products, and to underwrite those products with industry-standard guarantees. Our warranties are there to give you and your customers confidence in the components and assemblies we deliver.

Gates' global manufacturing capability brings supply continuity so you can assemble with confidence, plan your machine tool build schedule and meet your customer's order requirements on time and in full. Our European facilities are strategically located to provide inventory where you need it, when you need it.

And we don't stop there. Our approved distributor and service network throughout Europe provides that all-important aftermarket back-up and support for warranty and MRO works.

## HOW DO WE KNOW WHAT YOU NEED? BECAUSE WE THINK LIKE YOU DO.

Contact a Gates specialist now to see how we can help drive progress, and deliver success, in your machine tool manufacturing.