

## Strain Sensing Seams for Monitoring Body Movement

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**Abstract :** Strain sensing seams have been developed by integrating conductive sewing threads in different types of seams design on a fabric typical for sports clothing using sewing technology. The aim is to have a simple integrated textile strain sensor that can be applied to sports clothing to monitor the movements of the upper body parts of the user during sports. Different types of commercially available sewing threads were used as the bobbin thread in the production of different architectural seam sensors. These conductive sewing threads have been integrated into seams in particular designs using specific seam types. Some of the threads are delicate and needed to be laid into the seam with as little friction as possible and less tension; thus, they could only be sewn in as the bobbin thread and not the needle thread. Stitch type 304; 406; 506; 601;602; 605. were produced. The seams were made on a fabric of 80% polyamide 6.6 and 20% elastane. The seams were cycled(stretch-release-stretch) for five cycles and up to 44 cycles following EN ISO 14704-1: 2005 (modified), using a tensile instrument and the changes in the resistance of the seams with time were recorded using Agilent meter U1273A. Both experiments were conducted simultaneously on the same seam sample. Sensing functionality, among which is sensor gauge and reliability, were evaluated on the promising sensor seams. The results show that the sensor seams made from HC Madeira 40 conductive yarns performed better inseam stitch 304 and 602 compared to the other combination of stitch type and conductive sewing threads. These sensing seams 304, 406 and 602 will further be interconnected to our developed processing and communicating unit and further integrated into a sports clothing prototype that can track body posture. This research is done within the framework of the project SmartSeam.

**Keywords :** conductive sewing thread, sensing seams, smart seam, sewing technology

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