# Coefficient of Friction

The coefficient of friction is a dimensionless coefficient, hence the unit of coefficient of friction can not be defined. It is used to represent the value of frictional force acting on a surface. It can be defined as the ratio of the frictional force to the normal force acting on a surface of a body. The value of the coefficient of friction will be different when the body is at rest condition or in a moving condition. The coefficient of friction depends upon several factors like surface roughness, deviation angle of the force, the quantity of force, types of force(external or internal force), etc.

The coefficient of friction also depends on the material properties like the nature of materials, surface roughness, etc. Materials having a coefficient of friction less than 0.1 are considered lubricant materials. **It is represented with μ**. And, it can be determined by different laboratory methods; it will be discussed later in this article.

## Coefficient of Friction Formula

The formula for the coefficient of friction is used to calculate the frictional force acting on the surface. Its formula can be determined based on its definition. It can be defined as the ratio of the frictional force to the normal force acting on the surface. The coefficient of friction can be derived based on the equilibrium of forces and moments on the surfaces. The formula for the coefficient of friction can be related as follows:

**Coefficient of Friction (μ) = f / N**

Where,

- o   f is the frictional force
- o   N is the Normal force

## Types of Coefficient of Friction

Depending on whether the body is at rest or in moving condition, the types of coefficient of friction can be classified into the coefficient of static friction and coefficient of dynamic friction. It is the parameter that related the frictional force acting upon a particular surface to the normal force acting on that surface.

### Coefficient of Static Friction

The coefficient of static friction is the coefficient of friction when the body is in a static condition. In the state of static equilibrium either the body moves with constant velocity or it does not move. In this state, the coefficient of friction is adjustable and equal to the ratio of frictional force to the normal force. So, in this state frictional force is adjustable with respect to the applied external force.

Frictional force can be calculated as:

$$F = \mu_{static} \times N$$

### Coefficient of Dynamic Friction

The coefficient of dynamic friction is the coefficient of friction when the body is in a moving state. In the state of dynamic equilibrium, the body moves with accelerated velocity. In this state, the coefficient of friction is constant and equal to the ratio of frictional force to the normal force. So, in this state frictional force remains the same with respect to the applied external force. The value of the coefficient of dynamic friction is slightly lesser than the coefficient of static friction.

Frictional force can be calculated as:

$$F = \mu_{dynamic} \times N$$

# Importance of Coefficient of Friction

The coefficient of friction is one of the most important parameters in engineering mechanics, It has many practical applications in engineering. The frictional force acting over a surface depends on the value of the coefficient of friction, whether it is the dynamic coefficient or static coefficient of friction.

The coefficient of friction depends on the types of material, surface roughness, and characteristics of loads. Depending upon the coefficient of friction, a material can be used for different purposes. For example, a material having a low value of the coefficient of friction is used in the case of rotational types of equipment. Because the low value of the coefficient of friction indicates that less force is required in rotation.

Also check: Coefficient of Friction of a Laminar Flow

# How to Find the Coefficient of Friction?

The coefficient of friction can be determined by different laboratory experiments. The frictional force is a resistive force acting on a surface of a body, It prevents the sliding of an object over a surface. The coefficient of friction is a dimensionless number defined as the ratio of resisting frictional force to the normal force acting on the surface of the body.

There are different types of coefficient of friction, and based on that it will be determined in the laboratory through various experiments. In these experiments, the force required to move the object on the surface is measured and on behalf of that induced frictional force is measured and the coefficient of friction will be calculated.