

DE - Brand:

## Special Steel

# PMD23

### Chemical composition

(Typical analysis in %)

C	Cr	W	Mo	V			
1,30	4,20	6,40	5,00	3,10			

### Steel properties

Powder-metallurgical high-speed steel, fine distributed carbide structure, homogenous microstructure within whole cross-section, high bending and compressive strength, very good grindability.

### Applications

Machining tools like milling cutters, drills or broaches, cold-work tools for cutting, stamping or deep-drawing dies.

### Condition of delivery

Soft annealed to max. 260 HB

### Physical properties

Thermal expansion coefficient

$\left[ \frac{10^{-6} \cdot \text{m}}{\text{m} \cdot \text{K}} \right]$	20-100°C	20-200°C	20-300°C	20-400°C
	11,1	11,6	11,9	12,1

Thermal conductivity

$\left[ \frac{\text{W}}{\text{m} \cdot \text{K}} \right]$	20°C	350°C	700°C
	24,6	27,5	26,7

### Heat treatment

Soft annealing

Annealing only in neutral atmosphere

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

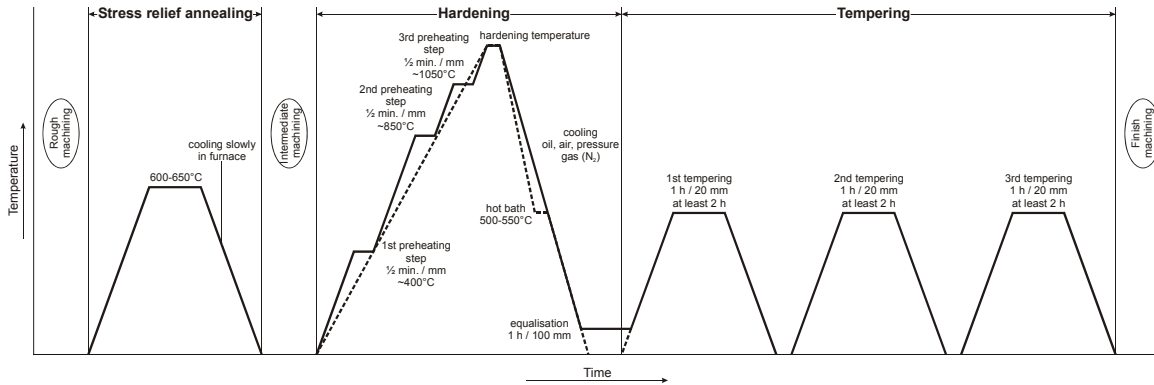
Stress relief annealing

Temperature	Cooling	
600 - 650°C	furnace	

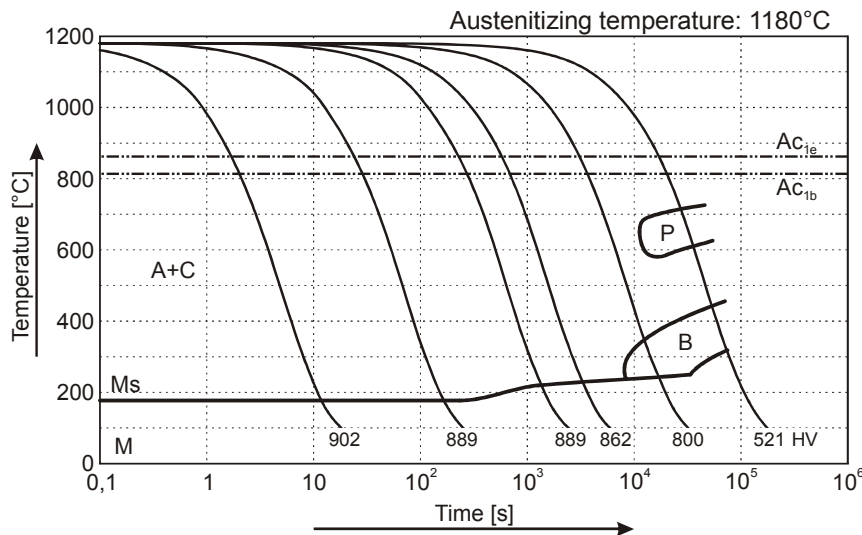
Hardening

Temperature	Cooling	Tempering
1050 - 1180°C	oil, pressure gas (N <sub>2</sub> ), air or hot bath 500 - 550°C	see tempering table

## (PMD23) Thermal Cycle Diagram



## Continuous Cooling Transformation Diagram (CCT)



## Tempering

DE-Brand PMD23 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			
	1050°C	1100°C	1150°C	1180°C
500°C	61,5 HRC	63,0 HRC	64,0 HRC	64,5 HRC
520°C	62,0 HRC	63,5 HRC	65,0 HRC	65,5 HRC
540°C	61,5 HRC	63,0 HRC	65,0 HRC	66,0 HRC
560°C	60,0 HRC	62,0 HRC	64,0 HRC	65,0 HRC
580°C	58,0 HRC	60,5 HRC	63,0 HRC	64,0 HRC
600°C	56,5 HRC	58,5 HRC	60,5 HRC	62,0 HRC