ZAMAK PROPERTIES AND CHARACTERICS

Chemical composition

The alloys used in casting must be in accordance with the UNI EN 1774, stating the chemical designations, the marking and other important requirements of the same alloys. For all zinc alloys, very low content of Cd, Pb and Sn are allowed for their significant negative effect: hence the need to use components of high purity and chemical composition totally compliant with the Standard requirements.

Also Zinc alloys, as defined by international standards of chemical composition, comply with the parameters of:

- "End of life vehicle '(ELV)" Restrictions on Hazardous Substances "(RoHS)
- "Waste Electrical and Electronic Equipment" (WEEE), as European legislation.

All products in zinc alloy should be marked with the Zinc Logo and the ISO recycling mark, as required in the EN12844 standard, in order to easily recognition of the alloy and its future recyclability.

The inclusion of copper (Cu) increases the already good, wear resistance of zinc (Zn).

TYPE OF ZAMA				
Element	**ZnAl4**	**ZnAl4Cu3**	**ZnAl4Cu1**	**ZnAl8Cu1**
Al%	3,7-4,3	3,7-4,3	3,7-4,3	8-8,8
Cu%	<0,05	0,7-1,25	2,7-3,3	0,9-1,1
Mg%	0,02-0,06	0,02-0,06	0,02-0,06	0,015-0,03
Fe%	<0,05	<0,05	<0,05	<0,05
Si%	<0,03	<0,03	<0,03	<0,045

Ni%	<0,02	<0,02	<0,02	<0,02
Pb%	<0,001	<0,001	<0,001	<0,001
Zn%	rest	rest	rest	rest

Physical characteristics

The loads of yield at room temperature are superior to many other metals and their alloys, as well as the breaking load.
Zinc alloys exhibit a high degree of plasticity and energy absorption when subjected to great efforts in the load level of destructive tests.
In fractures, the elongation levels are about 7% (up to 10% in the case of thicker side sections).
This means that it is possible to avoid sudden and unexpected catastrophic failures when cast details is over loaded.
The forces of casting zinc alloys in cutting, twisting, under bending and compression generate optimal values, especially when compared to other metals.
Great is also the stability of the impact resistance at normal temperature (at 30 ° they still remain constant).
Very high performant are the ability to attenuation of zinc alloys (ability to absorb energy and sound caused by mechanical vibrations that come from the outside) and the thermal conductivity.

FEATURE	**VALUE (REF. AT ZNALCU1)**
TENSILE STRENGTH KG/MM^2	33-42
SHEAR KG/MM^2	30-35
YIELD KG/MM^2	20-25
BRAKING LOAD KG/MM^2	65-75
COMPRESSION STRENGTH KG/MM^2	10.000
HARD BRINELL KGF/MM^2	80-90
ELECTRIC CONDUCIBILITY AT 20° SM/MM^2	15,3

LINEAR EXTENSION (51 MM) %	7
RESILIENCE (6,35 X 6,35 CHARPY)	65 J
THERMAL CONDUCTIVITY 20° W/M °K	108,9
RESISTIVITY AT 20° OHM/M	$6,55 * 10^{-8}$
ELASTICITY MODULE GPA	96
TORSION FORM GPA	> 33
FRICTION-	0,08
SPECIFIC HEAT CAPACITY J/KG°C	419
IMPACT RESISTANCE J	52
ENDURANCE MPA	57
MELTING RANGE °C	380 - 386

Economic-productive aspects

Zama in the liquid state is particularly fluid, allowing the realization of very thin walls with great precision. In addition, it also allows a very high mold life.

FEATURE	VALUE (REF. AT ZNALCU1)
Standard precision 100mm %	0,1
Minimum side thickness mm	0,4

Average Mold Duration Number of shocks	>500.000

Zama and Liquids

Corrosion resistance

Diecasting in zinc alloy complying with UNI standards possess **excellent corrosion resistance.**

Control over the content of impurities (Cd, Pb, Sn) gives safety against corrosion: one must carefully check the quality of the utilized alloy and have a special care that accidental causes do not contaminate the bath.

Exposure to atmosphere

Castings exposed to atmosphere are very resistant to corrosion because, thanks to the action of carbon dioxide and air humidity, insoluble salts of zinc will form on their surfaces. In any case, the corrosion value is in function of the air pollution level: usually it does not exceed 12 µ per year in industrial atmosphere (the most severe), also being reduced to 1.2 µ per year in rural.

Navy Exposure

The degree of corrosion in marine atmosphere is not so high as in the industrial one, but, as in every condition of high humidity, it can form a corrosion surface with white spots.
This eventuality can be avoided by a prior chromate treatment, very effective in the prevention of this type of corrosion, or with an anodic oxidation.

Drinking water
The degree of zinc corrosion in the distribution network varies enormously with the hardness and chemical composition of the water and can be evaluated in 1 - 12 µ per year.
In general, very hard water deposits calcium carbonate on metal surfaces which reduces the corrosion rate.

Aqueous solutions
The corrosion rate is low in cold solutions at limited acid concentration, pH> 6.5 and becomes irrelevant in neutral solutions (pH <12.5)

Effects on Zinc alloys,
following environmental exposure in normal atmospheric conditions:

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Initial	252	83
At 5 years	242	82
At 10 years	232	77
At 20 years	212	75

As from this table (extract from 07.12.01 Conference "Surface finishing of castings in zinc alloys " - Eng. Pula - Department of Mechanical Engineering - University of Brescia), Zama behaves very well to aging.

Finishes

In view of the excellent corrosion resistance, casting of zinc alloys are used in all those cases where an outward appearance is not important and there are no special needs.

Sometimes vibration drums can be used to improve the melting surface. An exceptional smooth finish can be obtained already before the final finish by means of a slight polishing or a chemical brightening.

Finishing operations are performed when you want to achieve decorative effects and when you want to improve the corrosion resistance in particular conditions of use. Chromate treatment, painting, galvanic treatments, passivation, anodization and galvanization offer various solutions to protect die-cast particular, to give it the desired aesthetic appearance. Galvanizing, for example, offers an extremely effective protection for normal environmental conditions. This derives from zinc ability to form, in the course of a few weeks, a protective layer composed of a mixture of oxide, hydroxide, and various basic zinc salts, which greatly slows the degree of corrosion progress. Passivation with paint is recommended in most ‘critical’ environmental conditions: laboratory tests confirm a percentage of corrosion of 0.05 - 0.5 after 240 hours in salt fog.

Any galvanic treatment (chrome plating, gold plating, nickel plating, burnishing, silvering ...) or a liquid coating or electrostatic make cast particulars ideal for any use (in the external environment or internal) with an aesthetic outcome without comparisons.