Single and multihead embroidery

Embroidery is used to decorate all kinds of fabrics by sewing thread in or onto it. Embroidery became a primarily mechanical task after the invention of the first embroidery machines in the 19th century. There are embroidery machines with only one head and others with several heads which can stitch the same motif onto several items at the same time.

Operation of embroidery machines

Nowadays embroidery machines are primarily used to embroider articles of clothing such as T-shirts, socks and caps. This is usually computer controlled. The fabric to be embroidered is first placed on an embroidery backing and then spanned into an embroidery frame. Based on the embroidery file, yarn rolls in various colors are laid in. Since embroidery heads are outfitted with several needles, yarn rolls need not be changed during the stitching process. The embroidery machine stitches the different yarns in succession.

Classification of embroidery machines

Embroidery machines generally fall into the flatbed or free-arm machine category. Pre-cut pieces are mainly embroidered on flatbed embroidery machines before the finishing process. Here the embroidery frames are located on a large, non-adjustable table. Flatbed embroidery machines can be equipped with up to 50 embroidery heads. Free-arm machines, on the other hand, are used to embroider finished goods, such as caps or T-shirts. These machines generally do not have more than twelve embroidery heads.

There is a further distinction between single- and multihead machines. Multihead machines are equipped with several embroidery heads, which simultaneously stitch the same motif on several articles of clothing.

Multihead machine: Free-arm machine from ZSK

Single-head machines: Flatbed machine from Tajima (left) and free-arm machine from ZSK (right)

Multihead machine: Flat-bed machine from Tajima

Different embroidery techniques

In addition to the traditional process, today's embroidery machines also allow for many other stitching techniques. This usually requires additional mechanical equipment.

Sequined embroidery

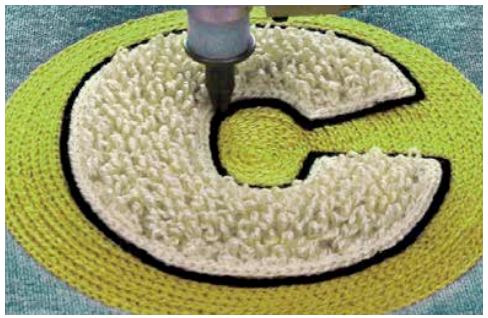
In sequined embroidery, very different sequins are attached to a backing. Sequins are fed to the embroidery machine on belts and backstitched onto the backing.

String and loop embroidery

In this stitching technique cord yarn is used to stitch a string onto embroidery backing. This technique is suited, for instance, to refined ornaments.

Moss embroidery

In contrast to traditional embroidery, moss embroidery is done with a single-thread system. The needle pierces the embroidery backing, picks up the thread under the needle plate and pulls it up. The loops that result from repeating the process create a surface on the top side.



3D embroidery

To create 3D effects in embroidery, foam material is glued to the plain cloth and stitched over. After overstitching, excess foam is removed from the embroidered fabric.

Needle system DB x K5 – for high functional reliability

The needle system DB x K5 has been specially designed for use in high performance machines. The main consideration was reducing skip stitches and thread breakage, maximum protection of thread and fabric, as well as loop pick-up.

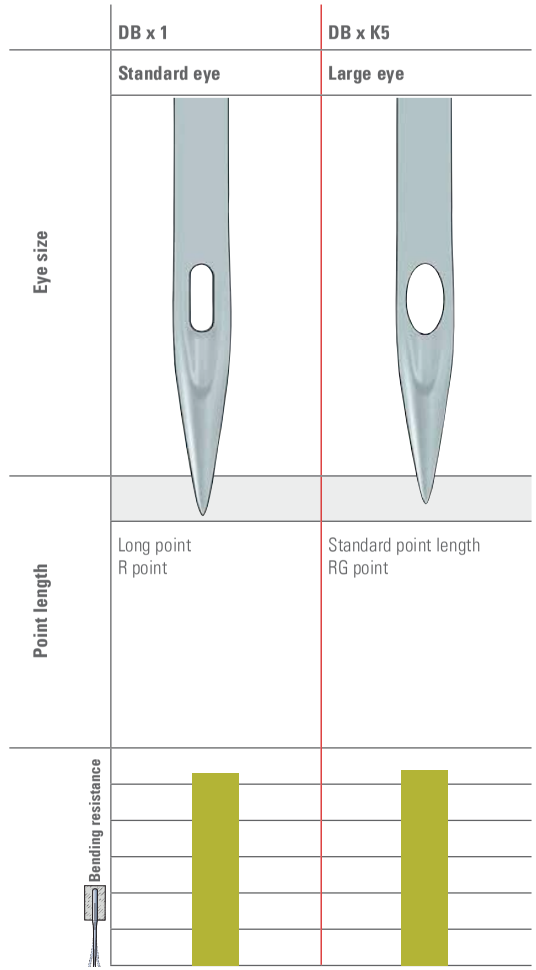
The versions

With its bending resistance, even the standard version of needle system DB x K5 stands above conventional needle systems normally used in embroidery. The constructional features of the SAN® 1 GEBEDUR® and its titanium nitride coating provide maximum wear protection with high stability. The blade construction of DB x K5 KK is the same as the standard version, yet the shorter shank means that bending resistance is lower.

Further needle systems used for embroidery

Along with the DB x K5, the needle system DB x 1 is also often used in embroidery. These two systems differ only in the length of the points and in eye size (for details see diagram). Needle system DB x 1 is suited, in particular in size Nm 55, for stitching very small lettering and for sequined embroidery.

Especially for moss embroidery, needle CE x 3 is used. Having a hook instead of an eye, it perfectly copes with the special requirements of this embroidery technique.



Comparison of needle systems DB x 1 and DB x K5

Special application needle DB x K5 SAN® 1 GEBEDUR®

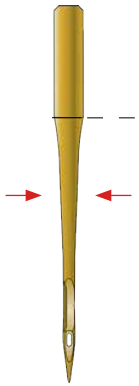
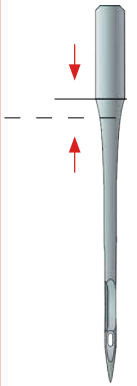
The features of special application needle DB x K5 SAN® 1 GEBEDUR® provide many advantages over the standard version. It is particularly suited to embroidery of sturdy products such as baseball caps and leather.

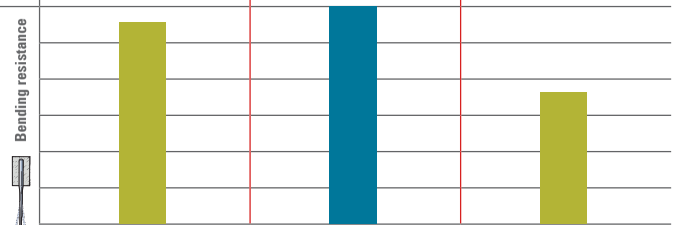
Features:

1. The reinforced blade boosts needle stability, reducing needle deflection and breakage.
2. The new scarf design with scarf chamfer leads to better loop pick-up, thereby reducing skip stitches and needle breakage; moreover it protects the hook.
3. The optimized geometry between eye and scarf also improves loop pick-up and further reduces the number of skip stitches.
4. The larger eye simplifies threading and facilitates smoother sliding of the thread in the eye of the needle.
5. The GEBEDUR® coating provides maximum protection against wear.

Areas of application:

- DB x K5: universal use
- DB x K5 SAN® 1 GEBEDUR®: universal use, intended for sturdy materials such as hats and leather
- DB x K5 KK: for Pfaff KSM machines, caps, sequined embroidery and 3D effects
- DB x K5 SS: for sequined embroidery

	DB x K5 Standard	DB x K5 SAN® 1 GEBEDUR®	DB x K5 KK
			
Shank length	Standard	Standard	Short
Point shape	RG (Standard)	RG (Standard)	RG (Standard)
Coating	Chrome	Titanium nitride	Chrome
Area of application	Standard needle for all common applications	Needle with very high stability and wear resistance; universal application	Needles for specific embroidery machines and applications, e.g. for 3D embroidery



Comparison of needle systems DB x K5 and DB x K5 SAN® 1 GEBEDUR® as well as DB x K5 KK

Point styles for single and multihead embroidery

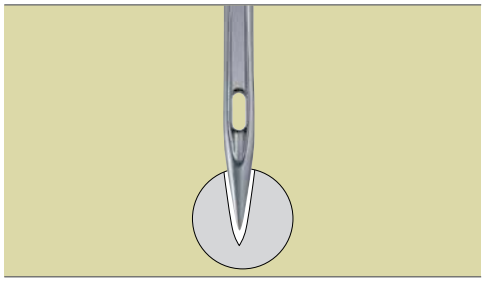
More information in
data sheet 'Cloth points'

The standard point on the DB x K5 needle – the RG point – is the point most suited to many types of embroidery fabric.
More demanding applications require other point styles.

Normal round point

For embroidery of textiles, leather, artificial leather and coated textiles

R

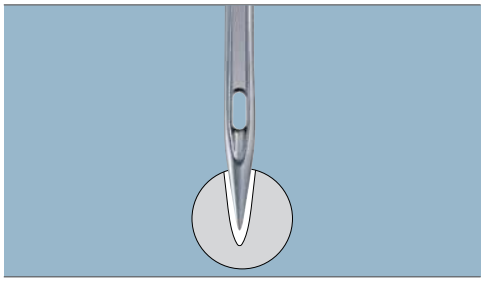


Example:
Delicate embroidery

Round point with small ball point

Universal point for embroidery of knitted and textile material such as microfiber

RG

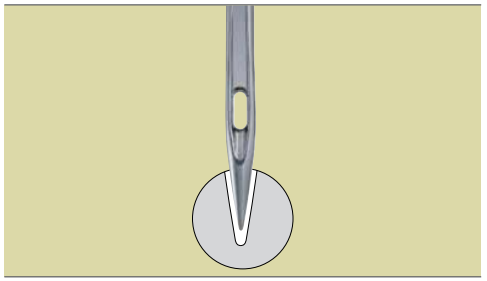


Example:
Conventional embroidery with no particular requirements

Light ball point

For embroidery of knitted fabrics

FFG

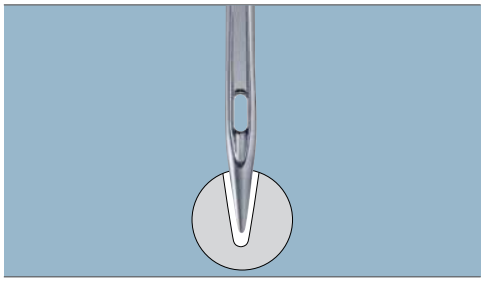


Example:
Logo embroidery on T-shirts

Medium ball point

For embroidery of elastic or coarsely-meshed sewing fabric and tulle

FG



Example:
Embroidery on tulle

The Groz-Beckert product range for single and multihead embroidery

Groz-Beckert designation	Point	Surface	Size Nm									
			55 7	60 8	65 9	70 10	75 11	80 12	85 13	90 14	100 16	110 18
DB x K5	**RG**	Chrome		•	•	•	•	•	•	•	•	•
DB x K5	FFG	Chrome		•	•	•	•	•		•		
DB x K5	FG	Chrome			•	•	•	•		•	•	
DB x K5	RG	GEBEDUR®					•	•				
DB x K5	FFG	GEBEDUR®				•	•					
DB x K5 KK*	**RG**	Chrome			•	•	•	•		•		
DB x K5 KK*	FFG	Chrome				•	•	•				
DB x K5 KK*	FG	Chrome		•	•	•	•	•				
DB x K5 R	R	Chrome		•	•	•	•	•		•		
DB x K5 SAN® 1	**RG**	GEBEDUR®		•	•	•	•	•				
DB x K5 SS**	**RG**	Chrome			•	•	•					
DB x K5	TR	Chrome						•		•	•	•
DB x 1	R	Chrome	•	•	•	•	•	•	•	•	•	•
DB x 1	FFG	Chrome	•	•	•	•	•	•	•	•	•	•
DB x 1	FG	Chrome	•	•	•	•	•	•	•	•	•	•
DB x 1	R	GEBEDUR®		•	•	•	•	•		•	•	•
DB x 1	FFG	GEBEDUR®		•	•	•	•	•		•	•	
CE x 3	R	Chrome								•	•	•

*short shank **very short shank

Comprehensively customized

The Groz-Beckert range of machine needles specifically for single and multihead embroidery covers different point styles, surfaces and sizes.

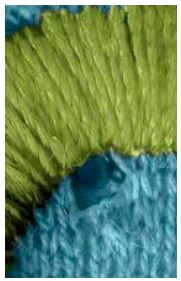
Frequent application problems and troubleshooting

From material damage to puckering: With the right products and some helpful tips and tricks from Groz-Beckert, sewing problems are quickly remedied.

Fabric damage during embroidery of knitted material

One of the most common problems in the embroidery of knitted goods is damage to the fabric. The causes can vary:

- Needle is too thick
- Wrong point style
- Damaged needle point



Example:
Knitting yarns tear when pierced by needle points that are too sharp or damaged. Needles that are too thick stretch the loops too wide and they burst.

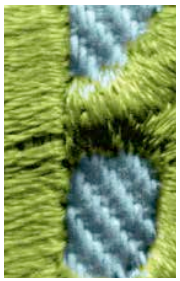
Excessive stitch density, incorrect orientation of the fabric and bad yarn quality – due to fibers that are too short or twisted – can damage the fabric. To prevent this, a needle with ball point is required. The RG or FFG point is recommended for delicate knits, for more coarsely-knitted material the FG point.

Solution:
With needle system DB x K5 Nm 65 with RG point, knitted fabrics can be embroidered smoothly and trouble-free.

Irregular embroidery appearance on woven fabric

Embroidery on woven fabric often results in irregular appearance of the embroidery design caused by irregular thread coverage. The causes include:

- Ball point too big
- Needle too thin
- Lettering too small
- Bad quality of fabric to be embroidered



Example:
Needle deflection due to a needle that is too thin or a ball point that is too big leads to irregular embroidery appearance.

Solution:
Using the DB x K5 Nm 75 with RG point ensures top results thanks to high stability and precise piercing of the needle.

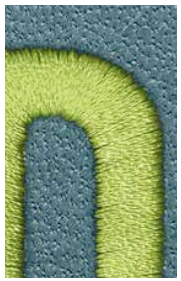
Recommendations for the embroidery on leather

Cutting points are not suited to embroidery of leather. Thread cutting, leather perforation and uneven needle hole openings when changing stitch direction would result. The RG point is a proven performer for delicate to medium-hard leather, and the R point for very hard leather. Moreover, the force required for the needle to pierce leather is relatively high, thus the needle must be highly stable.

Example:
Using a cutting point, a length- and crosswise cut is made in the leather. In extreme cases, the already embroidered leather can end up cut out.

Irregular embroidery appearance on leather

A poor embroidery appearance on leather is often caused by lettering that is too small and stitch density that is too high. But a needle that is too thick or bad quality of the leather can also cause poor embroidery appearance.



Solution:
Using DB x K5 SAN® 1 GEBEDUR® Nm 75 leads to trouble-free embroidery of leather. The embroidery is even and compact.

Puckering (distortion) during embroidery

Puckering occurs especially when very fine and dense fabric is embroidered, for example windbreaker jackets. Three factors must be considered:

- High stitch density: The more stitches there are in a design, the stronger the puckering.
- Thread size: The thicker the thread, the more pronounced is the puckering.
- Thread tension: The higher the thread tension, the more the fabric draws together, especially in long satin embroidery.

Needle size, however, hardly influences the degree of puckering.

Example: Puckering

Other applications

For 3D, delicate embroidery and applications with Lurex threads, Groz-Beckert will provide you with the right answers to common questions on everyday embroidery.

3D embroidery

3D embroidery embeds a foam material which is attached to the plain cloth to achieve the 3D effect. This leads to increased rubbing on the needle and on the thread. Furthermore, there is often cross stitching in the embroidered item around the embroidery motif, whereby piercing and thread-pull forces can vary greatly.

Solution:
Use DB x K5 SAN® 1 GEBEDUR®. Its characteristics include low penetration force, high wear resistance and high stability.

Delicate embroidery

The quality of delicate embroidery depends on several factors:

1. The finer the **embroidery base**, the better the stitching results. Fine lettering (≤ 5 mm) on knitted fabrics difficult or hardly possible.
2. Adapting the **stitching program** (has a huge influence on quality)
3. The finer the lettering selected, the finer the **thread**
4 **Needle size:** Nm 60-Nm 65
5. **Point shape:** fine fabric = R, knitted fabric = FFG or RG
6. Selection of suitable **backing (nonwoven)** (to stabilize)

Embroidery with Lurex thread

When Lurex thread is used for embroidery, needle size should be big enough for the Lurex thread to slide smoothly through the needle eye. Otherwise the thread may fray.
The quality of the embroidery program is also of major significance. Stitching density should not be set too high in order to prevent the Lurex threads from damaging one another in stitch formation.