Leibniz-Institut
für Polymerforschung
Dresden

DRESDEN concept

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EMBROIDERED MEDICAL TEXTILES (EMT) Overview

Embroidery technology offers plenty of flexibility for designing textile structures. Traditionally, embroidery is linked with decorative textile refinement. Technical embroidery is a growing niche market and has established itself with the Tailored Fiber Placement (TFP) process developed at the IPF, especially for the production of lightweight, structural-optimized fiber-reinforced composite parts. In addition, technical embroidery opens up huge opportunities for the design of medical textiles.

Benefits at a glance

- Various design options via precise and defined setting of embroidery parameters
- Tailorable structural and mechanical properties
- Arbitrary geometry in plane
- Porous structures for hard and soft tissue regeneration

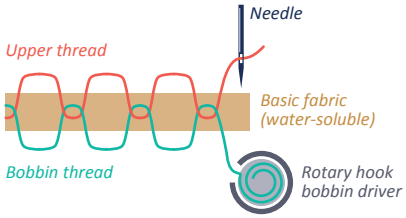
Stitch and structure formation

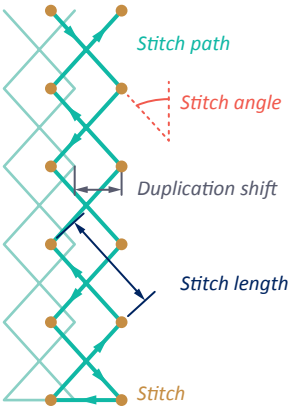
MULTI-NEEDLE HEAD
Directly embroidered medical textiles

Biocompatible threads can be processed directly by the multi-needle head. Loops are formed in several steps, with the needle guiding the upper thread and the hook feeding the lower thread.

According to the procedure of chemical lace manufacturing porous structures are achieved by processing the thread on a water- soluble base fabric is used, which is removed by washing out after the embroidery process.

The mechanical and structural properties of the structures are directly influenced by the embroidery parameters.



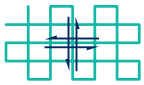


Zigzag assembly

Bidirectional extension

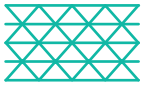
Zigzag and unidirectional assembly

Unidirectional extension



Running stitch in orthogonal assembly

Nonextensible structure



Running stitch in triaxial assembly

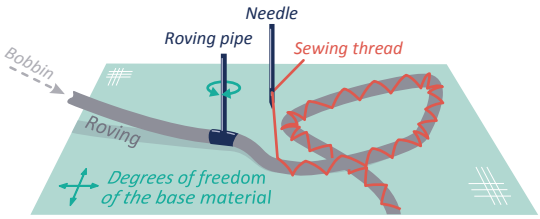
Nonextensible structure, enhanced stability

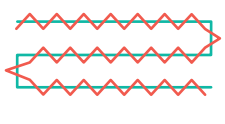
Blue arrows: Extension direction

TAPE HEAD
Fiber Placement of rovings, wires and tubes

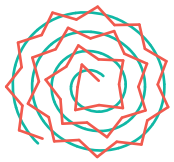
The outstanding advantage of technical embroidery over all other textile processing methods is that the thread material can be deposited entirely free at the two-dimensional level. The placement is limited only by the physical characteristics of the media.

The fiber materials are set down on the base material and finally fixed by direct embroidery using a zigzag stitch.



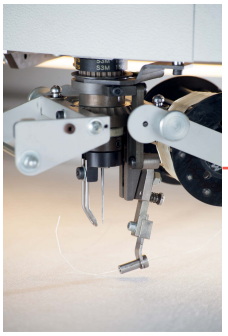


Meander assembly



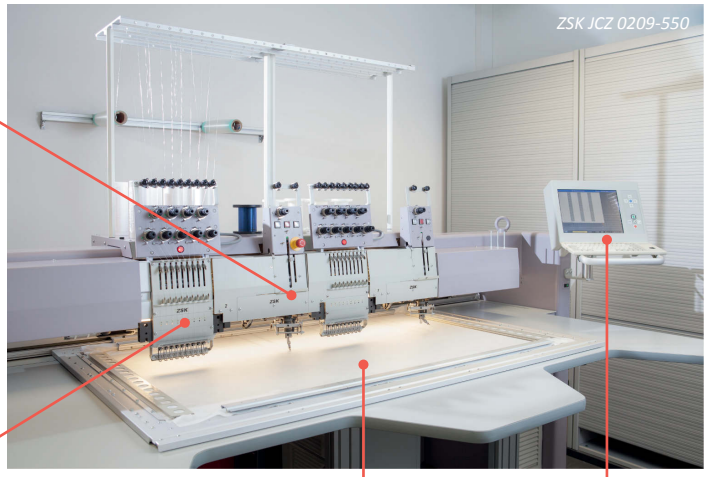
Spiral assembly

Facilities



Tape head for depositing and fixing rovings, wires and tubes

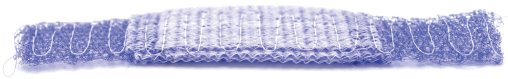
Multi-needle head for direct embroidery, different thread materials can be applied in one process



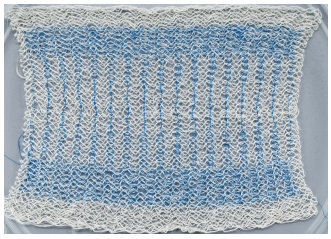
Embroidery hoop with removable base material

Computer-controlled embroidery

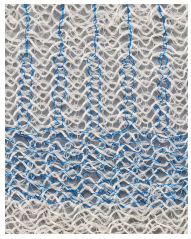
Examples for embroidered structures



Anterior Cruciate Ligament (ACL), consisting of three layers and three structural zones

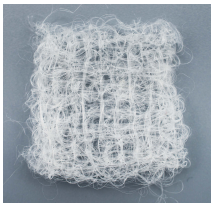


Hernia mesh with base pattern (white filament) and reinforcing structure (blue thread)

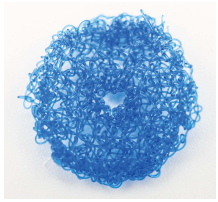


Magnified view of the mesh structure

Rolled structure with deposited multifilament



Voluminous structure by using bulk yarn



Circular scaffold with triaxial embroidery pattern

Stacked scaffold structure for long bone tissue engineering

Contact

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