



THE “E” STANDS FOR ELECTRIC

When you’re choosing the right e-bike, there are a lot of technical numbers out there, especially concerning the batteries. Below, you’ll find definitions of the key terms you need to know about e-bike battery specs. At the end, we put it all together so you know why those numbers matter so you know how to choose the right e-bike battery...

AMPS (A)

An Amp is a measure of electrical current, or rate of flow. Basically, it’s how much power is moving through the system.

VOLTS (V)

Think of a Volt as the “force” pushing Amps through the system. The higher the voltage, the more energy can be moved, or the faster it can be moved. So, a higher voltage system can send more energy through the circuits to the motor. 36V batteries are common but some high performance bikes have 48V batteries. All else being equal, a higher voltage system will deliver more torque for quicker starts but it will drain your battery faster.

WATTS (W)

Watts = Volts x Amps. Or, think of it as Force x Volume. Let’s say you have a 10A - 36V battery then it’s able to produce 360 watts. This is the real measure of power for a system.

AMP HOURS (Ah)

Amp-Hours (Ah) indicates the capacity of the battery. Technically, it’s a measure of how much current the battery can deliver in one hour at a useable voltage. For example, a 14Ah - 36V battery will provide 14 amps for one hour at approximately 36 volts. Or 7 amps for 2 hours, etc.

WATT HOURS (Wh)

This is one of the most commonly listed specs for batteries. Watt Hours refers to the number of watts that can be delivered in one hour or Ah x Volts. Using the 14Ah - 36V example above, you’d have a 504Wh battery. If you paired that with a 500W motor and ran it non-stop at highest level of assist output, you’d get about an hour of use. If you were running it on a lower setting, using only about half or 252W of the motor’s capability, you’d get about 2 hours of use, and so on.

As such, Watt Hours provides the most useful number in determining an e-bike’s real, usable range or run time, especially if you know the motor’s Watt rating.

...PUTTING IT ALL TOGETHER

Really, it comes down to simple math. Bigger numbers mean more capacity and/or power. Since off-the-shelf e-Bikes have electronically limited top speeds and are designed around a specific voltage, a number that you WANT to be bigger is the Watt Hour rating but you typically get that with a larger Amp Hour rating. Here’s why:

$$\text{Ah} \times \text{Volts} = \text{Wh}$$

So, increasing the Ah (battery capacity) for a given voltage (current flow rate) means more Wh (power delivered over time). Or more total power available to you. Because the voltage is constant, it’s delivering those stored amps at a

constant rate, so the more amps (as Amp Hours) that you have, the longer it'll take to use them up. Meaning, this is how to extend an e-bike's range.

The takeaway is that because most systems are standardized, what we're really looking to maximize is total range or time before you need to recharge the battery. To do that, look for an e-bike battery with a high Watt Hour rating.

Most modern major e-bike motor systems (think Bosch, Continental, Brose, Panasonic, SR Suntour, and Yamaha) have 36V batteries. And most every brand's system lists the battery's Voltage and Watt Hour ratings. So, a little backwards math ($Wh \div V = Ah$) will give you both figures if you want to know the Amp Hour rating, too.

If you plan to upgrade your battery to one with higher capacity, just match your bike's Voltage rating and get one with a higher Amp Hour rating, which will have more capacity and let you ride farther per charge...or its range.

RANGE

There are many factors in regards to range, however the largest will be the battery size, then the assist level, rider weight, type of bike, terrain, tires, etc.

City Bike Range

Assuming a 400wh battery with a Bosch active line motor, 220lb rider, street tires, upright riding position, little wind, and on asphalt.

Eco mode = 54 miles

Touring mode = 30 miles

Sport mode = 24 miles

Turbo mode = 20 miles

Same scenario with a 500wh battery then you'll see about a 25% increase in range due to the 25% increase in battery.

Eco mode = 68 miles

Touring mode = 38 miles

Sport mode = 30 miles

Turbo mode = 26 miles

Think of the battery and watt hours as the gas tank; the more Watt Hours then more gas, thus more range.

MTB Range

Assuming a 400wh battery with a Bosch active line motor, 220lb rider, MTB tires, hilly terrain, and off road.

Eco mode = 41 miles

Touring mode = 23 miles

Sport mode = 18 miles

Turbo mode = 15 miles

Same scenario with a 500wh battery then you'll see about a 25% increase in range due to the 25% increase in battery.

Eco mode = 51 miles

Touring mode = 29 miles

Sport mode = 22 miles

Turbo mode = 19 miles

Bosch has a great online range calculator to illustrate what you can expect with all the factors considered...

<https://www.bosch-ebike.com/us/service/range-assistant/>