

# Instructions for embroidering and testing the HC sample

## IMPORTANT

**As electricity is involved in this demonstration, please consult an electrician or smart textiles specialist before to connect the thread to any power source. Madeira provides this example without guarantee and takes no responsibility for the consequences of its usage.**

The example contains:

- a demonstrator for heating
- ways of changing the resistance for a certain surface, by embroidering multiple lines
- a demonstration of textile insulation

## Materials needed:

- 1 cone x HC 40
- 1 cone x Polyneon 40
- under thread e.g. Burmilon 120/2, magnetic sided bobbins
- needles size 75/#11
- a fabric and a backing which behave safely when warmed
- your usual embroidery machine
- alkaline 9V battery 6LR61 (do NOT use Li-ion batteries for this test!)
- optional: cables for the connection to the power source

Use the DST file and thread's order overview to embroider this example. We recommend embroidering HC 40 for this sample at a speed of app. 620 stitches / minute. Take care to adjust the threads tension.

After machine embroidering the sample, you can start testing. **Please keep yourself safe and run the tests only after receiving advice from a specialist or under supervision.** Use an insulated surface.

## Testing the heating

You can put the two open circles in contact with a battery or connect them to a battery or power bank with the help of suitable cables. This example is created so that the thread will warm gradually.

- Do not keep the battery connected for too long and disconnect it immediately when the thread gets hot.
- This is just an example and does not serve as a prototype for product development. A suitable way of embroidering the thread for creating a commercial product needs to be developed by the product development team of the customers.



Note: the HC threads are able to reach different temperatures. They can get warm very fast or slower, depending on the way they are embroidered and on the strength of the electrical charge connected to them. The main purpose of the HC threads is to conduct electricity and they can be used as top and / or under threads for smart textiles applications of low-voltage (< 9V). They do not get warm just by being connected to a power source but only when embroidered in specific ways.

## Testing the multiple lines of stitches

You can measure the resistance by placing the crocodile clips of a multimeter at the ends of each embroidered line. You will notice that the traces with multiple lines of stitches have a lower resistance.

## The textile insulation

It can be used to add robustness and protect the conductive traces and helps changing the colour.

