Do It Yourself Heated Hand Grips

Phase I – Experimentation and Design

Commercially available heated handgrips come in two basic styles, either permanent replacement grips or removable over grips. A $90 set of over grips is shown in the first two pictures followed by a used set of foam grips that will be used as the starting point for the heated handgrips. If you are buying foam grips try not to get them with those grooves – they are a pain when winding the heater wires on.

Tools needed for the experimentation phase included a Digital Laser Thermometer (DLT), Multimeter, 12VDC Power Supply, Tape Measure, and a wooden balustrade to simulate the size and shape of a foam handgrip. The key component is a spool of resistance wire – an unlabelled spool of which I had.

The first thing I did was to read the literature that came with the purchased over grips and then use the multimeter to measure the resistance of each of the over grips: 3 Amp max current draw, hi-lo heat settings, 11 ohms (Ω) per grip.

So the commercial grips are expected to draw about 36 Watts of power – less than a set of auxiliary lights (typically 55 Watts & 4½ Amps).

I clamped as much of the resistance wire as I could along my bench and measured the exact length (56”) and resistance (4.35 Ω) then calculated that the wire had a resistance of 0.93 Ω/ft. Next I wound a length of wire tightly onto the balustrade simulating a heated grip – but didn’t cut the wire off the coil. Then I connected the wire to the power supply and turned it on and waited until it seemed to have reached a steady temperature that I measured with the laser thermometer and evaluated by gripping it with a bare hand. The results were:

<table>
<thead>
<tr>
<th>Measured Resistance (Ω)</th>
<th>Calculated Length (ft)</th>
<th>Measured Temperature (ºF)</th>
<th>Bare Hand Comfort</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.2</td>
<td>11'-0&quot;</td>
<td>182</td>
<td>Barely holdable</td>
</tr>
<tr>
<td>11.0</td>
<td>11'-10&quot;</td>
<td>170</td>
<td>Hot</td>
</tr>
<tr>
<td>12.0</td>
<td>12'-11&quot;</td>
<td>155</td>
<td>Toasty</td>
</tr>
<tr>
<td>18.0</td>
<td>16'-9&quot;</td>
<td>117</td>
<td>Warm</td>
</tr>
</tbody>
</table>

Each additional Ohm of resistance lowers the temperature by about 7½ ºF so to have two temperature levels 30 ºF apart a resistance of 4 Ω needs to be switched in/out.
So the intended circuit is:

The sketch on the left was what I developed on my workbench and semi-includes the physical routing of the wires that I was developing on the fly. The diagram on the right is the same circuit the way you might see it in a set of instructions or wiring diagram.

If you are planning to make your own heated grips and you have resistance (heater) wire with similar resistance to what I used it is still a good idea to run a quick check of the heat levels. If you don't have a power supply, use a 12 VDC battery. If you don't have a DLT then use your hands. Remember that in-house testing is far different than January at 60 mph – when in doubt go hot, you can always turn it off if it gets too hot.

Phase II – Hand Grips Build
The grips have decorative ends that can be removed by a single screw. My design will have the wires running inside
the handlebars through the end of the grips and back up the grip before returning the same way. Two small holes are
drilled through the end of the grip and the two ends of the 86” of heater wire is fed into and through the grips. They are
then mechanically attached to, and soldered to, a pair of wires. The use of flux is important when soldering to heater
wire. I also used heat shrink tubing to cover the joint, although this is not necessary.

Once soldered, the wires are pulled out of the grip until the joints are stopped inside the plastic end. They are then
bent over tightly and bent again at the edge of the grip to point directly up the outside of the grip. Two wraps of
electrical tape hold them in place.

Although the decorative end cap is plastic, it has electrically conductive plating over it so to avoid shorting the heater
circuit out this piece needs to be insulated. This is accomplished using a donut cut from a plastic sheet and a strip of
electrical tape. The insulated cap is re-installed to help hold the wires secure during the rest of the build.

I decided to wrap both ends of the wire in parallel (near thumb picture 2) because this seemed easier than running one
straight to the top then insulating it and wrapping it back down to the bottom. My choice was risky because if the wires
short out half way up the wrapping, then half the heater wire is effectively removed from the circuit and the remaining
wire will get about twice as hot. With the other method, a short only removes one wrap from the circuit with much less
effect.

The wrapping needs to be kept tight so that it doesn’t move in use. The wire is stiff and this is hard on the fingers. On
my first attempt the wraps were too far apart and I had wire left over when I ran out of grip to wrap on (picture 2). A re-
wrap solved the problem and I soon had the other end (where it forms a loop) taped into place. Next step is a
complete wrap with electrical tape pulled tight to help hold the wire in place when in use. Followed by a second wrap
for good luck and in case the heat affects the first wrap.

The next step is to cut the heat shrink tubing to the correct length, slip it into place and shrink it on. Picture 3 shows a
sliver of the tubing fully shrunken as compared to the grip with the tube shrunk into place.
With two grips completed they can now be tested. First test is to wire them in series like they will be on the bike and to measure the resistance – 12.9 Ω. Next test is to power them up in the same configuration and see how hot they get – about 130 ºF pretty quickly and still climbing – good enough to confirm that the circuit is working.

**Phase III – Resistor Construction**

The commercial units have a hi-lo switch that allows the rider to select either of two heat levels. Earlier I determined that about a 4 Ω resistor would be good to separate the two levels. Unfortunately, there are no resistors available locally that are close to that value. I decided to use the resistance wire to make my own resistor – after all I had just made two of them. The question of where to put that bulky resistor was easily resolved – I decided to put it inside the steering stem which is hollow and located right where I planned to locate the switch – in the black plastic trim between the handlebar clamps.

I used a highlighter marker to wind the heater wire on – pulling the pen apart until I had just the plastic cylinder. One wire down inside and out a drilled hole near the other end then winding the wire on making sure that the wraps do not short against each other. A triple wrap with electrical tape and the resistor is ready to be soldered to its wires.

**Phase IV – System Bench Test**

With all the components completed, I wired the entire system up on the work bench and tested it. The starting temperature at the end of August was 90 ºF. The LO setting (with the resistor in series) produced about 112 ºF and the HI setting produced 134 ºF.

Good enough numbers for me to proceed – although I would have preferred higher temperatures (less wire).
Phase V – Mounting on the Bike

The decision to wire through the handle bar rather than outside it was made to allow the throttle grip to be twisted and a long length of wire to accommodate the rotation. The consequence of this is that a hole is needed for the wires to get out of the bars. I loosened the bars and rotated them fully forward to access the bottom of the bar (for drainage purposes). I decided to use a slot so that bullet connectors could be used to connect and disconnect the entire system without damaging it. To make the slot, I centre punched and drilled two holes then used a Dremmel tool with a cut off disk to remove the material between the holes. Between the Dremmel and a set of files all the sharp edges were smoothed.

The spool of resistance wire makes a good fish so it was easy to pull the wires through the bars from the ends to the centre (pic 3 see hanging grip and spool on the tank). The wires were cut to final length with the grips hanging – this would allow the system to be removed and re-installed at a later date.

I decided to take power from the fan circuit (switched and fused 10 Amps) reasoning that the fan is not likely to be needed if the weather is cold enough for me to want to use the heated grips. As a bonus, the fuse is very close to where I needed the power – on my bike the fan fuse is on the right side under a plastic panel by the steering stem. I used a splice on connector (picture 4 Blue) to splice in AFTER the fuse.

I already have two, illuminated, SPST (single pole single throw – or on-off switches) mounted in the plastic cover so finding room to mount another switch and miss the handlebar was tricky.

Mounting the cover with nine connectors and wires fitting around the handlebars was tricky to be sure and I do not recommend that anybody without a lot of DIY experience try this. If you don’t already have the first two switches in place is it a lot easier and should be within the abilities of any competent DIYer.

I also plan to buy the correct size of heat shrink tubing to cover the clutch and brake levers to insulate them for cold weather riding. I have ridden to work (1/2 to 3/4 hour at 60-100 kph) at least once every calendar month for the last 2-1/2 years. I don’t mind the cold but two tires and ice or snow is more than I am comfortable with.

Have a look at some of my other articles for how I winter proofed my bike.

Happy in Hondaland,

MagnAndy