Core-Spun Yarn: How It Is Made, Elastane Percentage, Advantages and Limits

Source page: www.textileschool.com/10233/core-spun-yarns-advantages-and-challenges/ · Made 18 October 2026 · Free to print for study

In one paragraph

A core-spun yarn is a two-part yarn: a continuous filament core, such as elastane (spandex) for stretch or polyester for strength, wrapped in a sheath of staple fibre such as cotton that is spun round it as the yarn is twisted. The core supplies the property the yarn is bought for (stretch, strength, flame or cut resistance) and the sheath gives it the look, feel and dyeing of an ordinary spun yarn. It is usually made on a ring frame fitted with a core attachment, which feeds the filament into the front roller nip so that it lands in the middle of the drafted fibre; elastane is stretched several times on the way in (3.8 times is common for 78 dtex elastane), which is why the finished yarn stretches. Stretch denim is mostly woven with core-spun weft, and poly-core sewing thread is another major use. Its limits are grin-through (the core showing at the surface), sheath slippage along the core, and the extra feed equipment and filament it needs.

At a glance

Core-spun yarn at a glance

Question	Short answer	Where it is explained
What is it?	A filament core fully covered by a sheath of staple fibre twisted round it	What is core-spun yarn?
Usual materials	Core: elastane, polyester filament or glass. Sheath: cotton, polyester or viscose staple, or para-aramid for protective yarns	Uses
How it is made	Ring frame with a core attachment; also compact, siro, rotor, air-jet, vortex and friction (DREF) spinning	How it is made
Elastane draft	Often about 3 to 4 times: 3.8 common for 78 dtex elastane in Bangladesh mills, 2.9 to 3.8 in a dual-core study; one published set runs from 1.95 to 4.40	Elastane percentage
Core share by mass	4 to 8% in the stretch denim weft yarns studied; about two-thirds in core-spun sewing thread	Core-to-sheath ratio
Main faults	Grin-through, sheath slippage, lower tenacity when elastane is added	Advantages and limits
Nearest alternatives	Single and double covered, air-covered and twisted elastane yarns	Comparison table

Core-to-sheath ratio by product

Product	Core	Sheath	Core share	Source
Stretch denim weft	Elastane, 44 to 156 dtex	Cotton	4 to 8% of the yarn in the study set	Helali, 2023
Dual-core denim weft	78 dtex elastane plus 110 dtex textured polyester filament	Cotton, 42 tex yarn	About 30% of the yarn (derived at an elastane draft of 3.5: 7.8 ÷ 3.5 + 11 ÷ 1.08 = 12.4 tex of 42 tex)	Babaarslan, 2018

Product	Core	Sheath	Core share	Source
Core-spun sewing thread	Polyester multifilament	Polyester staple (about 40 mm in poly/poly thread) or cotton	About two-thirds core, one-third sheath	Amann
Fire-barrier fabric	Glass filament	Cotton, flame-retardant treated	17% glass core content in the fabric (1998); about 20% glass with improved glass-core yarns (1999)	Sawhney, 1998; 1999
Easy-care cotton-surface fabric	Polyester filament	Cotton	40% polyester core in the fabric	Sawhney, 1998

Key figures and their sources

- The Ne 40 row is a comparison weft in a Lycra patent, 40 Ne cotton with 40 denier spandex drafted 3.5× (US7310932).
  Source: US7310932 (patents.google.com)
- Elastane stretches to several times its length: the Dorlastan used in the Helali study reaches 550% stretch, and the Sanko denim patent describes elastomers that stretch at least 400% (WO2012062480).
  Source: WO2012062480 (patents.google.com)
- A polyester multifilament core with a sheath of fine polyester fibres (cut to about 40 mm in poly/poly threads) or cotton, in a ratio of about two-thirds core to one-third sheath; the filament core gives substantially higher tear and abrasion resistance than a spun thread (Amann).
  Source: Amann (amann.com)

Formulas and diagrams

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Elastane is bought by its supply count, for example 78 dtex, the decitex equivalent of 70 denier (70 × 10 ÷ 9 = 77.8 dtex).
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The relation used in the published work is elastane draft = elastane count ÷ (yarn count × elastane ratio), with both counts in tex (Helali, 2023, equation 1).
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Elastane % = (elastane tex ÷ elastane draft) ÷ yarn tex × 100.
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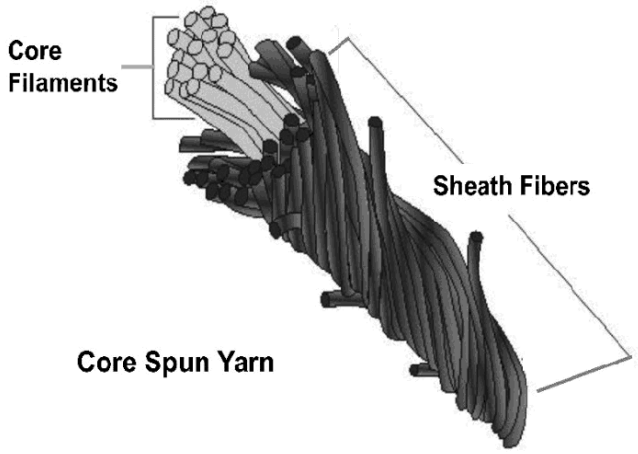
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For dtex divide by 10 to get tex; for an English count use yarn tex = 590.5 ÷ Ne; for denier use tex = denier ÷ 9.
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From a 0.8 ktex roving that is a draft of 800 ÷ 34.67 = 23.1.
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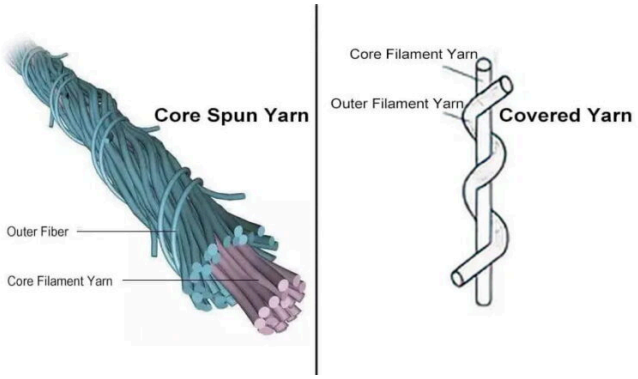
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Set the frame to 800 ÷ 36.9 = 21.7 instead and the sheath comes out at 36.9 tex, so with the core the yarn is 39.1 tex, about Ne 15.1 rather than Ne 16.
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If the weft were 40% of the fabric mass, a 6.04% yarn would give 0.40 × 6.04 = 2.4% elastane in the fabric.
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Divide the elastane (Lycra) count by its draft, then divide by the yarn count, both in tex: elastane % = (elastane tex ÷ draft) ÷ yarn tex × 100.
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The core is a continuous filament bundle; the sheath is staple fibre twisted round it, and the sheath is all that the eye and the skin meet.



Core-spun (left): staple fibre spun round the core. Covered (right): a filament yarn wound round it.

Revision questions

The questions readers ask most, with the article's own answer.

What is core spun yarn?

It is a yarn with a continuous filament core, such as elastane or polyester, completely covered by staple fibre such as cotton that is spun round it. The core gives stretch or strength; the sheath gives the look and feel of a spun yarn.

How do you calculate the Lycra percentage in a yarn?

Divide the elastane (Lycra) count by its draft, then divide by the yarn count, both in tex: elastane % = (elastane tex ÷ draft) ÷ yarn tex × 100. Ne 16 (36.9 tex) with 78 dtex elastane at 3.5× holds 7.8 ÷ 3.5 ÷ 36.9 = 6.04% elastane.

What is core spun thread used for?

Industrial sewing that needs filament strength with a spun-thread surface; the makers list denim, workwear, lingerie, towels and home furnishings. A cotton wrap protects the polyester core from needle heat.

What is a dual core yarn?

A core-spun yarn with two cores under one sheath: elastane for stretch beside a polyester or elastomultiester filament for strength and shape retention. It is used as stretch denim weft; in one study, dual-core denims recovered about 85 to 90% weft-wise after 50 loading cycles, against 56.63% for all-cotton denim.

What is the difference between core-spun and covered yarn?

In a core-spun yarn, loose staple fibres are spun round the core on a spinning frame, so the surface is spun fibre. In a covered yarn, a finished filament yarn is wound round the stretched core on a covering machine, so the surface is filament.

What is grin-through in core-spun yarn?

It is the core showing through the sheath: a glitter on the fabric face or a synthetic feel to the hand. A Lycra patent ties it to too low a core stretch ratio and an off-centre core; a sheath that slips along the core can also bare it.

Test yourself

Ten questions on this topic. Answer them without looking, then check on the last page.

1. In a core-spun yarn, what does the sheath of staple fibre provide?
2. How does a core-spun yarn differ from a blended yarn?
3. On a ring frame core attachment, how is the elastane stretched before it is covered?
4. What elastane draft do mills in Bangladesh commonly run for 78 dtex elastane?
5. What gives an elastic core-spun yarn its stretch after spinning?
6. When setting the ring frame draft for a core-spun yarn, which linear density should the roving be drafted to?
7. Does a higher elastane draft put more or less elastane into a core-spun yarn?
8. What is the approximate core-to-sheath ratio in core-spun sewing thread, and why is its tear and abrasion resistance higher than a spun thread's?
9. What is sheath slippage in a core-spun yarn?
10. How much faster is air covering of elastane than conventional covering, according to Rieter?

Answers

Each answer is stated in the article; the section to read again is named after it.

1. **The appearance, handle and comfort of a spun yarn.**
   See: What is core-spun yarn?
2. **In a blended yarn, two fibres are mixed through the whole cross-section.**
   See: What is core-spun yarn?
3. **The front roller surface runs faster than the feed rollers, so the elastane is stretched between them.**
   See: How core-spun yarn is made
4. **A draft of 3.8.**
   See: How core-spun yarn is made
5. **When tension comes off, the stretched core pulls back and gathers the sheath; that recovery is the stretch.**
   See: How core-spun yarn is made
6. **The sheath's, not the whole yarn's: the ring frame drafts the sheath only.**
   See: How to calculate the elastane percentage of a core-spun yarn
7. **Less elastane, not more.**
   See: How to calculate the elastane percentage of a core-spun yarn › How the draft and the elastane count change the percentage
8. **About two-thirds core to one-third sheath; the filament core gives the higher resistance.**
   See: What core-spun yarn is used for › What is core spun thread?
9. **The sheath sliding along the smooth filament core, which bares the core.**
   See: Advantages and limits of core-spun yarn › Sheath slippage
10. **Typically 30 to 50 times faster.**
    See: Core-spun vs covered, air-covered and twisted elastane yarns

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