

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, segregation-free, 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. 285 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. 285 HB

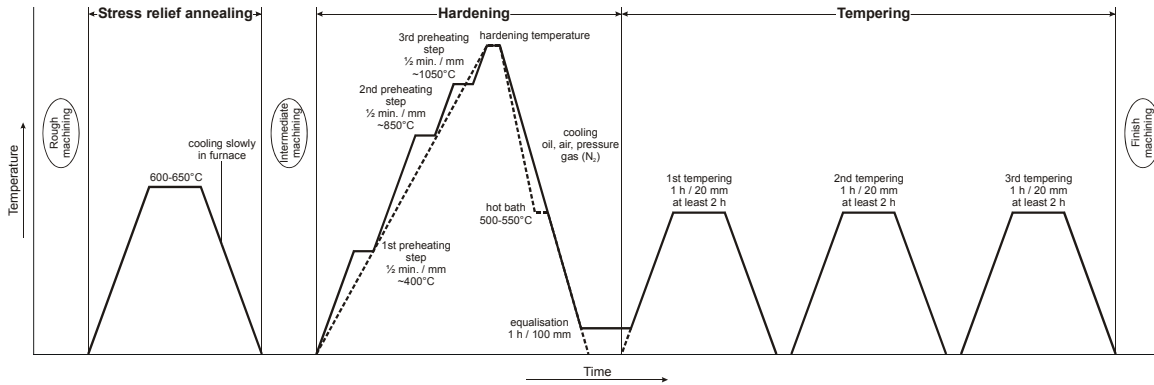
Stress relief annealing

Temperature	Cooling	
600 - 650°C	furnace	

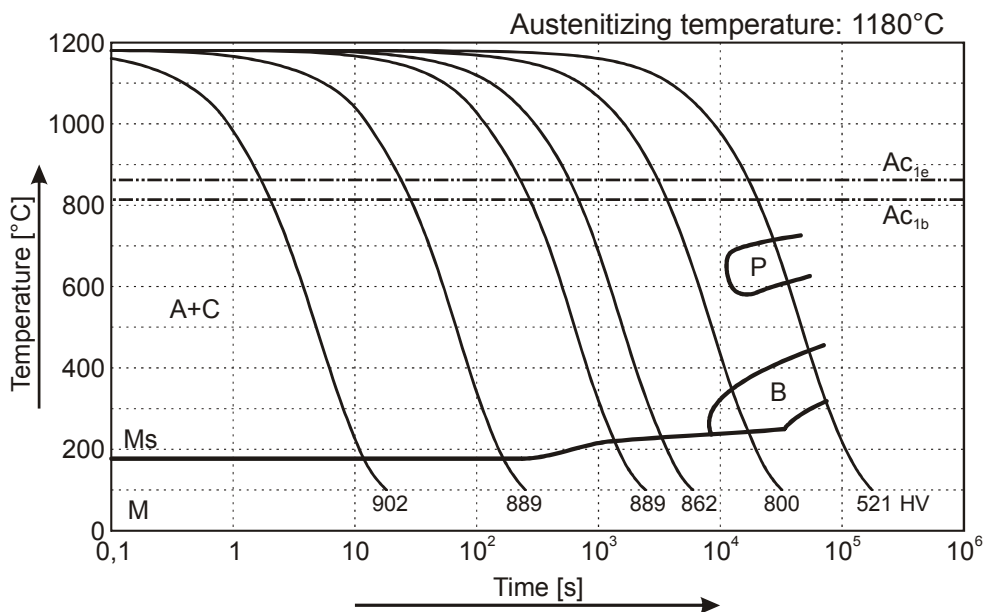
Hardening

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

## (PMD23) Thermal Cycle Diagram



## Continuous Cooling Transformation Diagram (CCT)



**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  $\pm 1$  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

Remarks: All technical information is for reference only.