

ASSAB
SuperClean

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.



VANADIS 4 EXTRA SUPERCLEAN	4
VANADIS 10 SUPERCLEAN	6
ASSAB PM 23 SUPERCLEAN	8
ASSAB PM 30 SUPERCLEAN	10
ASSAB PM 60 SUPERCLEAN	10
VANCRON 40 SUPERCLEAN	12
ELMAX SUPERCLEAN	14

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.

For the tool maker this means:

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

= Improved total economy

For the tool user this means:

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

= 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. 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



Excellent choice for blanking
in high strength materials.



Vanadis 4 Extra SuperClean

CHIPPING RESISTANCE NONE CAN MATCH

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

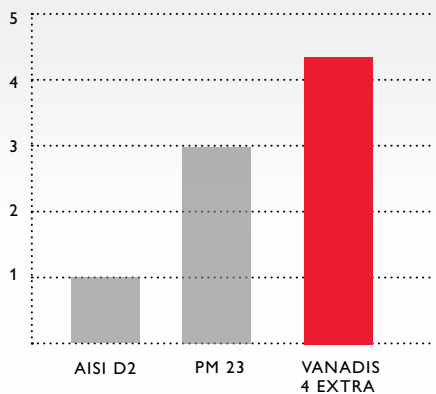
grindability compared to other high alloyed PM tool steel, giving the best conditions for excellent tool quality.

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

MACHINABILITY

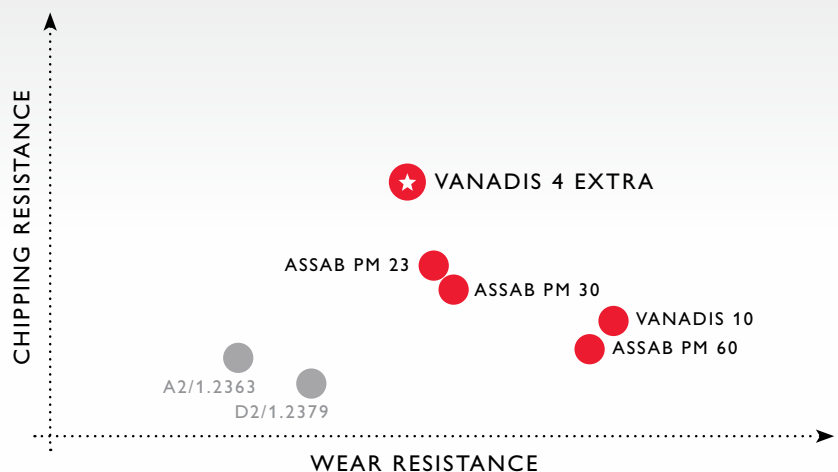
Relative machinability/grindability, (1=worse, 5=best)



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

ASSAB PM SUPERCLEAN FAMILY PROPERTIES

- POWDER METALLURGY GRADES
- REFERENCE GRADES



Trusted to work



Excellent for producing coated rotor-plates for electrical engines.



Vanadis 10 SuperClean

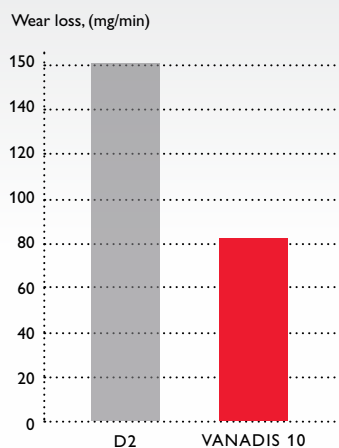
ABRASIVE WEAR RESISTANCE REINVENTED

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:

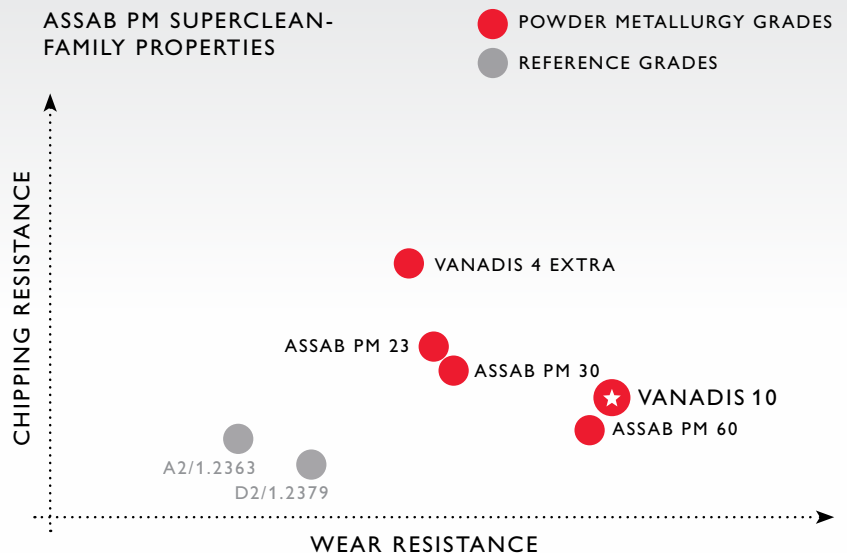
- Cr-Mo-V alloyed PM steel
- Extremely high abrasive wear resistance
- High compressive strength
- Very good through-hardening properties
- Good resistance to chipping
- Very good stability in hardening
- Good resistance to tempering back

TOOL WEAR



Pin-on-disc test. Disc material: SiC.
Vanadis 10 = 62 HRC, D2 = 62 HRC

ASSAB PM SUPERCLEAN-FAMILY PROPERTIES





The risk eliminator

Window frame fitting
by BT Components.



ASSAB PM 23 SuperClean

THE BEST OF BOTH WORLDS

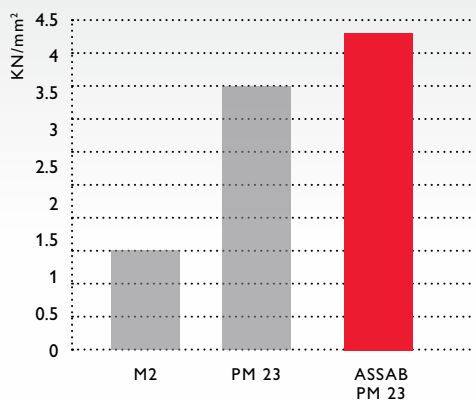
Sometimes, the best solution is to compromise. ASSAB PM 23 SuperClean was created with this in mind. Its combination of high chipping resistance and high wear resistance makes it the steel of choice in a wide range of applications where neither failure mechanism is dominant. ASSAB PM 23 SuperClean is 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:

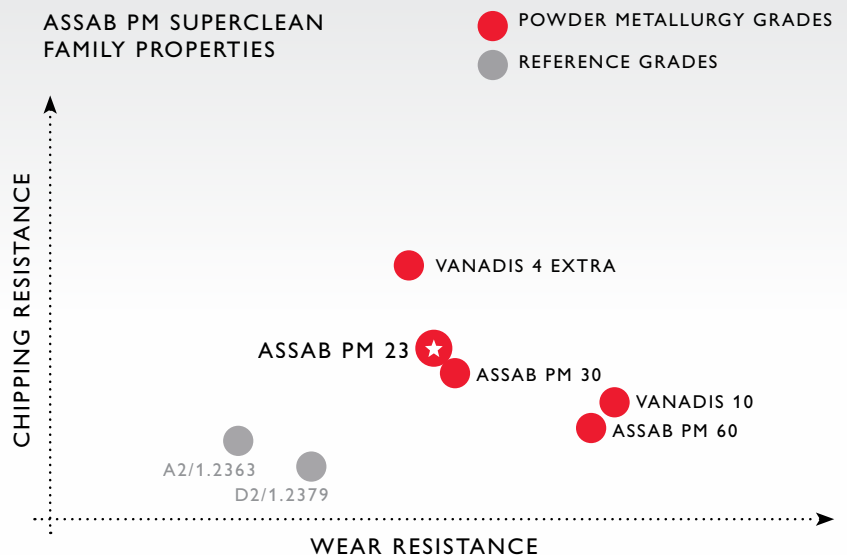
- Cr-Mo-W-V alloyed PM steel
- High wear resistance
- High compressive strength
- Very good through-hardening properties
- Good toughness
- Very good dimensional stability
- Very good temper resistance

BENDING STRENGTH



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

ASSAB PM SUPERCLEAN FAMILY PROPERTIES



Speed it up



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



ASSAB PM 30 SuperClean ASSAB PM 60 SuperClean

FOR TOOLING AT ELEVATED TEMPERATURES

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.

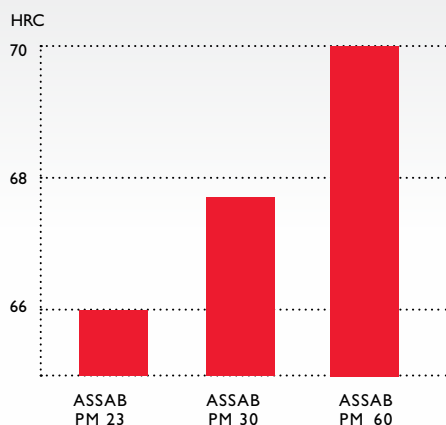
ASSAB PM 30 SuperClean characteristics:

- 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

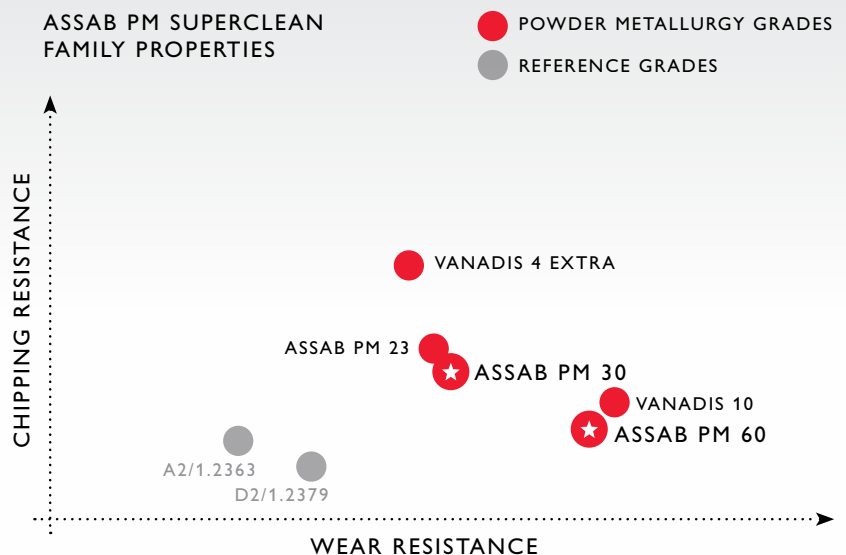
ASSAB PM 60 SuperClean characteristics:

- 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

MAXIMUM HARDNESS



ASSAB PM SUPERCLEAN FAMILY PROPERTIES



Every time a winner





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

Vancron 40 SuperClean

THE MARATHON RUNNER OF TOOL STEEL

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.

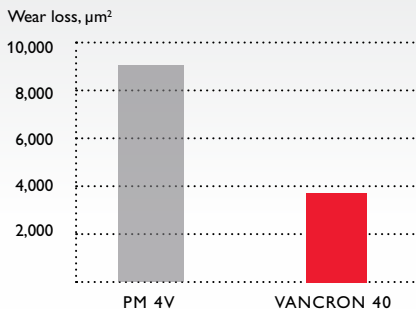
Soft work materials like aluminium and austenitic stainless steel as well as metal powder and high strength sheet materials are all prone to sticking

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



POWDER COMPACTING PUNCH

	PM 23	VANCRON 40
Surface coating	PVD (TiAlN)	Uncoated
Hardness, HRC	62	61
Parts produced	20,000	48,000
Failure mechanism	Galling	Wear

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

Higher output



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



Elmax SuperClean

SPECIALLY DEVELOPED FOR HIGH-TECH APPLICATIONS

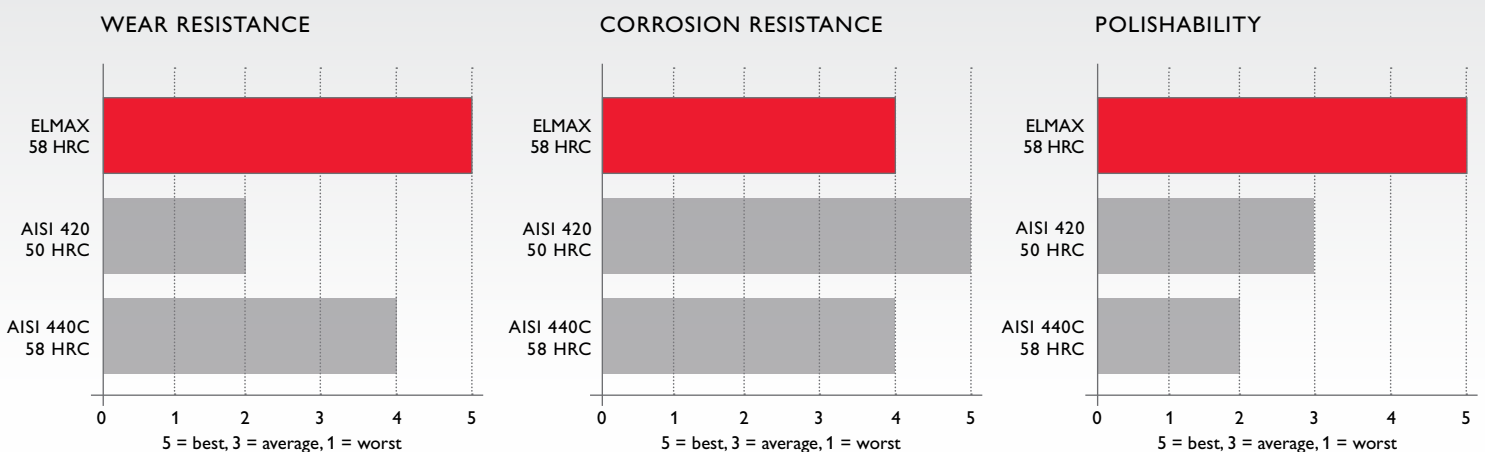
High wear resistance is usually associated with low corrosion resistance and vice versa. With Elmax SuperClean, you get a set of properties that only the finest powder metallurgy can offer. High wear resistance combined with corrosion resistance makes Elmax SuperClean especially suited for long-life, 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

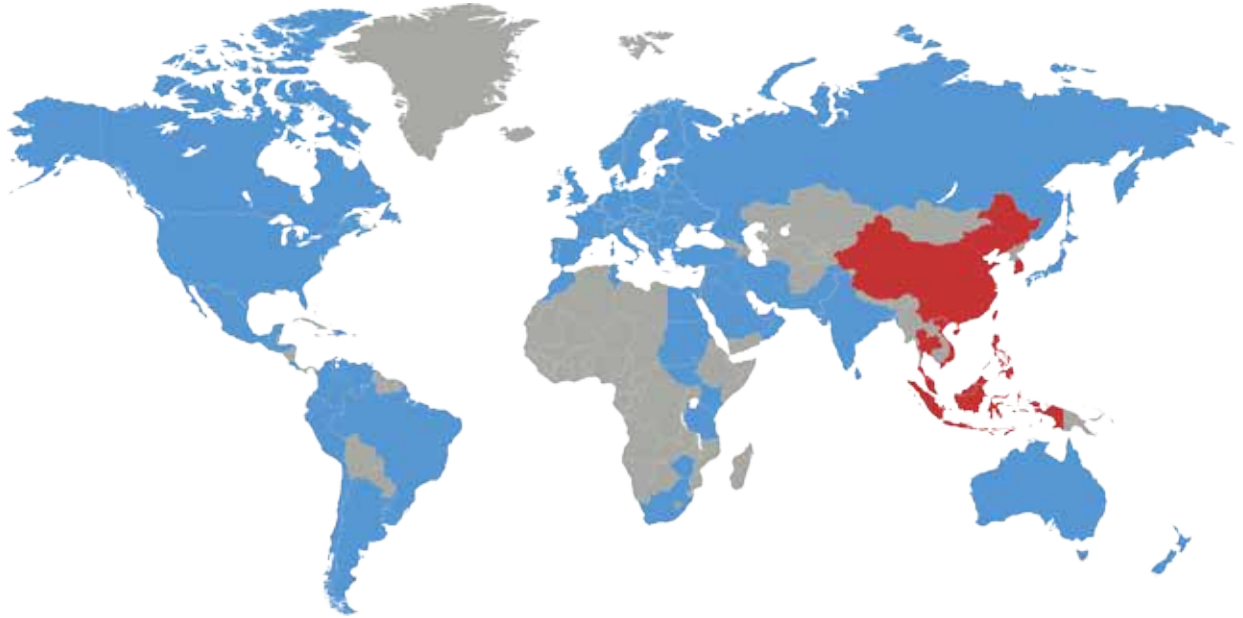
within the electronic industry such as connectors, plugs, switches, resistors, integrated circuits, etc. It is also used in the food processing industry, where cleanliness is an issue, and for producing industrial and custom knives. For these applications, its unique combination of properties make it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