APM 2723
HOT ISOSTATIC PRESSED (HIP) PRODUCTS

DATASHEET

APM 2723 is a high alloyed powder metallurgical high speed steel corresponding to ASTM M3:2 with a combination of very good abrasive wear resistance and high compressive strength. Suitable areas of use include demanding cold-work applications like blanking of harder materials like carbon steel or cold-rolled strip steel, as well as use for cutting tools.

As with all powder metallurgy tool steels, machinability and grindability are superior to conventional high speed steel due to the very fine microstructure. Thanks to the fully homogenous material achieved in the powder metallurgy process, the dimensional stability after heat treatment is excellent. The process also ensures that the cleanliness of the steel is very high with a low amount of non-metallic inclusions.

STANDARDS

- ASTM: M3:2
- EN Number: 1.3395
- SS: 2725
- JIS: SKH53

CHEMICAL COMPOSITION (NOMINAL) %

Chemical composition (nominal) %

C	Cr	Mo	V	W
1.23	4.2	5	3.1	6.4

Balance Fe.

FORMS OF SUPPLY

Components can be supplied in a wide range of dimensions and shapes thanks to the flexibility provided by powder metallurgy and near net shape technology. The products are supplied in the soft annealed condition at approximately 260 HB.

PHYSICAL PROPERTIES

Density: 7.98 g/cm^3, 0.287 lb/in^3

Mean coefficient of thermal expansion, 20-100°C: **10.8x10^{-6}/°C**

Modulus of elasticity*

Temperature, °C	MPa	Temperature, °F	ksi
20	230	68	33

* (x10^3)

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HEAT TREATMENT

Soft annealing

Protect the steel from decarburization and oxidation and heat through to 850–900°C (1560–1650°F). Cool in the furnace at 10°C/h (20°F/h) to 700°C (1290°F), then freely in air.

Stress relieving

After rough machining the tool should be heated to 600–700°C (1110–1290°F), holding time 2 hours. Cool slowly to 500°C (930°F), then freely in air.

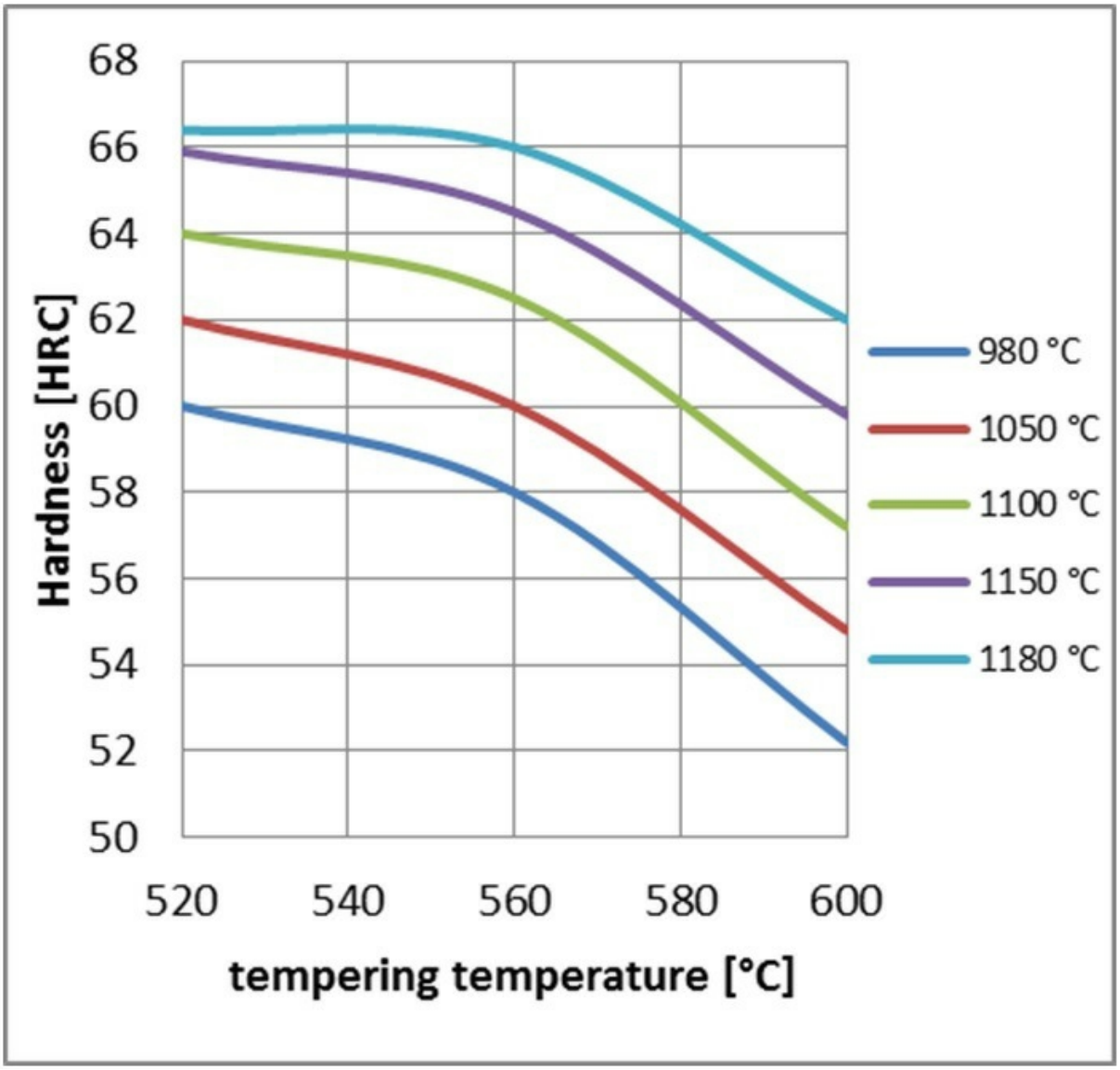
Hardening and tempering

Pre-heating temperature: 450–500°C (840– 930°F) and 850–900°C (1560–1650°F). Austenitizing temperature: 1050–1180°C (1920–2160°F) according to the desired final hardness, see diagram below. The tool should be protected against decarburization and oxidation during hardening.

Quenching media can be high speed gas at 2-5 bars overpressure in vacuum furnace or forced air/gas. Quenching should be performed until the part reaches 50°C followed by immediate tempering.

For cold work applications tempering should always be carried out at 560°C (1040°F) irrespective of the austenitizing temperature. Temper three times for one hour at full temperature. The tool should be cooled to room temperature between the tempers. The retained austenite content will be less than 1% after this tempering cycle.

The diagram below shows hardness ±1 HRC vs. tempering temperature for different austenitizing temperatures.



PROCESSING

APM 2723 can be worked as follows:

- Machining (grinding, turning, milling)
- Polishing
- Plastic forming
- Electrical Discharge Machining
- Welding (special procedure including preheating and filler materials of base material composition).

Grinding

During grinding, local heating of the surface, which may alter the temper, must be avoided. Grinding wheel manufacturers can furnish advice on the choice of grinding wheels. For grinding in hardened condition the use of CBN wheels is recommended.

Electric discharge machining - EDM

If EDM is performed in the hardened and tempered condition, finish with “fine-sparking”, i.e. low current, high frequency. For optimal performance the EDM’d surface should then be ground/polished to remove the white layer and the tool re-tempered at approx. 535°C (995°F).

Surface treatment

The steel grade is a good substrate material for PVD and CVD coating. If nitriding is requested, a small zone of 2-15 µm is recommended. The steel grade can also be steam-tempered if so desired.

MACHINING

The cutting data below are to be considered as guiding values which must be adapted to existing local conditions. For more information on machining visit sandvik.coromant.com.

Turning	Cemented carbide		HSS
	Medium	Finish	Finish
Cutting speed m/min	110-160	160-210	12-15
Feed, mm/rev	0.2-0.4	0.05-0.2	0.05-0.3
Cutting depth, mm	2-4	0.5-2	0.5-3

Face milling	Cemented carbide	
	Rough	Fine
Cutting speed m/min	80-130	130-160
Feed, mm/tooth	0.2-0.4	0.1-0.2
Cutting depth, mm	2-4	1-2

End milling	Cemented carbide	
	Rough	Fine
Cutting speed m/min	40-50	90-110
Feed, mm/tooth	0.01-0.2	0.06-0.2

Square/shoulder milling	Cemented carbide		
	0.1xD	0.5xD	1xD
Cutting speed m/min	120-150	110-140	100-130
Feed, mm/tooth	0.25	0.15	0.1

Drill size, mm	HSS		Coated HSS	
	Cutting speed, mm/min	Feed rate, mm/rev	Cutting speed, mm/min	Feed rate, mm/rev
3-5	12-14	0.005-0.15	15-20	0.005-0.15
5-10	12-14	0.15-0.25	15-20	0.15-0.25
10-20	12-14	0.25.0.35	15-20	0.25.0.35
20-30	12-14	0.35-0.4	15-20	0.35-0.4
30-40	12-14	0.4-0.45	15-20	0.4-0.45

Cutting data	Type of drill		
	Indexible insert Ø20-40 mm	Solid carbide Ø5-40 mm	Carbide tip Ø20-40 mm
Cutting speed m/min	120-150	60-80	30-40
Feed, mm/tooth	0.05-0.15	0.1-0.25	0.15-0.25

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