



## What is a Brake?

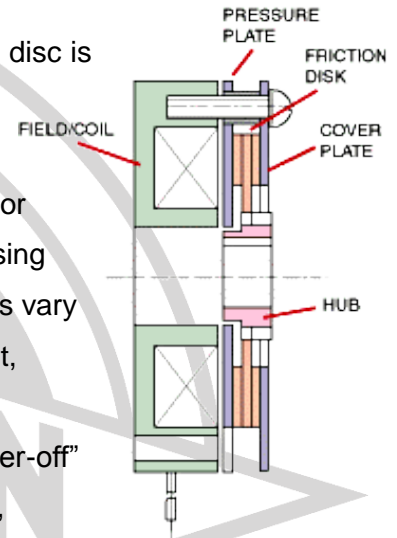
A brake is a device that resists and reduces motion of a mechanism. When the brake is engaged, it “slips” until the driving mechanism stops. When the brake is disengaged, the mechanism can rotate freely. Brakes are similar in principle to clutches. A clutch couples two mechanisms in order to transmit motion and power, while a brake “couples” a mechanism to a fixed frame in order to reduce motion and power.

Like a clutch, most brakes rely on friction from a disc to provide torque. The disc is connected to the driving mechanism and the housing is securely mounted to a frame or torque arm. To engage the brake, the disc is pressed against the housing (or pressed upon by plates in the housing) to generate friction for deceleration. To disengage the brake, the disc is pulled away from the housing and allowed to rotate freely. The engagement / disengagement mechanisms vary depending on the application and can be spring-applied, permanent magnet, mechanical, electromagnetic, pneumatic, or hydraulic. Utilizing a spring or permanent magnet for the engagement mechanism offers “failsafe” or “power-off” operation (the brake can still engage in the event of power or pressure loss, pneumatic brakes in buses and trucks use this configuration).

If the driving torque of the mechanism to be braked exceeds the capacity of the brake, then the brake will continue to slip and allow the mechanism to rotate. This is desirable in some situations such as in web handling applications where constant tension is required. Continuous braking generates heat so a tension brake should be designed with extra heat dissipation capability (fins or liquid cooling for example).

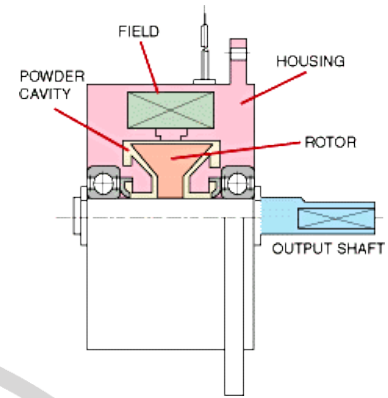
A tooth brake substitutes disc friction with interlocking teeth. The positive engagement provides much greater torque capacity in a smaller package but at the expense of low engagement speeds (engaging at higher speeds would damage the teeth). Tooth brakes are well suited for holding applications in which a load is already stationary and must remain motionless.

Some electromagnetically actuated brakes use powder cavities or hysteresis instead of disc friction to transmit power. These designs provide very accurate control of torque, making them ideally suited for use as tension / slip clutches.





In an electromagnetic particle brake, an energized coil applies magnetic flux to magnetic particles in a powder cavity causing them to bind together. The binding of the particles causes the rotor and housing to experience drag which provides the torque for the rotor to decelerate. The strength of the binding (and accordingly, the deceleration torque generated) can be finely controlled by the varying the amount of current provided to the coil.



In a hysteresis brake, an energized coil in the housing applies magnetic flux to a hysteresis disc attached to the driving mechanism. The hysteresis disc becomes magnetized and is subject to magnetic drag between itself and the housing. Like the magnetic particle brake, varying the amount of current provided to the coil controls the amount of braking torque generated.

