

COLD WORK TOOL STEELS High carbon high chromium steel (HCHCR D3)

			(-,						
Din - material - no.	1	1.2080										
Code	:	X210Cr12	2									
Comparable Standards	:	A ISI D3								\mathcal{A}	-	
Equivalent Brands	:	Bohler	ohler German No. Tew (DEW			Japan Poldi				(EWK)Thyssen Edelstahlwerke		
		K100	2080		SKDI		2002	00	3 12 T	Thyrodu	r2080	
Chemical composition	:	С	Si	Μ	n	Cr	r		Y			
(Typical analysis %)		2,05	0,25	0,3	30	11,5	50	X i				
Steel Properties	:	Ledeburit	ic Cr-steel fo	or colo	l work	. High r	resistance t	o wear a	Ind softer	ning.		
		Dimensio	nal and shap	oe stal	oility a	t heat t	reatment. (bood cut	ting capa	ability		
Dhusiaal Branartiaa		Thormoly	onductivity	\\/// m	~ K)	20°C)					
Physical Properties			conductivity	VV/ (1	II . K)	20.0						
		Density g	$/\text{cm}^3 = \frac{20^\circ\text{C}}{7,67}$			5						
		Coefficier	nt of Linear t	herma	ıl expa	nsion						
				0-200		-300	20-400	20-5	00 20)-600	20-700	
		10 ⁻⁶ °C ⁻¹ 2	11,7	12,0		2,4	12,9	13,	3 1	3,6	14,0	
Heat Treatment		Soft a	nnealing [®] C		Coolin	r		ц/	ardness H	ЧR		
	1	800-8			furnance				max 248			
		Harde	ning from °C	; i	n				ardness a ienching			
		940 -	980		Dil, Th Ca.400	ermal B °C	Bath	64	-66			
		960-1	000	4	Air, Co	mpress		63	3-65			
	C			F	or Th	ckness	to 30mm					
õ		Temperin	g ⁰C	100		200	300	400	500	60	D	
		HRC		64		62	60	57	53	42		
×												
APPLICATION	:	High per	formance cu	utting	tools,	stamp	oing, wood	working	drawing	, deep	drawing and	
		pressing	tools, rolls, (guage	s. She	ar blad	les for cutti	ng thin	materials	, thread	rolling dies,	
		cold rolls	for multiple r	rollers	stands							



COLD WORK TOOL STEELS High carbon high chromium steel (HCHCR D2)

			(,								
Din - material - no.	1	1.2379											
Code	:	X165QV12											
Comparable Standards	:	A ISI D2									F		
Equivalent Brands	:	Bohler	German N Tew (DEV		Japan Poldi			1	etal vne		Thyssen ahlwerke		
	_	K105	2601		SKD11		2002R	C4	750	Thyrod	dur2379	_	
Chemical composition	:	C	Si	M	n	Cr	Mo						
(Typical analysis %)	_	1,55	0,25	0,3	30	1,	00						
Steel Properties		Ledeb. Cr-steel for cold work. High wear resistance. Very good toughness, compression strength and dimensional stability. Possibility of nitriding.											
Physical Properties	:	Thermal c	conductivity	W/ (n	· · _	0°C 20							
			/cm ³ 20°C 7,69		Q	5							
			t of Linear th		7 \								
		10 ⁻⁶ °C ⁻¹ <u>-</u>	<u>0-100 20-</u> 9,8 11	200 ,7	20-300 12,1)-500 12,9	20-60 13,0			-800 3,5	
Heat Treatment	:	Soft ar	nnealing®C		Cooling			Н	ardness	s HB			
	: Soft annealing C Cooling Hardnes 840-880 furnance max 25												
		840-88	30	f	urnance			m	ax 250				
			ning from °C	f				H	ardness				
	11 X		ning from °C	ii	n)il, Therm		h	H qu			_		
		Harder	ning from °C	ii	n		h	H qu	ardness uenchin		-		
		Harder	ning from °C	ii	n Dil, Therm 500 - 550		h 500	H qu	ardness uenchin		- 700		
	-	Harder	ning from °C	ii 0	n Dil, Therm 500 - 550	°C		H q 62	ardness <u>Jenchin</u> 2-64	ig HRC	- 700 35		
APPLICATION		Harder 1020- Tempering HRC	ning from °C 1050 g °C 100 63	ii 0 5 200 61	n Dil, Therm 600 - 550 300 58	°C 400 58	500 59	Hi qi 62 525 58	ardness uenchin 2-64 550 56	600 51	35	. cold	
APPLICATION	:	Harder 1020- Tempering HRC High perfo	ning from °C 1050 g °C 100	in 0 5 200 61	n Dil, Therm 500 - 550 300 58 Dols, stam	°C 400 58 ping.T	500 59	H qu 62 525 58	ardness Jenchin 2-64 550 56	ig HRC 600 51	35 olling dies		
APPLICATION	:	Harder 1020- Tempering HRC High perfo	ning from °C 1050 g °C 100 63 prmance cutt	in 200 61	n Dil, Therm 500 - 550 300 58 Dols, stam	°C 400 58 ping.T d starr	500 59 hread roll	H qu 62 525 58 ing roll s for sl	ardness Jenchin 2-64 550 56 Is and theet thi	ng HRC	35 olling dies es up to 6	6 mm,	



COLD WORK TOOL STEELS Oil hardening Non Shrinking Steel (OHNS)

on nardening Non e			,								
Din - material - no.	: 1.2510										
Code	: 100MnC	rW4									
Comparable Standards	: A ISI : 0	I									
Equivalent Brands	: Bohler	German No. Tew (DEW	Japan	Poldi	Metal Ravne		/K)Thyssen Istahlwerke				
	K460	2510	SKS3	StabilK (OW4, Merilo I	EX Thy	rodur2510				
Chemical composition	: C	Si	Mn	Cr V							
(Typical analysis %)	0,95	0,25	1,10	0,60 0,1	0 0,60						
Steel Properties		Cold work tool steel. Very high resistance to cracking High machinability, medium toughness and resisstance to wear. Dimensional stability at heat treatment.									
Physical Properties	: Thermal	conductivity W/	(m.K) 2	20°C							
				30							
	Density	g/cm ³ <u>20°C</u> 7,85		6							
	Coefficie	nt of Linear ther	mal expans	ion							
	10 ⁻⁶ °C ⁻¹ -		-200 20-:			20-600	20-700				
	10 0	12,1	2,9 13	,3 14,0	14,4	14,8	14,9				
Heat Treatment		annealing [®] C	Cooling			ess HB					
	740-		furnance		max 2	:50	_				
	Hard	ening from °C	in			ess after hing HRC					
	- 780	820	0il, Thern 180 -220		64						
	Temperi	ng ⁰C 100	200 30	00 400 5	00 600	650					
F.C.	HRC	64	61 5	6 51 4	44 37	34					
APPLICATION	: Working	tools, sizing and	stamping to	ols. Machine k	nives for cell	ulose, pap	er and pulp, and				
	metal wo	rking industries,	, guages, pla	stic moulds, th	nread rooling t	tool, blank	ing tools.				



Installed Hardness for various application using D2 grade.

Cutting	Material Thickness	Material Hardness (HB) <180HRC >180HRC
Tools for		
Blanking, Fine-Blanking,	<3 mm (1/8")	60-62 58-60
Punching, Cropping	3-6 mm	
Shearing, Trimming, Clipping	(1/8"-1/4")	58-60 54-56

Forming	HRC
Tools for	
Bending, forming, deep-drawing, rim-rolling, spinning and flow-forming	56-62
Coining dies,	56-60
Cold extrusion dies, .	58-60
Punches	56-60
Tube and section forming rol s; plain rolls .	58-62
Dies for moulding of Ceramics, bricks, tiles, grinding wheels, tablets, abrasive plastics	58-62
Thread - rolling dies	58-62
Cold-healing tools	56-60
Crushing hammers	56-60
Swaging tools	56-60
Gauge, measuring tools, guide rails, bushes, sleeves, knurling tools, Sandblast nozzles	58-62

Installed Hardness for various application using D3 grade.

Cutting	Material Thickness	Material Har	dness (HB)
		<180HRC	>180HRC
Tools for			
Blanking, Punching,			
Cropping Shearing,			
Trimming, Clipping	<3	60-62	56-58

Forming	HRC
Tools for	
Bending, Raising, Deep-Drawing, Rim-Rolling, Spinning and Flow-Forming	56-62
Tube and section forming rolls	58-62
Cold drawing/sizing dies	58-62
Compacting dies for metal powder parts	58-62
Master hobs for cold hobbing	56-60
Dies for Moulding of Ceramics, bricks, tiles, Grinding wheels, Tablets, Abrasive plastics	58-62
Guages, measuring tools. Guide rails, bushes, sleeves, Knurling tools Sandblast nozzles	58-62
Crushing hammers	56-60
Swaging blocks	56-60



Installed Hardness for various application using AISI: 01 grade.

Cutting	Material Thickness (mm)	Material Hardness (HB)
Tools for		
Blanking, Punching,	up to 3 mm (1/8")	60-62
Plercing, Cropping Shearing,	3-6 mm (1/8-1/4")	56-60
Trimming, Clipping	6-10mm (1/4-13/32")	54-56
Short Cold shears, Rotary shear blades for	or plastic waste	56-60
Clipping, trimming tools for forgings	Hot	58-60
	Cold	56-58
Forming		HRC
Tools for		
Bending, Raising, Deep-Drawing, Rim-Ro	olling, Spinning and Flow-Turning	56-62
Coining dies		56-60
Tube and section forming rolls		58-62
Master hobs for cold hobbing	\sim	58-60
Swaging blocks		56-60
Guages, Measuring Tools, Guide Rails, B	ushes, Sleeves 🔍 🍝	58-62

Properties of Steel:

Din	Wear Resistance	Weldability	Machinability
1.2080 - D3	++	0	+
1.2379 - D2	++++	0	+
1.25.10 - 01	++	0	++
to +++ Ascending			
	Ũ		

Din - material - no.	1.2738(P20+Ni)	
Code	40 CrMnNiMo 8-6-4	•
Equivalent Brands	Metal Ravne (EWK)Thyssen Edelstahlwerke	
	Utopnin Thyroplast 2738	
Chemical composition	C Mn Cr Ni Mo	
(Typical analysis %)	0.40 1.5 1.9 1.0 0.2	5
Steel Properties	Pre-hardened plastic mould steel, hardness in as-delivered	d condition 280to325HB. Good
	machinability. suitable for texturing, improved through hard	enability cornpared to 1.2311
Physical Properties	Coefficient of thermal expansion 10 ⁻⁶ m(m-k)	
	20-100°C 20-200°C 20-300°C 20-400°C 20-500	°C 20-600°C 20-700°C
	11.1 12.9 13.4 13.8 14.2	14.6 14.9
	Thermal conductivity W/ (m. K) 20°C 35	0°C 700°C
	34.5 33	
Heat Treatment	Soft annealing ⁰	Hardnass HB
Heat Treatment		Hardness HB max 235
Heat Treatment	710-740 furnance r	
Heat Treatment	710-740furnancerHardening °CQuenchingHGGG	nax 235 Hardness after quenching HRC
Heat Treatment	710-740 furnance r Hardening °C Quenching H	nax 235 Hardness after
Heat Treatment	710-740furnancerHardening °CQuenchingH840-870Polymer or OilS	nax 235 Hardness after quenching HRC
Heat Treatment	710-740furnancerHardening °CQuenchingH840-870Polymer or OilS	max 235 Hardness after quenching HRC 51
Heat Treatment	710-740 furnance r Hardening °C Quenching H 840-870 Polymer or Oil S Tempering °C 100 200 300 400 500 G	max 235 Hardness after quenching HRC 51 600 700
Heat Treatment	710-740 furnance r Hardening °C Quenching H 840-870 Polymer or Oil S Tempering °C 100 200 300 400 500 G	max 235 Hardness after quenching HRC 51 600 700 39 28
	710-740 furnance r Hardening °C Quenching H 840-870 Polymer or Oil 5 Tempering °C 100 200 300 400 500 6 HRC 51 50 48 46 42 6	max 235 Hardness after quenching HRC 51 600 700 39 28 impacts on the core, for use in
	710-740furnancerHardening °CQuenchingH840-870Polymer or OilGTempering °C100200300400500HRC5150484642Large plastic moulds with deep engravings and intensive in	max 235 Hardness after quenching HRC 51 600 700 39 28 impacts on the core, for use in additional nickel content of 1 %
	710-740furnancerHardening °CQuenchingH840-870Polymer or OilGTempering °C100200300400500GHRC5150484642GLarge plastic moulds with deep engravings and intensive in large moulds which have to display high core strength. The strength is the strength is the strength in the strength is the strength in the strength is the strength in the strength is the streng	max 235 Hardness after quenching HRC 51 600 700 39 28 impacts on the core, for use in additional nickel content of 1 %



Din - material - no.	: 1.2311	
Code	: 40 CrMnMo7	
Equivalent Brands	: Metal Ravne (EWK)Thyssen Edelstahlwerke	
	UTOPNEX THYROPLAST2311	
Chemical composition	: C Mn Cr Mo	
(Typical analysis %)	0.40 1.5 1.9 0.2	
Steel Properties	: Pre-hardened plastic mould steel, hardness in as - delivered condition 280 to 325HB. Go	od
oteen repetites	machinability, suitable for texturing	Ju
Physical Properties	: Coefficient of thermal expansion 10 ⁻⁶ m(m-k) 20-100°C 20-200°C 20-300°C	_
	Annealed 12.8 13.2 13.8	_
	Quenched and tempered 12.4 13.0 13.4	
	Thermal conductivity W (m, K) 100°C 150°C 200°C 300°C Annual of the second sec	
	Annealed 39.7 40.6 41.5 41.8 42.0 Quenched and tempered 34.0 34.0 33.6 32.9 31.9	
Heat Treatment	: Soft annealing °C Cooling Hardness HB	
	710-740 furnance max 235	
	Hardening °C Quenching Hardness after	
	quenching HRC	
	840 - 870 Oil or Salt Bath, 51	
	180-220 °C	
	Tempering ^o C 100 200 300 400 500 600 700	
	HRC 51 50 48 46 42 36 28	
APPLICATION	: Plastic mould, Mould frames for plastic moulds and pressure casting moulds and recipie	nt
	sleeves. Suitable for use in Injection moulds, compression moulds, blow moulds and lerg	
		10
N	moulds.	

Din - material - no.	: 1.2	312											
Code	: 40	CrMn	Mo S	58-6									
Equivalent Brands	: <u>(E</u> \		-	en Edel PLAST		lwerke 1	-				*		
Chemical composition	: (I	Mn	I.	Cr	I	Мо	I.	S			
(Typical analysis %)	· <u>(</u>			1.5		1.9		0.2		0.05	-		
	_												
Steel Properties				- C									25HB. Higher ty of nitriding
		od pol			Uviuc	,3 y00u	maon	inabi		it nigno	i narune.	55, possibili	ly of millioning
Physical Properties	: Co	efficie	nt of	f l ineai	r the	rmal ex	oansio	n 10	¹⁰m(r	n-k) 20)-100°C	20-200°C	20-300°C
		nealed								,	12.5	13.4	13.9
	Qu	enche	d an	d temp	perec	ł	Ó	2			12.3	13.0	13.7
				ductivit	ty W,	/(m.k	<u> </u>	00°C		150°C	200°C	250°C	300°C
		nealec		d to pop				40.2		40.9	40.3	40.0	39.0 39.0
	Qu	enche	u an	d temp	Jerec			39.8		40.4	40.4	39.9	39.0
	0									1			
Heat Treatment		ft ann 0-740		g °C		Cooli furna					Hardn max 2	ess HB	
		5 7 10	9	\bigcirc						I	max E		
	На	rdenir	ng ⁰C)		Quer	ching					ess after	
	84	0 - 87	0			Oil o	r Salt I	Rath			51	hing HRC	
			9				220 °C				01		
1	Tor	nperir	ס₀ חנ	; 10	0	200	300	n ⊿	00	500	600	700	
	HR		iy u	51		50	48	_	46	42	36	28	
$\langle \mathcal{Q} \rangle$	Y									I			
	. DI-	otio -	البرم	d	1d f.	omes f	- ما مر م	t la ==	اداريم	م محما		antine mer	Ido vooininut
APPLICATION													lds, recipient
			Suta	aible fo	or us	e in Inj	ection	mοι	llds,	BIOM V	louids, L	arge Mould	s and Mould
	Fra	mes.											



Din - material - no.	: 1.2316 (420 mod)						
Code	:						
Equivalent Brands	: (EWK)Thyssen Edelstahlwerke THYROPLAST2316						
Chemical composition	: C Cr Mo						
(Typical analysis %)	0.36 16.0 1.2						
Steel Properties	: Excellent corrosion resistance good polishability. Usually this steel grade is sup quenched and tempered condition at a working hardness of approx. 300 HB.	plied in a					
Physical Properties	: Coefficient of thermal <u>20-100°C</u> <u>20-200°C</u> <u>20-300°C</u> <u>20-</u>	-400°C					
	expansion 10 ⁻⁶ m(m-k)	12.0					
	Thermal conductivity 20°C 350°C 700°C						
	W/ (m.K) 7172 210 247						
Heat Treatment	: Soft annealing °C Cooling Hardness HB 760 - 800 furnance max 230						
	Hardening C Quenching Hardness after						
	quenching HRC1020 - 1050Oil or Salt Bath,49						
	500 - 550 °C						
	Tempering °C 100 200 300 400 500 600						
	HRC 49 47 46 46 47 32						
E C		to to others					
APPLICATION	: Moulds for processing plastics with corrosive reactions. Sutaible for use in	INJECTION					
	moulds, Blow moulds, Compression moulds and Large moulds.						
S,							



HIGH SPEED STEELS:

Din - material - no.	:	1.3343										
Code	:	S 6-5-2										
											\checkmark	=
Chemical composition	:	С	Cr	N	10	V	\	N		1)
(Typical analysis %)		0,90	4,1	5	,0	1,9	6	,4		X		
Steel Properties	:	temperat	-	nigh re								g at elevated apability. Deep
Physical Properties	:	Thermal	conductivity	/ W/ (20°C	,					
			g/cm ³ 20°C 8,12	-		19,0						
			nt of Linear					0-500	00.000		700	00.000
		10 ⁻⁶ °C ⁻¹	10,7	0-200 11,7	20-300 11,9	12,		J-500 12,7	20-600		700 3,4	20-800 13,4
			1				I			1	1	
Heat Treatment	1	Soft anne 820 - 880			Cooling furnance				Hardn 225 -	ess HE	3	
		020 - 000	0	0	umance				225-	200		
		Heat up	Preheati		reheating		Harder	-	Tempe	ering		ermpared
			1.Step °C	9	2. Step °C	00	from	ו in	°C		hard	iness HRC
		450-600			1050	118	30 0	il, Air,	min.	3x	mi	n,64
	,	1	-1230 Thermal 540-560 Bath 550°C									
			1						1			
	Ĉ	Temperin	ng °C 200	300) 400	500	525	550	575	600	650	700
		HRC	63	61		62,5		65	64	62,5	57	47
, C)											
APPLICATION	:	Knives, T	hread Cutti	ng and	Twist Dr	lls, Bro	aching) and N	lilling To	ools, W	/oodw	vorking Tools,
			king Tools.				-		-			



HOTWORKTOOL STEELS : HOT DIE STEEL H13

Din - materi al - no.	.2344										
Code	X40 CrMoV5-1										
Comparable Standards	AISI : H13										
-											
Equivalent Brands		WK)Thyssen elstahlwerke									
		herme 2344 EFS									
Chemical composition	C SI Cr Mo V										
(Typical analysis %)	0.40 1.0 5.3 1.4 1.0	Y									
Steel Properties	: Highhot-wearresistance.highhot-tensile strength and toughness. Good thermal conductivity and insusceptibility to hot cracking. Can be water-cooled to a limited extent. Good tempering resistance, it maintains high hardness and strength at elevated temparature. Resistance to thermal fatigue, erosion and wear.										
Physical Properties	coefficient of thermal expansion 10 ⁵ m/(m-k)										
	0-100°C 20-200°C 20-300°C 20-400°C 20-500°C	20 600°C 20-700°C									
	0.9 11.9 12.3 12.7 13.0	13.3 13.5									
	Thermal conductivity W (m-k) 20°C 350°C 700°C										
	Thermal conductivity W / (m-k) 20°C 350°C Innealed 27.2 30.5	700°C 33.4									
	Quenched and tempered 25.5 27.5	30.3									
Heat Treatment	Cooling COCOOling Hardness HE	3									
	50-800 Funance max.230	max.230									
	lardening °C Quenching Hardness aft	Hardness after									
		quenching HRC									
	020 -1050 Air, oil or Salt Bath, 54 500-550°C										
õ											
		550 600 700									
	HRC 53 52 52 54 56 54	50 42 32									
APPLICATION	lotwork steel for universal use. Metal extursion tools for proce	essing light metals,									
	forging moulds, moulds, screws and barrels for plastic processing, nitrided ejectors										
	and hot-shear blades. Pressure die casting dies.										



HOTWORKTOOL STEELS : HOT DIE STEEL H11

Din - materi al - no.	:	1.2343											
Code	:	X38CrMoV5-1											
Comparable Standards	:	AISI : H11											
Chemical composition (Typical analysis %)	:	C SI Cr Mo V 0.38 1.0 5.3 1.3 0.4											
Steel Properties	:	High hot tensile s insusceptibility to ho	-		-					uctivit <u>v</u>	y and		
Physical Properties	:		Coefficient of thermal expansion 10 ⁻⁶ m/(m-k)										
		20-100°C 20-200	⁰ C 2	0-300°C		-400°C	20-5	500°C	20 60	0°C	20-700°C		
		11.8 12.4		12.6		12.7	12	2.8	12.	9	12.9		
		Thermal conductivity	y W / (m- k)		20°C	3	50ºC	700	°C			
		Annealed			5	29.8	30	0.0	33.4	1			
		Quenched and temp	ered	\checkmark		26.8	2	7.3	30.3	3			
				Ũ									
Heat Treatment	1	Soft annealing °C		Cooling				dness HB					
		750-800		unance			max	. 230					
		Hardening °C		ienchin	a		Hard	dness a	ifter				
					5			nching					
		1000 -1030		oil or		th,	54						
			500)-550°C									
		Tempering °C	100	200	300	400	500	525	550	600	700		
	2	HRC	52	52	52	52	54	52	48	38	31		
<u> </u>		×		-									
APPLICATION	:	Hot work steel for ur					-						
		processing light m					, screv	ws and	l barre	ls for	plastic		
		processing, shrink rings and hot-shear blades-											



HOTWORKTOOL STEELS :

Din - materi al - no.	1.2714 (Die Block)										
Chemical composition (Typical analysis %)	C Cr 0.56 1.1	Mo 0.5		NI .7	V 0.1						
Steel Properties	Tough die steel wit grade is usually sup 370-410 HB (Round	plied in -	anneale	d condi	tion or o			-		-	
Physical Properties	: Coefficient of thermal expansion 10 ⁻⁶ m/(m-k) <u>20-100^oC 20-200^oC 20-300^oC 20-400^oC 20-500^oC 20 600^oC</u>										
	12.2 Thermal conductivi	13.0 ty W / (13.: m- k)	2	13.7 0°C 5.0	350 38.0		700°C 35.0	14.4		
Heat Treatment	: Soft annealing °C Cooling Hardness HB 650 - 700 Funance max. 250 Hardening °C In Hardness after quenchin HRC N/nm ² 830 - 870 oil 58 2200								 hing		
	860 - 900 Air 56 2050									650	
	Tempering [®] C After que. HRC in oil N/mm ²	100 57 2120	200 54 1910	300 52 1790	400 49 1620	450 47 1530	500 46 1480	550 43 1360	600 38 1200	34 1080	
N. C. N.	Tempering °C After que. HRC in air N/mm²	100 55 1980	200 52 1790	300 50 1670	400 47 1530	450 45 1440	500 43 1360	550 40 1260	600 36 1140	650 32 1020	
APPLICATION	Standard steel for Hot-shear Blades.	orging (lies of a	ll kinds	. Mand	rels, Di	e Hold	ers, Arm	ioured T	rim Dies,	