BÖHLER

SPECIAL STEEL FOR THE WORLD´S TOP PERFORMERS

PRODUCT PROGRAM 1535°

PRECISION FLAT GROUND | PRECISION PLATES | NORMBARS
ERODING BLOCKS | GROUND BARS

EDITION 2015

Conditions / Information

BÖHLER K100 1.2080

BÖHLER K107 1.2436

BÖHLER K110 1.2379

BÖHLER K305 1.2363

BÖHLER K600 1.2767

BÖHLER K460 / BÖHLER K720 1.2510 / 1.2842

BÖHLER K945 1.1730

~ ST 52-3 1.0570

Aside from offering the outstanding 1535° program, we can supply a wide range of different materials for the most diverse of applications.

Here is a selection of our proven qualities. We would be pleased to advise you.

BÖHLER K340 ISODUR®
BÖHLER S290 MICROCLEAN®
BÖHLER M268 VMR®
BÖHLER W350 ISOBLOC®
BÖHLER K390 MICROCLEAN®
BÖHLER S390 MICROCLEAN®
BÖHLER M303 EXTRA
BÖHLER W360 ISOBLOC®
BÖHLER K490 MICROCLEAN®
BÖHLER S590 MICROCLEAN®
BÖHLER M333 ISOPLAST®
BÖHLER W400 VMR®
BÖHLER K890 MICROCLEAN®
BÖHLER S690 MICROCLEAN®
BÖHLER M340 MICROCLEAN®
BÖHLER M390 MICROCLEAN®

Simple, convenient and cost-effective in Order BÖHLER Web-Shop.
www.bohler.de

CONSTANT HIGH QUALITY
STANDARD GUARANTEED

Welcome to our comprehensive product range for precision flat ground, precision plates, normbars, eroding blocks and ground bars!

The following pages inform you of our terms, conditions and prices.

Pricing

All prices given in the tables apply to the 1535° programme and are to be understood as €/pc. excluding alloy, scrap and inflation surcharges as well as legal sales tax.

Minimum order quantity

To maximise your flexibility, there is no **minimum order volume**.

General conditions

Our goods and services are supplied exclusively in accordance with our general terms and conditions which can be found on our website at **www.bohler.de**

Stated prices are subject to change without notice. Should any mistakes, printing errors or typographical errors be contained in the list, no legal claim can be made to receive a product at the offered non-binding price.

Goods are shipped ex works to the buyer (buyer bears full risk and cost).

Invoices are payable in full without deduction by the 15th of the month following delivery.
If the payment deadline is exceeded we will charge interest of 8 percentage points above the base rate from the 16th of the month following delivery.

A fee of €25 is charged for supply of a factory certificate.
All technical information is provided without guarantee. The information given in the respective official material data sheet shall apply. Thank you for your understanding.

BÖHLER – YOUR SINGLE-SOURCE SUPPLIER

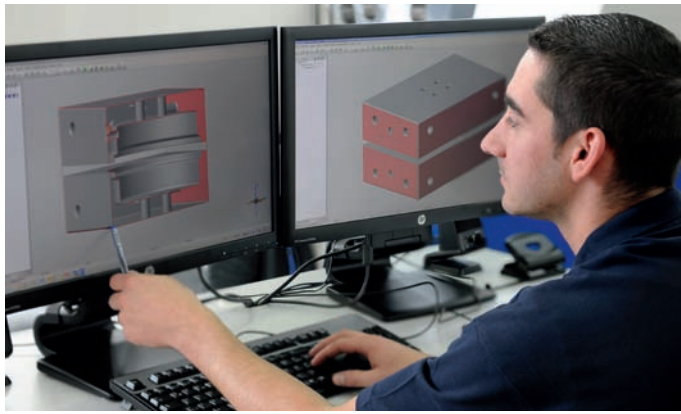
The market dictates maximum product complexity and quality with minimal lead times. This in turn increases demands for a sales and service partner who is familiar with customers' needs and who can respond to them quickly and reliably.
In addition to improving our BÖHLER high-performance materials, we have expanded our service portfolio for you.

Technical consultations

Do you have questions about material selection, implementation options and application technology, or require recommendations for heat treatment? Our specialists from Böhler would be happy to assist you.
One of our specialists can make a visit to your site upon request. We would be happy to provide you and your colleagues with known and lesser known facts about steel in an in-house seminar. We offer this service to support you in creating optimum solutions.

Mechanical machining according to customer datasets

Our employees in the machining department are working work around the clock in three shifts. Optimised collaboration between work preparation, CNC programming, tool presetting and machining specialists ensures seamless production flow. Use of state-of-the-art machines such as horizontal drills, 3- and 5-axis machining centres (also 5-axis simultaneous milling machines), deep drilling and milling centres, angled bed and vertical turret lathes with powered tools, grinding machines and 3D coordinate measurement systems guarantees compliance with preset tolerances of up to +/- 0.02 mm and accelerates the entire manufacturing process. With the latest machine technologies, we can also manufacture drawing-based parts from your datasets. For offers and further information contact our sales offices.



Service 1535° | special

Custom manufacturing

On request, in all BÖHLER- special grades, in a few working days. Please send us your request!

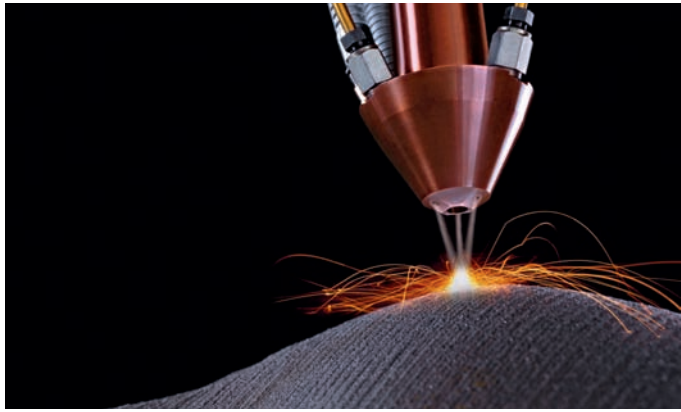
Special sizes

If you do not find anything among the approximately 6.000 Dimensions for "your case"
so we offer you a powerful Quick service:

- Special dimensions that only in one dimension (thickness, width or length) of the Standard dimensions deviate from this list, we manufacture within 2-5 business days.
- Special dimensions in which all 3 dimensions vary from the standard,
  We manufacture depending to the prematerial situation within 1-2 weeks. Please ask!

Logistics

Our logistics division with experienced and qualified employees stands for reliable and timely delivery to our customers. With a comprehensive stock of materials, state-of-the-art high bay racking and sawing technology and numerous machining systems, we can offer you customised products and ensure fast processing of your orders. Whether manufactured to size, sawed, milled or ground, we tailor steel to your specifications. From individual purchasing logistics up to delivery to you.



Material no. 1.2080
Abbreviated name X210Cr12
Condition Annealed

Properties and applications:

This high alloy standard brand is used in cutting and stamping tools. A high chrome carbide content lends the material a high wear resistance. Minimal shape changes during hardening. **BÖHLER K100** is also particularly suitable for cutting, drawing, shaping and measurement tools.

Reference analysis [%]

C	Si	Mn	Cr
2,00	0,25	0,35	11,50

Physical properties

Temperature [°C]	20						
Thermal conductivity [W/m.K]	20						
Temperature [°C]	20						
E-modulus [10^3N/mm²]	210						
Temperature [°C]	100	200	300	400	500	600	
Thermal expansion [10^{-6}m/m.K]	10,5	11,0	11,0	11,5	12,0	12,0	

Heat treatment

Annealing

Temperature [°C]	800	850	10-20 °C/h	600 °C then air	
Hardness after annealing	max. 248 HB				

Remarks: Controlled slow oven cooling.

Low stress annealing

Temperature [°C]	650	Hold time [h] approx. 2	

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

Hardening

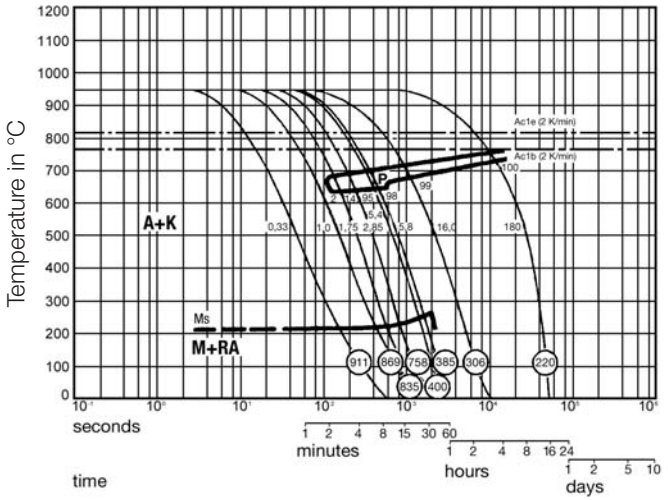
Temperature [°C]	940	970	
Quenching media [°C]	Oil	Air or compressed air only to a max. 25 mm WT,	
		above that in oil	

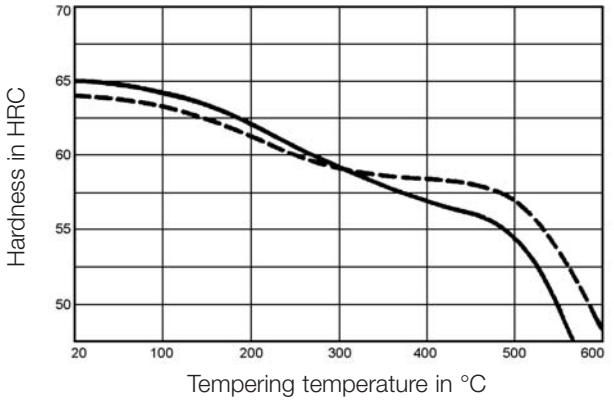
Remarks: Salt bath 220 - 250 °C, 500 - 550 °C, WT = work piece thickness

Tempering: At least 2 hours with subsequent air cooling (1 h per 20 mm work piece thickness). Guidelines for the achievable hardness after tempering can be taken from the tempering chart.

TTT and tempering chart

For continuous cooling





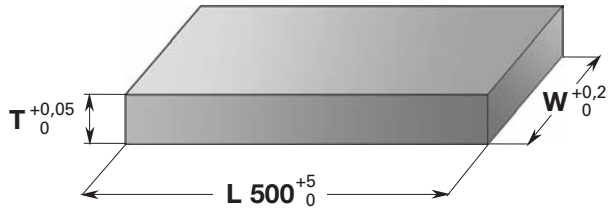
Precision flat ground according to DIN 59350 500 mm

Width mm	Thickness mm										€/pc.	Width mm
	2	3	4	5	6	8	10	12	15	20		
20	13	14	16	19	20	22	24	28	37			20
25	14	16	17	20	22	24	28	32	39	42		25
30	15	17	18	21	23	25	30	35	42	47		30
40	16	18	19	22	25	29	32	37	45	50		40
50	18	20	23	26	29	31	36	41	48	58		50
60	20	23	27	30	32	36	41	46	55	64		60
80	25	28	32	35	38	42	50	57	70	83		80
100	31	35	37	40	44	50	59	69	95	106		100
125	36	40	42	47	53	60	70	81	117	131		125
150	41	46	48	55	61	72	89	108	142	160		150
200	59	61	63	72	80	96	121	151				200

Material no. 1.2080
Abbreviated name X210Cr12
Condition Annealed

According to DIN 59350,
bars of 500 mm length,
precision ground to thickness,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,05/0 mm
Length: +5,00/0 mm



Material no. 1.2436
Abbreviated name X210CrW12
Condition Annealed

Properties and applications:

High alloy ledeburitic chrome steel with higher wear resistance than that of **BÖHLER K100 (material number 1.2080)**. Addition of tungsten and vanadium gives this steel a higher stability during tempering.

Reference analysis [%]

C	Si	Mn	Cr	W
2,10	0,25	0,30	11,50	0,70

Physical properties

Temperature [°C]	20						
Thermal conductivity [W/m.K]	20						
Temperature [°C]	20						
E-modulus [10^3N/mm^2]	210						
Temperature [°C]	100	200	300	400	500	600	
Thermal expansion [10^{-6}m/m.K]	10,5	11,0	11,0	11,5	12,0	12,0	

Heat treatment

Annealing

Temperature [°C]	800	850	Hold time [h] approx. 3	
Hardness after annealing	max. 255 HB			

Remarks: Controlled slow oven cooling.

Low stress annealing

Temperature [°C]	650	700	Hold time [h] approx. 2	

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

Hardening

Temperature [°C]	950	980	1020 (s)	s = secondary hardening	
Quenching media	Oil	Salt bath	Compressed air / air		

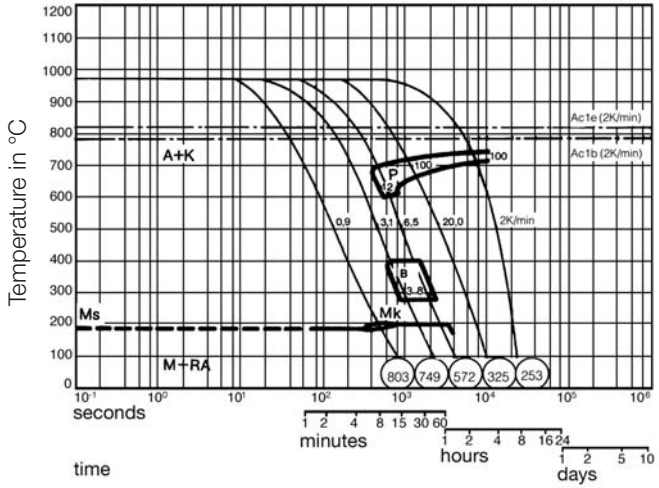
Remarks: For complicated or sharp-edged tools, air or salt bath hardening should preferably be used.

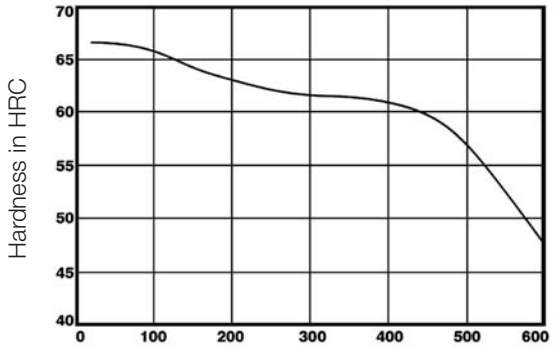
Tempering:

A minimum of 2 hours with subsequent air cooling. Guidelines for the achievable hardness after tempering can be taken from the tempering chart. For subsequent coating or nitriding processes, secondary hardening should be carried out at a hardening temperature of 1020 °C with a min. of two tempering operations at the maximum secondary hardness. Achievable hardness; 64-66 HRC: 61 HRC for custom heat treatment.

TTT and tempering chart

for continuous cooling





Precision flat ground with machining allowance, 500 mm

Width mm	Thickness mm												€/pc.	Width mm
	2,2	3,2	4,2	5,2	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	
10,3	11	12	13	14	15	18								10,3
15,3	12	13	14	15	16	19	21	24						15,3
20,3	13	14	15	16	18	20	23	26	29					20,3
25,3	14	15	16	18	20	23	26	29	33	42				25,3
30,3	15	16	18	20	23	26	30	33	38	47	50			30,3
40,3	16	18	20	23	26	30	34	38	44	55	59	70		40,3
50,3	18	20	23	26	30	34	38	43	51	60	68	82	104	50,3
60,3	20	23	26	30	34	38	43	49	57	68	80	93	117	60,3
80,3	24	26	30	34	38	44	49	56	70	84	99	119	142	80,3
100,3	29	30	34	39	44	49	56	67	86	104	121	145	167	100,3
125,3	33	35	39	44	49	56	70	78	108	123	146	172	195	125,3
150,3	38	41	44	52	57	64	80	89	129	145	169	205	233	150,3
200,3	55	59	63	68	73	86	102	129	172	190	227	271	295	200,3
250,3	61	65	69	79	87	101	120	168	206	230	270	320	352	250,3
300,3	67	75	80	95	105	117	141	198	242	270	325	375	397	300,3

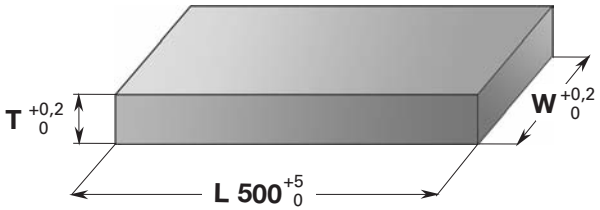
Square

■ mm	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4
€/pc.	18	20	24	27	36	50	72	98

Material no. 1.2436
Abbreviated name X210CrW12
Condition Annealed

According to DIN 59350,
bars of 500 mm length,
precision ground to thickness
with machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +5,00/0 mm
Square: +0,20/0 mm



SPECIAL MATERIALS FOR HIGH-PERFORMANCE TOOLS

Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm												€/pc.	Width mm
	3,2	4,2	5,2	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4	
10,3	22	23	24	25	26									10,3
15,3	23	24	25	26	28	30								15,3
20,3	24	25	26	28	30	32	35	40						20,3
25,3	25	26	28	30	32	34	38	45	54					25,3
30,3	26	28	30	32	34	37	45	54	65	80				30,3
40,3	30	32	34	36	39	45	50	63	70	94	103			40,3
50,3	34	36	38	41	46	51	55	69	88	102	112			50,3
60,3	38	40	43	46	49	55	62	78	96	112	126			60,3
80,3	46	52	58	64	70	74	84	98	125	136	160	202		80,3
100,3	60	65	69	75	82	91	108	122	140	168	196	250	306	100,3
125,3						120	132	158	180	210	258	330	390	125,3
150,3						140	151	170	218	248	284	364	434	150,3
200,3						185	206	240	308	356	410	486	570	200,3
250,3						223	270	336	360	418	476	582	660	250,3
300,3						270	302	378	420	492	560			300,3

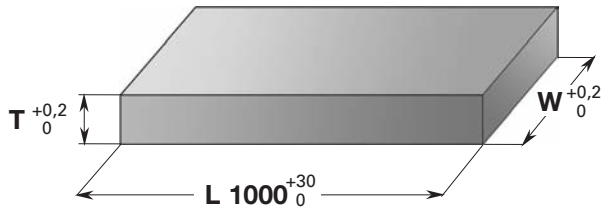
Square

■ mm	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4
€/pc.	30	34	41	46	72	90	120	172

Material no. 1.2436
Abbreviated name X210CrW12
Condition Annealed

Manufactured to factory standard,
bars of 1000 mm length,
precision ground to thickness with
machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm



Material no. 1.2379
Abbreviated name X153CrMoV12-1
Condition Annealed

Properties and applications:

Secondary heat-treatable high alloy ledeburitic chrome steel, low distortion, standard cold work steel with good toughness. This steel is more wear-resistant due to its higher V content and shows a high tempering stability at higher hardening temperatures. For this reason, it can be nitrided without the base material hardness falling below HRC 60. Suitable for complicated cutting tools, thread rolling dies, sinking dies, broaches, milling tools, shear blades and extruding tools.

Reference analysis [%]

C	Si	Mn	Cr	Mo	V
1,55	0,30	0,30	11,80	0,75	0,75

Physical properties

Temperature [°C]	20						
Thermal conductivity [W/m.K]	20						
Temperatur [°C]	20						
E-modulus [10^3N/mm^2]	210						
Temperature [°C]	100	200	300	400	500	600	
Thermal expansion [10^{-6}m/m.K]	10,5	11,0	11,0	11,5	12,0	12,0	

Heat treatment

Annealing

Temperature [°C]	800	850	Hold time [h] approx. 3		
Hardness after annealing	max. 255 HB				

Remarks: Controlled slow oven cooling.

Low stress annealing

Temperature [°C]	650	700	Hold time [h] approx. 2	

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

Hardening

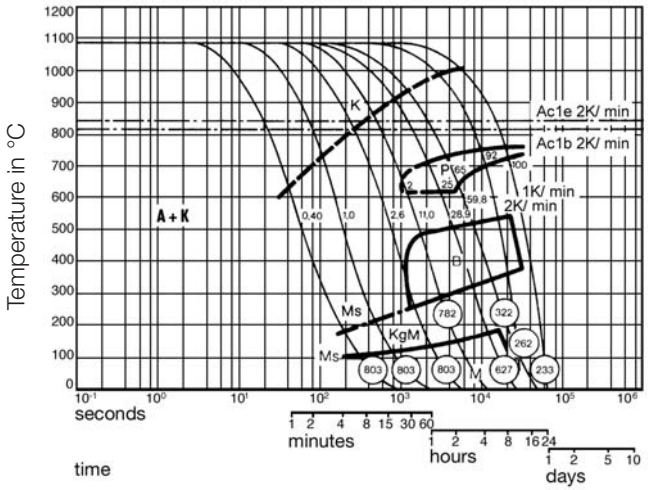
Temperature [°C]	1020	1040	1060 (s)	1080 (s)	s = secondary hardening	
Quenching media	Air	Salt bath 220-250 °C / 500-550 °C		Compressed air	Oil	

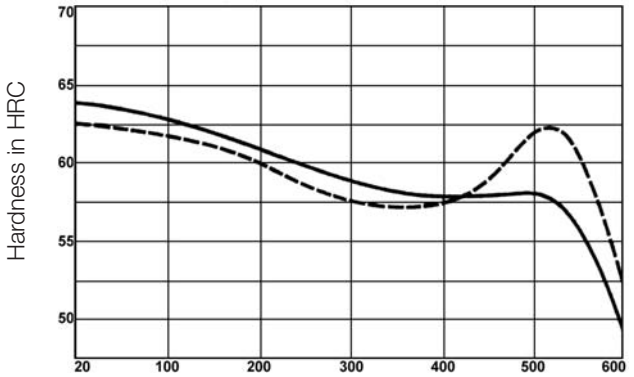
Remarks: Achievable hardness: 63-65 HRC..

Tempering: A minimum of 2 hours with subsequent air cooling – (1 h / 20 mm work piece thickness) three tempering operations at the maximum secondary hardness are recommended. Guidelines for the achievable hardness after tempering can be taken from the tempering chart. For subsequent coating or nitriding processes, secondary hardening is carried out at a hardening temperature of 1050–1080 °C with a min. of two tempering operations at the maximum secondary hardness.

TTT and tempering chart

For continuous cooling





Precision flat ground with machining allowance, 500 mm

Width mm	Thickness mm														€/pc.	Width mm
	2,2	3,2	4,2	5,2	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4		
10,3	10	11	12	13	14	17										10,3
15,3	11	12	13	14	16	18	20									15,3
20,3	12	13	14	16	18	20	22	24	26							20,3
25,3	13	14	16	18	20	22	24	26	29	37						25,3
30,3	14	16	18	20	22	24	26	29	33	40	45					30,3
40,3	16	18	20	22	25	28	29	32	39	49	53	61				40,3
50,3	18	20	22	25	28	30	32	36	44	56	64	75	95			50,3
60,3	20	22	25	28	30	32	36	42	51	62	73	88	106	114		60,3
80,3	22	25	28	31	34	36	44	51	62	77	90	108	118	126		80,3
100,3	25	29	31	34	37	44	53	62	75	90	106	128	147	172		100,3
125,3	29	32	35	38	44	51	63	74	90	112	136	165	180	210		125,3
150,3	33	37	41	44	51	62	73	90	116	132	150	192	210	236		150,3
200,3	48	49	56	61	68	78	95	120	156	170	205	248	260	295		200,3
250,3	53	60	68	77	83	96	115	157	186	203	250	300	320	354		250,3
300,3	60	66	71	85	94	108	130	180	216	245	300	346	380	448		300,3

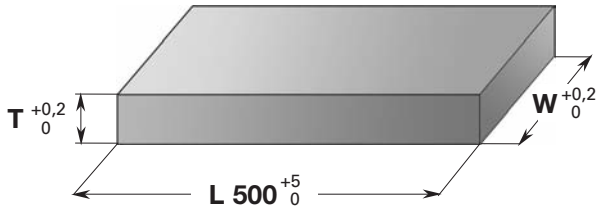
Square

■ mm	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4
€/pc.	14	16	18	22	26	35	48	64	89	124

Material no. 1.2379
Abbreviated name X153CrMoV12-1
Condition Annealed

According to DIN 59350,
bars of 500 mm length,
precision ground to thickness
with machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +5,00/0 mm
Square: +0,20/0 mm



Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm																						Width mm
	2,2	3,2	4,2	5,2	6,2	8,2	10,4	12,4	15,4	16,4	20,4	25,4	26,4	30,4	32,4	36,4	40,4	46,4	50,4	60,4	70,4	80,4	100,4	€/pct.
10,3	21	21	22	23	24	26																		10,3
15,3	21	22	23	24	25	27	30	34																15,3
20,3	22	23	24	25	26	28	31	35	40	42														20,3
25,3	23	24	25	26	28	30	33	38	45	48	54													25,3
30,3	24	25	27	29	31	34	36	44	54	56	65	82												30,3
32,3						35	37	47		58	67	84												32,3
40,3	29	31	33	35	37	39	45	50	63	65	70	95		105	114									40,3
50,3	31	35	37	39	41	46	51	55	70	75	90	105		115	122		152							50,3
60,3	34	37	40	43	46	49	55	64	80		98	115		129			167		193					60,3
63,3						55	61	69		89	101	117			150		170		203					63,3
70,3	37	41	46	51	56	62	68	75	93	100	113	134		155	163		182		218	246				70,3
80,3	41	46	52	58	64	70	75	85	99	112	126	138		163	169		202		225	268	313			80,3
90,3							84	92	110		134	155		187			230		262	332	382	424		90,3
100,3	55	60	65	69	75	84	92	110	124	128	143	169		199	208		258		310	360	420	483		100,3
125,3	64	70	76	82	90	98	129	135	160	172	186	218		264	278		335		396	470	545	620	740	125,3
150,3	72	76	82	92	108	138	142	155	172	199	221	253		295	316		376		450	531	615	712	828	150,3
156,3													310			382		465						156,3
160,3							151	164	208	218	232	282		326	340		416		498	562				160,3
180,3							172	183	245	254	291	330		370			460		545	660				180,3
196,3													375			460		560						196,3
200,3	95	102	110	120	134	163	188	212	250	275	316	362		420	444		500		620	728	890	965	1075	200,3
246,3													445			566		680						246,3
250,3	106	118	130	144	157	195	227	279	350	366	380	443		500	525		610		760	885		1095	1396	250,3
296,3													495			700		795						296,3
300,3	126	140	154	170	184	212	284	328	395	404	440	520		590	614		730		902	1076		1385	1700	300,3
350,3							335	385	445	460	495	560		695	725		896							350,3
400,3							380	440	505	520	550	620		790	860		1030		1200					400,3
500,3							445	505	580		705	850		980	1060		1270		1470	1660				500,3

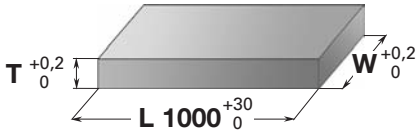
Material no.
1.2379
Abbreviated name
X153CrMoV12-1
Condition
Annealed

Manufactured to factory standard, bars of 1000 mm length, precision ground to thickness with machining allowance, width ground or milled, length machined, with decarburisation-free surface, packaged with corrosion protection.

Tolerances:
Width:
+0,20/0 mm
Thickness:
+0,20/0 mm
Length:
+30,0/0 mm
Square:
+0,20/0 mm

Square

■ mm	8,2	10,4	12,4	15,4	16,4	20,4	25,4	30,4	32,4	40,4	50,4	60,4	63,4	70,4	80,4	90,4	100,4	120,4	150,4	200,4	250,4	300,4
€/pc.	31	31	36	40	43	47	74	91	98	120	174	218	252	315	382	530	556	795	1070	1990	2970	3905



Precision plates Length 200.3 mm

Width mm	Thickness mm								€/pc.	Width mm
	20,4	25,4	30,4	40,4	50,4	60,4	80,4	100,4		
100,3	34	45	55	65	76	89	120	138		100,3
150,3	54	63	73	93	110	130	176	206		150,3
200,3	78	91	105	123	150	180	240	270		200,3

Precision plates Length 300.3 mm

Width mm	Thickness mm								€/pc.	Width mm
	20,4	25,4	30,4	40,4	50,4	60,4	80,4	100,4		
100,3	46	55	65	82	101	116	160	180		100,3
150,3	72	82	96	120	147	175	234	272		150,3
200,3	100	118	136	160	202	240	320	352		200,3
250,3	122	142	164	196	248	290	342	390		250,3
300,3	142	170	190	235	295	350	455	500		300,3

Precision plates Length 400.3 mm

Width mm	Thickness mm								€/pc.	Width mm
	20,4	25,4	30,4	40,4	50,4	60,4	80,4	100,4		
100,3	65	75	85	115	138	160	218	252		100,3
150,3	100	115	130	170	205	240	325	375		150,3
200,3	140	162	184	225	280	330	440	485		200,3
250,3	170	200	230	270	340	400	450	500		250,3
300,3	200	240	280	340	400	480	580			300,3
400,3	285	325	380	450	550	650				400,3

Precision plates Length 600.3 mm

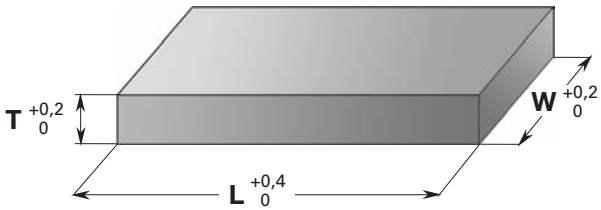
Width mm	Thickness mm								€/pc.	Width mm
	20,4	25,4	30,4	40,4	50,4	60,4	80,4	100,4		
100,3	90	108	128	162	200	230	316	372		100,3
150,3	134	162	190	238	290	330	430	520		150,3
200,3	180	220	250	316	384	445	580	650		200,3
250,3	230	270	318	406	490	580	680	750		250,3
300,3	260	310	360	450	555	645	760	880		300,3
400,3	350	410	470	590	720	855				400,3

Material no. 1.2379
Abbreviated name X153CrMoV12-1
Condition Annealed

Manufactured to factory standard,
precision ground to thickness,
width and length milled,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:

Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +0,40/0 mm



Norm bars 500 mm

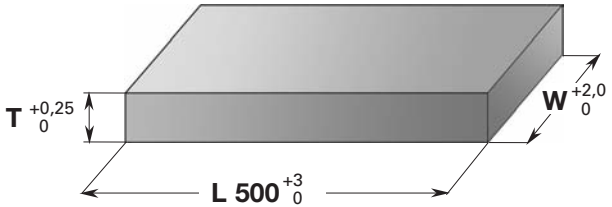
Width mm	Thicknes mm										€/pc.	Width mm
	10,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4		
103	95	108	118	128	145	164	187	217	244	271		103
113	101	116	125	138	155	175	199	232	262	291		113
123	107	123	135	147	166	188	214	249	282	313		123
133	114	129	141	155	176	199	227	263	297	330		133
143	119	138	149	165	187	211	241	280	315	349		143
153	125	145	157	174	197	222	254	295	334	370		153
163	130	151	166	181	207	234	269	312	351	390		163
173	137	159	174	192	217	245	283	328	370	411		173
183	144	166	180	200	227	257	296	344	389	432		183
193	149	174	190	210	238	270	309	359	406	451		193
203	155	180	197	219	248	282	324	377	425	471		203
213	161	188	204	227	259	293	337	391	442	491		213
223	167	194	213	236	269	305	350	407	460	511		223
233	174	201	221	245	280	317	365	422	477	529		233
243	179	209	229	253	290	329	379	439	495	550		243
253	186	217	238	263	298	340	392	455	514	571		253
263	191	223	245	272	309	351	407	471	533	591		263
273	197	231	252	281	319	364	420	487	551	611		273
283	202	239	261	290	330	377	433	503	567	630		283
293	210	245	269	298	340	388	448	519	587	652		293
303	215	252	276	307	350	399	461	535	604	671		303
313	221	260	285	316	360	411	475	551	623	692		313
323	227	266	293	325	371	423	488	567	641	712		323
333	233	273	301	335	381	435	503	582	657	729		333
343	240	282	308	344	391	446	516	599	676	750		343
353	245	288	317	351	402	459	530	614	695	771		353
363	251	295	324	361	412	470	543	630	712	791		363
373	257	302	333	370	422	483	557	646	730	810		373

Width mm	Thicknes mm										€/pc.	Width mm
	10,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4		
383	264	309	340	379	433	494	571	662	748	830		383
393	270	317	348	388	442	506	585	678	767	851		393
403	275	324	357	397	454	517	599	695	785	872		403
413	282	331	364	406	463	530	612	711	803	892		413
423	287	338	372	414	474	541	627	727	822	913		423
433	294	346	380	423	484	554	640	743	839	930		433
443	299	354	388	432	494	565	653	757	855	949		443
453	306	360	396	441	505	578	666	773	874	970		453
463	312	367	404	451	515	589	680	789	892	990		463
473	317	374	412	459	536	600	694	804	908	1009		473
483	324	381	420	467	535	612	706	820	926	1028		483
493	330	388	429	477	545	624	719	833	943	1046		493
503	336	396	435	486	556	635	732	849	959	1064		503

Material no. 1.2379
Abbreviated name X153CrMoV12-1
Condition Annealed

Manufactured to factory standard,
bars of 500 mm length,
precision ground to thickness,
width sawn, length milled,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +2,00/0 mm
Thickness: +0,25/0 mm
Length: +3,0/0 mm



Eroding blocks, annealed

Edge length mm	Thickness mm													€/pc.	Edge length mm
	15	20	25	30	40	50	60	70	80	90	100	120	150		
80,5	35	40	45	50	55	62	70	79	88	96	102	110	130		80,5
100,5	40	45	50	55	60	70	80	88	96	106	112	124	150		100,5
120,5	45	50	55	60	70	90	110	120	130	140	150	170	190		120,5
150,5	56	62	70	80	95	115	130	145	160	175	185	210	250		150,5
200,5	80	90	100	115	125	150	175	200	215	230	245	275	320		200,5
250,5	110	125	140	170	200	230	260	285	310	335	360	405	470		250,5
300,5	150	175	200	220	260	300	340	375	405	440	490	580	650		300,5

Material no. 1.2379
Abbreviated name X153CrMoV12-1
Condition Annealed / max. 255 HB

Tolerances:
Width: +2,0/0 mm
Thickness: +0,25/0 mm
Edge length: +2,0/0 mm

transverse grain in thickness direction

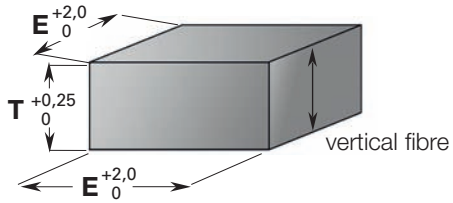
Eroding blocks, hardened

Edge length mm	Thickness mm													€/pc.	Edge length mm
	15	20	25	30	40	50	60	70	80	90	100	120	150		
80,5	50	56	62	68	77	86	95	105	115	123	130	145	170		80,5
100,5	56	64	72	80	90	100	110	118	126	134	142	165	195		100,5
120,5	63	72	81	90	110	125	140	155	170	180	195	225	260		120,5
150,5	75	90	100	105	125	140	170	190	210	230	250	280	320		150,5
200,5	120	130	140	150	180	210	240	275	310	345	380	420	470		200,5
250,5	150	175	200	215	255	305	360	415	470	510	550	610	690		250,5
300,5	190	210	230	265	340	420	500	570	640	700	760	850	970		300,5

Material no. 1.2379
Abbreviated name X153CrMoV12-1
Condition Hardened to 61 ± 1 HRC, tempered minimum 3x

Tolerances:
Width: +2,0/0 mm
Thickness: +0,25/0 mm
Edge length: +2,0/0 mm

vertical fibre in thickness direction



Ground bars

Tolerance h8, Length 1000 mm

Diameter mm						€/pc.
ø6	ø8	ø10	ø12	ø15	ø20	ø25
7	8	9	12	20	40	60

Tolerance:
Length: +30,0/0 mm

Material no. 1.2363
Abbreviated name X100CrMoV5
Condition Annealed

Properties and applications:

Steel for cutting and stamping tools used especially in automotive construction. Steel is used similarly to the ledeburitic tool steels according to **BÖHLER K100 (material no. 1.2080)** or **BÖHLER K105 (material no. 1.2601)**, but shows a higher toughness. It exhibits good behaviour during repair welding in a cold or pre-warmed condition.

Reference analysis [%]

C	Si	Mn	Cr	Mo	V
1,00	0,30	0,55	5,20	1,10	0,25

Physical properties

Temperature [°C]	20				
Thermal conductivity [W/m.K]	26				
Temperature [°C]	20				
E-modulus [10^3N/mm^2]	190				
Temperatur [°C]	100	200	300	400	500
Thermal expansion [10^{-6}m/m.K]	12,5	13,1	13,3	13,7	13,9

Heat treatment

Annealing

Temperature [°C]	800	850	Hold time [h] approx. 3
Hardness after annealing	max. 240 HB		

Remarks: Controlled slow oven cooling.

Low stress annealing

Temperature [°C]	650	Hold time [h] approx. 2

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

Hardening

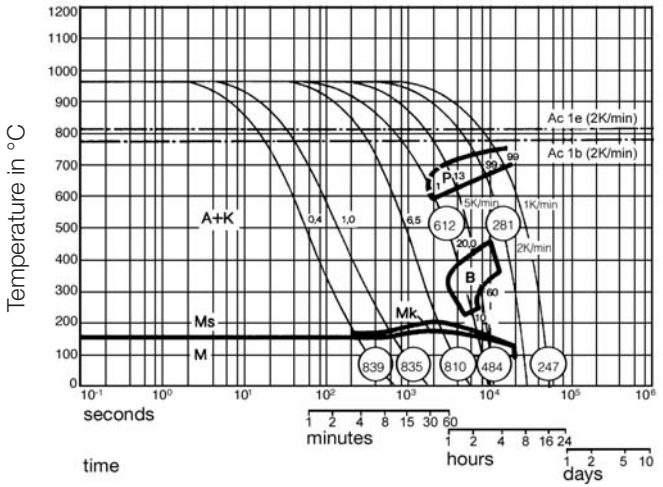
Temperature [°C]	950	980		
Quenching media	Air	Salt bath	Oil	

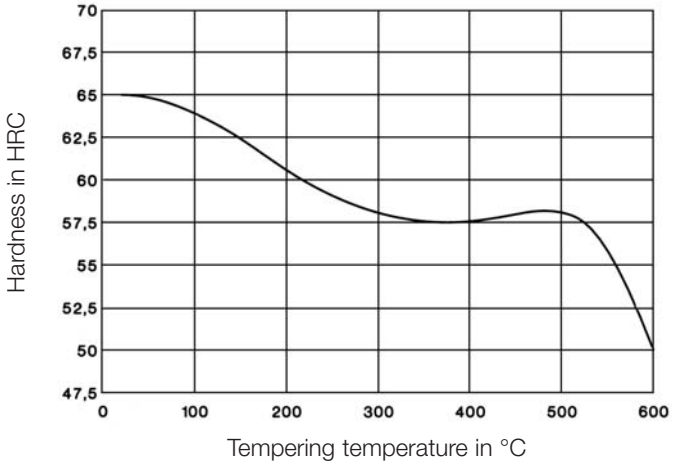
Remarks: For complicated or sharp-edged tools, air or salt bath hardening should preferably be used.

Tempering: At least 2 hours with subsequent air cooling (1 h per 20 mm work piece thickness).
Guidelines for the achievable hardness after tempering can be taken from the tempering chart.

TTT and tempering chart

For continuous cooling





Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm							€/pc.	Width mm
	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	
25,3	30	34	38						25,3
30,3	34	37	44	54	65				30,3
40,3	40	45	49	62	75	86	98		40,3
50,3	46	51	56	68	85	98	110		50,3
60,3	50	56	62	75	92	108	121	162	60,3
80,3	68	75	82	95	116	130	150	190	80,3
100,3	82	90	106	120	140	160	190	245	100,3
125,3		120	130	150	176	212	250	320	125,3
150,3		138	150	170	218	248	280	360	150,3
200,3		172	202	240	304	350	405	485	200,3
250,3					368	430	482	595	250,3

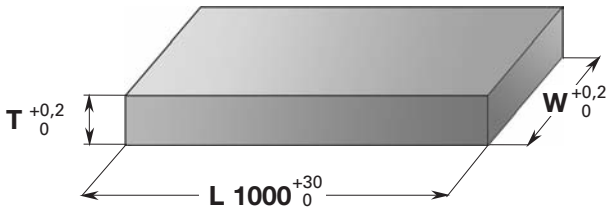
Square

■ mm	20,4	25,4	30,4	40,4	50,4	60,4	80,4	100,4
€/pc.	52	80	94	130	170	220	380	545

Material no. 1.2363
Abbreviated name X100CrMoV5
Condition Annealed

Manufactured to factory standard,
bars of 1000 mm length,
precision ground to thickness with machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm



Material no. 1.2767
Abbreviated name 45NiCrMo16
Condition Annealed

Properties and applications:

Due to its high nickel content it is a tough tool steel with good through-hardening properties. Suitable for very large tools, including plastic moulds or cold work tools for high toughness specifications.

Reference analysis [%]

C	Si	Mn	Cr	Mo	Ni
0,45	0,25	0,40	1,30	0,25	4,00

Physical properties

Temperature [°C]	20					
Thermal conductivity [W/m.K]	28					
Temperature [°C]	20					
E-modulus [10^3N/mm²]	210					
Temperatur [°C]	100	200	300	400	500	
Thermal expansion [10^{-6}m/m.K]	11,0	12,5	13,0	13,5	14,0	

Heat treatment

Annealing

Temperature [°C]	610	650	Hold time [h] approx. 4-5
Hardness after annealing	max. 260 HB		

Remarks: Controlled slow oven cooling.

Low stress annealing

Temperature [°C]	650	Hold time [h] approx. 2	

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

Hardening

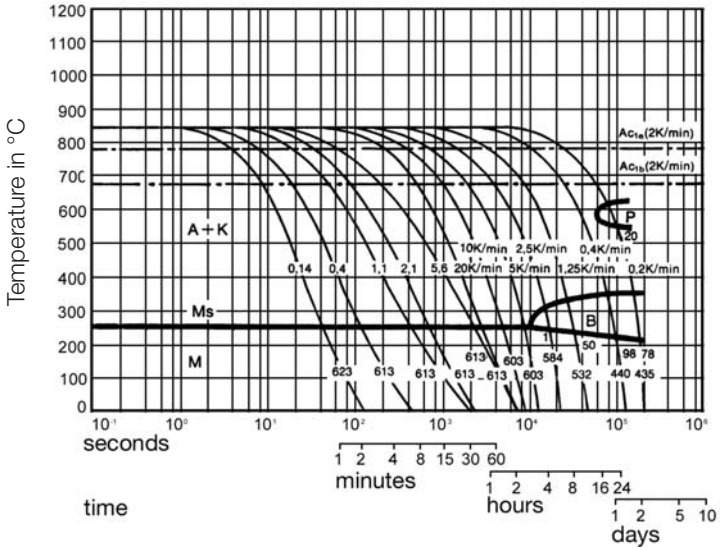
Temperature [°C]	840	870		
Quenching media	Oil	Salt bath (300° - 400°)	Air	

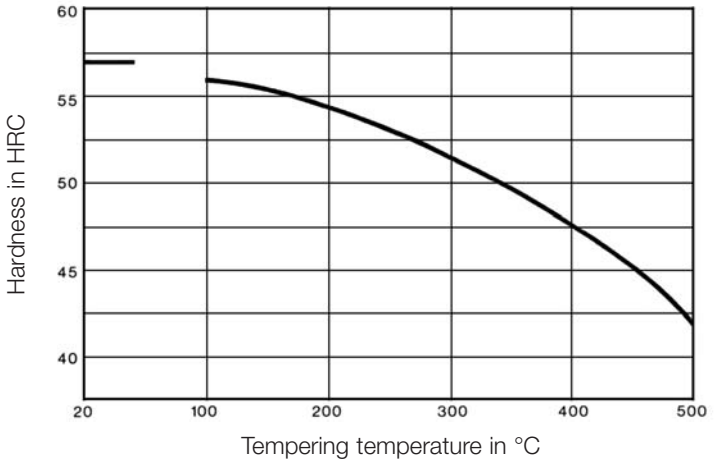
Remarks: Achievable hardness: 53–57 HRC for air hardening / 54–58 HRC for oil or salt bath hardening

Tempering: At least 2 hours with subsequent air cooling (1 h per 20 mm work piece thickness).
Guidelines for the achievable hardness after tempering can be taken from the tempering chart.

TTT and tempering chart

For continuous cooling





Precision flat ground with machining allowance, 500 mm

Width mm	Thickness mm												€/pc.	Width mm
	4,2	5,2	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4		
10,3	12	13	14	16										10,3
15,3	13	14	16	18	20	22								15,3
20,3	14	16	18	20	22	24	28							20,3
25,3	16	18	20	22	24	27	31	37						25,3
30,3	18	20	22	24	27	31	37	44	53					30,3
40,3	20	22	25	28	31	37	43	51	64	75				40,3
50,3	23	25	28	32	37	43	50	62	75	86	100			50,3
60,3	26	28	32	37	43	50	57	72	84	102	116	137		60,3
80,3	32	35	39	47	51	57	72	86	104	124	143	173		80,3
100,3	36	39	46	55	66	74	89	105	124	148	174	253		100,3
125,3				66	78	88	106	129	149	175	204	276		125,3

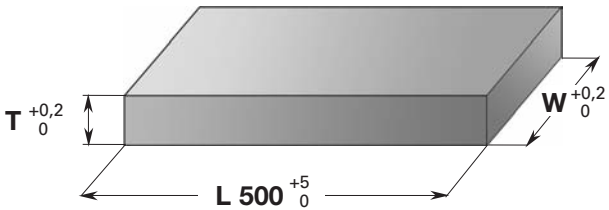
Square

■ mm	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4
€/pc.	18	22	26	35	48	64	89	125

Material no. 1.2767
Abbreviated name 45NiCrMo16
Condition Annealed

According to DIN 59350,
bars of 500 mm length,
precision ground to thickness
with machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +5,00/0 mm
Square: +0,20/0 mm



STRONG LOGISTICS FOR SHORT DELIVERY TIMES

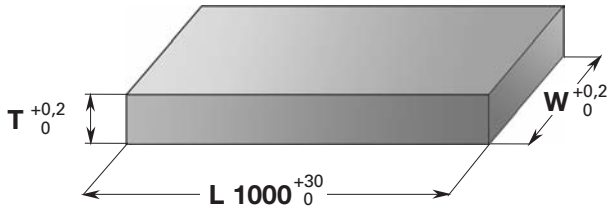
Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm															€/pc.	Width mm
	8,2	10,4	12,4	15,4	16,4	20,4	25,4	30,4	32,4	40,4	50,4	60,4	70,4	80,4	90,4	100,4	
20,3	28	32	36	40	43												20,3
25,3	31	35	39	45	50	55											25,3
30,3	35	39	45	54		65	85										30,3
32,3					58	67	87										32,3
40,3	38	42	50	63	66	75	95	104	112								40,3
50,3	44	51	53	70	76	90	110	125	130	150							50,3
60,3	50	55	65	80		98	125	140		170	204						60,3
63,3					88	106	130		161	190	220						63,3
70,3	62	68	75	90		115	136	155	172	203	236						70,3
80,3	68	77	88	100	112	125	145	170		212	248	280	320				80,3
90,3	77	85	97	113		138	158	195		236	280	330	390	440			90,3
100,3	85	96	110	124	128	150	175	200	215	270	320	357	420	480	530		100,3
125,3	115	129	140	160	176	192	216	262	275	336	398	460	540	628	670	736	125,3
150,3	139	145	154	170	190	220	252	298	320	378	456	530	605	710	790	824	150,3
200,3	163	190	212	252		315	362	420		500	616	726	870	964		1070	200,3
250,3	194	228	279	360		380	440	510		610	755	890	980	1076		1184	250,3
300,3	215	282	320	400		438	515	595		730	902	1080					300,3
500,3		440	505	590		710	865	1010		1275							500,3

Material no. 1.2767
Abbreviated name 45NiCrMo16
Condition Annealed

Manufactured to factory standard,
bars of 1000 mm length,
precision ground to thickness with
machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm



Square

■ mm	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4	90,4	100,4	120,4	150,4
€/pc.	29	35	41	50	74	89	118	175	220	320	380	485	556	790	1070

Ground bars

Tolerance h8, Length 1000 mm

Diameter mm				€/pc.
ø10	ø12	ø15	ø20	ø25
9	12	20	40	60

Tolerance:
length: +30,0/0 mm

Material no. 1.2510 / 1.2842
Abbreviated name 100MnCrW4 / 90MnCrV8
Condition Annealed

Properties and applications:

Oil-hardening low alloy steel. Standard cold work steels, with good machinability and low distortion, universally applicable. Both the K720 material and the internationally more commonly used K460 material are interchangeable in terms of their properties, machinability and dimensional stability during heat treatment.

Reference analysis [%]

K460	C	Si	Mn	Cr	V	W
	0,95	0,25	1,10	0,55	0,10	0,55

K720	C	Si	Mn	Cr	V
	0,90	0,25	2,00	0,35	0,10

Physical properties

Temperature [°C]	20					
Thermal conductivity [W/m.K]	30					
Temperature [°C]	20					
E-modulus [10^3N/mm^2]	210					
Temperature [°C]	100	200	300	400	500	
Thermal expansion [10^{-6}m/m.K]	11,5	12,0	12,2	12,5	12,8	

Heat treatment

Annealing

Temperature [°C]	710	750	Hold time [h] approx. 3
Hardness after annealing	max. 220 HB		

Remarks: Controlled slow oven cooling.

Low stress annealing

Temperature [°C]	650	Hold time [h] approx. 2

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

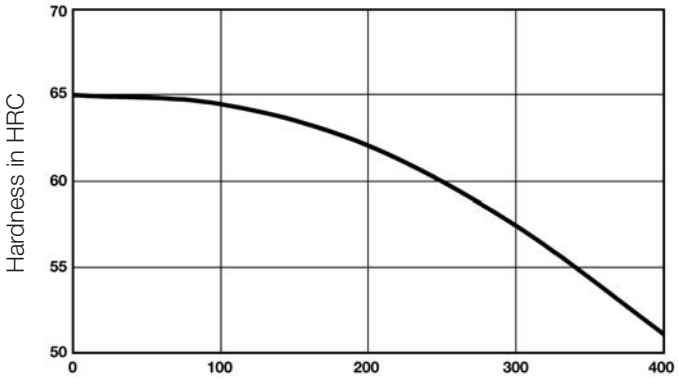
Hardening

Temperature [°C]	780	820
Quenching media	Oil	Salt bath up to 20 mm thickness

Tempering: At least 2 hours with subsequent air cooling (1 h per 20 mm work piece thickness).
Guidelines for the achievable hardness after tempering can be taken from the tempering chart.

Tempering chart

For continuous cooling



Tempering temperature for K460/K720 in °C

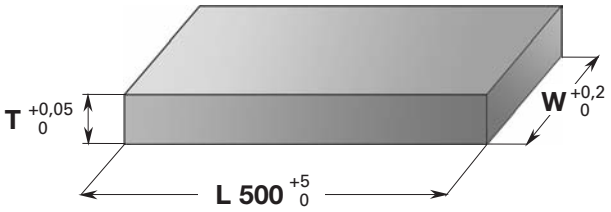
Precision flat steel according to DIN 59350, 500 mm

Width mm	Thickness mm																Width mm
	1,0	1,5	2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0	15,0	20,0	25,0	30,0	40,0	50,0	
	€/pc.																
10	3,90	4,10	4,60	5,20	5,30	6,50	8,40	9									10
12	4,00	4,40	4,80	5,40	5,60	6,80	8,60	9	10								12
15	4,60	4,90	5,20	5,60	5,80	7	9	10	11	12							15
20	5,00	5,20	5,40	5,80	7	8	10	11	12	13	14						20
25	5,40	5,80	6,40	7	8	9	11	12	13	14	16	18					25
30	6,10	6,50	7	8	9	10	12	13	14	15	17	20	25				30
35	6,80	7	8	9	10	11	13	14	15	16	19	22	27	32			35
40	7,50	8	9	10	11	12	14	15	16	18	21	25	29	36			40
50	8	9	10	11	12	14	15	16	18	20	24	28	35	40	46		50
60	9	10	11	12	14	15	16	18	21	24	27	33	39	45	50	74	60
70	10	11	12	14	15	16	18	20	24	26	31	38	44	51	59	83	70
80	12	13	14	15	16	18	20	23	26	28	36	42	50	61	72	96	80
100	14	15	16	17	18	20	23	26	28	34	40	48	58	71	88	116	100
120	16	17	18	19	21	23	26	28	32	38	44	53	66	84	97	128	120
125	18	19	20	21	23	26	28	31	35	40	46	56	70	87	105	139	125
150	20	21	22	24	26	28	31	35	39	46	54	70	87	104	125	166	150
160	22	23	24	27	29	31	35	38	46	52	61	76	94	120	128	190	160
180	24	26	27	29	31	35	38	44	52	58	75	85	110	136	152	212	180
200	27	30	30	32	36	38	44	51	59	66	80	96	128	155	178	239	200
250	33	35	37	38	40	46	53	60	68	79	96	128	141	174	200	285	250
300	40	41	42	43	45	54	62	70	78	92	120	148	170	209	250	310	300

Material no. 1.2510 / 1.2842
Abbreviated name 100MnCrW4 / 90MnCrV8
Condition Annealed

According to DIN 59350,
bars of 500 mm length,
precision ground to thickness,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,05/0 mm
Length: +5,00/0 mm
Square: +0,05/0 mm

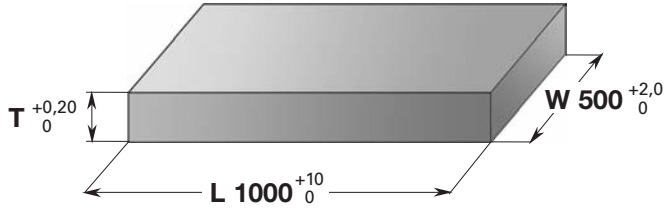


Square

■ mm	4,0	5,0	6,0	8,0	10,0	12,0	15,0	16,0	20,0	25,0	30,0	40,0	50,0	60,0
€/pc.	8,80	9,50	10	11	12	13	14	16	19	24	36	45	64	90

Ground plates 500 x 1000 mm

mm	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4
€/pc.	215	230	280	320	390	450	555	630	776



Precision flat ground according to DIN 59350, 1000 mm

Width mm	Thickness mm														€/pc.	Width mm
	2,0	3,0	4,0	5,0	6,0	8,0	10,0	12,0	15,0	20,0	25,0	30,0	40,0	50,0		
10	10	11	12	13	17	18										10
12	11	11	13	14	18	19	20									12
15	11	12	14	15	19	20	21	23								15
20	12	13	15	16	20	21	23	25	27							20
25	13	14	16	17	21	23	25	27	29	37						25
30	15	16	17	18	23	25	27	29	33	39	50					30
35	16	17	18	19	25	27	28	31	36	43	54	64				35
40	17	18	20	23	27	29	30	34	40	48	61	71				40
50	20	22	24	27	29	31	34	39	46	55	68	82	100			50
60	22	24	28	29	31	36	39	44	50	66	78	92	111	150		60
70	24	28	30	31	35	39	45	50	60	75	90	106	132	170		70
80	28	30	32	35	39	45	50	54	70	84	100	124	148	196		80
100	32	34	36	39	44	51	55	66	78	98	123	148	173	224		100
120	36	38	42	45	52	57	66	76	92	108	138	168	205	255		120
125	40	42	46	51	55	62	69	82	96	120	141	173	220	282		125
150	44	48	52	55	61	70	76	90	113	140	178	214	244	322		150
160	48	54	58	60	67	76	92	102	126	154	194	225	275	360		160
180	54	58	62	67	74	86	105	117	148	176	224	258	315	426		180
200	61	64	68	77	86	94	112	127	164	190	237	294	360	461		200
250	74	76	80	91	104	118	132	155	196	240	294	346	417	541		250
300	84	86	92	103	122	138	152	186	232	280	340	398	490	620		300

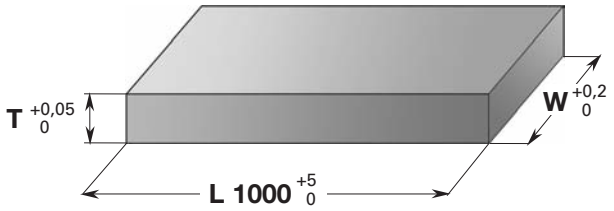
Square

■ mm	6,0	8,0	10,0	12,0	15,0	16,0	20,0	25,0	30,0	40,0	50,0	60,0
€/pc.	20	21	23	25	28	31	37	48	70	89	134	185

Material no. 1.2510 / 1.2842
Abbreviated name 100MnCrW4 / 90MnCrV8
Condition Annealed

According to DIN 59350,
bars of 500 mm length,
precision ground to thickness,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,05/0 mm
Length: +5,00/0 mm
Square: +0,05/0 mm



Precision flat ground with machining allowance, 500 mm

Width mm	Thickness mm														€/pc.	Width mm
	4,2	5,2	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	80,4	100,4	
20,3	8	9	10	11	12	13	14									20,3
25,3	9	10	11	12	13	14	16	18								25,3
30,3	10	11	12	13	14	15	17	20	27							30,3
40,3	11	12	13	14	16	18	20	25	32	36						40,3
50,3	12	14	15	16	18	20	23	28	35	39	49					50,3
60,3	14	15	16	18	20	23	25	32	40	46	56	75				60,3
70,3	15	16	18	20	23	25	30	37	45	52	65	85	114			70,3
80,3	16	18	20	23	25	28	34	44	52	63	74	98	127			80,3
100,3	18	20	23	26	28	34	38	50	63	70	90	113	144	176		100,3
120,3	21	24	28	30	34	39	48	58	72	86	99	134	165	205	280	120,3
125,3	24	26	30	33	37	42	52	62	80	98	109	146	185	226	294	125,3
150,3	29	31	33	36	40	46	57	74	93	114	130	184	221	264	316	150,3
160,3	30	33	35	40	46	52	62	80	100	122	140	197	231	288	357	160,3
180,3	32	34	37	44	52	62	82	90	114	144	166	220	243	320	381	180,3
200,3	34	38	44	51	59	69	88	96	130	155	172	240	262	344	410	200,3
250,3	42	49	53	64	69	81	103	128	150	184	218	275	310	390	470	250,3
300,3	48	56	64	72	83	99	123	156	180	220						300,3

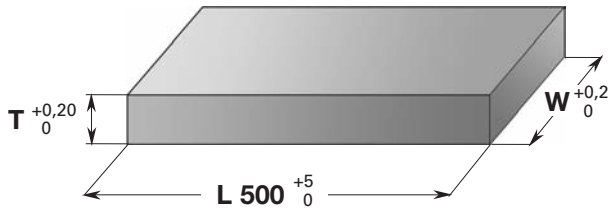
Material no. 1.2510 / 1.2842
Abbreviated name 100MnCrW4 / 90MnCrV8
Condition Annealed

According to DIN 59350,
bars of 500 mm length,
precision ground to thickness,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +5,00/0 mm
Square: +0,20/0 mm

Square

■ mm	10,4	12,4	15,4	16,4	20,4	25,4	30,4	32,4	40,4	50,4	60,4	80,4	100,4
€/pc.	12	13	17	18	19	24	35	38	46	73	105	160	226



Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm																			Width mm
	2,2	3,2	4,2	5,2	6,2	8,2	10,4	12,4	15,4	16,4	20,4	25,4	30,4	32,4	40,4	50,4	60,4	80,4	100,4	
10,3	10	10	11	12	14	16														10,3
15,3	10	11	12	14	16	18	20	22												15,3
20,3	11	12	14	16	18	20	22	24	26	29										20,3
25,3	12	14	16	18	20	22	24	26	30	31	33									25,3
30,3	14	16	18	20	22	24	26	28	32	35	38	50								30,3
32,3			19	21	23	25	27	30	35	38	42	56								32,3
40,3	17	18	20	22	24	27	30	34	38	42	47	59	68	72						40,3
50,3	19	22	24	26	28	30	34	38	44	48	54	65	76	80	88					50,3
60,3	22	23	26	28	30	34	38	44	48	55	63	75	88	92	104	135				60,3
63,3			27	29	33	37	41	46	52	56	68	82	92	102	118	154				63,3
70,3	25	27	29	31	35	39	45	49	58	60	72	87	100	110	122	160	205			70,3
80,3	27	29	31	35	39	45	49	55	66	70	80	95	110	120	140	179	229			80,3
100,3	31	33	35	40	46	51	55	62	77	88	98	120	130	145	170	214	270	338		100,3
120,3	34	38	40	46	55	58	65	75	92	95	110	140	165	172	190	248	328	356	476	120,3
125,3	36	40	43	48	58	63	70	80	98	102	118	150	180	190	205	280	341	420	506	125,3
150,3	50	53	55	59	63	69	77	89	108	116	132	180	220	230	250	321	388	476	545	150,3
160,3			59	63	68	76	87	100	119	130	150	192	230	240	265	349	418	522	629	160,3
180,3			64	70	75	86	101	118	140	150	167	210	254	266	304	385	440	548	680	180,3
200,3	60	64	68	76	82	96	114	134	160	170	182	225	272	290	340	412	470	616	708	200,3
250,3			82	92	102	112	130	152	187	210	228	279	328	350	406	508	552	698	822	250,3
300,3			95	105	115	135	156	175	218	224	274	330	395							300,3
€/pc.																				

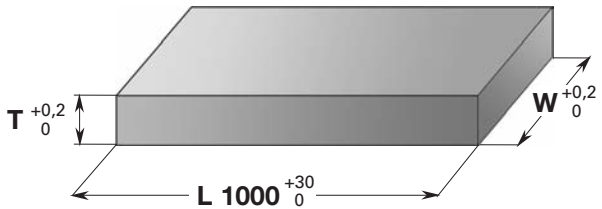
Material no. 1.2510 / 1.2842
Abbreviated name 100MnCrW4 / 90MnCrV8
Condition Annealed

Manufactured to factory standard,
bars of 1000 mm length,
precision ground to thickness,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,00/0 mm
Square: +0,20/0 mm

Square

■ mm	10,4	12,4	15,4	16,4	20,4	25,4	30,4	32,4	40,4	50,4	60,4	80,4	100,4
€/pc.	22	24	30	32	36	45	66	72	88	135	159	292	394



Normbars 500 mm

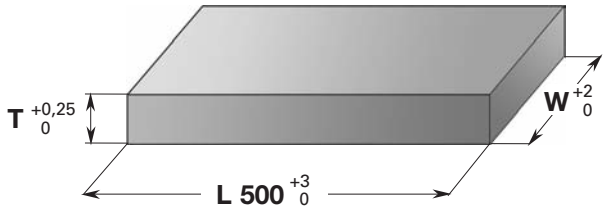
Width mm	Thickness mm						€/pc.	Width mm
	10,4	15,4	20,4	25,4	30,4	40,4		
103	65	80	91	103	127	147		103
113	70	86	96	112	136	157		113
123	73	91	102	119	145	169		123
133	77	95	107	126	154	179		133
143	82	101	115	134	164	191		143
153	87	106	120	140	172	201		153
163	91	112	126	147	181	212		163
173	95	117	134	154	191	222		173
183	99	123	139	162	199	234		183
193	104	127	145	169	209	244		193
203	107	132	151	177	218	254		203
213	113	138	157	184	227	265		213
223	117	144	165	191	236	275		223
233	122	149	170	198	244	287		233
243	125	154	176	204	253	297		243
253	129	160	183	213	263	308		253
263	135	165	189	220	272	318		263
273	139	170	194	227	282	329		273
283	143	175	200	235	290	340		283
293	147	180	207	242	298	350		293
303	151	187	212	249	309	362		303

Width mm	Thickness mm						€/pc.	Width mm
	10,4	15,4	20,4	25,4	30,4	40,4		
313	156	192	219	256	317	374		313
323	161	197	224	263	326	383		323
333	165	201	232	270	336	395		333
343	169	208	238	277	344	406		343
353	174	213	244	285	355	417		353
363	178	218	250	293	362	428		363
373	181	223	256	299	371	438		373
383	187	229	262	307	382	448		383
393	191	234	269	314	390	459		393
403	196	239	274	320	399	470		403
413	200	244	281	329	408	481		413
423	203	250	287	336	417	492		423
433	209	256	293	343	428	502		433
443	213	261	298	350	435	512		443
453	218	266	305	358	444	524		453
463	221	271	312	365	454	534		463
473	225	276	317	372	463	545		473
483	231	282	323	380	472	555		483
493	235	287	330	387	481	566		493
503	239	293	336	393	490	577		503

Material no. 1.2510 / 1.2842
Abbreviated name 100MnCrW4 / 90MnCrV8
Condition Annealed

Manufactured to factory standard,
bars of 500 mm length,
precision ground to thickness,
width sawn, length milled,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +2,00/0 mm
Thickness: +0,25/0 mm
Length: +3,0/0 mm



K460 Ground bars

Tolerance h8, Length 1000 mm

Diameter mm							€/pc.
ø5	ø6	ø8	ø10	ø12	ø15	ø20	ø25
3	4	5	8	10	14	24	35

Material no. 1.2510
Abbreviated name 100MnCrW4
Condition Annealed

Tolerance:
length: +30,0/0 mm

Material no. 1.1730
Abbreviated name C45U
Condition Self-hardened

Properties and applications:
Unalloyed tool steel. Body parts for tools, hand tools and farming tools of all kinds.

Reference analysis [%]

C	Si	Mn	P	S
0,48	0,30	0,70	max. 0,035	max. 0,035

Physical properties

Temperature [°C]	20					
Thermal conductivity [W/m.K]	50					
Temperature [°C]	20					
E-modulus [10^3N/mm²]	210					
Temperature [°C]	100	200	300	400	500	
Thermal expansion [10^{-6}m/m.K]	11,1	12,1	12,9	13,5	13,9	

Heat treatment

Annealing

Temperature [°C]	680	710	Hold time [h] approx. 3	
Hardness after annealing	max. 190 HB			

Remarks: Controlled slow oven cooling.

Low stress annealing

Temperature [°C]	600	650	Hold time [h] approx. 3	

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

Hardening

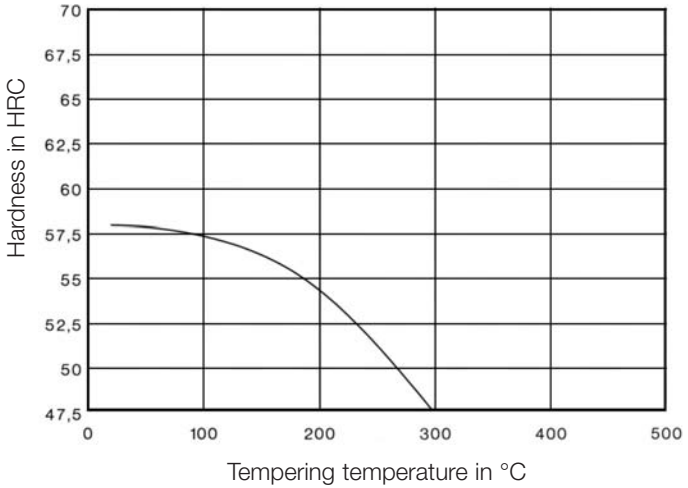
Temperature [°C]	800	830	
Quenching media	Water		

Remarks: Achievable hardness: 58 HRC / Case depth for 30 mm square: 3–5 mm / through-hardened work piece thickness: 15 mm

Tempering: A minimum of 1 hour with subsequent air cooling. Guidelines for the achievable hardness after tempering can be taken from the tempering chart.

Tempering chart

For continuous cooling



Precision flat ground 1000 mm

Width mm	Thickness mm																					Width mm
	4	5	6	8	10	12	15	16	20	25	30	32	40	50	60	63	70	80	90	100	120	€/pc.
20	12	13	14	15	16	17	18	19														20
25	13	14	15	16	17	18	20	23	24													25
30	14	15	16	17	18	21	22		28	34												30
32	15	16	17	18	20	23		28	30	35												32
40	16	17	19	20	22	25	26	30	33	36	43	48										40
50	17	19	21	23	27	29	33	35	36	41	53	57	62									50
60	21	23	25	28	30	33	36		41	47	58		66	76								60
63			27	30	33	35		45	46	51		64	69	88								63
70			31	33	35	36	39	46	49	52	62	69	76	92	103	115						70
80	28	31	34	36	38	46	50	52	58	62	70	75	84	97	112	122	127					80
90	31	35	38	40	42	51	54		62	66	76		92	108	123		143	165				90
100	35	38	40	43	48	56	58	65	70	71	85	89	102	120	138	145	153	176	205			100
120			46	49	55	64	71		79	84	96		115	135	160		175	205	236	260		120
125	41	45	49	55	62	70	73	80	82	87	103	112	122	144	168	183	192	221		276		125
140			55	65	70	78	84		93	98	119	126	132	155	180		206	240	268	290		140
150	50	54	58	67	72	81	89	94	98	109	122	134	139	162	191	206	218	250	280	312	390	150
160			62	72	78	87	94	98	103	112	131	141	148	172	208		250	280	305	360		160
180			75	78	81	93	100		108	123	136	150	160	191	222		265	294	340	380	450	180
200			80	84	91	99	107	111	128	130	155	162	180	216	246	260	285	325	370	400	495	200
250			100	108	111	123	131	136	141	158	183	194	219	264	302	312	340	388	450	490	610	250
300			112	119	129	140	154	160	165	188	216	230	262	308	360	373	400	455	530	575		300
350				150	166	182	198	206	220	238	260	270	298	370	428							350
400	150	160	170	180	190	204	214	236	250	262	295	310	352	424	465		520	552				400
450									260	292	320		382	468	520							450
500					205	215	230		280	322	360		429	530	605							500

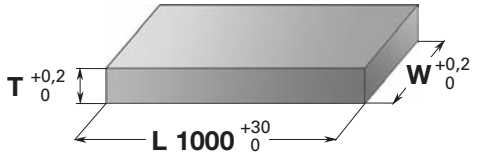
Material no. 1.1730
Abbreviated name C45U
Condition Normalised

In bars of 1000 mm length, with decarburisation-free surface, width ground or milled, precision ground to thickness, length machined, packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm

Square

■ mm	10	12	15	16	20	25	30	32	40	50	60	63	70	80	90	100	120	150	200
€/pc.	17	19	20	21	23	32	43	48	52	72	97	106	115	150	180	225	296	466	805



Material no. 1.0570
Abbreviated name S355J2+N (~ST 52-3)
Condition Normalised

Properties and applications:

Unalloyed construction steel, high toughness, good machinability, good weldability, good shape stability. Frames in tool and mould making for body parts and steel frames.

Reference analysis [%]

C	Si	Mn	P	S
≤ 0,22	≤ 0,55	≤ 1,6	≤ 0,035	≤ 0,035

Physical properties

Temperature [°C]	20					
Thermal conductivity [W/m.K]	30-45					
Temperature [°C]	20					
E-modulus [10^3N/mm²]	210					
Temperature [°C]	100	200	300	400	500	
Thermal expansion [10^{-6}m/m.K]	11,1	12,1	12,9	13,5	13,9	

Heat treatment

Heat treatment is not required as a rule for material 1.0570. We recommend a low-stress anneal for heavy-duty machining and complex geometries.

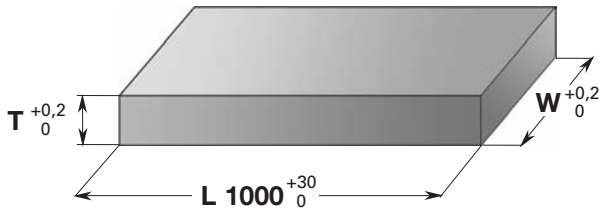
Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm														€/pc.	Width mm
	5,2	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4	100,4	
20,3		13	14	15	16	17										20,3
25,3	14	14	15	16	18	20	24									25,3
30,3	15	15	17	18	21	24	28	34								30,3
40,3	16	17	20	23	25	28	34	38	43							40,3
50,3	19	21	23	27	29	33	39	44	52	57						50,3
60,3	23	25	28	30	32	35	44	49	58	63	75					60,3
70,3				35	39	45	50	56	64	71	92	101				70,3
80,3	31	33	35	39	45	50	58	64	70	78	97	112	128			80,3
100,3	37	39	42	46	56	58	68	71	85	102	120	135	153	177		100,3
120,3			49	55	64	71	77	83	97	118	135	158	176	208	260	120,3
125,3	41	47	51	59	67	73	82	87	105	126	140	156		212	270	125,3
140,3			65	70	77	83	96	102	116	135	155	177	207	240	292	140,3
150,3	51	58	67	72	81	89	97	107	120	142	162	193	218	252	310	150,3
160,3	57	66	71	78	87	93	102	110	129	148	174		230	256	328	160,3
180,3				86	92	98	107	116	137	166	190	220	255	290		180,3
200,3		77	87	95	98	106	118	129	155	178	210	240	280	330	396	200,3
250,3		91	105	110	122	130	140	156	180	218	262	301	340	390	485	250,3
300,3				129	139	153	164	186	210	260	305	360	390	460	590	300,3
350,3				162	175	190	210	227	248	290	370	415		540	670	350,3
400,3				187	196	210	225	242	265	327	394	470				400,3
500,3				195	210	225	245	270	325	420	510	590				500,3

Material no. 1.0570
Abbreviated name S355J2+N
Condition Normalised

Manufactured to factory standard,
bars of 1000 mm length,
precision ground to thickness with
machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm



Square

■ mm	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4	100,4	120,4	150,4
€/pc.	17	19	20	21	32	41	52	72	96	115	146	220	305	482

Material no. 1.2162
Abbreviated name 21MnCr5
Condition Annealed

Properties and applications:

Case hardening steel. Tools for plastics processing, standard quality for small and medium-sized moulds. Good wear resistance after case hardening.

Reference analysis [%]

C	Si	Mn	Cr
0,20	0,30	1,20	1,10

Physikalische Eigenschaften

Temperature [°C]	20						
Thermal conductivity [W/m.K]	41						
Temperature [°C]	20						
E-modulus [10^3N/mm^2]	210						
Temperature [°C]	100	200	300	400	500	600	
Thermal expansion [10^{-6}m/m.K]	11,1	12,1	12,9	13,5	13,9	14,1	

Heat treatment

Annealing

Temperature [°C]	670	710	Hold time [h] approx. 3	
Hardness after annealing	max. 205 HB			

Remarks: Controlled slow oven cooling.

Carburising

Temperature [°C]	900	950	

Hardening

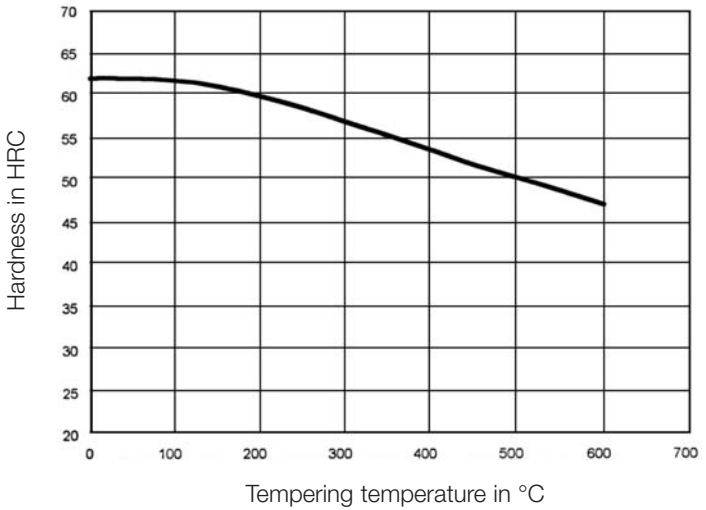
Temperature [°C]	810	840	
Quenching media	Oil	Salt bath (160–250 °C)	

Remarks: 1. Direct quenching from case hardening: Gradual cooling to hardening temperature
2. After cooling from case: Heating to hardening temperature

Tempering: 170 to 210 °C with subsequent air cooling. Achievable surface hardness: 62 HRC Achievable core hardness: 1000–1300 N/mm2 (for dim. 30 mm rd.)

Tempering chart

For continuous cooling



Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm									€/pc.	Width mm
	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	
20,3	27	28	31	32							20,3
25,3	28	30	35	37	46						25,3
30,3	31	33	39	44	53	65					30,3
40,3	37	40	48	56	68	78	86				40,3
50,3	46	48	60	62	74	81	96	104			50,3
60,3	52	56	69	72	84	93	106	125	145		60,3
70,3	62	65	78	81	94	105	116	142	160	193	70,3
80,3	71	73	88	91	104	120	142	158	182	204	80,3
100,3	82	85	98	108	123	142	160	185	215	234	100,3
120,3		108	120	130	150	166	192	220	260		120,3
150,3	127	130	140	146	170	185	220	265	318	324	150,3
180,3		146	166	180	200	225	258	298	340		180,3
200,3	157	162	184	190	210	236	276	330	372	420	200,3
250,3	196	205	232	240	270	290	320	392	452	494	250,3
300,3	217	222	253	260	302						300,3
500,3		300	335	350	425	502	570	658	780		500,3

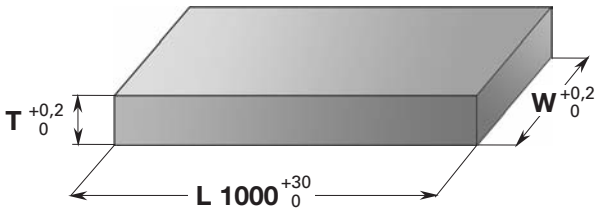
Square

■ mm	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4	100,4
€/pc.	36	48	61	80	102	134	181	215	245	340

Material no. 1.2162
Abbreviated name 21MnCr5
Condition Annealed

Manufactured to factory standard,
bars of 1000 mm length,
precision ground to thickness with
machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm



Material no. 1.2312
Abbreviated name 40CrMnMoS8-6
Condition Quenched and tempered to 980-1120 N/mm^2

Properties and applications:

Plastic mould steel with an increased sulphur content for good machinability. Is generally delivered in quenched and tempered condition and should not undergo further heat treatment. This prevents shape changes associated with heat treatment. Mould frames for die casting moulds.

Reference analysis [%]

C	Si	Mn	S	Cr	Mo
0,40	0,40	1,50	0,08	1,90	0,20

Physical properties

Temperature [°C]	20				
Thermal conductivity [W/m.K]	33				
Temperature [°C]	20				
E-modulus [10^{3}N/mm^2]	210				
Temperature [°C]	100	200	300	400	500
Thermal expansion [10^{-6}m/m.K]	12,8	13,0	13,8	14,0	14,2

Heat treatment

Annealing

Temperature [°C]	720	740	Hold time [h] approx. 3
Hardness after annealing	max. 230 HB		

Remarks: Controlled slow oven cooling.

Aufkohlen

Temperature [°C]	600	Hold time [h] approx. 2

Remarks: In hardened condition about 30 to 50 ° C below the tempering temperature.

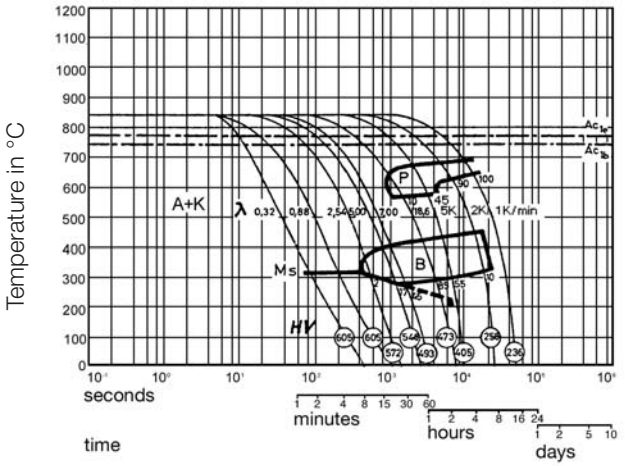
Hardening (if subsequent quenching and tempering is required)

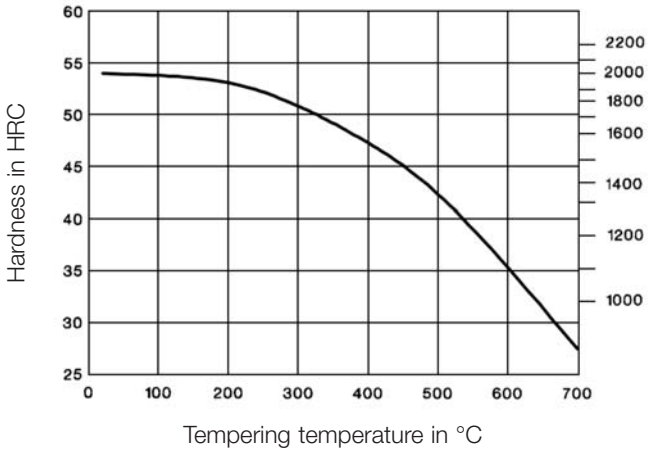
Temperature [°C]	840[1]	860[1]	860[2]	880[2]
Quenching media	Oil[1]	Air[2] (up to 150 mm thick)		

Anlassen: Slow heating up to tempering temperature immediately after hardening. Dwell time in furnace 1 hour for each 20 mm of work piece thickness, but a minimum of 2 hours, with subsequent air cooling. Guidelines for hardness after tempering can be taken from the tempering chart. Maximum achievable Hardness: 54 HRC

TTT and tempering chart

For continuous cooling





Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm																		€/pc.	Width mm
	4,2	5,2	6,2	8,2	10,4	12,4	15,4	16,4	20,4	25,4	30,4	32,4	40,4	50,4	60,4	70,4	80,4	90,4	100,4	
20,3			22	23	24	26	30													20,3
25,3			24	24	25	28	34	36	38											25,3
30,3			25	25	26	30	36	38	40	49										30,3
32,3					29	33		40	43											32,3
40,3	24	25	27	29	33	38	41	45	48	59	65									40,3
50,3	27	28	30	34	39	42	46	48	55	62	72	76	88							50,3
60,3	31	33	35	38	44	48	50	56	61	66	78	83	92	110						60,3
63,3	34	35	37	40	45	49		61	65	72		85	95	114						63,3
70,3	36	38	41	44	49	54	62		70	79	90	96	100	122	140					70,3
80,3	40	41	45	48	55	62	65	72	78	90	99	105	113	152	167	195				80,3
100,3	53	55	58	62	66	72	77	82	92	102	118	125	148	172	199	210	246			100,3
125,3			69	76	88	94	110	120	135	142	151	162	174	196	206	236	312			125,3
150,3			94	99	108	114	121	135	142	153	175	183	212	240	285	328	392	454	505	150,3
180,3			112	118	124	132	144		172	190	216		262	326	365	430	460	490	540	180,3
200,3			124	128	135	141	157	166	185	208	236	252	292	350	410	470	504	540	570	200,3
220,3					150	166		195	220	234	260	264	310	362	460	490	520	580	635	220,3
250,3					162	191	215		231	250	288		328	396	495	540	612			250,3
300,3					188	223	240		258	285	328		375	455	530	595	650			300,3
400,3					250	295	320		344	390	435		500	600	700					400,3
500,3					310	370	400		430	475	546		620	710	880					500,3

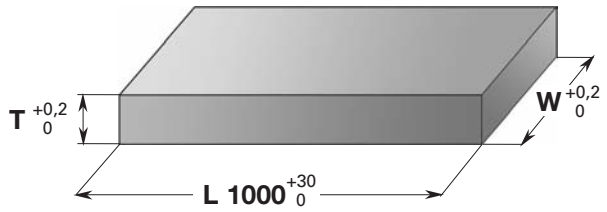
Material no. 1.2312
Abbreviated name 40CrMnMoS8-6
Condition Quenched and tempered to 980 -1120 N/mm^2

Manufactured to factory standard, bars of 1000 mm length, precision ground to thickness with machining allowance, width ground or milled, length machined, with decarburisation-free surface, packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm

Square

■ mm	10,4	12,4	15,4	16,4	20,4	25,4	30,4	32,4	40,4	50,4	60,4	70,4	80,4	100,4	120,4	150,4
€/pc.	28	30	34	35	39	50	65	67	78	105	130	152	215	310	455	670



MATERIAL, MACHINING AND SERVICE FROM A SINGLE SOURCE

Ground bars

Tolerance h8, Length 1000 mm

Diameter mm								€/pc.
ø6	ø8	ø10	ø12	ø14	ø15	ø16	ø18	ø20
4	5	7	10	12	14	15	18	21

Material no. 1.2312
Abbreviated name 40CrMnMoS8-6
Condition Quenched and tempered to 980 -1120 N/mm^2

Tolerances:
Length: +30,0/0 mm

Material no. 1.2083
Abbreviated name X42Cr13
Condition Annealed

Properties and applications:

Hardenable, high Cr-alloyed, corrosion-resistant steel with good wear resistance. Easy to machine and polish. Injection moulds of all types to withstand chemically aggressive moulding materials, also for processing of plastics with abrasive additives. Additional use for glass extrusion dies and blow moulds.

Reference analysis [%]

C	Si	Mn	Cr	V
0,38	0,70	0,45	14,25	0,20

Physical properties

Temperature [°C]	20					
Thermal conductivity [W/m.K]	22					
Temperature [°C]	20					
E-modulus [10^3N/mm²]	220					
Temperature [°C]	100	200	300	400	500	
Thermal expansion [10^{-6}m/m.K]	10,5	11,0	11,0	11,5	12,0	

Heat treatment

Annealing

Temperature [°C]	840	870	Hold time [h] approx. 3
Hardness after annealing	max. 225 HB		

Remarks: Controlled slow oven cooling.

Carburising

Temperature [°C]	650	Hold time [h] approx. 2

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

Hardening (if subsequent quenching and tempering is required)

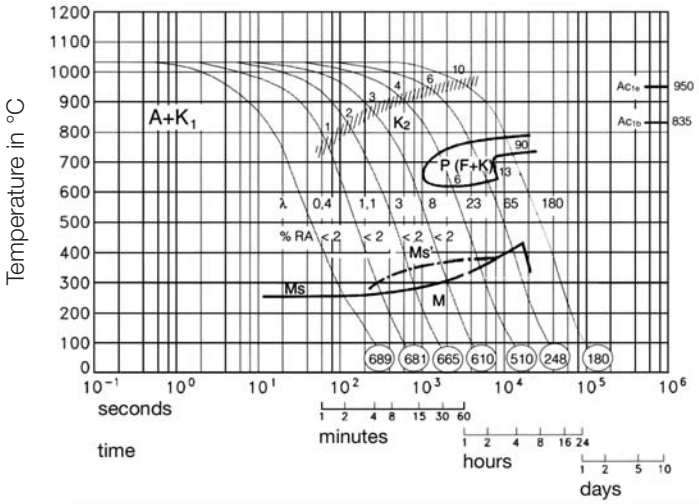
Temperature [°C]	1000	1050
Quenching media	Oil	Air

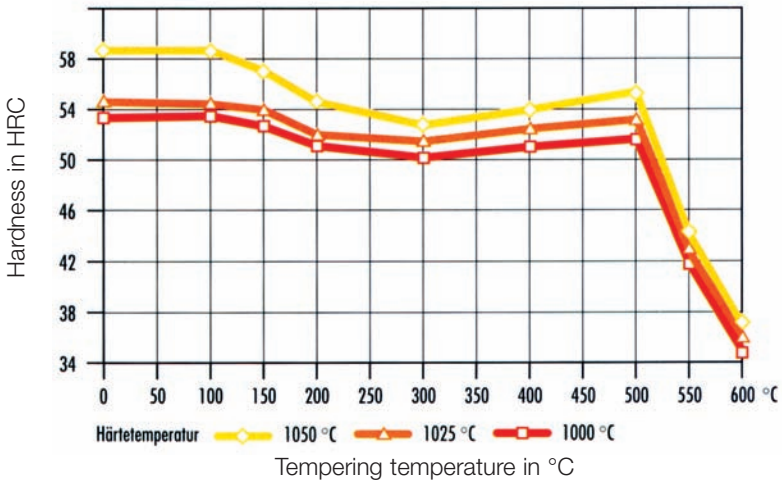
Remarks: Achievable hardness: 53-56 HRC

Tempering: 100 to 200 °C slow heating to tempering temperature immediately after hardening. Dwell time in furnace 1 hour for each 20 mm of work piece thickness, but a minimum of 2 hours, with subsequent air cooling. Guidelines for hardness after tempering can be taken from the tempering chart.

TTT and tempering chart

for continuous cooling





Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm									€/pc.	Width mm
	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	
20,3	28	32	36	39							20,3
25,3	29	33	39	42	50						25,3
30,3	35	37	46	54	61	86					30,3
40,3	39	44	52	65	73	98	108				40,3
50,3	45	53	60	73	88	108	120	156			50,3
60,3	51	57	67	84	102	119	132	172	197		60,3
70,3					110	130	140	187	222	252	70,3
80,3	70	78	85	107	117	141	167	210	236	275	80,3
90,3	78	81	95	118	134	158	186	236	270	326	90,3
100,3	87	96	106	128	149	175	205	267	320	370	100,3
120,3		125	136	148	175	210	256	330	386	450	120,3
130,3		135	144	157	191	227	273	350	414	490	130,3
140,3		146	152	168	207	242	290	374	441		140,3
150,3		155	160	177	225	260	305	386	468		150,3
200,3		195	220	262	330	376	430	510			200,3
250,3		235	270	310	394	455	515	630			250,3
300,3		292	325	390	455	535	610				300,3

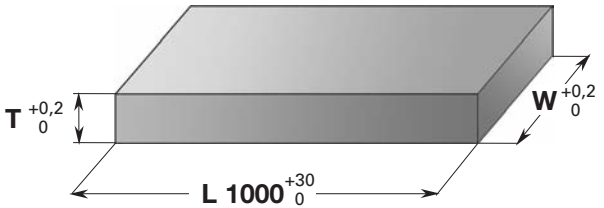
Square

■ mm	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4	100,4
€/pc.	41	49	75	94	122	177	220	320	380	550

Material no. 1.2083
Abbreviated name X42Cr13
Condition Annealed

Manufactured to factory standard,
bars of 1000 mm length,
precision ground to thickness with
machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm



Material no. ~ 1.2099
Abbreviated name Custom brand
Condition Quenched and tempered to approx. 1000 MPa

Properties and applications:

BÖHLER M315 EXTRA is a prehardened, corrosion-resistant plastic mould steel with significantly improved machinability compared with all 1.2085 types. It features uniform strength across the entire cross section for all manufacturable dimensions. **BÖHLER M315 EXTRA** is used for all mould frames, mould bodies, tools with high machining volumes and manufacture of corrosion-resistant tools as well as simple parts. **BÖHLER M315 EXTRA**, the corrosion-resistant mould frame steel, is used for processing aggressive plastics, in humid climate conditions, when condensation occurs and in other similar situations. Can also be used for chemical, pharmaceutical and foodstuff applications in mildly corrosive conditions. **BÖHLER M315 EXTRA** is magnetisable.

Reference analysis [%]

C	Si	Mn	Cr	S	Ni
0,05	0,20	0,90	12,80	0,12	+

Physical properties

Temperature [°C]	100	200	300	400	500
Thermal conductivity [W/m.K]	24,7	25,7	26,3	26,5	26,6
Temperature [°C]	100	200	300	400	500
Thermal expansion [10^{-6}m/m.K]	11,0	11,6	11,9	12,2	12,4

Heat treatment

Hardening (if subsequent quenching and tempering is required)

Temperature [°C]	1050	870	Hold time [h] approx. 0.5
Quenching media	Oil		

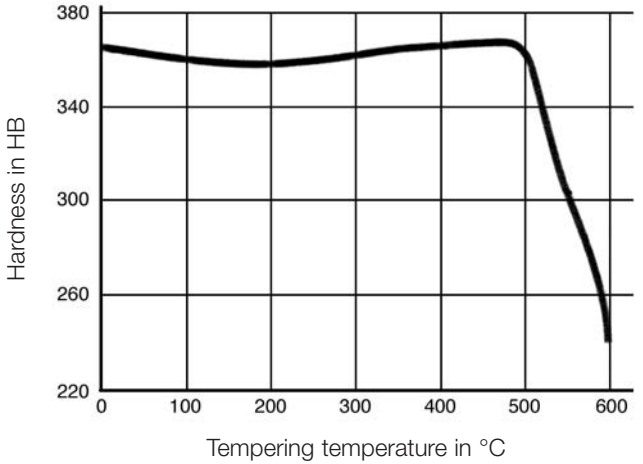
Low stress annealing

Temperature [°C]	480	Hold time [h] approx. 2

Tempering: Minimum 2 x 2 h immediately after hardening. Guidelines for hardness after tempering can be taken from the tempering chart.

Tempering chart

For continuous cooling



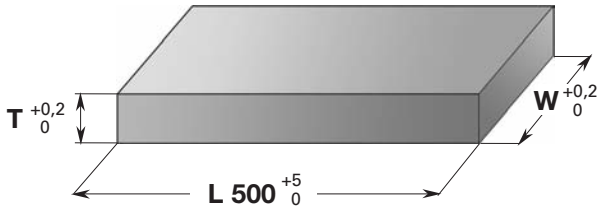
Precision flat ground with machining allowance, 500 mm

Width mm	Thickness mm									Width mm
	6,2	8,2	10,4	15,4	20,4	25,4	30,4	40,4	50,4	€/pc.
20,3	20	24	27							**20,3**
25,3	24	27	30	37						**25,3**
30,3	26	29	32	43	58					**30,3**
40,3	27	30	37	50	69	75				**40,3**
50,3	29	36	44	58	75	86	102			**50,3**
60,3	34	46	50	70	85	100	115	138		**60,3**
80,3	46	53	60	83	102	122	142	166	203	**80,3**
100,3	53	63	70	102	128	147	170	197	246	**100,3**
125,3	60	72	86	127	150	176	204	222	280	**125,3**
150,3	69	88	104	153	188	202	258	286	360	**150,3**
200,3	88	105	121	203	226	260	320	372	420	**200,3**
250,3	106	122	139	248	258	330	375	424		**250,3**
300,3	125	140	166	288	316	380	440	492		**300,3**

Material no. ~ 1.2099
Abbreviated name Custom brand
Condition Quenched and tempered to approx. 1000 MPa

According to DIN 59350,
with machining allowance,
in bars of 500 mm length,
precision ground to thickness with machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +5,00/0 mm



GET ACCESS TO MORE THAN 6000 ITEMS DIRECTLY FROM OUR WAREHOUSE!

Normbars 500 mm

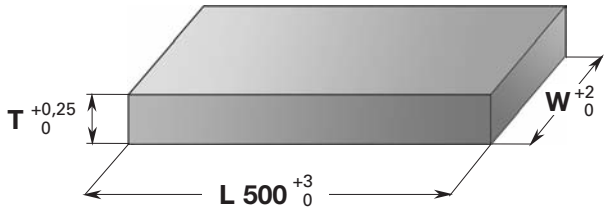
Width mm	Thickness mm										€/pc.	Width mm
	10,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4		
52	50	58	61	66	73	81						52
62	54	63	67	73	81	90	103					62
72	61	67	73	80	89	101	114	126				72
83	65	73	80	86	97	110	124	139	154	169		83
93	70	80	85	95	106	118	136	152	168	185		93
103	74	85	93	102	114	127	146	164	183	199		103
113	80	91	98	108	122	138	157	177	196	216		113
123	84	97	105	115	131	147	168	189	210	230		123
133	89	102	112	122	138	156	179	201	225	247		133
143	94	108	117	131	146	167	190	215	238	262		143
153	98	114	124	137	154	176	200	226	252	278		153
163	103	120	132	144	163	185	212	240	266	293		163
173	108	125	137	151	172	194	222	251	280	309		173
183	113	132	143	158	179	204	234	265	294	324		183
193	117	137	149	166	188	214	246	277	308	340		193
203	122	143	156	173	196	222	256	289	322	355		203
213	126	148	162	179	205	231	267	301	336	371		213
223	133	154	169	187	212	242	278	314	351	387		223
233	137	159	175	194	220	251	289	326	364	402		233
243	142	166	181	200	228	260	299	339	377	417		243
253	146	172	188	209	237	269	310	352	393	434		253
263	152	177	194	216	246	279	322	364	406	448		263
273	156	183	199	222	253	289	332	376	419	465		273

Width mm	Thickness mm										€/pc.	Width mm
	10,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4		
283	161	188	207	229	261	298	343	390	434	479		283
293	166	194	214	236	269	307	354	402	448	495		293
303	172	199	219	245	278	318	365	414	463	510		303
313	176	206	226	251	287	326	376	426	476	525		313
323	180	211	231	258	294	335	387	438	489	539		323
333	185	217	238	265	302	344	398	450	504	553		333
343	190	222	245	271	310	354	408	464	517	570		343
353	195	228	251	280	319	364	419	476	530	583		353
363	199	235	257	287	326	373	430	488	544	598		363
373	205	240	263	293	334	382	442	501	557	612		373
383	210	246	270	300	343	393	453	512	571	626		383
393	215	251	277	307	352	402	464	525	583	641		393
403	219	257	283	315	360	411	475	537	597	656		403
413	224	263	290	322	367	419	485	549	610	670		413
423	228	269	295	329	375	429	497	560	623	685		423
433	234	273	301	336	383	438	507	573	635	698		433
443	238	280	308	343	393	448	518	584	650	713		443
453	243	287	315	351	401	457	528	595	662	727		453
463	248	292	321	357	408	468	539	609	675	740		463
473	252	298	328	365	416	477	550	620	688	756		473
483	257	303	333	372	425	486	560	631	701	769		483
493	262	308	340	379	433	495	571	643	713	782		493
503	267	315	346	386	442	505	581	655	727	797		503

Material no. ~ 1.2099
Abbreviated name Custom brand
Zustand Quenched and temperated to approx. 1000 MPa

Manufactured to factory standard, bars of 500 mm length, precision ground to thickness, width sawn, length milled, with decarburisation-free surface, packaged with corrosion protection.

Tolerances:
Width: +2,00/0 mm
Thickness: +0,25/0 mm
Length: +3,0/0 mm



Material no. 1.2343
Abbreviated name X38CrMoV5-1
Condition Annealed, homogenised

Properties and applications:

Hot work steel with high toughness, very good heat resistance, water cooling capabilities, for heavy-duty hot work tools, in particular for processing light metal alloys and for die casting, extrusion, forging and other hot work tools.

Reference analysis [%]

C	Si	Mn	Cr	Mo	V
0,38	1,10	0,40	5,00	1,30	0,40

Physical properties

Temperature [°C]	100	200	300	400	500	600	700
Thermal conductivity [W/m.K]	26	27,7	28,9	29,5	29,5	29,1	29,2
Temperature [°C]	20	500	600				
E-modulus [10^3N/mm²]	215	176	165				
Temperature [°C]	100	200	300	400	500	600	700
Thermal expansion [10^{-6}m/m.K]	11,5	12,0	12,2	12,5	12,9	13,0	13,2

Heat treatment

Annealing

Temperature [°C]	750	800	Hold time [h] approx. 3
Hardness after annealing	max. 205 HB		

Remarks: Controlled slow oven cooling.

Low stress annealing

Temperature [°C]	600	650	Hold time [h] approx. 2

Remarks: Slow oven cooling. To relieve stresses after extensive machining or for complicated tools.

Härten

Temperature [°C]	1000	1040		
Quenching media	Oil	Water	Air	

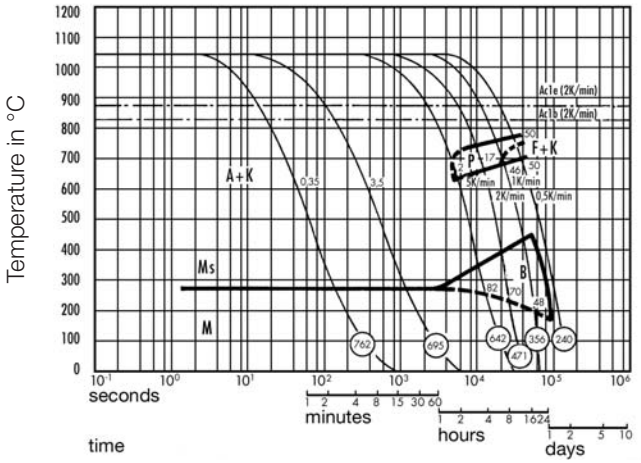
Remarks: Achievable hardness: 52–56 HRC for oil / salt bath treatment, 50–54 HRC for air hardening.

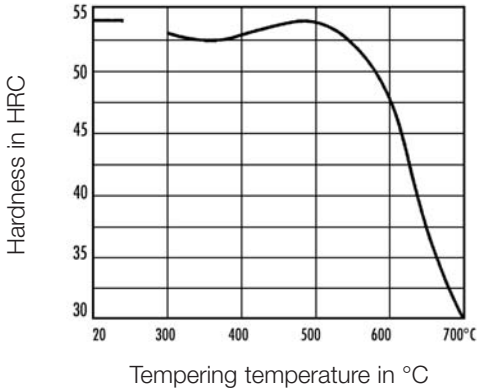
Tempering:

1. Tempering approx. 30°C above the maximum secondary hardness.
2. Tempering to work hardness. Guidelines for the achievable hardness after tempering can be taken from the tempering chart.
3. Tempering for stress relieving 30 – 50 °C below the highest tempering temperature.

TTT and tempering chart

For continuous cooling





Precision flat ground with machining allowance, 500 mm

Width mm	Thickness mm												€/pc.	Width mm
	4,2	5,2	6,2	8,2	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4		
10,3	12	13	15	16										10,3
15,3	13	15	17	18	20	22								15,3
20,3	15	17	18	20	22	26	29							20,3
25,3	16	18	20	22	25	28	33	39						25,3
30,3	18	20	22	25	28	34	38	46	56					30,3
40,3	20	22	25	28	34	38	44	54	67	79				40,3
50,3	23	25	28	34	38	44	53	64	79	90	105			50,3
60,3	27	30	34	38	45	53	62	76	91	106	121	141		60,3
80,3	33	37	41	49	54	62	76	91	109	131	148	178		80,3
100,3	38	41	49	58	70	78	94	110	130	156	179	260		100,3
125,3								132	154	180	210	284		125,3
150,3								156	185	212	252	309		150,3
200,3								188	205	230	273	344		200,3

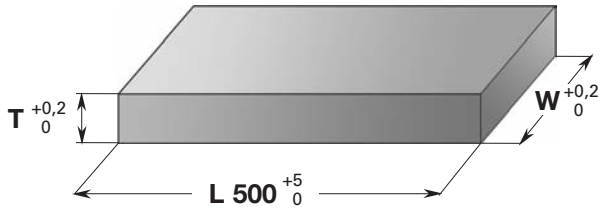
Square

■ mm	10,4	12,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4
€/pc.	18	22	26	35	48	64	89	126	140

Material no. 1.2343
Abbreviated name X38CrMoV5-1
Condition Annealed, homogenised

According to DIN 59350,
bars of 500 mm length,
precision ground to thickness with machining allowance,
width ground or milled,
length machined,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +5,00/0 mm
Square: +0,20/0 mm



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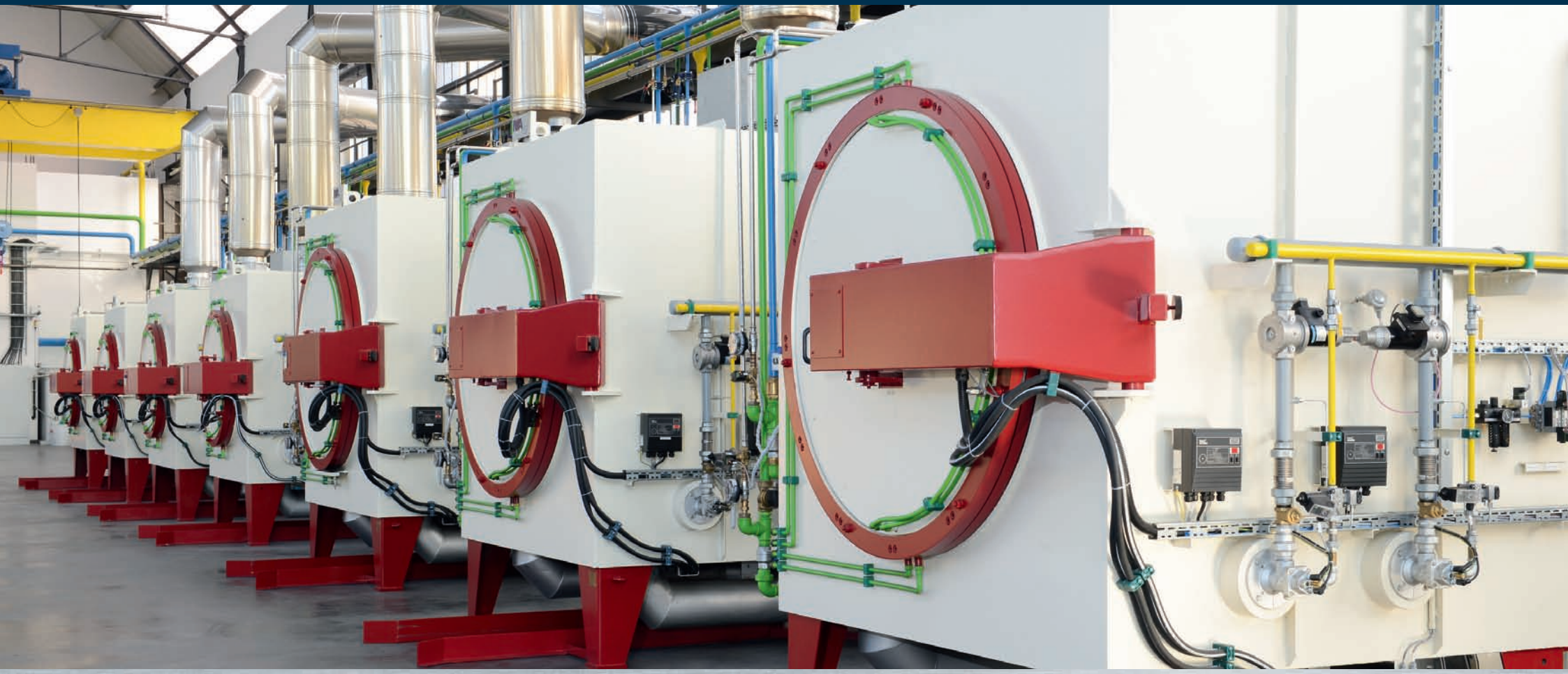


Precision flat ground with machining allowance, 1000 mm

Width mm	Thickness mm															Width mm
	8,2	10,4	12,4	15,4	16,4	20,4	25,4	30,4	32,4	40,4	50,4	60,4	70,4	80,4	100,4	
20,3	28	32	36	40	43											20,3
25,3	31	35	39	45	50	55										25,3
30,3	35	39	47	54		65	85									30,3
32,3					58											32,3
40,3	39	46	52	65	68	75	95	104	112							40,3
50,3	46	53	60	70	76	91	110	125	130	160						50,3
60,3	52	63	67	80		102	125	140		172	205					60,3
63,3					103				170							63,3
70,3	62	68	75	90		115	136	155		205	240	265				70,3
80,3	68	77	88	100	112	126	147	171	183	215	252	295	325			80,3
100,3	85	96	110	124	131	150	175	204	220	270	320	358	420	480		100,3
125,3	115	129	140	160	176	192	216	265	284	334	393	470	546	630	735	125,3
150,3	145	152	156	177	204	226	264	312	334	392	461	534	610	710	825	150,3
200,3	164	188	212	252	272	315	360	415	445	502	616	725	880	964	1080	200,3

€/pc.

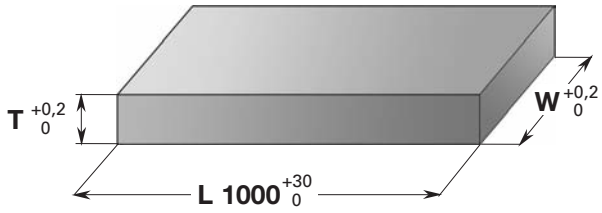
Square

■ mm	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4	100,4
€/pc.	50	73	93	124	180	218	320	380	556

Material no. 1.2343
Abbreviated name X38CrMoV5-1
Condition Annealed, homogenised

Manufactured to factory standard, bars of 1000 mm length, precision ground to thickness with machining allowance, width ground or milled, length machined, with decarburisation-free surface, packaged with corrosion protection.

Tolerances:
Width: +0,20/0 mm
Thickness: +0,20/0 mm
Length: +30,0/0 mm
Square: +0,20/0 mm



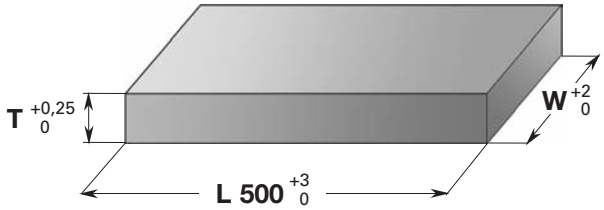
Normbars 500 mm

Width mm	Thickness mm												€/pc.	Width mm
	10,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4	90,4	100,4	120,4	
52	36	48	64	74	95	110	142							52
62	43	57	73	84	108	124	158	184						62
72	50	66	82	94	121	138	174	203	224					72
83	59	75	91	104	134	152	190	222	246	275				83
93	68	84	100	114	147	166	206	241	268	298	331			93
103	75	92	109	124	160	180	222	260	290	321	355	380		103
113	82	100	118	134	172	194	239	280	312	344	379	408		113
123	90	108	127	144	184	208	256	300	334	368	404	436	610	123
133	97	116	136	154	196	222	273	320	356	392	429	464	650	133
143	104	124	145	164	208	236	290	340	378	416	454	492	690	143
153	110	132	154	174	220	250	307	360	400	440	480	520	730	153
163	117	140	163	184	232	264	324	380	422	464	506	548	770	163
173	124	148	172	194	244	278	341	400	444	488	532	576	810	173
183	131	156	181	204	256	292	358	420	466	512	558	604	850	183
193	138	164	190	214	268	306	375	440	488	536	584	632	890	193
203	145	172	199	224	280	320	392	460	510	560	610	660	930	203
213	152	180	208	234	292	334	409	480	532	584	636	688	968	213
223	160	188	217	244	304	348	426	500	554	608	662	716	1006	223
233	167	196	226	254	316	362	443	520	576	632	688	744	1044	233
243	173	204	235	264	328	376	460	540	598	656	714	772	1082	243
253	180	212	244	274	340	390	477	560	620	680	740	800	1120	253
263	187	220	253	284	352	404	494	580	642	704	766	828	1158	263
273	195	228	262	294	364	418	511	600	664	728	792	856	1196	273

Material no. 1.2343 ESU
Abbreviated name X38CrMoV5-1
Condition Annealed, homogenised

Manufactured to factory standard,
bars of 500 mm length,
precision ground to thickness,
width sawn, length milled,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +2,00/0 mm
Thickness: +0,25/0 mm
Length: +3,0/0 mm



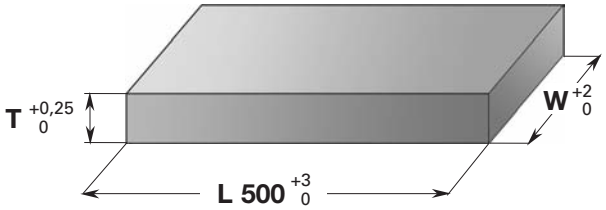
Normbars 500 mm

Width mm	Thickness mm												€/pc.	Width mm
	10,4	15,4	20,4	25,4	30,4	40,4	50,4	60,4	70,4	80,4	90,4	100,4	120,4	
283	202	236	271	304	376	432	528	620	686	752	818	884	1234	283
293	209	244	280	314	388	446	545	640	708	776	844	912	1272	293
303	215	252	289	324	400	460	562	660	730	800	870	940	1310	303
313	222	260	298	334	412	474	579	680	752	824	896	968	1348	313
323	230	268	307	344	424	488	596	700	774	848	922	996	1386	323
333	238	276	316	354	436	502	613	720	796	872	948	1024	1424	333
343	245	284	325	364	448	516	630	740	818	896	974	1052	1462	343
353	250	292	334	384	460	530	647	760	840	920	1000	1080	1500	353
363	258	300	343	394	472	544	664	780	862	944	1026	1108	1538	363
373	266	308	352	404	484	558	681	800	884	968	1052	1136	1576	373
383	272	316	361	414	496	572	698	820	906	992	1078	1164	1614	383
393	280	324	370	424	508	586	715	840	928	1016	1104	1192	1652	393
403	288	332	379	434	520	600	732	860	950	1040	1130	1220	1690	403
413	296	340	388	444	532	614	749	880	972	1064	1156	1248	1728	413
423	304	348	397	454	544	628	766	900	994	1088	1182	1276	1766	423
433	312	356	406	464	556	642	783	920	1016	1112	1208	1304	1804	433
443	320	364	415	474	568	656	800	940	1038	1136	1234	1332	1842	443
453	328	372	424	484	580	670	817	960	1060	1160	1260	1360	1880	453
463	335	380	433	494	592	684	834	980	1082	1184	1286	1388	1918	463
473	342	388	442	504	604	698	851	1000	1104	1208	1313	1416	1956	473
483	349	396	451	514	616	712	868	1020	1126	1232	1338	1444	1994	483
493	355	404	460	524	628	726	885	1040	1148	1256	1364	1472	2032	493
503	362	412	469	534	640	740	902	1060	1170	1280	1390	1500	2070	503

Material no. 1.2343 ESU
Abbreviated name X38CrMoV5-1
Condition Annealed, homogenised

Manufactured to factory standard,
bars of 500 mm length,
precision ground to thickness,
width sawn, length milled,
with decarburisation-free surface,
packaged with corrosion protection.

Tolerances:
Width: +2,00/0 mm
Thickness: +0,25/0 mm
Length: +3,0/0 mm



Ground bars

Tolerance h8, Length 1000 mm

Diameter mm				€/pc.
ø10	ø12	ø15	ø20	ø25
9	12	20	40	60

Material no. 1.2343
Abbreviated name X38CrMoV5-1
Condition Annealed, homogenised
Tolerance:
Length: +30,0/0 mm

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