Bringing together proven technologies.
The power to meet individual patient needs.

Zimmer® Continuum™ Acetabular System provides highly flexible solutions for orthopaedic surgeons who treat a wide range of patients. The system combines the proven biologic fixation\(^1,2\) of Trabecular Metal™ technology with Zimmer advanced bearing options. With one comprehensive system, surgeons have the ability to address variations of anatomy and bone quality and choose the bearing technology that best meets the needs of each patient.

\(^1\) BIOLOX is a registered trademark of CeramTec AG Corporation
Highly porous *Trabecular Metal* Material with over 10+ years of clinical history

- Initial stability\(^3\)
- Long-term biologic fixation\(^4,5\)
- Proven history\(^1,2,6-11\)

**Power to choose advanced bearing technologies to match patient demands**

*Longevity*® Highly Crosslinked Polyethylene is highly resistant to wear\(^12\) and aging\(^13-21\) with over ten years of clinical history.\(^22\)

*Metasul*® Metal-on-Metal Material has a very low wear rate\(^23\) with over twenty years of clinical history.\(^24-31\)

*BIOLOX*® *delta* Ceramic\(^*\) affords a very low wear rate in a material with improved mechanical properties compared to traditional ceramics.\(^32\)
Trabecular Metal Technology

For the orthopaedic surgeon who desires a proven\textsuperscript{1,2,6-11} advanced fixation material, Trabecular Metal Technology provides optimized mechanical and physical properties to address the need for initial stability and long term biologic fixation.

**Initial Stability**

\textbf{.98 Coefficient of friction}\textsuperscript{*}

Trabecular Metal Technology offers a high coefficient of friction and scratch fit.
- Helps reduce or eliminate the need for supplemental screws or grafts
- Reduces micromotion, enabling tissue ingrowth

\textsuperscript{*} For non-machined surfaces such as the Trabecular Metal Modular Shell and Continuum Shell

**Long Term Fixation**

\textbf{80\% Porosity}\textsuperscript{4,5}

Trabecular Metal Technology 3D construct provides a high level of porosity and potential for osteoconductivity.
- Allows for more rapid bone and soft tissue ingrowth
- Supports a vascularized structure to maintain healthy bone
Extensive Clinical History

10+ years\textsuperscript{1,2,6-11}

- More than 10+ years of clinical history, with over 75 peer-reviewed journal publications.
- More than 750,000 Trabecular Metal Components have been implanted worldwide since 1997\textsuperscript{12}
**Longevity Highly Crosslinked Polyethylene**

*Longevity* Highly Crosslinked Polyethylene offers the orthopaedic surgeon a highly advanced polyethylene choice in bearing surfaces. *Longevity* Polyethylene provides a proven low wear bearing surface which is resistant to aging.\(^{13-21}\)

**Highly reduced wear**

*89% over standard Polyethylene*\(^{10}\)

Proprietary electron beam process delivers 10Mrad dosage for greater crosslinking, resulting in superior long-term polyethylene wear performance.

**Relationship Between Wear Resistance and Level of Crosslinking\(^{23,24}\)**

**Highly resistant to aging**

*Over 10X fewer free radicals*\(^{13,16,33}\)

In contrast to warm-annealing, which leaves residual free radicals, melt-annealing virtually eliminates free radicals and results in long-term mechanical strength.

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*Zimmer scientists have determined that for crosslinked polyethylene in the hip, the optimal irradiation dose without compromising mechanical strength is in the range of 9.5 to 10.0Mrad.\(^{24,25}\)*
Works as Predicted

10+ years of clinical experience. More than 1 million Zimmer Highly Crosslinked Polyethylene Liners have been implanted worldwide.

Free Radical Concentration (spins/gram)

- Conventional GUR 1050 Polyethylene*
- Crossfire Polyethylene*
- X3 Acetabular Liner*
- Stryker X3** Reported Value
- Longitude Polyethylene*

* MGH Data
**X3 Brochure, The Power of Technology, Stryker, 2006
Note: Competitor trademarks are trademarks of their respective owners.
With successful clinical history dating back to 1988, *Metasul* Metal-on-Metal Technology offers a bearing surface with very low wear\textsuperscript{35,36} for multiple femoral head diameters. It offers the potential to improve stability and function of total hip arthroplasty.

### Stability and Function

- Metal-on-metal liners allow for a larger head size versus a polyethylene liner
- A larger head increases jump height and reduces the risk for dislocation
- A larger head size allows for greater range of motion before impingment and its associated risks for dislocation\textsuperscript{44,45}

### Extensive Clinical History

- 20+ years of published clinical history\textsuperscript{24-31}
- Launched in 1988, with over 460,000 implantations worldwide\textsuperscript{12}
- More than 50 independent publications have discussed the performance of *Metasul* Technology bearings
Lower wear characteristics

- *Metasul* wrought forged surface roughness is greatly reduced, which leads to a lower rate of wear in comparison to cast chromium-cobalt alloys\(^{37,43}\).

- Optimized clearance provides enhanced lubrication and minimized wear\(^{35,36}\).

**Internal Zimmer Analysis\(^2\)**

This information demonstrates the differences between cast and wrought alloys.

**Roughness of Cast Alloy**

<table>
<thead>
<tr>
<th>µm</th>
<th>R(_a) (µm) 0.017 ± 0.002</th>
</tr>
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<tbody>
<tr>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>−0.05</td>
<td>0.08</td>
</tr>
<tr>
<td>0.16</td>
<td>0.24</td>
</tr>
<tr>
<td>0.32</td>
<td>0.40</td>
</tr>
</tbody>
</table>

**Roughness of Wrought Alloy (Metasul material)**

<table>
<thead>
<tr>
<th>µm</th>
<th>R(_a) (µm) Max = 0.006</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>0.05</td>
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<tr>
<td>−0.05</td>
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<td>0.16</td>
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<td>0.32</td>
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Profilometry charts demonstrate lower surface roughness of *Metasul* Wrought Alloys.

A wrought high-carbon alloy with a carbide size up to forty times smaller than cast CoCr alloys leads to a lower surface roughness.
BIOLOX delta Ceramic Technology

*BIOLOX delta* Ceramic offers very low wear, high fracture resistance, and excellent biocompatibility.\textsuperscript{8-28} It is a high-performance material that meets the increased patient demands and outperforms earlier versions of ceramic materials.\textsuperscript{46}

**Very Low wear**

- Increased hardness offers resistance to scratching and subsequent wear
- Better wetting characteristics offer enhanced lubrication and lower wear\textsuperscript{47}

*Wetability contributes to lower wear.*
High fracture resistance

- Optimum composite balance combines hardness with increased bending strength$^{13,40}$

Zirconia Particles in Alumina Matrix

1 – Alumina grain
2 – Zirconia grain
Crack stopped by Zirconia grain

Small Zirconia particles distributed throughout Alumina particles help toughen the material.

Platelet-like Crystals in Alumina Matrix

1 – Alumina grain
2 – Zirconia grain
3 – Platelet-like crystal
Crack stopped by crystal

Platelet-like crystals reinforce the Alumina matrix.
References:


5. Barbella M. Materials marvels: titanium is a top choice for implants, but other materials are gaining popularity. Orthopaedic Design & Technology. September 1, 2008


12. Data on file at Zimmer


18. Kanholm, Digas G, J, Thanner J, Herberts P. Five to seven years experiences of highly crosslinked PE. SICOT Hong Kong, August 2008


46. CeramTec AG, internal data on file

Contact your Zimmer representative or visit us at www.zimmer.com