

LM6
ALUMINIUM-SILICON CASTING ALLOY
(A1—Si12)
Colour Code—YELLOW
This alloy conforms to British Standard 1490 LM6

Chemical Composition

	%
Copper	0.1 max
Magnesium	0.10 max
Silicon	10.0-13.0
Iron	0.6 max
Manganese	0.5 max
Nickel	0.1 max
Zinc	0.1 max
Lead	0.1 max
Tin	0.05 max
Titanium	0.2 max
Aluminium	Remainder

Mechanical Properties

	Sand	Chill	Die
	Cast	Cast	Cast
0.2% Proof Stress (N/mm ²)*	60-70	70-80	120
Tensile Stress (N/mm ²)*	160-190	190-230	280
Elongation (%)*	5-10	7-15	2-5
Impact Resistance Izod (Nm)	6.0	9.0	-
Brinell Hardness Number	50-55	55-60	55-60
Endurance Limit (5 x 10 ⁷ cycles; +/- Nmm ²)	51	68	-
Modulus of Elasticity (x10 ³ N/mm ²)	71	71	71
Shear Strength N/mm ²	120	-	-

*The values shown are typical ranges for sand and chill cast test bars produced to the requirements of B.S.1490 and for 6 mm diameter die cast bars; those in heavier type are minimum specification values.

Strength at Elevated Temperatures

Tensile strength and hardness decrease fairly regularly with increasing temperature and become relatively poor at temperatures of the order of 250°C.

Physical Properties

Coefficient of Thermal Expansion (per °C at 20-100°C)	0.000020
Thermal Conductivity (cal/cm ² /°C/s at 25°C)*	0.34
Electrical Conductivity (% copper standard at 20°C)*	37
Solidification Shrinkage (approx. %)	3.7
Specific Gravity	2.65
Freezing Range (°C) approx.	575-565

*Applies to sand castings; values are approximate and will vary with conditions.

Machinability

Alloys of this and similar compositions are rather difficult to machine. This is due firstly to their tendency to drag and secondly to the rapid tool wear caused by the high silicon content.

Carbide-tipped tools with large rake angles and relatively low cutting speed give comparatively good results. A cutting lubricant and coolant should be employed.

Corrosion Resistance

LM6 exhibits excellent resistance to corrosion under both ordinary atmospheric and marine conditions. For the severest conditions this property can be further enhanced by anodic treatment.

Anodising

LM6 can be anodised by any of the common processes, the resulting protective film ranging in colour from grey to dark brown.

Casting Characteristics

FLUIDITY-Can be cast into thinner and more intricate sections than any of the other types of casting alloys.

PRESSURE TIGHTNESS-Especially suitable for leak-tight castings.

HOT-TEARING-Castings in sand or chill moulds exhibit complete freedom from hot-tearing.

TYPICAL POURING TEMPERATURE-A typical temperature for sand and chill castings is 725°C but in practice it may range considerably above or below this value according to the dimensions of the casting.

Pouring temperatures for die castings depend very largely on the particular casting and the machine and vary too widely for a typical temperature to provide useful guidance. The melt should not, however, be allowed to stand at temperatures only a little above the freezing range or the bottom of the melt may become enriched in such elements as iron and manganese.

PATTERNMAKERS' SHRINKAGE-1.3% or 1/75.

N.B.-For die castings the shrinkage may be expected to be considerably less than 1.3%.

NOTES-For sand castings and medium and heavy section chill castings the alloy must be modified before pouring (by treatment with sodium or sodium salts—see booklet "Melting Practice for the Production of Aluminium Castings"), if the maximum mechanical properties are to be realised.

Heat-Treatment

Ductility can be improved slightly by heating at 250-300°C, but apart from stress relieving, the heat-treatment of LM6 is of little industrial interest.

Application and General Notes

Suitable for marine 'on deck' castings, water-cooled manifolds and jackets, motor-car and road transport fittings; thin section and intricate castings such as motor housings, meter cases and switch-boxes; for very large castings, e.g., cast doors and panels where ease of casting is essential; for chemical and dye industry castings, e.g., pump parts; for paint industry and food and domestic castings. In general use where marine atmospheres or service conditions make corrosion resistance a matter of major importance. Especially suitable for castings that are to be welded.

The ductility of LM6 alloy enables castings easily to be rectified or even modified in shape, e.g., simple components may be cast straight and later bent to the required contour.

Equally adaptable for sand and permanent mould castings and for die castings.

The aluminium-silicon alloys possess exceptional casting characteristics, which enable them to be used to produce intricate castings of thick and thin sections. Fluidity and freedom from hot-tearing increase with silicon content and are excellent throughout the range. Their resistance to corrosion is very good, but special care is required in machining. In general, the binary alloys are not heat-treated; at elevated temperatures their strength falls rapidly. Although of medium strength their hardness and elastic limit are low but they possess excellent ductility.