

CPM40 ESR

Aging tool steel, applied on **LCD/LED** screen shell's steam mold, its pre-hardened tool steel with high purity, suitable for non melt mark plastic mold which molding cycles on quenching and heating mold temperature.

material characteristics	material number / grade	SWG CPM40 VICTORY ESR						
	short designation	15CrNiMoAlCu16-12-11						
	comparable grade	-						
	chemical composition - reference analysis [%]	C	Si	Mn	Cr	Mo	Ni	others
		0.15	0.30	0.50	4.00	1.10	3.00	alloyed
	production technology	EF/LF/VD/ESR, forging, Q+T						
	service hardness / strength converted acc. to DIN EN ISO 18265 table B2	HB		HRC		N/mm ²		
		359 - 400		38 - 42		1140 - 1270		
	delivery condition	Q+T	359 - 400	38 - 42	1140 - 1270			
	maximum dimension	diameter			thickness			
-			≤ 400 mm					
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 ≤ 1,0; D ≤ 1,5				

variation upon request

technological properties		0	1	2	3	4	5	comment		
	toughness		■							in relation to service hardness 38-42HRC
	hot strength at working temp.		■	■	■					
	wear resistance		■	■	■	■				
	corrosion resistance	■								
	machinability		■	■						
	polishability		■	■	■	■				ISO/SPI: N1/A-1
	weldability		■	■						CET = 0.83 % acc. DIN EN 1011-2
	texturability		■	■	■	■				
	nitridability		■	■	■	■	■			nitriding hardness 900 - 1250 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 ⁻¹ · K ⁻¹]	20 °C	200 °C	300 °C	500 °C
		28.0	28.4	29.0	29.5
	coefficient of thermal expansion between 20 °C and ... [10 ⁻⁶ · K ⁻¹]	100 °C	200 °C	300 °C	500 °C
		11.2	11.6	12.2	12.6
	elastic modulus [kN/mm ²]	20 °C	200 °C	300 °C	500 °C
		212	199	192	175

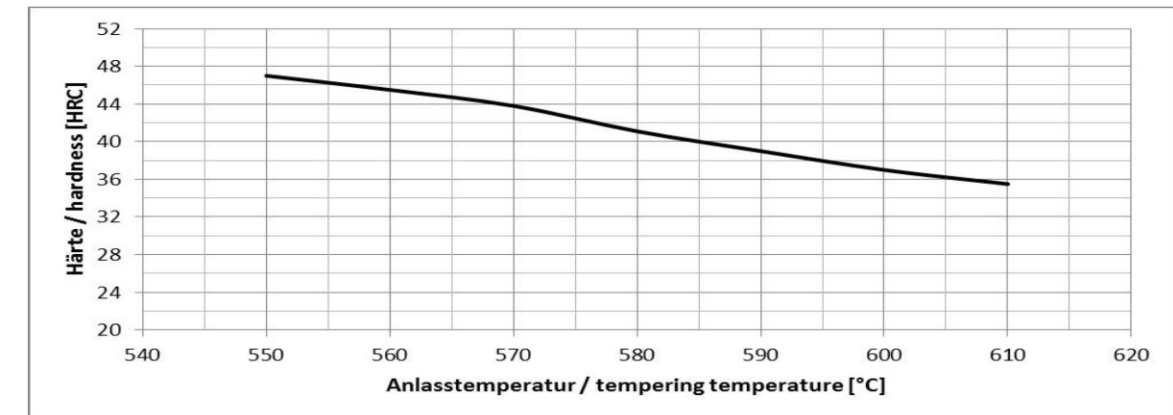
application	technology	mold making, injection molding, rapid heat cycle molding
	tools	plastic molds for "weldless molding"
	process temperature	< 300 °C
	tool size	small-, medium- and large-sized molds
	final products	plastic parts, textured, high gloss
	features	precipitation hardened, high cleanliness

SWG processing instructions	welding, texturing, polishing
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heat treatment		T min [°C]	T max [°C]	medium / comment
	annealing	650	680	air
	hardening	1000	1020	oil
	tempering	540	580	air
	stress relieving	500	530	min. 30 °C below tempering temp.
	pre-heating before welding	250	350	
	nitriding	450	530	min. 30 °C below tempering temp.
	PVD-treating	450	530	

diagrams/ structure	CCT-diagram	no
	tempering diagram	yes
	advice on heat treatment	pre-hardened
	microstructure	soft-martensite + precipitations

Tempering diagram: Average values on samples dia 25 mm x length 50 mm



PLEASE NOTE: The information contained in this data sheet is unbinding. It merely serves the first orientation of the user. Therefore, we do not assume any liability for the correctness, completeness or up-to-dateness of such data. In case of an order, the properties of the product are exclusively subject to the provisions of the respective contract.
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德标钢种 Din Grades

应用 Application	交付状态 Delivery Condition	钢种 Grade	化学成分 % Typical SWG analysis in w%						硬度(表面) Service hardness (surface)
			C	Cr	Mo	Ni	V	其它 Others	
塑胶钢 Plastic Mold Steels	预硬 Q+T	2311	0.40	2.00	0.20	-	-	-	28-34 HRC
		2312	0.40	1.90	0.20	-	-	S-0.05	28-34 HRC
		2738 / 2738H / 2738HH	0.36	1.80	0.20	1.10	-	-	30-38 HRC
		2711mod	0.55	1.10	0.80	2.00	0.10	-	36-42 HRC
		2714	0.55	1.10	0.50	1.70	0.10	-	38-44 HRC
	退火annealed	2767	0.45	1.25	0.20	3.90	-	-	49-53 HRC
不锈钢 Corrosion Resistant Steels	预硬 Q+T	2085	0.33	16.00	-	<1.00	-	S-0.08	28-34 HRC
		2316	0.35	15.50	1.00	0.50	-	-	28-34 HRC
		2316 VICTORY ESR	0.35	15.50	1.00	0.50	-	-	28-34 HRC
		2316mod VICTORY ESR	0.26	15.00	1.00	0.70	-	-	28-34 HRC
	预硬 Q+T 退火 annealed	2083	0.40	13.00	-	-	-	-	32-52 HRC
		2083 VICTORY ESR	0.40	13.00	-	-	-	-	32-52 HRC
		2083mod VICTORY ESR	0.38	13.00	-	-	0.25	添加 alloyed	29-52 HRC
		2343 / EX3	0.36	5.00	1.20	-	0.40	-	36-52 HRC
热作钢 Hot Work Steels	超精细化 退火 EFS- annealed	2343 VICTORY ESR	0.36	5.00	1.20	-	0.40	-	36-52 HRC
		2344 / EX4	0.40	5.20	1.30	-	1.00	-	36-52 HRC
		2344 VICTORY ESR	0.40	5.20	1.30	-	1.00	-	36-52 HRC
		2367 VICTORY ESR	0.36	5.10	2.80	-	0.55	-	35-52 HRC
		2357	0.50	3.30	1.50	-	0.25	-	52-56 HRC
冷作钢 Cold Work Steels	退火 annealed	2379	1.55	12.00	0.90	-	0.90	-	58-62 HRC

葛利兹钢种 SWG Grades

交付状态 Delivery Condition	钢种 Grade	化学成分 % Typical SWG analysis in w%						硬度(表面) Service hardness (surface)
		C	Cr	Mo	Ni	V	其它 Others	
预硬 Q+T	738HH	0.27	1.35	添加 alloyed	1.00	-	添加 alloyed	32-38 HRC
	XPM	0.27	1.35	0.50	1.00	-	添加 alloyed	38-42 HRC
	XPM VICTORY ESR	0.30	1.35	0.70	1.00	-	添加 alloyed	38-42 HRC
	CPM40 VICTORY ESR	0.15	4.00	1.10	3.00	-	添加 alloyed	38-42 HRC
	GEST80 VICTORY ESR	0.14	0.30	0.30	2.80	-	Cu, Al	38-42 HRC
	退火annealed	GPM58 VICTORY ESR	0.50	5.00	2.20	添加 alloyed	0.70	-
预硬 Q+T	CPM50 VICTORY ESR	0.28	14.00	-	0.60	-	N	38-42 HRC
退火 annealed	CRMHP VICTORY ESR	0.25	14.00	-	0.60	-	N	50-52 HRC
	OPTI N+ PESR	0.15	14.00	-	0.60	-	N	50-57 HRC
	HNS28 PESR	0.25	14.00	-	0.60	-	N	57-59 HRC
	HNS40HC PESR	0.40	15.00	2.00	<0.50	<1.50	N	58-60 HRC
	Cronidur®30 PESR	0.30	15.00	1.00	0.50	-	N	58-60 HRC
退火 annealed	EX1 VICTORY ESR	0.35	5.00	2.20	-	0.55	-	40-52 HRC
	2343PLUS VICTORY ESR	0.38	5.00	1.80	-	0.55	-	40-52 HRC
	EX55 VICTORY ESR	定制产品 Customized Steel						40-52 HRC
	EX6 VICTORY ESR	0.43	6.40	1.30	-	0.90	-	52-56 HRC

葛利兹钢材特性-应用参考表

Gröditz Steel Characteristic- Application Reference

特性比例(Characteristic ratio) : 0=不适合(NA) / 1=低度(Low) / 2=中度(Medium) / 3=好(Good) / 4=很好(Very good) / 5=非常好(Excellent)

Grade 钢种	Chemical Composition (%)化学成分-範圍值							Machin-Ability 机加性能					Polish-Ability 抛光性能					Grain-Ability 蚀纹性能					Wear-Ability 耐磨性能					Weld-Ability 焊接性能									
	C	Si	Mn	Cr	Mo	Ni	Others	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
	2311	0.40	0.30	1.50	2.00	0.20				■	■	■				■						■	■					■	■					■	■	■	
2312	0.40	0.30	1.50	1.90	0.20		S:0.05		■	■	■	■	■	■						■							■	■					■	■	■		
2738	0.36	0.25	1.50	1.80	0.20	1.10			■	■	■	■			■	■					■	■					■	■	■				■	■	■		
738HH	0.27	0.30	1.35	1.35	add	1.00	add		■	■	■	■			■	■	■				■	■	■				■	■	■	■			■	■	■	■	
XPM	0.27	0.30	1.55	1.35	0.50	1.0	add		■	■	■	■			■	■	■				■	■	■	■			■	■	■				■	■	■	■	
XPM ESR	0.30	0.30	1.55	1.35	0.70	1.00	add		■	■	■	■	■		■	■	■	■			■	■	■	■	■		■	■	■	■			■	■	■		
2711	0.55	0.25	0.70	0.70	0.30	1.70	V:0.1		■	■					■	■					■	■					■	■	■	■			■	■			
2714	0.55	0.25	0.70	1.10	0.50	1.70	V:0.1		■	■					■	■					■	■					■	■	■	■			■	■			
GEST 80 ESR	0.14		1.40	0.30	0.30	2.80	Cu:0.9 Al:0.3		■	■	■				■	■	■	■			■	■	■	■			■	■	■	■			■	■	■		
CPM 40	0.15	0.30	0.50	4.00	1.10	3.00	add		■	■					■	■	■	■			■	■	■	■			■	■	■	■			■	■			
2343(EX3)	0.36	1.00	0.35	5.00	1.20		V:0.4		■	■	■	■			■	■	■				■	■					■	■	■	■			■				
2343(EX3) ESR	0.36	1.00	0.35	5.00	1.20		V:0.4		■	■	■	■	■		■	■	■	■	■		■	■	■	■	■		■	■	■	■	■		■	■	■	■	
2344(EX4)	0.4	1.00	0.40	5.20	1.30		V:1.0		■	■	■	■			■	■	■				■	■	■	■			■	■	■	■			■				
2344(EX4) ESR	0.4	1.00	0.40	5.20	1.30		V:1.0		■	■	■	■	■		■	■	■	■	■		■	■	■	■	■		■	■	■	■	■		■				
2767	0.45	0.25	0.35	1.25	0.20	3.90			■	■	■	■			■	■	■				■	■	■	■			■	■	■	■	■		■	■			
GPM 58 ESR	0.5	≤0.5	0.50	5.00	2.20		V:0.7 Ni+		■	■					■	■	■	■			■	■	■	■			■	■	■	■	■		■				

交货状态 Delivery Status : (字段颜色 field color)---■ : 预硬模具钢料(Pre-hardened steel) / ■ : 退火模具钢料(Anneal steel)

※ The information provided in this table is based on our level of knowledge and is intended to provide general recommendations for the use of our products. This is not considered a guarantee of product quality characteristics, and every user of Gliese steel should make their own judgment on the suitability of choosing Groetiz steel products.

葛利兹钢材特性-应用参考表

Gröditz Steel Characteristic- Application Reference

特性比例(Characteristic ratio) : 0=不适合(NA) / 1=低度(LOW) / 2=中度(Medium) / 3=好(Good) / 4=很好(Very good) / 5=非常好(Excellent)

Grade 钢种	Chemical Composition (%)化学成分-範圍值							Corrosion resistance 耐腐蚀能力					Toughness 韧性					Chrome platability 镀铬性能					Nitridability 氮化性能																											
	C	Si	Mn	Cr	Mo	Ni	Others	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5																			
2311	0.40	0.30	1.50	2.00	0.20			■						■	■										■	■						■	■	■																
2312	0.40	0.30	1.50	1.90	0.20		S:0.05	■						■											■								■	■	■															
2738	0.36	0.25	1.50	1.80	0.20	1.10		■						■	■	■									■	■	■						■	■	■															
738HH	0.27	0.30	1.35	1.35	add	1.00	add	■						■	■	■									■	■	■						■	■	■															
XPM	0.27	0.30	1.55	1.35	0.50	1.0	add	■						■	■	■									■	■	■	■					■	■	■															
XPM ESR	0.30	0.30	1.55	1.35	0.70	1.00	add	■						■	■	■	■								■	■	■	■	■				■	■	■															
2711	0.55	0.25	0.70	0.70	0.30	1.70	V:0.1	■						■	■	■									■	■							■	■																
2714	0.55	0.25	0.70	1.10	0.50	1.70	V:0.1	■						■	■	■									■	■							■	■																
GEST 80 ESR	0.14		1.40	0.30	0.30	2.80	Cu:0.9 Al:0.3	■						■	■										■	■	■	■					■	■	■	■														
CPM 40	0.15	0.30	0.50	4.00	1.10	3.00	add	■						■											■	■	■	■					■	■	■	■	■													
2343(EX3)	0.36	1.00	0.35	5.00	1.20		V:0.4	■						■	■										■	■							■	■	■	■														
2343(EX3) ESR	0.36	1.00	0.35	5.00	1.20		V:0.4	■						■	■	■									■	■	■	■	■				■	■	■	■	■													
2344(EX4)	0.4	1.00	0.40	5.20	1.30		V:1.0	■						■	■										■	■							■	■	■	■	■													
2344(EX4) ESR	0.4	1.00	0.40	5.20	1.30		V:1.0	■						■	■	■									■	■	■	■	■				■	■	■	■	■													
2767	0.45	0.25	0.35	1.25	0.20	3.90		■						■	■	■									■	■	■						■	■																
GPM 58 ESR	0.5	≤0.5	0.50	5.00	2.20		V:0.7 Ni +	■						■	■	■									■	■	■	■	■				■	■	■	■	■													

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葛利兹不锈钢钢材系列特性-应用参考表

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特性比例(Characteristic ratio) : 0=不适合(NA) / 1=低度(Low) / 2=中度(Medium) / 3=好(Good) / 4=很好(Very good) / 5=非常好(Excellent)

Grade 钢种	Chemical Composition (%)化学成分-范围值							Machin-Ability 机加性能					Polish-Ability 抛光性能					Grain-Ability 蚀纹性能					Wear-Ability 耐磨性能					Weld-Ability 焊接性能									
	C	Si	Mn	Cr	Mo	Ni	Others	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
	2316	0.35	0.35	0.70	15.50	1.00	0.50		0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4
2085	0.33	≤1.00	≤1.00	16.00		≤1.00	S:0.08	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
CPM50 ESR	0.28	0.30	0.40	14.00		0.60	+N	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
2083	0.40	0.40	0.70	13.00				0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
2083 ESR	0.40	0.40	0.70	13.00				0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
2083 mod ESR	0.38	1.00	0.50	13.00			V:0.25	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
CRMHP	0.25	0.30	0.40	14.00		0.60	+N	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
OPTI N+	0.15	0.30	0.40	14.00		0.60	+N	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
Grade 钢种	Chemical Composition (%)化学成分-范围值							Corrosion resistance 耐蚀能力					Toughness 韧性					Chrome platability 镀铬性能					Nitridability 氮化性能														
	C	Si	Mn	Cr	Mo	Ni	Others	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
	2316	0.35	0.35	0.70	15.50	1.00	0.50		0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5					
2085	0.33	≤1.00	≤1.00	16.00		≤1.00	S:0.08	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
CPM50 ESR	0.28	0.30	0.40	14.00		0.60	+N	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
2083	0.40	0.40	0.70	13.00				0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
2083 ESR	0.40	0.40	0.70	13.00				0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
2083 mod ESR	0.38	1.00	0.50	13.00			V:0.25	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
CRMHP ESR	0.25	0.30	0.40	14.00		0.60	+N	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
OPTI N+	0.15	0.30	0.40	14.00		0.60	+N	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						

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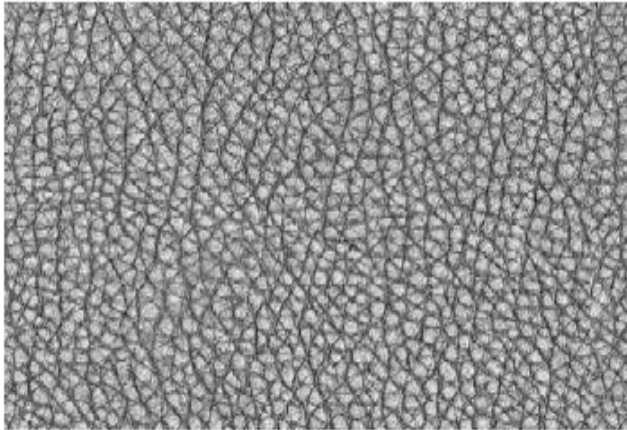
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Plastic 塑料		Plastic type 胶料种类	Recommendation 推荐	
			Steel grade 钢种	Hardness 硬度
Normal plastic 常用型胶料	Without corrosion 不带腐蚀性	PP, ABS, PE ,PS ,	2738/2738H 738HH XPM/XPMESR 2343/2344(EX3/EX4) 2343ESR/2344ESR(EX3ESR/EX4ESR) 2083/2083ESR	HRC29-38 HRC32-38 HRC35-42 HRC44-52 HRC48-52 HRC42-52
	With corrosion 带腐蚀性	PVC, POM , PA, SAN,PMMA	2316 2083/2083ESR CRMHP OPTI N+	HRC28-34 HRC42-52 HRC50-52 HRC54-57
Special plastic 特殊添加型胶料	+ < Plastic +GF% or Talc 加玻签或滑石粉.... 增强塑料	+ < 30% GF(Glass Fiber) or Talc 加 30%以下的增强型胶料	2738/2738H 738HH XPM/XPMESR GEST80 CPM40	HRC29-38 HRC32-38 HRC35-42 HRC38-42 HRC38-42
		+ > 30% GF(Glass Fiber) or Talc 加 30%以上的增强型胶料	2343/2344(EX3/EX4) 2343ESR/2344ESR(EX3ESR/EX4ESR) 2083/2083ESR CRMHP OPTI N+ GPM58	HRC48-52 HRC48-52 HRC42-52 HRC50-52 HRC54-57 HRC54-58
	Plastic + fire retardant 阻燃增强胶料	Added Cl-,Br-,P3- based fire retardant product 添加 Cl-,Br,P3-基阻燃剂胶料	2316 2083/2083ESR CRMHP OPTI N+	HRC28-34 HRC42-52 HRC50-52 HRC54-57

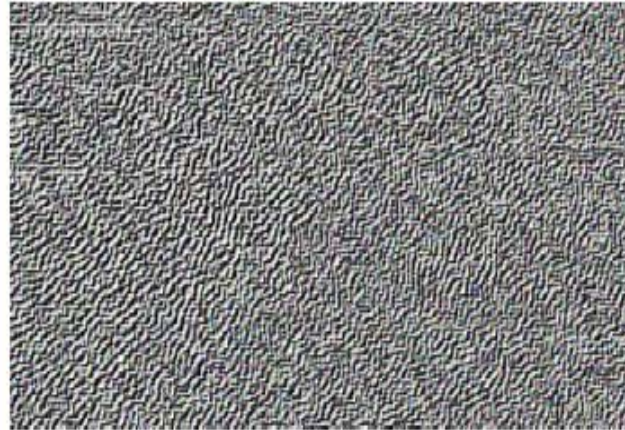
※ The information provided in this table is based on our level of knowledge and is intended to provide general recommendations for the use of our products. This is not considered a guarantee of product quality characteristics, and every user of Gliese steel should make their own judgment on the suitability of choosing Groetiz steel products.

Gröditz Steel Grade Application-Texture level

Normal Texturing
SWG 738HH

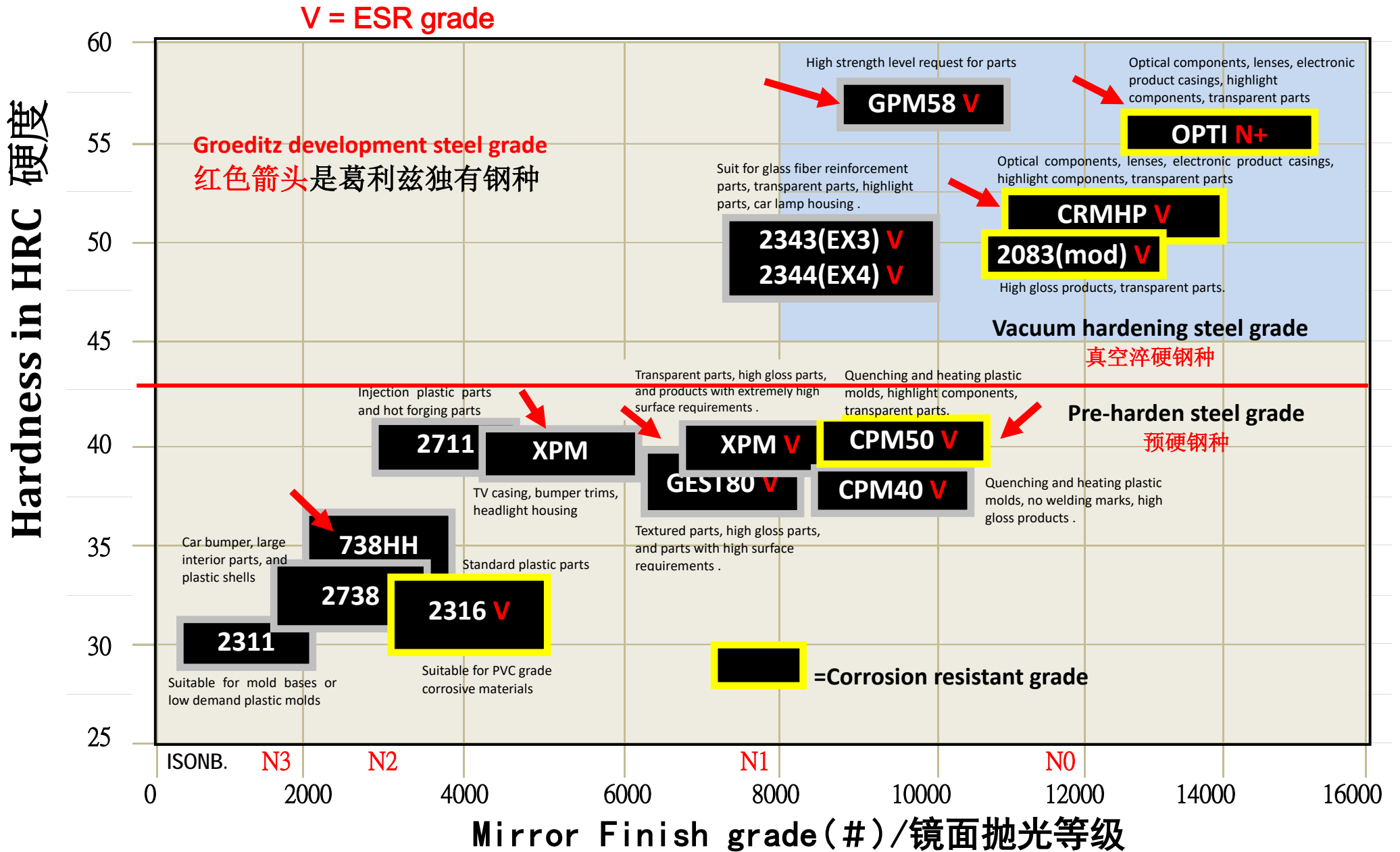


High Texturing
SWG XPM



Fine and Geometric Texturing
SWG 2083ESR, CRMHP ESR, GEST80 ESR





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Schmiedewerke Gröditz
GMH GRUPPE



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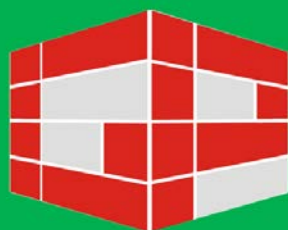
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