

# SURGICAL SUCCESS WITHOUT IMPLANT REMOVAL

**MAGNEZIX® PRODUCTS AND THEIR UNIQUE BENEFITS**



Intelligent innovations for a better life.  
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 **YNTELLIX**

**“THE RESULTS WITH THE MAGNESIUM SCREWS ARE OUTSTANDING AND NEVER FAIL TO IMPRESS ME AND MY PATIENTS EVERY TIME.”**

**DR. MED. CHRISTOPH JASCHKE, WALDKIRCH (GERMANY)**

**“THESE SCREWS ARE SO CONVINCING THAT I NOW USE THEM EXCLUSIVELY. THEY HAVE ESTABLISHED THEMSELVES AS STANDARD IMPLANTS.”**

**DR. MED. HUBERT KLAUSER, BERLIN**

**“IN OVER TWO AND A HALF YEARS, THERE WAS NOT A SINGLE IMPLANT-RELATED COMPLICATION, NO CORRECTION, NO DEEP-LYING INFECTIONS OR OTHER POST-OPERATIVE PROBLEMS.”**

**DR. TIMO JUUTILAINEN, PEIJAS (FINLAND)**

**“THESE IMPLANTS ARE A REAL BREAKTHROUGH.”**

**DR. GOWREESON THEVENDRAN, SINGAPORE**



# REVOLUTIONARY IMPLANTS FOR MODERN SURGERY

The new standard for implants: MAGNEZIX® combines the respective beneficial properties of non-degradable and resorbable implants without compromises. MAGNEZIX® implants are metallically stable and several times more resilient than conventional polymer implants made of PGA or PLA. Unlike conventional metal screws or wires, they do not need to be removed because they dissolve and are replaced by the body's own tissue. **As a result, they set completely new standards in surgery!**

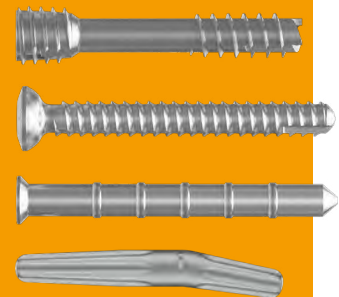
The MAGNEZIX® portfolio, with the successfully tried-and-tested compression screw CS, the versatile cortical screw CBS, the unrivalled Pin, the StarFuse® (PIP arthrodesis) and the CS<sup>c</sup> 4.8, offers the appropriate implant for a wide range of indications in orthopaedics, trauma and sports surgery.

## Advantages at a glance:

- Osteoconductive properties: Magnesium stimulates **bone growth**.
- Metallic and transformable: MAGNEZIX® implants are **metallic and stable**, but are converted (transformed) in the body to endogenous bone tissue.
- Reduced risk of infection: the degradation of magnesium creates a basic (resp. alkaline) **anti-bacterial environment** (infection inhibition). Even more: According to experimental results, the hydrogen released during the degradation process suggests anti-bone cancer properties.<sup>1</sup> In addition, all MAGNEZIX® implants are individually and sterilely packaged (ready-to-use).
- Favourable bone-like mechanical properties<sup>2</sup> **prevent "stress-shielding"** (bone atrophy due to shielding from load).
- Suitable for MRI and CT diagnostics<sup>3</sup>: MAGNEZIX® implants are radiologically visible, MRI-conditional and only generate **minimal artifacts in CT**. Post-operative imaging is significantly improved for surgeons and radiologists.
- Outstanding biocompatibility, no allergies known: MAGNEZIX® has **excellent compatibility** and is free of nickel, cobalt, chromium and aluminum.

## THE IDEAL SOLUTION:

MAGNEZIX® implants are ideal for all the stated indications that require a temporary fixation of the bone, and for which is not desirable that the foreign material remains permanently in the patient's body after the healing process. The complete transformation of MAGNEZIX® implants makes the subsequent metal removal unnecessary. **This reduces costs, time and risks.**



<sup>1</sup> Nan M., Yangmei C., Bangcheng Y. (2014): Magnesium metal – A potential biomaterial with antibone cancer properties. *J Biome Mate Res Part A* 2014; 102A: 2644-2651.

<sup>2</sup> Witte F, Hort N, Vogt C, Cohen S, Kainer KU, Willumeit R, Feyerabend F. (2008): Degradable biomaterials based on magnesium corrosion. *Current Opinion in Solid State and Materials Science* 12, 63-72.

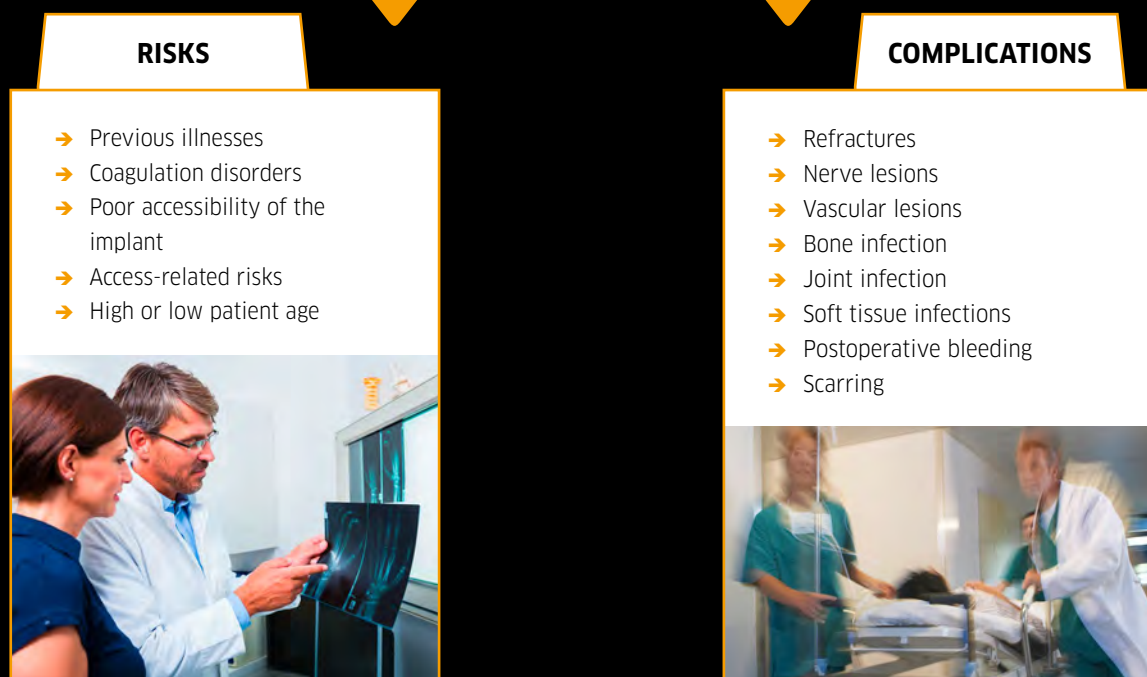
<sup>3</sup> Sonnow L., Könneker S., Vogt P. M. et al. (2017): Biodegradable magnesium Herbert screw – image quality and artifacts with radiography, CT and MRI. *BMC Medical Imaging* 17(1): 16. DOI: 10.1186/s12880-017-0187-7.



# FACTORS INFLUENCING IMPLANT REMOVAL



## IMPLANT REMOVAL



# THE BEST IMPLANT REMOVAL IS THE ONE WHICH IS UNNECESSARY

There are numerous reasons for removing conventional metal implants. These range from causative indications (e.g. implant breakage / migration, infection, allergies), to relative indications (e.g. functional restrictions, irritation of the surrounding tissue, low soft tissue coverage) to patient-side factors (including low patient age, growing skeleton, high activity or explicit removal desire).<sup>4,5</sup>

The most common reasons and motives for **implant removal**<sup>5</sup>:

- Implant failure
- Implant-related (long-term) functional restrictions
- Irritation of joints, tendons, muscles, subcutis and skin
- Primary infections or late infections
- Occurrence of possible allergies
- Occurrence of stress shielding
- Occurrence of stress fractures of the bone
- Troublesome implants at exposed positions in the body
- Increased expectations of patients
- Complicated diagnostic and therapeutic conditions resulting from renewed fracture of the affected bone and/or the implant
- Restrictions on diagnostic measures (CT, MRI)

**The improvement of health and quality of life** through the implant resp. metal removal (MR), however, is often accompanied by an increased **risk and complication potential**, which can be avoided by using MAGNEZIX®:

- Factors such as pre-existing illnesses of the patient (e.g. diabetes mellitus) or coagulation disorders can further increase the risk of implant removal.
- The removal must be considered or planned during insertion of the implant to ensure that access at a later date is as easy as possible. Access-related risks can lead to implant removal problems.
- The risk of implant removal may also be significantly increased by the age of the patient.
- Nerve and vascular lesions may occur.
- Infections of bones and soft tissues as well as wound healing disorders can arise.
- Refracture (at a "predetermined breaking point") may occur.
- Increased scarring with necessary scar corrections is possible.
- Technical complications, such as a worn drive or a broken implant can make removal much more complicated.

COMPLICATIONS	NECESSARY THERAPY	COMPLICATION RATE
REFRACTURES	Osteosynthesis treatment <sup>4,6</sup>	3 - 26 %
INFECTIONS	MR osteosynthesis material <sup>4,7</sup>	11.6 - 37 %
	MR ankle <sup>8</sup>	14.8 %
	MR calcaneus <sup>6</sup>	16.3 %
NERVE DAMAGE	MR osteosynthesis material <sup>4,9</sup>	8 - 29 %
	MR distal radius <sup>9</sup>	12 %
	MR proximal radius <sup>10</sup>	30 %

Significant complications in implant removal

REMOVAL RATE UP TO 81 %<sup>11</sup>

Sources:

<sup>4</sup> Vos D., Hanson B., Verhofstad M. (2012): Implant removal of osteosynthesis: the Dutch practice: Results of a survey. *Journal of Trauma Management & Outcomes*, 6: 6.

<sup>5</sup> Guidelines Commission of the German Society for Traumatology. (DGU). S1 - Guideline 012/004: Implantatentfernung nach Osteosynthese. ICD Z47.0, Stand 2018.

<sup>6</sup> Evers B. (2004): Indication, timing and complications of plate removal after forearm fractures: results of a metaanalysis including 635 cases. *J Bone Joint Surg Br* 2004; 86: 289.

<sup>7</sup> Backes M., Schep N. W., Luitse J. et al. (2015): High Rates of Postoperative Wound Infection Following Elective Implant Removal. *The Open Orthopaedics Journal*, 9: 418-421.

<sup>8</sup> Backes M., Schep N. W., Luitse J. et al. (2013): Indications for implant removal following intraarticular calcaneal fractures and subsequent complications. *Foot Ankle Int* 2013; 34: 1521-1525.

<sup>9</sup> Langkamer V. G., Ackroyd C. E. (1990): Removal of forearm plates. A review of the complications. *J Bone Joint Surg Br* 1990; 72: 601-604.

<sup>10</sup> Maier M., Marzi I. (2013): Frakturen und Folgeschäden. In: Wirth C. J., Mutschler W., Kohn D.: *Praxis der Orthopädie und Unfallchirurgie*, 3. Aufl., 148-167.

<sup>11</sup> Böstman O., Pihlajamäki H. (1996): Routine implant removal after fracture surgery: a potentially reducible consumer of hospital resources in trauma units. *J Trauma*. 1996; 41: 846-9.

# SMALL IMPLANT, BIG BENEFITS – MAGNEZIX® IN PAEDIATRIC SURGERY

It is generally accepted that children and adolescents should have temporary implants removed after healing<sup>12-14</sup>, as foreign material remaining in the growing body can cause numerous complications and problems. In young patients in particular, neither the children nor their parents want to undergo further surgery as well as all the associated burdens and risks such as anesthesia<sup>15</sup> or infection.

MAGNEZIX® implants are ideal for surgeries in paediatric orthopaedics and traumatology for the temporary fixation of fractures without leaving any foreign material in the children's body or having to remove them again surgically – with all the associated risks.

## Possible consequences when osteosynthesis material remains in a child:

- ➔ Negative influences on bone growth
- ➔ Fracture of the osteosynthesis material
- ➔ Functional restrictions
- ➔ Implant relocation
- ➔ Implant-associated infections
- ➔ Stress-related, mechanical weakening of the bone, bone atrophy

**SURGERY  
WITH MAGNEZIX®:**  
fewer risks, less pain,  
less suffering of young  
patients in particular.

## Common time for metal removal with radiologically confirmed stable bone consolidation in children<sup>12-14,16</sup>

LOCALIZATION	IMPLANT	TIME
HUMERUS DISTAL, EPICONDYLAR	Screws	3 months
HUMERUS DISTAL, CONDYLAR	Screws	3-4 months
FEMUR PROXIMAL	Screws	6-12 months
EPIPHYSIOLYSIS	Screws	After closure of the joint
TIBIA PROXIMAL	Screws	3 months
TIBIA DISTAL, UPPER ANKLE	Screws	3 months
PELVIC RING DORSAL	Screws	3-6 months
ACETABULUM	Screws	3 months



<sup>12</sup> Guidelines Commission of the German Society for Traumatology (DGU). S1 - Guideline 012/020: Proximale Femurfrakturen des Kindes. ICD 10: S72.0-, S72.1-, S72.2, Stand 2014.

<sup>13</sup> Guideline of the German Society for Paediatric Surgery. S2k - Guideline 006/126: Intraartikuläre Frakturen des distalen Humerus im Kindesalter, Stand 2015.

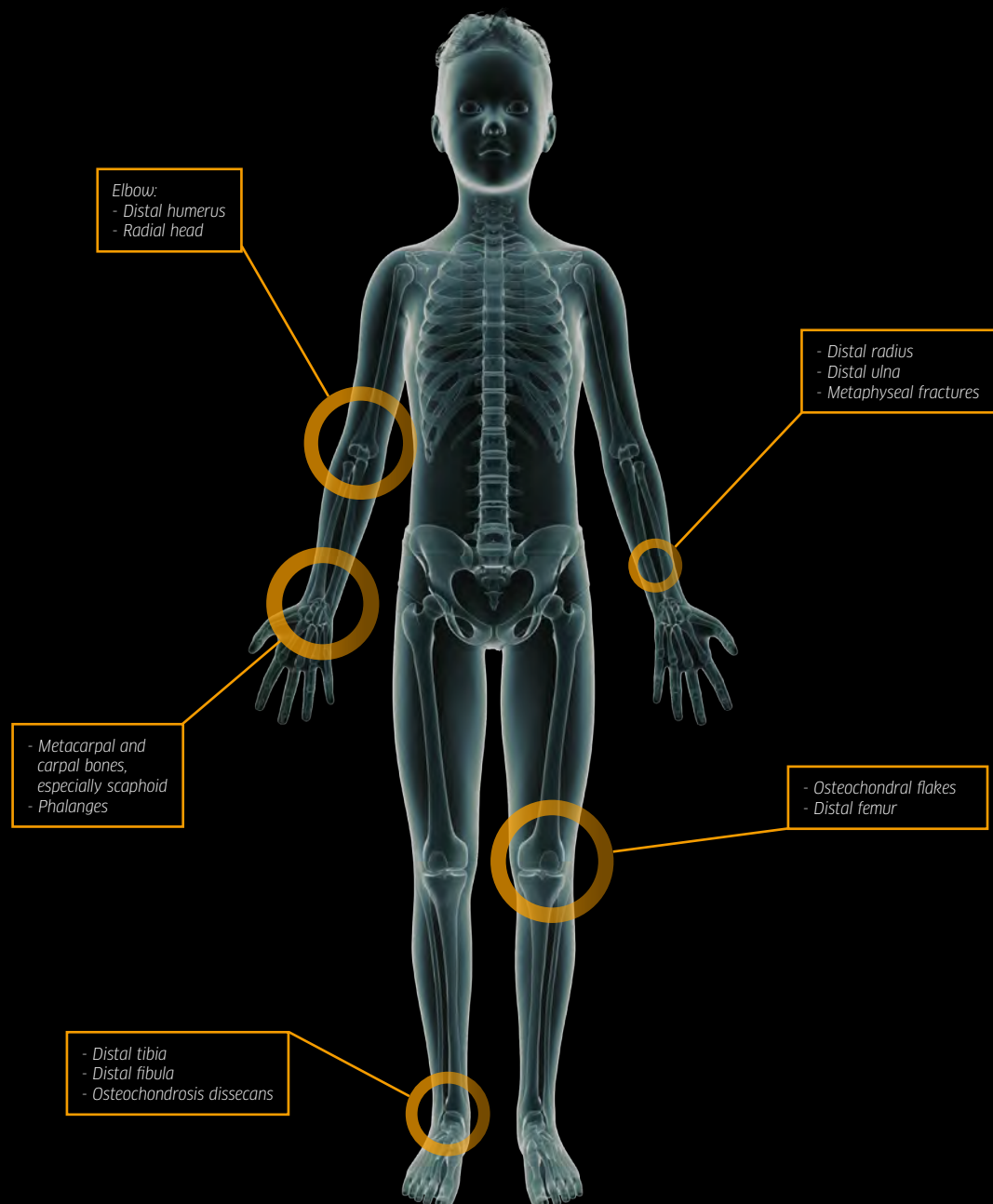
<sup>14</sup> Guidelines Commission of the German Society for Traumatology (DGU). S2k - Guideline 012/026: Frakturen des distalen Unterschenkels im Kindesalter. ICD S-82.88.

<sup>15</sup> Ziegler B. Becke K., Weiss M. (2018): Risikominimierung in der Kinderanästhesie – was sollten wir wissen – was sollten wir tun. Wiener Medizinische Wochenschrift, DOI: 10.1007/s10354-018-0651-1.

<sup>16</sup> Nuber S. (2016): Implantatentfernung beim Kind. In: OP-JOURNAL 2016; 32: 96-104.

## APPLICATION EXAMPLES

MAGNEZIX® implants are suitable for a wide range of indications.



**Ideal application areas for MAGNEZIX® implants** are the stabilization of bone fractures, for example in the area of the radial head or fractures especially in the area of the hand and foot. The MAGNEZIX® Pin is ideal for refixing cartilage scraping fragments or bony torn ligaments on the knee or upper ankle joint.

# BACK TO SPORTS: MAGNEZIX® FOR SPORTS TRAUMATOLOGY

In sports, very frequently accidents occur that lead to bone fractures. Forearm and elbow fractures are among the most common types of fractures in popular and professional sports. Likewise, fatigue fractures (stress fractures) can occur due to constant physiological loading or overloading of the bone. Frequently, middle foot, ankles and shin bones are affected amongst runners and football players.

## Treating sports injuries with MAGNEZIX® implants has many advantages:

- The controlled resorption of MAGNEZIX® makes a second surgery to remove the metal unnecessary, and no foreign material remains in the body.
- The bone-like properties prevent bone atrophy during the immobilisation phase.
- MAGNEZIX® implants stimulate bone growth and are converted into the body's own bone tissue.
- MAGNEZIX® implants provide high levels of stability and are particularly stronger compared to conventional resorbable implants.
- The degradation of magnesium creates an anti-bacterial, infection-inhibiting environment.
- They have a very good biocompatibility and tolerability, and allergies are unknown.

With MAGNEZIX®,  
professional and  
hobby athletes get  
faster fit again!

### Avoid unnecessarily long downtimes!

With MAGNEZIX®, your patients are faster back in sports, at work and in everyday life. By **eliminating the second implant removal surgery**, you save your patients time and a stressful post-treatment. And especially in the case of athletes: costs, training and/or work loss.



### HOW SAFE IS MAGNEZIX®?

MAGNEZIX® implants are class III (resp. class D) medical devices and are therefore subject to the highest safety standards with the strictest quality requirements. The implants we produce are approved by the German Association for Technical Inspection TÜV for use in the **European Economic Area (CE certificate)** – in addition, MAGNEZIX® implants also comply with the high approval standards of the internationally acclaimed approval and health authorities in Australia, Israel and Singapore.

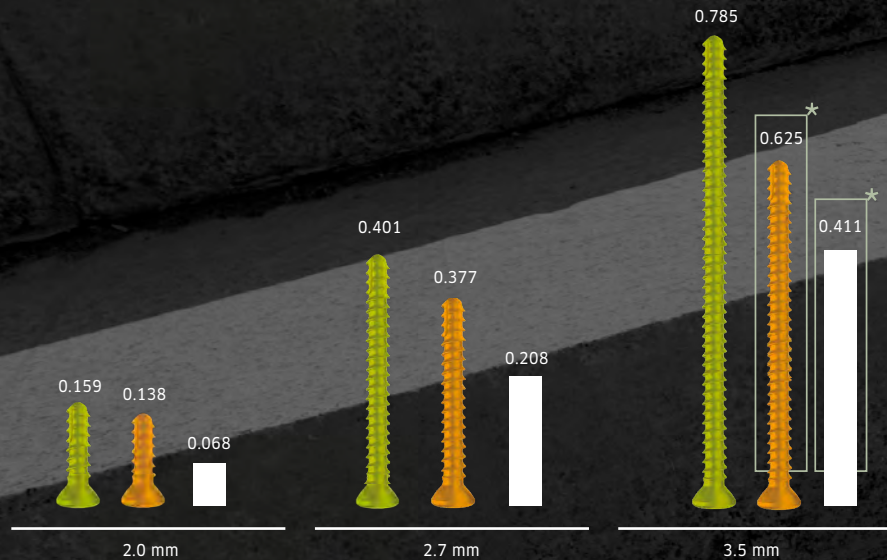
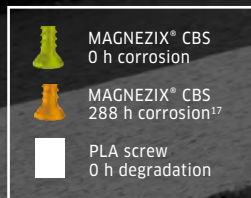
MAGNEZIX® products are approved world-wide in **51 countries (as by August 2018)** and have already been successfully used ten thousands of times. MAGNEZIX® implants are safe and of the highest quality "Made in Germany". All of our products are exclusively designed, developed and produced in Germany!



# EXCEPTIONALLY STRONG AND WITH SUPERIOR STABILITY

MAGNEZIX® screws (CS and CBS) and Pins, also boast convincing reliability: they are easier to use than analogous polymer implants, and have levels of mechanical stability which far exceed the values of earlier bioresorbable materials.

## MAX. TORSION [Nm]: MAGNEZIX® CBS versus PLA cortical screw

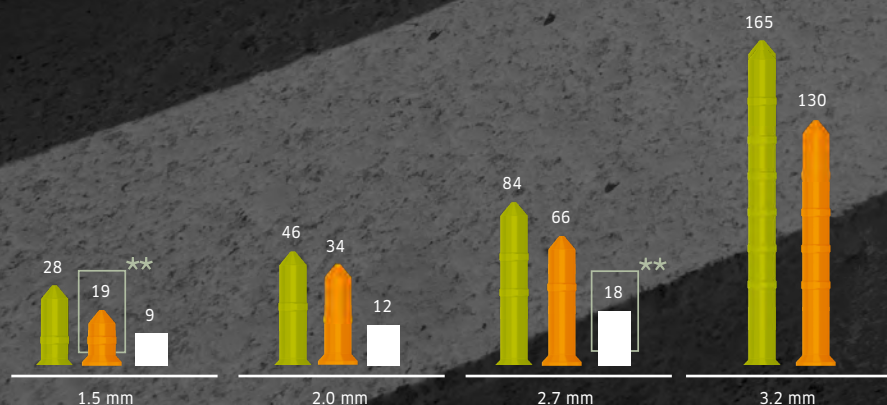
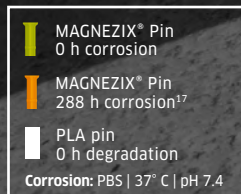


Mechanical testing pursuant to ASTM F 2502/F 543 | Certified testing laboratory | Corrosion medium: PBS at 37° C | Material: Sawbone Grade 40

## TORSION TEST WINNER!

All MAGNEZIX® screws are proven to be significantly stronger and more stable than comparable polymer implants. For instance, even an already corroded MAGNEZIX® CBS achieves higher torsional forces than a non-degraded PLA screw with the same diameter.

## MAXIMUM BENDING [N]: MAGNEZIX® Pin versus PLA pin



Mechanical testing pursuant to ASTM F1264-14 | ASTM F2502-11 | Load rate 5 mm/min

## CONVINCING STABILITY!

Not only initially, but even in a corroded state, the smallest MAGNEZIX® Pin 1.5 is still much more stable than a larger non-degraded PLA pin with a diameter of 2.7 mm.

# SUCCESS IS NOT A COINCIDENCE

## PATIENTS PREFER MAGNEZIX® BECAUSE THE BENEFITS SPEAK FOR THEMSELVES

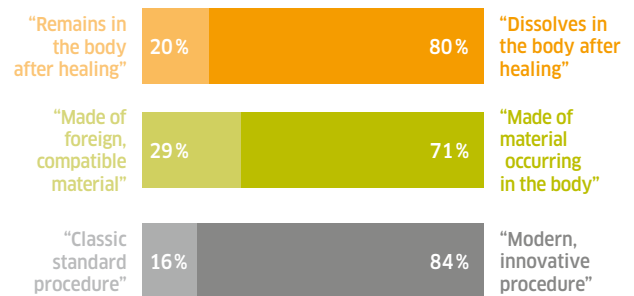
The **innovation** and **technical superiority** of MAGNEZIX® makes the impossible possible, so that a **stable metallic Mg implant** can be **remodeled into bone** in the body.

The associated benefits for all parties involved in the healthcare system, in **particular the patients** makes MAGNEZIX® the **material of choice** for the **implants of tomorrow** – and patients appreciate that, as a survey shows. In a representative health survey of 2000 German citizens:

- ➔ **80%** of participants said that an “implant that dissolves in the body” would be preferable to a conventional one.
- ➔ **Over 70%** of those surveyed would prefer to have implants implanted made of bodynear material (such as magnesium) rather than exogenous material (such as titanium).
- ➔ **More than 80%** of people favour modern, innovative treatment methods (like MAGNEZIX®) instead of proven standard procedures (such as, for example, titanium/steel implants).
- ➔ **75%** of the participants believe that in 10 years' time, medical progress will be manifested in more gentle treatments and more natural materials and substances rather than in the healing of serious diseases such as cancer and MS, or the use of robotics in the field of medicine.

**These results impressively demonstrate the sustainability and relevance of MAGNEZIX® for the benefit of the patient now and in the future.**

Suppose that a bone fracture would require the use of screws for stabilization. Beyond absolute stability and durability: What do you wish for such an implant?



### What will medical progress achieve over the next ten years?

Then, new materials and technologies will enable much gentler medical treatments



More natural active ingredients and materials will be used in medicine



Then, diseases like cancer, multiple sclerosis or Parkinson's will be curable

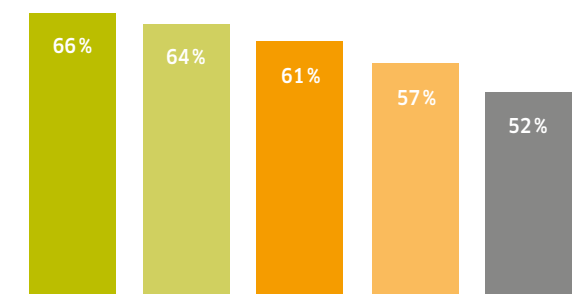


The majority of surgeries will be performed by/with robots



● true ● rather applies ● rather does not apply ● not true

### For surgical treatment of bone and joint injuries: What should be the characteristics of the products and methods used by the doctor?



- Low side effects, no unnecessary stress on the body
- One-time procedure – no follow-up operation
- Stability and resilience
- Proven/sustainable medical effect
- As painless as possible

# OUTSTANDING USER EXPERIENCE

## RECENT STUDIES SHOW IMPRESSIVE RESULTS IN TERMS OF PATIENT'S WELL BEING AND SATISFACTION



Sensational 3-year results<sup>18</sup> – further long-term follow-up examinations with respect to the clinical approval study prove:

- ➔ MAGNEZIX® offers the **same high level of safety and function** as long time tested implants made of titanium (Ti).
- ➔ Bioabsorption is clearly proven: No metal is visible in the MRI after 3 years.
- ➔ **No patient complained about pain** in the MAGNEZIX® comparison group.
- ➔ MAGNEZIX® implants offer **unique advantages** in terms of treatment with less interfered imaging.
- ➔ All MAGNEZIX®-patients were **satisfied** with the surgery and would undergo the operation again and **recommend MAGNEZIX® to others**.



Clinical superiority<sup>19</sup> over titanium – a comparative study of clinical healing results after implantation of 100 MAGNEZIX® versus 100 titanium implants attested:

- ➔ No significant differences in **stability and wound healing** compared to titanium.
- ➔ Huge long-term **cost reduction potential** with MAGNEZIX® implants.
- ➔ No residual foreign material and a no longer necessary metal removal imply a **clinical superiority** of MAGNEZIX® over titanium ("clinically superior").



<sup>18</sup> Plaass C. et al. (2018): Bioabsorbable magnesium versus standard titanium compression screws for fixation of distal metatarsal osteotomies – 3 year results of a randomized clinical trial. *Journal of Orthopaedic Science* 23 (2), pp. 321-327.

<sup>19</sup> Klauser H. (2018): Internal fixation of three-dimensional distal metatarsal I osteotomies in the treatment of hallux valgus deformities using biodegradable magnesium screws in comparison to titanium screws. *Foot and Ankle Surgery*, published online, DOI: 10.1016/j.fas.2018.02.005.



# WIDE RANGE OF APPLICATIONS: MAGNEZIX® PRODUCT OVERVIEW

MAGNEZIX® implants are ideally suited for indications in orthopaedic and sports medicine (acute and elective), where the aim is to fix bones (or bone fragments) without leaving the foreign material permanently in the body, because they are replaced by the body's own bone tissue – a very clear benefit for you and your patients.

## MAGNEZIX® CS

MAGNEZIX® CS implants are metallic and stable (similar to standard systems made of titanium for example). Despite their stability, they do not have to be removed because they are converted within the body and leave behind no foreign materials. The MAGNEZIX® CS compression screw is particularly suitable for orthopaedic surgical indications.



## MAGNEZIX® Pin

MAGNEZIX® Pins boast mechanical stability values which far exceed the levels of earlier resorbable implants. The MAGNEZIX® Pin is unrivaled and used in a particularly large range of applications in sports traumatology.

## MAGNEZIX® CBS

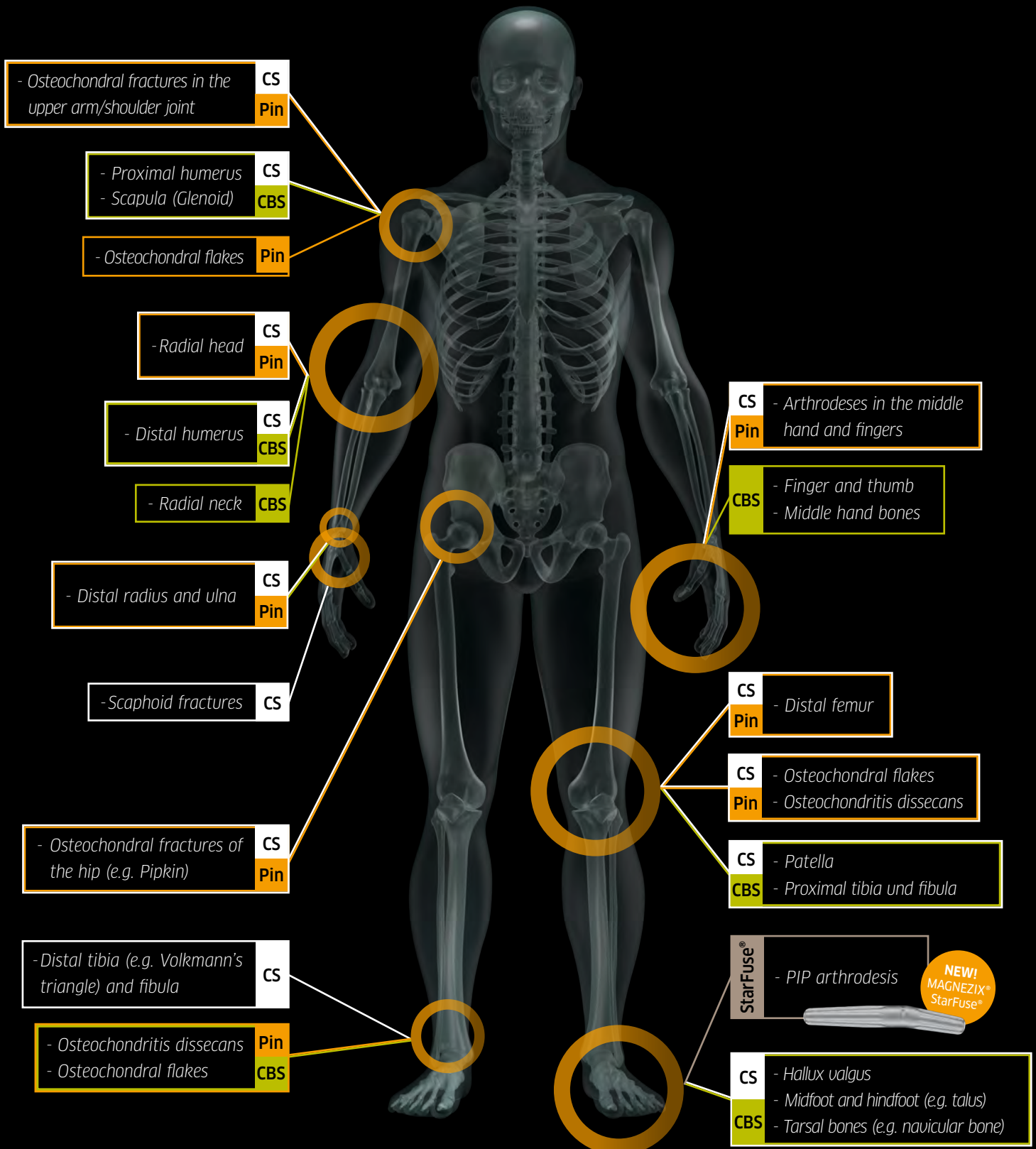
MAGNEZIX® CBS screws are much stronger than conventional PLA cortical screws. Thanks to their geometry, they can be used in a wide range of applications and are particularly suitable for traumatological indications. The MAGNEZIX® CBS is a multi-purpose implant with numerous areas of application, especially in trauma surgery.





# INDICATIONS AND APPLICATION EXAMPLES

The indications for MAGNEZIX® CS, CBS and Pins are reconstructive procedures after fractures and misalignments of the human skeleton. This overview shows examples highlighting which specific MAGNEZIX® products are particularly suitable for a range of indications:



# THE IDEAL SOLUTION: METAL THAT TURNS INTO BONE

MAGNEZIX® implants are metallic and stable - similar to systems made of steel or titanium - and are much more resilient than conventional polymer implants. However, unlike metal screws or wires, they do not have to be removed again - because they degrade, promote healing and are completely replaced by the body's own bone tissue.

## Upper extremity

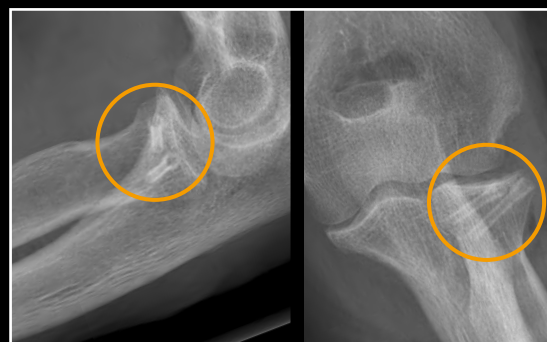


**Reverse Hill Sachs Lesion**  
Fixation with 2 MAGNEZIX® CS 3.2,  
post-op.

Image: PD Dr. Thilo Patzer, Schön Klinik Düsseldorf



**Glenoid defect**  
autologous reconstruction with  
2 MAGNEZIX® CS 2.7, post-op.



**Radial head fracture**  
Fixation with 2 MAGNEZIX® CS 2.7,  
post-op.



**Distal radius fracture**  
Fixation with 2 MAGNEZIX® CS 3.2,  
post-op.



**Scaphoid fracture**  
Fixation with MAGNEZIX® CS 3.2,  
post-op.



**5th metacarpal (boxers's) fracture**  
Fixation with MAGNEZIX® CS 3.2,  
6 weeks post-op.



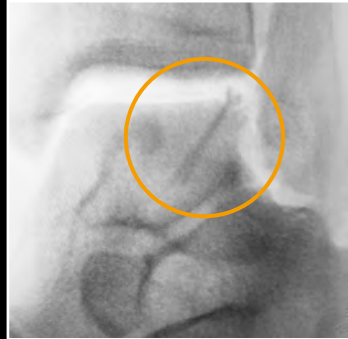
**DIP arthrodesis of distal  
interphalangeal joint**  
Fixation with MAGNEZIX® CS 2.7,  
3 weeks post-op.

**MAGNEZIX®** offers  
**CLEAR ADVANTAGES**  
for doctors and patients in a wide  
range of indications.

## Lower extremity



**Hallux valgus**  
Correction with 2 MAGNEZIX® CS 2.7,  
1 year post-op.



**OD of Talus**  
Fixation with 2 MAGNEZIX® CBS 2.0,  
post-op.



**5th metatarsal fracture**  
Fixation with MAGNEZIX® CS 3.2,  
10 weeks post-op.



**OD of knee joint**  
Fixation with 3 MAGNEZIX® Pins 2.0,  
3 months post-op.



**OD of knee joint**  
Fixation with MAGNEZIX® CBS,  
6 weeks post-op.



**Anterior cruciate ligament and lateral collateral ligament in child**  
Fixation with MAGNEZIX® CBS 3.5 and 2  
MAGNEZIX® Pins 1.5, 4 weeks post-op.



**Lateral malleolar fracture** Weber type A\*  
Fixation with MAGNEZIX® CS 3.2, pre-op until 24 months post-op.

Nowadays, **headless compression screws** are increasingly used in ankle fractures to prevent the negative effect of the commonly used lens head screws with washers and associated soft tissue irritation. This **modern, patient-friendly procedure** is additionally supported by the self-dissolving MAGNEZIX® CS Compression Screws made of magnesium.

**FIRST HEAL,  
THEN DISSOLVE!**  
The MAGNEZIX® principle  
means there is no need for  
a second operation to  
remove metal.

\* Photo source: These figures are recreated from the published paper titled "Acar B, Unal M, Turan A, Kose O. Isolated Lateral Malleolar Fracture Treated with a Bioabsorbable Magnesium Compression Screw. Cureus 2018 Apr 26; 10(4):e2539. doi: 10.7759/cureus.2539" with the permission of senior author.

# THE MATERIAL MAGNEZIX®

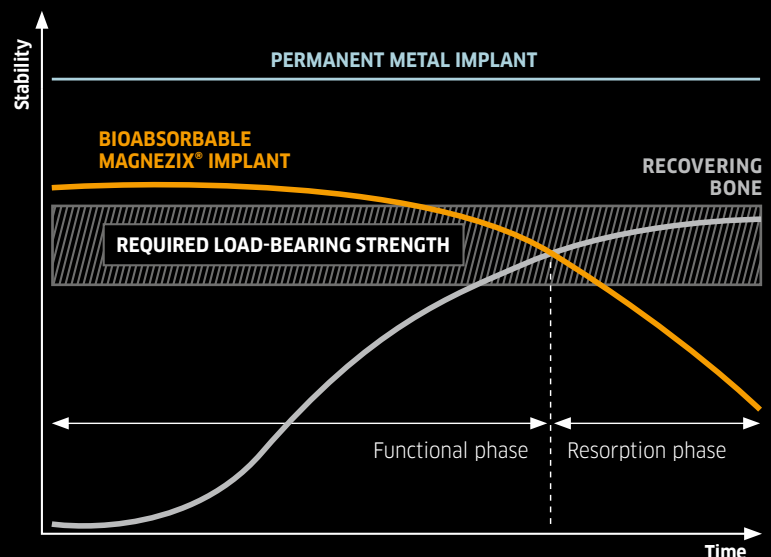
MAGNEZIX® is a **magnesium-based alloy (over 90 % Mg mass fraction)**, which although having metallic properties, is still completely converted in the body and replaced by the body's own tissue. The biomechanical properties of MAGNEZIX® are very similar to those of human bone.

Studies have verified that **magnesium alloys have osteoconductive properties**.<sup>20,21</sup> In addition, the degradation of magnesium creates an anti-bacterial alkaline environment in the immediate implant environment.<sup>22</sup> Therefore, MAGNEZIX® (consisting of more than 90 % magnesium) is expected to have **infection-inhibiting properties**. In addition, during magnesium degradation hydrogen is released which can scavenge free radicals in bone cancer cells, according to experimental results.<sup>23</sup> Furthermore, MAGNEZIX® implants are both radiologically visible and, unlike conventional screws made of steel or titanium, create only minimal artefacts.

## Controlled degradation process (schematic)

The MAGNEZIX® principle: First heal - then dissolve

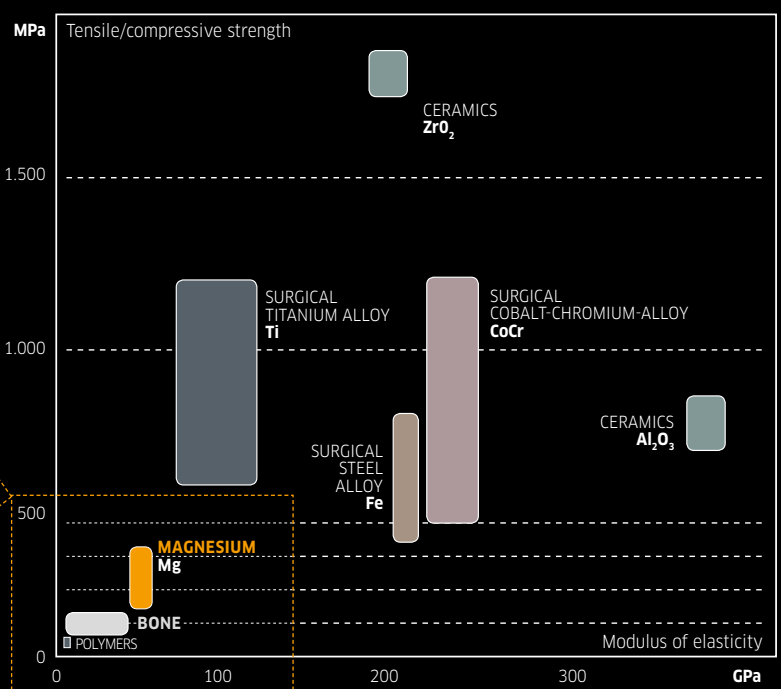
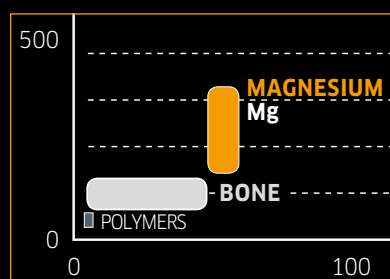
MAGNEZIX® is based on a magnesium alloy with metal-like properties (high stability). Over the course of time it is **completely degraded** in the body and is replaced by the body's own bone tissue.



## Bone-like properties

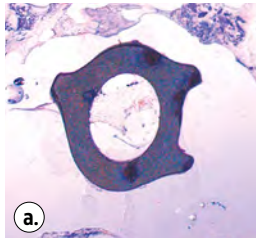
Stability alone is not enough - the ideal implant can do more.

MAGNEZIX® has mechanical stability values which are far above the values of those bioresorbable materials previously available. The favorable stress-strain ratio (modulus of elasticity) is very close to that of human bone.

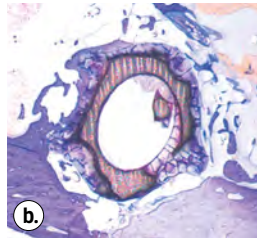




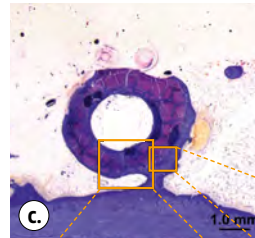
## Metal turns into bone



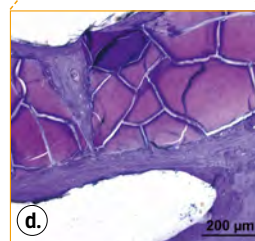
**Figure a:**  
Histological preparation of an implanted MAGNEZIX® CS after a few days.



**Figure b:**  
Incipient conversion of MAGNEZIX® CS after a few months.



**Figure c:**  
Histological analysis of an animal study shows a remodeling of the metal implant 12 months after implantation.



**Figure d:**  
Bone regeneration (osteoid) on the surface of the degraded implant has been histologically verified.



**Figure e:**  
The presence of osteoclasts and osteoblasts is typical for the bone conversion process.



**Hallux valgus correction**  
with 2 MAGNEZIX® CS 2.7,  
6 weeks post-op.



**Hallux valgus correction**  
with 2 MAGNEZIX® CS 2.7,  
1 year post-op.



Titanium implant 1 year post-op.

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# THE IMPLANTS

CS	DIMENSIONS	LENGTHS	Pin	DIMENSIONS	LENGTHS
<b>MAGNEZIX® CS 2.0</b> 	<b>Diameter</b> 2.0 mm <b>Head diameter</b> 2.5 mm	8 to 24 mm (in steps of 2 mm), not cannulated	<b>MAGNEZIX® Pin 1.5</b> 	<b>Diameter</b> 1.5 mm <b>Head diameter</b> 2.5 mm	8 to 30 mm (in steps of 2 mm)
<b>MAGNEZIX® CS 2.7</b> 	<b>Diameter</b> 2.7 mm <b>Head diameter</b> 3.5 mm <b>Guide wire</b> 1.0 mm	10 to 34 mm (in steps of 2 mm), cannulated	<b>MAGNEZIX® Pin 2.0</b> 	<b>Diameter</b> 2.0 mm <b>Head diameter</b> 3.0 mm	8 to 40 mm (in steps of 2 mm)
<b>MAGNEZIX® CS 3.2</b> 	<b>Diameter</b> 3.2 mm <b>Head diameter</b> 4.0 mm <b>Guide wire</b> 1.2 mm	10 to 40 mm (in steps of 2 mm), cannulated	<b>MAGNEZIX® Pin 2.7</b> 	<b>Diameter</b> 2.7 mm <b>Head diameter</b> 4.0 mm	12 to 50 mm (in steps of 2 mm)
<b>MAGNEZIX® CS 4.8</b> 	<b>Diameter</b> 4.8 mm <b>Head diameter</b> 5.7 mm <b>Guide wire</b> 1.7 mm	14 to 50 mm (in steps of 2 mm), 55 bis 70 mm (in steps of 5 mm), cannulated	<b>MAGNEZIX® Pin 3.2</b> 	<b>Diameter</b> 3.2 mm <b>Head diameter</b> 5.0 mm	12 to 50 mm (in steps of 2 mm)

CBS	DIMENSIONS	LENGTHS	StarFuse®	DIMENSIONS	ANGLE
<b>MAGNEZIX® CBS 2.0</b> 	<b>Diameter</b> 2.0 mm <b>Head diameter</b> 4.0 mm	6 to 20 mm (in steps of 2 mm)	<b>MAGNEZIX® StarFuse® Short</b> 	<b>Proximal length</b> 12 mm <b>Distal length</b> 6 mm	0° and 10°
<b>MAGNEZIX® CBS 2.7</b> 	<b>Diameter</b> 2.7 mm <b>Head diameter</b> 5.0 mm	6 to 30 mm (in steps of 2 mm)	<b>MAGNEZIX® StarFuse® Medium</b> 	<b>Proximal length</b> 12 mm <b>Distal length</b> 7 mm	0° and 10°
<b>MAGNEZIX® CBS 3.5</b> 	<b>Diameter</b> 3.5 mm <b>Head diameter</b> 6.0 mm	8 to 40 mm (in steps of 2 mm)	<b>MAGNEZIX® StarFuse® Long</b> 	<b>Proximal length</b> 12 mm <b>Distal length</b> 8 mm	0° and 10°



MAGNEZIX® [ma'gneziiks] implants are the world's first bioabsorbable metal implants with CE approval, and therefore satisfy the highest safety standards. The CE approval for MAGNEZIX® CS compression screws was issued in 2013, and made it possible to clinically use a self-dissolving metal screw in Europe for the first time. The launch of the Pins and the CBS cortical screws expanded the CE-certified MAGNEZIX® product portfolio in 2016 and 2017. The latest development is the PIP arthrodesis implant MAGNEZIX® StarFuse® (2018).

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