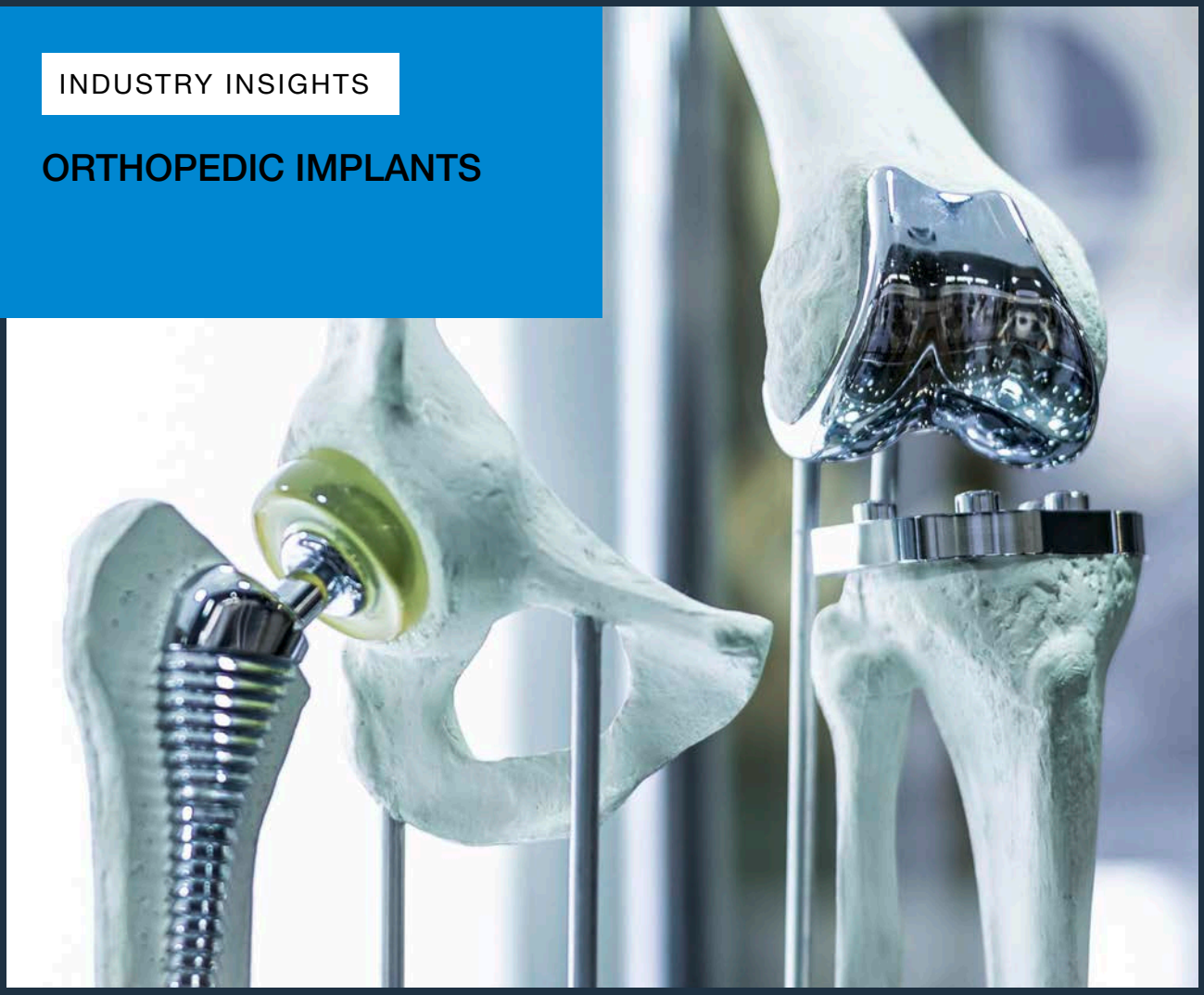
INDUSTRY INSIGHTS

ORTHOPEDIC IMPLANTS



# The No. 1 in grinding:
# 60% shorter process times in medical technology

In this case study, we provide insights into the grinding processes for manufacturing orthopaedic implants and show the challenges and opportunities in medical technology.

TYROLIT

# Table of contents

1 The Tyrolit USP in precision grinding

2 **Field report**
Reduction in process time for grinding artificial knee joints by over 60%

3 The market for 3 orthopaedic implants

4 Challenges & opportunities in the production process

5 Grinding orthopaedic implants correctly

6 The perfect process in just a few steps

# 1 The Tyrolit USP in precision grinding

**3 reasons why your processes in medical technology will become significantly more efficient with the No. 1 in grinding:**

## The world‘s No. 1 for abrasives

Tyrolit is the largest independent manufacturer of grinding and dressing tools and is proven to offer the best solutions in terms of **price/performance** compared to the competition.

## More than 35,000 satisfied customers

Customers confirm an average **30% reduction in process times** with consistent quality of the components produced after switching to Tyrolit sanding tools.

## More than 80,000 products

Tyrolit tools stand for **maximum service life** and **working speed** and are perfectly adapted to our customers‘ processes by experienced application engineers on site.

# 2 Field report

## Case study: 63% reduction in process time when grinding artificial knee joints

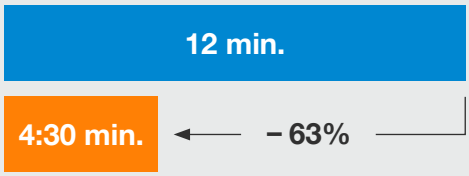
Together with a well-known grinding machine manufacturer, we have succeeded in drastically reducing the grinding times for artificial knee joints made from cobalt-chrome casting. Before optimization, a grinding time of around 12 minutes was required for each joint part. Thanks to the intensive cooperation between Tyrolit's application technology department and the machine manufacturer's experts, a new and fully optimized process was successfully implemented in just a few weeks.

In this case, a GENIS 2 CBN grinding wheel with an aluminum carrier body was used, which is 65% lighter than the steel version and also has better damping properties. In this way, the dynamics of the wheel could be significantly increased. Finally, at a peripheral speed of 95 m/sec and a feed rate of 10 m/min, an excellent grinding result was achieved and the grinding process was shortened to 4:30 minutes.

This corresponds to a reduction of 63 percent. The implemented improvements led directly to significant cost savings and a considerable reduction in unit costs per component.

» **In terms of cost-effectiveness, we support our customers with particularly efficient sanding tools and a drastic reduction in process times. The optimizations made by our application engineers on site result in immediately noticeable added value.**

## Results achieved




**Reduction** of grinding time through joint process optimization with Tyrolit application technology at the customer's site

## Product used


**GENIS 2 CBN grinding wheels** are high-performance tools for professional grinding of orthopaedic implants with outstanding working speed

# 3 The market for orthopaedic implants

Grinding and polishing tools for the manufacture of orthopaedic products must meet many requirements, but above all ensure maximum precision in every step of the process. At the same time, the rapid growth of the medical technology sector demands ever more efficient production processes.

### The market for orthopaedic implants is growing by 6,8%[1]

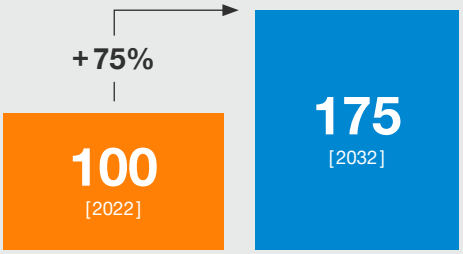
The medical technology sector is booming and has been experiencing continuous growth rates for years. At the same time, the technical requirements for spare parts from outside the body are increasing in terms of material quality, purity, geometric accuracy and surface quality.

According to statistics from the German Medical Technology Association, around 217,000 artificial hip joints, 8,000 shoulder joints and 153,000 knee prostheses are implanted in Germany every year. The most common reasons for orthopaedic operations are to alleviate disc and spinal complaints and to repair accident injuries to the head, shoulders, arms and pelvis. Increasing life expectancy and the growing proportion of obese people, which has more than doubled in industrialized countries in the last 20 years, will also lead to a significant increase in demand for medical technology products in the coming years.

In view of these figures, it is hardly surprising that there is a global demand for implants worth over 100 billion euros per year[3]. This figure will increase noticeably in the future. The market potential in 2032 is estimated at around 175 billion euros. The market leaders in the manufacture of medical implants currently come from the USA, Japan and Germany.

Source: [1] WHO/[2] Statista.de / [3] Medical Device Sectoral Overview

## Facts & Figures[2]

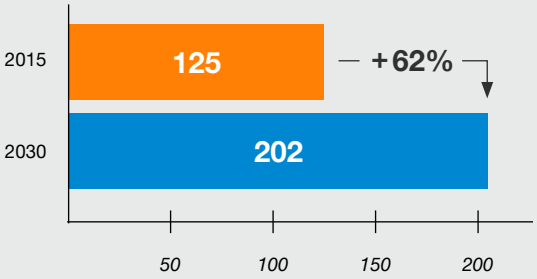


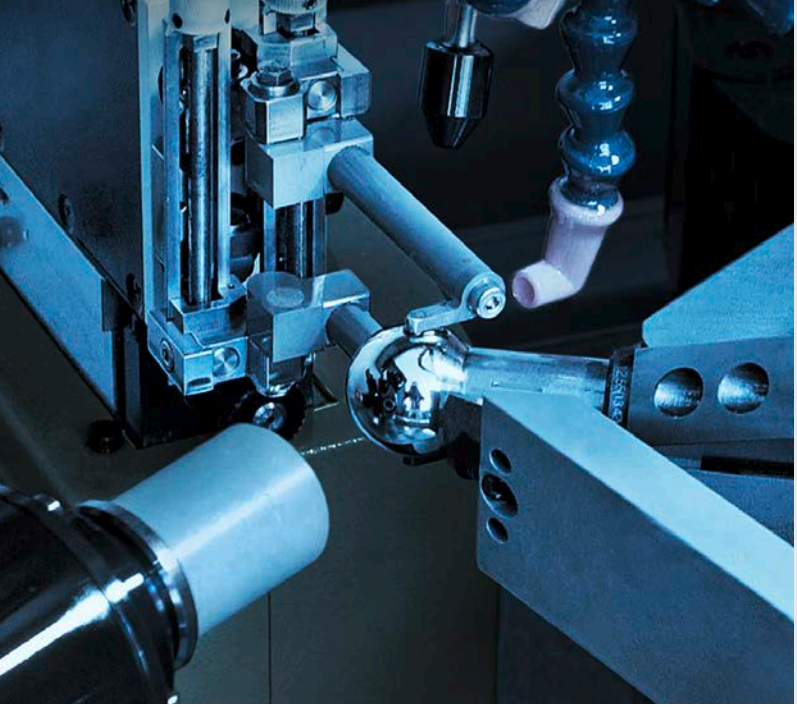

Global market potential for artificial implants [in billion euros]

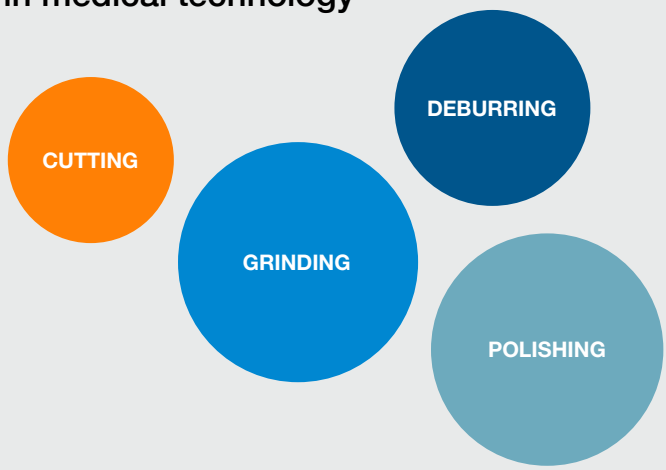
**217.000**

Number of artificial hip joints implanted in Germany in 2023

Number of the world‘s population over 80 years [in millions of inhabitants]








# 4 Challenges & opportunities in the production process

Grinding applications to achieve a perfect surface finish place extremely high demands on the tools used and at the same time offer many opportunities for optimization.

### Increasing competition increases the demands on the production process

Today, orthopaedic implants are predominantly made of ceramic, titanium or cobalt chrome. These materials are well tolerated by the body and can withstand high loads. Diamond is indispensable for processing these materials as the hardest and least wear-resistant abrasive. It has been gaining in importance in recent years, especially for ceramic and titanium processing. CBN - cubic boron nitride - which is considered the second hardest abrasive, is also frequently used in medical technology for machining cobalt chrome. Both abrasives are perfectly suited for applications in medical technology due to their crystallographic structure, their correspondingly high wear resistance and their extremely high cutting edge retention.

When manufacturing implants, the highest precision is required at every stage of production. The best surface qualities minimize friction in the artificial joint. This has the advantage that the patient does not feel the implants and at the same time increases the service life. Artificial hip joints have an average service life of 15 to 20 years. However, if they are well tolerated, implants can easily remain in the body for up to 40 years.

» **The toughness of the abrasive grain is an important criterion for the economical machining of materials made of ceramic, titanium or cobalt chrome. In order to optimize the stock removal rate and the quality of the workpiece surface, the focus is not only on toughness but also on microhardness properties and grit size distribution.**

# 5 Grinding orthopaedic implants correctly

## Innovative grinding tools with cutting-edge technology „Made in Austria“

Tyrolit grinding and polishing tools have proven themselves successfully on the market for years thanks to their high precision and cost-effectiveness. Tyrolit offers tools with diamond and CBN grit qualities specially developed for medical technology. These guarantee excellent performance in every application, which is optimally transferred to the workpiece by specially developed ceramic bonding systems. Customers can choose from a wide range of bonding systems for macro grains (>35µm) and micro grains (<35µm).

By supporting over 1000 customers in the medical technology sector, Tyrolit is able to recognize trends and developments at a very early stage. For some years now, we have seen a strong increase in demand for CBN tools with a ceramic bond. The production advantages are obvious: longer tool life, higher grinding performance and a significant reduction in costs per component. These parameters are measurable for customers and are directly reflected in profitability.

» **An important advantage of Tyrolit‘s ceramic bonding systems is their easy dressability, which ensures a stable geometry of the products to be manufactured.**

The requirements for grit geometries are also increasing overall. Excellent reproducibility of the surface topography is a basic prerequisite for a long service life of the grinding wheel and consistently high grinding results. However, this can only be guaranteed if the coating specification is homogeneous across its entire volume.

Tyrolit is the leading full-range supplier of **high-tech grinding tools for medical technology**. We offer solutions for processing orthopaedic implants:

KNEE JOINTS

HIP JOINTS

TRAUMA IMPLANTS

## The right carrier body as a prerequisite for an economical sanding process

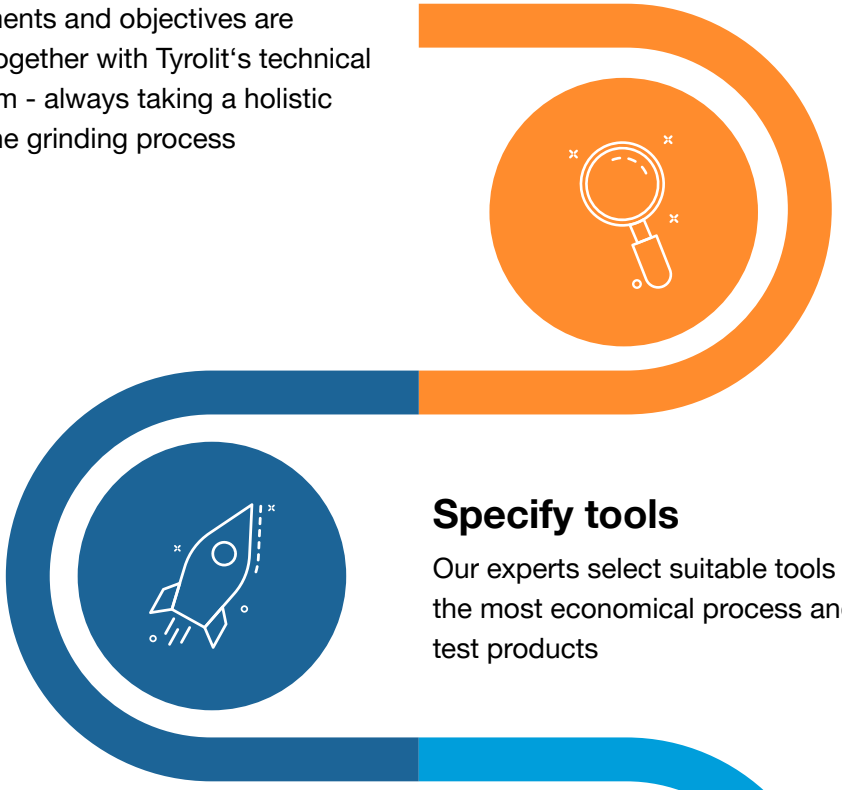
The right combination of abrasive coating and backing body is crucial for optimum sanding results in high-precision work. Tyrolit currently manufactures abrasive tools with backings made of steel, aluminum and carbon fiber. The main advantage of steel backings is their high strength, which leads to tight shape and dimensional tolerances, especially in highspeed applications. Carrier bodies made of aluminum or carbon fiber, on the other hand, have significantly higher damping properties, which significantly improve the surface quality. A further advantage is the reduced overall weight, which makes handling when changing tools on the machine noticeably easier.

# 6 The perfect process in just a few steps

To ensure the best possible solution for applications in medical technology, the experts at Tyrolit draw on the accumulated knowledge from **over 50,000 customer projects**. We look forward to discussing the challenges of your grinding processes with you and developing a solution that will inspire you.

## Define requirements

Requirements and objectives are defined together with Tyrolit‘s technical sales team - always taking a holistic view of the grinding process



## Specify tools

Our experts select suitable tools to create the most economical process and provide test products

## Optimize processes

Application engineers optimize the process at the customer‘s site. As a rule, process costs can be demonstrably reduced by at least 30%[1].

Source: [1] Data on file

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# Our quality promise as the world's No. 1 for abrasives

Maximum efficient grinding processes

Customized high-tech solutions

Support from experts on site

Fast delivery to all countries