

Falco e-Motor Review #244

750 Watts + Greenspeed GT20 = Electrified Fun

By Brian Zupke

The Falco 750+ e-Motor makes it easy to add electric assist to just about any recumbent trike or bike, and it can be configured to nearly any rider's needs. TerraTrike likes it so much that they use the Falco in their Rambler EVO (Electric Vehicle Option) trike. I mounted the Falco e-Motor System on a Greenspeed GT20 and had a great time testing it out. It had a lot of power for climbing and was fast enough that I had to stop grinning to keep the bugs out of my teeth. If you are looking for a good, versatile e-assist system, Falco has you covered.

Falco's direct-drive, 750 watt hub motor has no gearing and can be built on just about any size of wheel, from 700c all the way down to 16 in. Wires run from the motor (near the axle) to the battery, the ANT+ wireless module and an optional display console.

A common characteristic of hub motors is that they tend to be quiet. The Falco 750+ motor is no exception. I could hear a click when the motor engaged and another when it shut off, and that is about it. The click is less-pronounced at lower power levels.

There were two main candidates for locations to mount the battery on the GT20. One was on an under-seat rack that would have placed the battery near the chain stay. The other was on the rear rack. This would have precluded the use of a trunk, though I could have still carried panniers. Several companies offer solutions for mounting that put the battery in other places, which vary according to the type of recumbent trike or bike and the rider's needs. For my testing, I secured the battery to the GT20's rear rack. If I had been planning to keep the 750+, I would have opted to mount it alongside the chain stay, to maximize my cargo space.

All e-assist systems add weight to a bike or trike, but Falco's is not the heaviest. The



Falco motor weighs 13 lbs. and the lithium-ion battery weighs 5.5 lbs. While the added weight is somewhat of an issue when riding with the electric assist turned off, it is quite noticeable when it comes time to lift the trike.

Ramp-loading systems can make it much easier to load/unload an electric assist bike or trike for transport.

The 750+ system has several different modes of operation. In the Cruise mode, the



Our review setup from Falco was installed on a Greenspeed GT20. Falco supplied the motor laced to a Velocity Aeroheat wheel and Schwalbe 20 x 2.23 Big Apple tire. Components are available separately, but having the complete setup supplied ready to go make for an attractive package for either shops to install or home do-it-yourselfers.



rider can select one of five levels of power to be engaged while pedaling, with Level 1 providing the lowest amount of power and Level 5 the most. If the optional throttle control is used, its highest level applied power is also limited by the power level selected. For example, if the power level is set to 1, full throttle will only apply the maximum power for Level 1. This ensures that if you are using a lower power level setting, you don't surprise yourself when hitting full throttle.

The power levels can be controlled via a smart phone app or by a physical set of buttons connected to the display. Splitting the controls and the display allow them each to be positioned optimally for easy reach and viewing. Recumbent trikes are likely to mount them both off to the side, for instance; the test trike had both the display, and the plus/minus control attached to an accessory mount on the kingpin for the left wheel. This made the display easy to see, but required me to move my left hand off the handlebar in order to adjustment the power level. This really wasn't much of an issue, as the settings do not need to be changed that often.

The Falco's torque sensor detects when the rider puts pressure on the pedals. If the reading is corroborated by the speed sensor, power is applied. Pedaling harder does not cause the motor to apply more power, but



A range of battery sizes is available. More permanent installation options can be found. T-Cycle has a number of pre-fab mounts as well as assorted brackets and parts to make your own mount. The battery can be locked to the battery bracket with a keyed lock, above that is the on/off switch to the battery. Battery endurance depends on terrain, speed being maintained, overall load and tire selection



Falco's brushless electric motor is contained within the rear hub. Wheel size fitments include 700c, 29er, 650B, 26-inch, 24-inch, and 20-inch. Falco can build the wheel to your spec; motor options include 500 watt, 750 watt, and various battery capacity setups. Motor/battery combos are also available. The Falco system is compatible with 1/7/8/9 or 10-speed cassettes.

since the total power being applied to the wheel increases, the speed will increase.

In addition to the power levels 1-5, the Cruise mode also has regenerative braking levels -1 to -5. Regenerative braking both recharges the battery and acts as a drag brake. The regenerative mode can also be used to provide resistance when riding on a trainer, or when the rider wants to increase the effort required to maintain speed. Regenerative braking at the maximum level (-5) is fairly impressive. On a downhill stretch where I normally reach close to 50 MPH, I could keep my speed to below 30 MPH without manual braking.

The Falco's Turbo mode provides maximum power to the motor when pedaling or when the throttle is pressed. It ignores the power level setting, other than it requires the level to be greater than 0. If the power level is 0 or lower, the motor will not engage.

The 750 watt motor is powerful; however, in Cruise mode on steep hills, it was difficult to maintain my speed. When climbing a 10% grade, if I kept the throttle all out but stopped pedaling, the trike would slowly reduce speed until I stopped. If I didn't use the motor at all and only pedaled, I had difficulty maintaining more than 3 MPH. (Though to be honest, I can't blame all that on the Falco. Lately my training method has been heavy on ice cream and light on actually getting on my trike.) While pedaling and applying power from the motor, I was easily able to sustain speeds of 8-9 MPH. In Turbo mode, a lot more power

is applied to the wheel, and getting up those steep hills was a breeze. I was quite impressed by the amount of power the Turbo mode can put out and it inspired me to push myself harder so I could go even faster.

Like all e-assist motors, there is a legal limit to the maximum speed the 750+ can power. This speed is determined by the country in which the e-assist system was sold. In the US, the maximum powered speed is 20 MPH. The Falco's upper speed can be established via a PC, and can be set to either 20 MPH or 28 MPH.

In both Cruise and Turbo modes, pedaling backwards will disengage the motor and engage regenerative braking. In Cruise mode,



Power cable is routed through the bottom center portion on the left side of the hub. Hub needs to be 'clocked' into the correct position in the drop outs. An anti-torque tab keyed into the drop out keeps the center of the hub from spinning. The Falco motor is a five-phase, brushless design which causes no drag when the motor is switched off.



the level of braking is proportional to the power level. For example, if the level is set to 1, pedaling backwards results in a regen level of -1. If the level is 4, pedaling backwards results in a regen at Level -4. Having the regenerative braking activated by pedaling backwards is particularly handy if the rider wants to toggle back and forth, as it saves from constantly pushing buttons. This feature also allows the rider to trigger regen if neither the display nor phone app is being used.

The display and controller communicate wirelessly with the motor. However, they can be wired to the motor in order to draw power. If not wired, periodically they will have to be recharged. Personally, I prefer having the motor battery power the display and controller, as then I only have to worry about one battery. It does mean I have an extra wire routed from the motor to the display.

The display and motor must be paired before they can communicate. This is done by pressing and holding the Mode button on the display for about 10 seconds. Once they are paired, any time the motor and display are on, they will be connected.

The display shows whether the motor is in Cruise or Turbo mode, plus the selected power level. If regenerative braking is enabled, the power level shows negative and

Right: The control/display unit was mounted on either the left mirror post; display is easy to read, even in bright sunlight. All settings can be manipulated via the four gray buttons shown on the photo. Display can be powered by internal batteries, which need to be periodically recharged, or the display can be wired to the battery powering the Falco motor. A smart phone app is also available, which allows command and control to be provided wirelessly.



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The Falco system can be run without the controller or display. They are only required if you want to adjust the settings (such as the assist level) while riding. Otherwise, the settings can be made via a smart phone, Mac or PC app. They will be maintained even after the motor is powered down.

In order to use an app to configure the 750+, your device must be able to connect via ANT+. When I initially configured the test motor, I used my PC. I also downloaded the Falco Flash BLE application to my Android phone and could use it after plugging the USB ANT+ dongle (that I would normally connect to my PC) into my phone. Once set up, I could control the motor and monitor with the phone app.

The computer application provides access to all the configuration settings on the motor. Some are straightforward, like setting the five Cruise mode power levels, setting the maximum speed, etc. Some are a bit more complex, such as establishing the torque sensor threshold for turning the motor on. Fortunately, the defaults for the more complex settings pretty much worked without

me having to change them. Falco does have documentation on adjusting these settings. If the Falco motor is obtained through an authorized dealer, and they install it, they will configure the motor, and you shouldn't need to change anything.

The phone app is handy for monitoring the system (in place of the display) or adjusting the power levels. The main screen shows speed and distance information along with the current power level settings. The power level can be changed by swiping the screen up or down. Swiping left or right will switch to the other screens.

The phone app's eDrive Data screen shows the battery's voltage, the battery's capacity (in Watt/Hours), how many Watt/Hours remain, and what the current projected range is. The Power Configurator screen allows you to specify the amount of assist applied for each power level. You can distribute the power evenly or group them as you wish, for example, since I rarely use low power



Above: Falco system was temporarily installed on a Greenspeed GT20 for reviewing the system. A more permanent installation would include a prettier job of routing the wires and accessories. Small black box contains circuitry and antenna for the ANT+ which allows the Falco's hub motor to communicate with the Android smart phone used during the test. Reviewer Zupke would prefer a lower mounting position for a permanent installation, freeing up the rack for other purposes. Below: The Falco's control display is within easy reach of the rider when mounted on the mirror stalk.



Electric assist is nice to have when facing long rides up steep hills. Back-pedaling downhill puts the system into 'regen' mode, wherein electricity is generated and sent to the battery. Regen also causes a decent amount of drag which can be utilized on long downhills to moderate speed rather than riding the brakes.

settings, I group the levels higher. Other settings can be adjusted through the phone or computer, such as specifying the wheel circumference and parameters that control the behavior of the motor and torque sensor. Some of these would rarely be changed from factory settings, but it's good to know that special circumstance can be accommodated.

Overall, I was impressed with the Falco 750+ electric assist system. It packs a punch, delivering power and speed, but its variable power levels mean it can be configured to suit more sedate riders, too. The system's display and configurable control, and its ability to be mounted on different-sized wheels make it easy to install on a variety of bikes and trikes. Falco really kept the needs of riders in mind when they developed the 750+ system. This is definitely an electric assist I'd like to keep for myself. 