

Materials Services Schweiz

THYROHARD-Xtra

With brilliant performance.



thyssenkrupp



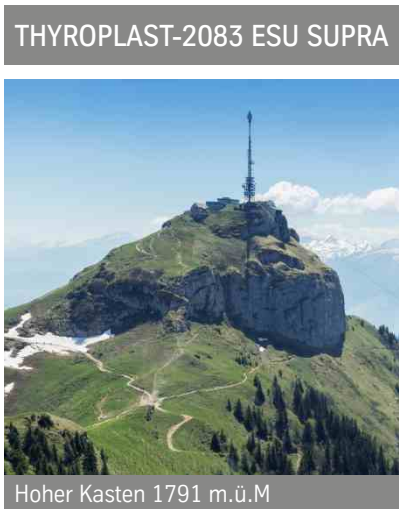
THYROHARD-Xtra - What is it exactly?

THYROHARD-Xtra is a nitrogen-alloyed, corrosion-resistant, martensitic steel with very good toughness and an individually adjustable hardness of 52 to 60 HRC. The combination of the ESR process and a sophisticated forging technique achieves a homogeneous microstructure. This means good machinability with excellent polishability and high dimensional stability after heat treatment. Furthermore, THYROHARD-Xtra has a high tempering resistance up to 540°C and can therefore also be high-temperature PVD coated.

Thanks to these outstanding properties, THYROHARD-Xtra is ideally suited for precise, highly polished and highly corrosion-resistant mould inserts, medical and other moulded parts.

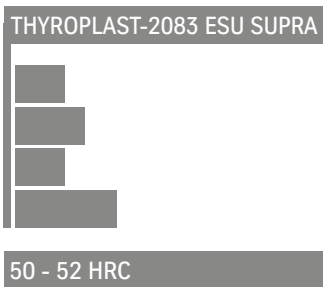
"THYROHARD-Xtra unites highest hardness, toughness and corrosion resistance with best polishability"

Cuno Sutter, Materials Expert/Key Account Manager



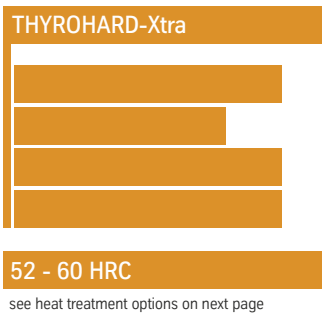
For simple demands on...

- + hardness
- + corrosion resistance
- + toughness
- + polishability
- + wear resistance



For the highest demands on...

- +++ hardness
- +++ corrosion resistance
- +++ toughness
- +++ polishability
- +++ wear resistance



THYROHARD-Xtra - Technical material data

 ESU SUPRA
annealed +A

 20 - 130mm

available dimensions

Sawn, milled, ground, deep-hole drilled - thanks to our extensive stock of panels and blocks, we are able to deliver any dimension in the desired design at short notice from our plant in Wil.

Chemical
composition
(guide values in %)

C	Mn	Cr	Ni	Mo	N	Additives
max. 0,45	max. 0,6	max. 16,5	max. 0,5	max. 1,9	max. 0,25	+

Physical
properties

Thermal expansion	m/(m*K)*10 ⁻⁶	20 – 100 °C 8,73	20 – 300 °C 10,22	20 – 500 °C 10,97
Thermal conductivity at 100°C	W/(m*K)	23,9		
Density	kg/dm ³	7,7		

Instructions for use

THYROHARD-Xtra is excellently suited for corrosion-resistant and high-gloss polished mould inserts, medical instruments and prototypes

Heat treatment

Annealing:

Soft annealing: 780 - 860°C, holding time 8 h, slow cooling in the furnace to 550°C

Annealing hardness: approx. 265 HB

Hardening:

Vacuum hardening: 970 - 1070°C, depending on application

Tempering:

Tempering according to specification

Vacuum hardening should preferably be carried out under nitrogen partial pressure (100-200 mbar).

Brand/material	Heat treatment	Hardness TARGET HRC
THYROHARD-Xtra Typ „hard“	1020°C / N ₂ 4.5bar tk -80°C Al 150°C min 2h	56 - 61
THYROHARD-Xtra Typ „tough“	970°C / N ₂ 4.5bar tk -80°C Al 300°C mind 2h	53 - 56
THYROHARD-Xtra Typ „coat“	1050°C / N ₂ 4.5bar tk -80°C Al 2x540°C mind 2h	52 - 55
THYROHARD-Xtra Typ „coat hard“	1070°C / N ₂ 4.5bar tk -80°C Al 2x510°C mind 2h	57 - 60

Important note on heat treatment:

For large cross-sections we recommend a specific heat treatment.

This includes deep-freezing to minus 126°C or 196°C, supplemented by tempering 3 times after consultation with our materials experts.

Welding

Well suited for laser welding

THYROHARD-Xtra - Technical material data

Processing

Turning with carbide (cutting speed v_c in m/min)

Indexable inserts	260 - 200	200 - 150	150 - 110
ISO P25	bis 250	bis 200	bis 150
ISO P35	bis 200	bis 150	bis 130

Drilling with carbide (cutting speed v_c from 35 - 50 m/min)

Drill diameter (mm)	3 - 8	8 - 20	20 - 40
Feed rate (mm/rev)	0.02 - 0.05	0.05 - 0.12	0.12 - 0.18
Carbide grade	K 10	K 10	K 10

Milling with cutter heads (cutting speed v_c in m/min)

Feed (mm/tooth)	bis 0.2	0.2 - 0.3
ISO P25	160 - 100	110 - 60
ISO P35	140 - 110	-
ISO P40	100 - 60	70 - 40

Hard turning

Cutting material	CBN 3
Insert geometry	SNGN 090308 T 02020
Cutting speed	$v_c \approx 125$ m/min.
Feed (mm/rev)	0.1
Depth of cut (mm)	0.2



Your contact persons



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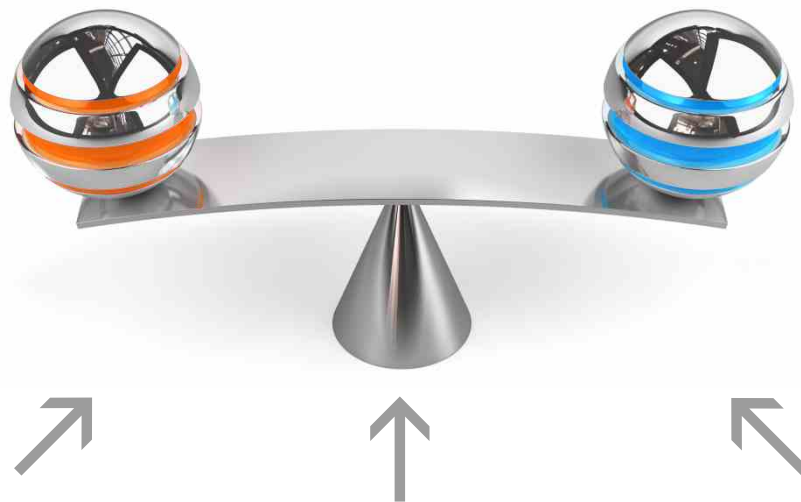


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Polishing tool steel - tips and tricks

Influences on the polishing result



Steel quality



- Alloy composition
- Degree of purity
- Porosity / homogeneity
- Microstructure

Polishing technique



- Experience
- Patience
- Feel for the material characterises the efficient polisher and the optimal polishing result

Heat treatment



- High hardness → good polishing result
- No coarse grain → good polishing result
- No carbide precipitation at the grain boundaries → good polishing result
- High C/Cr content → poor polishing result

Workflow

Working cycle	Plastic mould steels (Attention S-content) Hardness approx. 300 HB / 32 HRC	Plastic mould steels Hardness approx. > 54 HRC
Pre-machining	(hard) milling, (hard) turning, electro-erosion	(hard) milling, (hard) turning, electro-erosion
Rough grinding	180 grit	180 grit or linen
Fine grinding	320 grit in steps up to 500 grit on linen	220 grit in steps up to 320 grit on linen
Polishing	15 my diamond grit 6 my diamond grit on felt or Fibre	45 my diamond grit on wood / copper (hard) 15 my diamond grit on fibre (medium hard) 6 my diamond grit 3 und 1 my diamond grit on textile / felt for extreme requirements (soft)

Polishing tool steel - tips and tricks

Preparation

Surface finishing before polishing	Measurement mm	ideal roughness Ra μm	Time required for polishing
hard milled / turned	< 0.01	0.02 - 0.05	
grinded	< 0.01	0.1 - 0.4 (grinding point)	
eroded	< 0.02	1.12 - 1.6 (VDI 21 - 24)	

Auxiliaries for machine or hand polishing

Tool (carrier):

- Wood, copper
- Felt (various degrees of hardness)
- Nylon
- Various fabrics, e.g. jeans etc.

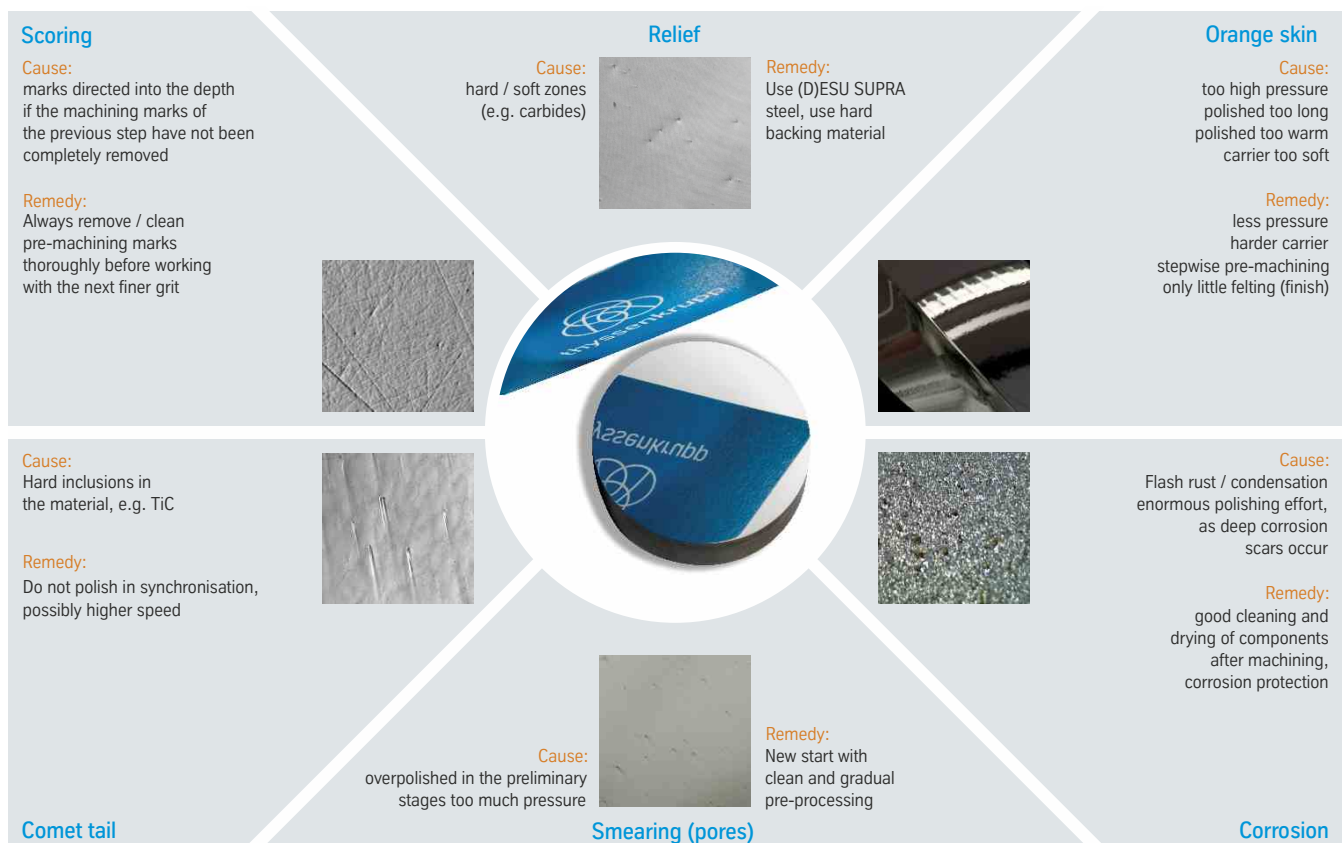
Polishing medium:

- high-quality, uniform polycrystalline diamond paste in various grain sizes

Factors influencing high gloss polishing:

pure steel, fibre course, annealed structure, (high) hardness, uniform / homogeneous structure according to the hardening, machining, hardening parameters, polisher (human factor)

Polishing error - Cause - Remedy



Polishing tool steel - tips and tricks

Steels and their suitability for polishing

Material	Polishability	Notes (Mirror Polish AG)
THYROHARD-Xtra	5	very good polishability, very high gloss
TSP-2379 (PM Stahl)	4	very good polishability, high gloss
THYROTHERM-2343 ESU SUPRA	4	good polishability
THYROTHERM-2344 ESU SUPRA	4	good polishability
THYRODUR-2767 ESU SUPRA	4	difficult, super shine
THYROPLAST-2083 ESU SUPRA	3	difficult (pores at the end possible)
THYROTHERM-2343	2	difficult (pores possible)
THYROPLAST-2361 ESU SUPRA	2	technically OK, finish with 600 grit (longitudinal tension)
THYRODUR-2379	1	technically OK, finish with 600 grit (longitudinal tension)

- 1 poor
- 5 very good, also high gloss (approx. Ra 0.02 - 0.05 µm)

Polishability



Materials Services Schweiz

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