

ASSAB 718 HH

UDDEHOLM IMPAX HH

ASSAB 	UDDEHOLM <small>a voestalpine company</small>	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			
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

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Edition 20210125

GENERAL

ASSAB 718 HH is a prehardened mould steel, which offers the following benefits:

- No hardening risks
- No hardening costs
- Time saving (i.e., no waiting for heat treatment)
- Lower tool cost (e.g., no distortion to rectify)
- Modifications easily carried out
- Can be subsequently nitrided to increase surface wear resistance and locally flame hardened to reduce surface damage.

ASSAB 718 HH is manufactured to consistently high quality standards with a very low sulphur content, giving a steel with the following characteristics:

- Good polishing and photo-etching properties
- Good machinability
- High purity and good homogeneity
- Uniform hardness

Note: ASSAB 718 HH is 100% ultrasonic tested.

Heavier sections are supplied premachined, which offers the following advantages compared with unmachined material:

- Saving of weight
- Free of decarburised surface
- Exact nominal size (plus tolerance)
- Less machining
- Absence of scale minimises machine and tool wear

Typical analysis %	C	Si	Mn	Cr	Ni	Mo	S
	0.37	0.3	1.4	2.0	1.0	0.2	<0.010
Standard specification	AISI P20 modified, WNr. 1.2738						
Delivery condition	Hardened and tempered to 340 – 380 HB						

APPLICATIONS

ASSAB 718 HH is used for the same applications as ASSAB 718 Supreme, but mainly when demands on strength and wear resistance are somewhat higher:

- Injection moulds for thermoplastics
- Extrusion dies for thermoplastics
- Blow moulds
- Forming tools, press-brake dies (possibly flame hardened or nitrided)
- Aluminium die casting prototype dies
- Structural components, shafts

PROPERTIES

PHYSICAL DATA

Delivery condition.

Temperature	20 °C	200 °C	400 °C
Density kg/m ³	7 800	7 750	7 700
Modulus of elasticity N/mm ²	205 000	200 000	185 000
Coefficient of thermal expansion /°C from 20°C	-	12.7 x 10 ⁻⁶	13.6 x 10 ⁻⁶
Thermal conductivity* W/m °C	29	30	31
Specific heat capacity J/kg °C	460	-	-

MECHANICAL DATA

TENSILE STRENGTH

Approximate tensile strength at room temperature.

Hardness	340 HB	370 HB
Tensile strength, R _m N/mm ²	1110	1180
Yield strength, R _{p0.2} N/mm ²	985	1090

COMPRESSIVE STRENGTH

Approximate compressive strength at room temperature.

Hardness	340 HB	370 HB
Compressive yield strength, R _{c0.2} N/mm ²	1000	1150

MACHINING RECOMMENDATIONS

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

Condition: Pre-hardened to ~360 HB

TURNING

Cutting data parameters	Turning with carbide		Turning with High Speed Steel
	Rough turning	Fine turning	Fine turning
Cutting speed (v_c), m/min	100 - 150	150 - 200	10 - 15
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 - 2.5
Carbide designation ISO	P20-P30 Coated carbide	P10 Coated carbide	-

DRILLING

HIGH SPEED STEEL TWIST DRILL*

Drill diameter mm	Cutting speed (v_c) m/min	Feed (f) mm/r
≤ 5	18 - 20	0.05 - 0.15
5 - 10	18 - 20	0.15 - 0.25
10 - 15	18 - 20	0.25 - 0.30
15 - 20	18 - 20	0.30 - 0.35

* For coated HSS, uncoated HSS is not recommended

CARBIDE DRILL

Cutting data parameters	Type of drill		
	Indexable insert	Solid carbide	Carbide tip ¹⁾
Cutting speed (v_c), m/min	150 - 170	120 - 150	60 - 90
Feed (f) mm/r	0.03 - 0.12 ²⁾	0.05 - 0.20 ²⁾	0.10 - 0.20 ²⁾

¹⁾ Drill with internal cooling channels and brazed tip

²⁾ Depending on drill diameter

MILLING

FACE AND SQUARE SHOULDER MILLING

Cutting data parameters	Milling with carbide	
	Rough milling	Fine milling
Cutting speed (v_c) m/min	100 - 140	140 - 170
Feed (f_z) mm/tooth	0.2 - 0.4	0.1 - 0.2
Depth of cut (a_p) mm	2 - 4	≤ 2
Carbide designation ISO	P20 - P40 Coated carbide	P10 Coated carbide or cermet

END MILLING

Cutting data parameters	Type of end mill		
	Solid carbide	Carbide indexable insert	High speed steel
Cutting speed (v_c), m/min	60 - 100	60 - 100	25 - 30 ¹⁾
Feed (f_z) mm/tooth	0.006 - 0.20 ²⁾	0.06 - 0.20 ²⁾	0.02 - 0.35 ²⁾
Carbide designation ISO	K10, P40	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

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

Type of grinding	Wheel recommendation
Face grinding straight wheel	A 46 HV
Face grinding segments	A 36 GV
Cylindrical grinding	A 60 KV
Internal grinding	A 60 IV
Profile grinding	A 120 JV

HEAT TREATMENT

ASSAB 718 HH is intended for use in the hardened and tempered condition, i.e., the delivery condition. When, however, the steel is to be heat treated to a higher hardness or case hardened, the following instructions may be helpful.

SOFT ANNEALING

Protect the steel and heat through to 700°C. Then cool in the furnace at 10°C per hour to 600°C, then freely in air.

STRESS-RELIEVING

After rough machining, the tool should be heated through to 550°C, holding time 2 hours. Cool slowly to room temperature.

HARDENING

Note: The steel should be fully soft annealed before hardening.

Preheating temperature: 500–600°C.

Austenitising temperature: 850°C

The steel should be heated through to the austenitising temperature and held at temperature for 30 minutes.

Protect the tool against decarburisation and oxidation during the hardening process.

QUENCHING MEDIA

- Oil (60 – 80°C)
- Martempering bath at 300°C, maximum 4 minutes, then cool in air

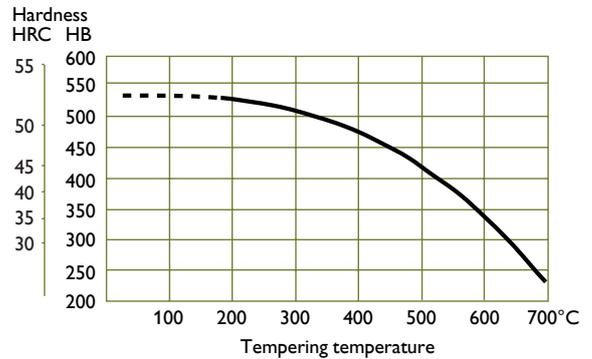
Note: Temper the tool as soon as its temperature reaches 50 – 70°C.

TEMPERING

Choose the tempering temperature according to the hardness required by reference to the tempering graph. Temper twice with intermediate cooling to room temperature, the preferred tempering temperature is 250°C or higher. In exceptional cases, a minimum tempering temperature of 180°C can be used for small simple inserts and parts where toughness is of less importance. Holding time at tempering temperature minimum 2 hours.

TEMPERING GRAPH

The diagram is valid for small samples 15 x 15 x 40 mm austenitised 30 minutes at 850°C, quenched in air and tempered 2 + 2 hours.



SURFACE TREATMENT

NITRIDING AND NITROCARBURISING

Nitriding gives a hard surface, which is very resistant to wear and erosion. A nitrided surface also increases the corrosion resistance.

For best results, the following steps should be followed:

1. Rough machining
2. Stress tempering at 550°C
3. Grinding
4. Nitriding

The following surface hardness and nitriding depths will be achieved after nitriding:

Process	Time h	Surface hardness HV ₁	Depth mm
Gas nitriding at 525°C	20	650	0.30
	30	650	0.35
Plasma nitriding at 480°C	24	700	0.30
	48	700	0.40
Gas nitrocarburing at 570°C	2	700	0.10

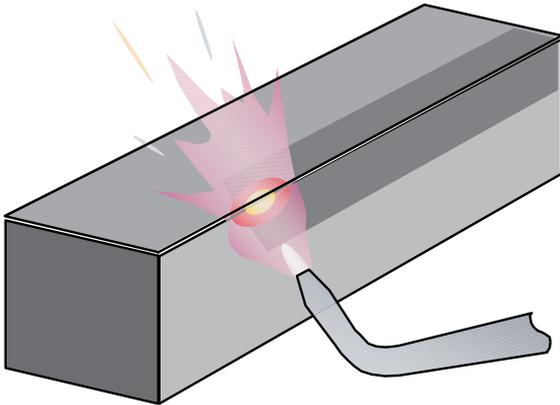
HARD CHROME PLATING

After plating, the tool should be tempered at 180°C for 4 hours, within 4 hours of plating, to avoid the risk of hydrogen embrittlement.

FLAME AND INDUCTION HARDENING

ASSAB 718 HH can be flame or induction hardened to a hardness of approx. 50 HRC.

Flame hardening may cause a certain amount of distortion, depending on the design of the mould. If possible, flame hardening should be carried out directly after rough machining. Grinding will then be performed after flame hardening.



The surface to be hardened is heated continuously by means of a gas flame to approx. 850°C (pale-red colour), followed by cooling in air. The gas flame may be an ordinary oxyacetylene flame. The size of the blowpipe and the temperature of the gas are adapted so that the heating is accomplished in a few seconds.

The flame hardened tool does not need to be tempered as this would cause a drop in hardness.

ELECTRICAL DISCHARGE MACHINING — EDM

If spark-erosion, EDM, is performed in the as-delivered condition, the tool should then be given an additional temper at approx. 550°C. If the steel has been rehardened, the additional tempering temperature should be 25°C lower than the last tempering temperature used.

WELDING

Good results when welding tool steel can be achieved if proper precautions are taken during welding (elevated working temperature, joint preparation, choice of consumables and welding procedure). If the tool is to be polished or photo-etched, it is necessary to work with an electrode type of matching composition.

Welding method	TIG	MMA
Preheating temperature	200 - 250 °C	200 - 250 °C
Filler material	ASSAB 718 TIG-WELD	ASSAB 718 WELD
Maximum interpass temperature	375°C	375°C
Post weld cooling	20 - 40 °C/h the first 2 h then freely in air.	
Hardness after welding	300 - 330 HB	300 - 330 HB
Heat treatment after welding:		
Tool that need to be polished	Temper at 520°C for 2 h	
Tool that need to be photo-etched	Temper at 550°C for 2 h	

POLISHING

ASSAB 718 HH has excellent polishability in its delivery condition. After grinding, polishing can be carried out using aluminium oxide or diamond paste.

TYPICAL PROCEDURE

1. Grind to 0.05 mm from the finished size.
2. Polish with diamond paste grade 45 to obtain a dull and even surface.
3. Polish with diamond paste grade 15.
4. Polish with diamond paste grade 3, or grade 1 for particularly high demands on surface finish size.

Note: Each steel grade has an optimum polishing time, which largely depends on hardness and polishing technique. Overpolishing can lead to a poor surface finish (e.g., an “orange peel” effect).

PHOTO-ETCHING

ASSAB 718 HH is particularly suitable for texturing by the photo-etching method. Its very low sulphur content ensures accurate and consistent pattern.

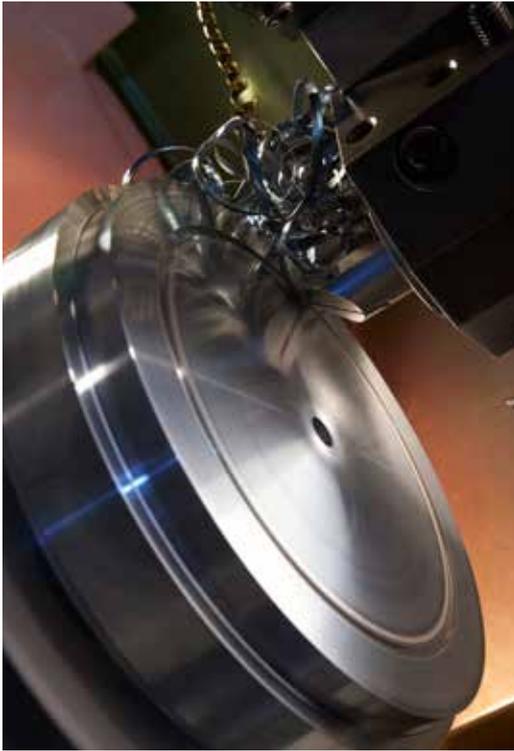
FURTHER INFORMATION

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

ASSAB

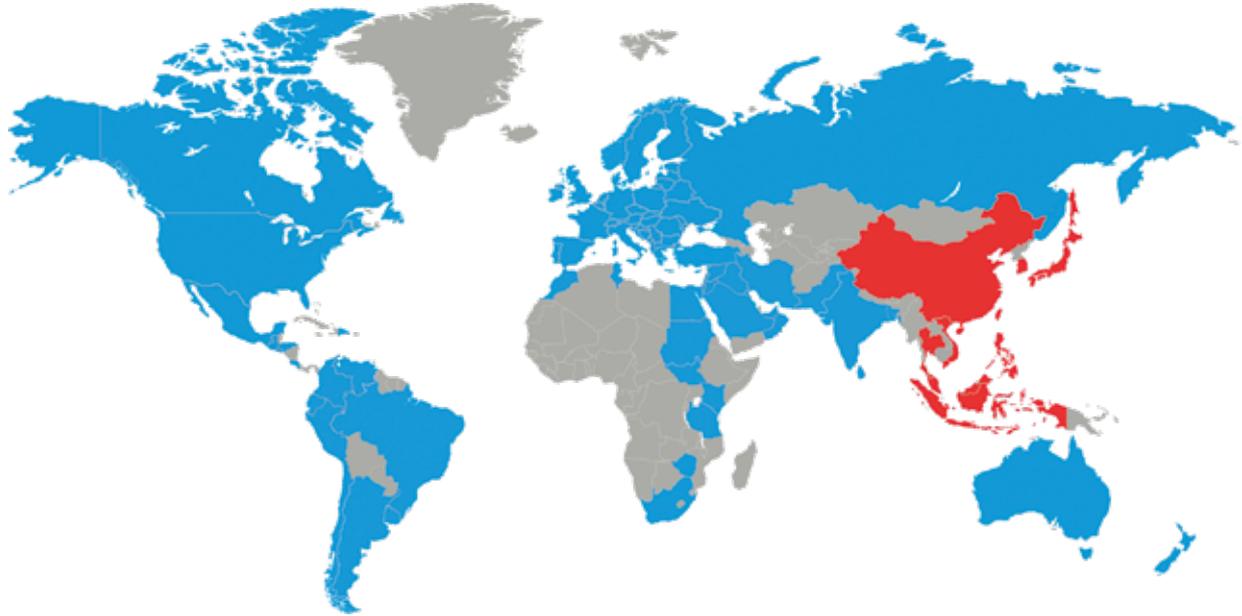
SUPERIOR TOOLING SOLUTIONS

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
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