

## Tailored to your needs!

**OPTI N+** is tailored to your needs. This new high-end development in the tool steel industry allows you to thrive your product to the top level.

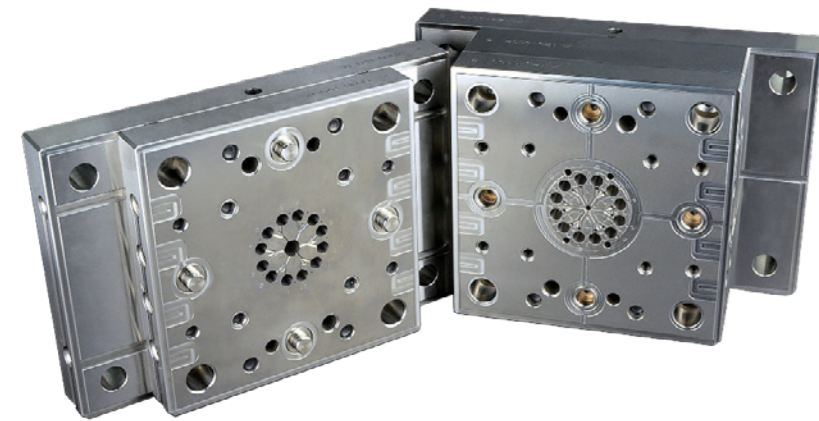
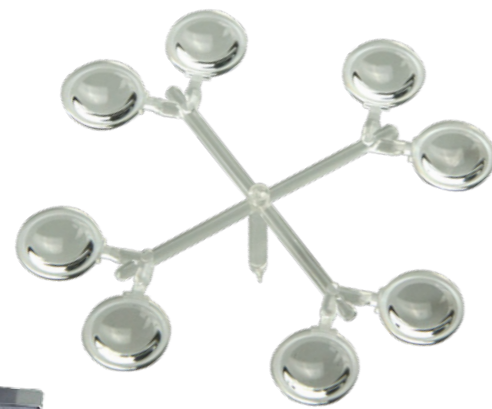


**Consumer products are differentiated by their design > prominent surface properties required**

- The mould steel needs to provide high wear resistance, good polishability and an extremely high homogeneity through the whole block
- SWGs solution: **OPTI N+**
- A corrosion resistant steel with a very low carbon content and a high hardness due to the addition of nitrogen

**Properties:**

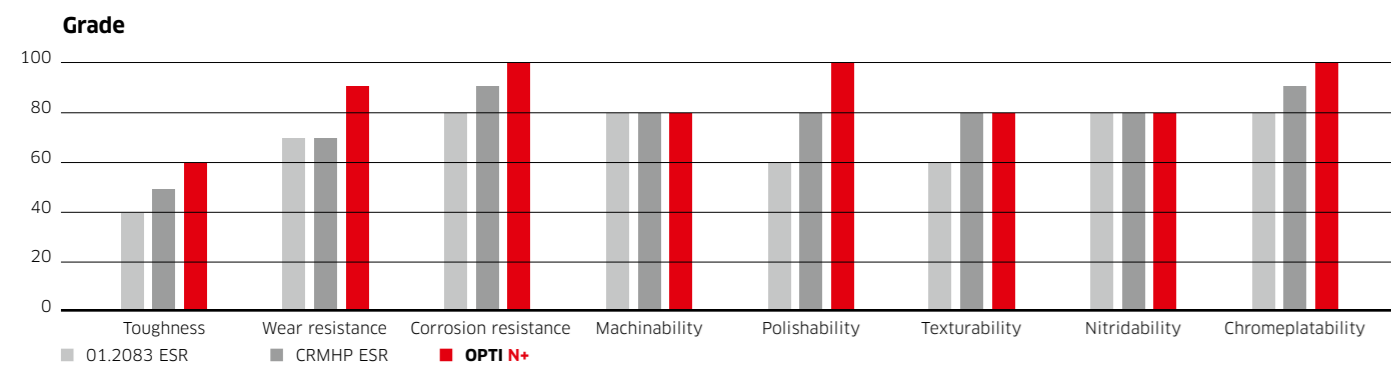
- High purity and mirror polishability
- High wear resistance
- Corrosion resistant for e.g. PVC processing
- Vacuum hardenability to approx. 57 HRC
- Extremely homogeneous through entire block and therefore a very even hardness distribution all over the block
- Low distortion



**Application:**

- High-end-Moulds for highest surface requirements
- PVD coating is possible
- For lenses, transparent and decorative parts

Grade		Service hardness	Delivery hardness	max. thickness	Coating reference layer type	Reason for coating
		1.2083 ESR	min 48 HRC	≤ 250	500	CrN-Multilayer
CRMHP ESR	min 48 HRC	≤ 250	500	CrN-Multilayer	Abrasion / Corrosion	
<b>OPTI N+</b>	50-57 HRC	≤ 260	500	CrN-Multilayer	Abrasion / Corrosion	



# OPTI N+ MADE FOR EXCELLENCE

exceeding performance you can rely on

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# Pioneering solutions OPTI N+

**OPTI N+** is the material of choice when it comes to outperformance of mould steel. Tool steels from SWG are used wherever reliable quality, long service life, innovation and a competent service with an international sales network are required.

As one of the leading suppliers of tool steels -working in close collaboration with customers -we are consistently developing new possibilities to meet the challenges of tomorrow.

Our aim is always to fulfil the specific requirements of our customers flexibly and efficiently. This is reflected in the broad spectrum of applications - ranging from the automotive, aerospace and pharmaceutical sectors to high-tech industry.

Based on our long-term experience in making first class plastic mould steel we have developed a new and advanced special grade: **OPTI N+**.

**OPTI N+** should be your steel of choice if you are looking for a mould which fulfills the highest surface requirements, a long-life time cycle with the target of highest corrosion and wear resistency including the best polishing ability.

## Top of the top!

Extremely homogeneous through the steel block and therefore a very even hardness distribution over the entire block. This leads to very low distortions after heat treatment.

Our advanced technology enables us to produce this new steel grade with a special remelting technology to ensure the uncompromising quality you will experience due to the life-time of your mould.

## Applications

### For optics

- Super purity, mirror polishability can reach AO. The best material option for high surface requirement moulds like optics and LGP
- High wear resistance, hardness up to 57HRC
- Better corrosion resistance than 1.2083ESR
- Low Distortions (Sub-zero treatment)

### For medical area

- High wear resistance, vacuum hardenability up to 57HRC
- Super purity, mirror polishability can reach AO
- Better corrosion resistance than 1.2083ESR

### For moulds requiring high wear resistance

- High wear resistance, vacuum hardenability up to 57HRC
- Better corrosion resistance than 1.2083ESR
- Mould for high glass fibre
- Mould requiring very long-life time

**For any other high-end application please do not hesitate to contact us.**

material characteristics	material number / grade	OPTI N+					
	DIN standard	X15CrNi13					
	short designation	1.4024mod PESR, AISI 420mod PESR					
	chemical composition - reference analysis [%]	C	Si	Mn	Cr	Ni	N
		0.15	0.30	0.40	14.00	0.60	alloyed
	production technology	EAF/LF/VD/PESR, forging, annealing					
	service hardness/strength	HB		HRC		N/mm <sup>2</sup>	
		-		50-57		-	
	delivery condition	annealed		≤ 260			
	maximum dimension	diameter			thickness		
	-			≤ 500mm			
US-specification	EN 10228-3			SEP 1921			
	table 3 - type 1 - qual. class 4			group 3 - class E,e			
cleanliness	DIN 50602			ASTM E45 method A			
	K1 ≤ 10			A ≤ 0,5; B,C,D ≤ 1			

variation upon request

technological properties		0	1	2	3	4	5	comment	
	toughness		■	■					
	hot strength at working temp.		■	■					in relation to service hardness
	wear resistance		■	■	■	■			
	corrosion resistance		■	■	■	■	■		polished surface for best corrosion resistance
	machinability		■	■	■	■			annealed
	polishability		■	■	■	■	■		ISO/SPI: NO/A-1
	weldability		■						CET = 0.91% acc. DIN EN 1011-2
	texturability		■	■	■	■			
	nitridability		■	■	■	■			nitriding hardness 900-1200 HV1
chrome-platability		■	■	■	■	■		high cleanliness	

RATING PROPERTIES: 0 = not suitable; 1 = low; 2 = middle; 3 = good; 4 = very good; 5 = perfectly suitable

physical properties	thermal conductivity [W · m <sup>-1</sup> · K <sup>-1</sup> ]	20 °C	200 °C	300 °C	500 °C	-
		19,9	23,5	24,4	25,1	-
	coefficient of thermal expansion between 20 °C and ... [10 <sup>-6</sup> · K <sup>-1</sup> ]	20 °C	50 °C	100 °C	120 °C	140 °C
		10,356	10,434	10,584	10,644	10,704
		150 °C	160 °C	180 °C	200 °C	220 °C
		10,734	10,764	10,824	10,884	10,944
	elastic modulus [kN/mm <sup>2</sup> ]	20 °C	200 °C	300 °C	500 °C	-
		218	206	198	180	-

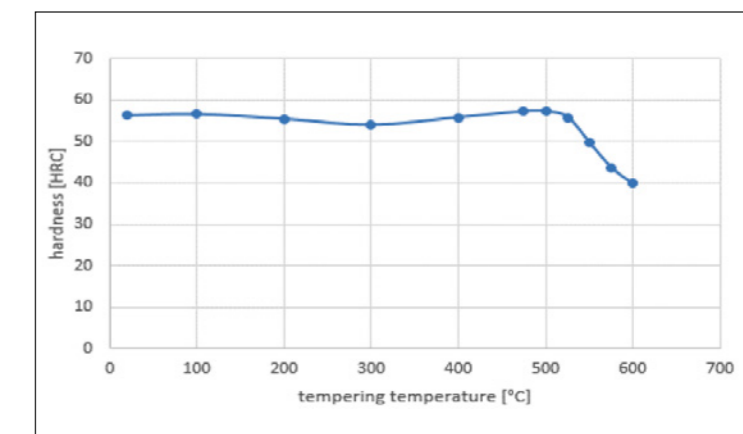
application	technology	mould making, corrosion resistant
	tools	corrosion resistant plastic moulds with high requirements on surface quality
	process temperature	< 300 °C
	tool size	small- and medium-sized moulds
	final products	transparent plastic parts, high gloss parts, lenses, optical parts, electronic covers
	features	for very high surface quality

SWG processing instructions	welding, texturing, polishing, vacuum hardening
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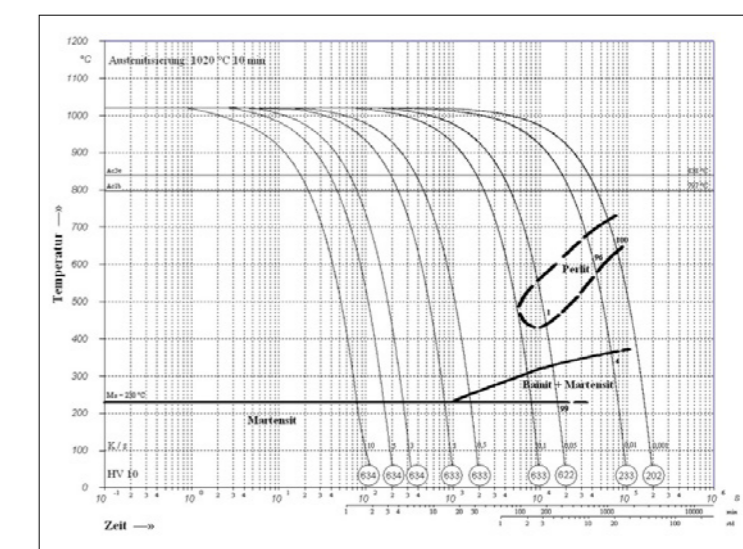
heat treatment		T min [°C]	T max [°C]	medium / comment
	annealing	760	800	furnace
	hardening	1000	1030	vacuum, oil
	tempering	250	600	furnace
	stress relieving	450	500	max. 30 °C below tempering temp.
	pre-heating before welding	320	350	
	nitriding	400	500	max. 30 °C below tempering temp.
PVD-treating	400	500		

diagrams / structure	TTT-diagram	yes
	tempering diagram	yes
	advice on heat treatment	vacuum hardening after pre-machining
	microstructure	martensitic

Tempering diagram: Average values on samples dia 25 mm x length 50 mm; hardened at 1020 °C in oil



TTT-diagram (continuous)



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