

C	Si	Mn	Cr	Mo	W	V	Co
0.38	1.05	0.35	5.25	1.35		1.00	

### Features and Uses

C.M.V. is reliable hot work steel with a wide variety of applications. It combines very good red-hardness with toughness and tools made from it may be water-cooled in service.

C.M.V. may be cold hobbled in the annealed condition.

Applications include:

Die casting dies for aluminium, magnesium and zinc.

Extrusion dies for aluminium and glass.

Liners, mandrels, pressure pads, followers, bolsters, die cases, die holders and adaptor rings of copper and brass extrusion.

Hot stamping and press forge dies.

Split hot heading dies, gripper dies.

Hot punching, piercing and trimming tools. High speed wood turning,

cutting and shaping.

Plastic moulds.

Shear blades for hot work.

Hot swaging dies.

### Work and Heat Treatment Forging

Preheat slowly to 750°C. then increase temperature more rapidly to 1050° / 1100°C. Do not forge below 850°C.

It is essential to cool slowly after forging either in a furnace or in vermiculite.

### Annealing

Soak thoroughly at 840° / 860°C. before furnace cooling at a maximum rate of 20°C. per hour down to 600°C. followed by cooling in air. To avoid scaling, box annealing in cast iron chips is preferred.

### Stress Relieving

Heat carefully to 700°C, allow a good soaking period (2 hours per inch of ruling section) cool in furnace or in air.

### Hardening

Preheat to 780° / 820°C, soak thoroughly then increase rapidly to the hardening temperature

of 1000° / 1030°C. When the part has attained this temperature, soak for 20 to 30 minutes, cool in air. Large sections may be quenched in oil.

To reduce scaling or decarburisation we recommend isothermal molten salt bath treatment. Preheat in salt at 780° / 820°C then transfer to salt bath standing at 1000° / 1030°C, soak and quench into salt standing at 500° / 550°C, allow to equalize, withdraw and cool in air. Alternatively the steel may be vacuum hardened or pack hardened.

Tools should be tempered as soon as they become hand warm.

### Tempering

Heat uniformly to the required temperature allowing a soaking time of 2 hours per inch of ruling section, withdraw from the furnace and allow to cool in air. A second tempering is strongly recommended, the tool being allowed to cool to room temperature between tempers. The usual tempering range is 530° / 650°C. , depending on the hardness requirements and the operating temperature of the tool.

### Nitriding

C.M.V. will respond to Nitriding whether gas Nitriding (cracked ammonia) or liquid Nitriding (Tuftriding and Sulfinuz). The object of Nitriding is to increase the surface hardness of hardened and tempered parts, for example die casting dies, and to improve resistance to scaling or erosion.

It is important to note that with increase in penetration of the Nitriding there is a reduction in resistance to thermal shock and an increase in embrittlement.

### Welding

In general we do not advise the welding of parts or tools but users sometimes prefer to weld in order to avoid the cost of retooling.

It should be remembered that C.M.V. is an air hardening steel and that in welding, the area of the weld attains a temperature of about 1000°C. Cracking is likely to occur during cooling unless proper precautions are taken.

The most popular methods of welding are:

- a) Atomic Hydrogen
- b) Argon Arc

### Welding Procedure

1) It is desirable to anneal the tool prior to welding but with care welding may be done on hardened and tempered tools.

2) It is important to preheat the die to 300° / 500°C and to maintain this temperature during welding.

3) After the weld has been completed, maintain at 300° / 500°C for one hour, then cool the die slowly in a furnace or in insulating material.

4) If the tool has been annealed prior to welding, stress relieve at 700°C. before re-hardening.

5) If the tool has not been annealed prior to welding re-temper at 550° / 600°C for a minimum of 2 hours.

### Hot Hobbing

A number of die casting blocks in C.M.V. have been successfully hot hobbled.