

		REFERENCE STANDARD		
		AISI	W.Nr.	JIS
ASSAB DF-2	ARNE	O1	(1.2510)	(SKS 3)
ASSAB DF-3		O1	(1.2510)	(SKS 3)
ASSAB XW-5	SVERKER 3	D6 (D3)	(1.2436)	(SKD 2)
ASSAB XW-10	RIGOR	A2	1.2363	SKD 12
ASSAB XW-41	SVERKER 21	D2	1.2379	SKD 11
ASSAB XW-42		D2	1.2379	SKD 11
CARMO	CARMO		1.2358	
CALMAX	CALMAX		1.2358	
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 6 SUPERCLEAN	VANADIS 6 SUPERCLEAN			
VANADIS 10 SUPERCLEAN	VANADIS 10 SUPERCLEAN			
VANCRON 40 SUPERCLEAN	VANCRON 40 SUPERCLEAN			
ELMAX SUPERCLEAN	ELMAX SUPERCLEAN			
ASSAB 518		P20	1.2311	
ASSAB 618		P20 Mod.	1.2738	
ASSAB 618 HH		P20 Mod.	1.2738	
ASSAB 618 T		P20 Mod.	1.2738 Mod.	
ASSAB 718 SUPREME	IMPAX SUPREME	P20 Mod.	1.2738	
ASSAB 718 HH	IMPAX HH	P20 Mod.	1.2738	
NIMAX	NIMAX			
MIRRAX 40	MIRRAX 40	420 Mod.		
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 Mod.	1.2083 ESR	SUS 420J2
MIRRAX ESR	MIRRAX ESR	420 Mod.		
POLMAX	POLMAX			
RAMAX HH	RAMAX HH	420 F Mod.		
ROYALLOY	ROYALLOY			
PRODAX				
ASSAB PT18				
ASSAB MMXL				
ASSAB MM40				
ALVAR 14	ALVAR 14		1.2714	SKT 4
ASSAB 2714			1.2714	SKT 4
ASSAB 8407 2M	ORVAR 2M	H13	1.2344	SKD 61
ASSAB 8407 SUPREME	ORVAR SUPREME	H13 Premium	1.2344 ESR	SKD 61
DIEVAR	DIEVAR			
HOTVAR	HOTVAR			
QRO 90 SUPREME	QRO 90 SUPREME			
FORMVAR	FORMVAR			
ASSAB 705		4340	1.6582	SNCM8
ASSAB 709		4140	1.7225	SCM4
ASSAB 760		1050	1.1730	S50C

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The information contained herein is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as a warranty of specific properties of the products described or a warranty of fitness for a particular purpose. Each user of ASSAB products is responsible for making its own determination as to the suitability of ASSAB products and services.

General

RoyAlloy is a patented free machining stainless holder steel, which is supplied in the prehardened condition.

RoyAlloy is characterised by:

- Excellent machinability
- Improved dimensional stability
- Readily weldable
- Good corrosion resistance
- Greater ductility
- Good notch toughness
- Uniform hardness in all dimensions
- Better surface finish (as-rolled surface)
- Good indentation resistance

Note: RoyAlloy is ultrasonic tested according to ASSAB specification.

Typical analysis %	C 0.05	Si 0.4	Mn 1.2	Cr 12.6	V 0.12
Standard specification	None (Patented)				
Delivery condition	Hardened and tempered to 290 - 330 HB				
Colour code	Alternate Yellow / Blue				

Applications

- Mould bases (holders/bolsters, cavity plates, support/backing plates, ejector plates)
- Moulds requiring extensive machining and corrosion resistance
- Plastic and rubber moulds with low demands on polishability
- Dies for plastic extrusion
- Constructional parts



RoyAlloy is available in both flats and rounds.

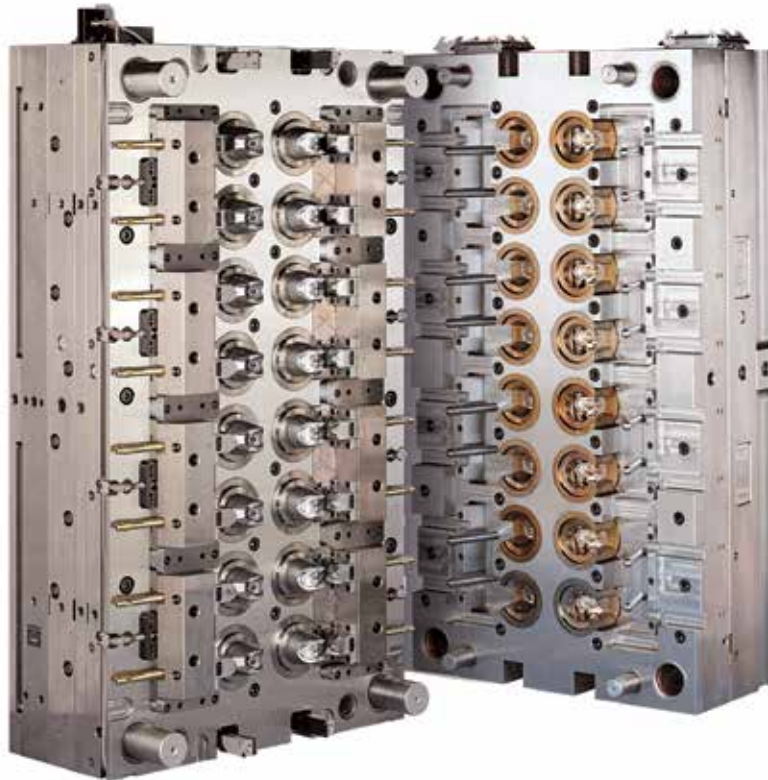
Properties

PHYSICAL PROPERTIES

Prehardened to 321 HB.



Temperature	20°C	100°C	200°C
Density kg/m ³	7 800	-	7 750
Modulus of elasticity MPa	200 000	-	190 000
Coefficient of thermal expansion per °C from 20°C	-	-	11.0 x 10 ⁻⁶
Thermal conductivity W/m °C	-	27.5	28
Specific heat J/kg °C	-	500	540



RoyAlloy is the preferred steel of choice of many mould makers and end users. RoyAlloy provides enhanced machinability, improved dimensional stability and superior surface finishes compared with 420F and 1.2085 type of steels.

MECHANICAL PROPERTIES

Impact strength

The energy absorption at impact testing depends on the test material (bar size and delivered hardness), test temperature and specimen (type, location, and orientation in the bar).

Charpy V-notch impact toughness at room temperature tested in the LT direction.

Hardness	321 HB
Impact energy J	22

Compressive strength

Approximate values.

Hardness	302 HB
Compressive strength MPa	760

Tensile strength

Approximate values. Longitudinal specimens tested at room temperature.

Hardness	321 HB
Yield strength, Rp0.2 MPa	890
Tensile strength, Rm MPa	1069
Elongation, A ₅ %	12
Reduction of Area, Z %	34

CORROSION RESISTANCE

RoyAlloy was developed with a chemical composition adjusted to sufficiently provide good corrosion resistance during tool operation and storage. Tooling made from RoyAlloy will have good resistance to corrosion caused by humid working and storage conditions, and when moulding corrosive plastics under normal production conditions.

Machining recommendations

The cutting data below are to be considered as guiding values and starting point for evaluation your own best practice.

Condition: Prehardened condition ~321 HB

TURNING

Cutting data parameters	Turning with carbide		Turning with HSS ¹
	Rough turning	Fine turning	Fine turning
Cutting speed (v_c) m/min	130 - 190	190 - 250	25 - 28
Feed (f) mm/r	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 - P20 Coated carbide or cermet	-

¹ High speed steel

DRILLING

High speed steel twist drill

Drill diameter mm	Cutting speed (v_c) m/min	Feed (f) mm/r
≤ 5	17 - 19 ¹	0.05 - 0.10
5 - 10	17 - 19 ¹	0.10 - 0.20
10 - 15	17 - 19 ¹	0.20 - 0.25
15 - 20	17 - 19 ¹	0.25 - 0.30

* For coated HSS drill, $v_c = 29-31$ m/min

Carbide drill

Cutting data parameters	Type of drill		
	Indexable insert	Solid carbide	Brazed carbide ¹
Cutting speed (v_c) m/min	215 - 240	110 - 130	70 - 110
Feed (f) mm/r	0.05 - 0.15 ²	0.10 - 0.25 ²	0.15 - 0.25 ²

¹ Drill with internal cooling channels and brazed carbide 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	130 - 190	190 - 250
Feed (f_z) mm/tooth	0.2 - 0.4	0.1 - 0.2
Depth of cut (a_p) mm	2 - 5	≤ 2
Carbide designation ISO	P20 - P40 Coated carbide	P10 - P20 Coated carbide or cermet

End milling

Cutting data parameters	Type of milling		
	Solid carbide	Carbide indexable insert	High speed steel
Cutting speed (v_c) m/min	80 - 120	120 - 170	35 - 40 ¹
Feed (f_z) mm/tooth	0.006 - 0.20 ²	0.06 - 0.20 ²	0.01 - 0.35 ²
Carbide designation ISO	-	P15 - P40	-

¹ For coated HSS end mill, $v_c \sim 60-66$ m/min

GRINDING

Wheel recommendation

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 JV
Profile grinding	A 120 JV

Heat treatment

RoyAlloy is supplied in the prehardened condition with through-hardness of 290 - 330 HB. Each plate is carefully hardness-tested to ensure consistency.

RoyAlloy is intended for use in prehardened condition (i.e., delivery condition), no further heat treatment is generally required.

Welding

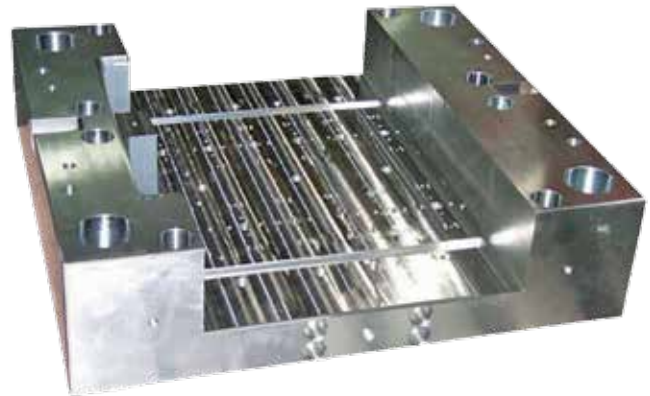
RoyAlloy is readily weldable with RoyAlloy filler metal or several standard stainless filler metals, using TIG (GTAW) and MMA (SMAW) processes.

Neither preheating nor postheating is necessary. Test had shown that RoyAlloy does not develop an overhardened heat-affected zone (HAZ) around the weld deposit. This eliminates the concern of weld-induced cracking during repair or, subsequently, during service.

For best results, use RoyAlloy welding electrodes. RoyAlloy electrodes provide an optimal match with the base metal in terms of chemical composition and mechanical properties.

Further information

For further information, i.e., steel selection, heat treatment, application and availability, please contact our ASSAB office nearest to you.



RoyAlloy remains dimensionally stable even after extensive machining of 152 x 711 x 813 mm. 0.15 mm distortion, corner to corner.

Relative comparison of ASSAB plastic mould steels

ASSAB grade	Machinability	Wear resistance	Polishability	Corrosion resistance
ASSAB 618	██████████	████	██████████	████
NIMAX	██████████	██████	██████████	████
CORRAX	██████████	██████	██████████	██████████
VIDAR 1 ESR	██████████	██████	██████████	████
ASSAB 8407 SUPREME	██████████	██████	██████████	████
STAVAX ESR	██████████	██████	██████████	██████████
POLMAX	██████████	██████	██████████	██████████
MIRRAX ESR	██████████	██████	██████████	██████████
MIRRAX 40	██████████	██████	██████████	██████████
UNIMAX	██████████	██████	██████████	████
ASSAB XW-10	██████████	██████	██████████	████
ELMAX	██████████	██████	██████████	██████████
VANADIS 4 EXTRA	██████████	██████	██████████	████
VANADIS 10	██████████	██████	██████████	████
VANCRON 40	██████████	██████	██████████	████
RAMAX HH	██████████	██████	██████████	██████████
ROYALLOY	██████████	██████	██████████	██████████

ASSAB 618, Nimax, Mirrax 40, Royalloy and Ramax HH are tested in prehardened condition. Corrax is tested in solution-treated condition.

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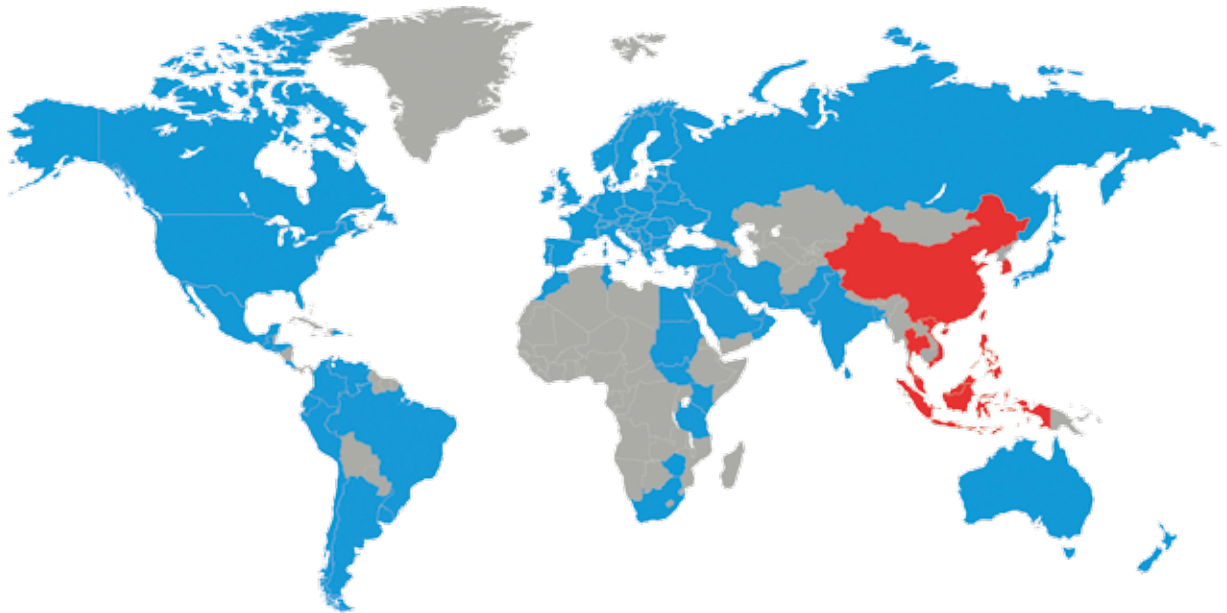
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Choosing the right steel is of vital importance. ASSAB engineers and metallurgists are always ready to assist you in your choice of the optimum steel grade and the best treatment for each application. ASSAB not only supplies steel products with superior 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 steels 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