ASSAB 2083

ASSAB	UDDEHOLM a voestalpine company	REFERENCE STANDARD		
		AISI	WNr.	JIS
ASSAB DF-3	ARNE	O1	1.2510	SKS 3
ASSAB XW-10	RIGOR	A2	1.2363	SKD 12
ASSAB XW-42	SVERKER 21	D2	1.2379	(SKD 11)
CALMAX / CARMO	CALMAX / CARMO		1.2358	
VIKING	VIKING / CHIPPER		(1.2631)	
CALDIE	CALDIE			
ASSAB 88	SLEIPNER			
ASSAB PM 23 SUPERCLEAN	VANADIS 23 SUPERCLEAN	(M3:2)	1.3395	(SKH 53)
ASSAB PM 30 SUPERCLEAN	VANADIS 30 SUPERCLEAN	(M3:2 + Co)	1.3294	SKH 40
ASSAB PM 60 SUPERCLEAN	VANADIS 60 SUPERCLEAN		(1.3292)	
VANADIS 4 EXTRA SUPERCLEAN	VANADIS 4 EXTRA SUPERCLEAN			
VANADIS 8 SUPERCLEAN	VANADIS 8 SUPERCLEAN			
VANCRON SUPERCLEAN	VANCRON SUPERCLEAN			
ELMAX SUPERCLEAN	ELMAX SUPERCLEAN			
VANAX SUPERCLEAN	VANAX SUPERCLEAN			
ASSAB 518		P20	1.2311	
ASSAB 618 T		(P20)	(1.2738)	
ASSAB 618 / 618 HH		(P20)	1.2738	
ASSAB 718 SUPREME / 718 HH	IMPAX SUPREME / IMPAX HH	(P20)	1.2738	
NIMAX / NIMAX ESR	NIMAX / NIMAX ESR			
VIDAR 1 ESR	VIDAR 1 ESR	H11	1.2343	SKD 6
UNIMAX	UNIMAX			
CORRAX	CORRAX			
ASSAB 2083		420	1.2083	SUS 420J2
STAVAX ESR	STAVAX ESR	(420)	(1.2083)	(SUS 420J2)
MIRRAX ESR	MIRRAX ESR	(420)		
MIRRAX 40	MIRRAX 40	(420)		
TYRAX ESR	TYRAX ESR			
POLMAX	POLMAX	(420)	(1.2083)	(SUS 420J2)
ROYALLOY	ROYALLOY	(420 F)		
COOLMOULD	COOLMOULD			
ASSAB 2714			1.2714	SKT 4
ASSAB 2344		H13	1.2344	SKD 61
ASSAB 8407 2M	ORVAR 2M	H13	1.2344	SKD 61
ASSAB 8407 SUPREME	ORVAR SUPREME	H13 Premium	1.2344	SKD 61
DIEVAR	DIEVAR			
QRO 90 SUPREME	QRO 90 SUPREME			
FORMVAR	FORMVAR			

( ) - modified grade

Edition 20210505

GENERAL

ASSAB 2083 is a corrosion resistant mould steel with the following characteristics:

- Good corrosion resistance
- High wear resistance
- Good polishability

Typical analysis %	C 0.38	Si ≤ 1.0	Mn ≤ 1.0	Cr 13.0
Standard specification	WNr. 1.2083, AISI 420, JIS SUS 420J2			
Delivery condition	Soft annealed to approx. 190 HB			

APPLICATIONS

- Mould inserts
- Small to medium sized cavities and cores used for moulding corrosive plastics (e.g. PVC) and plastics containing abrasive fillers
- Moulds for long production runs of small to medium sized parts
- Moulds subjected to humid working/ storage conditions.

PROPERTIES

PHYSICAL DATA

Hardened and tempered to 50 HRC

Temperature	20 °C	200 °C	400 °C
Density kg/m^3	7 800	7 750	7 700
Modulus of elasticity MPa	200 000	190 000	180 000
Coefficient of thermal expansion /°C from 20 °C	-	11.0 x 10^{-6}	11.4 x 10^{-6}
Thermal conductivity W/m°C	19	20	24
Specific heat J/kg°C	460	-	-

* The scatter may be as high as ±15%.

MECHANICAL PROPERTIES

TENSILE STRENGTH

The tensile strength values are to be considered as approximate only.

All specimens were hardened in oil from 1030°C and tempered twice to the hardness indicated.

Hardness	52 HRC	40 HRC
Tensile strength, R_m MPa	1 900	1 300
Yield strength, Rp0.2, MPa	1 460	1 100

HEAT TREATMENT

SOFT ANNEALING

Protect the steel and heat through to 890°C. Then cool in furnace at 20°C per hour to 850°C, then at 10°C per hour to 700°C, freely in air.

STRESS RELIEVING

After rough machining the tool should be heated through to 650°C, holding time 2 hours. Cool slowly to 500°C, then freely in air.

HARDENING

Preheating temperature: 600–850°C.
Austenitising temperature: 1000–1050°C, but usually 1020°C-1030°C.

Temperature °C	Soaking time min	Hardness before tempering HRC
1 000	30	~55
1 020	30	~58
1 050	30	~60

Soaking time = time at hardening temperature after the tool is fully heated through.

Protect the tool against decarburisation and oxidation during austenitising.

QUENCHING MEDIA

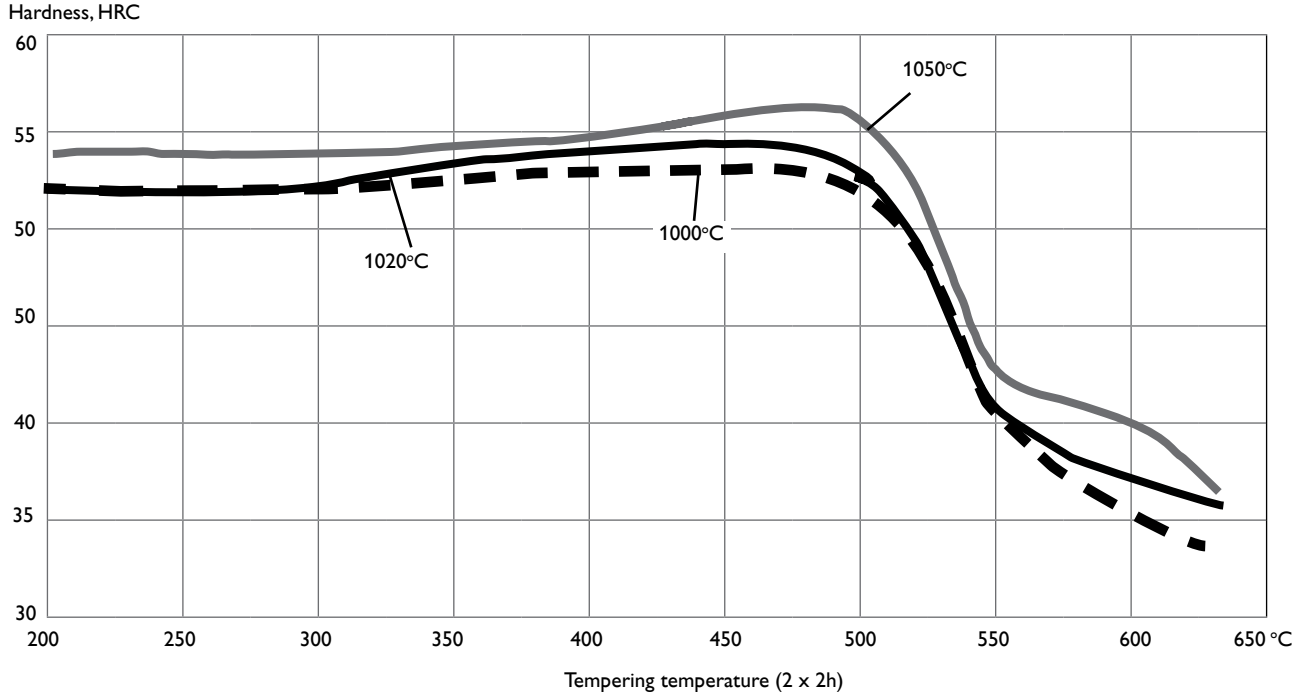
- Sufficient overpress gas (e.g.N_2) quenching in vacuum furnace
- High speed gas/circulating atmosphere
- Fluidised bed or salt bath at 250-550°C, then cool in air blast
- Warm oil, approx. 80°C

Note: Temper the tool as soon as its temperature reaches 50-70°C.
Note: In order to obtain the optimum properties for the tool the cooling rate should be fast, but not at a level that gives excessive distortion or cracks.

TEMPERING

Choose the tempering temperature according to the hardness required by reference to the tempering graph below.
The preferred tempering temperature is 250°C minimum. The minimum holding time at tempering temperature is 2 hours. Tempering at 250°C is recommended for the best combination of toughness, hardness and corrosion resistance. Temper at least twice. The tool should be cooled to room temperature between tempers.
A combination of high austenitising temperature and low tempering temperature <250°C gives a high stress level in the mould, and should be avoided.

TEMPERING GRAPH



Note: The curves as shown in the tempering graph are valid for small samples. Actual hardness achieved after hardening and tempering depends on the mould size.

MACHINING RECOMMENDATIONS

The cutting data below are to be considered as guiding values which must be adapted to existing local conditions.

Condition: Soft annealed condition ~190 HB

TURNING

Cutting data parameter	Turning with carbide		Turning with high speed steel
	Rough turning	Fine turning	Fine turning
Cutting speed (V_c) m/min	160 – 210	210 – 260	18 – 23
Feed (f) mm/rev	0.2 – 0.4	0.05 - 0.2	0.05 - 0.3
Depth of cut (a_p) mm	2 – 4	0.5 - 2	0.5 - 3
Carbide designation ISO	P20 – P30 Coated carbide	P10 Coated carbide	-

DRILLING

HIGH SPEED STEEL TWIST DRILL

Drill diameter mm	Cutting speed (Vc) m/min	Feed (f) mm/rev
< 5	13 – 15 *	0.05 – 0.15
5–10	13 – 15 *	0.15 – 0.20
10–15	13 – 15 *	0.20 – 0.25
15–20	13 – 15 *	0.25 – 0.30

* For coated HSS drill v_c = 21 – 23 m/min.

CARBIDE DRILL

Cutting data parameter	Type of drill		
	Indexable insert	Solid carbide	Carbide tipped [1]
Cutting speed (V_c) m/min	210 – 230	80 – 100	70 – 80
Feed. (f) mm/rev	0.03 – 0.10 [2]	0.10 – 0.25 [3]	0.15 – 0.25 [4]

[1] Drill with internal cooling channels and brazed carbide tip
[2] Depending on drill diameter 20-40 mm
[3] Depending on drill diameter 5-20 mm
[4] Depending on drill diameter 10-20 mm

MILLING

FACE AND SQUARE SHOULDER

Cutting data parameter	Milling with carbide	
	Rough milling	Fine milling
Cutting speed (V_c) m/min	170 – 250	250 – 290
Feed (f) mm/tooth	0.2 – 0.4	0.1 – 0.2
Depth of cut (a_p) mm	2 – 4	0.5 - 2
Carbide designation ISO	P20 - P40 Coated carbide	P10 - P20 Coated carbide or cermet

END MILLING

Cutting data parameter	Type of milling		
	Solid carbide	Carbide indexable insert	High speed steel
Cutting speed (V_c) m/min	120 – 150	160 – 220	25 – 30 [1]
Feed. (f) mm/tooth	0.01 – 0.20 [2]	0.06 – 0.20 [2]	0.01 – 0.30 [2]
Carbide designation ISO	–	P20 – P30	–

[1] For coated HSS end mill v_c = 45 – 50 m/min.
[2] Depending on radial depth of cut and cutter diameter

GRINDING

WHEEL RECOMMENDATION

Type of grinding	Soft annealed condition	Hardened condition
Surface grinding straight wheel	A 46 HV	A 46 HV
Surface grinding segments	A 24 GV	A 36 GV
Cylindrical grinding	A 46 LV	A 60 KV
Internal grinding	A 46 JV	A 60 IV
Profile grinding	A 100 LV	A 120 KV

ELECTRICAL DISCHARGE MACHINING — EDM

If spark erosion is performed in the hardened and tempered condition, the white recast layer should be removed mechanically, for example, by grinding or stoning. The tool should then be given an additional temper at approximately 25°C below the highest previous tempering temperature.

WELDING

There is a general tendency for tool steel to track after welding. When welding is required, take proper precautions with regards to joint preparation, filler material selection, preheating, welding procedure and postweld heat treatment to ensure good welding results. The following guidelines summarise the most important welding process parameters.

Welding method	TIG	MMA
Preheating temperature	200 - 250°C (soft annealed ~200 HB) 200°C (hardened 56 HRC) 250oC (hardened 52 HRC)	
Filler material	Stavax TIG- Weld	Stavax TIG- Weld
Max interpass temperature	400°C (soft annealed ~200 HB) 350°C (hardened 56 HRC) 400°C (hardened 52 HRC)	
Post weld cooling	20-40°C/h for the first two hours and then freely in air.	
Hardness after welding	54 - 56 HRC	
Heat treatment after welding		
Hardened condition	Temper at 10 - 20°C below the hi8ghest previous tempering temperature.	
Soft annealed condition	Soft anneal according to the "Heat treatment recommendation".	

PHOTO ETCHING

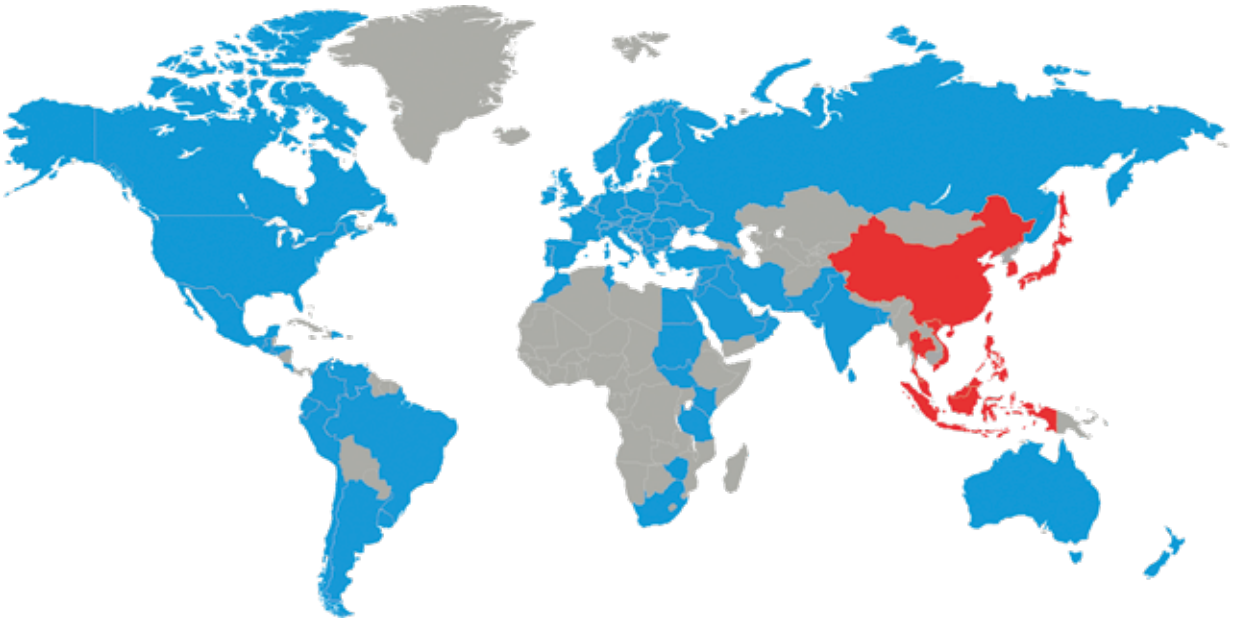
A special photoetching process might be necessary because due to the good corrosion resistance of ASSAB 2083. Leading photo-etching companies are familiar with etching corrosion-resistant steels such as ASSAB 2083.

FURTHER INFORMATION

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

ASSAB
SUPERIOR TOOLING SOLUTIONS
A ONE-STOP SHOP

ASSAB is unmatched as a one-stop product and service provider that offers superior tooling solutions. In addition to the supply of tool steel and other special steel, our range of comprehensive value-added services, such as machining, heat treatment and coating services, span the entire supply chain to ensure convenience, accountability and optimal usage of steel for customers. We are committed to achieving solutions for our customers, with a constant eye on time-to-market and total tooling economy.



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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