Some things last forever
ASSAB SuperClean Concept - The Ultimate PM Tool Steel
Some things last forever

There are times when even the most durable ordinary tool steel fails, giving rise to unwanted production stops, delays and lower cost-effectiveness. When ASSAB 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 of ASSAB PM tool steel lasted entire production runs – some 40,000,000 units manufactured using a single tool. Apparently, some things do last forever.

ASSAB now introduces ASSAB 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.

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The latest revised edition of this brochure is the English version, which is always published on our web site www.assab.com
ASSAB 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 ASSAB 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.

ASSAB SuperClean Concept consists of a number of proven steel grades, engineered for a wide range of applications. The ASSAB 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 ASSAB SuperClean Concept is the way forward.

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. ASSAB 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. ASSAB SuperClean Concept is an example of that ambition: to provide the future tooling materials, today.

WE COACH, YOU CREATE

In a broader perspective, ASSAB 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 ASSAB tool steel will be beneficial in more ways than one. We are always ready to coach you as you create.
Reliable tool performance
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 toolmaking 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 SuperClean offers very good machinability and grindability compared to other high alloyed PM tool steel, giving the best conditions for excellent tool quality.

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

Relative machinability and grindability for AISI D2, PM 23 and Vanadis 4 Extra. High value indicates good machinability.
Trusted to work
Excellent for producing coated rotor-plates for electrical engines.

Vanadis 10 SuperClean
ABRASIVE WEAR RESISTANCE REINVENTED

When it comes to wear resistance, there is simply no match for Vanadis 10 SuperClean. Suitable for very long production runs where abrasive wear is a dominating failure mechanism, Vanadis 10 SuperClean 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 toolmaking, Vanadis 10 SuperClean offers a good machinability and grindability together with a good dimensional stability during heat treatment. Vanadis 10 SuperClean is usually be hardened to 60–65 HRC.

Uddeholm Vanadis 10 SuperClean characteristics:
• Cr-Mo-V alloyed PM steel
• Extremely 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

Wear loss, (mg/min)

D2 VANADIS 10

ASSAB PM SUPERCLEAN-FAMILY PROPERTIES

POWDER METALLURGY GRADES
REFERENCE GRADES

CHIPPING RESISTANCE

WEAR RESISTANCE

ASSAB PM 23
ASSAB PM 30
VANADIS 4 EXTRA
VANADIS 10
ASSAB PM 60

Pin-on-disc test. Disc material: SiC.
Vanadis 10 = 62 HRC, D2 = 62 HRC
The risk eliminator
ASSAB PM 23 SuperClean
THE BEST OF BOTH WORLDS

Sometimes, the best solution is to compromise. ASSAB PM 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. ASSAB PM 23 SuperClean 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.

ASSAB PM 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
Speed it up
Introduced as high speed steel variants of the well-known Vanadis series of PM steel grades, the ASSAB PM 30 SuperClean and ASSAB PM 60 SuperClean offer similar properties as their cousins, ASSAB PM 23 SuperClean and Vanadis 10 SuperClean – with a twist.

ASSAB PM 30 SuperClean is close to ASSAB PM 23 SuperClean when it comes to chipping and wear resistance, but combines these properties with an unusually good compressive strength and high hardness (67 HRC). ASSAB PM 60 SuperClean almost matches Vanadis 10 SuperClean when it comes to extreme wear resistance. In addition, ASSAB PM 60 SuperClean 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.

ASSAB PM 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

ASSAB PM 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

ASSAB PM 30 SuperClean features:
- MAXIMUM HARDNESS
  - HRC 70
  - HRC 68
  - HRC 66

ASSAB PM 60 SuperClean features:
- MAXIMUM HARDNESS
  - HRC 70
  - HRC 68
  - HRC 66

Excellent grades for mass production of aluminium cans of all kinds.
Every time a winner
A tool manufactured in Vancron 40 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 40 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.

**Vancron 40 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

<table>
<thead>
<tr>
<th>Wear loss, µm³</th>
<th>PM 4V</th>
<th>VANCRON 40</th>
</tr>
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<tbody>
<tr>
<td>10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,000</td>
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</tr>
</tbody>
</table>

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

### POWDER COMPACTING PUNCH

<table>
<thead>
<tr>
<th></th>
<th>PM 23</th>
<th>VANCRON 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface coating</td>
<td>PVD (TiAIN)</td>
<td>Uncoated</td>
</tr>
<tr>
<td>Hardness, HRC</td>
<td>62</td>
<td>61</td>
</tr>
<tr>
<td>Parts produced</td>
<td>20,000</td>
<td>48,000</td>
</tr>
<tr>
<td>Failure mechanism</td>
<td>Galling</td>
<td>Wear</td>
</tr>
</tbody>
</table>
Higher output
Elmax SuperClean
SPECIALY DEVELOPED FOR HIGH-TECH APPLICATIONS

High wear resistance is usually associated with low corrosion resistance and vice versa. With 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 SuperClean as your tool steel means higher output, reduced maintenance and a more predictable production process – leading, in the end, to improved production economy.

Elmax SuperClean 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.

**Elmax SuperClean characteristics:**
- Cr-V-Mo-alloyed stainless PM steel
- High wear resistance
- High compressive strength
- High corrosion resistance
- Very good dimensional stability

**Relative property profile for Elmax SuperClean, AISI 420 and AISI 440C in plastic moulds.**
Choosing the right steel is of vital importance. ASSAB engineers and metallurgists are always ready to assist you in your choice of the optimum steel grade and the best treatment for each application. ASSAB not only supplies steel products with superior quality, we offer the state-of-the-art machining, heat treatment and surface treatment services to enhance steel properties to meet your requirement in the shortest lead time. Using holistic approach as a one-stop solution provider, we are more than just another tool steel supplier.

ASSAB and Uddeholm are present on every continent. This ensures you that high-quality tool steels and local support are available wherever you are. Together, we secure our position as the world’s leading supplier of tooling materials.

For more information, please visit www.assab.com