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Material Data Sheet: Material 1.2709 (Maraging Steel)

Utilization:

Mould and die casting, Prototypes, Serial parts, Springs, etc.

Material Properties:

Martensite hardening steel, low warping, very good toughness properties, high extension limit and tensile strength. Uniform contraction (0,09%)

Physical Properties:

Thermal conductivity: hardened approx. 20 W/mK

Coefficient of thermal expansion: 10,3 x 10^{-6} m/mK at 20°C to 100°C

Tensile strength: ≈ 1100 N/mm² (directly after the generative process)
max. ≈ 2050 N/mm² (heat treated at 510 °C)

Yield point Rp 0,2: ≈ 2000 N/mm² (heat treated at 510 °C)

Elongating at fracture: ≈ 11% (directly after the generative process)
≈ 4% (heat treated at 510 °C)

Hardness: ≈ 35 HRC (directly after the generative process)
≈ 52 HRC (heat treated at 510 °C)

Special Properties using generative manufacturing:

Surface roughness: depending to the used layer thickness min. Rz 40-60 µm (without finishing)

Density: in average 99,9 % (8,1 kg/dm³)

Minimum wall thickness: ≈ 0,5 mm (depending to the geometry)

Part accuracy: max. ± 0,05 mm (depending to the geometry)

Chemical composition:

Element	C	Si	Mn	Ni	MO	Ti	Co	Al	P	S	Cr
Volume %	max. 0,03	max. 0,1	max. 0,1	17 -19	4,5-5,2	max. 1,2	7,0-9,5	max. 0,1	max. 0,01	max. 0,01	max. 0,5

(double checked for each lot by spectral analyzing)

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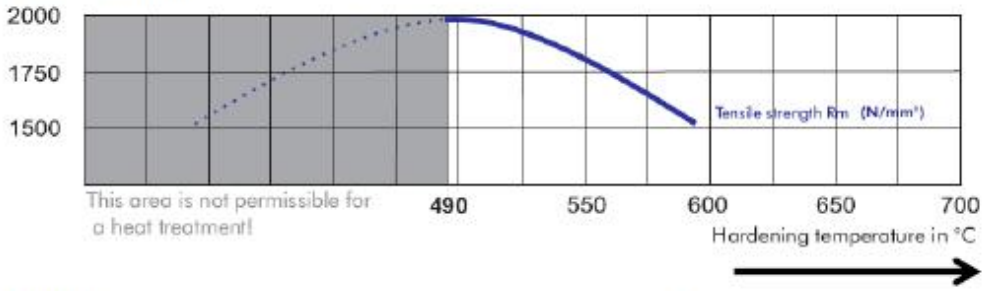
Tensil strength:



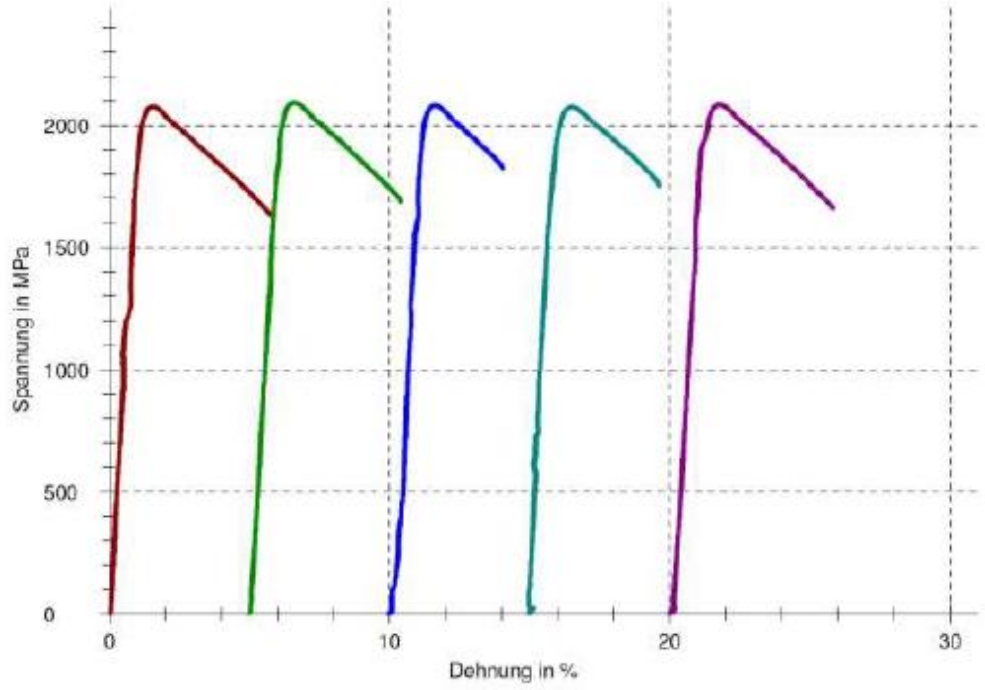
Results:

Nr	S0 mm²	Rp 0.2 MPa	Rm MPa	ε-Bruch %
1	28,27	2052,81	2076,54	5,85
2	28,65	2064,74	2092,90	5,42
3	28,46	2074,70	2081,98	4,05
4	28,94	1973,67	2074,89	4,64
5	28,75	2040,16	2085,71	5,82

Statistic:

Serie n = 5	Rp 0.2 MPa	Rm MPa	ε-Bruch %
x	2041,22	2082,40	5,15
s	39,91	7,28	0,79
min	1973,67	2074,89	4,05
max	2074,70	2092,90	5,85

Serial chart:



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Density analyses:

Test performed at:

EURO-LABOR Universitätsstr. 142 · 44799 Bochum
Telefon +49-234-5886295 · Fax +49-234-58817666 · info@euro-labor.com

EURO LABOR

Powder: 1.2709
Heat treatment: hardened (measuring result 52 HRC)
Section grinding: no etching

fiftyfold magnification

Status: not metallic inclusions (mainly Oxides), nearly no pores

Powder: 1.2709
Heat treatment: hardened (measuring result 52 HRC)
Section grinding: no etching

fiftyfold magnification

Status: not metallic inclusions (mainly Oxides), nearly no pores

Here displayed: Area with max. number of inclusions

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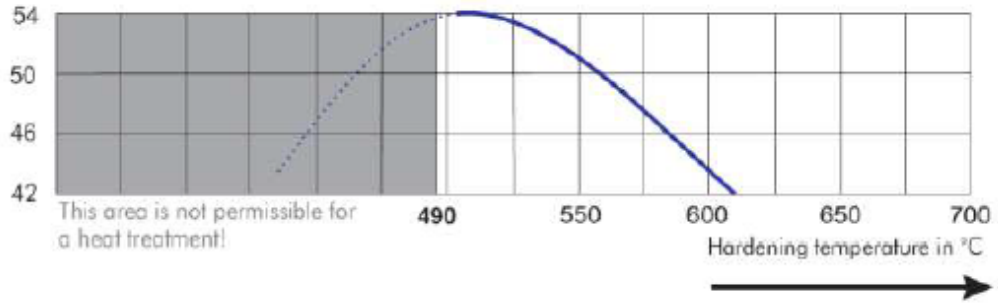
Heat treatment:

Hardening chart for 1.2709



In case of heat treating or hardening the following has to be absolutely considered:

The heat treatment of 1.2709 has to be implemented in a controlled furnace.

The minimum temperature to be reached for heat treatment is 490 °C. This applies also in the case where the required hardness is less than 54 HRC. In this case a temperature above 500 °C has to be set.

Procedure for heat treating:

1. Reaching the target temperature (e.g. 510 °C) this must be maintained for min. 6 hours.
2. For cooling down the furnace temperature must be controlled and reduced uniformly.
3. The optimal cooling rate is 2 °C/min
4. Reaching 300 °C the furnace can be cooled down non-controlled.

Quenching work pieces and targeting faster cooling rates is not permissible!
This damages the material properties.