

Reading the Seam

Stitch type, machine and thread — how an industrial seam is specified



Learning Nugget LN 031 · Learning Stream LS 17 Seam / Stitch · MOON 3.0_A2 · Technical Advisory Services

Colour is a code, not decoration



Five colours and one icon family run through every slide. Once you know them, you can see what a slide is about before reading it.



Method and evidence

Standards, codes, published data
— what can be cited.



Observation and diagnosis

What a seam shows, and how it
is read back to a cause.



Defect and failure

What goes wrong, and what it
looks like when it does.



Correction and answer

The corrective move, and the
AMANN product that belongs
there.



Limit and caution

Trade-offs, thresholds, and where
a figure still needs confirming.

The storyline

CONTEXT

Where the seam sits

CHALLENGE

Why seams fail

UNDERSTANDING

The vocabulary

APPROACH

The decision path

SOLUTION

What the numbers say

APPLICATION

Segment by segment

LEARNING

Diagnosis

NEXT STEP

What happens next

CONTEXT

CHALLENGE

UNDERSTANDING

APPROACH

SOLUTION

APPLICATION

LEARNING

NEXT STEP



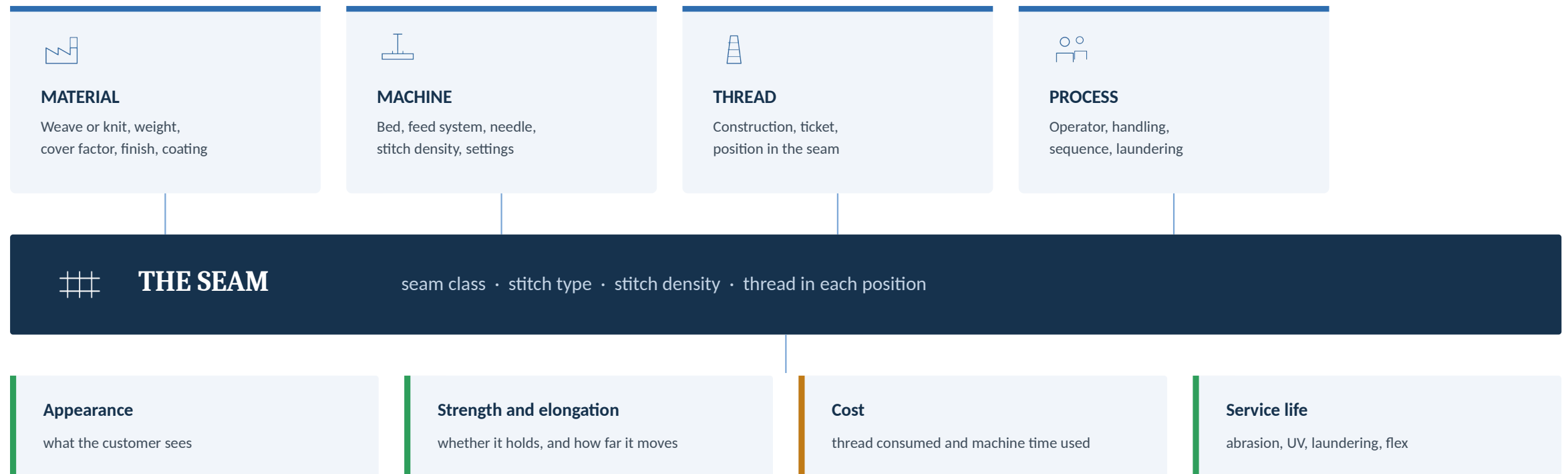
Four inputs meet at a single point

Material, machine, thread and process meet at one point — and the product's service life is decided there.

Of the four inputs to a seam, only one is the thread



Sewing is the last operation that can still change the product — and the first place a failure becomes visible.





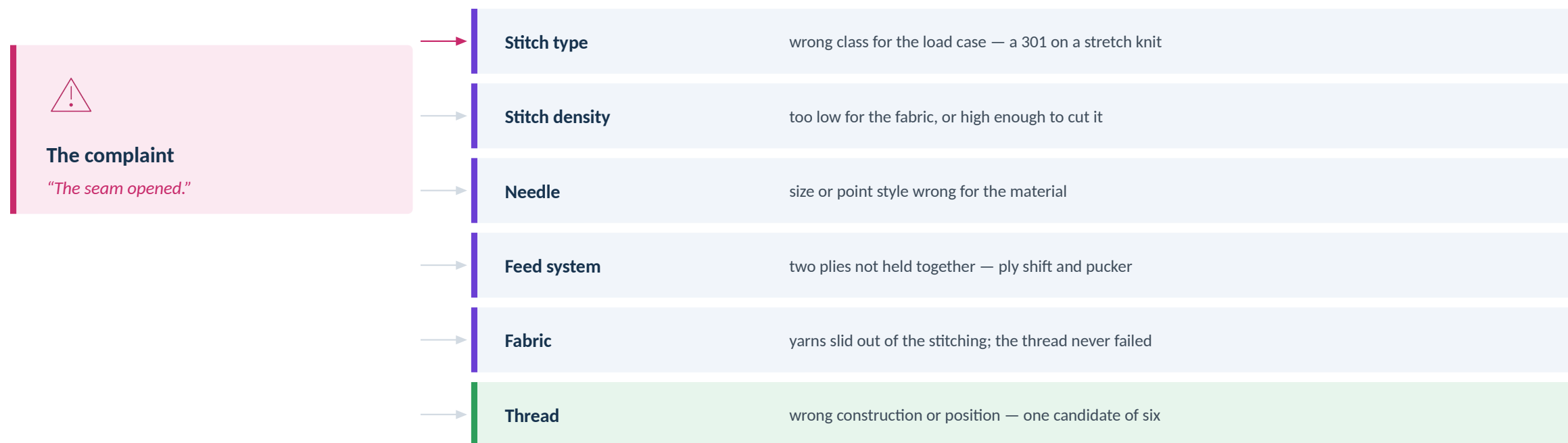
When a seam fails, the thread is blamed

It is rarely the cause. Six candidates produce the same complaint, and only one of them is the thread.

One complaint, six candidate causes



The complaint arrives as "the thread broke". The diagnosis has to work through six possible causes, of which the thread is only one.



The thread supplier is the party most often asked to explain the other five.

A complete specification is four numbers. Most tech packs carry two.



USUALLY STATED



Seam class

ISO 4916 — how the plies are arranged, and the seam allowance



Stitch type

ISO 4915 — security, elasticity, thread consumption

USUALLY MISSING



Stitch density

stitches per centimetre — strength, appearance, pucker, cycle time



Thread per position

needle, looper, bobbin, cover — four different jobs

Anything left unstated is decided on the shop floor — and that is where the complaint comes from. The thread is the last of the four, not the first.

CONTEXT

CHALLENGE

UNDERSTANDING

APPROACH

SOLUTION

APPLICATION

LEARNING

NEXT STEP



Two standards describe a sewn joint

One describes the stitch, the other the seam. Confusing them is the most common technical error in a specification.

Two ISO standards, and the letter codes still used alongside them



ISO 4915 • the stitch

How the threads interlace or interloop with each other and with the material.

Three-digit number: 301 • 401 • 504 • 516 • 605



ISO 4916 • the seam

How the plies are arranged and where the rows of stitching fall.

Five-digit numeric code: 1.01.01 • 2.04.06 • 6.03.01

	ASTM D6193 — the letter codes in daily use	ISO 4916 — the numeric codes
Structure	Two or more capitals = class • lower case = configuration • number = rows of stitching	Digit 1 = class 1–8 • digits 2–3 = ply configuration • digits 4–5 = needle position
Classes	6 — SS, LS, BS, FS, OS, EF	8 — classes 7 and 8 have no letter equivalent
Felled jeans seam	LSc	2.04.06
Clean-finish hem	EFb	6.03.01



SSa, LSc and EFb are ASTM D6193 codes, not ISO 4916 codes. Quote both notations: it takes one sentence and it prevents a misunderstanding.

Six classes cover everything ISO 4915 contains



Elasticity, security and thread consumption are linked: gaining one usually costs another.

	100	200	300	400	500	600
AMANN's name	Chain & blind	Hand stitch	Lock stitch	Chain stitch	Overlock	Cover stitch
Mechanism	Intraloooping	In and out	Interlacing	Interlooping	Interlooping at the edge	Interlooping + top cover
Threads	1	1	2	2 or more	1–5	up to 9
Elasticity	High	Minimal	Lowest	High	High	Highest
Security	Ravels	Low	High	Chain end runs back	High	High
Thread per m of seam	3.57 m	1.80 m	2.62 m	5.14 m	13.63 m	27.18 m
Reversible	No	n/a	Yes	No	No	No
 503 is not a seaming stitch. Coats state it is designed to collapse and flatten when a seam is loaded laterally — it neatens an edge; it does not carry load.						

Consumption: AMANN's published values at 4 stitches/cm, 1 mm material thickness, summed from the needle, looper and cover components.

Read a seam from the back, not from the face



301 and 401 are almost identical on the face. On the back they cannot be confused.

301 Lockstitch

1 needle + 1 bobbin • 2 threads • reversible

FACE



BACK



401 Two-thread chainstitch

1 needle + 1 looper • 2 threads • not reversible

FACE



BACK



504 Three-thread overedge

1 needle + 2 loopers • 3 threads • trims the edge

FACE



BACK



516 Five-thread safety stitch

401 + 504 in one pass • 2 needles + 3 loopers • 5 threads

FACE



BACK



406 Two-needle bottom coverstitch

2 needles + 1 looper • 3 threads • bottom cover only

FACE



BACK



605 Three-needle coverstitch, top cover

3 needles + looper + spreader • 5 threads • covered both sides

FACE



BACK



Schematic; proportions exaggerated. Needle thread in blue, looper and bobbin thread in navy, cover thread lighter, trimmed edge marked.

How the plies are held: the eight seam classes



CLASS 1 • SS Superimposed



Plies laid on each other, joined near the edge. The plain seam — the most common seam in industry.

CLASS 2 • LS Lapped



Plies overlapped, edges enclosed by folding. The felled jeans seam — the strongest common apparel seam.

CLASS 3 • BS Bound



A binding strip folded over the raw edge and stitched. Necklines, collarettes, waistbands.

CLASS 4 • FS Flat



Edges butted, the stitch itself bridges the joint. No added thickness — underwear, seamless-feel sportswear.

CLASS 5 • OS Decorative / ornamental



Stitching on a single ply for visual effect. Topstitch designs, pin tucks, pocket ornamentation, darts.

CLASS 6 • EF Edge finishing / neatening



A single ply folded or covered. Hems, serged panel edges, blind hems, facings.

CLASS 7 Attaching a separate item



A component — elastic, tape, braid — added onto an edge. No ASTM letter class equivalent.

CLASS 8 Single-ply construction



One piece turned in on both edges. Belt loops, straps, spaghetti tubes, waistband tunnels.

Classes 1–6 correspond to the ASTM letter classes SS, LS, BS, FS, OS and EF. Classes 7 and 8 have no letter equivalent. Lapped seams have by far the most documented variants, which is why most engineered construction is found there.



Specify in one direction: product first, thread last

Five steps, always in the same order. Reversing them produces a proposal nobody can defend.

The specification path



Walk through it out loud with the customer. It produces a proposal you can defend, and it shows how the decision was reached.

Every stitch belongs to a machine class, and to a speed limit



Machine class	ISO stitch	Needles	Lower devices	Speed sti/min	Anchor model
Single-needle lockstitch	301	1	1 hook + bobbin	4,000–5,500	JUKI DDL-8700
Twin-needle lockstitch	301 × 2	2	2 hooks	3,000	JUKI LH-4500C
Zigzag lockstitch	304	1	1 hook	5,000	JUKI LZ-2290C-7
Blindstitch	103	1 curved	1 looper	up to 3,000	Strobel VEB 100-2
Single-needle chainstitch	401	1	1 looper	5,500	JUKI MH-481-5
Chainstitch, feed-off-the-arm	401 · LSc	3	3 loopers	4,500	Union Special 35800
Overlock 2 / 3-thread	503 / 504	1	1–2 loopers	7,000–8,500	JUKI MO-6804S
Safety stitch	515 / 516	2–3	2 loopers + chain looper	7,000	JUKI MO-6816S
Coverstitch, bottom cover	406 / 407	2–3	1 looper	6,500	JUKI MF-7500
Coverstitch, top and bottom	602 / 605	2–3	looper + spreader	6,500	JUKI MF-7900
Flatseamer	607	4	looper + spreader	4,200–5,500	JUKI MF-3620
Heavy-duty unison feed	301	1	double-capacity hook	2,800	PFAFF 1245
CNC pattern sewer	301	1	double-capacity shuttle	2,800	JUKI AMS-221F

Speeds and needle systems as published by the manufacturers. Manufacturers rarely print ISO stitch numbers — Union Special, which specifies its class 35800 as “401 LSc-3”, is the exception.

Identifying a needle: system, size and point



CLOTH POINTS — the point displaces the yarns

	R	set cloth point
		wovens, artificial leather, standard lockstitch
	SPI / RS	slim set point
		densely woven material, very straight seams
	SES / FFG	light ball
		fine single jersey, light knitwear with elastane
	SUK / FG	medium ball
		medium knits, higher elastane content, denim
	SKF / G	heavy ball
		coarse, highly elastic, open-structure knitwear

CUTTING POINTS — the point cuts a slit, and its direction matters

LR		cuts at 45° slanted to the right, in the sewing direction
LL		cuts at 45° slanted to the left — the mirror image of LR
S		wide triple-edge cut in the sewing direction
D		wide triple-edge cut, straight — DH is the medium version
P		cuts perpendicular to the sewing direction, at 90°
SD		round point with polished triple cutting edges — a slightly triangular cut

*A slit running along the seam line can link up between stitches;
a slit across it stays isolated by intact material.*

Nm means two different things

On a needle, Nm is the blade diameter in hundredths of a millimetre. On a thread, Nm is the metric count. The same two letters carry two meanings on the same product page.

AMANN's rule

“The sewing thread must be thinner than 40 % of the sewing needle diameter.” Worked example: Saba 80 ≈ 0.26 mm → Nm 90–100.

The field test

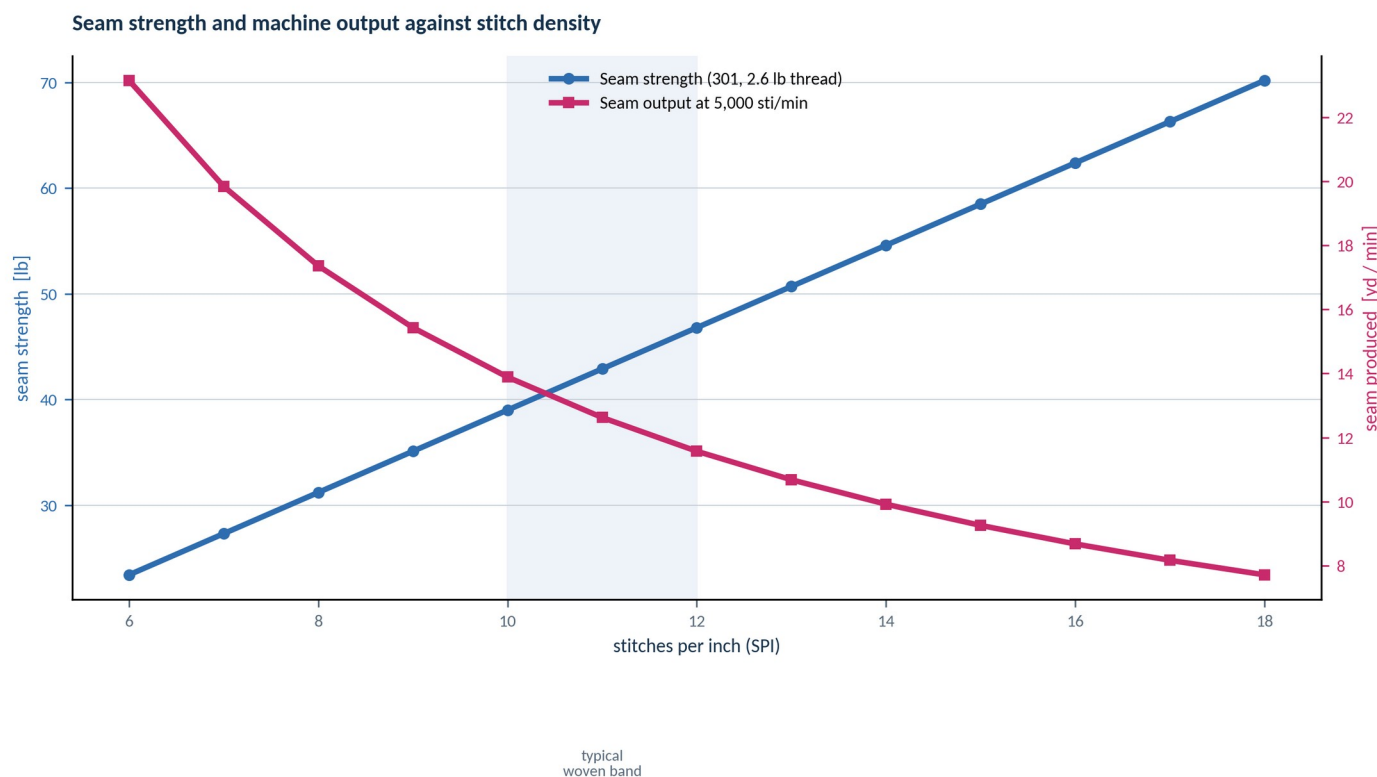
Thread a loose needle, hold the thread taut and let go. If the two are correctly matched, the needle spirals slowly down the thread.



Three numbers decide cost and performance

Stitch density, thread consumption and thread position. Each one is a lever, and each one trades against the others.

Density buys strength and costs output



Seam strength

301: $\text{SPI} \times \text{thread strength} \times 1.5$

401: $\text{SPI} \times \text{thread strength} \times 1.7$

The knit paradox

Higher density adds elasticity and reduces stitch cracking, but it also raises the risk of needle cutting. The remedy is a smaller needle and a finer thread rather than more stitches.

Typical bands

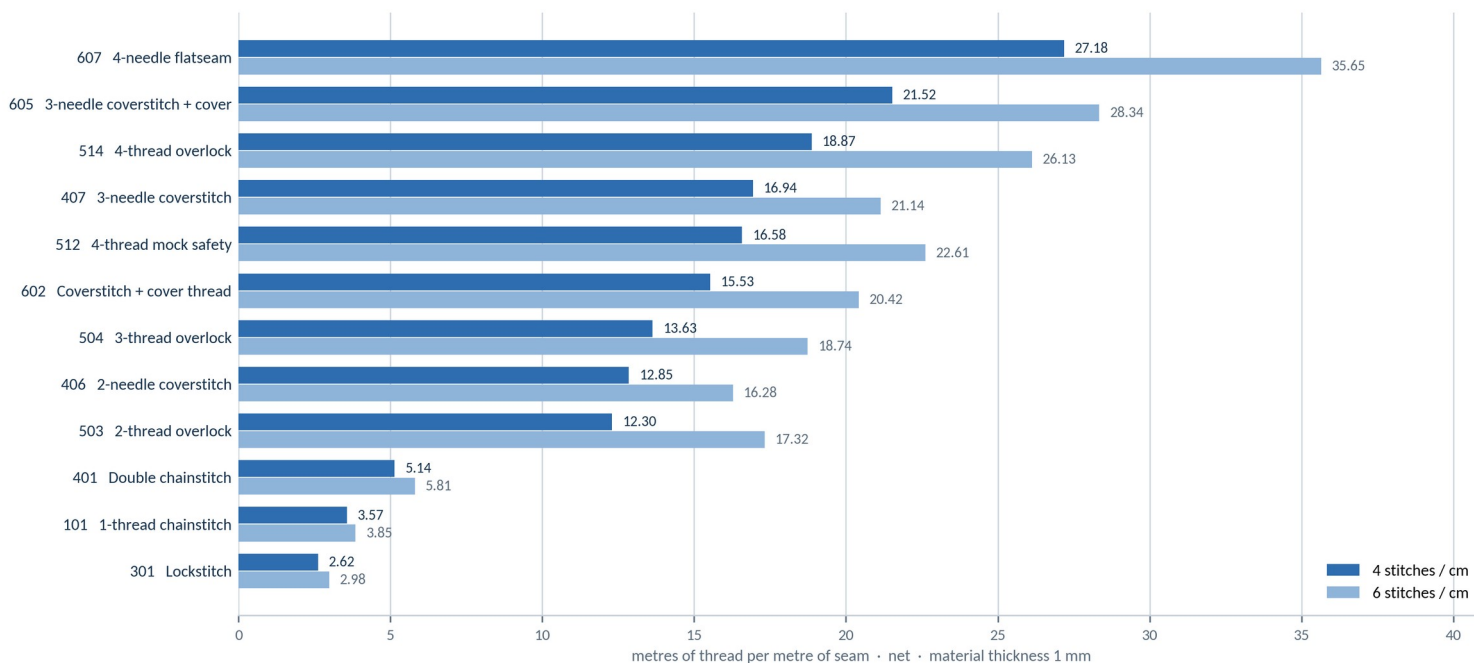
Denim 7–8 SPI • trousers 10–12 • dress shirts 14–20 • jersey 10–12 • elastane knits 14–18 • buttonhole 85–90.

Strength model and density bands: American & Efird, "Stitches Per Inch — What You Should Know". Output curve at a constant 5,000 stitches per minute.

The stitch specification is a cost decision



Thread consumption by stitch type



AMANN publishes the needle, looper and cover components separately; the totals shown are the sum of those components.

10×

from a 301 lockstitch hem to a 607 flatseam, at the same stitch density.

Add 10-15 %

AMANN's stated allowance on top of the net figure — seam starts and ends, colour changes, cone changes.

Watch the looper

On a 504 the looper carries about 88 % of the thread. The thread chosen for the looper decides the cost of that seam.

Method: seam length × ratio × number of rows, plus the allowance. For a costing figure, unpick a measured length of the customer's own seam — the measured value is the one to cost from.

Four thread positions, four different jobs



Needle thread

Passes through the material at every stitch;
on a lockstitch it sits proud on the face.

Loop formation • abrasion • needle heat •
colour fastness

Bobbin thread

Interlaces with the needle thread inside the
plies — class 300 only.

Consistent tension • winding • run-out
management

Looper thread

Carries 60–88 % of the thread in classes
400–600 and forms the structure on the
back.

Bulk • coverage • elasticity • softness — and
cost

Cover thread

Laid across the surface by a spreader in
602, 605 and 607.

Appearance • softness • abrasion resistance



The rule most often broken: a texturised bulk yarn is not a needle thread on a lockstitch machine. Sabatex and Sabatex Soft are looper and cover threads — built for volume and coverage, not for repeated passage through a needle eye and a hook.



One logic, applied in eight segments

Identify what actually governs the segment. Everything else follows from it.

Start from AMANN's own product assignments



Seam operation	Stitch	AMANN products named on the application page	Why
Closing seams	301 · 401 · 516	Saba 150/120/80/50/30 · Saba Recycled · Sabaflex 80 · Sabasoft 120	Core-spun strength with a textile surface; Sabaflex where it stretches
Topstitch seams	301	Saba · Serafil 60/80 · Serafil fine · Rasant	Serafil for filament sheen; Saba and Rasant for a matt line
Serging / overlock	503 · 504 · 512 · 514	Saba 120/80 · Sabatex 120/250 · Sabatex Recycled	Sabatex is the bulk yarn for the loopers
Coverstitch	406 · 407 · 602 · 605	Sabatex 120/250 · Sabasoft 120	Volume and coverage on both faces of a hem
Flatlock	607	Sabasoft 120	Microfilament softness for a seam worn on the skin
Buttonholes, bar tacks	304 and cycles	Saba 80/50/30	High density demands abrasion resistance and consistent loop formation
Blindstitch hems	103	Serafil fine 180 / 300 · Strongfix as a securing thread	A fine, semi-transparent thread that disappears into the face
Upholstery	301	Rasant-Oxella 30/15 · Saba · Rasant · Serafil · Onyx · Serabraid	Needle heat and abrasion through many layers; no fraying at corners
Mattresses	401 · 301	Topfil 60/80 needle with Texturan 120 under thread	A matched needle-and-looper pair at machine design speed
Shoes, bags, leather	301 · 304	Serafil · Serafil WRe · Onyx · Strongbond · Strongcore · Serabraid	Abrasion, flex fatigue, multidirectional sewing
Outdoor, marine, awnings	301	Serabond · Outdoor-Pro · GORE TENARA	UV and weather; in this segment the thread degrades before the fabric does
Protective clothing	301 · 401 · 504 · 304	N-tech · Nc-tech · A-tech · K-tech · Kc-tech	The thread must match the fabric's protective chemistry, not only its strength

A starting point for the conversation, not a quotation. Product, ticket size, make-up and current availability are confirmed against the live range before quoting.

What governs the seam in each segment



Segment	What governs the seam	Typical stitch and density	AMANN starting point
Shirts and blouses	Pucker resistance, not strength	14–20 SPI · finest thread the fabric takes	Saba · Rasant · Serafil fine
Jeans and denim	Survival of the garment wash-down	401 felled LSc at 7–8 SPI	Saba coarse · Meta · Rasant-Oxella
Jersey and underwear	Softness and elongation in skin contact	607 flatseam · 406 hems · 12–16 SPI	Sabatex Soft · Sabasoft · Sabaflex
Workwear and PPE	The thread must match the protective chemistry	301 · 401 · 504 · seam strength to EN ISO 11612	N-tech · A-tech · K-tech
Footwear and leather	Abrasion, flex fatigue, needle heat	301 uppers · 101 Goodyear inseam	Serafil · Onyx · Strongbond
Automotive interior	UV and fogging — and a controlled tear at airbag seams	301 panels · 504 serging · 401 × 2 side airbags	Serafil Automotive · Oxcel · Strongbond+
Home interior, mattress	Flame retardancy and machine speed	401 tape edge · 401 + 504 · 301	Topfil + Texturan · Rasant-Oxella
Outdoor and technical	UV, anti-wick, chemical and heat resistance	301 throughout	Serabond · Outdoor-Pro · GORE TENARA



Two cases where a stronger thread is the wrong answer: airbag deployment seams, where the thread is specified to tear so that the bag can deploy; and any seam where excess thread, needle size or density perforates the material and lowers seam efficiency.



From the symptom to the cause

Almost every seam complaint reaching a thread supplier is one of six failure modes. Each has a first move.

Six failure modes, six first moves



Thread breakage

A hard melted nodule on the broken end means needle heat, not tension.

- ✓ Check the broken end before touching a tension nut.

Skipped stitches

The loop was not picked up by the hook or looper.

- ✓ Presser foot pressure and throat plate first — they cost nothing.

Seam pucker

Four distinct causes: jamming, tension, feed, shrinkage.

- ✓ Identify which of the four before changing anything.

Seam slippage

The stitching is intact; the fabric yarns moved.

- ✓ Widen the seam allowance from 6 to 12 mm.

Needle cutting on knits

One cut yarn produces a run along the seam, often after washing.

- ✓ Ball point, smallest needle, finest thread that meets the requirement.

Stitch cracking

The thread ruptures at full fabric extension.

- ✓ Change the stitch class, not the thread size.



Two habits separate an adviser from someone guessing: noting where in the operation the defect occurs, and changing one thing at a time.

Six things to say in a customer conversation

**1****Ask for all four numbers.**

Seam class, stitch type, stitch density, thread per position.

2**Name the code system.**

SSa is ASTM, not ISO. Giving both notations takes one sentence.

3**Put the consumption on the table.**

Seam length × ratio, plus 10–15 %. It turns a price discussion into an engineering one.

4**Ask which needle is in the machine.**

System, size and point. The most productive question on a factory visit.

5**Separate strength from slippage.**

ISO 13935 and ISO 13936 catch different failures.

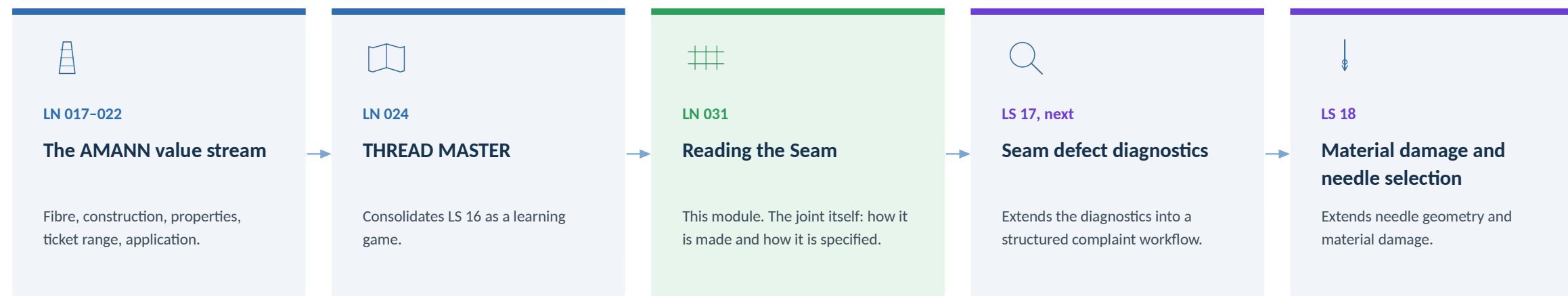
6**Leave a one-page seam specification.**

Codes, density, thread per position, needle, consumption, test standard.

Where this nugget sits, and what happens next



LS 16 walks from fibre to application. LS 17 starts at the joint and works back. A technical adviser needs both.



Before publication

The LN number is checked against the live platform, and the AMANN product data is confirmed by AMANN Product Management.

Then produced as

Podcast, slideshow and a downloadable reference document on www.amann.education.

IN ONE SENTENCE

Specify the seam. The thread follows.

Product, seam, stitch, machine, thread — always in that order. Anyone who knows the order can read an unfamiliar specification, price a seam, and explain a recommendation in one sentence. The stitch numbers and the product names simply fill in that order.

AMANN.

Beyond Threads.

Sources: ISO 4915 and ISO 4916; AMANN product and application pages and the AMANN stitch-type and thread-requirement publication; Coats, American & Efird, Groz-Beckert and Schmetz technical bulletins; JUKI, Brother, PFAFF, Dürkopp Adler, Union Special, Yamato, Kansai Special and Pegasus machine documentation; peer-reviewed literature as cited in the reference document. Status 3 September 2026.

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