

## SM - 2738

■ Typical analysis	C	Si	Mo	Ni	Mn	Cr	S (max)	P (max)
	0,4	0,3	0,2	1,0	1,5	1,9	0,005	0,012

Figures in % by mass.

■ Standards	
EN	40 CrMnNiMo 8-6-4
WERKSTOFF Number	W1.2738
AISI	≈P20 + Ni
AFNOR	≈P40 CMND8

### ■ Characteristics

SM-2738, prehardened 280 - 325 HB, grade specially designed for plastic mold industry. Chromium, Molybdenum, Manganese and Nickel additions are optimized to have a fully martensite-bainite microstructure after quenching. The steel is melted in an electrical furnace and refined with VOD or DH device.

The cleanliness of the steel is guaranteed as well as the soundness. This makes the steel particularly well adapted for mold steel even when polishing or chemical etching are required for surface finish quality.

### ■ Applications

Typical applications for 2738 grade are:

- Plastic injection molds for thermoplastics.
- Extrusion dies for thermoplastics
- Compression molds.

### ■ Physical properties (reference values)

Thermal conductivity $W m^{-1} K^{-1}$	Thermal expansion coefficient $10^{-6} °C^{-1} / 10^{-6} °K^{-1}$				Specific heat $J/Kg °C$
	20°C	20 - 100°C	20 - 200°C	20 - 300°C	
29	11,5	11,9	12,6	12,6	470

### ■ Metallurgical properties

- Internal soundness: All plates are ultrasonically tested. The acceptance standards of EN 10228.3 c/4 are guaranteed.
- Cleanliness: The content of non metallic inclusions is reduced to an extremely low level. This ensures a good polishability and chemical etching ability. Non metallic inclusions content is assessed in accordance with ASTM E45 Method A ("Worst field").

A (Sulfides)		B (alumina)		C (silicate)		D (Globular oxides)	
Thin	Heavy	Thin	Heavy	Thin	Heavy	Thin	Heavy
0,5	0,5	1,5	1,0	1,0	0,0	1,5	1,0

### ■ Metallurgical transformation points

$AC_1$ °C (°F)	$AC_3$ °C (°F)	$M_s$ °C (°F)	$V_1$ °C/h (°F)	$V_2$ °C/h (°F)
728 (1351)	785 (1436)	310 (590)	1000 (1830)	100 (212)

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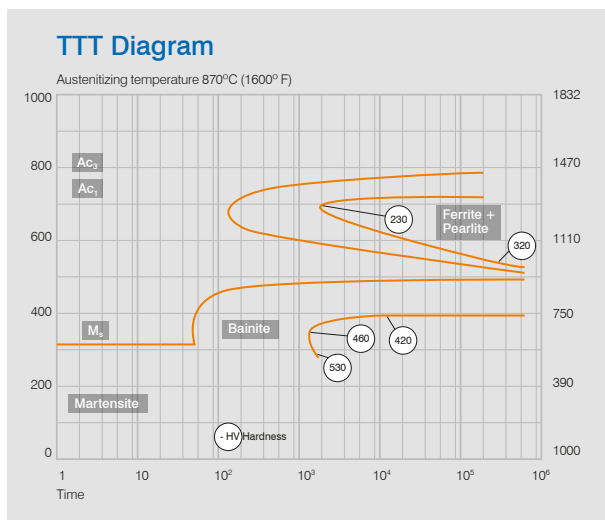
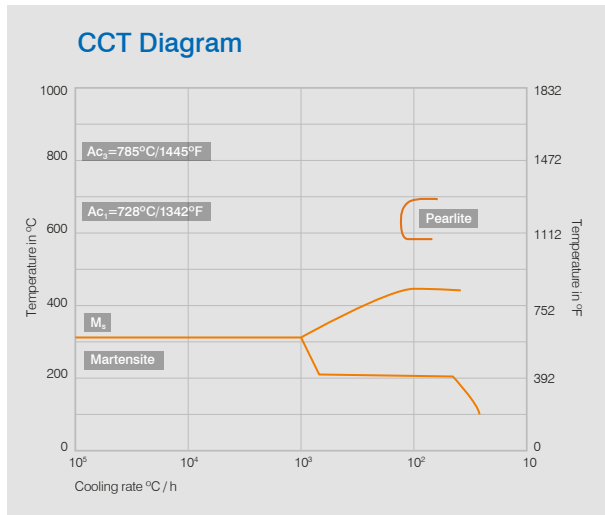
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### ■ Homogeneity

Owing to its high nickel content, SM-2738 has an excellent hardenability resulting in good uniformity of hardness and microstructure.



### ■ Heat Treatment

For particular applications where mechanical properties higher than 280-325 HB are required, hardening can be performed in the following way:

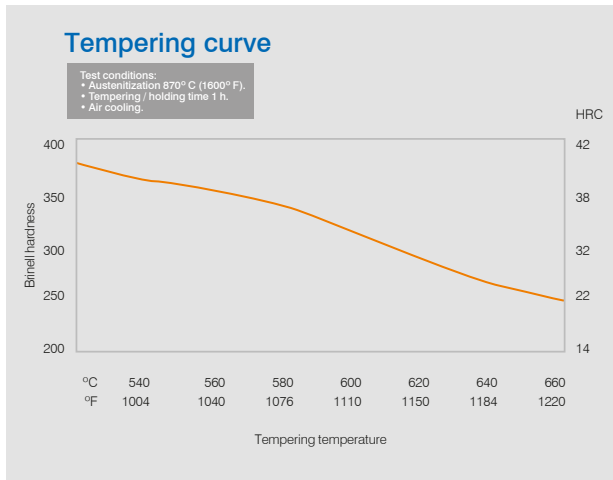
- Heating about 850°C - (1560°F) with a sufficient holding time 1 hour/25mm (1hour/inch).
- Oil or air quenching depending on thickness (see CCT diagram in order to prevent any pearlitic constituent).

Tempering temperature controls mechanical characteristics. Generally, follow these instructions:

- Uniform heating at the selected tempering temperature (see tempering curve).
- Holding time: one hour per inch of total thickness.
- Double tempering with intermediate cooling to room temperature 1 hour/50 mm of thickness.

In case of complicated parts, holding time should be determined considering the thicker section of the part. For any further information on heat treatments, please contact us.

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### ■ Surface treatment

Quality of surface treatment depends largely on the surface roughness and characteristics after polishing. Homogeneity of hardness, microstructure and good cleanliness ensure a good behavior for chromium plating, nickel plating or nitriding. After hard chromium plating, the steel should be tempered for about 4 hours at 180°C (356°F) in order to avoid hydrogen embrittlement.

### ■ Machining

SM-2738 grade shows good performances in drilling and in milling using carbide tools. Cutting conditions ( cutting speed, feed rate, etc...) depend on the tool. Cutting conditions of SM-2311 can be applied on SM-2738 grade.

### ■ Electrical discharge Machining (EDM)

This method of machining can be used on SM-2738 grade.

After machining, a hardened surface layer- the "white layer" - generally appears by grinding and polishing. This layer should be completely removed.

### ■ Polishing

SM-2738 has a good polishability in quenched and tempered condition. After grinding, polishing shall be performed with aluminium oxide or diamond paste.

It is necessary to avoid overpolishing ( high pressure or polishing time ) which may lead to defects on the polished surface (orange peel, waves...).

### ■ Texturing

SM-2738 is particularly adapted for texturing or specific steel making process and heat treatment of plates lead to a uniform structure and a homogeneous hardness which ensure accurate and consistent pattern reproduction.

### ■ Welding

GTAW is the recommended process to ensure a clean weld without any sulphides, porosities or oxides which affect properties of the weld, such as chemical etching ability, polishability...

Pre- and postheating treatment must be achieved to ensure crack free welds.

For more information about welding procedure, please contact us.