since 1945
75 years

IDUN

UDDEHOLM IDUN

ASSAB

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IDUN

Reliable and efficient steel is essential for good results. The same goes for achieving high productivity and high availability. When choosing the right steel many parameters must be considered. By using superior steel your productivity and your product performance can be greatly improved. When using a pre-hardened and stainless steel you will spend less time to finish your product.

Idun allows you to skip the long and costly process of hardening, surface treatment and the transportation in between that is normally required with standard materials. A safe and reliable fast forward button to your finished product. It shortens tool making lead time and improves tool holder durability. It is e.g. perfect for custom made tool holders.

The driving force behind our research and development is always to enhance your competitiveness and strengthen your business. Idun is the solution that keeps you one step ahead.

The properties of Idun also makes it a suiting steel grade for components where the combination of being pre-hardened and stainless is required.

GENERAL

Idun is a remelted stainless tool steel supplied prehardened to 42–46 HRC.
Idun is produced using the electro-slag remelting (ESR) process—an additional step in the steel making process that ensures very clean steel with low sulphur content (0.003% max.) and non-metallic inclusions.

Idun is characterised by:

- Good machinability
- Good wear resistance
- Excellent ductility and toughness
- Uniform hardness even in large dimensions
- Excellent corrosion resistance

These properties combine to give a steel with outstanding production performance.
The practical benefits of good corrosion resistance can be summarised as follows.

- Time-saver
- No coating needed
- No nickel handling
- Shiny lasting finish
- Stainless properties throughout the material

The benefit of the pre-hardened condition can be summarised as follows.

- No hardening risks
- No hardening costs
- Time saving, e.g. no waiting for heat treatment
- Possible to machine the final product in one step

In addition, the combination of high hardness with a high toughness results in a component with good resistance to indentations and minimise the risk of unexpected failures.

Typical analysis %	C 0.21	Si 0.9	Mn 0.45	Cr 13.5	Mo 0.2	Ni 0.6	V 0.25	N +
Delivery condition	Pre-hardened to 42 – 46 HRC							

APPLICATIONS

Idun is intended for applications with severe demands on high temperature strength of the material, while also requiring excellent machinability.

Examples of applications are:

- Indexable insert drills and milling cutters
- Milling chucks and tool tapers
- Engineering components with severe demands on high temperature strength and stainless properties

PROPERTIES

PHYSICAL DATA

Hardened and tempered to 42 – 46 HRC.
Data at room and elevated temperatures.

Temperature	20°C	200°C	400°C
Density kg/m^3	7 700	-	-
Modulus of elasticity MPa	215 000	210 000	195 000
Coefficient of thermal expansion /°C from 20°C	-	10.6 x 10^{-6}	11.4 x 10^{-6}
Thermal conductivity W/m°C	-	20	21
Specific heat J/kg°C	460	-	

MECHANICAL DATA

TENSILE STRENGTH

All specimens have been taken from a bar Ø 35 mm, hardness 42 – 46 HRC.

Testing temperature	20°C	200°C
Tensile strength, Rm MPa	1 490	1 340
Yield strength, Rp0.2 MPa	1 250	1 100
Reduction of area, Z %	51	50
Elongation, A5 %	12	11

HEAT TREATMENT

Idun is intended for use in the as-delivered condition i.e. hardened and tempered to 42 – 46 HRC.

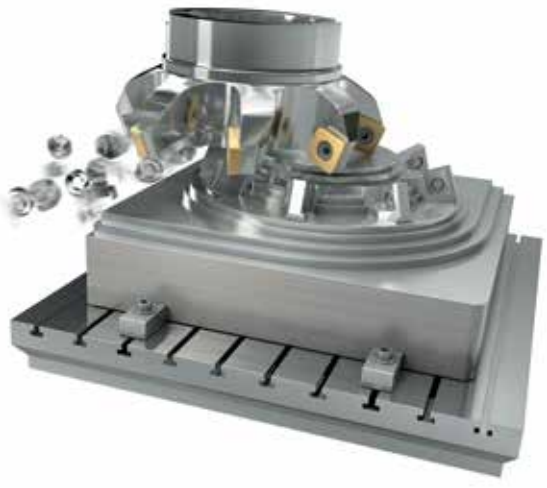
When the steel is to be heat treated to higher hardness, instructions below are to be followed.

SOFT ANNEALING

Protect the steel and heat through to 780°C. Cool at 10°C per hour to 600°C, then freely in air.

STRESS RELIEVING

After rough machining, the component should be heated through to max. 500°C, holding time 2 hours, then cool freely in air.



HARDENING

Note: It is recommended to do soft annealing before hardening.
Preheating temperature: 500 – 600°C.
Austenitising temperature: 980 – 1000°C but usually 980°C.

The steel should be heated through to the austenitising temperature and held at temperature for 30 minutes.
Protect the component against decarburisation and oxidation during the hardening process.

QUENCHING MEDIA

- Vacuum with sufficient positive pressure
- High speed gas/circulating atmosphere

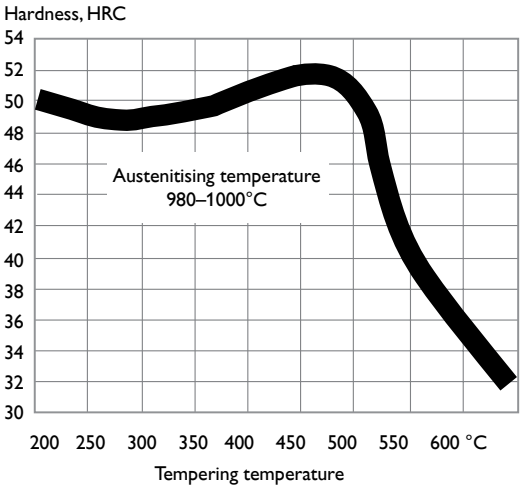
In order to obtain the optimum properties, the cooling rate should be as fast as possible within acceptable distortion limits. Temper the component as soon as its temperature reaches 50 – 70°C.

TEMPERING

Choose the tempering temperature according to the hardness required by reference to the tempering graph. Temper minimum twice with intermediate cooling to room temperature. Lowest tempering temperature 250°C. Holding time at temperature minimum 2 hours.

TEMPERING GRAPH

The tempering curve is approximate.



Above tempering curve is obtained after heat treatment of samples with a size of 15 x 15 x 40 mm, cooling in forced air. Lower hardness can be expected after heat treatment of tools and dies due to factors like actual tool size and heat treatment parameters.

MACHINING RECOMMENDATIONS

The cutting data below are to be considered as guidelines and may require adjustments based on equipment, selection of cutting tools, etc.

The recommendations, in following tables, are valid for Idun, hardness approx. 45 HRC.

TURNING

Cutting data parameter	Turning with carbide	
	Rough turning	Fine turning
Cutting speed (V_c) m/min	60 – 80	80 – 100
Feed (f) mm/rev	0.2 – 0.4	0.05 – 0.2
Depth of cut (a_p) mm	2 – 4	0.5 – 2
Carbide designation ISO	P20 – P30 Coated carbide	P10 Coated Carbide

DRILLING

COATED HIGH SPEED STEEL TWIST DRILLS

Drill diameter mm	Cutting speed (Vc) m/min	Feed (f) mm/rev
≤ 5	10 – 12	0.05 – 0.15
5 – 10	10 – 12	0.15 – 0.20
10 – 15	10 – 12	0.20 – 0.25
15 – 20	10 – 12	0.25 – 0.30

CARBIDE DRILL

Cutting data parameter	Type of drill		
	Indexable insert	Solid carbide	Carbide tip [1]
Cutting speed (V_c) m/min	90 – 110	80 – 100	70 – 80
Feed. (f) mm/rev	0.05 – 0.25 [2]	0.10 – 0.25 [3]	0.15 – 0.25 [4]

[1] Drill with replaceable or brazed carbide tip
[2] Feed rate for drill diameter 20–40 mm
[3] Feed rate for drill diameter 5–20 mm
[4] Feed rate for drill diameter 10–20 mm

MILLING

FACE AND SQUARE SHOULDER MILLING

Cutting data parameter	Turning with carbide	
	Rough milling	Fine milling
Cutting speed (V_c) m/min	40 – 50	50 – 70
Feed (f) mm/tooth	0.15 – 0.25	0.1 – 0.2
Depth of cut (a_p) mm	2 – 4	≤2
Carbide designation ISO	P20 – P40	P10 – P20

END MILLING

Cutting data parameter	Type of end mill		
	Solid carbide	Carbide indexable insert	High speed steel
Cutting speed (V_c) m/min	60 – 100	80 – 100	8 – 10 [1]
Feed. (f) mm/tooth	0.03 – 0.15 [2]	0.08 – 0.15 [2]	0.05 – 0.20 [2]
Carbide designation ISO	–	P15 – P40	–

[1] For coated high speed steel end mill Vc = 25 – 30 m/min
[2] Depending on radial depth of cut and cutter diameter

THREAD CUTTING

For making small internal thread we recommend to use thread milling. A suitable cutting speed is 40 – 50 m/min.

GRINDING

A general grinding wheel recommendation is given below. More information can be found in the "Grinding of tool steel" brochure.

Type of grinding	Delivery condition
Face grinding straight wheel	A 46 HV
Face grinding segments	A 36 GV
Cylindrical grinding	A 60 KV
Internal grinding	A 60 JV
Profile grinding	A 120 JV

WELDING

Good results when welding tool steel can be achieved if proper techniques are used. Precautions such as pre-heating, heat treatment, post weld heat treatment, joint preparation, selection of consumables, etc. are required.

For best result after polishing and photo-etching use consumables with a matching chemical composition to the mould steel.

Welding method	TIG
Working temperature	200 – 250°C
Welding consumables	MIRRAX TIG-WELD
Hardness after welding	54 – 56 HRC
Heat treatment * after welding	Temper 530°C, 2 h. Weld metal hardness after tempering 42 – 46 HRC.

* Post treatment is recommended to reduce the risk of cracking and to achieve an even hardness profile.

Small repairs can be made at room temperature.

LASER WELDING

For laser welding, Stavax laser weld rods are available. For further information, please contact nearest ASSAB sales office.

POLISHING

Idun has a very good polishability in the hardened and tempered condition.

The main principle is to use smaller steps at the fine-grinding/polishing stages and not to start polishing on too rough of a surface. It is also important to stop the polishing operation immediately after the last scrath from the former grit szie has been removed.

PHOTO-ETCHING

Idun has a very low inclusion content and a homogeneous microstructure. The high cleanliness level provides for good photo-etching/texturing characteristics.

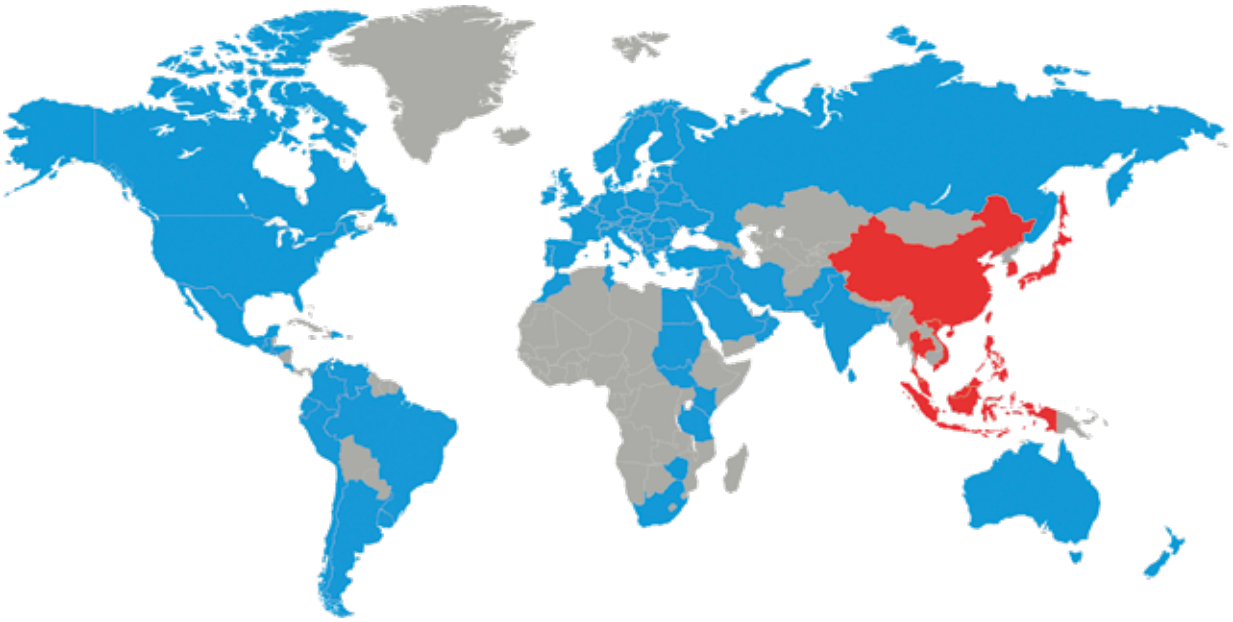
The special photo-etching process that might be necessary because of Idun's good corrosion resistance is familiar to all the leading photoetching companies.

EDM–ELECTRICAL-DISCHARGE MACHINING

If spark-erosion, EDM, is performed in the as delivered condition, the tool should then be given an additional temper at approx. 500°C. If the steel has been rehardened, the additional tempering temperature should be 25°C lower than the last tempering temperature used. However, the best is to remove the affected layer completely by grinding.

FURTHER INFORMATION

Please contact nearest ASSAB office for further information on the selection, heat treatment and application of ASSAB tool steel.



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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