ASSAB 618

ASSAB
a voestalpine company

ASSAB	UDDEHOLM	REFERENCE STANDARD		
		AISI	WNr.	JIS
ASSAB 618 / 618 ESR		(P20)	1.2738	
ASSAB 618 HH / ASSAB 618 ESR HH		(P20)	1.2738	
ASSAB 718 SUPREME / 718 HH	IMPAX SUPREME / IMPAX HH	(P20)	1.2738	
NIMAX / NIMAX ESR	NIMAX / NIMAX ESR			
MIRRAX 40	MIRRAX 40	(420)		
MIRRAX ESR	MIRRAX ESR	(420)		
STAVAX ESR	STAVAX ESR	(420)	(1.2083)	(SUS 420J2)
TYRAX ESR	TYRAX ESR			
VIDAR 1 ESR	VIDAR 1 ESR	H11	1.2343	SKD 6
UNIMAX	UNIMAX			
ROYALLOY	ROYALLOY	(420 F)		
POLMAX	POLMAX	(420)	(1.2083)	(SUS 420J2)
CORRAX	CORRAX			
ELMAX SUPERCLEAN	ELMAX SUPERCLEAN			
VANAX SUPERCLEAN	VANAX SUPERCLEAN			
ASSAB 2083		420	1.2083	SUS 420J2
COOLMOULD	COOLMOULD			
ASSAB 2714			1.2714	SKT 4
ASSAB 2344		H13	1.2344	SKD 61
DIEVAR	DIEVAR			
VIDAR SUPERIOR	VIDAR SUPERIOR	(H11)	(1.2343)	(SKD 6)
FORMVAR	FORMVAR			
ASSAB 8407 SUPREME	ORVAR SUPREME	H13 Premium	1.2344	SKD 61
ASSAB 8407 2M	ORVAR 2M	H13	1.2344	SKD 61
QRO 90 SUPREME	QRO 90 SUPREME			
SKOLVAR	SKOLVAR			
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			

( ) - modified grade

Edition 20250123

20250102

GENERAL

ASSAB 618 is a vacuum degassed, pre-hardened mould steel.

ASSAB 618 is manufactured to consistently high quality standards with a 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 618 is 100% ultrasonic tested.

Typical analysis %	C 0.37	Si 0.3	Mn 1.4	Cr 2.0	Ni 1.0	Mo 0.2
Standard specification	AISI P20 modified, WNr. 1.2738					
Delivery condition	Hardened and tempered to 290- 330 HB					

APPLICATIONS

- 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
Density kg/m^3	7 800	7 750
Modulus of elasticity N/mm^2	205 000	200 000
Coefficient of thermal expansion /°C from 20°C	-	12.7 x 10^{-6}
Thermal conductivity* W/m °C	-	28
Specific heat J/kg °C	460	-

MECHANICAL PROPERTIES

Tensile strength and compressive strength depend on the hardness in the delivered condition.

TENSILE STRENGTH

Approximate tensile strength at room temperature.

Hardness	325 HB
Tensile strength, Rm N/mm^2	1 020
Yield strength, $Rp_{0.2}$ N/mm^2	900

COMPRESSIVE STRENGTH

Approximate compressive strength at room temperature.

Compressive yield strength, $Rc_{0.2}$ N/mm^2	850 - 1 000

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 ~310 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	120 - 170	170 - 220	15 - 20
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	14 - 16 *	0.08 - 0.15
5 – 10	14 - 16 *	0.15 – 0.25
10 – 15	14 - 16 *	0.25 – 0.30
15 – 20	14 - 16 *	0.30 – 0.35

* For coated high speed steel drill vc = 24–26 m/min

CARBIDE DRILL

Cutting data parameters	Type of drill		
	Indexable insert	Solid carbide	Carbide tip [1]
Cutting speed (vc), m/min	180 - 200	120 - 150	60 - 80
Feed (f) mm/r	0.05 – 0.15 [2]	0.08 – 0.20 [2]	0.15 – 0.25 [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	80 – 150	150 – 190
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 - P20 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	70 – 110	80 – 120	15 – 20 [1]
Feed (f_z) mm/tooth	0.03 - 0.20 [2]	0.08 – 0.20 [2]	0.05– 0.35 [2]
Carbide designation ISO	–	P20 – P40	–

[1] For coated high speed steel end mill vc = 35–40 m/min
[2] Depending on radial depth of cut and cutter diameter

GRINDING

Wheel recommendation

Type of grinding	Wheel recommendation
Face grinding straight wheel	A 46 HV
Face grinding segments	A 24 GV
Cylindrical grinding	A 60 KV
Internal grinding	A 46 JV
Profile grinding	A 100 KV

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 nitrocarburising at 570°C	2	700	0.10

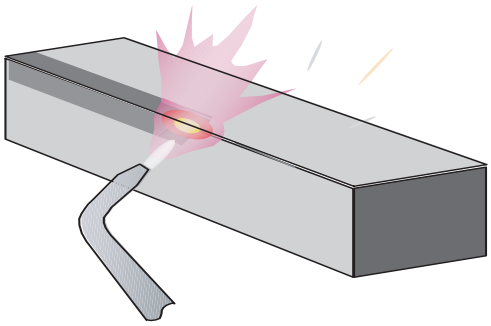
* Nitriding depth is the distance from the surface where hardness is 50 HV higher than the matrix hardness

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 618 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 EDM is performed in as-delivered condition, the EDM'd surface is covered with a resolidified layer (white layer) and a rehardened and untempered layer, both of which are very brittle and hence detrimental to the tool performance.

When a profile is produced by EDM, it is recommended to finish with "fine-sparking", i.e., low current, high frequency. For optimal performance, the EDM'd surface should be ground/polished to remove the white layer completely. The tool should then be retempered at approx. 550°C. If the steel has been rehardened, the tool should be retempered at approx. 25°C lower than the tempering temperature used following the rehardening process.

WELDING

There is a general tendency for tool steel to crack 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 TIG method is recommended when the tool is to be polished or photo-etched, and 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 for the first 2 hours, then freely in air < 70°C.	
Hardness after welding	300 - 330 HB	300 - 330 HB
Heat treatment after welding:		
Tool that need to be polished	Temper at 550°C for 2 h	
Tool that need to be photo-etched	Temper at 610°C for 2 h	

1) Preheating temperature must be established throughout the tool and must be maintained for the entire welding process, to prevent weld cracking. For hardened and tempered tool, the actual preheat temperature used is typically lower than the original tempering temperature to prevent a drop in hardness.

2) The temperature of the tool in the weld area immediately before the second and subsequent pass of a multiple pass weld. When exceeded, there is a risk of distortion of the tool or soft zones around the weld.

POLISHING

ASSAB 618 has good 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 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).

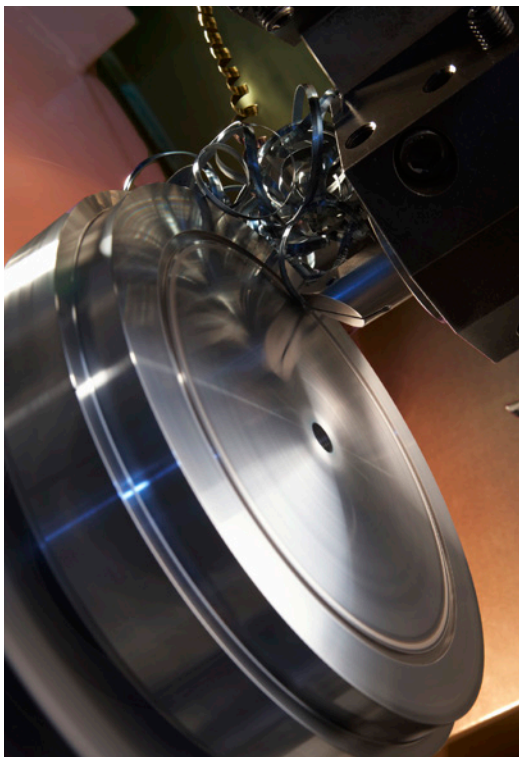
PHOTO-ETCHING

ASSAB 618 is suitable for texturing by the photo-etching method. Its low sulphur content ensures accurate and consistent pattern.

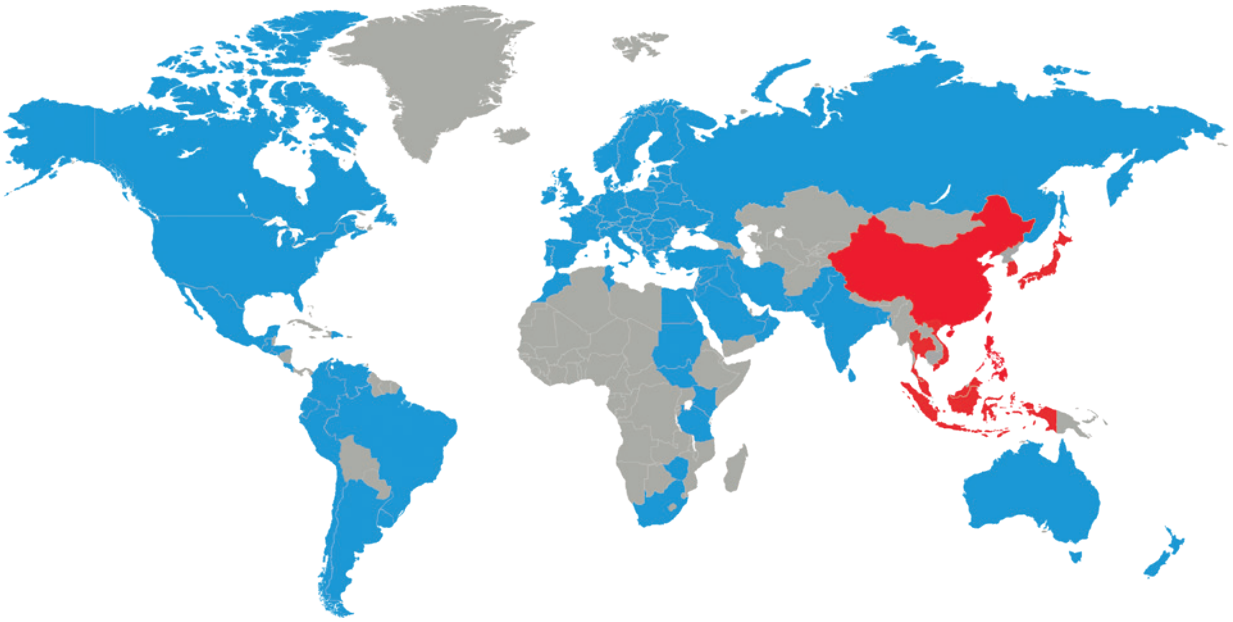
FURTHER INFORMATION

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 most suitable treatment for each application. ASSAB not only supplies steel products of superior quality, but we also offer state-of-the-art machining, heat treatment, surface treatment services and additive manufacturing (3D printing) to enhance your tooling performance while meeting your requirements in the shortest lead time. Using a holistic approach as a one-stop solution provider, we are more than just another tool steel supplier.

In Asia Pacific, ASSAB anchors the distribution network for Uddeholm, a Swedish tool steel manufacturer with more than 350 years of experience in the tool steel industry. Both are integral parts of voestalpine AG, a prominent Austrian-based company listed on the Vienna Stock Exchange since 1995. Together, we establish ourselves as a key player in the steel and technology sector, with a diverse range of products and services.

For more information, please visit:

www.assab.com

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