

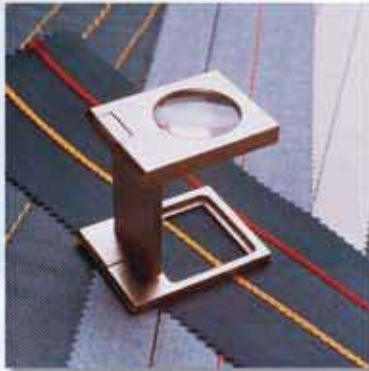
Service & Technology

Information for the sewing industry



Stretch it

The need for elastic seams



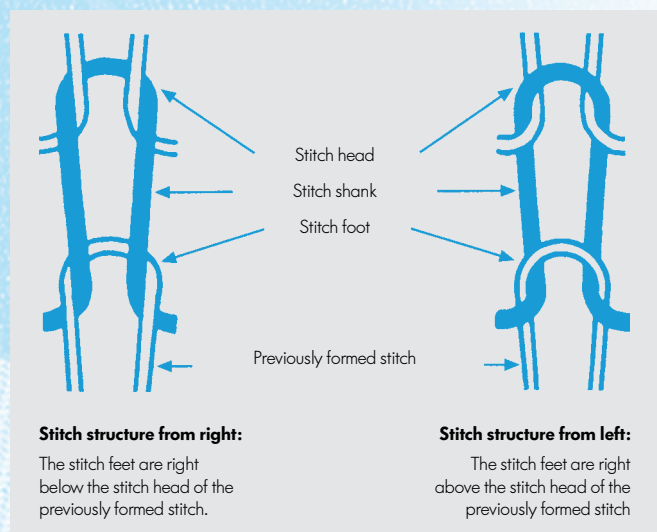
Stretch it – the need for elastic seams

No matter what you wear, there is always one piece that is stretchy. Not only underwear, more and more outerwear is elastic, too. Stretch jackets, trousers, shirts, and blouses are seen quite often. Stretch cardigans, T-shirts, and leggings are standard garments completing the wardrobe. Knitted fabrics and fabrics containing elastane are the basis of modern collections and very popular, and not only because of their wearability. And stretch fabrics and knitwear require elastic seams when it has to be a quality garment.

Whether knitwear or stretch fabrics – for a perfect sewability and a better understanding of the appropriate sewing conditions, it is helpful to have a quick look at the material.

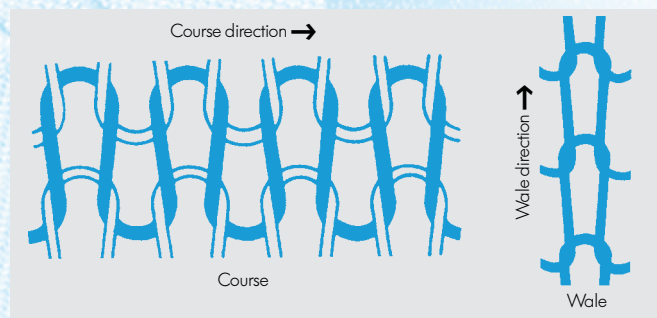
Knitwear

Knitwear is the generic term for all crocheted and knitted fabrics. Knitwear is described as a textile, where one thread loop is interlocked with another loop. The stitch is the smallest unit in a knitted fabric, and it consists of a head, two shanks, and two feet. Stitches are elastic and don't fill their space entirely.



Construction of a knitted stitch

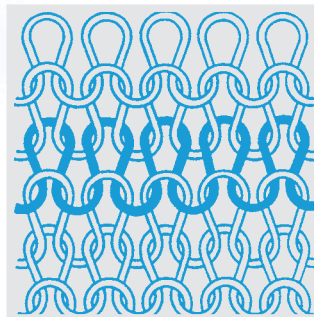
Neighbouring stitches are called a course, and stitches on top on each other are called a wale.



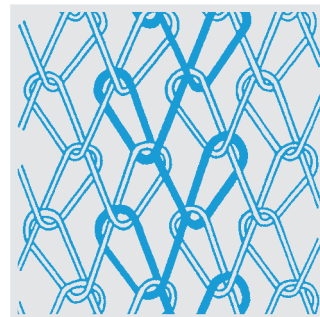
Courses and wales in knitted wear

Stitch forming techniques can be classified in cross-thread techniques for knitted fabrics and weft knitted fabrics, and warp-thread techniques for chainstitch fabrics.

Knitted fabrics are made of stitches, which are formed from a loop of thread, which is held in position by other loops of thread. A distinction is made between right and left stitches, which are also characteristic for the stitch patterns on the right or left side of the fabric.



Knitted fabric (left/left pattern)



Chainstitch fabric (right/left pattern)

In the chainstitch knitting technique, threads running in the longitudinal direction are looped together. The threads of one or more thread chains are linked with neighbouring threads by lateral offset.

Elastic fabrics

Elastic or stretch fabrics are fabrics which are able to expand and regain their original form, over and over again. There are different technologies to give fabrics a distinct and continuous elasticity. Currently, the most important production technique is the adding of elastane or elastodiene fibre materials. A share of only 2–5% elastane fibres results in a recover elasticity of 20–25% of the fabric. Sometimes elastane fibres are integrated as raw fibres, sometimes they are woven in, bundled or braided.

There are two types of elastic fabrics: Mono-elastic fabrics, which stretch in a longitudinal or horizontal direction, and bi-elastic fabrics, which stretch in both directions.

Processing

To make full use of the positive features of knitted and elastic fabrics in production, their typical characteristics must be considered from a sewing technical point of view, too. Elasticity is the key – also for the seams. They must “go along” with movement and must not “block” the elasticity of a fabric. The rule of thumb for realising elastic seams is:

The greater the thread reserve in the seam, the better the seam elasticity.

The reserve, that means the amount of thread worked into a seam, is determined by processing parameters. They determine seam elasticity, and for sewing stretch fabrics they must be chosen extremely carefully. Only the use of highly elastic sewing threads makes it possible to deviate a bit from this requirement. Through its high elasticity, **sabaFLEX** makes for an extremely high level of seam elasticity. In this case – and only in this case – seam elasticity not only depends on the thread quantity inserted into the seam, so the choice of sewing parameters is as important. In all other cases, when traditional sewing threads like **saba^C** or **Rasant** are used, it is essential to observe the above rule very closely.

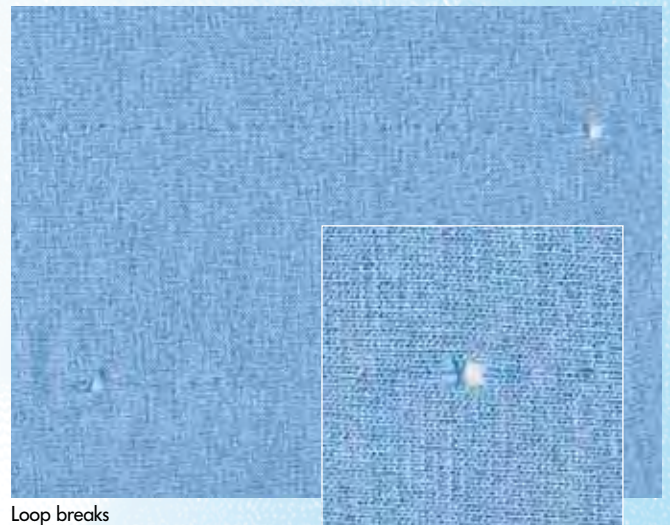
In addition to seam elasticity, the selection of suitable processing parameters is essential for perfect seams without any loop breaks or damage to the elastane.



Elastane threads sticking out of the fabric

Damage to the elastane occurs,

- if the penetrating needle damages or pulls out the elastane threads in the fabric;
- if the elastane threads are insufficiently bound in the fabric; with only little latitudinal strain, the elastane threads will then show along the seams.



Loop breaks

Loop breaks can also occur when the needle penetrates the fabric. If the stitches cannot expand as required, they will break or at least be damaged, and they will tear later during use. This knitwear problem often occurs with rigid finishes, because here, the stitches' flexibility and ability to expand is reduced. Low air humidity has a similar effect. At least with knitted fabrics made of natural fibres, dry air makes the fabric brittle and the stitches become inflexible.

Processing parameters

Stitch type

Selecting the right stitch type is decisive for thread quantity in the seam. Under standard sewing conditions

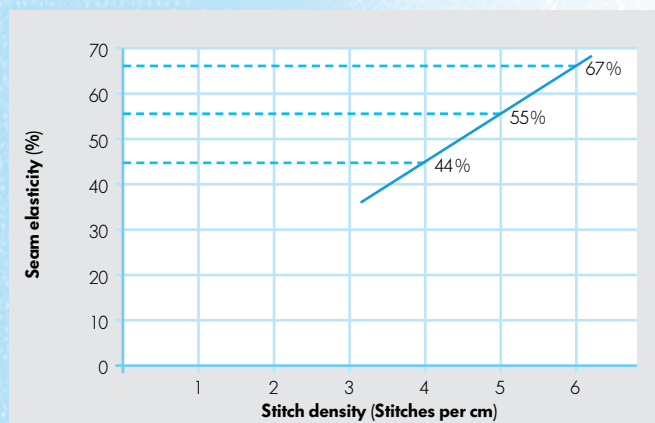
- the lockstitch uses 2.80 m of thread
- the double chainstitch uses 4.80 m of thread
- the 4-thread overedge stitch uses 17.10 m of thread

based on a seam length of 1 m. This clearly shows that an unfavourable stitch type does not provide a sufficient quantity of thread, so that the seams will break with very little tension. A classic example here is the cording seam. It is often not made with a 2-needle interlock stitch (stitch type 402), but rather with a lockstitch (stitch type 301) when the manufacturer does not own the required special sewing machines. The lockstitch, however, cannot provide ample thread reserve for sufficiently elastic cording seams (especially at areas such as the knees, which are exposed to a lot of movement), not even with an extremely low thread tension.

Page 9 shows an overview of thread requirements for all common stitch types under consideration of the standard sewing parameters. This might help when selecting the suitable stitch types.

Stitch density

The stitch density, too, has an influence on the thread reserve and thus on seam elasticity. The greater the stitch density, the greater the elasticity of the seam.



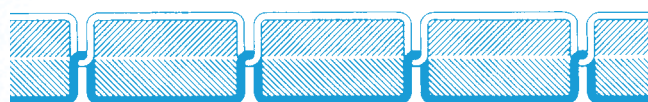
Influence of stitch density on seam elasticity (Material: fabric containing elastane; sewing thread: SABA^c 120; stitch type: double chainstitch 401)

Decisive for selecting the suitable stitch density is the material to be processed, together with the required seam elasticity. A stitch density of 5 stitches per cm is considered standard, depending however on the chosen stitch type. For extremely elastic seams, stitch densities of 7 or 8 stitches per cm can be necessary. Sometimes however, elastane or stitch damage or rippled seams may occur. High stitch densities can cause displacement pucker in elastic fabrics too.

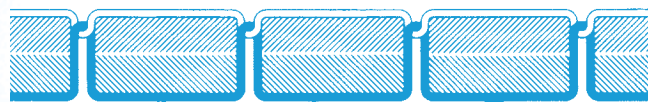
If the highest possible stitch density was chosen, but the seam elasticity is not sufficient, one should consider changing the stitch type or using **sabaFLEX** (see page 6).

Thread tension

The importance of thread tension for seam elasticity is often underestimated. Yet, perfectly set thread tension is a basic requirement for the greatest possible thread reserve in the seam – under the chosen sewing conditions – and for a perfect thread balance of needle and bobbin thread. Too high thread tensions will noticeably reduce the quantity of thread in a seam, so that the seams will break in the lengthwise direction under very little stress. Lockstitch seams are especially known for this problem. At the same time, an unfavourable thread balance of needle and bobbin thread can reduce seam elasticity. The pictures below show good examples for that. If the needle or bobbin threads in the fabric are almost completely straight, seam elasticity cannot be very high.



Seam pattern with optimal thread tension



Seam pattern if the needle thread tension is too high



Seam pattern if the bobbin thread tension is too high

The same can be applied to other stitch types. The correct thread systems' thread balances for all stitch types are listed in the overview on page 9. Special attention should always be paid to the needle thread tension, because the needle thread is the thread with the shortest travel within the seam in almost all stitch types, and therefore it is the weakest link as regards elasticity.

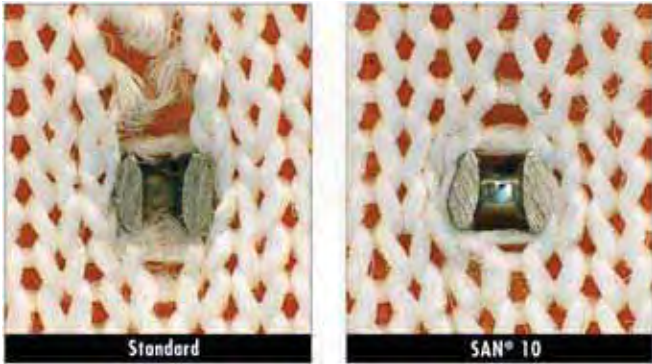
Needle

Choosing the right needle is decisive for preventing loop breaks or damage to the elastane. Only in very rare cases does damage occur despite the use of the best possible needle. Then it is up to the fabric supplier to improve the sewability of the fabric.

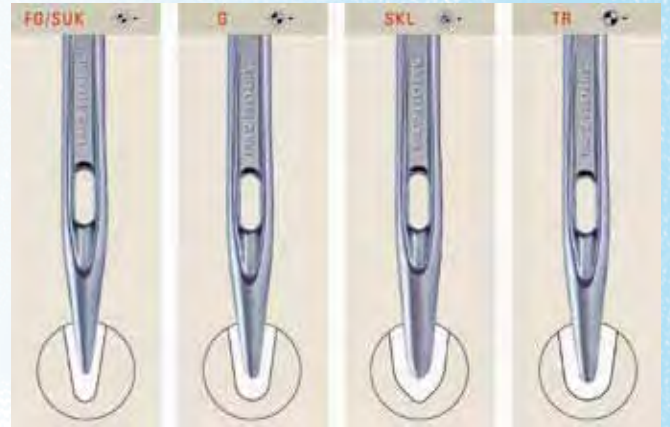
Needle size

The needle has a large influence on the occurrence of loop breaks or elastane damage. Therefore, the needles for sewing stretch or knitted fabrics should always be as thin as possible – the lighter and more delicate the fabric, the finer the needle. Reducing the needle size by as little as 0.05 mm can help prevent the occurrence of loop breaks.

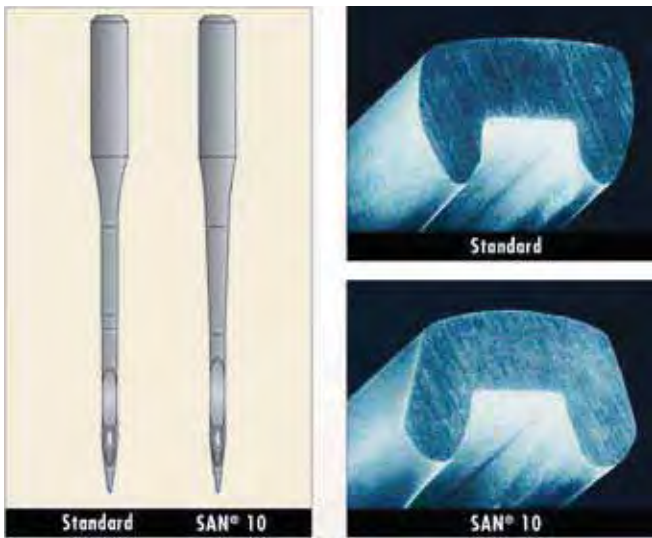
In practice, the use of SAN[®] 10 needles has proved to be well-suited for knitted and stretch fabrics. The SAN[®] 10 (Special purpose needle from Groz-Beckert) has been developed especially for the requirements of fine and delicate materials: The SAN[®] 10 needle provides higher stability through a design change in the blade and eye areas of the needle. Therefore, smaller needle sizes can be used to prevent loop breaks and elastane damage, without any adverse affect on the stability and the resulting consequences for the sewing process. The SAN[®] 10 needle of the size Nm 70/Size 10, for example, has the same stability as a regular Nm 75 needle/Size 11. But the thread displacement in the stitching hole can be compared with that of an Nm 65 needle/Size 9. This means maximum protection for the fabric threads and an improved sewing performance.



Cross-section of fabric-thread displacement in the area of the eye
Source: Groz-Beckert KG



Displacement points
Source: Groz-Beckert KG



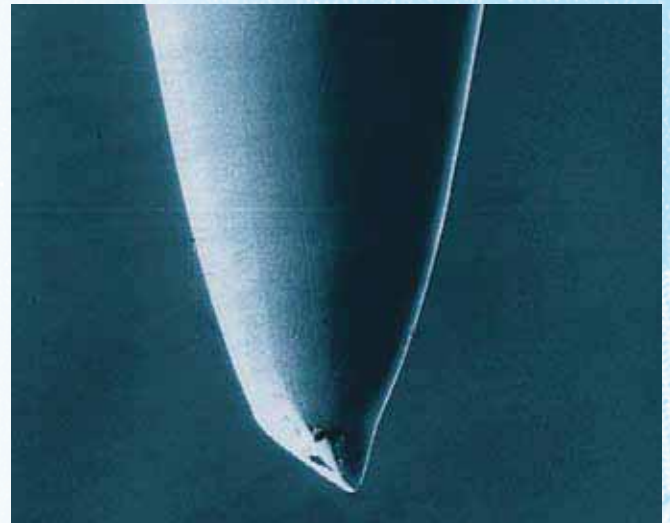
Special design of the SAN®10 compared to standard needles
Source: Groz-Beckert KG

Needle point

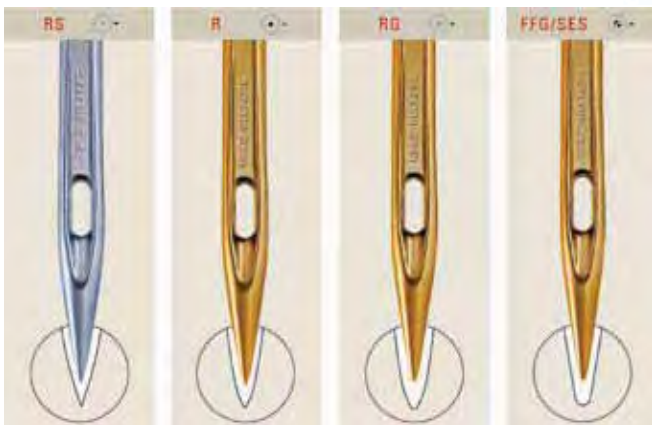
For stretch fabrics as well as for knitted fabrics, the use of needles with ball point is recommended, for example the slightly rounded point FFG/SES or medium ball point FG/SUK needles. These point shapes normally don't penetrate the elastane threads or the stitch threads, they rather glide by them. The standard version of the SAN® 10 needle has a small ball point.

Needle change

The slightest damage to the needle point leads to loop breaks or fabric damage when the needle penetrates the material. Therefore, the needle should be regularly checked and replaced, if necessary. Practice shows that frequent, regular needle changes clearly reduce loop breaks and fabric damage.



Damaged needle point
Source: Groz-Beckert KG



Additional sewing recommendations

Size of stitchplate hole

The size of the stitchplate hole must match the needle size. As a rule of thumb, one could say: the relation of needle size to stitchplate hole size should be 1:1.5. If the stitchplate hole is too big, the material is drawn up through the hole like a funnel. Fine knitwear and stretch fabrics can thus be damaged.

Sewing speed

If all of the above measures have been taken, and loop breaks or elastane damage still occurs, a reduction in sewing speed could be the solution. There is no doubt that this measure is very unpopular in production, and it can therefore only be used in very exceptional cases. As a first step, one should always check whether better knitwear finishes or a better integration of the elastane thread in the stretch fabric can solve the problem.

Seam construction and seam allowance

This point is important for processing elastane fabrics. To prevent elastane threads showing along the seams, it might be useful to increase the seam allowance. Sometimes changing the seam construction can lead to the elastane thread having a better hold in the fabric. With cased seams or double lapped felling seams, for example, the elastane threads are integrated into the seam stronger. Depending on the model construction, however, these changes can often not be realised in practice.

Sewing thread selection

If extremely high level of seam elasticity is not required, the use of the standard AMANN qualities, such as **saba^c**, **Rasant**, **Serafil** and **sabaTEX** will ensure a perfect seam quality. The correct sewing thread type and size can be selected as usual. Seam elasticity must then be ensured through the other sewing parameters (see above). If seam elasticity is to be provided by the sewing thread, highly-elastic threads must be used. **sabaFLEX** offers sewable elasticity.

Garments made of stretch fabrics or knitwear are often worn next to the skin. Therefore, the softness of the seams, which is strongly influenced by the sewing thread utilised, is of utmost importance. The question of which is the softest seam must be answered by sewing tests. Often **sabaTEX**, AMANN's bulk yarn, can be used for soft seams due to its specific characteristics. But sometimes, other sewing thread concepts make surprisingly soft seams, too. Over the past few seasons, AMANN Sewing Advisory And Product Service has gathered much experience in this regard – and will be glad to share its expertise with you (contact nt@amann.com).

Seam samples

As a rule, seam samples of individual qualities, and in the case of knitwear also the individual colours, should be created prior to production. This is the only certain way to avoid production problems and complaints. Prevention is the key – because loop breaks or elastane damage cannot be repaired. Products with loop breaks or elastane damage are sub-standard goods.

Therefore, one should produce seam samples under production conditions, which are then tested by hand. For this test, the joined fabric parts are pulled forcefully up and down and forth and back with both hands along the seam. This will then show whether there are any damaged stitches, which cannot be detected visually, or if any individual elastane thread is not sufficiently integrated into the fabric.



Seam sample manual stress test

Practice shows that the sewability of fabrics showing elastane damage in this type of test can only be improved slightly. With knitted fabrics, the influence and effects of the processing parameters listed above is greater.

Sewable flexibility: Use of sabaFLEX

It has long been a wide-spread opinion that elastic seams can be achieved only through ample thread reserve in the seam. And that there would be no need for elastic sewing threads. So until recently, there were no highly elastic sewing threads. Maybe because it was thought that they were not suited for industrial sewing and nobody thought about how sewable elastic threads could be produced for industrial conditions.

But practice has disproved this opinion. High standards in seam elasticity and the ever increasing use of elastic fabrics in outerwear production have challenged this view. AMANN's answer is **sabaFLEX**, a highly elastic sewing thread, which was developed in late 2002.

sabaFLEX is a multifilament thread consisting of PTT (polytrimethyleneterephthalate), a modified polyester material. It is available in the ticket numbers 80 and 120. The following chart shows the most important technical data.

	sabaFLEX 80	sabaFLEX 120
Ticket number (ISO 2060)	approx. Nm 50/3 (dtex 200 x 3)	approx. Nm 97/3 (dtex 103 x 3)
Maximum tensile strength (ISO 2062)	approx. 1,540 cN	approx. 740 cN
Elongation at break (ISO 2062)	approx. 68 %	approx. 68 %

This great elongation of almost 70 % is three times as much as conventional sewing threads and offers many advantages for processing elastic materials:

- With **sabaFLEX** – combined with the appropriate parameters – it is possible to achieve extremely high seam elasticity. Thus, it is possible to make seams that follow even highly elastic materials.
- The lockstitch, usually a big NO-NO in the processing of elastic materials, can be used with **sabaFLEX**. Thus, elastic materials processing is facilitated in many respects, and the designers can be given much more freedom.
- **sabaFLEX** provides an additional security reserve, even with perfectly sewn seams. So, broken seams due to material over-stressing in use are reduced significantly.

Applications

Its advantages become more distinct when you look at some practical applications. Especially the use of the lockstitch, which becomes possible with **sabaFLEX**, is beneficial for many detailed improvements, which not even come to one's mind at first thought.



Underwear

Processing step: binding edge with elastic satin ribbon.

Standard method

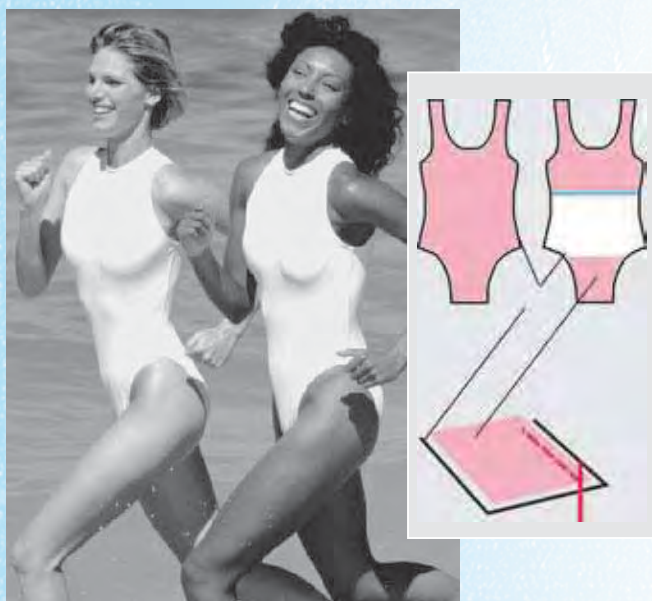
Satin ribbon is sewn on with a zigzag double chainstitch (stitch type 404). The bobbin thread chain is on the inside; it is slightly raised and can irritate sensitive skin. The look of the zigzag seam does not match the fine character of the satin ribbon.

Sewing with sabaFLEX 120

The elastic satin ribbon can be sewn on with a lockstitch. The result is a fine, flat seam. The straight seam line perfectly matches the elegant binder.

Swimwear

Processing step: attaching the lining to front and back parts.



Standard method

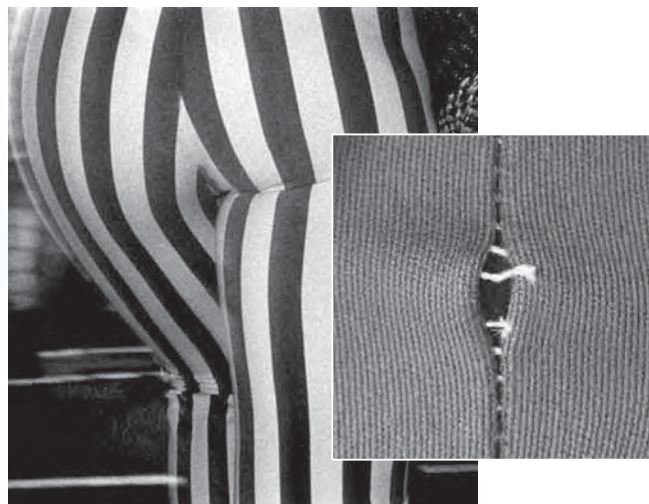
The first processing step is to attach the lining to the front and back parts using a basting seam. This facilitates the next processing steps. These basting seams, which have no function whatsoever later, are torn out manually prior to shipping. If these seams are not torn out before delivery, they will tear when the piece of garment is tried on in a store, and this will leave a negative impression with potential customers as regards quality.

Sewing with sabaFLEX

The basting seams are sewn with **sabaFLEX**. The **sabaFLEX** seam runs inside the final seam and is unseen on the finished piece. Because **sabaFLEX** basting seams are elastic, the processing step in which the basting seams are torn out is unnecessary.

Elastic Outwear

Processing step: closing back seams on trousers



Standard method

In order to achieve sufficient seam elasticity, the double chainstitch is recommended. Because many production sites – especially the ones in the women's wear field – do not have the required machinery; they still quite often use the lockstitch. They sometimes try to improve quality by sewing the seams twice, two seams closely together. However, this measure does not increase the seam elasticity in any way. It can only improve the seam strength – and only if the first seam is not damaged while sewing the second seam. The risk of splitting back seams remains, and it happens quite often, when the back seams are stretched.

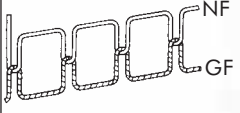


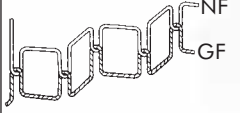
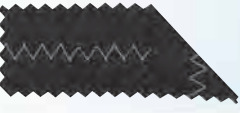

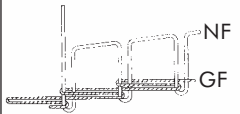


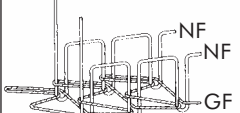


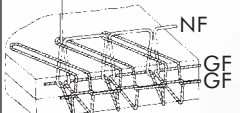





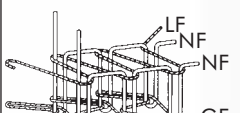





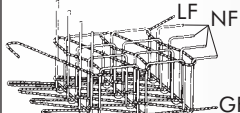


Sewing with sabaFLEX 80

Sewing the back seam with a lockstitch. A single seam can guarantee sufficient seam elasticity and seam breaking strength. Using double chainstitch machines are not necessary.

There are many more examples in the area of garment production, but also in other areas, such as medical textiles or shoes. Further information on this topic can be found in the **sabaFLEX** info brochure, which can be ordered from AMANN Sewing Advisory And Product Service at nt@amann.com.

Sewing thread requirement of usual stitch types in consideration to standard sewing parameters

For further information please have a look at our Service & Technology brochure „Determining your sewing thread requirements“ (see page 10)

Stitch Type	ISO 4915 DIN 61400	Seam Construction	Seam Appearance		Seam Width (mm)	Stitch rate (stitches/cm)	Thread Required (per 1 m of seam)	%
			Top	Bottom				
Lockstitch	301				–	4	NF: 1,40 m GF: 1,40 m 2,80 m	50 50 100
Lockstitch (Zigzag)	304				5	4	NF: 2,70 m GF: 2,70 m 5,40 m	50 50 100
Double chainstitch	401				–	4	NF: 1,70 m GF: 3,10 m 4,80 m	35 65 100
Two-needle double chainstitch (with common looper)	406				5	4	NF: 3,40 m GF: 8,40 m 11,80 m	29 71 100
Three-thread overedge stitch (Interlaced at needle hole)	504				5	4	NF: 1,70 m GF: 12,10 m 13,80 m	12 88 100
Four-thread overedge stitch (Interlaced at needle hole)	514				6	4	NF: 3,40 m GF: 13,70 m 17,10 m	20 80 100
Two-needle covering chainstitch (with cover thread)	602				6	4	NF: 3,40 m GF: 8,40 m LF: 5,10 m 16,90 m	20 50 30 100
Three-needle covering chainstitch (with cover thread)	605				6	4	NF: 5,10 m GF: 11,60 m LF: 5,80 m 22,50 m	23 52 25 100
Four-needle covering chainstitch (with cover thread)	607				6	4	NF: 6,80 m GF: 14,80 m LF: 5,80 m 27,40 m	25 54 21 100

NF = Needle thread · GF = Bobbin/looper thread · LF = Cover thread

Remember to allow extra thread for beginning and end of seam!

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All facts and figures are intended exclusively for your information.
All recommendations presuppose adjustment of the sewing conditions
to the appropriate sewing fabric.