

Simply Complex

From the outside, internally geared hubs seem simple, but complicated works are inside. Here's what makes Shimano's Alfine hub turn. *By Andrew J. Bernstein*

Critical Cog

The hub's single external cog is attached to a driver unit—similar to a freehub body—that turns the labyrinth of gears inside the hub and uses a clutch to engage different gears. Alfine hubs require a gear combination that creates a 1.8:1 ratio with the crank—the cog turns about twice as fast as your pedals.

Gear System

An interlocking set of gears, called a planetary system, helps you ride up a hill—or go faster on a flat. Depending on the gear, the driver unit either first spins outer ring gears, or the planetary gears deeper in the hub, rotating around sun gears near the center. In all, there are 11 combinations, offering a range that's the theoretical equivalent of an 11-45-tooth cassette.

Fixed Axle

The whole system spins around a stationary axle that has three pawls—spring-loaded, wedge-shaped pieces of metal. Shifting causes specific pawls to extend from the axle, preventing one or more of the three free-moving sun gears [a fourth is always stationary] from spinning.

Easy Clean

Many internal hubs are greased to reduce friction, but they must be taken apart to be cleaned. Instead, the sealed Alfine employs an oil bath—like a car's transmission—which can be drained through a port. Fresh oil can be injected with a special syringe.

Disc-Brake Rotor

Alfine hubs can work with disc brakes, which offer excellent stopping power and better control, especially on wet roads or when the bike is heavily loaded. If you prefer rim brakes, a rubber cover hides the rotor's mount.

