

SHIVPRIYA TEXCHEM · KNOWLEDGE SERIES

# S & Z Twist.

## The direction that decides how fabric behaves.

Twist direction is treated as a detail on a specification sheet and is nothing of the sort. It decides whether a knitted garment hangs straight or twists on the body, whether a twill line looks sharp or flat, and whether a fabric skews in the first wash.

### Z

the direction almost every single yarn in the world is spun

### S + Z

the combination behind every balanced ply yarn

### Spirality

the garment defect that traces directly back to residual torque

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## CHAPTER 01

## Reading S and Z

The convention is visual and unambiguous. Hold the yarn vertically and look at the surface fibres. If they run in the direction of the central stroke of the letter S, it is S twist. If they follow the central stroke of Z, it is Z twist.

| DIRECTION       | ALSO CALLED        | WHERE IT IS USED                                                  |
|-----------------|--------------------|-------------------------------------------------------------------|
| <b>Z twist</b>  | Right-hand twist   | The near-universal default for single spun yarn worldwide         |
| <b>S twist</b>  | Left-hand twist    | Ply twist over Z singles; special effects; some warp applications |
| <b>Z over Z</b> | Same-direction ply | Harder, livelier, denser yarn — chosen deliberately               |
| <b>S over Z</b> | Opposed ply        | The standard balanced ply construction                            |

**Why Z became standard.** There is no deep physical reason. Early machinery was built to twist one way, and the whole industry standardised around it. **The convention matters far more than the choice** — mixing directions unintentionally is what causes problems.

## CHAPTER 02

## A twisted yarn wants to untwist

Inserting twist stores elastic energy in the fibre assembly. That stored energy is torque, and it does not go away — it waits for an opportunity to release, usually at the worst possible moment.

### 01 Twist stores energy

Every fibre is bent and strained into a helix. The assembly is permanently trying to return.

### 02 Tension holds it

Under tension the yarn behaves. Torque is present but restrained.

### 03 Slack releases it

Let the yarn go slack and it snarls, kinks and doubles back on itself.

### 04 Fabric releases it slowly

In a knitted loop torque acts over days and washes, gradually distorting the structure.

### 05 Setting relaxes it

Steam or heat setting relieves internal stress and makes the twist permanent and calm.

Residual torque is not a fault in the yarn. It is **stored energy that the fabric has to absorb** — and where it cannot, the garment moves instead.

CHAPTER 03

## Spirality — where twist direction becomes visible

Single jersey knitted from a single Z-twist yarn will spiral. The side seam of the T-shirt rotates around the body. It is the single most common twist-related complaint in the garment trade.



Every loop leans the same way — thousands of small rotations become one visible defect

| REMEDY                    | EFFECTIVENESS | COST OR TRADE-OFF                                                |
|---------------------------|---------------|------------------------------------------------------------------|
| Lower twist multiplier    | Good          | Weaker yarn; more breaks in knitting                             |
| Steam-set the yarn        | Very good     | An extra process stage and its cost                              |
| Plied yarn                | Excellent     | A balanced ply has near-zero net torque; costs more              |
| Alternate S and Z feeders | Very good     | Requires two yarn lots and careful feeder discipline             |
| Interlock or rib          | Excellent     | Double-jersey structures self-balance; different fabric entirely |
| Heat-set the fabric       | Partial       | Helps, but does not remove the underlying torque                 |

**The practical answer.** For single jersey the reliable fix is **low-twist, steam-set yarn** — or alternating S and Z feeders where the machine and the programme allow it. Fabric finishing alone will not hold the correction through repeated washing.

## CHAPTER 04

## Twist direction and the twill line

In woven fabric twist direction interacts with weave direction. Get the combination right and the twill line is prominent and clean; get it wrong and it flattens out.

| WEAVE                   | YARN TWIST | VISUAL RESULT                                                    |
|-------------------------|------------|------------------------------------------------------------------|
| <b>Right-hand twill</b> | Z twist    | Twill line and fibre helix oppose — a flatter, subdued line      |
| <b>Right-hand twill</b> | S twist    | They reinforce — a prominent, sharply defined twill line         |
| <b>Left-hand twill</b>  | Z twist    | They reinforce — prominent line                                  |
| <b>Left-hand twill</b>  | S twist    | They oppose — subdued line                                       |
| <b>Plain weave</b>      | Either     | Little visual effect; twist matters for strength, not appearance |

### 01 Denim convention

Classic denim is right-hand twill with Z-twist yarn — the subdued line is part of its character.

### 02 Left-hand denim

Left-hand twill with the same Z yarn gives a softer fabric and a different wash appearance.

### 03 Gabardine and worsted

A sharp, prominent twill is the aesthetic; twist direction is chosen deliberately to achieve it.

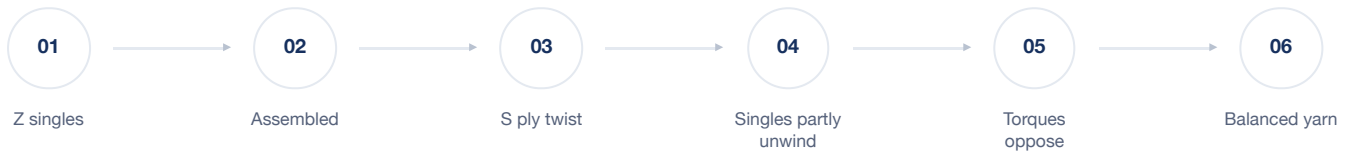
### 04 Skew and torque

Uncontrolled residual torque in the weft is a leading cause of fabric skew after washing.

CHAPTER 05

## Why balanced ply uses both directions

The standard ply construction opposes the two twists so their torques cancel. It is the most elegant use of twist direction in the industry and the reason ply yarn behaves so calmly.



**Ply twist partly unwinds the singles — the opposing torques cancel out**

CONSTRUCTION

BEHAVIOUR

|                                        |                                                                                 |
|----------------------------------------|---------------------------------------------------------------------------------|
| <b>Z singles, S ply, TM ratio ~0.7</b> | The classic balanced yarn — hangs open when slack, no snarling                  |
| <b>Z singles, S ply, high ply TM</b>   | Over-plied; torque now runs the other way and the yarn snarls in S              |
| <b>Z singles, Z ply</b>                | Torques add. A hard, dense, lively yarn — correct for crepe, wrong for knitwear |
| <b>Z singles, S ply, low ply TM</b>    | Under-plied; the structure opens under abrasion and the plies separate          |

**The working ratio.** Ply twist multiplier at roughly **0.7 times the singles twist multiplier**, in the opposite direction, is the long-standing rule for a balanced yarn. It is a starting point to be verified by the snarl test, not a law.

## CHAPTER 06

## Using twist direction deliberately

Once you can control direction, it becomes a design tool. Several well-known fabrics exist entirely because someone chose to combine directions on purpose.

| FABRIC                 | HOW TWIST DIRECTION CREATES IT                                                                   |
|------------------------|--------------------------------------------------------------------------------------------------|
| <b>Crepe</b>           | Very high twist yarn, unset, allowed to snarl in the fabric — the crinkle is released torque     |
| <b>Voile</b>           | High-twist yarn in both directions gives a crisp, dry, open fabric with a clean handle           |
| <b>Georgette</b>       | Alternating S and Z yarns in both warp and weft produce the characteristic grainy surface        |
| <b>Seersucker</b>      | Differential tension and yarn behaviour create the puckered stripe                               |
| <b>Shadow stripe</b>   | Alternating S and Z yarns in the warp reflect light differently — a stripe with no colour change |
| <b>Balanced jersey</b> | Alternating S and Z feeders cancel spirality without changing the yarn count                     |

A shadow stripe uses no second colour and no second count. It is **twist direction alone**, made visible by light.

## CHAPTER 07

# Testing twist properly

Twist is measured by untwisting a known length until the fibres are parallel and counting the turns.

Simple in principle, and easy to get wrong in ways that matter.

## 01 Untwist method

For single yarn: clamp a set length, untwist to parallel, count turns. Straightforward but operator-sensitive.

## 03 Ply twist first

On plied yarn, remove ply twist before attempting to measure singles twist.

## 05 Note the direction

Always record S or Z. A twist figure without a direction is an incomplete specification.

## 02 Untwist–retwist

For fine yarns: untwist and continue until the original length returns. Halve the count. More repeatable.

## 04 Report as TM

Turns per inch is meaningless without the count. Twist multiplier normalises and compares.

## 06 Test enough samples

Twist varies along the yarn. A single test tells you very little about the lot.

### TPI

Turns per inch — the raw count.  
Only comparable within one count.

### TM

Twist multiplier — TPI divided by the square root of the count.  
Comparable across counts.

### Direction

S or Z. Non-negotiable in any specification that will be woven or knitted.

### Balance

The snarl test. Faster and more informative than any number on the report.

## CHAPTER 08

## Diagnosing twist-related faults

A surprising share of fabric complaints trace back to twist direction or residual torque. These are the common ones and where they actually originate.

| COMPLAINT                       | WHAT IS HAPPENING                      | WHERE TO FIX IT                                   |
|---------------------------------|----------------------------------------|---------------------------------------------------|
| <b>T-shirt seam rotates</b>     | Spirality from single-direction torque | Yarn: lower TM, steam set, or alternate feeders   |
| <b>Fabric skews after wash</b>  | Residual torque releasing in finishing | Yarn setting and controlled fabric finishing      |
| <b>Yarn snarls at the creel</b> | Unbalanced twist, usually over-plied   | Twisting: correct the ply TM ratio                |
| <b>Twill line looks flat</b>    | Twist direction opposing the weave     | Design: change twill direction or yarn twist      |
| <b>Knit fabric feels hard</b>   | Twist multiplier too high for knitting | Yarn: specify a knitting TM, not a weaving one    |
| <b>Faint stripes in fabric</b>  | Mixed S and Z yarn in one lot          | Sourcing: enforce single-direction lot discipline |

**The sourcing trap.** Yarn from two suppliers, one Z and one S, blended into one warp or one knitting run produces a **shadow stripe nobody ordered**. Specify direction on every purchase order, not only on the technical ones.

## CHAPTER 09

## Putting direction in the specification

Twist direction costs nothing to specify and a great deal to get wrong. It belongs on every yarn order.

### 01 State direction explicitly

Write “Z twist” or “S twist” on the order. Do not rely on Z being assumed, even though it usually is.

### 03 Specify setting for knitting

For single jersey, require steam-set yarn and state the setting condition.

### 05 Require a snarl result

For ply and high-twist yarn, ask for the balance test result on the delivered lot.

### 02 Give TM, not just TPI

And state the intended end use so the spinner can check your number against it.

### 04 Enforce lot discipline

One direction per lot, per programme. Mixed directions are invisible until the fabric.

### 06 Match direction to weave

For twill and worsted, confirm the twill direction and choose twist to suit the appearance you want.

**How Shivpriya reads it.** For knitting programmes we ask about **twist multiplier and setting before we ask about price**. Spirality complaints arrive months after delivery, when the garment has been washed — and by then the yarn lot is long gone.

## IN CLOSING

# A letter on a spec sheet. A garment that twists.

Twist direction is the cheapest thing to specify correctly and one of the most expensive to discover late. If you are seeing spirality, skew or an unexpected shadow stripe, it is almost always a twist issue — talk to us and we will trace it back through the yarn rather than around the fabric.

## TALK TO US

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