

# MEDICAL INDUSTRY ADVANCED TOOLING SOLUTIONS

Uddeholm is the world's leading provider of tool steel, with business and operations in over 90 countries. Since the beginning, our promise and foundational business idea is to deliver a tool and die solution that enhances competitiveness and creates added value for our customers.

By applying our experience and expertise of raw material and metallurgy to innovative technology, we are forcing new challenges in the industry to adjust to our ever-present and indispensable rule: choose the right material for the job.

It is a simple way of developing advanced tool steel and delivering solutions that make a difference for our customers. Quality and global traceability is key.

Some say we are leaders, and that makes us proud. Because when it comes to tool steel, we aim to be the one leading the way. And we do so by always delivering more than tool steel.

We add value and we enhance competitiveness. That is what makes Uddeholm the world's leading provider of tool steel solutions. And it will be for the next 350 years too. Shaping the world for generations to come.



**TECHNICAL CONSULTATION**

The selection of tool steel has an impact on the tool's performance and your profitability. Book an onsite consultation with one of our experts to evaluate the steels that best suits your application.



**TAILOR-MADE SOLUTIONS**

Our expertise in High Performance Metals counts in applications where general engineering steels are deemed insufficient. We hold the UK's largest stock in our award-winning stock facility.



**COMPONENT SERVICES**

Our experience in the tooling industry is now being applied to components. We provide solutions which reduce high maintenance costs and minimise production downtime.

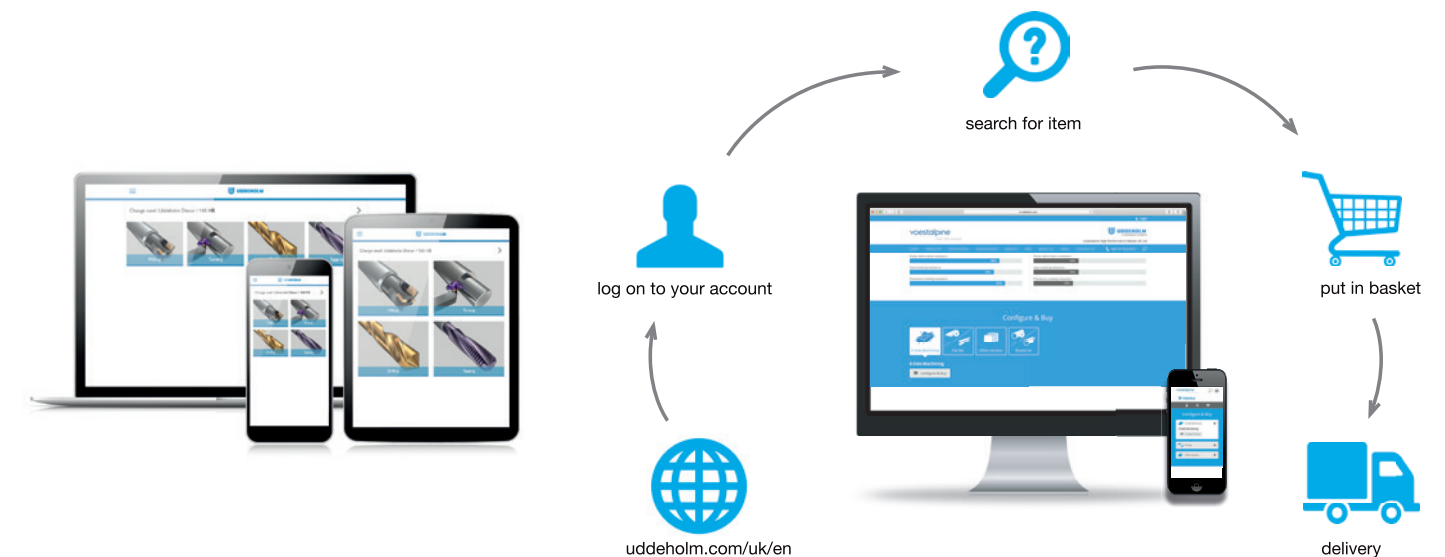
**STEEL APPS & WEB SHOP**

Service is an essential part of our business, be it in person or by harnessing technology to support you in your production environment whatever the time of day.

The Uddeholm Machining App contains information and recommendations on how you can use Uddeholm steel for different types of tooling applications. You can save your calculations together with images so you can easily re-use them, or send them directly to Uddeholm or a colleague.

The new Uddeholm web shop is open 24/7, providing you with the freedom to place and track orders online in just a few clicks, with complete access to your order history and vital documents.

You can download the free Uddeholm Machining Guideline & Uddeholm Steel book and also register for access to our exclusive web shop at [www.uddeholm.co.uk](http://www.uddeholm.co.uk)





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.

To save on die manufacturing time, Uddeholm now offer our premium die steels machined and heat treated to customer specifications.



### QUALITATIVE COMPARISON OF RESISTANCE OF BASIC PROPERTIES

UDDEHOLM TOOL STEEL	HOT WEAR	PLASTIC DEFORMATION	PREMATURE CRACKING	HEAT CHECKING
Dievar	██████	██████	██████	██████
Unimax	██████████	██████████	██████	██████████
Orvar 2 Microdized	██████	██████	██████	██████
Orvar Supreme	██████	██████	██████	██████
Orvar Superior	██████	██████	██████	██████
Vidar Superior	██████	██████	██████████	██████
QRO 90 Supreme	██████████	██████████	██████	██████████
Formvar	██████	██████	██████	██████

The longer the bar, the better.

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.

Some of the most complicated mould tools today are designed around medical devices and wearables.

A common challenge in high volume plastic production is getting the best part quality out from the tool. Thermal hot spots can present a serious issue for high volume production, slowing down parts produced and causing distortion. When cycle times are measured every second counts.

Uddeholm's mould steel programme has the answers to these demands. Whether its higher abrasive wear, increased toughness or better resistance to corrosion, higher thermal conductivity and conformally cooled inserts using additive manufacturing, uddeholm is here to offer a technical solution.



PROPERTY	Impax Supreme	Nimax ESR	Corrax	Orvar Supreme	Stavax ESR	Mirrax ESR	Tyrax ESR	Unimax	Elmax SuperClean	Vanax SuperClean
Normal hardness HRC (HB)	(~310)	(380)	46	52	52	52	57	58	58	60
Wear resistance	1	2	3	5	5	5	6	6	8	7
Toughness	9	10	7	6	5	6	6	6	3	4
Compressive strength	4	5	6	7	7	7	8	8	9	9
Corrosion resistance	1	1	9	2	7	8	7	2	5	10
Machinability**	5	5	4	9	8	7	7	7	3	4
Polishability	7	8	7	8	9	9	10	9	8	8
Weldability	6	7	6	4	4	4	4	4	2	-
Nitriding ability	6	5	-	10	-	-	-	8	-	-
Etchability	8	9	8*	9	8*	8*	8*	9	8*	8*



High volume production such as blister packaging for tablets 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.

**PROPERTY COMPARISON**



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.



**RELATIVE COMPARISON OF THE RESISTANCE TO FAILURE MECHANISMS**

Uddeholm Grade	Hardness/Resistance to plastic deformation	Machinability	Grindability	Dimension Stability	Resistance to		Fatigue cracking resistance	
					Abrasive wear	Adhesive wear	Ductility/resistance to chipping	Toughness/gross cracking
Arne	Low	High	High	Low	Low	Low	Low	
Calmax	Low	High	High	Low	Low	Low	Low	
Caldie (ESR)	Low	High	High	Low	Low	Low	Low	
Rigor	Low	High	High	Low	Low	Low	Low	
Sleipner	Low	High	High	Low	Low	Low	Low	
Sverker 21	Low	High	High	Low	Low	Low	Low	
Sverker 3	Low	High	High	Low	Low	Low	Low	
Vanadis 4 Extra	Low	High	High	Low	Low	Low	Low	
Vanadis 8	Low	High	High	Low	Low	Low	Low	
Vanadis 23	Low	High	High	Low	Low	Low	Low	
Vancron Superclean	Low	High	High	Low	Low	Low	Low	

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 SS731** 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

C	Si	Mn	P max	S max	Cr
1.25	0.25	0.40	0.020	0.011	0.30

#### MARTENSITIC STAINLESS STEEL UHB AE8-L

C	Si	Mn	P max	S max	Cr
0.67	0.40	0.60	0.025	0.015	13.0

### 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.

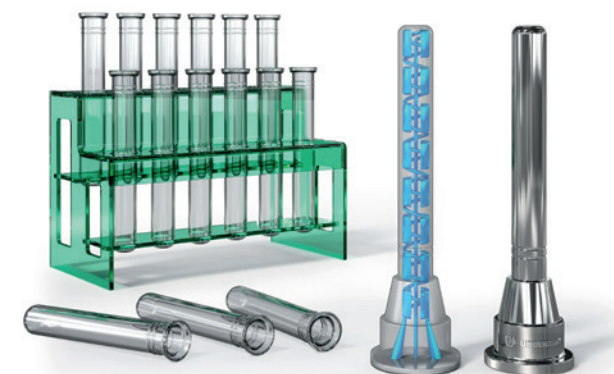


Sometimes the design of a component cannot change to facilitate tool design issues. The intricate nature of many medical components can lead to issues with hot spots in tools which cannot be easily dealt with.

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.

Not only are we leading the charge with cutting edge material developments for additive manufacture, we can also offer our customers a complete package by covering the whole value chain from concept to finished part.



WE CONSULT WITH YOU RIGHT THROUGH THE VALUE CHAIN



DESIGN

- Design for optimal printability
- Conformal cooling
- Topology optimisation



SIMULATION

- AM Process simulation
- Check AM productivity
- Cost calculations



MANUFACTURE

- Parameters and scan strategy
- Material selection
- Hybrid manufacturing



POST PROCESS

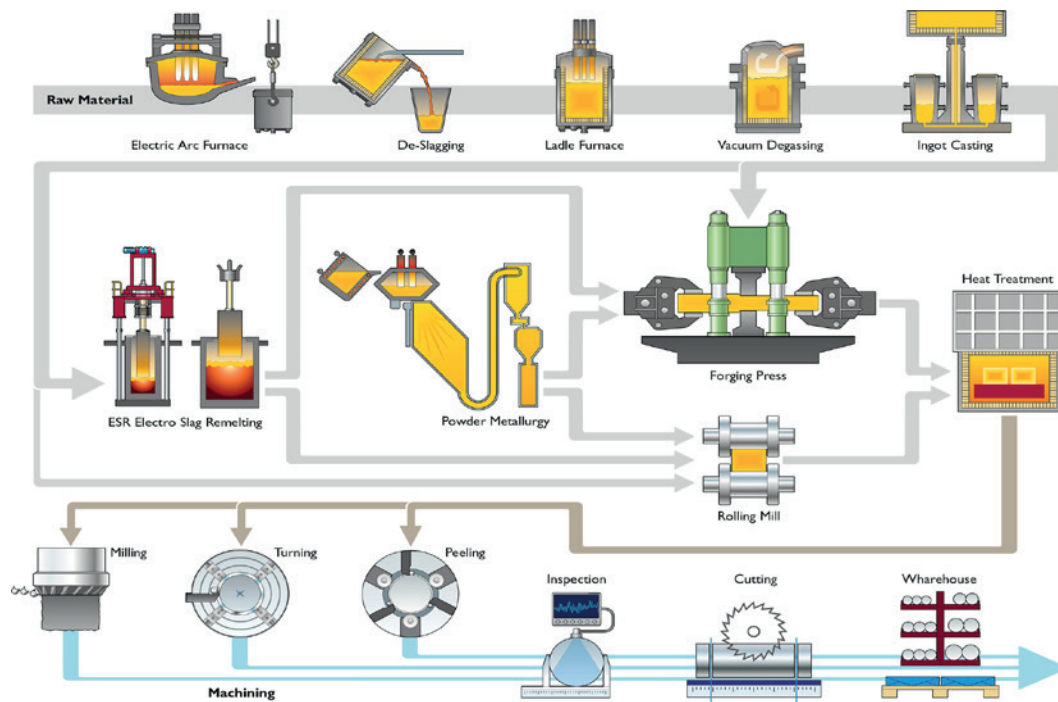
- Machining
- Surface finish
- Heat treatment / PVD coatings

QUALITY IS ASSURED AT EVERY STAGE



**LABORATORY AND  
ONSITE TESTING**

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. Ferritoscope testing of materials as well as Positive Material Identification (PMI) for all grades is also available.



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.

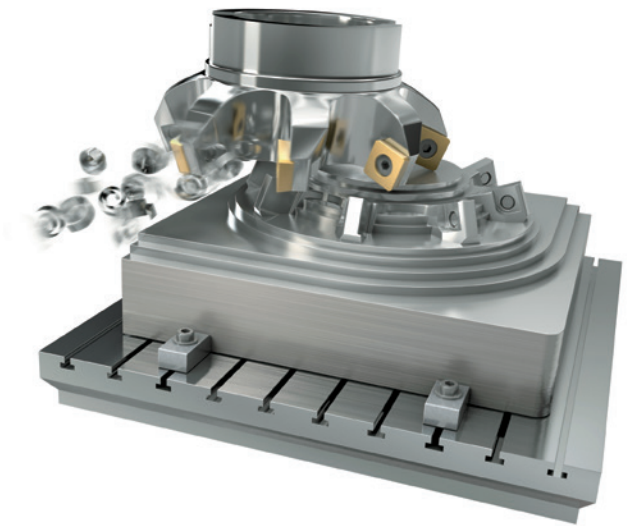


Value Added Services give our customers access to cutting, machining, bevelling, testing, surface coating, heat treatment and other solutions to fit with their individual needs.

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.



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

\* chamfering available on request

**#1 IN HIGH  
PERFORMANCE  
TOOL STEEL**

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