ASSAB Premium Steel for Knives

RETAIN YOUR EDGE

Edition 20181022

A CUT ABOVE THE REST

ASSAB PREMIUM TOOL STEEL FOR KNIVES

ASSAB is one of the market leaders in providing the premium tool steel for the manufacturing industry. Products used in your everyday life, like your car, dishwasher or lawn mower, all contain parts that have been cut out and formed using tools made from ASSAB steel. Stringent modern demands on productivity and the cutting of difficult and hard work materials, have inspired us to develop one of the best tool steels in the world. If we can improve tool performance in the most demanding industrial applications, imagine what it can do for your knife blade performance.

CLEAN, CLEANER, SUPERCLEAN

ASSAB has state-of-the-art steel making facilities. Among them is one of the world's most modern plants for powder metallurgical steel, where the steel making process is a triple update from standard levels. That's why we call our PM grades SuperClean. For knife manufacturers it means steel that enables sharper edges, tougher blades and trouble-free production with excellent grinding and polishing properties.

EDGE RETENTION

WEAR RESISTANCE

High carbide density provides resistance against wear. PM steel has a high amount of vanadium carbides, which are twice as the hard as chromium carbide found in conventional steel.

EDGE STABILITY

Edge chipping is minimised with a high level of purity and a uniform structure. The carbides found in PM steel are smaller and rounder than those in conventional steel, meaning no weak points. Edge rolling and impact damage are minimised through high hardness and high cleanliness.

EDGE ANGLE

A high hardness PM steel can be ground to a smaller, hence sharper edge angle without the risk of roll over the edge. Especially suited for chefs' knives.

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


PREMIUM STEEL
FOR EVERYDAY USE

Vanax SuperClean

A TRUE REVOLUTION IN THE WORLD OF KNIFE STEEL

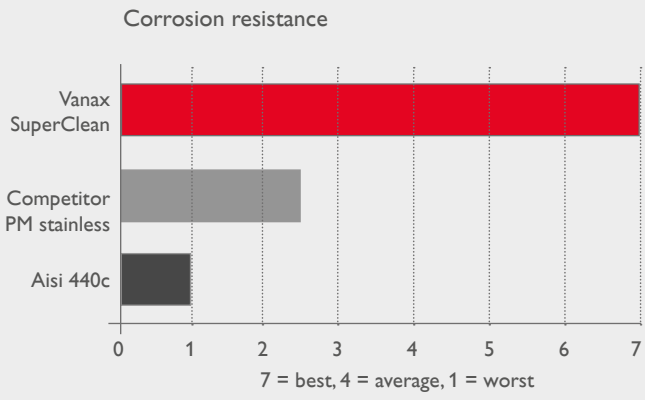
Corrosion resistance as good as 300 series stainless steel, wear resistance and edge retention of vanadium alloyed PM steel? Sounds like a dream come true for any real knife enthusiast.

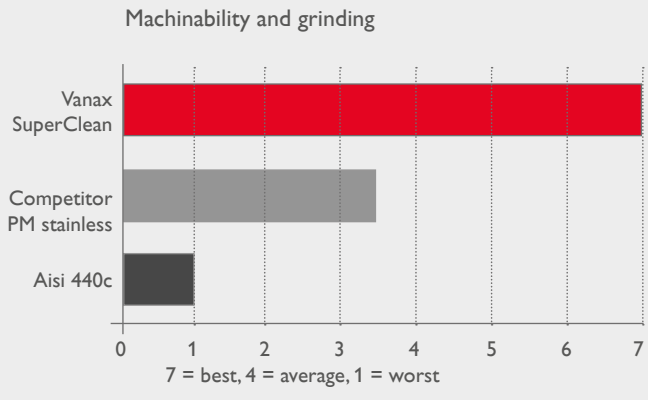
In Vanax SuperClean we have made this happen with a revolutionary method of replacing most of the carbon with nitrogen to optimise the amount of chromium in solid solution. The nitrogen forms extremely small (<1 µm) and hard vanadium nitrides, enabling a great combination of wear resistance, edge retention, grindability and toughness.

Vanax SuperClean, with its excellent corrosion resistance and toughness, is the most innovative powder metallurgical knife steel in the market today. It is perfectly suited for the most demanding applications, like salt-water tactical knives, as it gives an outstanding blade that retains its edge, regardless if used in corrosive and high wear environment, with a minimum need of maintenance.

Vanax SuperClean is excellent for chefs' knives and kitchen knives.

Relative property profile for Vanax SuperClean
(at recommended hardness)






DEVELOPED
FOR ACTIVE USE

Elmax SuperClean

THE BEST ALL-ROUND KNIFE STEEL

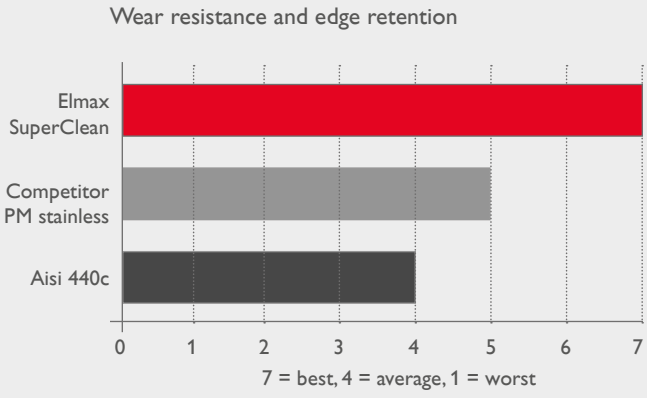
Elmax is a perfectly balanced PM grade which has been designed to reach a hardness well over 60 HRC with good corrosion resistance and excellent edge retention. The superclean production process combined with small sized powder and carbides guarantees trouble-free grinding and polishing. Our process and powder properties is to ensure a super fine edge and that it can be ground even at hardnesses up to 62 HRC. This means that the final grinding can be done after hardening, eliminating heat treatment related risks such as distortion and surface decarburization. It also means maximised toughness and a minimised risk for edge chipping.

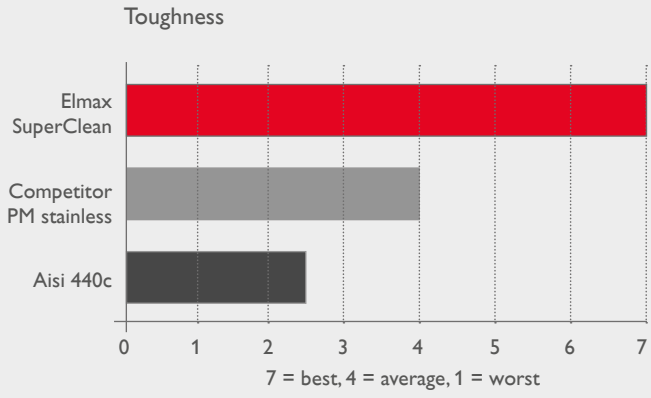
Internal lab toughness tests have shown that Elmax, even at maximum hardness, outperforms other stainless PM knife grades, regardless of their hardness.

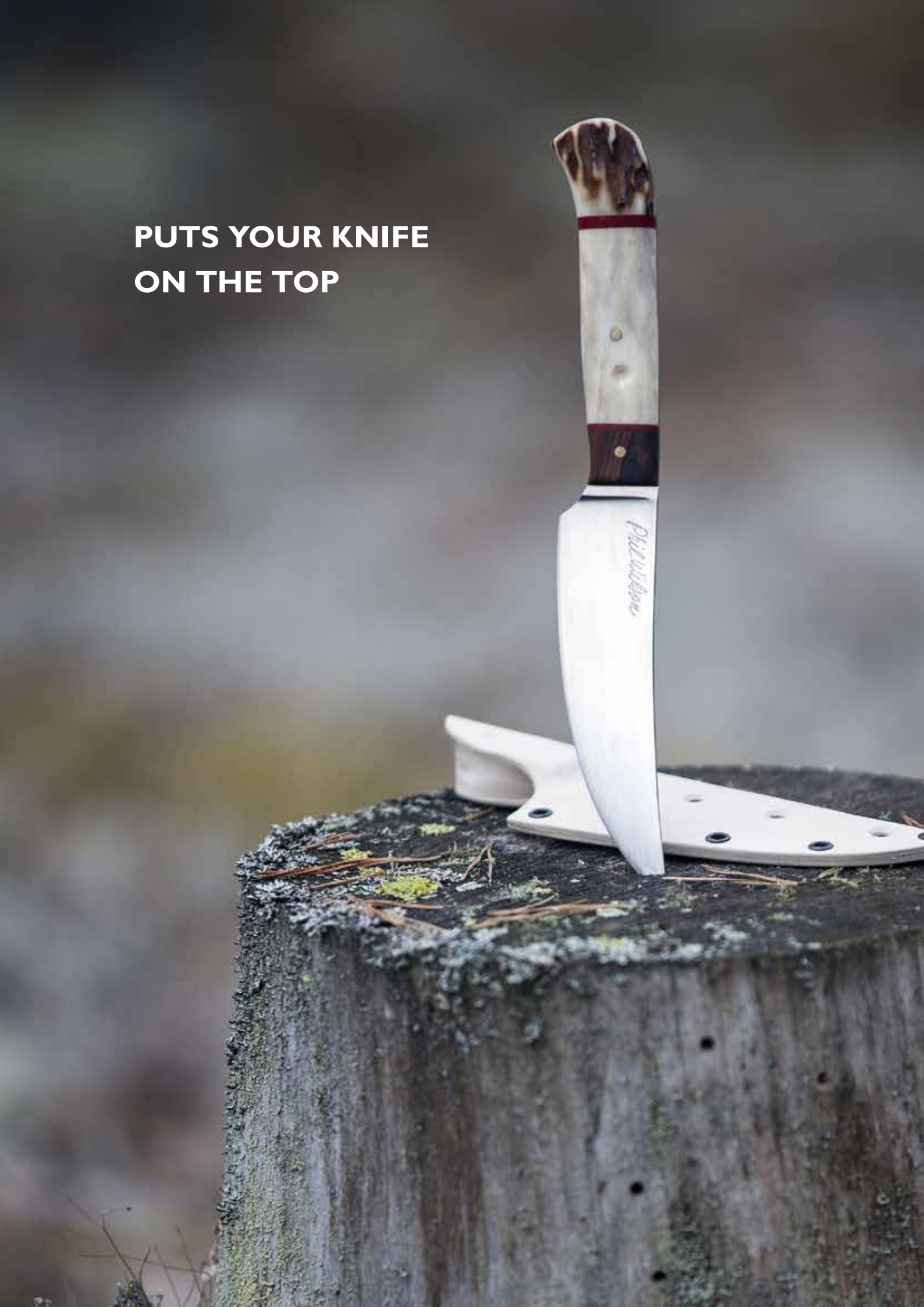
Firstedge® 1450
TrackLock™

Firstedge® 5150
Elite Field Knife

Relative property profile for Elmax SuperClean
(at recommended hardness)






PUTS YOUR KNIFE
ON THE TOP

Vanadis 4 Extra SuperClean

THE RELIABLE CHOICE

A PM tool steel grade designed for maximum toughness and recommended for use in tactical utility knives, where high reliability is needed. Although it can be hardened to 64 HRC, the recommended hardness range is 58–62 HRC.

Vanadis 8 SuperClean

WHEN WEAR RESISTANCE IS THE KEY

Vanadis 8 SuperClean has a very high alloy content with 8% vanadium and a hardness of 60-64 HRC that makes this our most wear-resistant PM grade. The high wear resistance of Vanadis 8 SuperClean is combined with excellent chipping resistance and toughness. This makes Vanadis 8 SuperClean suitable for knives where abrasive wear is predominant.

ASSAB 88

A UNIVERSAL KNIFE STEEL

ASSAB's modern version of the classic D2/W1.2379 tool steel with improved toughness to better fit active knife use. Even though this is not a PM steel, the finer steel structure in ASSAB 88 gives better machinability, polishability and edge retention. The hardness range is 58–64 HRC.

TECHNICAL GUIDELINES

CHEMICAL COMPOSITION

Vanax SuperClean

	C	N	Cr	Mo	V
ANALYSIS %	0.36	1.55	18.2	1.1	3.5

The high content of soluble chromium, molybdenum and nitrogen in the matrix results in Vanax SuperClean's excellent corrosion properties.

Elmax SuperClean

	C	Cr	Mo	V
ANALYSIS %	1.7	18.0	1.0	3.0

The high chromium content gives Elmax SuperClean good corrosion resistance. The addition of vanadium and high carbon content improve hardness and abrasive wear resistance.

Vanadis 4 Extra SuperClean

	C	Cr	Mo	V
ANALYSIS %	1.4	4.7	3.5	3.7

The alloy design and combination of carbon and vanadium are balanced to form a relatively low amount of small but very hard vanadium carbides. This results in a steel with good wear resistance and maximised toughness.

Vanadis 8 SuperClean

	C	Si	Mn	Cr	Mo	V
ANALYSIS %	2.3	0.4	0.4	4.8	3.6	8

The combination of a very high carbon content with a high amount of chromium and vanadium leads to the formation of a very large volume of chromium and vanadium carbides. This gives the high wear resistance.

ASSAB 88

	C	Mn	Cr	Mo	V
ANALYSIS %	0.9	0.55	7.8	2.5	0.5

A tool steel with properties well suited for knives. Good wear resistance, good resistance to chipping and high compressive strength give a knife with good edge retention.

HEAT TREATMENT

Vanax SuperClean and Elmax SuperClean

Vanax SuperClean and Elmax SuperClean are heat treated according to normal procedures with regard to soft annealing, stress relieving, hardening and tempering. However, to achieve maximum hardness, it is important to use as high a quenching speed as possible. In a vacuum furnace, we recommend using a minimum of 4 bar quench, and ensuring that the furnace is loaded properly and not overfilled. It is also possible to use other quenching media, such as oil and salt bath. Low-temperature tempering is recommended to ensure good corrosion resistance, but if necessary, clamp tempering can be used in the range 450–500°C.

Both grades have a thin layer of 300 series stainless capsule material on the surface, which protects the PM steel during the manufacturing process. It is recommended to remove this layer before hardening. The reason is that it will act as an insulation and the result could be a lower hardness. The recommended machining allowance is 0.2 mm per side. Bevel grinding can still be performed after heat treatment. For Vanax SuperClean it is recommended to apply a nitrogen partial pressure of 150-200 mbar to counteract loss of N on the surface. If grinding is performed after heat treatment, 0.2 mm should still be removed at some stage in the production process to ensure full removal of the capsule material.

Vanadis 8 SuperClean and ASSAB 88

Vanadis 8 SuperClean and ASSAB 88 are heat treated according to normal procedures. As they are non-stainless, high-temperature tempering is recommended. Therefore deep cooling is no longer necessary to attain full hardness.

RECOMMENDED HEAT TREATMENT	Austenitising ■30 min holding time □15 min holding time	CRYO TREATMENT	Tempering ■ (3x1h) □ (2x2h)	HARDNESS
Vanax SuperClean	1080°C	-195°C	200°C	60 HRC
Elmax SuperClean	1040°C	-195°C	250°C	58 HRC
Elmax SuperClean	1150°C	-195°C	200°C	62 HRC
Vanadis 4 Extra SuperClean	1040°C	–	560°C	62 HRC
Vanadis 8 SuperClean	1180°C	–	540°C	64 HRC
Vanadis 8 SuperClean	1020°C	–	540°C	60 HRC
ASSAB 88	1150°C	–	540°C	63 HRC
ASSAB 88	1030°C	–	540°C	59 HRC

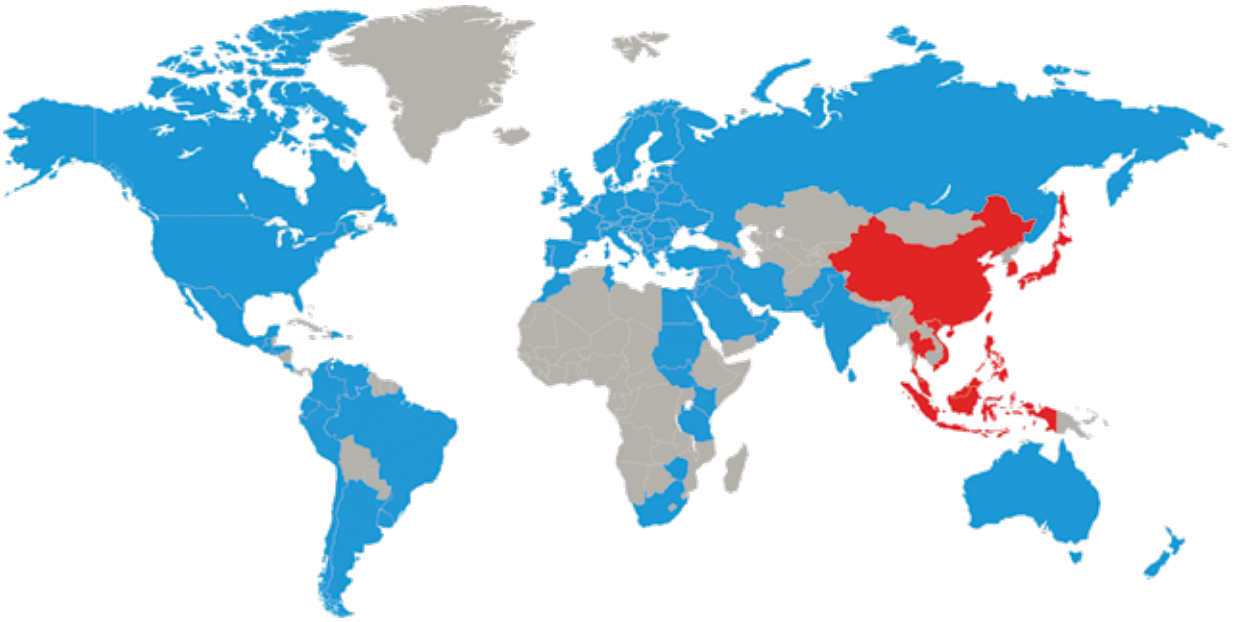
* Deep cool immediately after quenching. If liquid nitrogen cannot be used, deep cooling in dry ice to -72°C can be used with a similar result.
** Optional – if not used, toughness is further enhanced, but a loss of 2 HRC can be expected.

GRINDING

A general grinding wheel recommendation is given below. The data are to be considered guidelines and may require adjustments based on equipment, selection of grinding wheel, etc.

TYPE OF GRINDING	SOFT ANNEALED CONDITION	HARDENED CONDITION
Face grinding straight wheel	a 46 HV	B 151 R50 B3* A 46 GV
Face grinding segments	a 36 Gv	A 46 GV
Cylindrical grinding	A 60 KV	B 151 R50 B3* A 60 JV
Internal grinding	a 60 JV	B 151 R75 B3* A 60 IV
Profile grinding	A 100 IV	B 126 R100 B6* A 100 JV

* Use CBN wheels for long production series



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 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 a 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 steel 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

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