



## LM25 ALUMINIUM CASTING ALLOY

(Al – Si7Mg)

This alloy conforms to British Standard 1490 LM25. Castings are standardised in the following conditions - as cast, LM25-M precipitation treated LM25 - TE; solution treated and stabilized LM25 - TB7; and fully heat treated LM25 - TF.

### CHEMICAL COMPOSITION

	%
Copper	0.1 max.
Magnesium	0.20-0.60
Silicon	6.5-7.5
Iron	0.5 max.
Manganese	0.3 max.
Nickel	0.1 max.
Zinc	0.1 max.
Lead	0.1 max.
Tin	0.05 max.
Titanium*	0.2 max.
Aluminium	Remainder.

\* 0.05% min. if Titanium alone used for grain refining.

## MECHANICAL PROPERTIES

	<b>Sand Cast</b>			
	<b>LM25-M</b>	<b>LM25-TE</b>	<b>LM25-TB7</b>	<b>LM25-TF</b>
0.2% Proof Stress (N/mm <sup>2</sup> )*	80-100	120-150	80-110	200-250
Tensile Stress (N/mm <sup>2</sup> )*	<b>130-150</b>	<b>150-180</b>	<b>160</b>	<b>230-280</b>
Elongation (0%)*	<b>2</b>	<b>1</b>	2.5	
Brinell Hardness Number	55-65	70-75	65-75	90-110
Endurance Limit (5 X 10 <sup>8</sup> Cycles +_ N/mm <sup>2</sup> )	70-100	55	60	60
Modulus of Elasticity (X 10 <sup>3</sup> N/mm <sup>2</sup> )	71	71	71	71

	<b>Chill Cast</b>			
	<b>LM25-M</b>	<b>LM25-TE</b>	<b>LM25-TB7</b>	<b>LM25 TF</b>
0.2% Proof Stress N/mm <sup>2</sup> *	80-100	130-200	90-110	220-260
Tensile Stress (N/mm <sup>2</sup> )*	<b>160-200</b>	<b>190-250</b>	<b>230</b>	<b>280-320</b>
Elongation (%)	<b>3</b>	<b>2</b>	<b>5</b>	<b>h2</b>
Brinell Hardness Number	55-65	75-95	65-75	90-110
Endurance Limit (5 X 10 <sup>8</sup> Cycles + N/mm <sup>2</sup> )	80-110	75	95	95
Modulus of Elasticity (x 10 <sup>3</sup> N/mm <sup>2</sup> )	71	71	71	71

\* The values shown are typical ranges for test bars produced to the requirements of B.S.1490. Specification minima are in bold type.

## **STRENGTH AT ELEVATED TEMPERATURES**

The tensile properties of LM25 alloy at elevated temperatures are influenced by the condition (heat - treatment) of the castings and the duration at the elevated temperature. For short term testing e.g. 30 minutes at temperature, the properties fall only slowly and uniformly up to about 200°C at which temperature for example, the strength of LM25-TF is reduced by approximately 20%, Very prolonged heating (10,000 hours) results in sharp, loss of strength at about 135°C and at 200°C the strength on LM25-TS is less than half of that at room temperature. For prolonged service at elevated temperatures (above 130°C) there is, therefore, no practical advantage to be gained by heat treatment.

## **PHYSICAL PROPERTIES**

Coefficient of Thermal Expansion (per °C at 20 -100 °C)	0.000022
Thermal Conductivity (cal/cm <sup>2</sup> /cm/°C/s at 25°C *	0.36
Electrical Conductivity (% copper standard at 20°C) *	39
Specific Gravity	2.68
Freezing Range (°C) Approx	615-550

\*Applies to fully heat treated sand castings; values are approximate and for castings in other conditions will depend on their thermal history.

## **MACHINABILITY**

The heat treated alloy has fairly good machining properties, but tools should preferably be of high speed steel and must be kept sharp. A moderately high rate of tool wear may be expected. Liberal cutting lubricant should be employed.

## **CORROSION RESISTANCE**

Resistance to corrosive attack by sea water and marine atmospheres is high.

## **ANODISING**

A protective anodic film can be obtained by either the sulphuric or chromic acid process but the grey opaque character of coatings of normal thickness precludes their colouring in light shades for decorative purposes.

## **CASTING CHARACTERISTICS**

<b>FLUIDITY</b>	Good, suitable for fairly thin castings.
<b>PRESSURE TEST</b>	Suitable for castings required to be leak tight.
<b>HOT TEARING</b>	The production of castings in this alloy very rarely introduces problems due to hot tearing.
<b>TYPICAL POURING TEMPERATURE-710°C</b>	The actual temperatures employed may range considerably above or below this value and will depend upon the particular conditions for each castings.

## **NOTE**

Achievement of the specified minimum tensile properties is dependent on maintaining the optimum magnesium content. Care must therefore be taken during melting and degassing to avoid loss of magnesium by oxidation resulting from overheating or by excessive chlorination.

## **HEAT TREATMENT**

- LM25-TE** (Precipitation treated) - Heat for 8-12 hours at 155- 175°C and allow to cool in air
- LM25-TB7** (Solution treated and stabilized)-heat for 4-12 hours at 525-545°C and quench in hot water, followed by a stabilizing treatment at 250°C for 2-4 hours.
- LM25-TF** (Fully heat treated)- heat for 4-12 hours at 525- 545°C and quench in hot water, followed by a precipitation treatment of 8-12 hours at 155-175°C

## **APPLICATION**

LM25 alloy is mainly used where good mechanical properties are required in castings of a shape or dimensions requiring an alloy of excellent castability in order to achieve the desired standard of soundness. The alloy is also used where resistance to corrosion is an important consideration particularly where high strength is also required.

Consequently LM25 finds application in the food, chemical, marine, electrical and many other industries and above all in road transport vehicles where it is used for cylinder blocks and heads, and other engine and body castings. Its potential uses are increased by its availability in four conditions of heat treatment in both sand and chill castings. It is, in practice, the general purpose high strength casting alloy.