AUTOMOTIVE TOOLING SOLUTIONS

UDDEHOLM

ONE WORLD, ONE UDDEHOLM, ONE GREAT IMPACT

Selecting a tool steel supplier is a key decision for all parties, including the tool maker, the tool user and the end user.

Thanks to superior material properties, Uddeholm's customers get reliable tools and components. Our products are designed to be state-of-the-art. Consequently, we have built a reputation as the most innovative tool steel producer in the world.

Uddeholm produce and deliver high quality Swedish tool steel to more than 100,000 customers in over 100 countries. We secure our position as a world-leading supplier of tool steel. Wherever you are in the manufacturing chain, trust Uddeholm to be your number one partner and tool steel provider for optimal tooling and production economy.

Quite simply, it pays to go for a better steel.

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AUTOMOTIVE TOOLING SOLUTIONS

At Uddeholm we place innovation at the heart of what we do. Our research and development facility in Sweden is continually developing new products and renewing existing ones. Uddeholm aim to solve the challenges our customers face, ensuring we retain our leading position in providing world-wide tooling solutions.

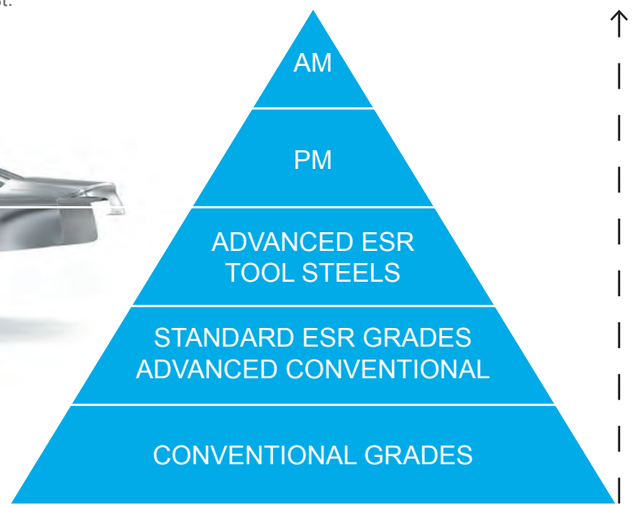
Uddeholm has created a package specifically designed for the automotive industry which meets the need of the automotive OEM's for shorter delivery times.

The package focuses on optimal total economy, less downtime in production and shorter lead times, within the following areas:

In **cold work**, a new generation of presswork tool steels has been developed to tackle AHSS production materials.

Within the **hot work** segment Uddeholm focus on long run die casting production, hot forging and hot stamping.

As the leading developer of high quality plastic **mould tool** steels, the tool life and performance can be maximized to achieve greater savings in productivity and total tooling cost.



AM additive manufacturing PM is powder metallurgy steels

TOTAL TOOLING ECONOMY

FULL SERVICE

Uddeholm offers a complete programme of services to prepare and maintain tools close to our customers around the world, which include heat treatment, coatings and more. Call to discuss your requirements.

TAILOR-MADE SOLUTIONS

The selection of tool steel has an impact on the tool's performance and your profitability. Discuss your needs with our local representatives and let them help you find the steel that best suits your needs.

TECHNICAL SUPPORT

If you encounter tooling difficulties, our experienced customer service staff and technical experts will help you solve your problems. Call us to find the nearest Uddeholm contact in your area.

WORKING IN PARTNERSHIP

Whilst our production, research and development is based in Sweden, we have regional experts across the world. This structure enables us to provide our customers with expert solutions by working in partnership with them.

We invest extensively in product development and our services. Whether it is material properties, new steel grades or analysing customer tools to improve efficiencies, our technical teams at our production facility work closely with our UK division.

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.

COLD WORK TOOLING

FACTORS INFLUENCING TOOL LIFE IN COLD WORK APPLICATIONS

TOOL DESIGN

↓

TOOL MATERIAL

↓

HEAT TREATMENT

↓

TOOL PRODUCTION

↓

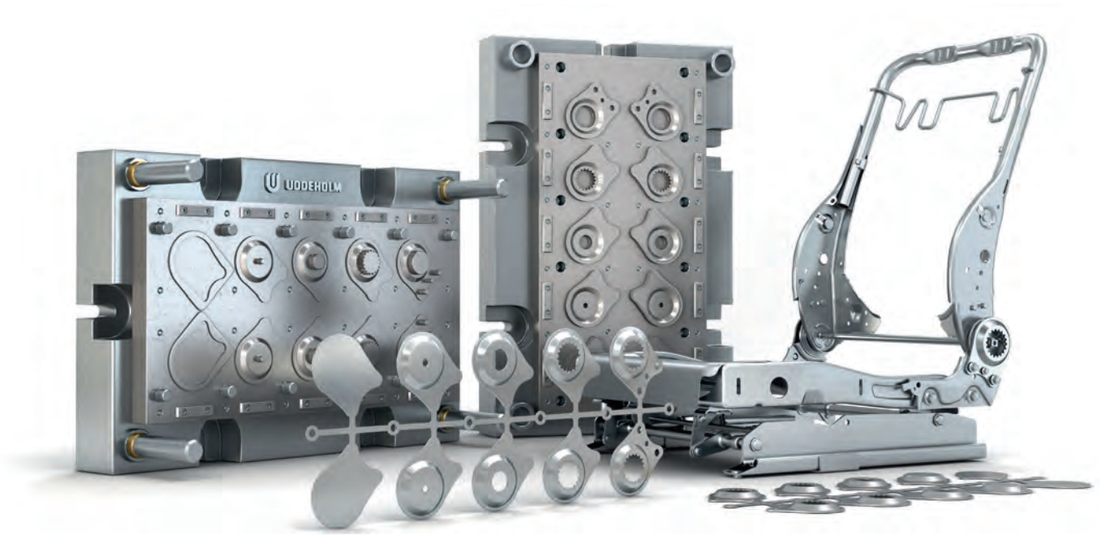
WORK MATERIAL

↓

PRODUCTION CONDITIONS

↓

TOOL MAINTENANCE



TOOL STEEL SELECTION

The selection of a tool steel for a given application will depend on which failure mechanisms dominate. The choice of a tool steel for a specific application requires more than just a knowledge of the steel properties, it also includes:

- The number of parts to be produced
- Type of work material.
- Thickness of the work material and the hardness of the work material must also be taken into consideration.

The basic idea is to select a tool steel with such properties that all the failure mechanisms except wear are eliminated. The wear can then be optimized to match the number of components required.

Choosing the right tool steel for the application becomes more and more important as the demands on the tool increase.

The tool must have sufficient wear resistance and reliability, and not fail due to premature chipping, cracking or plastic deformation.

At Uddeholm, we work with you to establish the optimal tooling economy for your application. We find the lowest possible tooling cost (including maintenance) per part produced, which can only be achieved if the correct tool steel for the application in question is used.

RELATIVE COMPARISON OF THE RESISTANCE TO FAILURE MECHANISMS

Uddeholm Grade	Hardness/ Resistence to plastic deformation	Machin-ability	Grind-ability	Dimension Stability	Resistence to		Fatigue cracking resistence	
					Abrasive wear	Adhesive wear	Ductility/ resistence to chipping	Toghness/ gross cracking
Arne								
Calmax								
Caldie (ESR)								
Rigor								
Sleipner								
Sverker 21								
Sverker 3								
Vanadis 4 Extra								
Vanadis 8								
Vanadis 23								
Vancron 40								

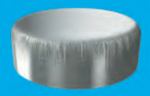
The longer the bar, the better the resistance. The Vancron and Vanadis steels mentioned in the table are Uddeholm PM SuperClean tool steels.

FINE BLANKING

Fine blanking technology enables the production of components that have a higher precision and better quality to conventional stamping. The automotive industry uses around 60% of all fine blanked parts, in applications such as seat belts, gearboxes, brake systems and airbags as they all need to deliver added safety assurance.

Carbon steel, stainless steel, brass, copper and aluminium components are typical material for fine blanking. Countersinks, bends and embossing can be produced in the same operation as the fine blanking itself. As a result, the number of production operations can be reduced, which is of major importance to the total production economy.

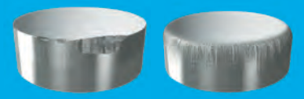
Whenever sheet metal components are subjected to dynamic loading or serve as running surfaces such as gears, fine blanking is essential in enabling the product to live up to the high-quality standard demanded by the application.

TOOL STEEL RECOMMENDATION	 Abrassive wear	 Adhesive wear / Galling	 Plastic Deformation	 Chipping
PROBLEM AREAS	High strength sheet Hot rolled sheet High carbon sheet	Stainless sheet Thick sheet	High strength sheet Complicated design Thick sheet	High strength sheet Complicated design Thick sheet
BEST SOLUTION	Uddeholm Vanadis® 8	Uddeholm Vanadis® 4 Extra	Uddeholm Vanadis® 60	Uddeholm Caldie®
ALTERNATIVE SOLUTION	Uddeholm Vanadis® 30 Uddeholm Vanadis® 4 Extra Uddeholm Sleipner®	Uddeholm Vanadis® 8 Uddeholm Vanadis® 30 Uddeholm Caldie®	Uddeholm Vanadis® 30 Uddeholm Vanadis® 8 Uddeholm Vanadis® 4 Extra	Uddeholm Vanadis® 4 Extra Uddeholm Vanadis® 8 Uddeholm Vanadis® 30

POWDER COMPACTING

Uddeholm Steels for powder compacting are great problem solvers. We recognise that tooling life is particularly crucial in powder compacting processes. By using various combinations, you can achieve superior results in your processes. With Uddeholm, the lifespan of tools can be increased, often lasting twice as long as those made of conventional steel or high speed steel.

Galling, adhesive wear and high friction are serious problems in many cold forming operations. After many years of analysing tooling problems, Uddeholm can now offer the best solutions to address them. Our investment in new production processes and continued research and development makes this possible. Uddeholm Vancron 40 has the internal surface coating that vastly reduces friction. This means you do not need to surface coat any tools made of Uddeholm Vancron 40, furthermore they are easy to heat treat and have excellent dimensional stability.

TOOL STEEL RECOMMENDATION	 Cold Welding / Wear	 Chipping / Wear	 Total Breakage
PROBLEM AREAS	Less lubricants Abrasive Powders Stainless powders Higher density	Large production volumes High pressures Complicated geometrics Abrasive powders	Long core pins Thin walls Tight radii
BEST SOLUTION	Uddeholm Vancron® 40 / Uddeholm Vandis® 8	Uddeholm Vandis® 4 Extra / Uddeholm Vandis® 8	Uddeholm Unimax®
ALTERNATIVE SOLUTION	Uddeholm Vanadis® 4 Extra	Uddeholm Caldie®	Uddeholm Caldie® Uddeholm Vanadis® 4 Extra

ADVANCED HIGH STRENGTH SHEET

NEW MATERIALS REQUIRE NEW TOOLING SOLUTIONS

The increasing use of advanced high strength steel in new product designs places higher demands on the tool steel used in production. Previous generations of tool steel are insufficient to handle the pressure and loads. To succeed, you need tool steel that can really withstand the toughest conditions. Uddeholm Sustainable Solutions is a new steel concept that really works.

Many industrial products can be reduced in weight and achieve increased durability by using advanced high strength steel in their design. With steel from Uddeholm Sustainable Solutions, it is possible to avoid premature tool failures and achieve optimum tooling economy at the minimum cost per part produced.

Meeting the higher demands of the automotive industry

Uddeholm has, together with key industrial partners, been working with advanced high strength steel for more than a decade. Thanks to our long history and experience we can give you the right advice when it comes to tool steel suitable for processing advanced steel strength.

BENEFIT FROM UDDEHOLM'S EXPERIENCE

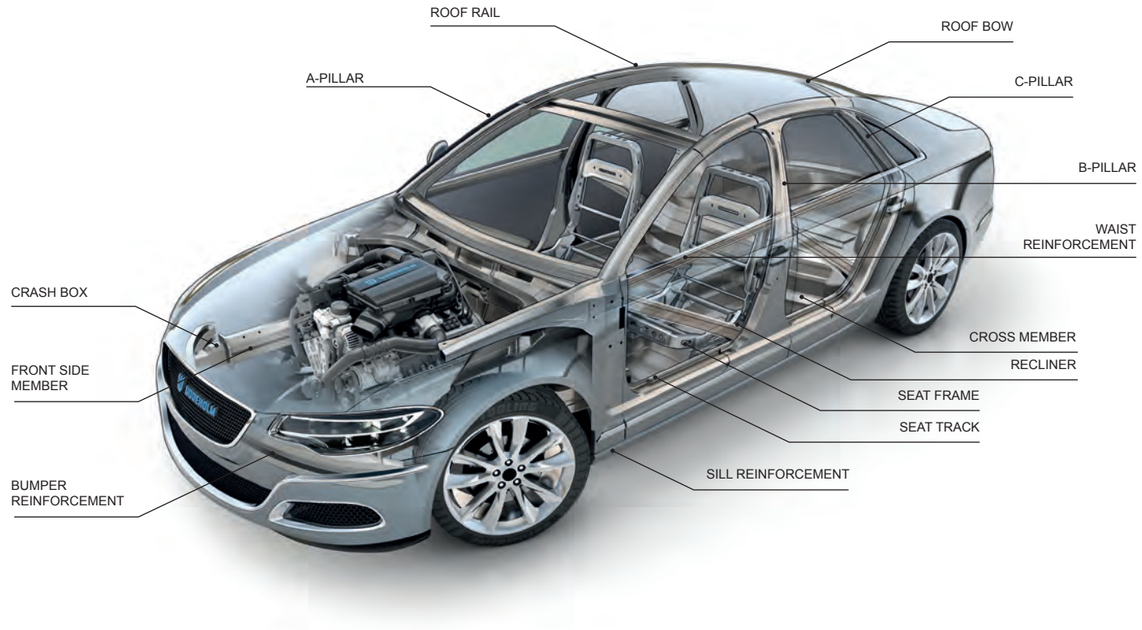
By using Uddeholm's knowledge base you will be able to effectively select the right tool steel for trouble free press lining tooling applications. Uddeholm's guidelines are available to all our customers and are based on many years of experience in advanced high strength tooling solutions.

AVOID PREMATURE TOOL FAILURES

Through new product development, Uddeholm has products specifically designed to handle high demands for blanking and forming advanced high strength steel. With Uddeholm products you can avoid premature tool failures, enjoy reliable tooling solutions and save money.

LIGHTER VEHICLES – PART BY PART

In the opposite illustration, we identify examples of parts that can be manufactured in advanced high strength steel, using tool steel from Uddeholm.

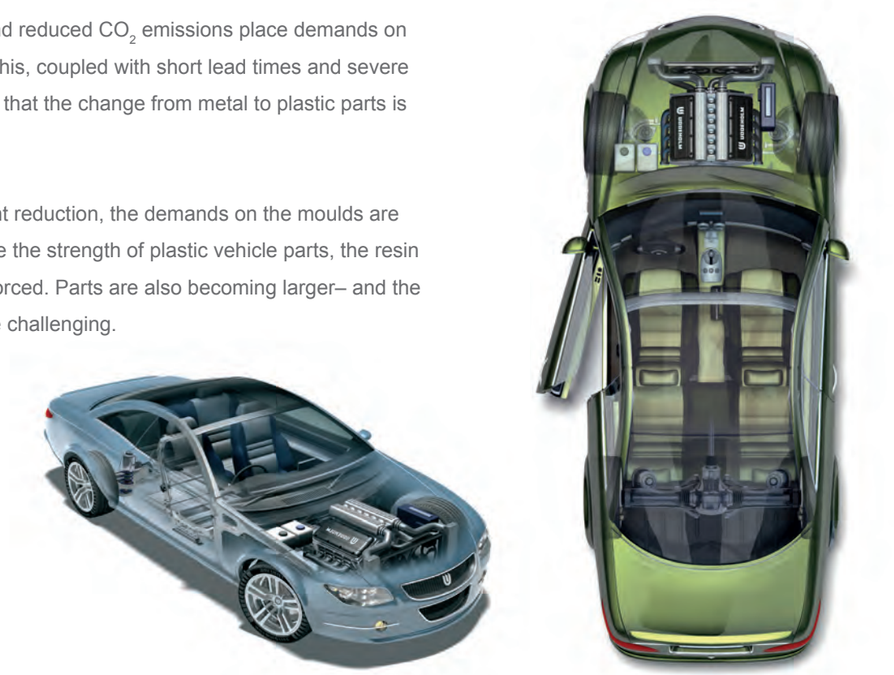


TOOL STEEL RECOMMENDATION	Abrassive wear	Adhesive wear / Galling	Plastic Deformation	Chipping	Breakage
PROBLEM AREAS	Hot rolled sheet High carbon sheet Electrical sheet	Stainless sheet Coated sheet Thick sheet	High strength sheet Thick sheet	Complicated design	Thin walls Complicated design Long punches
BEST SOLUTION	Uddeholm Vanadis® 8	Uddeholm Vancron® 40	Uddeholm Vanadis® 8	Uddeholm Unimax®	Uddeholm Unimax®
ALTERNATIVE SOLUTION	Uddeholm Vanadis® 4 Extra	Uddeholm Vanadis® 8	Uddeholm Vanadis® 4 Extra	Uddeholm Calmax®	Uddeholm Caldie®
	Uddeholm Sleipner®	Uddeholm Vanadis® 4 Extra	Uddeholm Sleipner®	Uddeholm Caldie®	Uddeholm Calmax®
	Uddeholm Caldie®	Uddeholm Caldie®	Uddeholm Caldie®	Uddeholm Vanadis® 4 Extra	Uddeholm Vanadis® 4 Extra

PLASTIC MOULDING

Lower fuel consumption and reduced CO_2 emissions place demands on vehicle weight reduction. This, coupled with short lead times and severe pressure on prices, means that the change from metal to plastic parts is becoming more important.

In addition to vehicle weight reduction, the demands on the moulds are ever increasing. To improve the strength of plastic vehicle parts, the resin normally needs to be reinforced. Parts are also becoming larger– and the surface requirements more challenging.



PROPERTIES

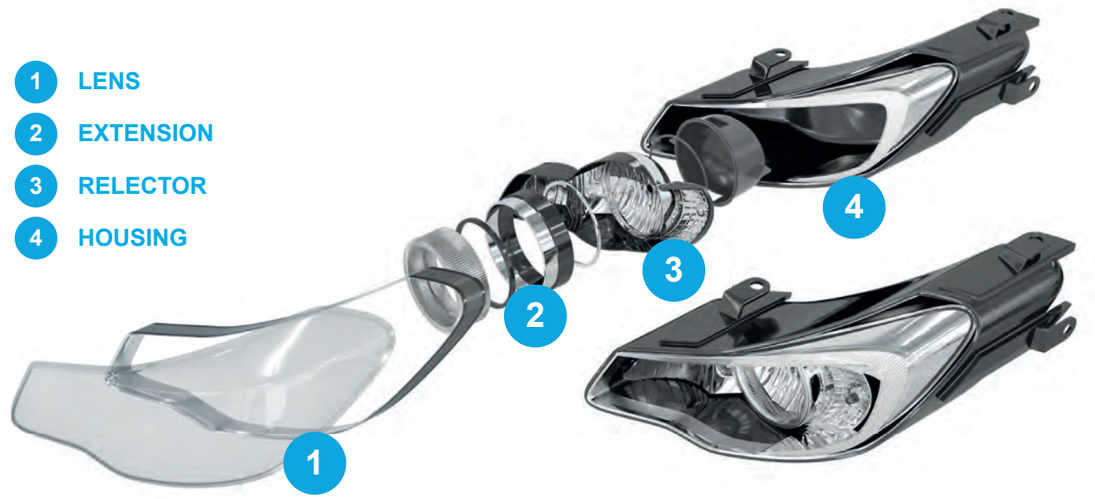
UDDEHOLM TOOL STEEL	Impax Supreme	Nimax	Mirrax 40	Corrax	Vidar 1ESR	Orvar Supreme	Stavax ESR	Mirrax ESR	Polmax	Unimax	Rigor	Elmax	Vanadis 4 Extra	Ramax HH	RoyAlloy
Normal hardness HRC (HB)	(~310)	(380)	(380)	46	48	52	52	52	52	58	59	59	62	(~340)	(~310)
Wear resistence	3	4	4	5	6	7	7	7	7	8	8	8	10	4	3
Toughness	9	10	6	7	8	6	5	6	5	6	3	3	5	3	4
Comprehensive strength	4	5	5	6	6	7	7	7	7	8	9	9	9	5	4
Corrosion resistence	2	2	7	10	3	3	8	9	8	3	2	2	2	7	7
Machinability	5	5	6	4	9	9	8	7	8	7	5	5	4	6	7
Polishability	7	7	8	7	8	8	9	9	10	8	5	5	8	4	4
Weldability	6	7	5	6	4	4	4	4	4	4	2	2	2	5	6
Nitridingability	6	5	-	-	10	10	-	-	-	8	6	6	8	-	-
Etchability	8	8	8*	8*	9	9	8*	8*	8*	9	5	5	8	3	3

AUTOMOTIVE LIGHTING AND MIRRORS

Uddeholm's solutions for the automotive industry are the result of dedicated research and innovative product development from the best metallurgists and field specialists in the world. Tool steel from Uddeholm not only meets the toughest demands on production, it delivers the added value that enhances competitiveness for you. The headlights represent an essential part of the car's design and have a great influence on its personality. Parts are becoming larger and surface requirements more challenging. The increased demand for high gloss finished parts straight from the tool is possible. At Uddeholm we have developed several steel grades specifically for the tough demands of the automotive industry.

Uddeholm provides the world's most advanced tool steel, perfectly suited for moulds with complex shapes and demanding surfaces. Corrosion, high temperatures, temperature changes and wear are just a few of the challenges you face every day. By choosing the right tool steel you can maximise tool life and performance.

1. LENS
2. EXTENSION
3. RELECTOR
4. HOUSING



UDDEHOLM GRADE	Wear resistence	Toughness	Polishability	Corrosion resistence
Vidar 1 ESR				
Orvar Supreme				
Mirrax ESR				
Mirrax 40				
Nimax ESR				
Nimax - no ESR				

DIE CASTING

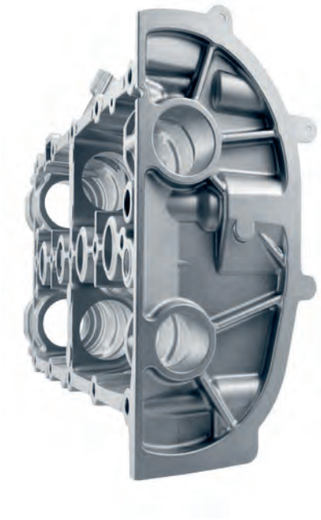
The continued growth of the die casting process depends, to a large extent, on the greater use of die castings in the automotive industry, where weight reduction is increasingly important.

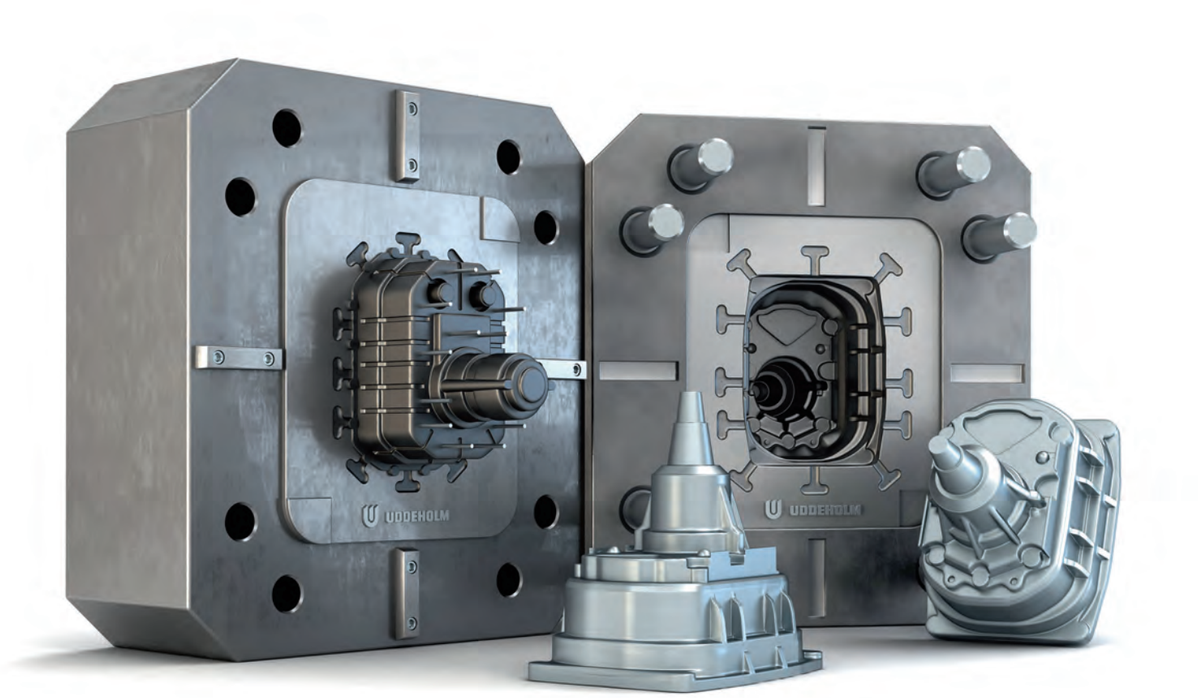
Long production runs have focused attention on the importance of obtaining improved die life. During the recent years Uddeholm has occupied a leading role in developing die materials to meet this demand and that of higher die steel specifications.

This has resulted in the grades Uddeholm Orvar Supreme, Uddeholm QRO 90 Supreme and Uddeholm Dievar.

Increasing demands on die cast products will ensure continued development of die casting alloys with higher strength and ductility, improved machinability, weldability and corrosion resistance. The trends in product design are going towards:

- larger components
- thinner wall thicknesses
- more complicated shapes
- closer tolerances





QUALITY COMPARISON

UDDEHOLM TOOL STEEL	Temper resistance	Hot yeild stregnth	Ducility	Toughness	Hardenability
Diever					
Unimax					
Orvar Supreme					
Orvar Superior					
Vidar Superior					
QRO 90 Supreme					

Qualitative comparison of critical die steel properties.
All steel tested at 44–46 HRC except for Uddeholm Unimax where 54–56 HRC is used.

UDDEHOLM TOOL STEEL	Heat checking	Gross Cracking	Erosion	Indentation
Diever				
Unimax				
Orvar Supreme				
Orvar Superior				
Vidar Superior				
QRO 90 Supreme				

Qualitative comparison of resistance to different die failures (the longer the bar, the better).

FORGING APPLICATIONS

In hot forging, a heated billet is pressed between a die set to form a nearly finished product. Large numbers of solid metal parts are produced in steel, aluminium and copper alloys whose irregular shapes need to be aided by superior die mechanical properties in order to avoid premature failure.

Just as for any other production process that uses tool steel, the tool steel properties required for hot forging are crucial to extend the life of the die. In order to achieve fewer interruptions and longer production runs, hardenability, toughness, ductility and temper resistance are some of the most important properties to look for when selecting tool steel for hot forging dies.

QUALITATIVE COMPARISON OF RESISTANCE OF BASIC PROPERTIES

UDDEHOLM TOOL STEEL	Hot wear	Plastic Deformation	Premature cracking	Heat check
Diever				
Unimax				
Orvar 2 Microdized				
Orvar Supreme				
Orvar Superior				
Vidar Superior				
QRO 90 Supreme				
Formvar				
Alvar 14				

Qualitative comparison of resistance to different die failures (the longer the bar, the better).

COMPONENTS

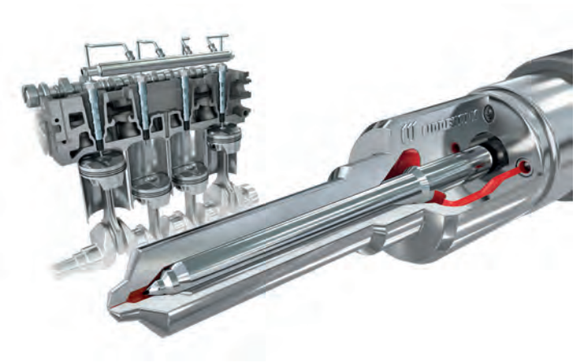
The qualities of Uddeholm tool steel are not just aimed at the general tooling market, the properties also contribute and give excellent results to actual components within the automotive industry.

Uddeholm high performance steels give optimized design, increased performance, lower maintenance costs and the best overall economy.

Uddeholm's component business offers a first-class tool solution in applications where conventional engineering and stainless steel is insufficient.

Examples of components for automotive industry:

- High pressure injection systems.
- DC tooling for automotive assembly.
- Shafts, spindles and sockets with high torque values.
- Gear and bearing tooling.
- Tool holder concept.
- Shots sleeves (Diecasting).



PROPERTIES

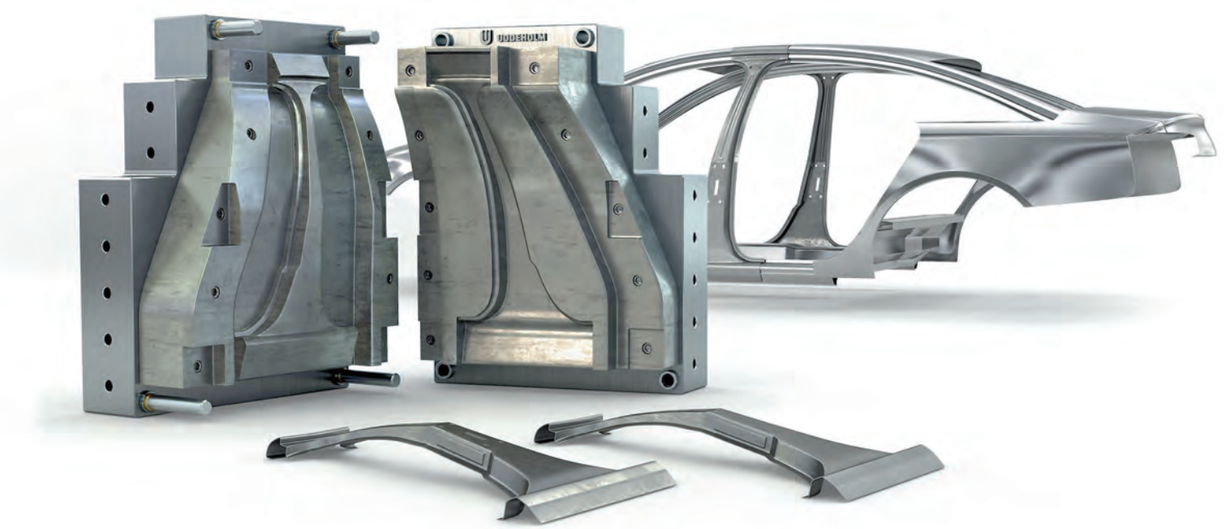
UDDEHOLM TOOL STEEL	Delivery hardness ~ HB	Recommended hardness HRC	Yeild Strength Rp0.2 (Mpa)	Tensile strength (Mpa)
Impax Supreme[1)]	310	33	900	1000
Nimax[1)]	380	40	785	1265
Ramax Hh[1)]	340	37	990	1140
Mirrax Esr	250	50	1290	1780
Mirrax 40[1)]	380	40	1020	1150
Elmax Superclean	250	58	2200	2900
Corrax	330	46	1400	1500
Stavax Esr	190	50	1460	1780
Bure	180	42	1200	1400
Orvar Supreme	180	48	1350	1600
Dievar	160	50	1470	1770
Unimax	185	56	1780	2150
Caldie	215	60	2350[2)]	-
Sleipner	235	60	2350[2)]	-
Vanadis 4 Extra Superclean	230	62	2530[2)]	-
Vanadis 8 Superclean	<270	62	2600[2)]	-
Balder[1)]	420	44	1230	1440
Idun	420	44	1250	1490

[1)] Prehardened [2)] Compressive strength

HOT STAMPING

PARTS CAN BE MADE LARGER, STRONGER AND MORE COMPLEX THAN EVER BEFORE

Hot stamping has rapidly become a complement to cold forming in the automotive industry. By using a heated blank that forms and hardens quickly in the die, parts can be made larger, stronger and more complex than ever before. This means fewer structural parts per vehicle, with as much as 30–35% weight reduction of individual parts. It can also eliminate some of the issues that exist during the cold blanking and forming of advanced high strength work materials that can lead to spring back and cracking. But because this is a hot process, high demands placed on the tool steel during hot stamping brings an increased risk of premature tool failures, leading to production stops and delays.



At Uddeholm, we have developed new grades and coatings that are appropriate for the varied production issues on the inserts in hot stamping. Grades such as a Premium H13 like Uddeholm Orvar Supreme; higher strength tool steels like Uddeholm Dievar, Uddeholm Caldie, Uddeholm QRO90 and Uddeholm Unimax. Theses alloys have better heat transfer characteristics than conventional hot work tool steels, which is an important aspect for cycle time reduction during hot stamping. In order for tool steel to function reliably at the high temperatures involved, the tool steel needs to have excellent temper resistance and hot yield strength as well as good toughness at elevated temperatures.

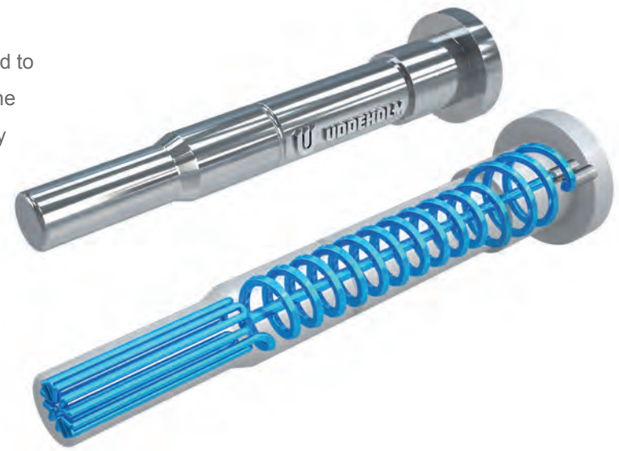
At Uddeholm we know that your total economy can be improved by upgrading your tool steel. This is particularly important in the automotive industry where the lowest cost per produced part often wins. Good quality tools pay off in the end as they ensure long and stable production runs.

ADDITIVE MANUFACTURING

As a new and flexible way to produce parts and tooling, additive manufacturing offers new possibilities for optimization of design and properties. Tooling is an optimal application for additive manufacturing with high demands on finished component quality, shorter series runs, reductions in cycle times and an ever-increasing demand for shorter lead times.

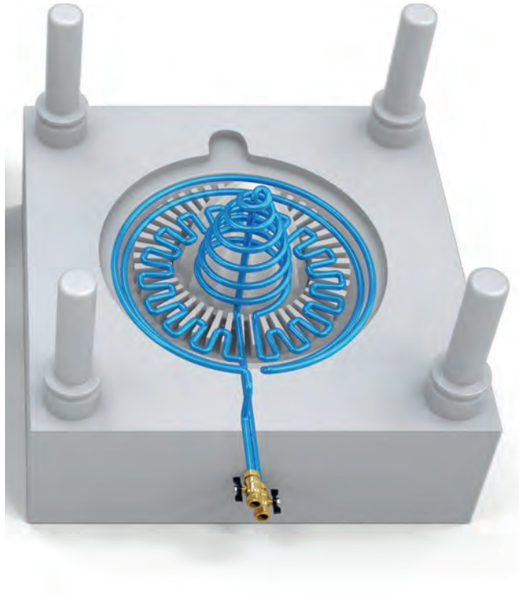
Most of the powders available today have been developed to be easy to print and not focused on demands posed by the applications. This is unfortunate since the new technology also brings possibilities for optimizing the materials, and that is what we at Uddeholm want to do using our expertise in tooling materials.

We will develop alloys with focus on the application to bring maximum added value to the user while still being able to be printed.

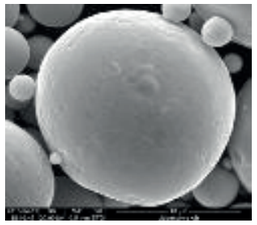


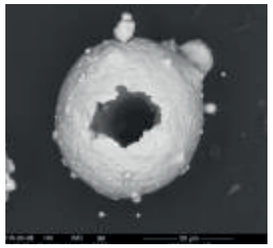
One of the largest benefits to the AM production route is that complexity of a tool, component or insert can be more easily accommodated.

Where conventional manufacture is limited by the access available to certain areas, or dimensions of the item, AM allows for intricate conformal cooling and internal features that would otherwise not be possible.



It's better to know you're getting a high-quality powder...





... than gamble and get it wrong!

Corrax is Uddeholm's first metal powder.

SERVICES

We strive to provide the best possible service to you and constantly monitor our operations and procedures in order to continually improve our performance.

Heat treatment, Machining, Apps and Technical consultation are all added value services we provide to our customers across the UK and Ireland.

TRUSTED TO DELIVER

All high performance engineering steel stock is held in our new purpose-built warehouse facility at Uddeholm UK headquarters in Oldbury, West Midlands. The new KASTO system is the tallest in the UK and one of the largest in Europe.

VALUE ADDED SOLUTIONS

Our cutting, machining, bevelling, testing and other services provide turnkey solutions to our customers. This includes an onsite material testing service used when customers require additional certification to that supplied by the mill. Uddeholm is present on every continent, ensuring high-quality Swedish tool steel and local support wherever you are. We continually invest to secure our position as the world's leading supplier of tooling material. Our goal is clear – to be your number one partner and tool steel provider.

CONTACT US

For all enquiries and order progress queries please contact our internal sales team.

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For more information, please visit www.uddeholm.co.uk

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