



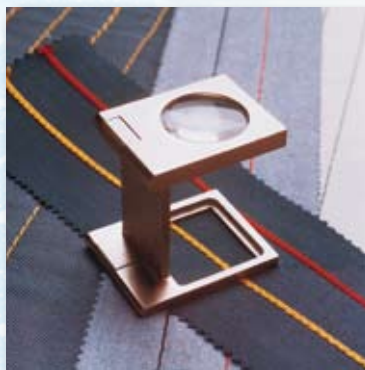
Service & Technology  
Information for the sewing industry



**PPE**

Protective Clothes  
Workwear

Sewing threads and  
sewing recommendations



# PPE – Personal Protective Equipment

## Material and seams with the ability to withstand extreme conditions

PPE – these three letters indicate a very important production segment and a great variety of different models and specifications. PPE stands for

### Personal Protective Equipment.

It covers an unusually wide application range from fire brigade to forestry and agriculture, to the construction industry, disaster control and more. It is composed of the protective clothing and work clothes segment, each having its own requirements profile:

### Protective clothing:

Constitute an essential part of work safety standards and measures for protection. Protective clothing protects the wearer from harm at the workplace which can involve life-threatening situations; protective clothing has to fulfil the highest safety standards. The clothing is to be provided by the employer and worn by the employee. A classic example for this type of protective clothing is the fire fighter's protective garments.

### Work clothing:

These are worn at the workplace and don't have to fulfil the safety standards that protective clothing must meet. It has no specific protective function against harmful influences or substances. The craftsmen's overalls are a prime example for this.

### Profession-related clothing:

These also have no specific safety function and can be distinguished from work clothes only in that they are specifically required by the profession involved. These are for instance all known uniforms (post, police, airline, etc.).

Specific standards, laws and safety regulations are applied in the production of PPE. Above all the production of protective clothing is strictly regulated through numerous provisions and precise quality characteristics. Consequently, this affects the choice of material, finishing and generally the sewing thread and the design of the seams. Specific know-how is required to be able to meet the right choice of materials and production method.

In addition to the general safety function, other functions have priority with work clothes and uniforms: In this case the clothing has to not only clothe the employee, but to deliver the employer's image to the customer and provide uniformity in appearance. Business fashion has to be stylish and incorporate an image. It is an important instrument to demonstrate Corporate Identity.

It also has to fulfil functional value requirements and be comfortable at the same time. In this regard the countless wear and care cycles, due to economic reasons, and the challenging conditions represented by industrial laundering are a special challenge. Appearance, quality and functionality must remain, even after being worn and washed many, many times.

Independent of the large variety of PPE articles, fundamental quality criteria apply as well as specified safety standards. These can be used as guidelines to reach high functional value and wearing comfort objectives. For this Service & Technology brochure, AMANN has compiled the most important data and recommendations to ensure the best sewing quality.



## Seam quality requirements

Seam quality and product quality are closely linked in PPE. Trousers with a broken closing seam, a chafed top-stitching seam on a pocket or a wavy seam on an easy care item ruins its functional value and thus the quality of the product. Reworking or repairing such problems is often very time-consuming and costly. It is better to secure the best seam quality by choosing the best processing parameters in advance.

Seams on PPE are exposed to extreme mechanical stress. The wear and tear through regular and rigorous usage plus the high number of laundry cycles are often underestimated. A clear indication of this fact is shown in the number of valid complaints. A careful analysis of all quality criteria of a seam can determine a suitable processing parameter to prevent seam damage and subsequent customer complaints.



Seam quality criteria

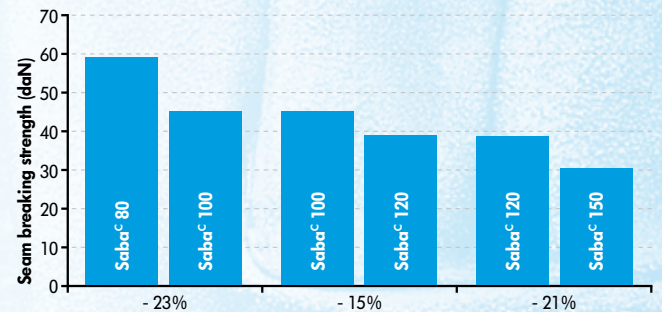
### Seam stability

It is important to check cross-resistance and seam shift resistance to assess seam stability. While the latter depends on the fabric, the right choice of sewing parameters is vital to cross-resistance. If a seam's cross-resistance is insufficient, the seams will tear in use later. A well-known example from practice here are broken back seams on trousers.

The following parameters are relevant for cross-resistance:

#### Thread

The choice of sewing thread – its raw material, strength, and construction – is the first factor influencing the level of cross-resistance quality. Changing the ticket no. from Saba<sup>c</sup> 80 to Saba<sup>c</sup> 100 will for instance cause a reduction in seam cross-resistance by approx. 23%.



**Reduction of seam breaking strength**  
 (Stitch typ 401; 5 stitches/cm; seam length of 50 mm; in accordance with EN ISO 13935)

Comparison of seam breaking strength of different thread strengths

#### Stitch density

Increasing the stitch density by only one stitch/cm for instance leads to a 25-30% increase in cross-resistance.

#### Stitch type

When comparing the most important stitch types for joining seams (the two-thread lock stitch and the double chain stitch), it is the two-thread chain stitch that should be favoured under the aspects of cross-resistance. In this case seam stability with the same thread type is approx. 10% higher.

#### Thread balance in the seam

Incorrect needle and bobbin thread balance can reduce cross-resistance by more than 20%.

These observations show how significant sewing parameter changes are, in particular for seam stability and stitch density. **Precise finishing parameter specifications and testing during production is very important.**

With the manufacture of PPE, seam stability values are frequently specified through standards or technical product directions. They are usually DIN EN ISO 13935-2 tested and specified in Newton (N). AMANN Sewing Advisory and Product Service is pleased to provide sewing recommendations that adhere to provisioned mechanical strength values.

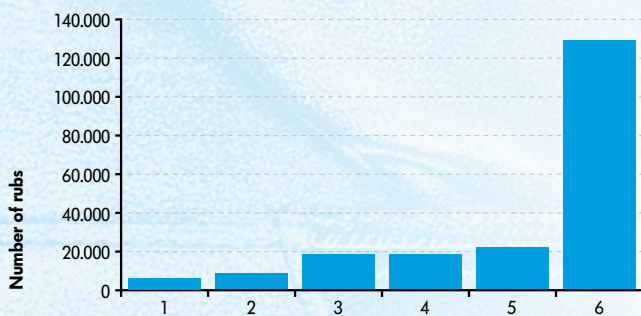
## Seam abrasion resistance

Chafed seams in heavy work and protective clothing are at the top of the complaints statistics list. In practice, the abrasion resistance of seams is often overestimated while the mechanical stresses are often underestimated. Points in the seam that will be exposed to extreme abrasion in use should therefore not be sewn using conventional methods.



Chafed seams - often reason for complaints with protective or work clothes

Above all seam abrasion resistance is determined through the thread used. It is primarily the raw material that determines the level of seam abrasion resistance. The following figure shows the big differences in a seam's abrasion resistance depending on the raw material. A particularly critical seam position should therefore be processed with polyamide sewing threads. In addition to the raw material, the sewing thread construction and its strength influences seam abrasion resistance. Core spun threads feature better abrasion resistance than cut staple threads, for example. Continuous filament threads are the best.



Comparison of seam abrasion resistance of different sewing threads of the same size (Modified Martindale test):

- 1 Cotton thread
- 2 Polyester cut staple thread
- 3 Polyester/cotton core spun
- 4 Polyester/polyester core spun
- 5 Polyester continuous filament
- 6 Polyamide continuous filament

## Seam elasticity

To add to the wearing comfort, work wear and uniforms are often designed with elasticised fabrics. Even the traditional work overall today is often made with an elastic fibre blend. If seam elasticity is not sufficient for the fabric and use then seam damage will occur. Broken seams that are stressed in a lengthwise direction are the result. Yet in practice the cause is often not correctly recognised and rectified.

The lengthwise elasticity of a seam is determined by the thread reserve – that means the amount of thread worked into a seam. The rule of thumb is: The greater the thread reserve in the seam, the better the seam elasticity. The thread reserve is primarily determined by the following processing parameters:

- Stitch type
- Stitch density
- Thread tension

Information about the appropriate sewing parameters for the processing of elasticised fabrics is available in the AMANN Service & Technology brochure "Stretch it".

## Seam appearance

PPE doesn't only have to function and be practical; it has to be visually appealing. And the good look of a seam plays a big part. Complaints in this area almost always involve a seam that is not even. Seam pucker is one of the most frequently occurring problems in PPE production. Particularly easy care work wear has to have even seams.



Seam pucker on work wear

Seam pucker can be avoided by choosing the appropriate sewing parameters that correspond to the fabric. The Service & Technology brochure "Prevention of seam pucker" contains very relevant information to this topic. The chapter "Seam pucker – No thanks!" in Focus "Sewing and Embroidering" has information about the most important preventative and remedial measures to take. (May be ordered at [www.amann.com](http://www.amann.com))

In addition to seam pucker, in many cases the sewing characteristics of PPE fabrics are critical. Many materials are due to their finish not easy to process under optimal sewing conditions without doing damage to the fabric. Sometimes the damage occurs immediately after the sewing process, but sometimes they show up only after laundering. AMANN Sewing Advisory and Product Service is often asked for their advice to remedy this problem. AMANN finds that a simple recommendation to optimise sewing conditions can't always solve the problem. It often helps to use a different fabric or optimise the fabric finish. A sewing test prior to production could uncover the problem in due time and is urgently recommended when using critical materials.



Material damage due to needle penetration

### Care properties

PPE care property standards are very high due to heavy-duty industrial laundering and exceed ordinary household laundry conditions by far:

- The washing action is more vigorous due to the larger circumference of the laundry drum, bigger loads and faster movement of the wash itself.
- Laundry detergent is more aggressive, especially the bleaches with added oxygen (Ozonit®) or chlorine.
- The washing method is more advanced: mechanical load and transport while being wet means more pressure and tensile stress for each industrially laundered item.
- The drying temperatures are higher for shorter drying times. This applies also to tunnel finishers, which are usually applied to shirts and work smocks. If the tunnel finisher is not used in the process, then a rotary iron is used that removes remaining moisture while pressing the articles. This also utilises a temperature as high as possible to shorten process times.

Sewing and embroidery threads have to meet these extreme care conditions. First and foremost here is a high level of colourfastness and dimensional stability during laundering.

AMANN quality sewing threads fulfil care durability standards in practice provided that approved wash and care conditions (adhering to internationally recognised standards and provisions, for instance the Hohenstein quality standard 701) and the correct choice of sewing thread are applied. We cannot stand behind this quality statement under deviating care conditions, for example when aggressive detergent additives or a higher temperature is utilised. Extreme care conditions fundamentally require an individual test to be able to ensure durability over many laundering cycles. We recommend consulting with AMANN Sewing Advisory and Product Service. Product data sheets offer care indications and information about the most important colourfastness properties of the AMANN article. These may be ordered at [www.amann.com](http://www.amann.com). The chapter "Care" in Focus "Sewing and Embroidery Threads" offers comprehensive information to this topic.

### Seam profitability

PPE is a market with much competition and downward pressure on prices. Often the quantity and order volumes are very large. Thus in product calculation every penny counts. Even the cost of every seam has to be examined.

Seam costs are primarily determined by sewing thread costs. But the cheapest sewing thread does not automatically mean the most cost-effective seam. In addition to the sewing thread cost, the cost for sewing thread related production standstills and – with PPE particularly relevant – for the repair of damaged seams and goods that do not fulfil the required number of laundering cycles due to seam damage have to be considered. All in all it is not the sewing thread price that plays the biggest role, but the profitability of the seam over the product's entire life cycle. High-quality seams are required that fulfil high stress standards during use at an economical price. For instance a sewing thread concept that corresponds to the requirements of the model. In addition to the sewing thread recommendations in this Service & Technology, AMANN Sewing Advisory and Product Service offers their support. Alternative solutions and their corresponding savings can be provided by means of seam plans allowing for the quality required for use.

## Individual, product-dependent requirements

In addition to the above mentioned quality criteria, there are a number of product-dependent requirements for protective clothing. These are for example:

- Heat resistance
- Weathering resistance (Weatherproofing)
- Chemical resistance
- Conductibility

To fulfil all requirements, standards and legal provisions that apply is a complex task. In practice this brings the question about the choice of sewing thread. Which sewing thread should I use? Which sewing thread characteristics are tested? How can I achieve the specifications required for the seams?

As a rule the ISO standards for PPE do not include explicit guidelines for threads. The test parameters refer to the complete article of clothing; the threads are examined with it as a whole. The seams have to fulfil the same requirements as all other materials that were utilised. The following table shows by way of example the test parameters of protective clothing for workers exposed to heat (DIN EN 531:1998) according to field of application.

Test parameter	Test standard
Dimensional change	DIN EN 25077
Limited flame spread (Code A)	DIN EN 532
Convective heat (Code B)	DIN EN 367
Radiated heat (Code C)	DIN EN 366
Molten aluminium splash (Code D)	DIN EN 373
Molten iron splash (Code E)	DIN EN 373

The requirements for the material in these tests also apply to the sewing threads; tests are conducted on material and thread in combination. This means for example in the limited flame spread test that the thread and seams were exposed to flame as well. Therefore requirements apply to the thread as well as all respective materials.

For the production of protective clothing with other safety functions, as for example chemical protection, bullet-proofing, weather-proofing, etc., similar specifications exist that have to be separately tested for and implemented. As a rule here too the sewing threads are tested in combination and must be selected to correspond with the individual requirements. The AMANN Sewing Advisory and Product Service is happy to be of assist in this matter. AMMAN has a broad range of special sewing threads for technical applications to fulfil special safety functions.

## Sewing recommendations

### Sewing thread selection

The following product lines from the AMANN range have proven their suitability for the production of PPE:

### Saba<sup>C</sup> – The high-performance thread

Saba<sup>C</sup>, this 100% polyester core spun thread has the best possible characteristics for meeting the requirements of PPE:

- high tensile strength
- good abrasion resistance
- keeps looking good even when exposed to abrasive stress
- well-balanced elongation behaviour
- best care properties



In addition, Saba<sup>C</sup> features high sewing performance and is suited for all machines and automated sewing machines. Thus, this article combines best sewing performance and optimal seam quality – a perfect combination for producing PPE. Today a large share of PPE is being sewn with fully synthetic thread constructions. The advantages of these 100% polyester concepts are being given more and more attention. Saba<sup>C</sup> is available in a wide range of ticket numbers and in numerous colours.

## Rasant – The functional thread



The polyester/cotton core spun thread is a standard in PPE and particularly relevant for work clothes and uniforms. The traditional overalls worn by craftsmen have been made exclusively with this polyester/cotton core spun thread for many years. The reason has been its high thermal resistance, which can be beneficial when sewing tightly-woven heavy materials of the type that are used for the overalls for example. Needle temperatures of over 250°C, which are easily reached while sewing medium-heavy work wear, contain the risk of thermal damage to sewing thread and material. If Rasant is used, this sewing thread through its cotton layer is better protected from high-temperature needles. But be careful: The layer does not cover the polyester core completely, so some melting is still possible. If this is not noticed at the time of the sewing process, hidden seam damage can occur which will get worse during use and lead to broken seams. Many machines used for the production of work wear and uniforms today are equipped with needle cooling, so this issue has lost some of its significance.

In addition to its high thermal resistance, Rasant generally features an outstanding sewing performance. Rasant easily fulfils the high demands of automated multidirectional sewing assemblies. Rasant's ticket number and colour range has been adapted to the needs of work wear and uniform production.

## Pax<sup>X</sup> – The economic thread

Pax<sup>X</sup> is the cost-efficient alternative to the above two core spun threads Saba<sup>C</sup> and Rasant. Pax<sup>X</sup> is 100% polyester and features a special air-jet texturised construction. Thickened or spliced areas and other annoying faults are reduced to a minimum – plus there's no fibre abrasion during processing.



Pax<sup>X</sup> has excellent sewing characteristics guaranteeing good seam quality. Pax<sup>X</sup> is available in the ticket numbers Pax 50, 80, and 120.

To determine the ticket numbers of Saba<sup>C</sup>, Rasant and Pax<sup>X</sup> to be used you must consider the material and the sewing operation; it can vary with core spun threads from fine count 150 to the coarse ticket number 25. As a rule, we recommend using a somewhat coarser ticket number than you would use in the production of fashion apparel because of the high stress in later use. For example, using Saba<sup>C</sup> 150 for closing seams on trousers is unacceptable, even if this thread is used for fine women's wear trousers.

There are many different ways to determine the overedging seam. In practice the SabaTEX polyester bulk yarn has been successfully utilised, but also the finer ticket number from the Saba<sup>C</sup>, Rasant or Pax<sup>X</sup> ranges. Since the edge-finishing represents a large part of the total thread consumption and therefore the sewing thread cost, the price of the sewing thread is vital. However the quality criteria for abrasion resistance and visual appearance should also be considered.

As far as blind stitching is also used, Serafil 120/2 or 200/2 will be suitable.

For positions in PPE seams that will be exposed to extreme abrasion, sometimes the use of polyamide threads is required (see page 4). ONYX and NEOX offer the best conditions here for optimal seam quality. ONYX, the efficient polyamide continuous filament is available in ticket numbers 10, 13, 20, 30, 40, 60 and 80. NEOX, the bonded polyamide thread is available in ticket numbers 10, 15, 20, 30, 40 and 60.

For individual product requirements for protective clothing such as heat and chemical resistance, the following special sewing threads are available from the TechX program:

- Sewing threads from DuPont™ Kevlar® of para-aramide fibres: K-tech 35, 50, 75 and K<sup>C</sup>-tech 22  
For heat protective clothing, bullet-proof vests, forester trousers, work gloves
- Sewing threads from DuPont™ Nomex® of meta-aramide fibres: N-tech 40, 70, N-tech CS 70, 80/2 and N<sup>C</sup>-tech 20, 34, 40, 60  
For heat protective clothing, fire-fighter clothing, work gloves, military uniforms, car racing garments
- Sewing threads of continuous polyetheretherketone (PEEK) filaments: ZYEX® 24  
For chemical protection clothing
- Sewing threads of a polyamide/ polyester/ inox metal component blend:  
I-tech 20  
For safety shoes
- Sewing threads of a polyester and carbon blend: C-tech 80  
For clean room and protective clothing
- Sewing threads of 100% expanded polytetrafluorethylene (ePTFE) Gore™ Tenara® HTR, TR und LTR  
For chemical safety gear

Further information to these special sewing threads for protective clothing can be found in the Service & Technology "TechX – Performance Threads".

## Needles

The following recommendations for needle sizes can be used as orientation:

Products	needle size	
	Nm	Size
Saba <sup>C</sup> 25, Rasant 20, Rasant 25	130-160	20-23
Rasant 30	120-140	19-22
Saba 30; Saba <sup>C</sup> 35; Rasant 35	10-130	18-20
Saba <sup>C</sup> 50; Rasant 50	100-110	16-18
Saba <sup>C</sup> 80; Rasant 75	90-100	14-16
Saba <sup>C</sup> 100	80-90	12-14
Saba <sup>C</sup> 120; Rasant 120	70-80	10-12
Saba <sup>C</sup> 150	60-70	8-10
Saba 200	60-70	8-10

Depending on the fabric, machine type, and sewing operation, coarser needles may be required for sewing PPE.

The needle point form must also correspond to the fabric. Usually round or ball points, for example R or FFG/SES, are suitable. To avoid fabric damage through needle penetration – a common problem when sewing PPE – sensitive materials or knit fabrics should be processed with a ball point needle. At the same time you should take care to change the needle when appropriate to prevent damage to the weave by a damaged needle point.

## Stitch types / Machines

Due to the particularly high standards the functions of PPE have to fulfil, the opportunity to apply safety stitching arises. For the same reason, the double chain stitch should have priority over of the two-thread lock stitch where possible. The large batch sizes of some PPE orders enable the implementation of automated sewing machines for the purpose of increasing productivity.

Depending on the materials used, usually fine or medium heavy machine sets are appropriate. It is important to match the machine setting to the individual material. When processing dense heavier-woven materials, thermal damage occurs quite frequently, depending on the number of plies. As prevention we recommend using sewing machines with air needle cooling.

## Stitch density

The standard stitch density is 4 stitches per centimetre. Higher stitch densities may be necessary for special sewing operations for the purpose of improving seam stability, or for sewing elasticised materials to increase seam elasticity. Since stitch density strongly influences sewing quality, special consideration should be given to the selection of parameters, and these are to be double-checked during production.

A lower stitch density may be suitable when using coarser sewing threads or when the visual effect calls for it.

## Thread tension

Thread tension has a significant influence (often underestimated in production) on seam quality. A too high (or too low) thread tension has a direct negative effect on the look, stability and elasticity of a seam. In practice, it has been frequently observed that sewing machines are being operated with a thread tension that is set too high. Now and then thread tension values of over 200 cN have been seen in production lines for light to medium work wear. These production conditions dramatically reduce seam elasticity and cause wavy seam quality due to puckering. Thread tension that is too high causes the threads to lay tight in their seams. They don't have enough lengthwise reserve and pull particularly light material which causes pucker.

To avoid this problem needle and bobbin thread tension must be set as low as possible. Tension should be regularly controlled with the appropriate measuring devices.



Thread tension meter and spring balance to check thread tension on the sewing machine

## Machine embroidery

We have become familiar with embroidery as a decorative element in the fashion industry, but it entered the PPE sector ages ago. It can be an embroidered name on the overalls craftsmen wear or a uniform, or a logo for the sake of Corporate Identity on smocks, shirts and T-shirts. Aside from the high-end image compared to a printed logo or employee name, embroidery is also applied especially because of its ultra durability.

The standard ticket number for machine embroidery is 40 – this is approximately a 120 sewing thread size. This count can be used for almost all logos and motifs. AMANN has the right threads for even the finest lettering (< 5 mm) and filigree details: Serafil in the ticket numbers 120/2 and 200/2 (corresponds to embroidery thread sizes 60 and 75) is perfect for the task and makes the finest embroidery.

PPE embroidery technical standards are very high and exceed the household washing conditions for industrial laundering by far. Embroidery threads are exposed to extreme conditions: washing action, washing detergents, method and temperature stresses particularly in the finishing area.

The AMANN embroidery threads ISACORD and ISALON have absolutely no problem with extreme laundering stresses. The washing action and method that can cause mechanical damage to viscose embroidery thread after only one washing have no effect on ISACORD and ISALON. Both polyester embroidery threads show excellent abrasion resistance. Even laundry detergent at temperatures to the boiling point has no effect on the fibre or the colour. This allows for example a white baker's apron to be colourfully embroidered and still be washed at high temperatures or bleached with aggressive bleaches. Drying and ironing are the only processes that could affect polyester embroidery due to the high temperatures:

- If the drying temperature is higher than the dyeing temperature (140 °C to 150 °C) for polyester threads the dye molecules could break free and wander – in the industry this is called migration. There is the risk of "ghost printing", this is when the embroidery marks the cloth in its immediate proximity, depending on the dryer or tunnel finisher load. To reduce the possibility of encountering this problem AMANN offers a list of thread dyes with excellent fastness to heat. For the colour black – which is used in almost every embroidery – there is a special dyeing process that guarantees very good fastness. This colour is available as ISACORD colour number 0021.

- While mangling or pressing, the direct contact of hot plate to embroidery can cause the polyester fibres to melt. Because PPE fabrics also often contain a polyester blend (a usual blend is 67% cotton + 33% polyester) this problem is rare. In addition to avoiding direct contact between embroidery and hot plate, it may help to reduce the temperature of the hot plate to under the melting point of polyester (depending on manufacture between 230 °C and 260 °C).

To rule out any of these types of problems in advance, manufacturers and launderers of PPE demand guaranteed fastness.

However, currently there is not yet one practical standard to test and guarantee fastness. The range of test conditions is as wide as the number of users. Some of the standards available and stipulated as tests are based on finished pieces and cannot be used for embroidery. Others give test conditions that are not observed in practice: all ISACORD and ISALON colours would endure a temperature of 145 °C in the tunnel finisher (DIN EN ISO 15797) without the colours fading – this guarantee would not help the business that dries at 180 °C or more. Chlorine processing at 30 °C or boiling for 240 minutes at 95 °C are just as out of step with actual practice and thus do not receive our guarantee.

AMANN is busy working on clear and concise valid information for the user. In cooperation with the customer we are trying to offer solutions and be able to guarantee practice-relevant specifications. Ask us about it, we'd be pleased to offer more information.

## Service

We will be glad to offer you our assistance in all technical sewing and processing problems. Just give us a call!

**Telephone +49 (7143) 277-250**

## Processing of easy care articles

More and more work clothes are made easy care. This reduces the care expenses to a minimum and therefore most perfectly matches work clothes requirements. However, in practice, many articles cannot meet their easy care quality promises; often, after laundering their appearance is more than disappointing, with creases and particularly puckered seams. So, after laundering, extra care is required. And this is not easy care.

### DTB research group "Non-iron work clothes"

In answer to the dilemma depicted above, AMANN has initiated the cross-sector research group "Non-iron work clothes", together with the DTB (Dialog TextilBekleidung, an association of textile and clothing companies). Fabric, sewing, sewing technology, laundering and testing experts have participated and formulated the following tasks:

- Examine the given quality level in the easy care range
- Analyse causes for seam pucker
- Work out processing recommendations for easy care products

### DTB test series

To examine the given quality level, the research group, technically supported by the AMANN Sewing Advisory and Product Service, has examined a large number of current easy care articles from different fabric manufacturers. Examined were typical blended cotton-polyester fabric qualities used in conventional business fashion for non-iron shirts, blouses, lab coats, jackets, coats, etc.

The fabrics underwent sewability tests with subsequent examination and an evaluation of the evenness of the seams. To gain knowledge of the causes for pucker after laundering, several process variations were examined in the sewing tests, each variation accounting for different negative influencing variables on the evenness of a seam:

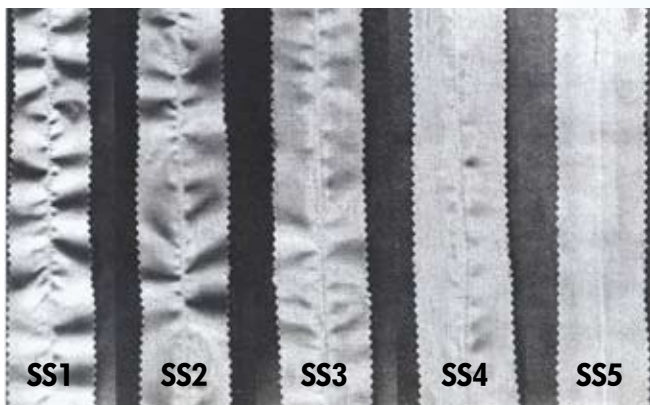
- Thread tension
- Needle
- Stitch density
- Sewing thread

In addition, a test series with optimal processing conditions (Saba<sup>c</sup> 120, 4 stitches/cm, needle Nm 80, needle thread tension 80 cN) was included in the tests to document the best possible result and to allow examination of the fabric quality itself.

Test series	Sewing thread	Needle size	Stitch density	Thread tension
		Nm	St/cm	cN
① optimal sewing conditions	Saba <sup>c</sup> 120	80	4	70
② Thread tension	Saba <sup>c</sup> 120	80	4	<b>150</b>
③ Needle	Saba <sup>c</sup> 120	<b>110</b>	4	70
④ Stitch density	Saba <sup>c</sup> 120	80	<b>2,5</b>	70
⑤ Sewing thread	<b>Tow spun 120</b>	80	4	70

Processing conditions in DTB test series

All seam samples underwent customary industry laundering tests at the Hohenstein Institute labs. Assessment of the seam samples – both, laundered and unlaundered – was in accordance with the AATCC standard 88B. This photo standard grades seam pucker from 1 to 5. Proven quality standards, for example the Hohenstein Institute quality standard 702, consider the grade SS 3 as “tolerable”, even though a non iron label seems inappropriate here. Lower grades, such as SS 1 or SS 2, are not accepted.



AATCC photo standard

## Results

Half the fabrics tested failed. Their appearance after laundering was so bad they couldn't be assessed, although the unlaundered fabric samples had all been graded excellent (SS5) or at least good (SS4). After laundering, however, the fabric samples appeared extremely creased and wavy. Any assessment of the seams was not possible or recommended. This result shows once again that not all of the easy care articles actually deserve this quality label. Not all articles with excellent looking seams during production have the seam quality after laundering to correspond with the “non iron” label.



Unacceptable look on tested easy care fabrics

The other articles that qualified for assessment achieved different grades from acceptable (SS3) to excellent (SS5). Analysis of the different processing variations allowed making clear statements on the most important causes and factors of influence for seam pucker:

### Foremost, fabric quality determines the achievable result.

The fabric, with its construction and finish, determines the seam quality that can be achieved. This became very clear in the test series with ideal sewing conditions. Depending on the selected fabric, grades for seam evenness here ranged from SS5 to SS3.



Different seam looks depending on fabric

**A thread tension that is too high has a significant adverse effect on the evenness of a seam and makes a "non iron" quality label out of the question.**

All fabric samples achieved lower grades in the test series with increased thread tension, before and after laundering. Compared to the test series with ideal sewing conditions, the grades were at least one lower. The majority of the fabric samples produced with a too high thread tension did not achieve the minimum pass grade of SS3 required in recognised quality standards, for example by the Hohenstein Institute. The best fabric samples sewn with too high thread tensions were given a SS3 after laundering – a grade that is not at all sufficient for a "non iron work clothes" quality label.



Unacceptable seam look due to too high thread tension

During this test series, the other determining factors selected have proven to have minor effect.

Compared to the thread tension's influence on seam evenness, the influence of stitch density, needle size and sewing thread can be disregarded to the extent that these factors stay within the ranges considered in this study.

## **Sewing recommendations**

There is no one-for-all solution for realising the easy care promise. In truth it requires reliable controlling of the most important factors of influence and careful implementation of suitable production conditions. No doubt, this cannot be easily achieved in today's globalized practice of production, but it is the only promising way.

To achieve a satisfactory non iron quality for work clothes, the following recommendations must be followed for both influencing factors, fabric and thread tension:

### **1. Use of appropriate easy care articles**

Only such easy care articles may be used that in fact meet the quality requirement for this quality label. This must be proven in sewing tests prior to production. If the fabric supplier will not present confident proof of optimal sewability (including behaviour after laundering), the garment producer is left to do the assessment. Tests at the producer's site can at the same time be used to determine and document the optimal sewing conditions for the production sites.

### **2. Keep thread tension low**

The thread tension values must be kept as low as possible. Exact requirements and regular controls are urgently required. For this, checking the thread tension with a simple spring scale or thread tension meter (for suppliers see [www.amann.com](http://www.amann.com)) is sufficient. In any case, checking the thread tension by hand or by rule of thumb is not exact enough.

You may order detailed documentation of this DTB test series from AMANN's Sewing Advisory and Product Service at: [nt@amann.com](mailto:nt@amann.com).

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# At a glance – Sewing threads for PPE

Products	Saba <sup>c</sup>	Rasani <sup>3)</sup>	Pax <sup>x</sup>	Serafil
Raw material Construction	Polyester/Polyester Corespun	Polyester/Cotton Corespun	Polyester Continuous filament air jet texturised	Polyester Continuous filament
Ticket No.	30 <sup>1)</sup> , 35, 50, 80, 100, 120, 150, 200 <sup>1)</sup>	30 <sup>2)</sup> , <b>50, 75, 120</b>	50, 80, 120, 150	80, 120, 120/2, 200/2
<b>Light weave articles,</b> e. g. shirts, blouses				
Joining seams	120, 150	<b>120</b>	120	
Decorative seams	120, 150	<b>120</b>	120	
Embroidery				120/2, 200/2 (detail embroidery)
Serging seams	200 <sup>1)</sup>		150	
Buttonholes	120, 150	<b>120</b>	120	
<b>Medium weave articles,</b> e. g. uniforms, aprons, smocks				
Joining seams	80, 100, 120	<b>75, 120</b>	80, 120	
Decorative seams	30 <sup>1)</sup> , 80	<b>75</b>	80	
Embroidery				120/2, 200/2 (detail embroidery)
Serging seams	120, 150	<b>120</b>	120, 150	
Blindstitch seams				120/2, 200/2
Buttonholes	30 <sup>1)</sup> , 80, 100, 120	<b>75, 120</b>		
<b>Heavy weave articles,</b> e. g. work clothes, gloves, protective jackets				
Joining seams	35, 50, 80	<b>35, 50, 75</b>	80	
Decorative seams	30 <sup>1)</sup> , 35, 50, 80	<b>35, 50, 75</b>	80	
Embroidery				
Serging seams	120, 150	<b>120</b>	120	
Buttonholes	30 <sup>1)</sup> , 80	<b>75</b>	80	
Special applications Cleanroom garments				80, 120

<sup>1)</sup> other thread construction / <sup>2)</sup> Polyamide-core / <sup>3)</sup> bold printed tickets are also available in water-repellent finishing (WR)

ONYX <sup>3)</sup>	NEOX	SabaTEX	SabaFLEX	ISACORD	ISALON
Polyamid Continuous filament <b>30, 40, 60, 80</b>	Polyamid Continuous filament bonded 10, 15, 20, 30, 40, 60	Polyester Continuous fila- ment texturised 100, 120, 250	PTT Continuous filament 80, 120	Polyester Continuous filament trilobal 40	modified. Polyester Continuous filament trilobal 40
			120		
			120		
				40	40
		120, 250			
			80, 120		
			80		
				40	40
		120, 250			
<b>40, 60, 80</b> (fore seams that resist extremely abrasive)	40, 60 (fore seams that resist extremely abrasive)		80		
<b>30, 40, 60, 80</b>	30, 40, 60				
				40	40
		100, 120			



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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 yarn.

All data were arranged after best knowledge and certain and correspond to the conditions during printing.  
For mistakes, misprint and any changes of the instructions no adhesion. All illustrations are noncommittal.

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