ElektorWheelie

Construction and driving

In the first instalment about the self-balancing single-axle electric 'vehicle' in the Summer Circuits issue we explained the operation of the electronics. There is, of course, also some mechanical construction required before the ElektorWheelie is ready to be used.

The ElektorWheelie is delivered as a kit containing all the necessary parts. The kit contains all electronic bits, the batteries, the steel housing, the wheels, the motors, the control lever and an economy battery charger. The printed circuit board comes completely assembled and ready mounted in the housing, just like the motors. In this article, with the help of a few photographs, we describe what remains to be done by you.

DIY tinkering

1. The main things you have to do yourself is mounting the control lever and attaching the wheels.
2. We start with the control lever. For this you need the brackets/bearing mounts and four bolts with matching washers and nuts.
3. The mounting brackets/bearing mounts are attached with the bolts to the middle of the base plate (between the motors). The housing already has the mounting holes for these. Tighten the bolts firmly so that they cannot come loose due to vibrations.
4. Now you need to attach the coupling between the control lever and the potentiometer. Start by adjusting the potentiometer to roughly the centre position. Make sure there is sufficient free movement clockwise as well as anti-clockwise because the pot is used to determine the position of the control lever.
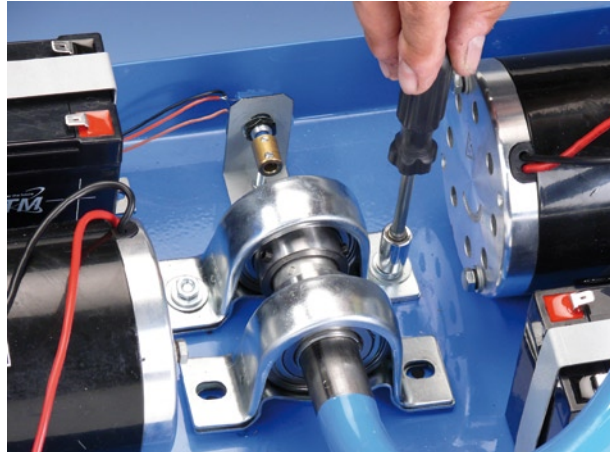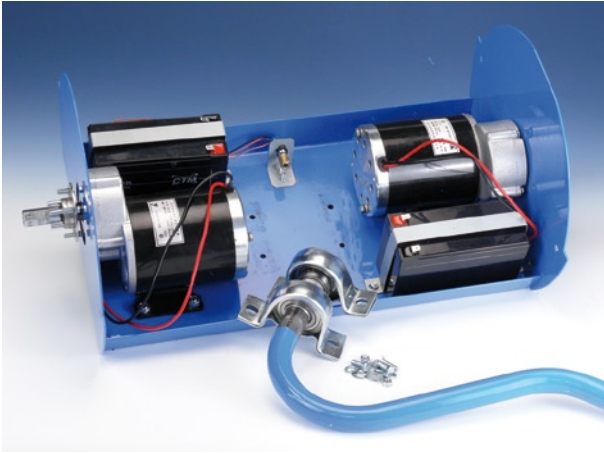
5. Now turn to the cabling. The wiring diagram shows the electrical connections effectively made. Note that some cables may be a bit short for the next step and should be connected afterwards.

6. You can now slide the cover at an angle over the control lever and fasten it at the sides with four screws. After this you attach the wheels and the two remaining parts of the control lever. Make sure the large wheel nuts are fastened securely!

As already mentioned, the kit is supplied with a simple charger. A complete battery charging cycle takes about 16 hours. An improved charger based on an earlier Elektor design is described elsewhere in this issue. This circuit ensures that the batteries can be charged independently so no imbalance can occur in respect of individual capacity. Before the first trip it is a good idea to test whether the ElektorWheelie functions properly. To do this, place the Wheelie on a crate or box with the wheels off the ground. Turn the Wheelie on and check whether it responds correctly to tilting forwards and backwards. Also check the operation of the control lever.

The first trip

To allow you to drive the ElektorWheelie, you first need to insert the double pin of the *Safety Switch*. The electronics can now be turned on with the *Main Switch*. Hold the Wheelie upright, in the position in which you will drive it (base plate as horizontal as possible). The electronics will calibrate itself in this position and will attempt to maintain this position when you are driving the Wheelie.
Now place your right foot on the *Foot Switch* built into the

base plate. This switch lets the electronics know that you have stepped onto the Wheelie. You can now test the Wheelie by leaning forwards or backwards a little and check whether the Wheelie moves with it. The foot switch is part of the safety for the Wheelie, a little more about that later.

Now put your other foot on the ElektorWheelie platform. It is important that you stand fully upright and not bend your knees! It also helps if you look straight ahead, not down.

You accelerate by moving your weight towards your toes. Don't push against the control lever, that doesn't work well. To slow down you move your weight towards your heels. The electronics in the vehicle ensures that you will remain balanced and that you can remain standing on the balancing two-wheeler as demonstrated in the ElektorWheelie video on YouTube.

Steering is done with the control lever. Push it to the left slightly and the left motor will turn a little slower, so that the Wheelie will make a left turn. A small deflection to the right and the Wheelie will veer to the right.

When the rider is no longer standing on the base plate, the current to the motors is interrupted after a short delay (hysteresis), so that the Wheelie will not carry on and decide for itself where to go. As an additional safety feature the ElektorWheelie is fitted with an emergency stop (*Safety Switch*). This works as follows: A pin is attached with a cord to a strap around your arm. Should you fall unexpectedly then the pin will be pulled out by the cord, causing the motors and electronics to be switched off *instantly*.

Tips

Make the first trip with the assistance of someone else! All
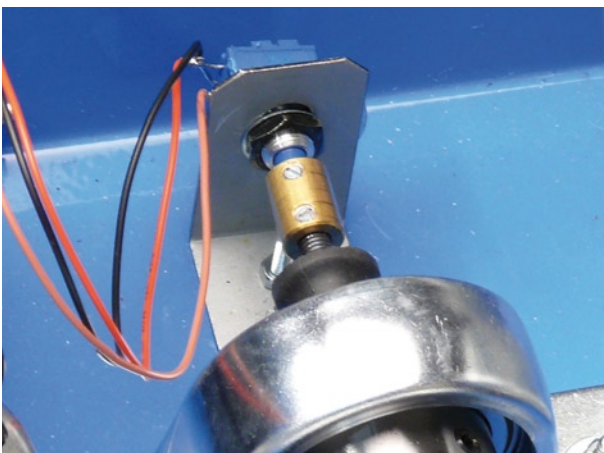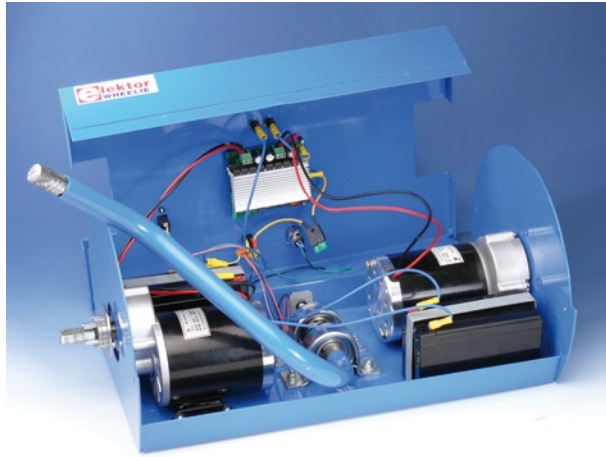
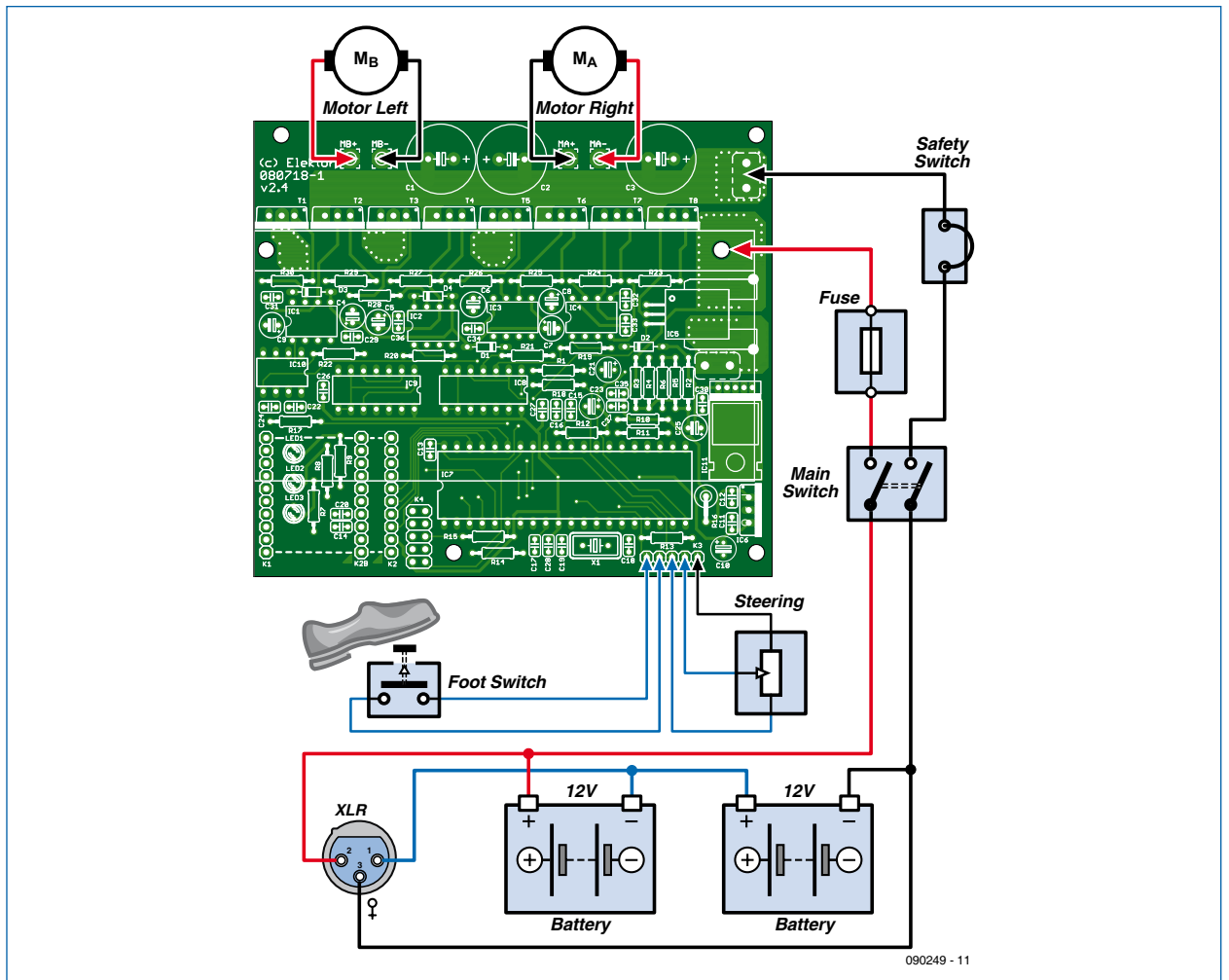sorts of things can go wrong. Helmet, knee and elbow protection are certainly recommended initially.

The software controlling the ElektorWheelie vehicle is 'open'. That means that you can adapt and change the firmware to your heart's content, but at your own risk. However, the supplied software has passed thorough testing and has had extensive development and is therefore very suitable without any further changes.

You are also invited to visit the ElektorWheelie forum on our website at www.elektor.com/forum. There you can discuss and gather ideas about the software and the hardware and, of course, share your experiences with other Elektor readers.

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Notice

This article provides a brief overview of the assembly of a pre-production sample. Each ElektorWheelie kit supplied to customers comes with an extensive construction manual. A pdf file of the manual will be available as a free download from www.elektor.com/wheelie in due course. Photos, videos and impressions may be found in the ElektorWheelie blog at http://ewheelie.blogspot.com.

The wiring diagram shows how all the parts are to be connected together. Pay careful attention to the polarity of the batteries and the connections to the motors (do not swap left and right).

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