

## Fabric Structures: knit introduction and filling knits

This section introduces knit structures and then describes filling knits, one of two major knit structures. The previous sections described woven structures. As review, recall there are three main structures:

*Woven fabric*: interlacing of 2 sets of yarns at right angles

*Knit fabric*: inter-looping yarns, horizontally or vertically

*Non-woven fabric*: random order of yarns or fibers held together with a variety of methods

### Textile Structure Categories & Subcategories

| Wovens                                               |                                                                                                                                   | Knits                                                                                                                                              |                                                    | Non-wovens                                         |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|
| Basic Weaves                                         | Complex Weaves                                                                                                                    | Filling (weft) Knits                                                                                                                               | Warp Knits                                         |                                                    |
| Plain<br>Plain-basket<br>Plain-rib<br>Twill<br>Satin | Leno<br>Slack Tension<br>Pile<br>Figure:<br>Dobby<br>Jacquard<br>Gauze<br>Crepe<br>Double<br>Surface:<br>Spot<br>Swivel<br>Lappet | Single:<br>Plain Jersey<br>Jersey variation<br>Jacquard jersey<br>Purl<br>Double:<br>Plain double<br>Jacquard double<br>Interlock<br>Sliver (pile) | Tricot<br>Raschel:<br>Lace<br>Net<br>Sliver (pile) | Multiple methods that are neither wove nor knitted |

## Knit Fabrics: Introduction

*Knit fabrics* are produced with looped yarns in various configurations. Unlike handknit fabrics, commercial production knits are formed on knitting machines with many “needles” that look nothing like hand knitting needles.

There are two main knit categories: *filling (weft) knit* and *warp knit*. The names “borrowed” from weaving indicate that production knit technologies followed woven technologies. The names *filling* and *warp* also indicate the general direction of the yarn loops in the fabrics. The term *weft knit* may be used instead of *filling knit*.

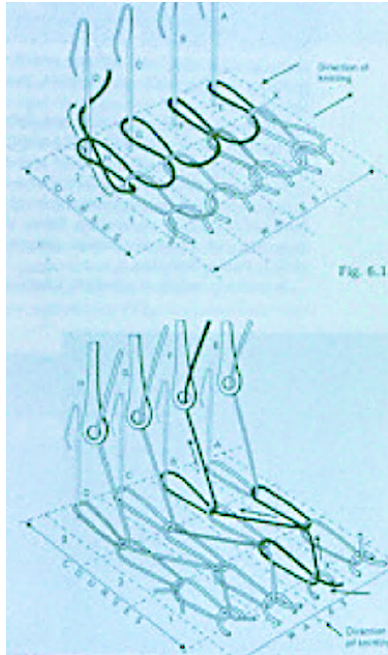


Illustration of knitting machine needles forming a basic filling knit (top) and basic warp knit (bottom). Follow the black yarn loops—the filling knit yarn travels in the crosswise (filling) direction, the warp knit yarn travels in the lengthwise (warp) direction.

K. LaBat collection

Is it the “right side” of the fabric? In knit production two terms refer to the “planar sides” of a fabric. “Technical face” and “technical back” are used to distinguish which sides emerges from the knitting machine as a guide for production personnel. A knit designer could use either the technical face or the technical back as the appearance, or “right”, side of a product.

Knits have length and crosswise direction “rules” for product pattern lay-out. Filling knits are generally more stable in the length direction and have more stretch, sometimes a lot, in the crosswise direction. Warp knits are generally more stable than filling knits with limited stretch in cross and length directions. However, stretch and stability also depend on fiber and yarn type. Knits have no true bias (45-degree angle) like wovens.

### Knit Structures: Filling Knits

- single filling knit
- double filling knit

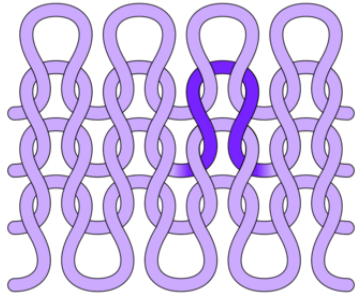
#### Single Filling Knit—variations

- plain jersey
- purl
- jersey variation
- Jacquard jersey

#### Single Filling Knit-plain jersey

Think of *single filling knit plain jersey* as a typical “t-shirt” knit (pictured below). The face side of the knit looks like “V”s stacked vertically. The back, or purl side, looks like horizontal rows of

“bumps”. What you are seeing are the tops of the “V” structures—look at the first loop illustration below. An easy way to determine if a knit is single or double is to pull the fabric in the crosswise direction. If it’s a single filling knit, the fabric curls to the face(“V”) side. A double knit is more stable with similar loop structures on both sides—it won’t curl to either side.



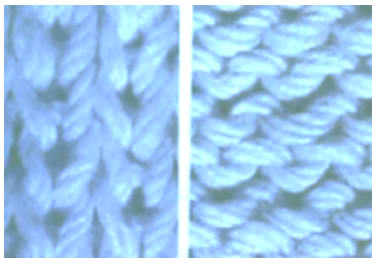
Filling knit stitch illustration.

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[https://commons.wikimedia.org/wiki/File:Knitting\\_stitches.png](https://commons.wikimedia.org/wiki/File:Knitting_stitches.png)

Retrieved: June 13, 2026



Jersey knit swatch. Technical front (left) and technical back (right).

Note “V’s” on the front and “top of loop” on the back. Compare to the illustration above.

K. LaBat

Hand knitters are familiar with the single filling knit. The loops are formed with two knitting needles manipulated with the hands. Production knits are formed differently with many needles lined up in a “bed” of a knitting machine—each needle is topped with a hook that pops up one at a time to grab the yarn forming loops in sequence across the width of the fabric. A device carries the yarn across the machine. The next row loops into the previous row when the carriage device returns or in circular knitting the yarn circles around the machine.



Hand knitting with 2 needles.

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Retrieved: June 13, 2026

Two types of knitting machines are pictured below. Both are “flat bed machines”. One is a production machine—you can see the fabric emerging from the bottom of the machine. The other machine is often used by knit designers to make custom pieces. You can see the separate needles lined up horizontally across the bed of the machine. The device with a handle is used to carry the yarn across the needle bed. Each needle is activated to pick up the yarn forming a loop. Filling

knits are also made on circular knitting machines to make tubular knits. Tubular handknits can be made using four double-pointed hand knitting needles.

There are many knitting production videos available online—search for “production knitting video”. An example from the *Textile School* via *Cotton Incorporated* can be found at:

<https://youtu.be/U1bk4ZI0Qvc> Retrieved June 29

The video also includes demonstrations of *warp knitting* described in the next section.



Automatic computerized flat knitting machine (Jacquard), 2017. Production machine.

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[https://commons.wikimedia.org/wiki/File:Automatic\\_Computerized\\_Flat\\_Knitting\\_Machine.jpg](https://commons.wikimedia.org/wiki/File:Automatic_Computerized_Flat_Knitting_Machine.jpg)  
Retrieved June 29, 2026.

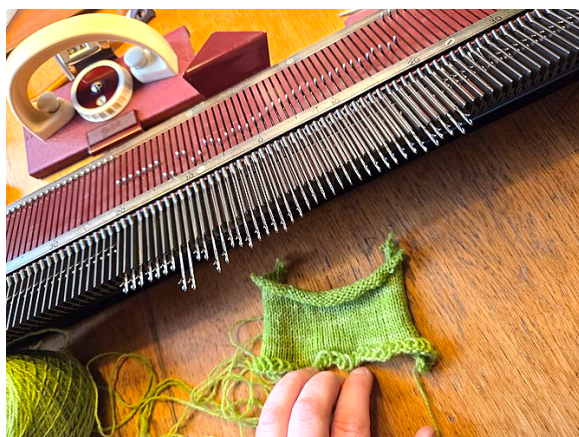


Wikibook Machine Knitting. Brother knitting machine. Used for custom knit designs

Source: Gudde Fog, Denmark, CC BY-SA 4.0

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<https://commons.wikimedia.org/wiki/File:MachineKnittingKnittax.jpg> Retrieved June 22, 2026.



Closeup on a Knittax M2 knitting machine. Note the row of needles in varying activated positions and the carriage device with handle that carries the yarn across the bed. Also note that the knit “curls” to the face or V-side of the swatch.

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[https://commons.wikimedia.org/wiki/File:Knittax\\_M2.jpg](https://commons.wikimedia.org/wiki/File:Knittax_M2.jpg)

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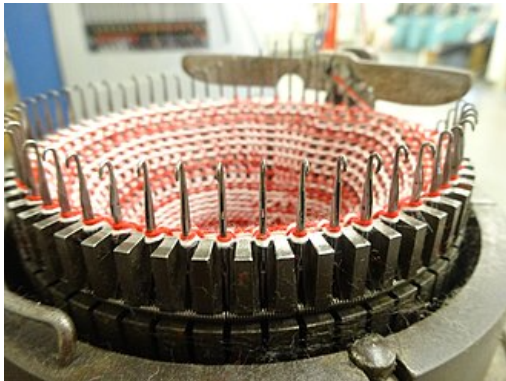
<https://drkrinfabricprof.com>



“Hand” circulae knit, knitting socks with 4 needles.

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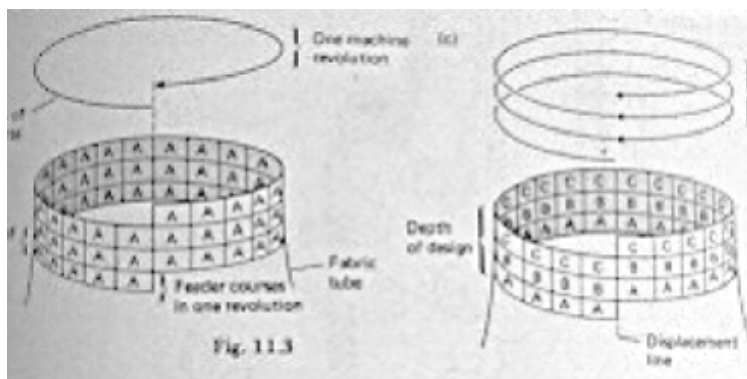
Circular Production Knitting Machine

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<https://commons.wikimedia.org/wiki/File:Old-Knitting-Machine-Knitting-Machine-Close-up-Dial-1588882.jpg>  
Retrieved June 13, 2026.

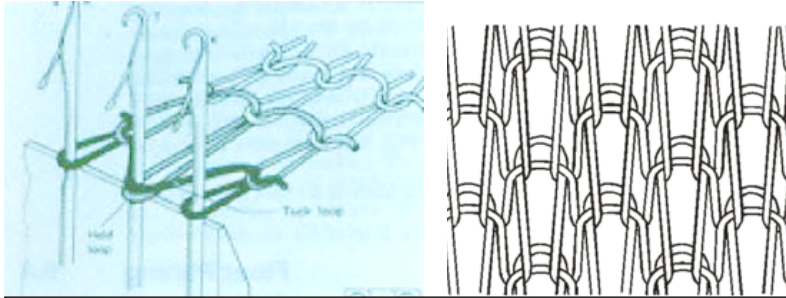
Tubular knits, especially with horizontal stripes (think of little boys’ t-shirts) can distort when washed. If the knit was not “set” or finished properly the knit can “skew” after laundering so that the stripes are no longer horizontal but slant and the t-shirt side seams twist out of alignment. An illustration of the skew problem is shown below—the wider the color stripe, the more the skew. The stripes are produced in a continuous coil. After knitting, the tube is cut and the colors matched and stitched and the rows are forced into horizontal position. The stripes are then set in place by various methods—heat setting is typical for synthetic (thermoplastic) fibers.

A good explanation of the problem can be found at: <https://apparel.wiki/blog/why-do-garments-twist-after-washing/> Retrieved June 26, 2026.



### Single Filling Knit- jersey variations

*Single filling knit-jersey variations* are made by “tucking” stitches and/or “floating” stitches. The “tuck stitch” and the “float stitch” can provide texture and color variations. The photo below is of a typical “picot” stitch texture formed by holding or “tucking” a stitch to pick up and knit in the next row. Fabric name examples are “picot knit” jersey and “Lacoste knit” jersey. Lacoste knit was originally designed by Rene’ Lacoste for tennis shirts—known for its durability and comfort. You may be familiar with the Lacoste logo—an alligator.



Left: simple tuck stitch on knitting machine. Right: Lacoste knit loop structure

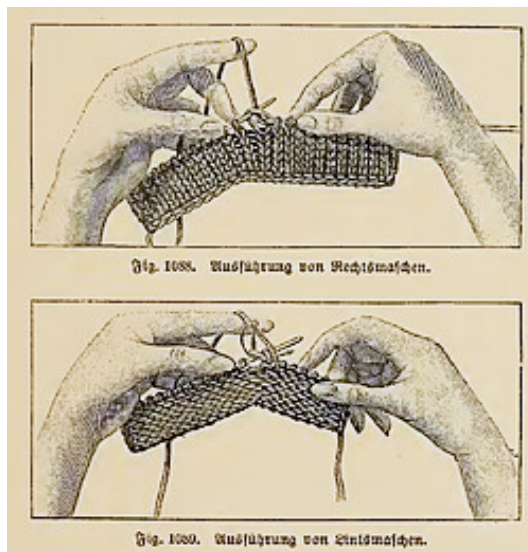
Lacoste Attribution: Elkagye, Public domain, via Wikimedia Commons

[https://upload.wikimedia.org/wikipedia/commons/b/bd/Lacoste\\_fabric\\_structure.png](https://upload.wikimedia.org/wikipedia/commons/b/bd/Lacoste_fabric_structure.png)

Retrieved June 30, 2026.

### Single Filling Knit—purl variation

*Single Filling Kni—purl variation* refers to using the technical back of the fabric as the appearance side—with the tops of the loops (“bumps”) or purls used as the design feature of the product. Look at the illustration of handknitting to see the knit side and the purl side of the fabric.



Hand knitting: face side (top) and back side (bottom). Although referred to as the back side of the fabric, the “back side” can be used on the right side of a product—then called a “purl knit”.

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Retrieved: June 29, 2026.

### Filling Knits: rib knit

*Rib Knits* are often used for cuffs and necklines of sweaters, sweatshirts and T-shirts. Rib knit is also used for body-conforming sweaters. Rib knitting alternates vertical columns of knit and purl stitches (pictured below). Alternating knit and purl columns produces a very stretchy knit in the crosswise direction. Rib knits may be described by the numbers of stitches in each row; 2X2 and 1X1 (two-by-two and one-by-one) are typical. I'm including *rib knit* in the single filling knit section after describing knit and purl stitches—although in production knitting it is categorized as a double knit since rib knits are made on “double bed” flat or circular knitting machines.



Rib Knit often used for sweater cuffs providing excellent crosswise stretch.

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[https://upload.wikimedia.org/wikipedia/commons/b/b5/Ribbs\\_tickning.jpg](https://upload.wikimedia.org/wikipedia/commons/b/b5/Ribbs_tickning.jpg) Retrieved: June 29, 2026.

### Single Filling Knit Variation—Jacquard

The term *Jacquard* gives a clue, taken from a weaving term, that the structure is multi-colored—often in very complex patterns. *Single filling knit—Jacquard* multi-colored fabrics are made by bringing one yarn color in one row to the face of the fabric while “floating” other colors along the back of the fabric. When the yarn floats on the back of the fabric it doesn't appear on the face of the fabric. A yarn can be “picked up” and brought to appear on the front of the fabric. See the illustration of a yarn “floating” over 4 stitches and photos of two types of Jacquard jersey fabric garments.

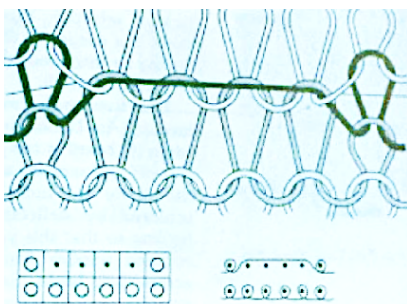
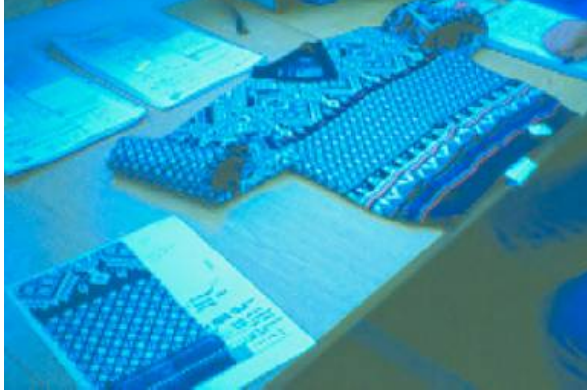


Illustration of yarn “floating” over four stitches in one row. Two types of knit notations for the stitches. Circles and loops represent the yarn formed on needles. Dots represent needles that are not “activated” to form a stitch.

K. LaBat collection



Two color (blue and white) sweater.

The photo was taken at Winona Knitting Mills (no longer in operation) by K. LaBat. An archival video of production at Winona Mills, Winona, Minnesota can be found at: <https://www.youtube.com/watch?v=A2nxnY4NCPo&t=628s> Retrieved: June 30, 2026.



Wool Knit Suit with Abstract Jacquard Pattern. See the link for more views. Designed by Yves Saint Laurent, 1970's.

Goldstein Gallery Collection

<https://goldsteincollection.rediscoverysoftware.com/mDetail.aspx?rID=1988.034.013a-c&db=objects&dir=GOLDSTEIN>

Retrieved: June 29, 2026

### **Double Filling Knit—variations**

- plain double
- Jacquard double
- Interlock
- Sliver (pile)

### **Double Filling Knit—plain**

Double filling knit production fabrics are made on double bed knitting machines. Yarns alternate between the front and back beds. The appearance of a simple double filling knit is as if two layers of single knit are sandwiched together—the “V”s appear on the face and the back of the fabric. Look carefully at the illustration to follow the yarn as it moves from front side to back side. For a detailed explanation of single and double filling knits go to Cottonworks by Cotton Incorporated: <https://cottonworks.com/learning-hub/knitting/single-and-double-knits/> Retrieved: July 3, 2026.

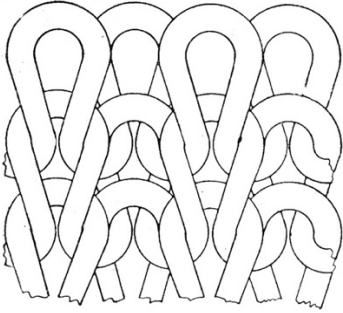


Illustration of an example of double filling knit loops.

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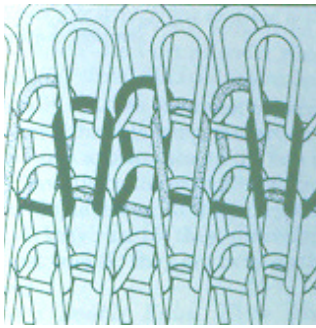
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[https://upload.wikimedia.org/wikipedia/commons/5/56/Double\\_knit\\_structure\\_%28weft\\_knitted%29.jpg](https://upload.wikimedia.org/wikipedia/commons/5/56/Double_knit_structure_%28weft_knitted%29.jpg)

Retrieved: July 3, 2026

### Double Filling Knit—Interlock

*Double filling knit—Interlock* looks like plain double knit with identical technical face and back sides. It is constructed by interlocking two rows of stitches with slightly different loop configurations that works well with small diameter (fine) yarns. It is typically thicker and heavier than jersey and does not curl. While stable, it can “ladder” or “run” when stretched on one edge—but the laddering is limited. Use a fine, new needle to stitch interlock fabrics that will slip easily between compact yarns.



Interlock stitch illustration.

Interlock swatch with top edge stretched in cross direction resulting in “runs”.

K LaBat collection.

### Double Filling Knit—sliver

*Sliver knits* are high pile fabrics made on circular knitting machines. As the knitting machine forms loops, the knitting needle hooks simultaneously pick up tufts of fibers from a “sliver” (pronounced sly-ver). You may recall from information on yarn production that a sliver is a chunky pre-yarn with very fluffy feel and appearance. The fabrics are often called “faux fur” or “plush fleece”.



Sliver knitting machine with sliver being fed to the knitting needles.

Sliver knit swatch showing the pile surface on one side and the knit stitches on the other.

K. LaBat collection

### Characteristics of Filling Knits:

- Stretch in the filling (crosswise) direction
- Single filling knits “curl” to the technical face when stretched in the crosswise direction
- Double filling knits do not “curl” when stretched
- All else equal (fiber, yarn, stitch count, etc.) double filling knits are thicker than single filling knit

Filling knits are formed with yarn loops that travel in the crosswise (filling direction). Many types of production filling knits are produced—from the simplest t-shirt jersey knit, to textured and multi-colored knits, to faux fur.

Next Section on *Warp Knits*