

The Ultimate PM Tool Steel

**Uddeholm** Superclean Concept

**SOME THINGS  
LAST FOREVER**



# THE ULTIMATE PM TOOL STEEL

There are times when even the most durable ordinary tool steel fails, giving rise to unwanted production stops, delays and lower cost-effectiveness. When Uddeholm launched the third generation powder metallurgy (PM) tool steel, we gave tool makers and tool users worldwide a new instrument to achieve the best possible total economy. In some cases, the new tools made in Uddeholm PM tool steel lasted entire production runs – some 40,000,000 units manufactured using a single tool. Apparently, some things do last forever.

Uddeholm now introduces Uddeholm SuperClean Concept, building on the proven success of our PM steel grades. With unique properties and unparalleled cleanliness, they are the most advanced and refined products we have ever developed, designed to give you the upper hand in the battle for optimal productivity. In the end, going for a better steel will improve your total economy.



UDDEHOLM VANADIS® 4 EXTRA SUPERCLEAN	4
UDDEHOLM VANADIS® 8 SUPERCLEAN	6
UDDEHOLM VANADIS® 23 SUPERCLEAN	8
UDDEHOLM VANADIS® 30 SUPERCLEAN	10
UDDEHOLM VANADIS® 60 SUPERCLEAN	10
UDDEHOLM VANCRON® 40 SUPERCLEAN	12
UDDEHOLM ELMAX® SUPERCLEAN	14

## UDDEHOLM SUPERCLEAN CONCEPT – THE WAY FORWARD

There is no denying the fact that an optimised manufacturing process with long runs and harsh conditions calls for tooling materials that are able to withstand extremely high stresses. The steel grades in Uddeholm SuperClean Concept were all developed with one quest in mind: to bring reliable productivity and improved economy for even the longest production runs to the market.

Uddeholm SuperClean Concept consists of a number of proven steel grades, engineered for a wide range of applications. The Uddeholm powder metallurgy production process eliminates the macro segregation problem encountered in conventional ingot metallurgical production of higher alloy tool steel. The result is a range of tooling materials with extreme cleanliness and unique properties that set it apart from everything else available on the market. Furthermore, the process also eliminates the inclusions that limit the performance of most other PM steel. Simply put – the Uddeholm SuperClean Concept is the way forward.

For the tool maker this means:

- Improved machinability
- Improved dimensional stability
- Excellent polishability
- + Excellent surface treatment properties

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= Improved total economy

For the tool user this means:

- Improved resistance to chipping, cracking and wear
- Longer tool life
- Fewer production interruptions
- + Reliable productivity

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= Improved total economy

## DEVELOPING THE FUTURE OF TOOLING

As is often the case, several of our PM tool steel grades are the results of our close collaboration with customers. Uddeholm focuses on research and development in order to help our customers stay ahead of the game by developing and manufacturing products with cutting-edge properties. Uddeholm SuperClean Concept is an example of that ambition: to provide the future tooling materials, today.

## WE COACH, YOU CREATE

In a broader perspective, Uddeholm offers a comprehensive service package that strongly support our customers whenever they face modern production challenges. Our global presence guarantees that you will get the same high quality tool steel wherever your production is located. Along with excellent delivery service, technical support and a range of additional steel treatment services, you can be assured that choosing Uddeholm tool steel will be beneficial in more ways than one. We are always ready to coach you as you create.

**RELIABLE TOOL PERFORMANCE**



Excellent choice for blanking in high strength materials.



# Uddeholm Vanadis® 4 Extra SuperClean

## CHIPPING RESISTANCE NONE CAN MATCH

Uddeholm Vanadis 4 Extra SuperClean offers excellent chipping resistance and very good wear resistance. This combination makes it especially well-suited for consistent tool performance for demanding cold work applications, such as blanking, forming and coining. It is also well adapted for working in advanced high strength steel, which are increasingly common in the automotive industry.

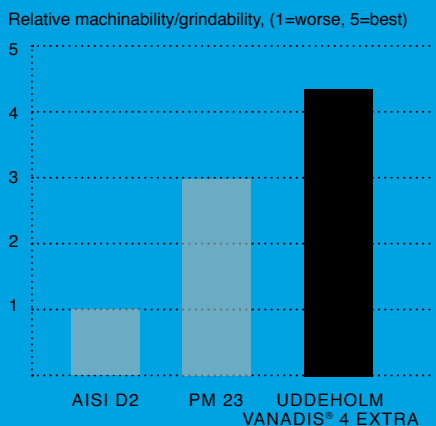
The tool making process is a very important link in the tooling sequence. In order to achieve a long and reliable tool performance the quality of the tool in terms of surface finish is extremely important. Vanadis 4

Extra offers very good machinability and grindability compared to other high alloyed PM tool steel, giving the best conditions for excellent tool quality.

Uddeholm Vanadis 4 Extra SuperClean characteristics:

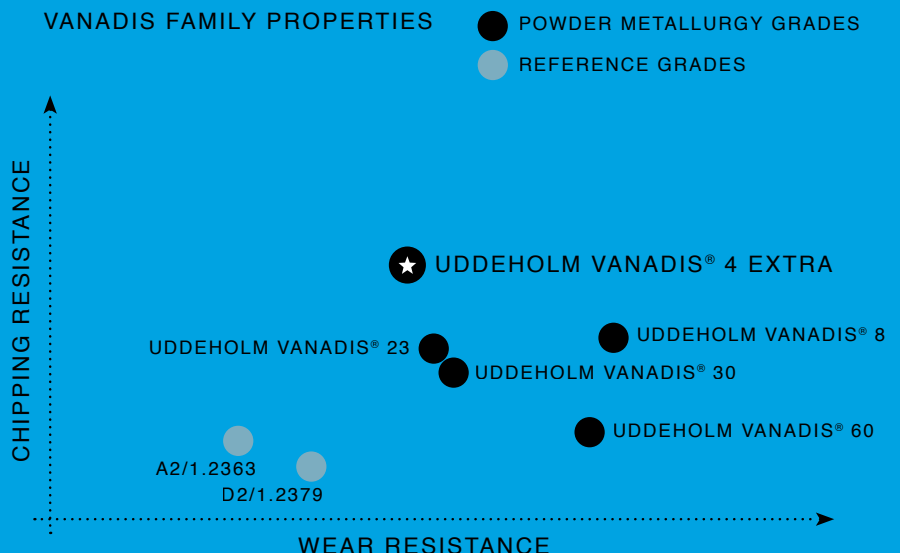
- Cr-Mo-V-alloyed PM steel
- Excellent resistance to chipping
- High abrasive/adhesive wear resistance
- High compressive strength
- Very good dimensional stability
- Very good through-hardening properties
- Good temper back resistance
- Very good machinability and grindability

### MACHINABILITY



Relative machinability and grindability for AISI D2, PM 23 and Uddeholm Vanadis® 4 Extra. High value indicates good machinability.

### VANADIS FAMILY PROPERTIES



**TRUSTED TO WORK**



Excellent for producing coated rotor-plates for electrical engines.



# Uddeholm Vanadis® 8 SuperClean

## ABRASIVE WEAR RESISTANCE REINVENTED

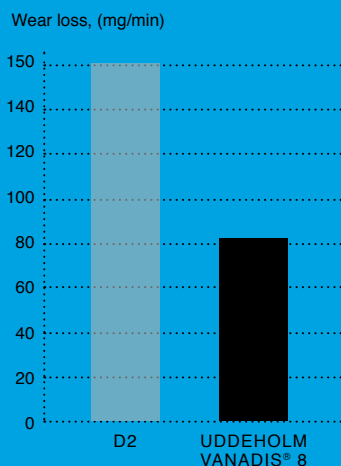
When it comes to wear resistance, there is simply no match for Uddeholm Vanadis 8 SuperClean. Suitable for very long production runs where abrasive wear is a dominating failure mechanism, Vanadis 8 is popular for various cold work applications, e.g. blanking and forming. As its properties also include good resistance to chipping, it is an interesting alternative in applications where tools in cemented carbide commonly chip or crack. In tool making, Vanadis 8 offers a good machinability and grindability together with a good dimensional stability

during heat treatment. Vanadis 8 is usually be hardened to 60–65 HRC.

Uddeholm Vanadis 8 SuperClean characteristics:

- Cr-Mo-V alloyed PM steel
- High abrasive wear resistance
- High compressive strength
- Very good through-hardening properties
- Good resistance to chipping
- Very good stability in hardening
- Good resistance to tempering back

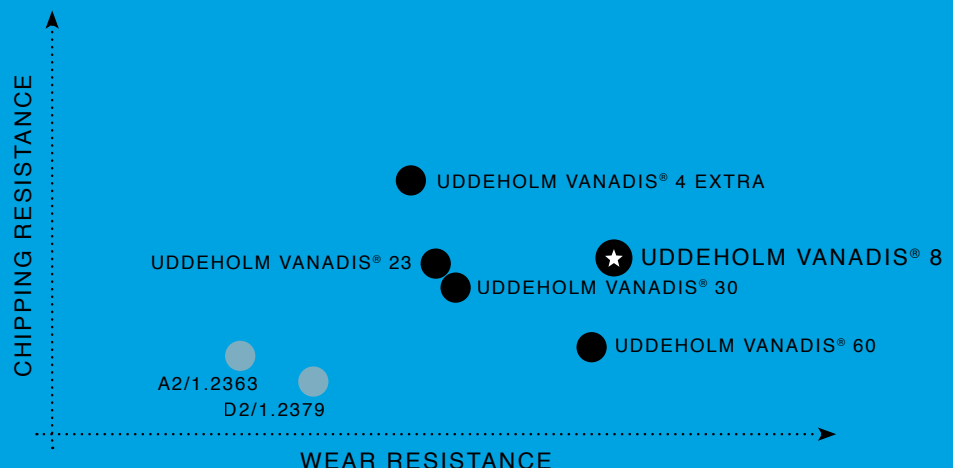
### TOOL WEAR



Pin-on-disc test. Disc material: SiC.  
Uddeholm Vanadis® 8 = 62 HRC, D2 = 62 HRC

### VANADIS FAMILY PROPERTIES

- POWDER METALLURGY GRADES
- REFERENCE GRADES





**THE RISK ELIMINATOR**



Window frame fitting  
by BT Components.



# Uddeholm Vanadis<sup>®</sup> 23 SuperClean

## THE BEST OF BOTH WORLDS

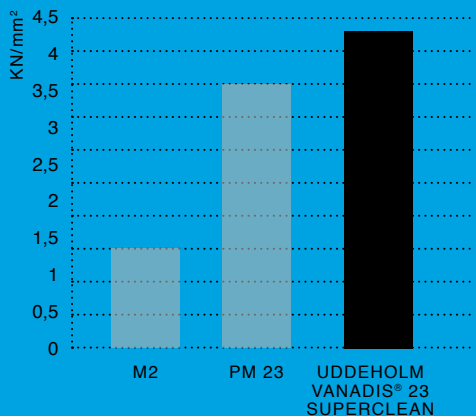
Sometimes, the best solution is to compromise. Uddeholm Vanadis 23 SuperClean was created with this in mind. Its combination of high chipping resistance and high wear resistance makes it the steel of choice in a wide range of applications where neither failure mechanism is dominant. Vanadis 23 is perfect for high volume cold work applications like blanking of harder materials, e.g. carbon steel or cold rolled strip steel. It is also suitable for forming thinner work materials. The machinability and grindability are superior to conventional high speed steel and so is the dimensional

stability after heat treatment. The extremely powder metallurgy process ensures that the cleanliness is on a high level with a low amount of non-metallic inclusions.

Uddeholm Vanadis 23 SuperClean characteristics:

- Cr-Mo-W-V alloyed PM steel
- High wear resistance
- High compressive strength
- Very good through-hardening properties
- Good toughness
- Very good dimensional stability
- Very good temper resistance

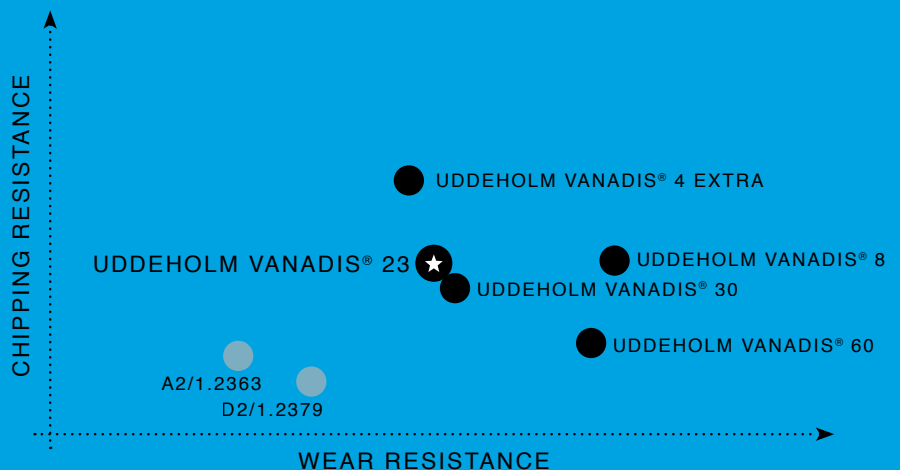
### BENDING STRENGTH



Bending strength bar dimensions 100 mm diameter, transverse direction at 65 HRC.

### VANADIS FAMILY PROPERTIES

- POWDER METALLURGY GRADES
- REFERENCE GRADES



**SPEED IT UP**



Excellent grades for mass production of aluminium cans of all kinds.



# Uddeholm Vanadis® 30 SuperClean

# Uddeholm Vanadis® 60 SuperClean

## FOR TOOLING AT ELEVATED TEMPERATURES

Introduced as high speed steel variants of the well-known Uddeholm Vanadis series of PM steel grades, the Vanadis 30 and Vanadis 60 offer similar properties as their cousins, Vanadis 23 and Vanadis 8 – with a twist.

Vanadis 30 is close to Vanadis 23 when it comes to chipping and wear resistance, but combines these properties with an unusually good compressive strength and high hardness (67 HRC). Vanadis 60 almost matches Vanadis 8 when it comes to extreme wear resistance. In addition Vanadis 60 also offers very good compressive strength, as it can reach up to 70 HRC.

Both steels can be put to use in tooling where elevated temperatures are an issue. In some cold work applications, the active surface of a tool can reach temperatures in excess of 200°C. Such conditions can be found in high-speed presses.

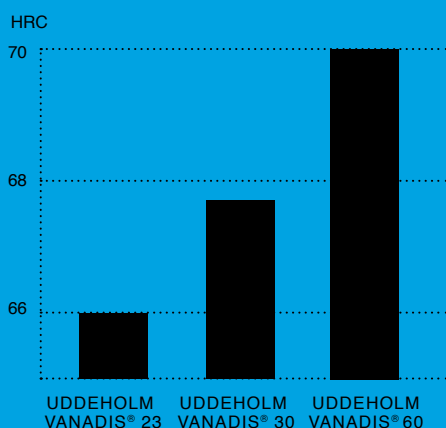
Uddeholm Vanadis 30 SuperClean characteristics:

- W-Mo-V-Co alloyed PM steel
- High wear resistance
- High compressive strength at high hardness
- Good through hardening properties
- Good toughness
- Good dimensional stability
- Good grindability and machinability
- Very good temper resistance

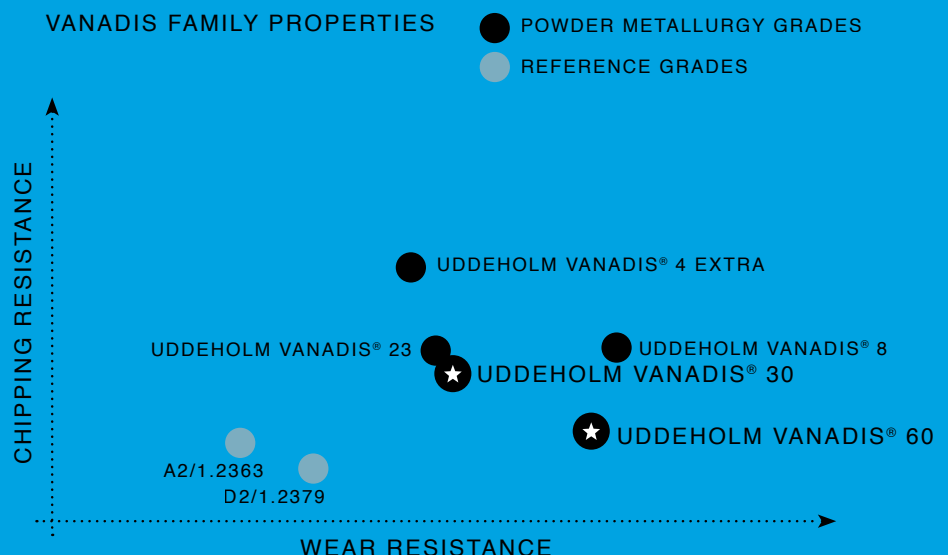
Uddeholm Vanadis 60 SuperClean characteristics:

- W-Mo-V-Co alloyed PM steel
- Excellent wear resistance
- Maximum compressive strength
- Good through hardening properties
- Good toughness
- Good dimensional stability
- Very good temper resistance

MAXIMUM HARDNESS



VANADIS FAMILY PROPERTIES



**EVERY TIME A WINNER**





Over 40 million of these parts were produced in one single tool.

## Uddeholm Vancron® SuperClean

### THE MARATHON RUNNER OF TOOL STEEL

A tool manufactured in Uddeholm Vancron SuperClean keeps on going long after the competition has given in. There are even cases where one single tool served throughout an entire production run of some 40,000,000 parts. At the heart of this unique tool steel is its unique properties of the contact surface. Combining excellent galling resistance, adhesive wear resistance and low friction, it is especially suited for coping with problems that may occur in various cold work applications, such as powder compacting, cold extrusion, blanking and forming processes.

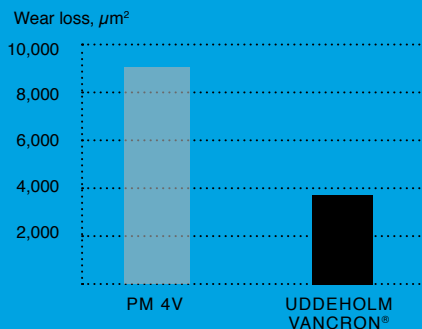
Soft work materials like aluminium and austenitic stainless steel as well as metal powder and high strength sheet materials

are all prone to sticking or cladding to the surface of the tool in many common applications. Vancron SuperClean will vastly improve tool life and reduce the cost per produced part. In addition, production will run smoother, with fewer disturbances – effectively increasing production output.

Uddeholm Vancron SuperClean characteristics:

- Cr-Mo-W-V-N-alloyed PM steel
- Extremely high galling resistance
- Very high adhesive wear resistance
- Good chipping and cracking resistance
- High compressive strength
- Good through hardening properties
- Good dimensional stability in hardening
- Easy to machine in hardened condition

#### TOOL WEAR



Component: Laboratory test – blanking of strip  
 Work material: AISI 304, thickness = 1mm  
 Tool type: Blanking punch

#### POWDER COMPACTING PUNCH

	PM 23	UDDEHOLM VANCRON®
Surface coating	PVD (TiAlN)	Uncoated
Hardness, HRC	62	61
Parts produced	20,000	48,000
Failure mechanism	Galling	Wear

**PUTS YOUR KNIFE  
ON THE TOP**



Uddeholm Elmax used in Spyderco's knife LionSpy, produced by LionSteel.



## Uddeholm Elmax® SuperClean

**SPECIALLY DEVELOPED FOR HIGH-TECH APPLICATIONS**

High wear resistance is usually associated with low corrosion resistance and vice versa. With Uddeholm Elmax SuperClean, you get a set of properties that only the finest powder metallurgy can offer. High wear resistance combined with corrosion resistance makes Elmax SuperClean especially suited for long-life, low maintenance moulds and high-tech applications. Choosing Elmax as your tool steel means higher output, reduced maintenance and a more predictable production process – leading, in the end, to improved production economy.

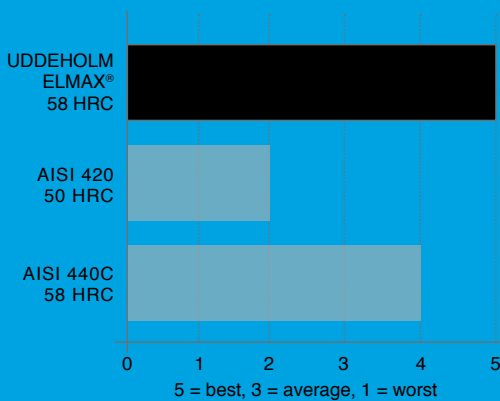
Uddeholm Elmax has been specially developed for high-tech applications. These

include products within the electronic industry such as connectors, plugs, switches, resistors, integrated circuits, etc. It is also used in the food processing industry, where cleanliness is an issue, and for producing industrial and custom knives. For these applications, its unique combination of properties make it a very popular choice.

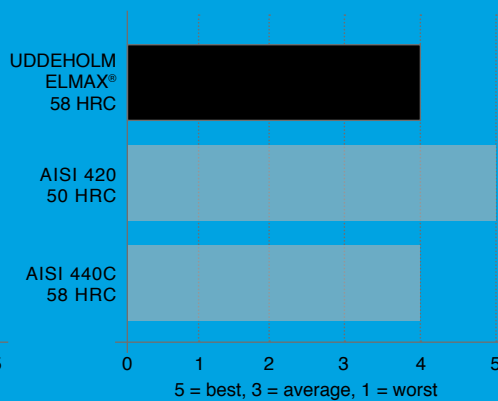
Uddeholm Elmax SuperClean characteristics:

- Cr-V-Mo-alloyed PM steel
- High wear resistance
- High compressive strength
- High corrosion resistance
- Very good dimensional stability

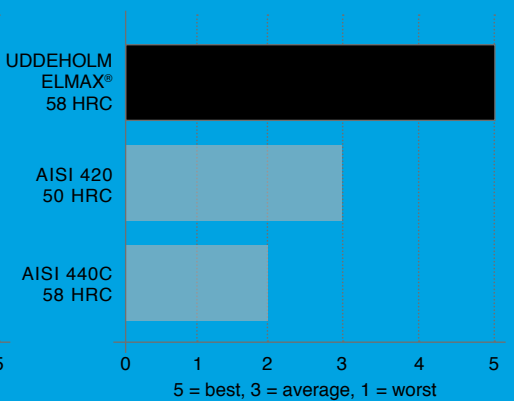
WEAR RESISTANCE



CORROSION RESISTANCE



POLISHABILITY



Relative property profile for Uddeholm Elmax® SuperClean, AISI 420 and AISI 440C in plastic moulds.

# #1 IN HIGH PERFORMANCE TOOL STEEL

Since 1668 we have been providing a wide range of innovative cutting-edge solutions for our customers in demanding segments. Our dedicated employees work in almost ninety countries and together we deliver improved competitiveness to clients worldwide. Welcome to Uddeholm, #1 in high performance tool steel.