

# STRESS AND STRAIN OF DIE CAST ALLOYS

**Strain is relative to the change in shape or size of your component due to externally applied forces, while stress is the internal force (per unit area) associated with the strain.**

The stress and strain of die cast alloys are an important design consideration when creating a metal component. There is nothing worse than coming up with a brilliant component design only to choose the wrong alloy for the job. Choosing the right alloy starts with understanding the mechanical and physical properties of die cast alloys. One must understand the stress and strain characteristics of die cast alloys and choose the allowable stresses before part failure.

## Understanding Stress and Strain

Imagine you took an elastic band and held an end in each hand. When you begin to pull it apart, it stretches—that effectively is the strain. As you pull it further and further that is the stress. Eventually, the band is going to break. That breaking point is the maximum stress also known as the UTS (ultimate tensile strength).

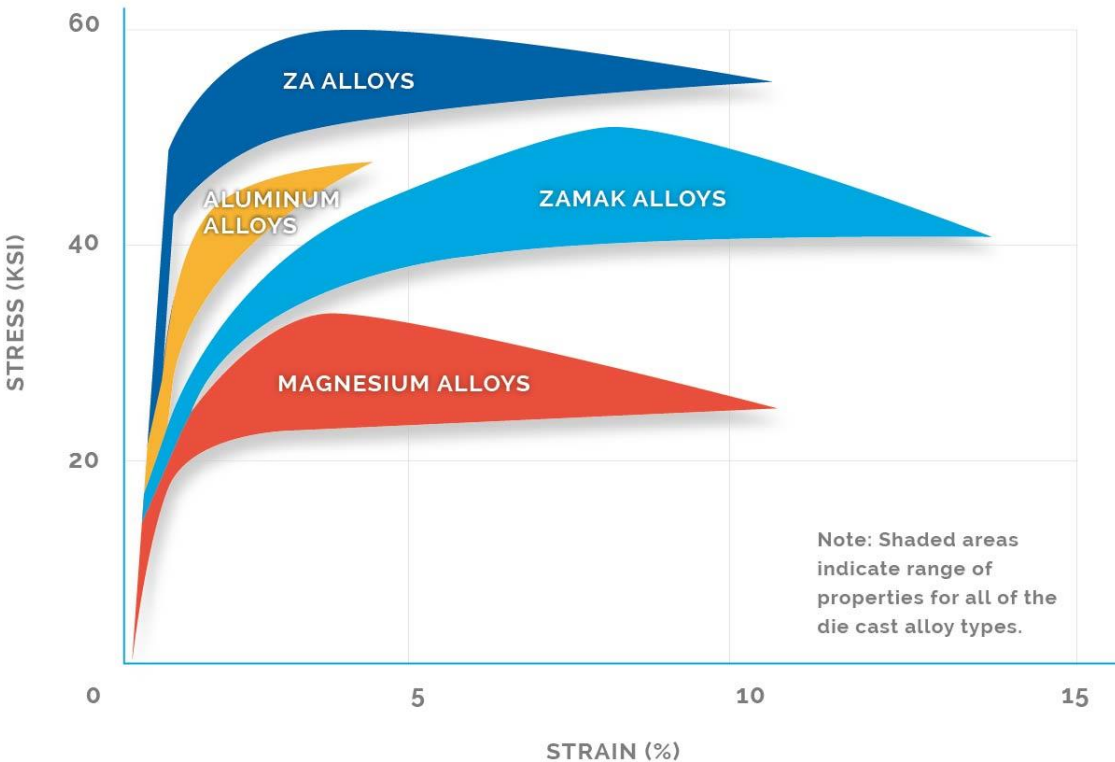
When you're creating a new project it is important to determine your allowed stress. How much can your part endure while still maintaining its integrity and functionality? While strength is typically important for our customers, sometimes a project requires a more ductile material. Aluminum alloys are not very ductile; although it has relatively high strength when it fails it is a sudden failure versus Zamak alloys that have a much higher UTS (ultimate tensile strength).

## Tensile Testing

Tensile testing applies stress to every part of the material providing data on the ultimate tensile strength, yield strength, elongation, and reduction of the area. During the elongation period, more stress is added to the component to reach its failure point. Different than creep, where the same amount of stress is applied over a period of time.

The stress vs. strain graph below is unique for each material and is found by recording the amount of deformation (strain) at distinct intervals of tensile or compressive loading (stress). We perform tensile testing to quantify material failure in an effort to create better and longer lasting components.

# STRESS-STRAIN CURVES OF DIE CAST ALLOYS



## STRESS-STRAIN CURVES FOR DIES CAST ZAMAK & ZA ALLOYS

