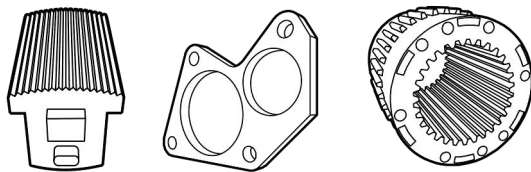


TOOL ALLOYS

DATA SHEET US 2000 MC

ZERTIFIED TO ISO 9001



Alloytyp

Cr - V - W - Mo

US 2000 MC

is an air-hardening semi-high speed steel, developed to meet a wide variety of applications and requirements.

US 2000 MC is made by modern metallurgical melting technique.

In comparison to cold work steel D2 (1.2379) and high speed steel M2 (1.3343) **US 2000 MC** provides a much higher impact toughness and better wear resistance. The excellent micro structure with very small and evenly distributed **MicroCarbides** is responsible for the outstanding cutting edge stability.

The typical tool hardness is 58 to 64 HRc.

The standard heat treatment of **US 2000 MC** allows a wide range of surface treatments like nitriding and PVD or CVD coating.

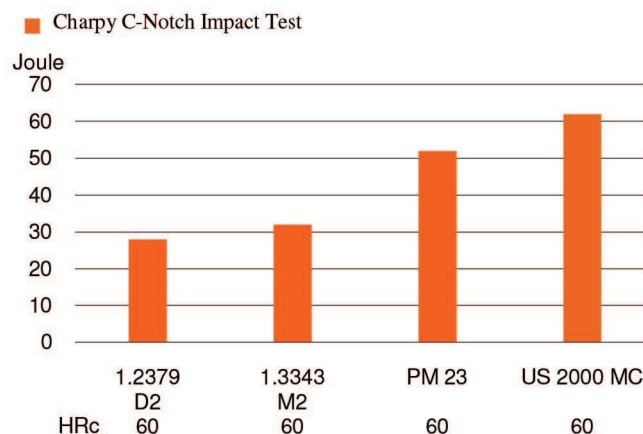
TYPICAL APPLICATIONS

- _ Stamping and Forming Tools
- _ Fineblanking Tools
- _ Cold Extrusion Dies
- _ Thread Rolling Dies
- _ Holepunches
- _ Shear Blades and Industrial Knives
- _ Powder Pressing Tools

PHYSICAL PROPERTIES

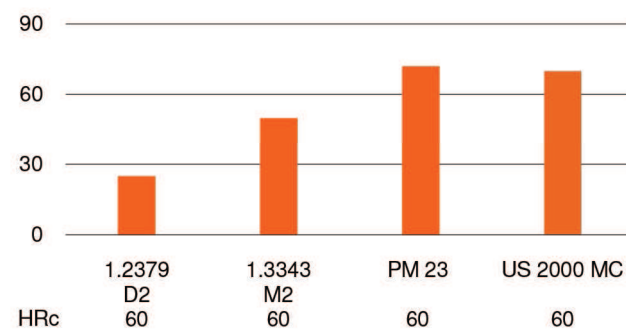
Modulus of Elasticity E [kN/mm ²]	220
Specific Weight [kg/dm ³]	7,78
Hardness (soft annealed) [HB]	207/248

IMPACT TOUGHNESS



Standard size of the Charpy test piece with a 12,7 mm notch radius.

RELATIVE WEAR RESISTANCE



HEAT TREATMENT

SOFT ANNEALING

US 2000 MC is heated uniformly to 840 – 900 °C and hold for 2 hours. Followed by cooling to 540 °C in the furnace at a cooling rate of 10 °C per hour.

Then air cool to room temperature.

The annealed hardness is about 230 HB.

STRESS RELIEVING

Stress relieving is recommended after rough machining.

US 2000 MC is heated to 600 – 700 °C and hold for 2 hours.

Followed by cooling to 500 °C in the furnace.

Then air cool to room temperature.

HARDENING

US 2000 MC is preheated in 2 steps (450 °C / 850 °C), then heat to austenitizing temperature (1010 °C – 1120 °C).

1010 °C is recommended to reach the highest impact toughness.

1120 °C is used for highest hardness.

Soaking time 20 – 45 minutes, depending on tool size.

QUENCHING

Quenching in air, hot bath or oil is possible. When using vacuum treatment, a quenching pressure of min. 5 bar is needed.

To reach the highest toughness level, quenching in hot bath (app. 550 °C) is recommended.

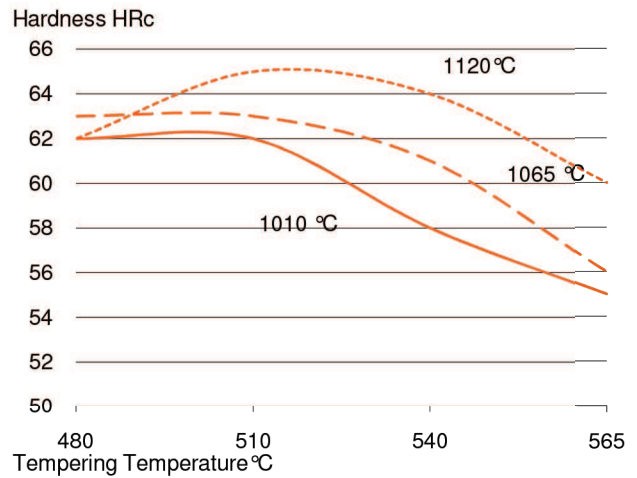
TEMPERING

The tempering procedure must start immediately after the tool has cooled down to below 40 °C.

Triple tempering is recommended. Cool to room temperature in between tempers.

US 2000 MC is usually tempered 510 °C - 540 °C.

TEMPERING GRAPH



HEAT TREATMENT INSTRUCTIONS

1 st preheating	450–500 °C
2 nd preheating	850–870 °C
Hardening	As specified in table
Tempering	3 x each 2 hours at 510°C to 540°C

Quenching after hardening in hot bat at app. 550 °C or in vacuum with at least 5 bar pressure.

Required hardness HRc ± 1	Hardening temp. °C	Holding time at hardening temp. min*	Tempering °C
58	1010	40	540
60	1065	30	540
62	1120	20	540
64	1120	20	510

* Holding time in minutes, depending on tool sizes.

Tool Alloys

Robert Zapp Werkstofftechnik GmbH
Zapp-Platz 1
40880 Ratingen
Postfach 10 18 62
40838 Ratingen
Phone +49 2102 710-591
Fax +49 2102 710-596
werkzeuglegierungen@zapp.com

RS Acciai Srl

Firenze
Italy
Phone +39 055 7318818
Fax +39 055 7311083
rsacciai@rsacciai.it
www.rsacciai.it

MACHINING DATA

TURNING

Cutting parameter	Turning with cemented carbide		HSS
	medium turning	finish turning	
Cutting speed (V _C) m/min.	70-90	90-130	12-15
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		HSS
	Medium turning	finish turning	
Cutting speed (V _C) m/min.	70-90	90-130	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	50-80	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
0 - 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.	80-110	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.

RS Acciai Srl

Firenze

Italy

Phone +39 055 7318818

Fax +39 055 7311083

rsacciai@rsacciai.it

www.rsacciai.it