

# DATA SHEET

## CPM® S110V

### Typical Composition

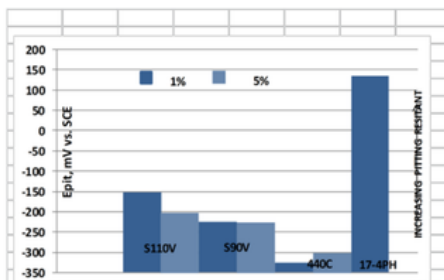
C	Nb (Cb)	Co	Cr	Mo	V
2.80	3.00	2.50	15.25	2.25	9.00

**CPM® S110V** is a high alloy martensitic stainless tool steel. CPM® S110V contains a high volume fraction of both vanadium-rich and niobium-rich primary alloy carbides for exceptionally good wear resistance compared to other commercially available PM tool steels. It also offers better corrosion resistance than 440C ESR or CPM® S90V.

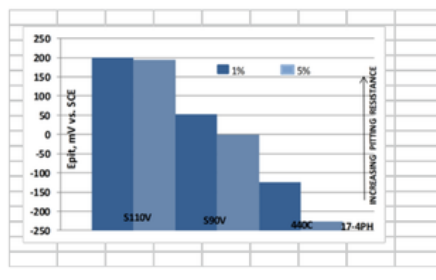
CPM® S110V is currently available on special request in the as-HIP condition or as a clad layer on components. It is also available in hot rolled decarb free sheet.

The CPM® process results in a fine and uniform carbide distribution in CPM® S110V compared to conventionally produced high alloy tool steels which results in relatively good machining, grinding, and toughness characteristics despite the high alloy content.

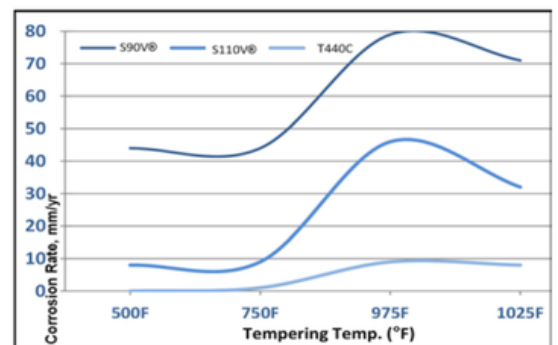
*Typical Applications:* As-HIP solid or clad components requiring a combination of high wear resistance and good corrosion resistance such as: Screw elements, barrel liners for compounding machines, industrial knives, high end cutlery, slitters and circular cutters, rolls and wear components for food and chemical processing applications.



Pitting resistance in 1% and 5% NaCl solutions (Tempering at 1025F)



Pitting resistance in 1% and 5% NaCl solutions (Tempering at 500F)



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### Machining and Grinding

Due to its carbide content and high annealed hardness, machining and grinding CPM® S110V will be more difficult than 440C ESR (or D-2), and comparable to or slightly more difficult than CPM® S90V. Grinding equipment and practices similar to those used for CPM® S90V are acceptable. SG type alumina wheels or CBN wheels are recommended for best performance with CPM® steels.

### Thermal Treatments

#### Annealing

Heat to 1650°F (900°C), hold 2 hours, slow cool at a maximum rate of 25°F (15°C) per hour to 1100°F (595°C), then furnace cool or cool in still air to room temperature.

**Annealed Hardness: Approximately 350–400 BHN.**

#### Stress Relieving

**Annealed Material:** Heat to 1100–1300°F (595–705°C), hold 2 hours, then furnace cool or cool in still air.

**Hardened Material:** Heat to 25–50°F (15–30°C) below original tempering temperature, hold 2 hours, then furnace cool or cool in still air.

#### Hardening

**Austenitize:** 2150°F (1175°C) Hold 20 minutes.

**Quench:** Salt quench, interrupted oil quench, positive pressure gas quench or air cool at a minimum cooling rate of 250°F/min (140°C/min) to below 1000°F (540°C). Cool to below 125°F (50°C) before tempering. For optimum vacuum heat treatment response, a minimum 4 bar gas quench is recommended.

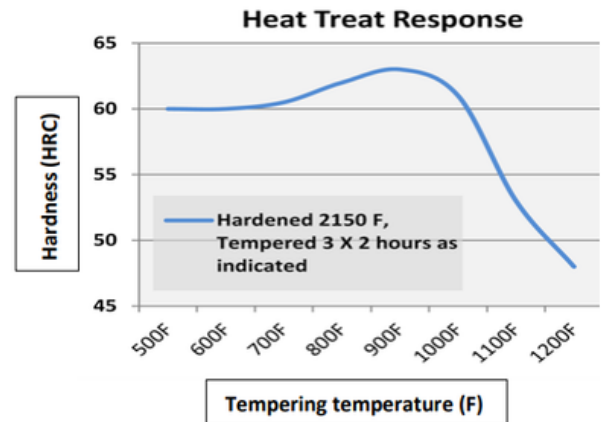
**Temper:** Temper three times, minimum hold time 2 hours at temperature each temper. Cool completely to room temperature between tempers.

**Tempering temperatures:** 400–750°F (200–400°C): Best corrosion resistance 975–1000°F (525–540°C): Maximum hardness and compressive yield strength, reduced corrosion resistance 1025–1050°F (550–565°C): Optimum for best stress relieving and dimensional stability.

*Note: Tempering any martensitic stainless steel above 750°F (400°C) may reduce its corrosion resistance.*

#### Corrosion Resistance

CPM® S110V displays enhanced corrosion resistance compared to other high hardness martensitic stainless tool steels such as 440C ESR and CPM® S90V. Corrosion tests results in representative media are illustrated by the following laboratory test data.



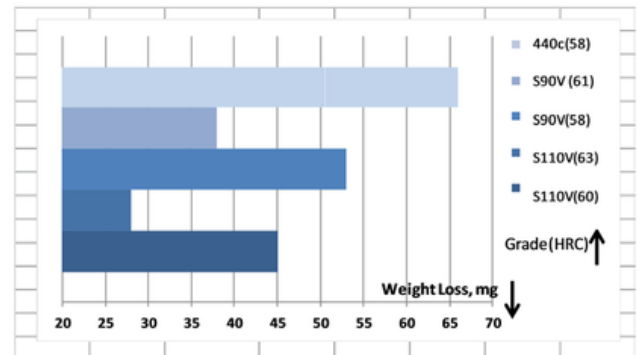
**Deep freezing** (optional): When tempering at or below 750°F (400°C), a freezing treatment may be used between the first and second tempers to reduce retained austenite and maximize hardness. Freezing treatments should always be followed by at least one temper.

**Size Change:** +0.03 to +0.05% for a fully martensitic microstructure. The presence of retained austenite may reduce the net growth.

**Typical Application Hardness: 58/61 HRC.**

#### Wear Resistance

CPM® S110V features the same high vanadium content as CPM® S90V, plus the added contribution of 3.5% niobium, resulting in 25% greater volume of wear-resistant carbides, including 50% more of the wear-resistant MC type. The abrasive wear resistance of CPM® S110V at various hardnesses is compared to other wear- and corrosion-resistant grades below.



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