

Gear Ratio

A gear is a rotating circular machine part having cut teeth or, in the case of a cogwheel or gearwheel, inserted teeth (called cogs), which mesh with another (compatible) toothed part to transmit rotational power.

The gear ratio is the number of turns the output shaft makes while the input shaft turns one time. If the gear ratio is 2:1, then the smaller gear is turning two times while the larger gear turns just once. It also means that the larger gear has twice as many teeth as the smaller gear.

A Gear Ratio can increase the output torque or output speed of a mechanism, but not both. A classical example is the gears on a bicycle. One can use a low gear that allows one to pedal easily up hill, but with a lower bicycle speed. Conversely a high gear provides a higher bicycle speed, but more torque is required to turn the crank arm of the pedal. This tradeoff is fundamentally due to the law of energy conservation and is the key concept of Mechanical Advantage. With a given power source you can either achieve high velocity output or high force/torque output but not both.

Draw a diagram to illustrate the use of two gears with a 3:1 ratio.