

## CHEMICAL COMPOSITION

C	Cr	Mo	W	Co	V
1.30	4.2	4.5	5.6	-	4.0

SAFETY DATA SHEET SDS: A

## STANDARDS

- USA: AISI M4
- Europe: HS 6-5-4
- Germany: 1.3351
- France: AFNOR X135WMoCrV 6-5-4-4
- Japan: JIS SKH54

## DELIVERY HARDNESS

- Typical soft annealed hardness is 250 HB
- Cold drawn and cold rolled material is typically 10-40 HB harder

## DESCRIPTION

EM4 is a vanadium based grade used for cold work applications.

## APPLICATIONS

- Punches
- Form tools
- Rolls
- Broach inserts
- Dies

## FORM SUPPLIED

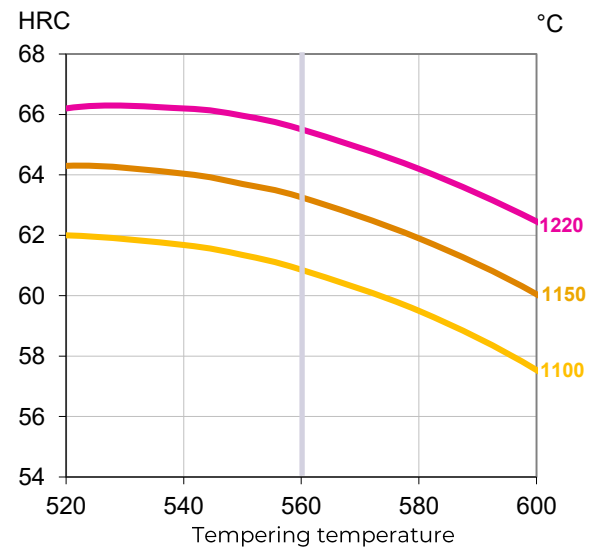
- Drawn wire
- Round bars
- Flat bars
- Square bars

Available surface conditions: hot rolled, drawn, ground, peeled, turned.

## HEAT TREATMENT

- Soft annealing in a protective atmosphere at 850-900°C for 3 hours, followed by slow cooling 10°C per hour down to 700°C, then air cooling.
- Stress-relieving at 600°C to 700°C for approximately 2 hours, slow cooling down to 500°C.
- Hardening in a protective atmosphere with preheating in 2 steps at 450-500°C and 850-900°C and austenitising at a temperature suitable for chosen working hardness.
- 2 tempers at 560°C are recommended with at least 1 hour holding time each time.

## GUIDELINES FOR HARDENING



Hardness after hardening, quenching and tempering 2x1 hour

Tool	Hardening	Tempering
Single-edge cutting tools	1220°C	550-570°C
Multi-edge cutting tools	1100-1220 °C	550-570°C
Cold work tools	1100-1180°C	550-570°C

## PROCESSING

E M4 can be worked as follows:

- machining (grinding, turning, milling)
- polishing
- hot 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 can alter the temper, must be avoided. Grinding wheel manufacturers can provide advice on the choice of grinding wheels.

## SURFACE TREATMENT

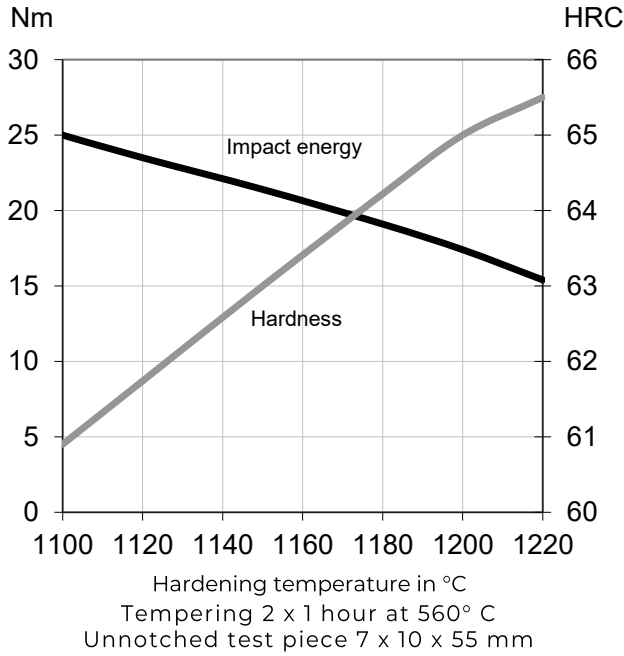
The steel grade is a perfect substrate material for PVD coating. If nitriding is requested, a small diffusion zone is recommended but avoid compound and oxidized layers.

**PROPERTIES**

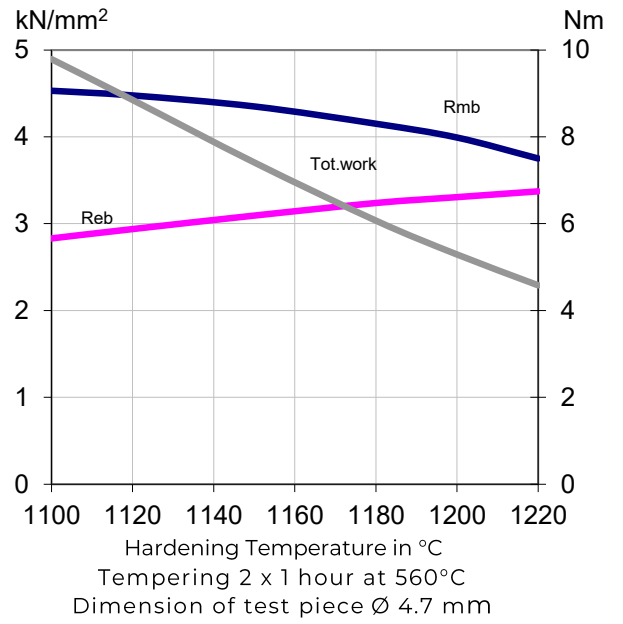
**PHYSICAL PROPERTIES**

Temperature	20°C
Density g /cm <sup>3</sup>	8.0

**IMPACT TOUGHNESS**



**4-POINT BEND STRENGTH**



Rmb = Ultimate bend strength in kN/mm<sup>2</sup>  
Reb = Bend yield strength in kN/mm<sup>2</sup>  
Tot. work = Total work in Nm

**COMPARATIVE PROPERTIES**

