

# Alleima® 20AP free-cutting medical wire

## Wire Datasheet

Alleima® 20AP is a hardenable, free-cutting carbon steel medical wire characterized by excellent machinability. The grade has high hardness, high wear resistance and exceptional dimensional stability after hardening.

### Applications

Alleima® 20AP is used for dental applications such as dental burrs and drills.

### Chemical composition (nominal) %

C	Si	Mn	P	S	Pb
1.0	0.2	0.4	≤0.030	0.05	0.2

### Forms of supply

Forms of supply/ finishes	Diameter	Cu-Sn coating	Standard tolerance	Length
	mm			m
<b>Wire in coils</b>				
Drawn	0.80-1.60		D4	-
	1.60-2.50		D4	-
<b>Straightened wire</b>				
Drawn	0.80-1.15		D4	2
	1.15-2.00		D4	2
	2.00-2.50		D3	2
Drawn/ground	2.00-3.00		h7	2
	3.00-6.00		h7	3
	6.00-12.00		h7	3

Other sizes on request.

Ovality: For D1 and D2, max. 50% of the tolerance width, for D3 max. 25% of the tolerance width.

## Mechanical properties

Forms of supply/ Finishes	Diameter	Tensile strength	Proof strength	Elongation
	mm	$R_m$ <sup>1)</sup>	$R_{p0.2}$ <sup>1) 2)</sup>	$A$ <sup>1)3)</sup>
		MPa	MPa	%
<b>Wire in coils</b>	0.80-1.60	770		
Drawn	1.60-2.50	720	770	4
<b>Straightened wire</b>	0.80-1.15	>980	720	7
Drawn	1.15-2.00	>920	>910	3
Drawn/ground	2.00-2.50	>900	>850	5
	2.00-3.00	>920	>830	7
	3.00-6.00	810	>850	6
	6.00-12.00	750	670	10
			620	12

1) Nominal values. Other properties on request.

2)  $R_{p0.2}$  and elongation values are given for information only.

## Impact strength

Quenching time and temperature is dependent on material size, the specimens for impact strength are larger than standard wire.

Table of impact strength for Exera® 20AP, hardened and quenched condition (soaking temperature 800°C and soaking time 10 min, tempering time is 30 min)

Tempering temperature, °C	Impact strength, J
200	1.3
300	2.0
400	7.3
500	10.0
600	17.0

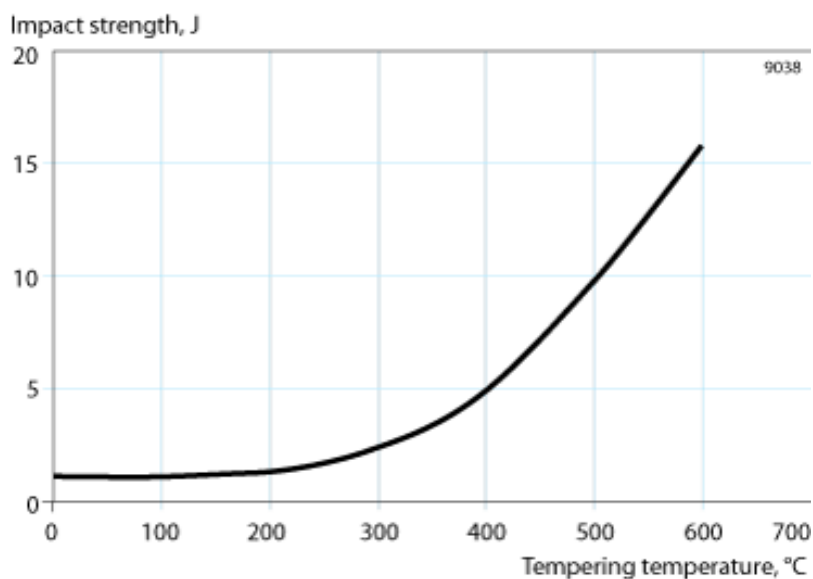


Figure 1. Impact strength after recommended hardening procedures, valid for all dimensions. Soaking time 30 minutes. Standard Charpy-V specimens at 20°C.

## Physical properties

**Density** annealed 7.8 g/cm<sup>3</sup>, 0.28 lb/in<sup>3</sup>

### Resistivity

Cold drawn, 0.18 μΩm  
Heat treated, 0.21 μΩm

### Thermal expansion

Temperature, °C	20-100	20-200	20-300
Cold drawn	11.5	11.5	12.5
Heat treated	11.5	12.0	12.5

1) Mean values in temperature ranges (x10<sup>-6</sup>)

Exera® 20AP is a magnetic material.

## Heat treatment

### Soft-annealing

When required, soft-annealing should be conducted for a period of one hour at a temperature of 650 - 680°C.

### Hardening

Diameter	Temperature	Soaking time	Quenching
mm	°C	approx. min.	
≤5	800 - 820	3 - 6	in oil at 50°C
> 5	790 - 810	6 - 10	in water

The smaller the diameter, the shorter the soaking time. To avoid oxidation and decarburization, hardening should be conducted in a protective gas atmosphere using nitrogen, argon or a vacuum.

Contact Alleima for further advice.

Prolonged service at elevated temperatures causes decreased hardness when used in the hardened and tempered condition. See also "Impact strength".

## Tempering

Temperature, °C	100 - 600
Tempering time, min	30 - 60

The core of the material needs a tempering time of at least 30 minutes. To reduce the risk of cracking, tempering should be conducted immediately after hardening. The heating rate should not be too high, particularly in the case of intricately shaped components.

## Hardness

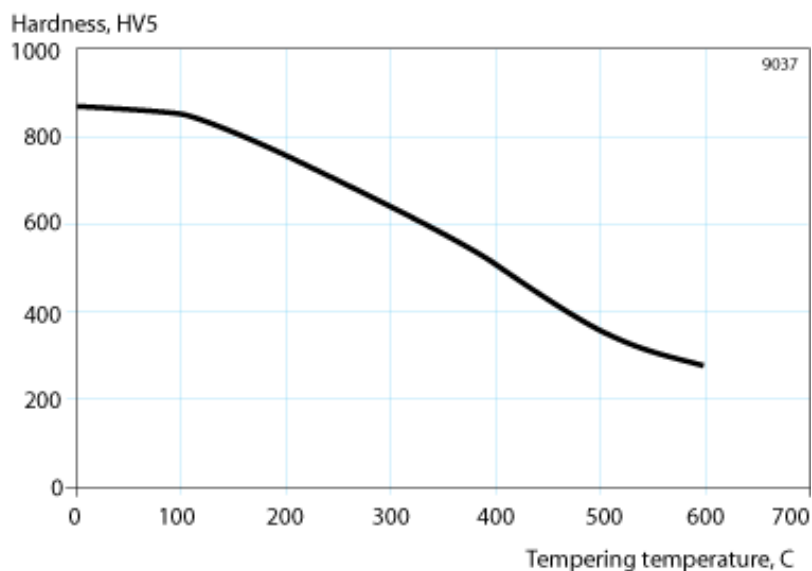


Figure 2. Hardness after recommended hardening procedures, valid for all dimensions. Soaking time 30 minutes.

### Disclaimer:

Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice. This datasheet is only valid for Alleima materials.