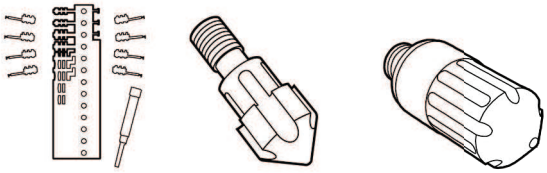
TOOL ALLOYS
DATA SHEET CPM® 10 V

CERTIFIED TO ISO 9001



CHEMICAL COMPOSITION

Carbon	2.45 %
Chromium	5.25 %
Vanadium	9.75 %
Molybdenum	1.30 %
Manganese	0.50 %
Silicon	0.90 %

CPM® 10 V

is a unique cold work tool steel produced by the special Crucible Particle Metallurgy process. It has been developed using a high-strength air-hardened base alloy with the addition of concentrated carbon and vanadium. As a result, the material CPM® 10 V is characterized by a combination of outstanding wear resistance, toughness, hardness properties as well as excellent cutting edge stability. Due to its extraordinarily high resistance to wear and outstanding toughness, CPM® 10 V is particularly suitable for use together with hard materials or other highly resistant materials in cold working applications, in which tool breakage or chipping poses problems or where low-cost production is required.

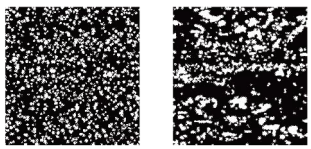
TYPICAL APPLICATIONS

_ punching tools
_ fine blanking tools
_ punch dies
_ knife blades for cutting, shearing and deburring
_ paper and film cutters
_ sinter press dies
_ wear parts
_ centre points
_ machine parts and further more

PHYSICAL PROPERTIES

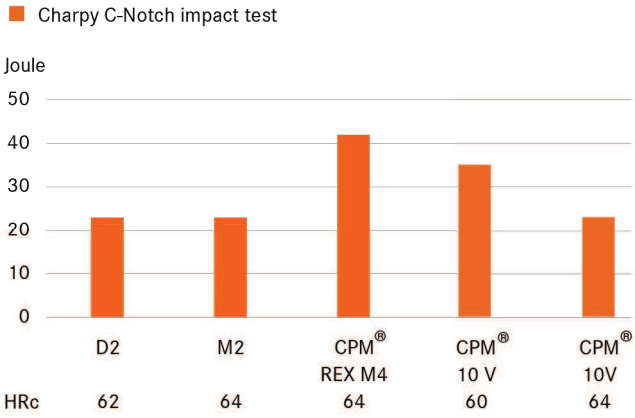
Modulus of elasticity E [kN/mm²]	221
Specific weight [kg/dm³]	7.41
Coefficient of thermal expansion over temperature range of 21 - 593 °C [mm/mm °C]	11.95

POWDER METALLURGICAL AND CONVENTIONAL MICROSTRUCTURE



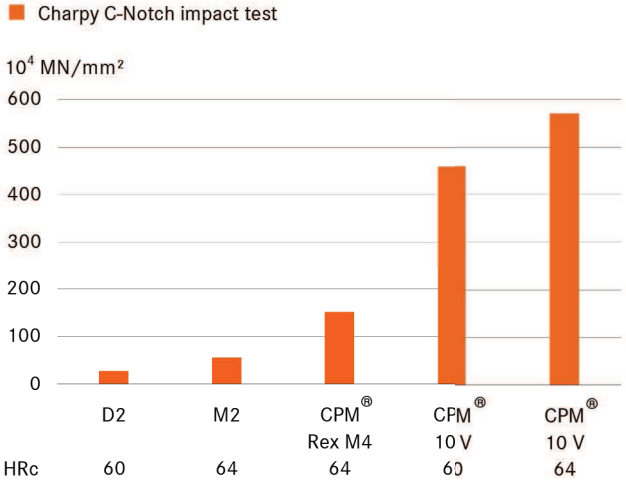
The uniform distribution of carbides in the powder- metallurgical structure compared to conventional tool steels with big carbides and carbide clusters.

TOUGHNESS



Standard size of the Charpy-test-piece with a 12.7 mm notch radius.

WEAR RESISTANCE



Reciprocal of wear rate in wear test with non lubricated crossed cylinder in contact with a rotation tungsten carbide cylinder.

RS Alloys
Steel & Copper

HEAT TREATMENT ANNEALING

SOFT ANNEALING

The material is heated uniformly to a temperature of 870 - 900 °C; maintain temperature for 2 hours and allow to cool to 540 °C in the furnace at a cooling rate of 10 °C per hour. This is followed by cooling in air. The typical hardness achieved by soft annealing is HB 248/269.

STRESS RELIEVING

Stress relieving follows rough machining by heating to a temperature of 600 – 700 °C. Once complete heat penetration has been reached, the material is allowed to cool in the furnace to approx. 500 °C followed by cooling in air.

HARDENING

Hardening of CPM® 10 V usually involves the use of 2 preheating stages (450 – 500 °C/ 850 – 870 °C). The material is then rapidly heated from the preheating temperature to the austenitizing temperature of 1070 °C to 1180 °C; 1070 °C for achieving optimum toughness and 1180 °C for achieving maximum wear resistance. To achieve a corresponding degree of dissolution of the alloy elements as well as an appropriate hardening and tempering level, a minimum heat penetration time of 30 min. is recommended for hardening at 1070 °C and a minimum heat penetration time of 10 min. for hardening at 1180 °C. These temperature equalisation times should be correspondingly adapted for large or very thick-walled material cross-sections.

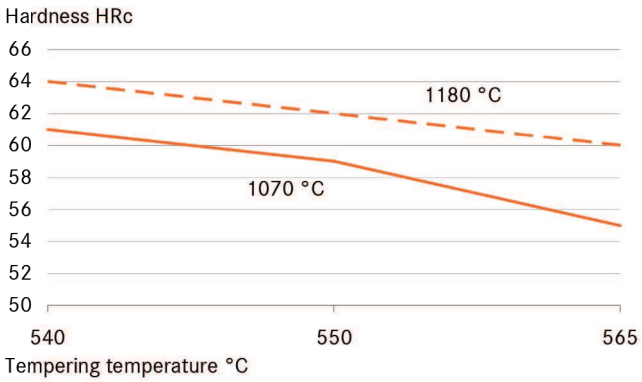
QUENCHING

Air, hot bath or interrupted oil quenching can be used. We recommend hot bath quenching at approx. 550 °C. Particular care must be taken in case of protective gas or vacuum heat treatment to ensure that an appropriate quenching rate is achieved in order to obtain the required hardness level at the recommended tempering temperature.

TEMPERING

Temper immediately after the tools have been quenched to a temperature below 40 °C. Two-stage tempering is obligatory while triple tempering is recommended particularly when hardening takes place at temperatures above 1150 °C. It is important to ensure the tools are quenched to room temperature between the individual tempering processes. The standard tempering temperature is 540 °C. With exception to the stress relieving procedure, temperatures below 540 °C should be avoided in order to ensure effective tempering treatment.

TEMPERING DIAGRAM



HEAT TREATMENT INSTRUCTIONS

1st preheating	450–500 °C
2nd preheating	850–900 °C
Hardening	as specified in table
Tempering	3 x each 2 hours at 540 °C

Quenching after hardening in hot bath at approx. 550°C or in vacuum at least at 5 bar overpressure.

Required hardness HRc ± 1	Austenitizing temperature °C	Holding time at austenitizing temperature minutes*
59	1060	30–40
60	1080	30–40
61	1100	30–40
62	1120	20–30
63	1150	15–20
64	1180	10–15

* Previous preheating at 870 °C. The data referred to 13 mm round bar samples. The holding times at austenitizing temperature should be correspondingly adapted for large and very thin profile dimensions. The maximum permissible austenitizing temperature of 1180 °C must not be exceeded.

MACHINING DATA

TURNING

Cutting parameter	Turning with cemented carbide medium turning	finish turning	HSS
Cutting speed (V_C) m/min.	70-100	100-120	8-10
Feed (f) mm/U	0.2–0.4	0.05–0.2	0.05–0.3
Cutting depth (a_p) mm	2–4	0.05–2	0.5–3
Tools according ISO	P 10–P 20*	P 10*	–

* Use wear resistant coated cemented carbide, e.g. Coromant 4015 or Seco TP 100.

MILLING

FACE- AND EDGEMILLING

Cutting parameter	Milling with cemented carbide medium turning	finish turning	HSS
Cutting speed (V_C) m/min.	50-70	70-100	15
Feed (f) mm/U	0.2–0.3	0.1–0.2	0.1
Cutting depth (a_p) mm	2–4	1–2	1–2
Tools according ISO	K 15*	K 15*	–

* Use wear resistant coated cemented carbide, e.g. Coromant 4015 or Seco TP 100.

END MILLING

Cutting parameter	Solid carbide	Milling cutter w. indexable tips	Coated HSS
Cutting speed (V_C) m/min.	20–35	60-80	12*
Feed (f) mm/U	0.01–0.20**	0.06–0.20**	0.01–0.30**
Tools according ISO	K 20	P 25***	–

* for TiCN-coated end mills made of HSS V_C ~ 25-30 m/min.
** depends on radial depth of cut and on milling cutter – diameter.
*** Use wear resistant coated cemented carbide, e.g. Coromant 3015 or SECO T15M.

DRILLING

SPIRAL DRILL MADE OF HSS

Driller-⌀ mm	Cutting speed (V_C) m/min.	Feed (f) mm/U
–5	5 - 8*	0.05–0.15
5 – 10	5 - 8*	0.15–0.25
10 – 15	5 - 8*	0.25–0.35
15 – 20	8 – 8*	0.35–0.40

* for TiCN-coated end mills made of HSS V_C ~ 25-30 m/min.

CARBIDE METAL DRILLER

Cutting parameter	Drill type Insert drill	Solid carbide tip	Coolant bore driller with carbide tip*
Cutting speed (V_C) m/min.	70-90	40	35
Feed (f) mm/U	0.08–0.14**	0.10–0.15**	0.10–0.20**

* driller with coolant bores and a soldered on carbide tip
** depends on driller-diameter

GRINDING

Grinding method	soft annealed	hardened
Surface grinding, straight grinding wheels	A 13 HV	B 107 R75 B3* 3SG 46 GVS** A 46 GV
Surface grinding	A 24 GV	3SG 36 HVS**
Cylindrical grinding	A 60JV	B126 R75 B3* 3SG 60 KVS** A 60 IV
Internal grinding	A 46 JV	B126 R75 B3* 3SG 80 KVS** A 60 HV
Profile grinding	A 100 LV	B126 R100 B6* 5SG 80 KVS** A 120 JV

* for these applications we recommend CBN-wheels
** grinding wheel from the company Norton Co.

TOOL ALLOYS
STOCK LIST CPM® 10 V

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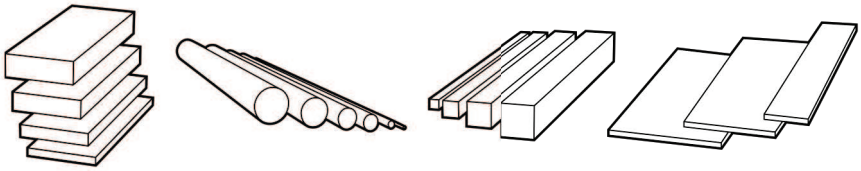

The sizes indicated below are usually available in a machined execution and can be considered as finished sizes.

ROUND BAR DIMENSIONS
cold drawn
1.8 mm
2.3 mm
3.3 mm
3.8 mm
4.2 mm
4.8 mm
5.3 mm
5.8 mm
6.3 mm

ROUND BAR DIMENSIONS
6.7 mm
8.3 mm
9.9 mm
10.3 mm
11.2 mm
13.0 mm
16.2 mm
19.4 mm
22.6 mm
25.7 mm
28.0 mm
32.1 mm
38.5 mm
45.2 mm
51.5 mm
57.9 mm
64.2 mm
70.6 mm
77.7 mm
84.1 mm
90.5 mm
103.1 mm
115.8 mm
128.5 mm
145.0 mm
156.0 mm
166.6 mm
184.0 mm
206.3 mm
221.7 mm
257.1 mm
311.1 mm

FLAT BAR DIMENSIONS
in thicknesses
12.7 mm
15.7 mm
19.5 mm
21.5 mm
25.4 mm
31.7 mm
38.1 mm
44.4 mm
50.8 mm
63.5 mm
76.2 mm
101.6 mm
152.4 mm

SQUARE
203.0 x 203.0 mm

PLATES
4.0 mm
for finished size 3.17

Further dimensions are available within 3-4 weeks after request.

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