



ZSK TECHNICAL EMBROIDERY SYSTEMS
A DIVISION OF ZSK STICKMASCHINEN

TECHNICAL EMBROIDERY SYSTEMS

MACHINES TO PLACE AND EMBROIDER WIRES, FIBERS, AND TUBES





ATTACHMENT BY EMBROIDERY IS ONE OF THE MOST ACCURATE AND EFFICIENT PRODUCTION METHODS.

ZSK TECHNICAL EMBROIDERY SYSTEMS

ZSK TECHNICAL EMBROIDERY SYSTEMS enable the use of new and innovative techniques to place and fix different media on textiles and other flexible carrier materials.

Media as wires, fibers, tubes, and optical fibers can be placed flexibly and will be secured strongly through embroidery techniques like the ZigZag stitch.

E-textile and smart textile products can be realized in semi-fully automated.

METHODS

The different embroidery technologies developed by ZSK TECHNICAL EMBROIDERY SYSTEMS enable a wide scope of products, applications, and methodical procedures to be implemented for specific design goals and constraints.

Examples

- Integration of wire into fabrics for heating and sensing (e.g. moisture, temperature, stretch) applications, via Tailored Wire Placement (TWP)
- Fixation of fibrous material like carbon, glass, basalt, aramid, natural, thermoplastic, ceramic fibers, producing near net shape preforms via Tailored Fibre Placement (TFP)
- Placement of LED and/or RFID and electronic chips via Technical Sequins Devices. LED or electronic chips.
- Embroidery with conductive yarn to create textile electrodes for body signal monitoring (e.g. ECG) or electro stimulation (EMS or TENS) or embroidered connectors between electronic parts and textiles (conductive paths and connection pads).

To obtain these widely varied applications, ZSK TECHNICAL EMBROIDERY SYSTEMS provides configurable machinery with three different embroidery technologies. Each of these three technologies is obtained by a specific embroidery head: W-Head for fiber or wire placement, the F-Head for standard embroidery, and the K-Head for textile electrodes.

These three different embroidery heads can be freely combined with each other on a single machine configured at the factory as a custom combination machine.

W-HEAD

ZSK's W-Head allows the laying of fibers, wires, and tubes onto a textile or a flexible carrier material. Using the W head, the following technical embroidery processes can be realized:

Tailored Fiber Placement (TFP) or Technical Application with Fibers.
Tailored Wire Placement (TWP) or Technical Application with cables.



F-HEAD

In technical embroidery, the F-Head (standard embroidery head used for decoration) is used to create functional fabrics through the use of conductive yarns and the automated implementation of electrical connections, LEDs and / or RFIDs through Function Sequin Device.



K-HEAD

The K-Head facilitates mass embroidery. With only one thread, the K-Head creates voluminous and soft surfaces.

In combination with conductive material, this technical embroidery head is ideal for producing high surface area sensors required for smart or medical textiles.



W-HEAD

PLACING WIRES

Currently, the placing of wire is an essential part in the production of many products from all spheres of life. Placing wire with ZSK's Technical Embroidery Systems is cost efficient, reliable, and environmentally friendly.

Today's most common application for laying of wires obtained by embroidery is the production of heated steering wheels with a market share of almost 100 % and heated car seats with a market share of over 10 %. Without any damage for the textile characteristics, especially the breathability and drapability, heating wires are easily placed on a textile substrate.

Placing wire with ZSK's Technical Embroidery Systems can be used for many other fields of application.

Applications include:

- Heated clothing
- Infrared heating systems
- Luminous textiles to improve security or comfort
- Embroidered RFID antennas
- Embroidered sensors on textiles for measurement of fill level, movement, temperature, moisture or stretch
- Embroidered circuits to integrate electrical functions

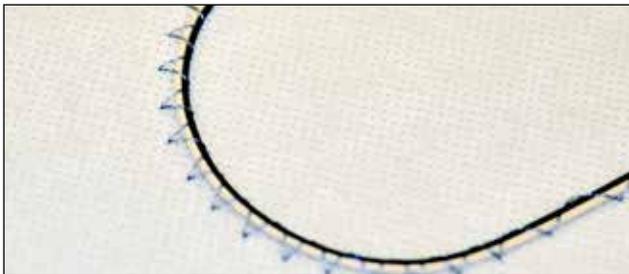


Fig.: Two wires placed simultaneously by the W-head



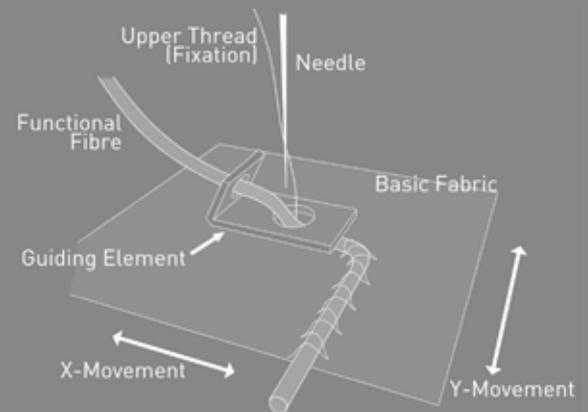
Fig.: Dog coats with heating wire (left) and LED wire (right) applied by ZSK W-head

PRINCIPLE OF W-HEAD EMBROIDERY

The media to be stitched is supplied by an active wire and fiber system to a guiding element close to the surface of the carrier material, commonly called fibre/wire foot.

The media is finally fixed by embroidery by an upper thread with a ZigZag stitch.

The carrier material, fixed by the clamping and stretching system, is moved by the pantograph, enabling to lay the media in any direction and quantity. The W-Head can process wires from 70 µm up to 12 mm thickness.



ADVANTAGE OF SUPERIOR FLEXIBILITY

Embroidery allows the absolutely free and flexible placing of the media at the 2-dimensional level of the carrier material. The placement is limited only by the physical characteristic of the media.

This is an essential difference and advantage between ZSK's Technical Embroidery Systems and other techniques like weaving, knitting, or even braiding, for many technical applications.

TFP - TAILORED FIBER PLACEMENT

Placing Fibers

TFP is an innovative technology that allows you to create reinforced fabrics, more commonly called ,preforms', applying and fixing fibrous materials in the required directions and quantities. All this completely in a fully automated way.

The fibers mainly used are carbon fiber, glass fiber, and thermoplastic fibers; however natural fibers, rather than basalt, aramid or ,combined' fibers are also used by our customers.



TFP technology inevitably plays an important role in the composite materials industry since allows you to produce precise preforms while reducing drastically:

- waste of material
- production costs
- production times

Further advantages of TFP technology, are:

- high precision in positioning the fibers making preforms with highly localized reinforcements, in the more critical areas
- possibility of combining multiple fibers within the same preform
- absolute freedom to create different thicknesses (up to 7mm) within the same preforms
- Highly automated and scalable technology

Composite components that benefit from technology TFP and its production advantages are not only found in the automotive sector, but also in the sports sector and in the industrial one.

Among the major application examples, there are:

- Car rims, arms for suspensions, shoe soles
- Protective equipment; for example helmets
- Wind turbines
- Bicycle saddles and rims



TAILORED TUBE PLACEMENT (TTP)

Placing Tubes

The W Head can be used also to place tubes of several diameters on a textile structure

Examples of use:

- Integration of tubes into textile reinforced concrete e.g. for heat exchange systems
- Suits and vests with tubes for cooling purposes
- Pipe systems for fluids of any kind applied to a textile structure or a flexible carrier material
- Ducts for electrical cables and connections as a cable harnesses applied to a textile structure or a flexible carrier material



F-HEAD

The F-Head is the most commonly used embroidery technology, often referred to as standard embroidery. By using this standard technology with a satin or running stitch with conductive threads, many applications for Wearables, E-Textiles and Smart Textiles are possible. Due to several available attachments like sequin, cording, Hot Air Cutting, or PCB Placement devices the F-Head can be used for a wide variety of technical applications.



Fig.: ZSK LED sequins automatically integrated to light up the eyes

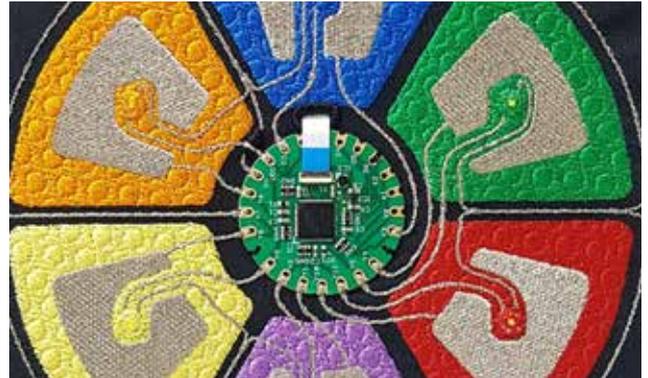


Fig.: Embroidered connections to the ZSK E-Tex Board with embroidered control elements

PRINCIPLE OF F-HEAD EMBROIDERY

The loop forming at the so-called double lockstitch happens in several steps. The needle leads the embroidery yarn and the hook at the bobbin the lower bobbin thread.

First, the needle will pierce the textile material, at the same time the hook at the bobbin rotates and picks the bobbin thread.

Now the hook passes through the loop of the upper embroidery yarn. The needle leads back and the hook turns further on into the start position.

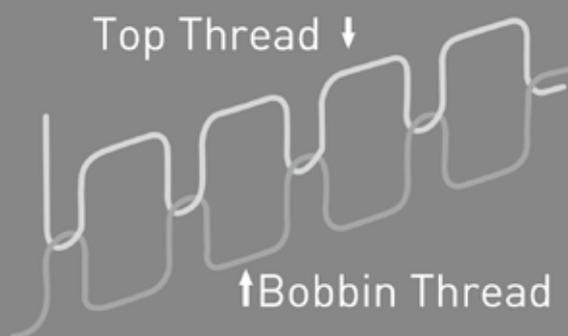


Fig.: Automatically placed Bosch PCB by ZSK PCB Placement Device



Fig.: Copper wire (70 μm) embroidered as bobbin thread



K-HEAD



The K-Head creates moss embroidery. This single thread system creates loops at the surface of the carrier material. Voluminous surfaces will be generated by the compact placement of the stitches.

An actuator system with four separate single motor units supports the customization of parameters like the height of the loops, the presser foot or the inclined position to satisfy required needs.

Moss embroidery associated with electro conductive yarn is the ideal combination for products from the fields of Smart Textiles, Wearables and Medical Textiles. At these groups, textiles are equipped with additional functions like sensors or actors.

Fields of Application

- Workaday clothes and workwear with integrated electrodes for ECG or EEG for e.g. long-term monitoring of at-risk patients or high-risk groups
- Custom-fit and high-individualized textile electrodes for e.g. electrophysiological techniques to stimulate dedicated muscle fibers
- Textiles like braces for electric stimulation therapy at sports, fitness, or medical rehabilitation



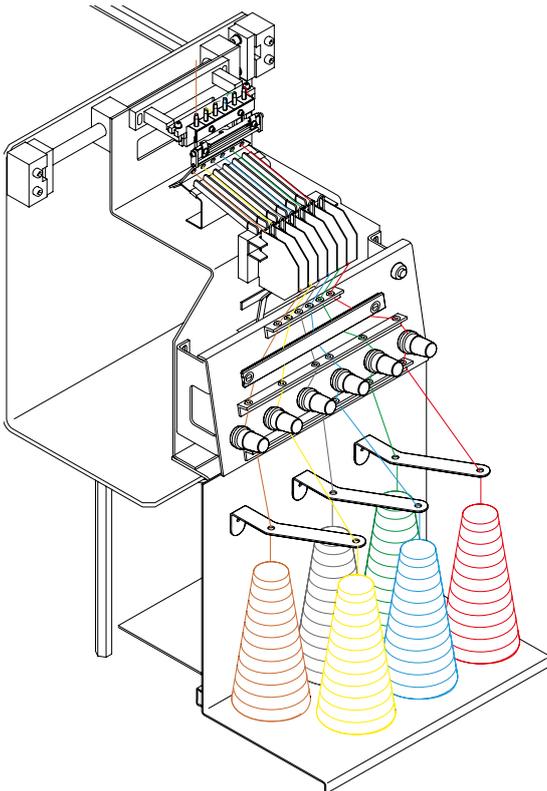
Moss embroidery - volume by compact stitches



Moss embroidery - close detail

K-Head Supply System

ZSK Technical Embroidery Systems with K-Head offer a special supply system for the working thread which is positioned below the table. The system holds available six positions to provide fibers or conductive yarns with different characteristics.



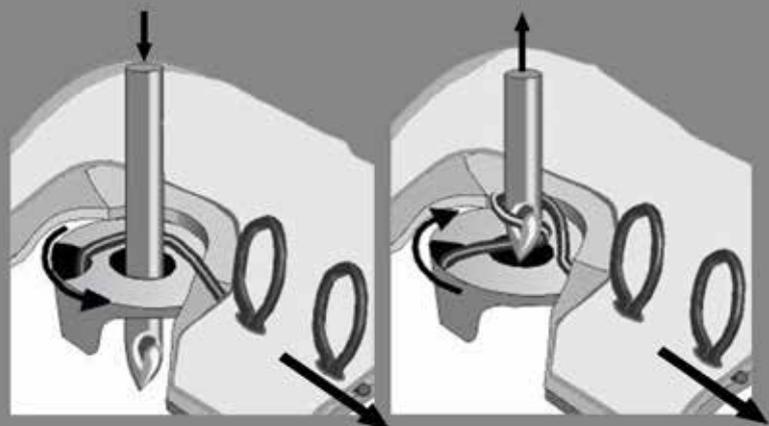
Graphical scheme of K-Head supply system



Neosmartnest: a smart hammock for neonatal care with moss embroidered electrodes for ECG monitoring by Kluba Medical GmbH [1]

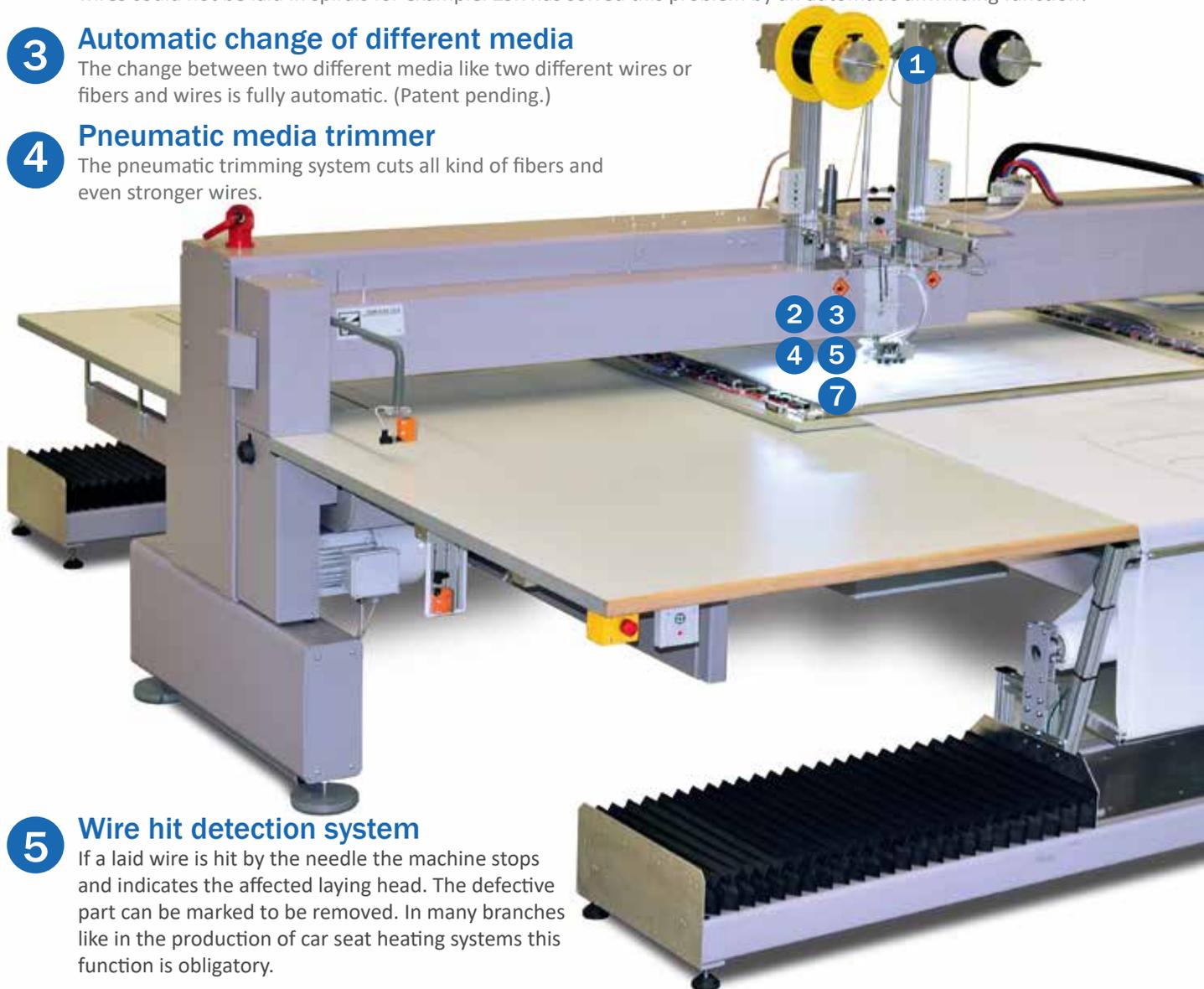
PRINCIPLE OF K-HEAD EMBROIDERY

The moss embroidery machines are built differently than traditional embroidery machines however use a similar embroidery technique. Moss embroidery is created by a one-thread system. In this system, the needle goes through the carrier material (1) and pulls the thread out from under the needle, plate side up. Then, a loop is created by a rotary motion of the needle (2) on the upper side of the carrier material. Repeating this pattern produces a moss-like surface.



OPTIONS

- 1 Active wire and fiber supply systems**
Two supply systems can be installed on each laying head. Each supply system can take wire or fiber rolls up to 10kg. A new function implemented detects the end of supplied media.
- 2 Automatic unwinding function**
The advantage to supply wires and fibers from large rolls has the disadvantage that the material has to be guided to the zig-zag layer by a system of pipes. That limits the possible rotation to 360 degrees. Because of this limitation wires could not be laid in spirals for example. ZSK has solved this problem by an automatic unwinding function!
- 3 Automatic change of different media**
The change between two different media like two different wires or fibers and wires is fully automatic. (Patent pending.)
- 4 Pneumatic media trimmer**
The pneumatic trimming system cuts all kind of fibers and even stronger wires.



- 5 Wire hit detection system**
If a laid wire is hit by the needle the machine stops and indicates the affected laying head. The defective part can be marked to be removed. In many branches like in the production of car seat heating systems this function is obligatory.
- 6 Fast fiber laying**
For large objects a fiber laying speed up to 5m per minute can be reached
- 7 HV-TFP**
High Volume - Tailored Fiber Placement allows multiplying the productivity of ZSK technical embroidery systems by laying two or more rovings parallel at the same time.
- 8 Carbon protection for the electronics**
All electronic devices of a ZSK technical embroidery machine can be protected against carbon dust.

Pneumatic clamping and stretching system 9

A flat clamping and stretching system for the carrier material has been designed to automate.

Automatic pull through system 10

The carrier material is automatically pulled trough from roll to roll, back to front.

The system is available for all one head laying systems.

- Carrier material (woven, non woven, foils) up to 140cm wide is pulled automatically from back to front.
- The roll and re-roll stands follow the side movement of the pneumatic frame which allows to transport and re-clip the carrier material in any position of the frame.
- Transporting and re-clamping is possible in back to front and vice versa direction in the middle of a wire laying design.
- The length of wire laying design is just limited to the length of the carrier material available on the roll.
- The unrestricted changing of the transporting direction of the carrier material allows to have the start and end of a wire for example at one point for easy connection.

Semi automatic pull through system 11

In case of multi head systems (up to 11 production areas) the carrier material is pulled through from left to right. In connection with a pneumatic clamping and stretching system, the motor supported roll up loading time takes less then 2 minutes.

Automatic bobbin changer 12

The pneumatic bobbin changer for the under thread is equipped with a magazine for 7 full and one empty bobbin for up to 8 hours of running time.



SGW 0100-1375-1200

ADVANTAGE HIGH LEVEL OF AUTOMATION

A significantly higher efficiency can be achieved by the production of technical textiles by using our advanced automation techniques. Quality, production output and labour costs will benefit on a high level from the options which are available for any machine of ZSK's technical embroidery systems.

MACHINES

Machine models and laying sizes for technical embroidery machines

W - Head

Machine	No of Heads	Head Distance	Working Area Depth	Working Area Width	Machine Net Size (Length x Depth)
JCW 0100-500-700	1	-	600 mm	400 mm	1.570 x 1.730 mm
1 JGW 0100-650-700	1	-	600 mm - multiple	650 mm	2.000 x 1.800 mm
JGW 0200-550D-700	2	550 mm	600 mm	2 x 550 mm 1 x 1.100 mm	3.440 x 1.840 mm
CSGW 0100-1375-1000	1	-	900 mm	1.300 mm	4.100 x 2.460 mm
1 CSGW 0100-1375-1200	1	-	1.100 mm - multiple	1.200 mm	4.100 x 3.800 mm
CSGW 0100-1375-1500	1	-	1.400 mm	1.300 mm	4.100 x 3.460 mm
CSGW 0100-1375-2000	1	-	1.900 mm	1.300 mm	4.100 x 4.460 mm
CSGW 0100-1375-2500	1	-	2.400 mm	1.300 mm	4.100 x 5.460 mm
3 CSGW 0200-600-1200	2	600 mm	1.100 mm	2 x 600 mm	4.100 x 2.860 mm
CSHW 0200-600D-1200	2	600 mm	1.100 mm	2 x 600 mm 1 x 1.300 mm	4.900 x 2.900 mm
CSHW 0400-300Q -2000	2	900 mm	1.900 mm	4 x 300 1 x 1.800 2x900 mm	4.825 x 4.425 mm
CMCW 0200-900D-2000	2	900 mm	1.900 mm	2 x 900 mm 1 x 2.100 mm	5.690 x 4.460 mm
CMCW 0200-900D-2500	2	900 mm	2.400 mm	2 x 900 mm 1 x 2.100 mm	5.690 x 5.460 mm
1 CMCW 0600-600-700	6	600 mm	600 mm	6 x 600 mm	5.690 x 1.860 mm
CYCW 0600-1180-1500	6	1.180 mm	1.400 mm	6 x 700 mm	8.900 x 3.600 mm
3 CYCW 0600-1180-2000	6	1.180 mm	1.900 mm	6 x 700 mm	8.900 x 4.600 mm
CYGW 0800-800-1000	8	800 mm	900 mm	8 x 800 mm	9.275 x 2.460 mm
QYGW 1000-600-1000	10	600 mm	900 mm	10 x 600 mm	9.275 x 2.460 mm
CYGW 1400-480-1400	14	480 mm	1.300 mm	14 x 480 mm	9.275 x 3.260 mm
CZBW 0500-1500-2000	5	1.500 mm	1.900 mm	5 x 1.500 mm	11.540 x 4.550 mm
CZBW 0500-1500-2500	5	1.500 mm	2.400 mm	5 x 1.500 mm	11.540 x 5.450 mm
CZBW 1000-750D-1500	10	750 mm	1.400 mm	10 x 750 mm	11.540 x 3.450 mm
CZBW 1000-750D-2000	10	750 mm	1.900 mm	10 x 750 mm	11.540 x 4.550 mm
2 CZBW 1000-750D-2500	10	750 mm	2.400 mm	10 x 750 mm	11.540 x 5.550 mm
2 CZCW 0400-1800-1500	4	1.800 mm	1.200 mm	4 x 1.800 mm	13.000 x 3.460 mm
CZCW 0800-900D-1500	8	900 mm	1.200 mm	8 x 900 mm 4 x 1.800 mm	13.000 x 3.460 mm
CZCW 0800-900D-2000	8	900 mm	1.900 mm	8 x 900 mm 4 x 1.800 mm	11.560 x 4.460 mm
CZCW 0800-900D-2500	8	900 mm	2.400 mm	8 x 900 mm / 4 x 1.800 mm	11.560 x 5.460 mm

- 1** Pull Through System - Roll to Roll - back to front
- 2** Pull Through System - Roll to Roll - left to right
- 3** System on Request

Combi Head - F +W

Machine	No of Heads	Head Distance (W-W F-W)	Working Area Depth	Working Area Width (F+W W)	Machine Net Size (Length x Depth)
JCZA 0109-550-700	1+1	- 275 mm	600 mm	550 mm	2.000 x 1.730 mm
JGZA 0109-550-700	1+1	- 550 mm	600 mm	1.100 mm* 1.100 mm	3.440 x 1.840 mm
CSGZ 0109-825-1200	1+1	- 550 mm	1.100 mm	825 mm 1.300 mm	4.100 x 2.860 mm
CSGZ 0109-825-2000	1+1	- 550 mm	1.900 mm	825 mm 1.300 mm	4.100 x 4.460 mm
CMCZ 0209-900-2500	2+2	900 mm 450 mm	2.400 mm	2 x 900 mm 1 x 2.100 mm	5.690 x 5.460 mm 3
CYGA 0809-800-1000	8+8	800 mm 350 mm	900 mm	800 mm	9.275 x 2.460 mm
CZCZ 0409 -1800-1500	4+4	- 450 mm	1.400 mm	1.700 mm 1.800 mm	11.560 x 3.500 mm
CZCZ 0809-900-1500	8+8	900 mm 450 mm	1.400 mm	900 mm 1.800 mm	11.560 x 3.460 mm
CZCZ 0809-900-2000	8+8	900 mm 450 mm	1.900 mm	900 mm 1.800 mm	11.560 x 4.460 mm 3

Combi Head - F + K

Machine	No of Heads	Head Distance (K-K F-K)	Working Area Depth	Working Area Width	Machine Net Size (Length x Depth)
JCHA 0109-550-700	1+1	- 275 mm	700 mm	550 mm	2.000 x 1.730 mm

Combi Head - F + K + W

Machine	No of Heads	Head Distance (F-F F-K K-W)	Working Area Depth	Working Area Width (F+K+W W)	Machine Net Size (Length x Depth)
JGVA 0109-550-700	1+1+1	- 275 mm 275 mm	600 mm	1.100 mm* 1.100 mm	3.440 x 1.840 mm
CSGV 0109-825-1000	1+1+1	- 275 mm 275 mm	900 mm	825 mm 1.300 mm	4.100 x 2.460 mm
CMCV 0109-1470-2000	1+1+1	- 275 mm 275 mm	1.900 mm		

F - Head

Machine	No of Heads	Head Distance	Working Area Depth	Working Area Width	Machine Net Size (Length x Depth)
SPRINT 6 - LED	1	-	220 mm	420 mm	1.040 x 985 mm

* W-Head layer foot must be witched up



ABOUT

ZSK Technical Embroidery Systems is a division of ZSK STICKMASCHINEN GmbH, the leading German manufacturer of industrial embroidery machines „Made in Germany“.

With great expertise and experience in the textile machine construction, the company from the Lower-Rhine area has developed a broad range of applications for its embroidery machines.

Beside large machines for the challenges at the mass production and embroidery machines to individualize textiles, ZSK STICKMASCHINEN GmbH manufactures machines for laying and fixing fibres, wires and tubes, the so-called TECHNICAL EMBROIDERY SYSTEMS.

ZSK STICKMASCHINEN has been shaped this sector with the development of customized embroidery solutions since the 1990's.

Today ZSK's TECHNICAL EMBROIDERY DIVISION offer a wide selection of highly automated options enabling the usage of technical embroidery machines in large scale for the mass production of technical and innovative products.

SERVICE



Hotline

Sales and service partner in over 75 countries worldwide will help you when you need it.



Training Courses

Training courses for customers and partners on location or at ZSK Embroidery Academy, Krefeld or at the Training and Education Centre TEC in Seattle, USA.



Spare Parts

Guaranteed fast and global delivery and installation for over 10.000 available spare parts.



Technical Support

Trained experts and technicians that speak your language in more than 75 countries.

Email: service@zsk.de



ZSK TECHNICAL EMBROIDERY SYSTEMS

A DIVISION OF ZSK STICKMASCHINEN

Magdeburger Str. 38 - 40
47800 Krefeld
Germany

Online: www.technical-embroidery.com
Email: contact@technical-embroidery.com



facebook.com/ZSK.Stickmaschinen



twitter.com/zsktechembroid



instagram.com/zsk_stickmaschinen



youtube.com/zskfilm

Picture Credits

[1] Kluba Medical GmbH
Düsseldorf, Germany

Note

We reserve the right to change the data given in this catalog without previous notice and at any time.

The measurements given for the embroidery space may vary, depending on the embroidered goods or applicable conditions.

Any information to rotational speed may vary, depending on the applicable conditions, machine models or frame types.

No design or registered trademark on the products contained in this catalog may be used without prior permission.

ZSK - DIE STICKMASCHINE.