

# TECHNICAL DATA SHEET

## SK1ST

### Automated unit for stitching and cutting of one layer and multilayer preforms

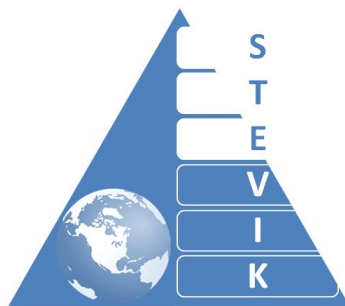
#### ► DESCRIPTION

The unique automated unit for stitching and ultrasonic cutting of dry preforms is made by «KSL Keilmann Sondermaschinenbau GmbH» and consists of programmable multiaxial manipulator, produced on the base of KUKA robot, and automated blocks. The unit does not have any analogues worldwide and it is used for preform creation in aircraft, aerospace and automobile industries.

#### ► UNIT CAPACITIES:

- Reinforcement of one layer and multilayer preforms of round cross-section with different diameter, thickness and length;
- Stitching of multilayer preforms in transversal direction over double curved surface;
- Connection of separated sub preforms in one complex three dimensional preform by one side stitching method;
- Additional lateral reinforcement with aramid fibers of complex preforms, made of carbon, fiberglass or organic fabrics, having irregular shape;
- One side lateral stitching with aramid fibers for creation of local reinforcements in complex three dimensional preforms;
- One side lateral stitching of multilayer preforms long curved space line to form bending line;
- One side stitching of three dimensional multilayer preforms with aramid fiber to create permanent local seal areas to guide resin flow during preform impregnation;
- One side local stitching of three dimensional multilayer preforms to create crack stoppers;
- Quilting over the surface of three dimensional preforms for layer compression to achieve defined thickness;
- Lateral reinforcement of foam fillers of aircraft three dimensional form by tufting technology.
- Carrying of single thread seam with one-needle yarn, which enters material upside with two needles.
- Lay out and cutting along the outline of one layer and multilayer preforms.





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### ► COMPLETENESS OF SET

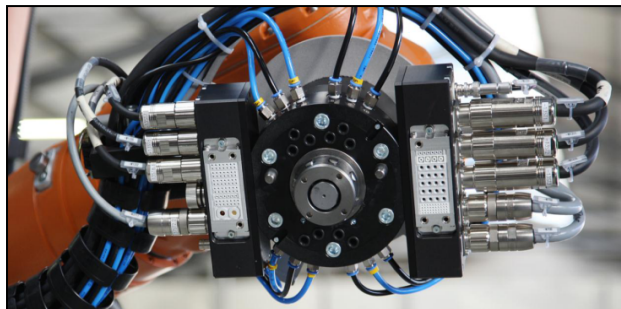
Following elements and blocks can be supplied, depending on aims and demands for process standardization:

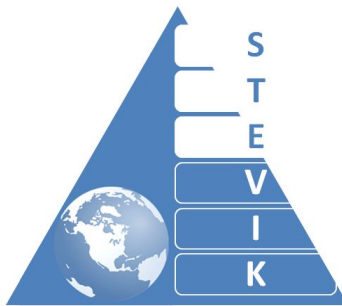
- Multiaxial manipulator with CNC with safeguard and booster frame
- Automatic tool swapping device, mounted on manipulator
- Head of one side stitching for blind stitch
- Head of one side stitching with tufting technology
- Biangular head
- Head for ultrasonic cutting
- Roving winding workstation for bobbins of tufting heads
- Tool set for automatic head swapping
- Device for automatic swapping of stitching heads
- Specially developed software

### ► MULTIAXIAL MANIPULATOR

Manipulator has 9 controlled synchronized axes, provides working with tufting head and is adapted for mandrel replacement during braiding machine function. Unit provides automatic change of tufting and cutting heads from tool set in 60 sec. Electric and pneumatic system connections run in pre-set automatic mode without operator assistance.

Manipulator positioning accuracy is  $\pm 0,06$  mm. Manipulator frame provides increase of manipulator access range while ergonomic high of manufacturing for operator is 910 mm.



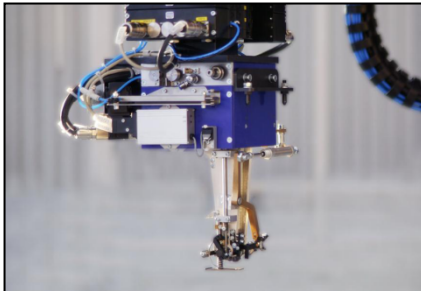


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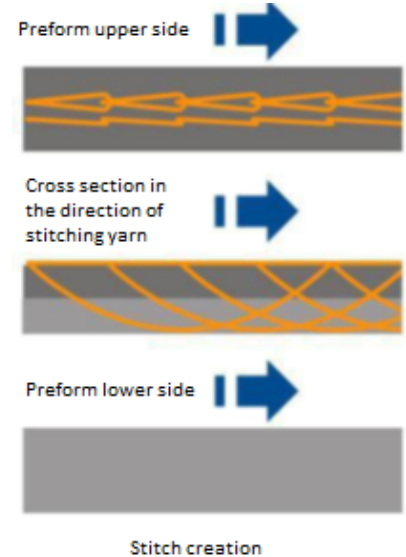
#### Head of blind switch



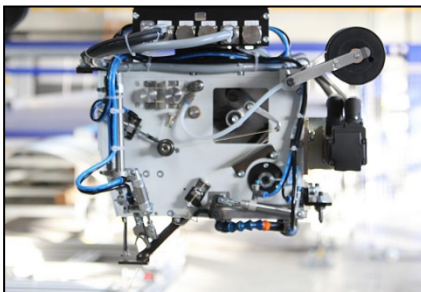
Stitch forming with one special yarn and one curved needle during one pass without needle penetration into a base. Stitch type – upper side thread chain plus additional chain.

#### Examples of usage:

Connection of separate sub preforms (for example skin stringers) in one complex three dimensional preform.



#### Two needle head

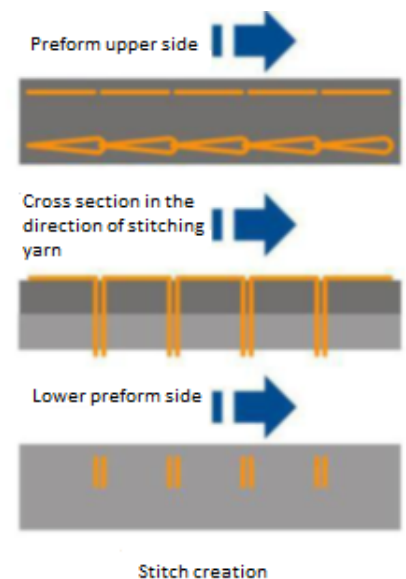


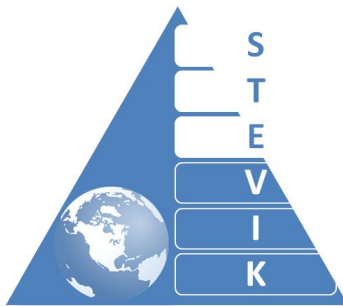
Single thread chain stitch seam is formed with one single needle thread, which is brought into the material by one curved needle from the top side of the material.

#### Examples of usage:

Quilting over the surface for layer compression to achieve defined thickness;

lateral reinforcement with fibers of complex preforms, having irregular form;  
one side local stitching of multilayer three dimension preforms to create crack stoppers.



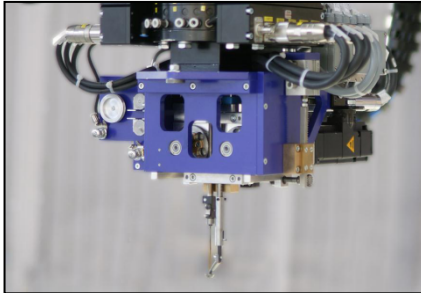


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#### Tufting head

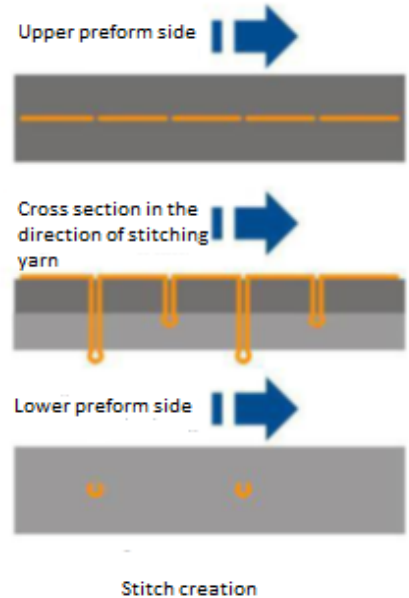


Stitch is formed by single yarn method with straight needle without interlace using a pad, at which the needle penetrates. Penetrating into material, the needle inserts the thread forming a loop at the lower end of the needle position. The loop can be placed either within or outside the material.

#### Examples of usage:

Reinforcement in transversal direction with pre-set angle of reinforcement;

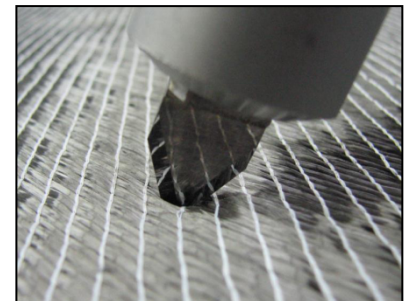
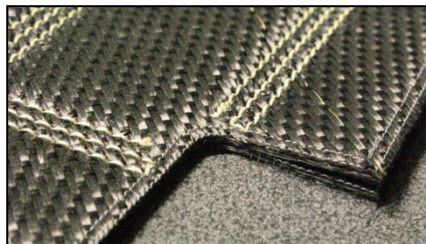
Reinforcement of foam filler aircraft multilayer three dimensional panels.



#### Ultrasonic cutting head



Layout and cutting of multilayer three dimensional preforms



#### ► NOTE

Please contact us for more detailed information as well as for system development according to your technical specification.

Standard warranty period: 12 months.