ASSAB 2083 ESR

ASSAB
a voestalpine company

ASSAB 2083 ESR - 20260113-8

GENERAL

ASSAB 2083 ESR is a vacuum degassed corrosion resistance mould steel. The improved cleanliness and homogeneity version of ASSAB 2083 as a result of the ESR process.

ASSAB 2083 ESR is manufactured to consistently high quality standards, resulting in a steel with the following characteristics:

- Good corrosion resistance
- High wear resistance
- Excellent polishability

Typical analysis %	C 0.39	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
- Other applications that need high mechanical strength and corrosion resistance

PROPERTIES

Physical data

Hardened and tempered to 48-49 HRC

Temperature	20 °C	200 °C	400 °C
Density kg/m³	7 640	7 580	7 520
Modulus of elasticity MPa	203 000	193 000	174 000
Coefficient of thermal expansion /°C from 20 °C	-	11.2 x 10^{-6}	11.9 x 10^{-6}
Thermal conductivity W/m°C	21.60	22.80	24.00
Specific heat J/kg°C	457.2	-	-

* Thermal conductivity is very difficult to measure. 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 1020°C and tempered twice to the hardness indicated.

Hardness	52 HRC	42 HRC	31 HRC
Tensile strength, R_m MPa	1 800	1 360	1 030
Yield strength, Rp0.2, MPa	1 480	1 150	890

HEAT TREATMENT

Soft annealing

Protect the steel and heat through to 840°C. Then cool in furnace at 30°C per hour to 600°C, then 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. For hardened tool, 50°C lower than the last tempering temperature.

Hardening

Preheating temperature: 600–850°C.
Austenitising temperature: 1000–1040°C

Temperature °C	Soaking time min	Hardness before tempering HRC
1000	30	~51
1030	30	~55
1050	30	~54

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

Protect the tool against decarburisation and oxidation during austenitising.

QUENCHING MEDIA

- Vacuum with sufficient positive pressure
- 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

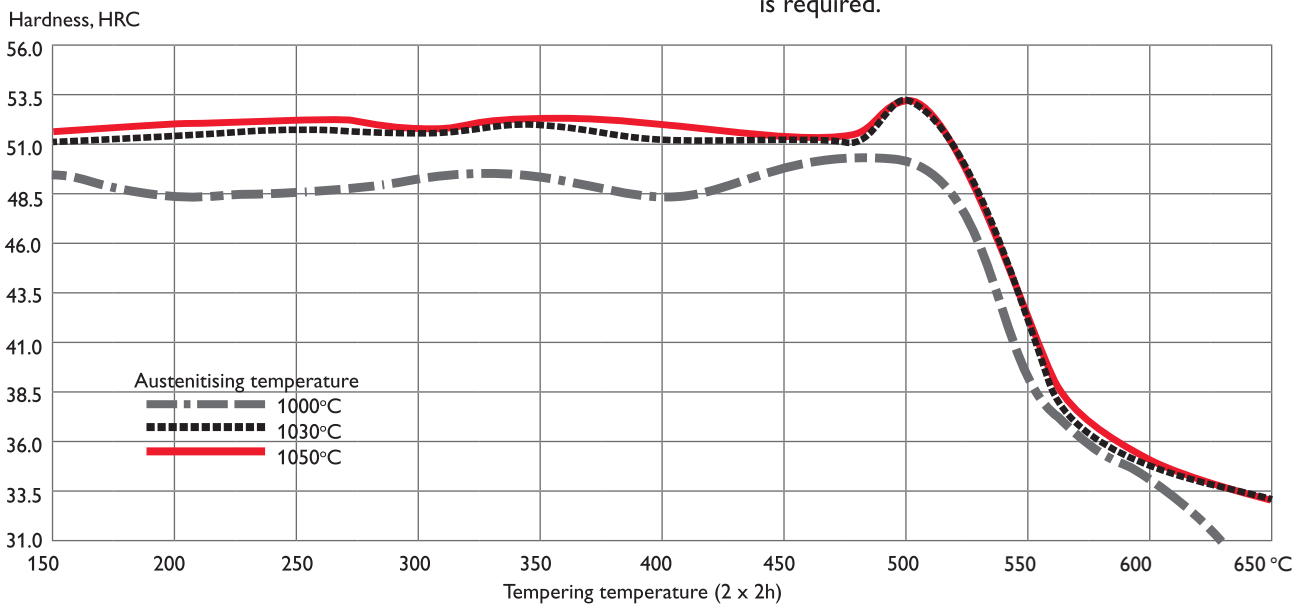
Choose the tempering temperature according to the hardness required by reference to the tempering graph below.

Temper at least twice and the tool should be cooled to room temperature between tempers.

Note that:

- The preferred tempering range is between 200°C - 300°C with a minimum holding time ~2 hours.
- Tempering at 250°C is recommended for the best combination of toughness, hardness and corrosion resistance.
- The temperature tempering is recommended for large molds for minimal internal stress and also for the mold when PVD coating at high temperature is required.

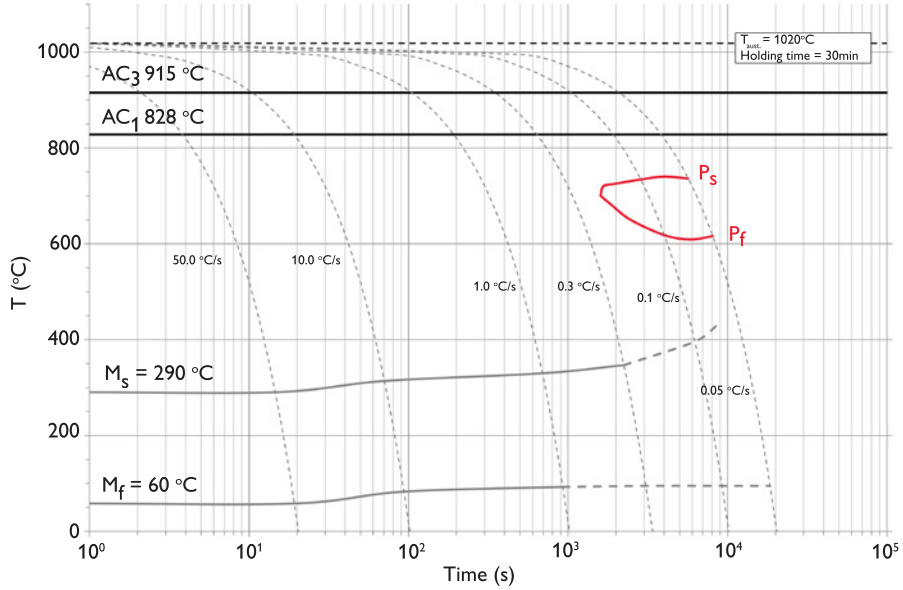
TEMPERING GRAPH



The Tempering curves are obtained after heat treatment of samples with size of 20mm x 20mm x 20mm, 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.

CCT GRAPH

Austenitising temperature : 1020°C. Holding time 30 minutes



MACHINING RECOMMENDATIONS

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

Turning

Cutting data parameter	Annealed 160 - 220 HB		Hardened and Tempered 48-52 HRC	
	Rough turning	Fine turning	Rough turning	Fine turning
Cutting speed (V_c), m/min	150 – 200	200 – 250	50 – 70	70-90
Feed (f), mm/rev	0.2 – 0.4	0.05 - 0.2	0.2 - 0.5	0.05 - 0.3
Depth of cut (a_p), mm	2 – 4	0.5 - 2	0.1 - 2	0.5 - 1
Carbide designation ISO	P20/25 TiCN+Al_2O_3 +TiN coated	P10/15 TiCN+Al_2O_3 +TiN coated	P20/25 TiCN+Al_2O_3 +TiN coated	P10/15 TiCN+Al_2O_3 +TiN coated

Drilling

For drilling process up to diameter of 20 mm in annealed condition 160-220 HB is recommended to use solid carbide drill ISO P15 Class with a cutting speed of 60-100 m/min and feed of 0.1 to 0.4 mm/rev. or carbide indexable insert drill ISO P40 Class TiCN/TiN coated with a cutting speed of 180-250 m/min and feed of 0.10-0.25mm/rev.

In order to avoid distortions on the part during hardening and tempering, it is recommended to perform a stress relief heat treatment before hardening if more than 30% of part weight is removed in machining operations.

Milling

Cutting data parameter	Annealed 160 - 220 HB		Hardened and Tempered 48-52 HRC		
	Rough milling	Fine milling	Rough milling	Fine milling	Bell Nose end milling
Cutting speed (V_c), m/min	200 – 250	250 – 300	40 – 60	50 - 70	60 - 90
Feed (f), mm/tooth	0.2 – 0.4	0.1 - 0.2	0.2 - 0.5	0.1 - 0.2	0.1 - 0.2
Depth of cut (a_p), mm	2 – 4	0 - 2	0.1 - 2	0.1 - 2	0.1 - 2
Carbide designation ISO	P20/25 TiAlN coated	P10/15 TiAlN coated	P20/25 AlTiCrN coated	P10/15 AlTiCrN coated	P10/15 AlTiCrN coated

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 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 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) 250°C (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 highest 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 ESR. Leading photo-etching companies are familiar with etching corrosion-resistant steels such as ASSAB 2083 ESR.

FURTHER INFORMATION

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

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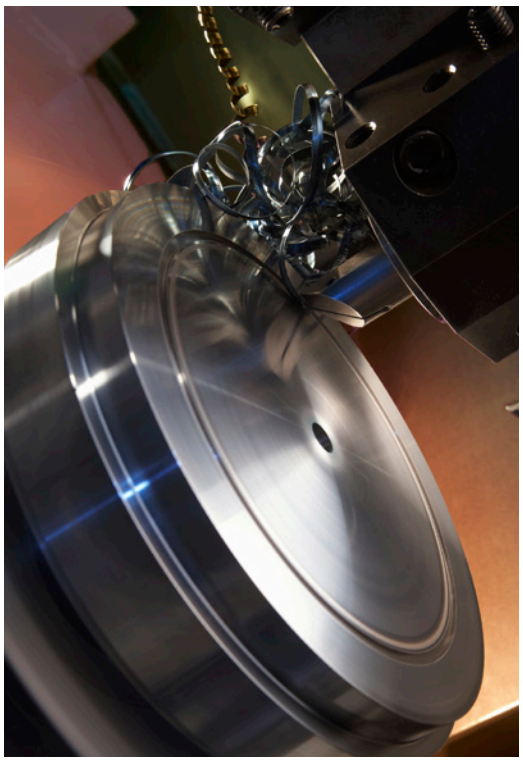
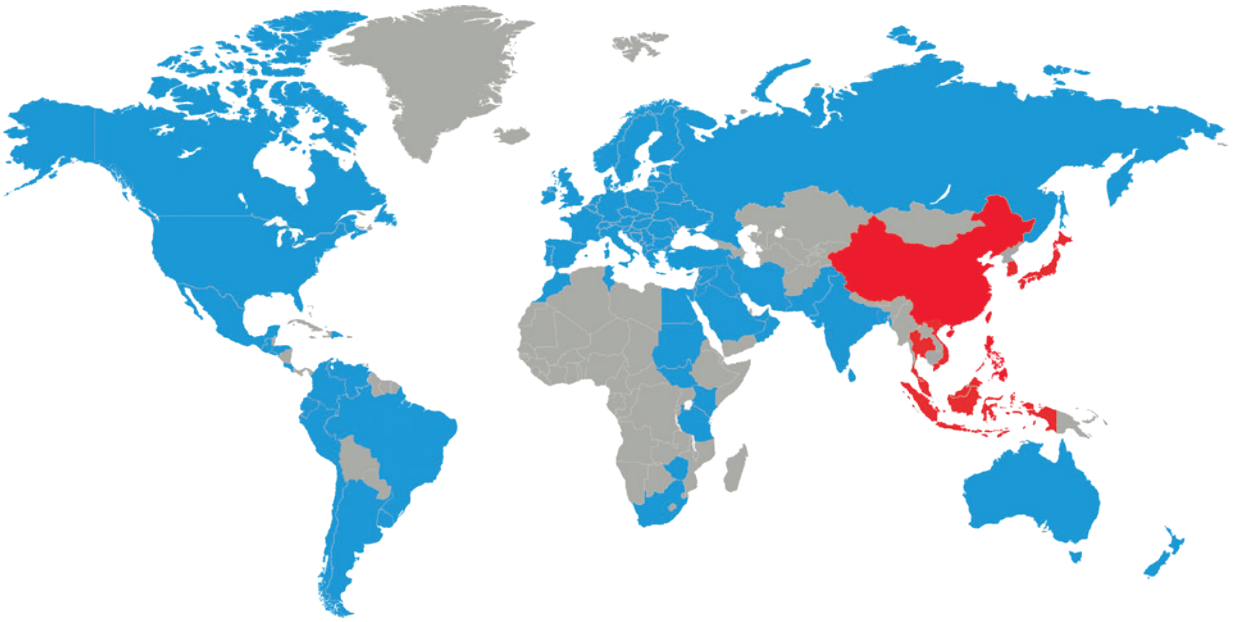
SUPERIOR TOOLING SOLUTIONS
A ONE-STOP SHOP



ASSAB is 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:

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