DE - Brand:

Special Steel

PMD M4

Chemical composition

(Typical analysis in %)

C	Cr	Mo	W	V			
1,35	4,20	4,50	5,80	4,00			

Steel properties

Powder-metallurgical high-speed steel, fine distributed carbide structure, high compressive strength, excellent toughness, high wear resistance, high thermal stability. The volume of carbides is a little bit higher, compared to PMD23.

Applications

Cold work tools for punching and cutting, precision blanking tools, cold extrusion and deep drawing dies, coining tools. Also for machining tools like milling cutters, broaches etc.

Condition of delivery

Soft annealed to max. 260 HB

Physical properties

Thermal expansion coefficient

$\left[\frac{10^{-6}\cdot m}{m \cdot K}\right]$	20-100°C	20-200°C	20-300°C	20-400°C
	10,6	11,7	11,9	12,4

Thermal conductivity

$\left[\frac{W}{m \cdot K}\right]$	20°C	350°C	700°C
	23,5	26,8	26,2

Heat treatment

Soft annealing
Annealing only in neutral atmosphere

Temperature	Cooling	Hardness
870 - 900°C	furnace	max. 260 HB

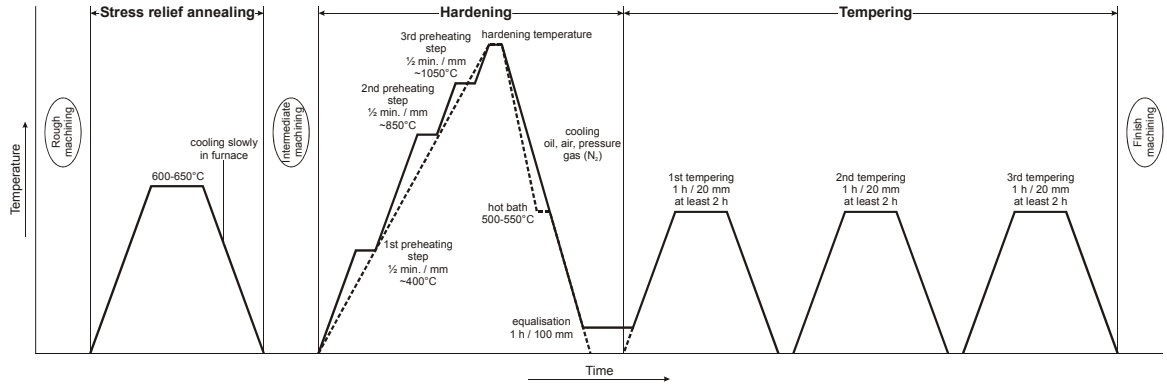
Stress relief annealing

Temperature	Cooling	
600 - 650°C	furnace	

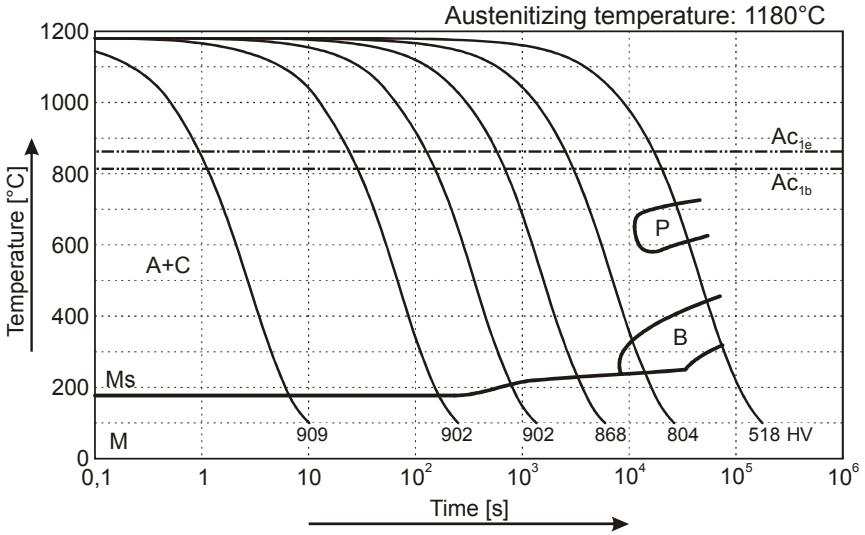
Hardening

Temperature	Cooling	Tempering
1100 - 1200°C	oil, pressure gas (N_2), air or hot bath 500 - 550°C	see tempering table

(PMD M4) Thermal Cycle Diagram



Continuous Cooling Transformation Diagram (CCT)



Tempering

DE-Brand PMD M4 has to be tempered minimum three times with 540-560°C in any case.

Reference values for hardness after tempering three times, according to the austenitizing temperature (all datas ±1 HRC).

Tempering temperature	Austenitizing temperature		
	1120°C	1160°C	1200°C
540°C	64,0 HRC	64,5 HRC	65,0 HRC
550°C	63,0 HRC	64,0 HRC	65,0 HRC
560°C	62,0 HRC	63,5 HRC	64,5 HRC
580°C	61,0 HRC	62,0 HRC	63,0 HRC
590°C	59,0 HRC	60,0 HRC	62,0 HRC

Remarks: All technical information is for reference only.