HIGH PERFORMANCE STEELS
MEDICAL INDUSTRY SOLUTIONS
Uddeholm produce and deliver tool steel to more than 100,000 customers in over 100 countries. As the world-leading supplier of tool steel we are continually investing in innovation.

Modern tool steels are increasingly complicated to machine by a cutting tool. Costs related to machining are often the major part of the total production cost for a tool. Working with Uddeholm reduces lead-time and increases productivity.

We offer a broad range of flexible customer-adapted machining solutions designed to reduce your consumption of resources whether it is time, money or skilled people in production and planning.

Our machining services extend the possibilities for increased value by offering a range of solutions from black steel to finished components. We also offer machining recommendations for all our steel grades.

Steel is one of the most essential construction materials in the world today. As part of our business, we aim to achieve a sustainable society and are convinced that technical innovations will play a major role in this goal. Our experience, know-how and values will be key in the continued development. The great challenge for Uddeholm is to make sure that the company’s profitability is the result of striking a long-term balance between social, environmental and financial interests.

We want to make a difference. Together, our network of experts around the world strive constantly to create solutions that are sustainable, safe and long-lasting – for ourselves and our customers.

Steel APPS

The Uddeholm Machining App contains information and recommendations on how you can use Uddeholm steel for different types of tools. Choose a steel, and the type of tool you are using, and you will get recommendations on which settings you should use for best results. You can save your calculations together with images so you can easily re-use them, or send them directly to Uddeholm or a colleague.

Download the free Uddeholm Machining Guideline & Uddeholm Steel book today. Visit www.uddeholm.co.uk for the link.

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Medical forgings are typically formed from material grades such as Cobalt-Chrome, Stainless Steels and Titanium alloys due to the benefits they offer.

Beneficial though these properties may be in offering medical implants and other components they can present issues in production.

Forging dies often measure tool outputs in double digit figures before re-cutting.

Uddeholm high performance tool steels can increase tool life in these high demand applications and solve serious failure issues such as gross cracking by offering superior toughness.

Polymer technology has advanced to a stage where conventional tool steels struggle to cope with increased demands placed on the tooling by advanced polymers. Increased wear and high temperature injection and curing can lead to a reduction in tool life. Corrosive gasses produced as a by product of production can also seriously damage the tool steel leading to premature failure.

Thermal hot spots can present a serious issue for high volume production, slowing down parts produced. When cycle times are measured in seconds every single one counts. Uddeholm Coolmould® offers superior thermal conductivity when conventional cooling isn’t good enough. Additive manufacture can offer further significant reductions in cycle time and can be used as an alternative when Coolmould® is not appropriate.

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>Impax Supreme</th>
<th>Norax ESR</th>
<th>Corrax</th>
<th>Orvar Supreme</th>
<th>Stavax ESR</th>
<th>Mirax ESR</th>
<th>Tyrax ESR</th>
<th>Elmax SuperClean</th>
<th>Vanax SuperClean</th>
<th>Viper SuperClean</th>
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<tbody>
<tr>
<td>Normal hardness HRC (HB)</td>
<td>(~310)</td>
<td>(380)</td>
<td>46</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>57</td>
<td>58</td>
<td>60</td>
<td></td>
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<tr>
<td>Wear resistance</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td></td>
<td></td>
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<tr>
<td>Toughness</td>
<td>9</td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td></td>
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<tr>
<td>Compressive strength</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Corrosion resistance</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Machinability**</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>4</td>
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<tr>
<td>Polishability</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>10</td>
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<td>8</td>
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<tr>
<td>Weldability</td>
<td>6</td>
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<td>6</td>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Nitriding ability</td>
<td>6</td>
<td>5</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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</tr>
<tr>
<td>Etchability</td>
<td>8</td>
<td>9</td>
<td>8*</td>
<td>9</td>
<td>8*</td>
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<td>8*</td>
<td>8*</td>
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<td></td>
</tr>
</tbody>
</table>

*The longer the bar, the better.*

**Machinability**
High volume production requires consistency and reliability. Minutes of downtime can result in major cost implications to production lines.

When the stakes are so high Powder Metallurgy grades are the best option. Our 3rd generation Superclean PM steels offer superior resistance to wear, chipping and plastic deformation compared to conventional standard grades used in this application such as D2 and A2.

At Uddeholm, we pride ourselves on the quality of our steel and the subsequent benefits this offers to our customers. Responding to evolving market demand through close contact with our customer base, we are developing new steel grades and fine-tuning existing grades to provide solutions, which can deliver optimum results.

Increasing tool life, decreasing maintenance periods and removing post processing such as coatings can deliver significant savings to our customers.

The automation of process within the medical sector can present a multitude of challenges.

Productivity is key in high volume production. Reliable steel selection can ensure downtime; maintenance and related costs are kept to a minimum.

Guide rails, location pins and loading components can often be overlooked as sacrificial elements, this doesn’t need to be the case.

Speak to your Uddeholm technical expert about your process and they will assess any potential improvements in steel selection. We see a plethora of wide ranging and ingenious solutions every day and can help improve your process, reducing downtime and saving you money.

Improved machinability, increased stability in heat treatment and providing a good substrate for coatings can all offer reduced total tooling costs and improved productivity.

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The longer the bar, the better the resistance. The Vancron and Vanadis steels mentioned in the table are Uddeholm PM SuperClean tool steels.
STRIP STEEL FOR MEDICAL BLADES

The medical industry needs cold rolled steel that meets the high demands in this sector. We have a range of stainless steel grades suitable for the specific requirements needed.

UHB SS716 is a multipurpose stainless grade with outstanding mechanical properties. It is characterised by its superior fatigue properties, toughness and impact strength. The UHB SS716 can work in high temperatures and corrosive environments.

UHB AEB-L is the right choice for edge sharpness, wear resistance and with good corrosion resistance. The combination of 0.67% Carbon together 13% Chromium gives a stainless grade that is optimal for all cutting applications.

UHB SS31 is an alternative to UHB SS716 and is often used in thinner applications.

RAZOR
SIZE RANGE
Thickness: 0.075mm - 0.10mm
Width: 3mm - 25mm

SCALPEL
SIZE RANGE
Thickness: 0.20mm - 0.70mm
Width: 5mm - 60mm

STEEL GRADES
(Nominal composition in weight %)

HIGH CARBON STEEL UHB 26CS

<table>
<thead>
<tr>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>P max</th>
<th>S max</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25</td>
<td>0.25</td>
<td>0.40</td>
<td>0.020</td>
<td>0.011</td>
<td>0.30</td>
</tr>
</tbody>
</table>

MARTENSITIC STAINLESS STEEL UHB AEB-L

<table>
<thead>
<tr>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>P max</th>
<th>S max</th>
<th>Cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.67</td>
<td>0.40</td>
<td>0.60</td>
<td>0.025</td>
<td>0.015</td>
<td>13.0</td>
</tr>
</tbody>
</table>

DELIVERY CONDITIONS
Our standard packing specification gives superb product protection. Customized options are offered on request.

- Both razor and scalpel strips are delivered unhardened.
- Slit to narrow dimensions with deburred or rounded edges.
- Delivered in Pancake coils or Traverse wound coils (for thin & narrow razor sizes).
- Packed in wooden boxes with a centre support.
- Enclosed in an anti-corrosion system.

ADDITIVE MANUFACTURING
UNLOCKING DESIGN POTENTIAL

Sometimes the design of a component cannot change to facilitate tool design issues. The intricate nature of many medical components can lead to issues with hot spots in tools which cannot be easily dealt with.

Additive manufacture opens up a world of possibilities which were previously not possible using conventional methods.

High thermal coefficient materials can often be banned for medical use. Corrax AM is our solution, offering medical grade stainless steel which can be hardened to 52HRC ensuring the highest possible wear resistance with no limitations to the design.

Not only are we leading the charge with cutting edge material developments for additive manufacture, we can also offer our customers design consultation all over the world using our AMC’s or Additive Manufacturing Centres.

Moldflow, topology and 3D scanning of existing parts is all part of the consulting package we can offer our customers.

Responding to customer demands we can develop steels for industry applications and our R&D team are working right now on a solution for your future.
Our specialist laboratory facility located at our UK Head Office and warehouse facility in Oldbury, enables the rapid testing of samples to your specifications. For example, chemical analysis, tensile, charpy, and micro examination can all be done onsite. Ferritiscope testing of materials as well as Positive Material Identification (PMI) for all grades is also available.

First stage machining can be an expensive and time-consuming task, absorbing the resources of skilled machinists on basic operations. Uddeholm offer a complete and comprehensive selection of products in a variety of pre-machined finishes from simple milled faces to precision ground pieces.

Our breadth of capabilities allows us to handle a wide dimensional range. We are able to offer three standard options or, if required pieces can be machined to your bespoke requirements with the option to include heat treatment and surface coatings.

As pressures to reduce costs continue to increase, our state of the art machines can produce parts in a fraction of the time it would take via conventional machining, saving time, resources and money.

Steel cleanliness is critical to ensure maximum material performance and consistency in high performance and cyclic applications. Through automation and experience we can guarantee that every batch of production meets the same high level of mechanical standards.

Optical polish, high impact strength and superior machinability can all be achieved by following Uddeholm’s ESR production process, to enhance the cleanliness of the steel. If you are looking to improve the performance of your conventionally produced steels this is a good place to start.

 Powder Metallurgy grades can further improve mechanical properties particularly in high wear applications. By reducing the carbide size and segregations within the material, powder metallurgy grades can vastly increase tool life when compared to Conventional and ESR grades.

During our production process, we forge and roll the steel to our tight specification to enable us to break down the naturally formed carbide networks, thus reducing the inherent stress raisers. Heat treatment stabilises and prepares the steel for further treatments as per customer specifications, hardening and PVD coating for example.

### SERVICE LEVEL

<table>
<thead>
<tr>
<th>SERVICE LEVEL</th>
<th>HEIGHT</th>
<th>WIDTH</th>
<th>LENGTH</th>
<th>EDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>rough milled 10mm – 600mm -0.00 / + 0.25mm</td>
<td>sawn 20mm – 1000mm</td>
<td>sawn 20mm – 2000mm</td>
<td>deburred/chamfering *</td>
</tr>
<tr>
<td>Fine</td>
<td>fine milled 10mm x 600mm -0.0mm / + 0.1mm</td>
<td>fine milled 10mm x 1000mm -0.0mm / + 0.1mm</td>
<td>fine milled 20mm - 830mm -0.0mm / + 0.1mm</td>
<td>deburred/chamfering *</td>
</tr>
<tr>
<td>Precision</td>
<td>precision ground 10mm – 400mm -0.0mm / + 0.05mm</td>
<td>fine milled 20mm – 830mm -0.0mm / + 0.1mm</td>
<td>fine milled 20mm - 830mm -0.0mm / + 0.1mm</td>
<td>deburred/chamfering *</td>
</tr>
<tr>
<td>Unique</td>
<td>Bespoke service designed for your application</td>
<td></td>
<td></td>
<td>deburred/chamfering *</td>
</tr>
</tbody>
</table>

* chamfering available on request

Value Added Services give our customers access to cutting, machining, bevelling, testing, surface coating, heat treatment and other solutions to fit with their individual needs.
#1 IN HIGH PERFORMANCE TOOL STEEL