



Comprehensive Technical Reference for Sewing, Quilting & Industrial Textile Production

SECTION 1: DOCUMENT LEGEND & HOW TO READ THIS CHART

1.1 Color Coding

- Green zones = Optimal match (recommended for production use)
- Yellow zones = Acceptable with adjustments (test swatch required)
- Red zones = Incompatible (risk of machine damage or seam failure)

1.2 Abbreviations Used

Table

Abbreviation	Full Term
wt	Standard Weight
T	Tex
D	Denier
Nm	Metric Ticket Number
ply	Number of twisted strands
tsp	Tensile Strength in Pounds



%E	Elongation Percentage
GSM	Fabric Weight (grams per square meter)
SPI	Stitches Per Inch

1.3 Measurement Systems Overview

This chart covers FOUR primary thread sizing systems used globally:

1. Standard Weight (wt) — Predominantly used in North America for quilting, home sewing, and embroidery. Higher number = finer thread.
2. Tex (T) — ISO standard used in industrial manufacturing worldwide. Higher number = thicker thread.
3. Denier (D) — Used for silk, synthetic fibers, and lightweight apparel. Higher number = thicker thread.
4. Metric Ticket Number (Nm) — European standard. Higher number = finer thread.

CRITICAL RULE: Never mix systems without conversion. A "40 wt" thread is NOT the same thickness as "40 Tex."

SECTION 2: STANDARD THREAD WEIGHT (wt) SYSTEM

2.1 Definition

Standard Weight (also called "Cotton Count" or "English Count") measures how many hanks of 840 yards each weigh one pound. In practical terms: higher weight number = finer, thinner thread.

2.2 Complete Weight Scale



Table

Weight (wt)	Approximate Diameter (mm)	Tex Equivalent	Denier Equivalent	Metric (Nm)	Typical Uses
8 wt	0.45–0.50	300 T	2700 D	Nm 3.3	Heavy-duty canvas, leather, upholstery, sails, tarpaulins
12 wt	0.38–0.42	200 T	1800 D	Nm 5.0	Denim, heavy canvas, outdoor gear, belting
18 wt	0.32–0.36	135 T	1200 D	Nm 7.4	Medium canvas, workwear, bag construction
20 wt	0.30–0.33	120 T	1080 D	Nm 8.3	Heavy quilting, decorative topstitching, bag making
24 wt	0.27–0.30	100 T	900 D	Nm 10.0	General quilting, medium-weight decorative work
28 wt	0.25–0.27	85 T	765 D	Nm 11.8	Hand quilting, visible decorative stitching
30 wt	0.23–0.25	80 T	720 D	Nm 12.5	Machine quilting, general-purpose medium weight



35 wt	0.21–0.23	68 T	612 D	Nm 14.7	General sewing, craft projects
40 wt	0.19–0.21	60 T	540 D	Nm 16.7	Universal all-purpose – most common domestic weight
50 wt	0.17–0.19	48 T	432 D	Nm 20.8	Quilting standard – fine piecing, detailed work
60 wt	0.15–0.17	40 T	360 D	Nm 25.0	Fine quilting, heirloom sewing, lightweight fabrics
80 wt	0.12–0.14	30 T	270 D	Nm 33.3	Micro quilting, English paper piecing, fine detail
100 wt	0.10–0.12	24 T	216 D	Nm 41.7	Invisible appliqué, micro-stitching, silk work
120 wt	0.09–0.10	20 T	180 D	Nm 50.0	Ultra-fine detail, heirloom techniques

2.3 Weight System Logic (Inverted Scale)

plain

THICKER ← → FINER

8 wt	20 wt	40 wt	60 wt	100 wt	120 wt
(heavy)		(all- purpose)	(fine)	(micro)	(ultra)

MEMORY AID: "Weight goes UP, thread goes DOWN (in thickness)."



SECTION 3: TEX SYSTEM (ISO 2060)

3.1 Definition

Tex measures the weight in grams of 1,000 meters of thread. Higher Tex number = thicker, heavier thread. This is the direct opposite logic of the Standard Weight system.

3.2 Complete Tex Scale

Table

Tex (T)	Weight Equivalent	Denier Equivalent	Metric (Nm)	Typical Applications
9 T	~120 wt	81 D	Nm 111	Micro-embroidery, fine silk
12 T	~100 wt	108 D	Nm 83	Fine embroidery, lingerie
15 T	~80 wt	135 D	Nm 67	Fine quilting, detail work
18 T	~70 wt	162 D	Nm 56	Lightweight apparel
24 T	~60 wt	216 D	Nm 42	General sewing, quilting
27 T	~50 wt	243 D	Nm 37	Standard quilting



30 T	~45 wt	270 D	Nm 33	Medium-weight sewing
35 T	~40 wt	315 D	Nm 29	General-purpose
40 T	~35 wt	360 D	Nm 25	Heavy quilting, bag making
50 T	~28 wt	450 D	Nm 20	Topstitching, decorative
60 T	~24 wt	540 D	Nm 17	Heavy-duty seams
70 T	~20 wt	630 D	Nm 14	Upholstery, denim
80 T	~18 wt	720 D	Nm 12.5	Canvas, leather
90 T	~16 wt	810 D	Nm 11	Industrial heavy-duty
100 T	~15 wt	900 D	Nm 10	Marine canvas, sails
120 T	~12 wt	1080 D	Nm 8.3	Extreme heavy-duty
135 T	~11 wt	1215 D	Nm 7.4	Industrial belting



200 T	~8 wt	1800 D	Nm 5.0	Safety harnesses, straps
300 T	~5 wt	2700 D	Nm 3.3	Rope core, marine rigging

3.3 Tex System Logic (Direct Scale)

plain

FINER ← → THICKER
9 T 30 T 60 T 100 T 200 T 300 T
(micro) (medium) (heavy) (indust.) (extreme) (marine)

SECTION 4: DENIER SYSTEM

4.1 Definition

Denier measures the weight in grams of 9,000 meters of thread. Higher Denier = thicker thread. Commonly used for silk, nylon, and polyester threads in apparel and lightweight applications.

4.2 Complete Denier Scale

Table

Denier (D)	Tex Equivalent	Weight Equivalent	Metric (Nm)	Typical Applications
50 D	5.5 T	~200 wt	Nm 200	Ultra-fine silk, chiffon

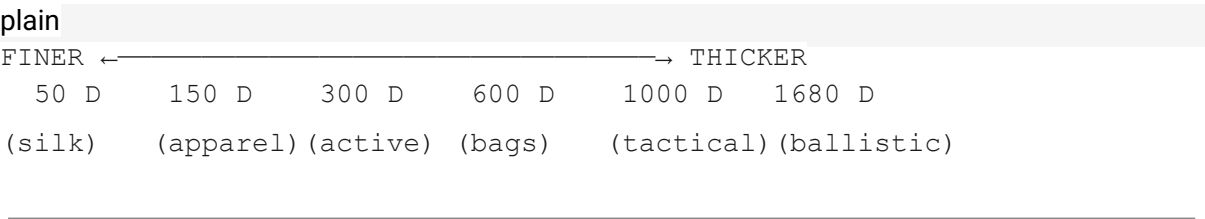


70 D	7.8 T	~140 wt	Nm 143	Fine lingerie, silk
100 D	11 T	~100 wt	Nm 100	Lightweight apparel
120 D	13 T	~85 wt	Nm 83	Blouses, fine garments
150 D	17 T	~65 wt	Nm 67	General lightweight
200 D	22 T	~50 wt	Nm 50	Medium apparel
250 D	28 T	~40 wt	Nm 40	General sewing
300 D	33 T	~33 wt	Nm 33	Sportswear, activewear
400 D	44 T	~25 wt	Nm 25	Heavy sportswear
500 D	56 T	~20 wt	Nm 20	Outerwear, bags
600 D	67 T	~17 wt	Nm 17	Heavy-duty bags
800 D	89 T	~13 wt	Nm 12.5	Luggage, backpacks
1000 D	111 T	~10 wt	Nm 10	Tactical gear, military



1200 D	133 T	~8 wt	Nm 8.3	Industrial webbing
1680 D	187 T	~6 wt	Nm 6.0	Ballistic nylon, extreme

4.3 Denier System Logic



SECTION 5: METRIC TICKET NUMBER (Nm)

5.1 Definition

Metric Number (Nm) measures how many kilometers of thread weigh one kilogram. Higher Nm = finer thread. Predominantly used in Europe and for technical textile specifications.

5.2 Complete Metric Scale

Table

Metric (Nm)	Tex Equivalent	Weight Equivalent	Denier	Region/Use
Nm 200	5 T	~200 wt	45 D	European micro-silk
Nm 150	6.7 T	~150 wt	60 D	Fine European lingerie



Nm 100	10 T	~100 wt	90 D	European apparel
Nm 80	12.5 T	~80 wt	112 D	European quilting
Nm 60	17 T	~60 wt	150 D	European general sewing
Nm 50	20 T	~50 wt	180 D	European standard
Nm 40	25 T	~40 wt	225 D	European medium-heavy
Nm 30	33 T	~30 wt	300 D	European heavy-duty
Nm 20	50 T	~20 wt	450 D	European industrial
Nm 10	100 T	~10 wt	900 D	European marine
Nm 5	200 T	~5 wt	1800 D	European extreme-duty

SECTION 6: COMPLETE CONVERSION MASTER TABLE

6.1 Quick-Reference Conversion Matrix

Use this table to convert between ANY two systems instantly.

Table



Standard (wt)	Tex (T)	Denier (D)	Metric (Nm)	Visual Thickness	Tensile Strength (approx)
120 wt	20 T	180 D	Nm 50	Hair-thin	0.5–1.0 lbs
100 wt	24 T	216 D	Nm 42	Very fine	1.0–1.5 lbs
80 wt	30 T	270 D	Nm 33	Fine	1.5–2.5 lbs
60 wt	40 T	360 D	Nm 25	Light	2.5–4.0 lbs
50 wt	48 T	432 D	Nm 21	Medium-fine	4.0–6.0 lbs
40 wt	60 T	540 D	Nm 17	Medium	6.0–9.0 lbs
35 wt	68 T	612 D	Nm 15	Medium-plus	8.0–11.0 lbs
30 wt	80 T	720 D	Nm 12.5	Medium-heavy	10.0–14.0 lbs
28 wt	85 T	765 D	Nm 12	Heavy-medium	12.0–16.0 lbs
24 wt	100 T	900 D	Nm 10	Heavy	15.0–20.0 lbs



20 wt	120 T	1080 D	Nm 8.3	Very heavy	20.0–28.0 lbs
18 wt	135 T	1200 D	Nm 7.4	Extra heavy	25.0–35.0 lbs
12 wt	200 T	1800 D	Nm 5.0	Industrial	40.0–55.0 lbs
8 wt	300 T	2700 D	Nm 3.3	Extreme	60.0–85.0 lbs

6.2 Conversion Formulas

plain

$$\text{Tex (T)} = 1000 \div \text{Nm}$$

$$\text{Tex (T)} = \text{Denier (D)} \div 9$$

$$\text{Denier (D)} = \text{Tex (T)} \times 9$$

$$\text{Standard Weight (wt)} \approx 590.5 \div \text{Tex (T)} \text{ [approximate for cotton]}$$

$$\text{Nm} = 1000 \div \text{Tex (T)}$$

Note: Exact conversions vary by fiber density. Cotton, polyester, and silk have different specific gravities, so use these formulas as starting points and verify with manufacturer specs.

SECTION 7: THREAD WEIGHT + PLY COMBINATIONS

7.1 Understanding Ply Notation

Thread labels often show numbers like "50/2" or "40/3." The format is: WEIGHT/PLY

- First number = Standard weight (fineness of individual strand)



- Second number = Ply count (number of strands twisted together)

7.2 How Ply Affects Performance

Table				
Designation	Total Thickness	Use Case	Tensile Strength	Notes
50/2	Fine	Piecing, fine quilting	Moderate	Standard for precision work
50/3	Medium-fine	General quilting, apparel	Good	More durable than 50/2
40/2	Medium	All-purpose sewing	Good	Most common domestic thread
40/3	Medium-plus	Heavy seams, bags	Very Good	Stronger than 40/2
30/2	Medium-heavy	Topstitching, decorative	Excellent	Visible stitch definition
30/3	Heavy	Upholstery, canvas	Superior	Maximum strength for weight
20/2	Very heavy	Leather, heavy denim	Extreme	Industrial-grade strength



12/3	Extreme	Marine, safety gear	Maximum	Near-uncuttable seams
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7.3 Ply Selection Rules

- For seams under stress: Use higher ply (e.g., 40/3 instead of 40/2)
- For invisible stitches: Use lower ply (e.g., 60/2 instead of 60/3)
- For decorative work: Ply affects sheen – more plies = more light reflection
- For quilting: 50/2 or 50/3 are industry standards; 2-ply sinks into fabric better

SECTION 8: FABRIC-TO-THREAD MATCHING MATRIX

8.1 By Fabric Weight (GSM)

Table

Fabric Weight (GSM)	Fabric Examples	Recommended Thread (wt)	Recommended Tex	Recommended Needle
20–40 GSM	Organza, tulle, chiffon	80–100 wt	20–30 T	60/8–70/10
40–70 GSM	Voile, lightweight silk, batiste	60–80 wt	30–40 T	70/10–75/11
70–100 GSM	Quilting cotton, shirting, lawn	50–60 wt	40–48 T	75/11–80/12



100–140 GSM	Poplin, broadcloth, percale	40–50 wt	48–60 T	80/12–90/1 4
140–180 GSM	Twill, sateen, light denim	35–40 wt	60–68 T	90/14–100/ 16
180–250 GSM	Medium denim, canvas, corduroy	30–35 wt	68–80 T	100/16–110 /18
250–350 GSM	Heavy denim, upholstery canvas	20–30 wt	80–120 T	110/18–120 /20
350–500 GSM	Leather, vinyl, heavy canvas	12–20 wt	120–200 T	120/20–140 /22
500+ GSM	Industrial canvas, sailcloth	8–12 wt	200–300 T	140/22–180 /24

8.2 By Fabric Type (Detailed)

LIGHTWEIGHT FABRICS (20–100 GSM)

Table

Fabric	Best Thread (wt)	Best Tex	Fiber Recommendation	Needle	Stitch Length
Chiffon	100 wt	24 T	Fine silk or polyester	60/8	2.0–2.5 mm



Organza	80–100 wt	24–30 T	Silk or fine polyester	60/8–70/10	2.0–2.5 mm
Voile	80 wt	30 T	Cotton or polyester	70/10	2.5 mm
Batiste	60–80 wt	30–40 T	Cotton	70/10–75/11	2.5 mm
Lightweight silk	60–80 wt	30–40 T	Silk thread	70/10	2.0–2.5 mm
Quilting cotton	50 wt	48 T	Cotton or cotton-wrapped polyester	75/11–80/12	2.5 mm

MEDIUM-WEIGHT FABRICS (100–200 GSM)

Table

Fabric	Best Thread (wt)	Best Tex	Fiber Recommendation	Needle	Stitch Length
Quilting cotton (layered)	50 wt	48 T	50/2 or 50/3 cotton	80/12	2.5–3.0 mm
Shirting	50–60 wt	40–48 T	All-purpose polyester/cotton	75/11–80/12	2.5 mm



Poplin	40–50 wt	48–60 T	All-purpose polyester	80/12–90/14	2.5–3.0 mm
Flannel	40 wt	60 T	Polyester (reduces lint)	90/14	3.0 mm
Light denim (4–6 oz)	40 wt	60 T	Core-spun polyester	90/14	3.0–3.5 mm
Twill	35–40 wt	60–68 T	Polyester or cotton	90/14	3.0 mm

HEAVYWEIGHT FABRICS (200–400 GSM)

Table

Fabric	Best Thread (wt)	Best Tex	Fiber Recommendation	Needle	Stitch Length
Medium denim (8–10 oz)	30–40 wt	60–80 T	Core-spun polyester	100/16	3.5 mm
Heavy denim (12–14 oz)	20–30 wt	80–120 T	Heavy-duty polyester	110/18	3.5–4.0 mm
Canvas (light)	30–40 wt	60–80 T	Polyester or cotton-wrapped	100/16	3.5 mm



Canvas (heavy)	20–30 wt	80–120 T	Bonded nylon or polyester	110/18–120/20	4.0 mm
Corduroy	30–40 wt	60–80 T	Polyester	100/16	3.5 mm
Upholstery fabric	20–30 wt	80–120 T	Bonded nylon	110/18–120/20	4.0 mm

EXTREME FABRICS (400+ GSM)

Table

Fabric	Best Thread (wt)	Best Tex	Fiber Recommendation	Needle	Stitch Length
Leather (light)	20–30 wt	80–120 T	Nylon or polyester	110/18 (leather point)	3.5–4.0 mm
Leather (heavy)	12–20 wt	120–200 T	Bonded nylon	120/20–140/22 (wedge point)	4.0–5.0 mm
Vinyl/PVC	30–40 wt	60–80 T	Polyester (low friction)	90/14–100/16 (Teflon-coated)	3.5–4.0 mm



Sailcloth	12–20 wt	120–200 T	Bonded polyester	120/20–140/22	5.0–6.0 mm
Marine canvas	8–12 wt	200–300 T	UV-resistant polyester	140/22–180/24	6.0 mm
Webbing /straps	12–20 wt	120–200 T	Bonded nylon	120/20–140/22	4.0–5.0 mm

SECTION 9: NEEDLE SIZE CROSS-REFERENCE

9.1 Needle Sizing Systems

Table

American Size	European Size	Metric (mm)	Shaft Diameter	Eye Width	Best Thread Range
8	60	0.60 mm	0.57 mm	0.76 mm	80–120 wt
9	65	0.65 mm	0.61 mm	0.81 mm	80–100 wt
10	70	0.70 mm	0.66 mm	0.86 mm	60–80 wt



11	75	0.75 mm	0.71 mm	0.92 mm	50–70 wt
12	80	0.80 mm	0.76 mm	0.98 mm	40–60 wt
14	90	0.90 mm	0.86 mm	1.12 mm	35–50 wt
16	100	1.00 mm	0.96 mm	1.27 mm	30–40 wt
18	110	1.10 mm	1.06 mm	1.42 mm	20–35 wt
19	120	1.20 mm	1.16 mm	1.57 mm	18–30 wt
21	130	1.30 mm	1.26 mm	1.72 mm	12–20 wt
22	140	1.40 mm	1.36 mm	1.87 mm	8–18 wt
24	160	1.60 mm	1.56 mm	2.13 mm	8–12 wt
25	180	1.80 mm	1.76 mm	2.39 mm	8 wt



9.2 Needle Type Selection

Table

Needle Type	Point Style	Best For	Thread Compatibility
Universal	Slightly rounded	Woven fabrics, general use	All weights
Ballpoint	Rounded	Knits, stretch fabrics	40–60 wt
Stretch	Medium ballpoint	Lycra, spandex blends	50–60 wt
Jeans/Denim	Sharp, reinforced	Denim, canvas, heavy fabrics	30–40 wt
Leather	Wedge or cutting point	Leather, faux leather	20–40 wt
Microtex	Extra sharp	Silk, microfiber, fine fabrics	60–100 wt
Quilting	Tapered	Quilting through layers	40–50 wt
Embroidery	Large eye, scarf	Machine embroidery	30–60 wt
Metallic	Extra-large eye	Metallic threads	30–40 wt (specialty)



Topstitching	Extra-large eye	Visible topstitching	20–40 wt
Self-threading	Slotted eye	Accessibility sewing	40–60 wt
Twin/Double	Two needles	Decorative hems, pintucks	50–80 wt
Triple	Three needles	Decorative stitching	60–80 wt

9.3 Needle-Thread-Fabric Compatibility Chart

plain

FABRIC	NEEDLE (EU)	NEEDLE TYPE	THREAD (wt)
Chiffon	60–70	Microtex	80–100 wt
Silk	70–75	Microtex/Sharp	60–80 wt
Cotton lawn	70–80	Universal	50–60 wt
Quilting cotton	75–80	Quilting	50 wt (50/2 or 50/3)
Shirting	75–80	Universal	50–60 wt
Poplin	80–90	Universal	40–50 wt
Flannel	90	Universal	40 wt
Light denim	90	Jeans	40 wt
Medium denim	100	Jeans	30–40 wt
Heavy denim	110–120	Jeans	20–30 wt
Canvas	100–120	Jeans/Universal	20–40 wt
Leather	90–140	Leather point	20–40 wt



Vinyl	90-100	Universal/Teflon	30-40 wt
Knits	70-90	Ballpoint/Stretch	40-60 wt
Fleece	90	Ballpoint	40 wt
Upholstery	110-120	Jeans/Heavy	20-30 wt
Sailcloth	120-180	Heavy-duty	8-20 wt

SECTION 10: FIBER TYPE SPECIFICATIONS

10.1 Natural Fibers

Table

Fiber	Weight Availability	Strength	Elasticity	Heat Resistance	Best Applications
Cotton	8-120 wt	Moderate	Low	Good (up to 400°F/204°C)	Quilting, general sewing, heirloom
Silk	60-100 wt	Moderate	Moderate	Poor (up to 300°F/149°C)	Fine garments, embroidery, appliqué
Linen	20-60 wt	High (when dry)	Low	Good	Upholstery, heavy garments



Wool	20–60 wt	Moderate	High	Moderate	Tailoring, overlocking
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10.2 Synthetic Fibers

Table

Fiber	Weight Availability	Strength	Elasticity	Heat Resistance	Best Applications
Polyester (spun)	12–120 wt	High	Moderate	Excellent (up to 450°F/232°C)	All-purpose, outdoor, activewear
Polyester (filament)	20–80 wt	Very High	Low	Excellent	Embroidery, industrial
Nylon (bonded)	12–80 wt	Extreme	High	Good (up to 350°F/177°C)	Upholstery, leather, heavy-duty
Rayon/Viscose	30–60 wt	Low	Low	Poor (up to 300°F/149°C)	Decorative embroidery, sheen



Acrylic	30–60 wt	Moderate	High	Poor	Craft projects, blankets
Metallic	30–40 wt (special)	Low	Low	Poor	Decorative, costume
Monofilament	40–80 wt (special)	Moderate	High	Good	Invisible stitching, quilting

10.3 Blended/Engineered Threads

Table

Thread Type	Construction	Weight Range	Key Benefits	Best For
Core-spun polyester	Polyester core + cotton wrap	30–60 wt	Strength of poly, feel of cotton	Quilting, apparel, general
Cotton-wrapped polyester	Poly core + cotton wrap	30–50 wt	Reduced shrinkage, high strength	Quilting, piecing
Trilobal polyester	Triangular cross-section	30–60 wt	Maximum light reflection	Machine embroidery



rPET (recycled polyester)	Recycled plastic bottles	30–60 wt	Eco-friendly, near-virgin strength	Sustainable projects
Fire-resistant (FR)	Treated fibers	30–60 wt	Self-extinguishing	Children's wear, industrial
UV-resistant	Stabilized polyester	12–40 wt	Colorfast in sunlight	Outdoor, marine
Anti-static	Carbon-core threads	40–60 wt	Prevents static buildup	Electronics, clean rooms

SECTION 11: TENSION CALIBRATION GUIDE

11.1 Understanding Tension

Thread tension is the balance between upper thread (needle) tension and lower thread (bobbin) tension. Incorrect tension causes:

- Too tight: Puckering, thread breakage, skipped stitches
- Too loose: Loops on underside, weak seams, thread nesting

11.2 Tension Settings by Thread Weight

Table

Thread (wt)	Upper Tension (typical dial)	Bobbin Tension	Notes
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100 wt	1.0–2.0	Very light	Use fine needle, reduce presser foot pressure
80 wt	1.5–2.5	Light	Reduce tension to prevent shredding
60 wt	2.0–3.0	Light-medium	Standard for fine work
50 wt	2.5–3.5	Medium	Standard quilting tension
40 wt	3.0–4.5	Medium	Most common domestic setting
30 wt	3.5–5.0	Medium-heavy	May need bobbin adjustment
20 wt	4.0–6.0	Heavy	Loosen upper significantly
12 wt	5.0–7.0	Very heavy	Industrial machines recommended
8 wt	6.0–9.0	Maximum	Industrial only; test extensively

11.3 Tension Test Procedure

Step 1: Thread machine with chosen thread and correct needle.

Step 2: Set upper tension to midpoint of recommended range.

Step 3: Sew 4 inches (10 cm) on test fabric scrap.

Step 4: Examine stitch formation:

- **Balanced:** Locking point is IN the fabric, not visible on either side.



- Upper too tight: Bobbin thread visible on top; fabric puckers.

Upper too loose: Needle thread visible on bottom; loops form.

Step 5: Adjust upper tension in 0.5 increments. Re-test.

Step 6: If upper adjustment fails, adjust bobbin tension (turn screw clockwise to tighten, counterclockwise to loosen).

- Step 7: Record final settings for this thread/needle/fabric combination.

11.4 Factors Affecting Tension

Table

Factor	Effect on Tension	Adjustment
Thread weight increase	Requires looser upper tension	Decrease dial setting
Fabric thickness increase	Requires more pressure	Increase presser foot pressure
Fabric stretchiness	Requires differential feed	Adjust differential or use walking foot
Stitch length increase	Reduces tension per stitch	May need slight tightening
Thread elasticity	Creates dynamic tension	Use stretch needles, reduce tension
Humidity	Cotton swells, poly doesn't	Adjust for fiber type



Machine speed	Higher speed = more tension	May need slight loosening
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SECTION 12: INDUSTRIAL VS. DOMESTIC MACHINE LIMITS

12.1 Domestic Sewing Machines

Table

Specification	Typical Range	Maximum Safe Thread
Motor power	60–100 watts	Up to 30 wt (80 T)
Maximum stitch speed	800–1,500 SPM	—
Needle system	130/705 H	Up to 120/20
Thread delivery	Vertical spool pin	Up to 1,000m spools
Bobbin size	Class 15 or 66	Standard domestic bobbins
ABSOLUTE MAX	—	30 wt (80 T)

WARNING: Using thread heavier than 30 wt in a domestic machine risks:

- Motor burnout
- Timing belt damage
- Hook/needle collision
- Bent or broken needles
- Stripped gears



12.2 Semi-Industrial / Prosumer Machines

Table

Specification	Typical Range	Maximum Safe Thread
Motor power	150–250 watts	Up to 20 wt (120 T)
Maximum stitch speed	1,500–2,500 SPM	—
Needle system	134R or 135×5	Up to 140/22
Thread delivery	Horizontal spool pin + guides	Up to 5,000m cones
Bobbin size	Large capacity	Industrial-style bobbins
ABSOLUTE MAX	—	20 wt (120 T)

12.3 Industrial Lockstitch Machines

Table

Specification	Typical Range	Maximum Safe Thread
Motor power	250–550 watts	Up to 12 wt (200 T)
Maximum stitch speed	3,000–6,000 SPM	—



Needle system	DP×5, 134R, 135×17	Up to 180/24
Thread delivery	Standalone cone stand + tensioners	Any cone size
Bobbin size	Large M-style or L-style	Industrial bobbins
ABSOLUTE MAX	—	8 wt (300 T)

12.4 Industrial Heavy-Duty Machines

Table

Machine Type	Thread Range	Applications
Walking foot (compound feed)	20–12 wt	Leather, upholstery, canvas
Post bed	30–20 wt	Shoes, bags, 3D sewing
Cylinder bed	30–20 wt	Bags, saddles, tubular items
Long arm	30–12 wt	Quilting, sails, large items
Bar tack / Bartacker	40–20 wt	Reinforcement stitching
Buttonhole	40–30 wt	Precision buttonholes
Zigzag / Overlock	40–12 wt	Seaming, finishing



Coverstitch	40–30 wt	Hemming, activewear
Chainstitch	30–12 wt	Denim, heavy seams
Blindstitch	60–40 wt	Invisible hems

SECTION 13: SPECIALTY THREADS REFERENCE

13.1 Metallic Threads

Table

Type	Denier Range	Needle Required	Tension Notes
Fine metallic	40–80 D	80/12 Metallic needle	Very loose tension
Medium metallic	80–150 D	90/14 Metallic needle	Loose tension, slow speed
Heavy metallic	150–300 D	100/16 Metallic needle	Very loose, reduce speed 50%

Special Requirements:

- Use metallic needles (larger eye, polished surface)
- Thread directly from spool (no horizontal winding)
- Reduce machine speed by 30–50%
- Use nylon or silicone thread lubricant
- Never use in bobbin



13.2 Monofilament Threads

Table

Type	Diameter	Transparenc y	Best Uses
Fine monofilament	0.10–0.15 mm	95%+	Invisible appliqué, quilting
Medium monofilament	0.15–0.25 mm	90%	General invisible stitching
Heavy monofilament	0.25–0.40 mm	80%	Upholstery, outdoor

Special Requirements:

- Use Microtex or sharp needles
- Lower iron temperature (melts at 400°F/204°C)
- Can be scratchy on skin – avoid garment seams
- Store away from heat and UV light

13.3 Elastic Threads (Shirring)

Table

Type	Stretch Ratio	Needle	Thread in Bobbin?
Fine elastic	150%	80/12	Yes (hand-wind loosely)
Medium elastic	200%	90/14	Yes (hand-wind loosely)



Heavy elastic	300%	100/16	Yes (hand-wind loosely)
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Special Requirements:

- Wind bobbin by hand (machine winding stretches too much)
- Use regular thread in needle
- Increase stitch length to 3.5–4.0 mm
- Steam after sewing to set gathers

13.4 Water-Soluble Threads

Table

Type	Dissolution	Use Case
Wash-away	Cold water	Basting, trapunto
Heat-away	Ironing	Temporary stitching
Vanishing	Time + air	Marking, basting

Special Requirements:

- Use with regular thread in bobbin
- Test dissolution on fabric sample first
- Some leave residue – pre-wash if needed

13.5 Conductive Threads

Table

Type	Resistance	Applications
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Stainless steel fiber	10–100 Ω /cm	Wearable tech, sensors
Silver-plated nylon	1–10 Ω /cm	High-conductivity circuits
Copper fiber	0.1–1 Ω /cm	Maximum conductivity

Special Requirements:

- Use conductive needle (or dedicated needle)
- Do not mix with regular thread in same project
- Test conductivity after washing
- Avoid sharp bends that break fibers

SECTION 14: QUALITY CONTROL CHECKLIST

14.1 Pre-Production Checklist

- ☐ Verify thread weight matches fabric specification
- ☐ Confirm needle size is appropriate for thread weight
- ☐ Check needle type matches fabric type
- ☐ Verify machine can handle thread weight (check Section 12)
- ☐ Test tension on fabric scrap
- ☐ Check thread for defects (knots, weak spots, dye inconsistencies)
- ☐ Verify bobbin thread matches or complements top thread
- ☐ Run 12-inch test seam and examine stitch quality
- ☐ Check seam strength with pull test



- Document settings for production consistency

14.2 During Production Monitoring

- Check stitch quality every 30 minutes
- Monitor for thread breakage (more than 1 break per hour = problem)
- Verify tension consistency across seam length
- Check for needle deflection or bending
- Monitor bobbin thread level
- Clean lint from machine every 2–4 hours (cotton) or 4–6 hours (poly)
- Record any anomalies in production log

14.3 Post-Production Inspection

- Visual inspection of all seams for consistency
- Pull-test critical seams (stress points)
- Check for skipped stitches
- Verify no puckering or distortion
- Test wash/dry performance if applicable
- Document results for future reference

SECTION 15: GLOSSARY OF TERMS

Cotton Count: See Standard Weight (wt).



Denier (D): Weight in grams of 9,000 meters of thread. Higher = thicker.

Elongation: The percentage a thread stretches before breaking. Critical for stretch fabrics.

Filament: A continuous strand of fiber, as opposed to staple (short fibers spun together).

GSM (Grams per Square Meter): Standard measurement of fabric weight.

Mercerization: A chemical treatment that strengthens cotton thread and gives it luster.

Metric Number (Nm): Kilometers of thread per kilogram. Higher = finer.

Ply: Number of individual strands twisted together to form a thread.

SPI (Stitches Per Inch): Stitch density. Higher SPI = stronger seam but more thread used.

Standard Weight (wt): Length-based system where higher numbers = finer thread.

Tensile Strength: Maximum force a thread can withstand before breaking, measured in pounds or Newtons.

Tex (T): Weight in grams of 1,000 meters of thread. Higher = thicker.

Ticket Number: A sizing system used primarily for industrial threads, often based on Tex.

Twist: The number of turns per inch in a thread. More twist = stronger but less soft.

SECTION 16: SOURCES & STANDARDS



16.1 International Standards

Table

Standard	Organization	Description
ISO 2060	International Organization for Standardization	Tex system standardization
ASTM D1907	American Society for Testing and Materials	Yarn number by wrap method
ASTM D2260	ASTM	Standard tables for conversion of thread sizes
DIN 60905	Deutsches Institut für Normung	German thread measurement standards
JIS L 1013	Japanese Industrial Standards	Japanese thread testing methods

16.2 Major Manufacturer Specifications

Table

Manufacturer	Website	Specialty
Aurifil	aurifil.com	Premium cotton quilting threads
Gutermann	gutermann.com	All-purpose and specialty threads



Mettler	mettler.com	Swiss precision threads
Coats	coats.com	Industrial and consumer threads
Superior Threads	superiorthreads.com	Specialty and decorative threads
Madeira	madeira.de	Embroidery threads
Isacord	isacord.com	Industrial embroidery
Robison-Anton	robisonanton.com	Commercial embroidery
Sulky	sulky.com	Decorative and utility threads
WonderFil	wonderfil.eu	Specialty threads

16.3 Recommended Reading

1. Hargrave, Harriet. "Thread Magic: The Enchanted World of Thread." C&T Publishing.
2. Fons, Marianne & Liz Porter. "Quilter's Complete Guide." Oxmoor House.
3. Schmetz Needles. "Sewing Machine Needle Guide." Schmetz GmbH.
4. Threads Magazine. "Understanding Thread." Taunton Press.
5. American & Efird. "Industrial Sewing Thread Handbook." A&E Technical Publications.

APPENDIX A: QUICK REFERENCE CARD (Pocket Size)

plain



THREAD WEIGHT QUICK REFERENCE			
REMEMBER: wt ↑ = thinner Tex ↑ = thicker			
FABRIC	→	THREAD (wt)	→ NEEDLE
Chiffon	→	80-100 wt	→ 60/8-70/10
Quilting cotton	→	50 wt	→ 75/11-80/12
Shirting	→	50-60 wt	→ 75/11-80/12
Denim (light)	→	40 wt	→ 90/14
Denim (heavy)	→	20-30 wt	→ 110/18-120/20
Canvas	→	20-30 wt	→ 110/18-120/20
Leather	→	20-40 wt	→ 90/14-140/22
Upholstery	→	20-30 wt	→ 110/18-120/20
CONVERSION: wt ≈ 590 ÷ Tex Tex = D ÷ 9 D = Tex × 9			

APPENDIX B: TROUBLESHOOTING GUIDE

Table

Problem	Likely Cause	Solution
Thread breaks frequently	Needle too small	Increase needle size
Thread breaks frequently	Tension too tight	Loosen upper tension
Thread breaks frequently	Thread too heavy for machine	Use lighter thread or industrial machine
Skipped stitches	Needle damaged or wrong type	Replace needle, verify type



Skipped stitches	Thread too thick for needle eye	Use larger needle or finer thread
Puckering	Tension too tight	Loosen tension, use finer thread
Puckering	Thread too heavy for fabric	Use lighter thread
Loops on underside	Upper tension too loose	Tighten upper tension
Loops on top	Bobbin tension too loose	Tighten bobbin tension
Thread shredding	Needle eye too small	Use larger needle
Thread shredding	Needle has burr	Replace needle
Thread nesting	Thread not seated in tension discs	Re-thread machine completely
Thread nesting	Bobbin inserted incorrectly	Re-insert bobbin correctly
Uneven stitches	Thread weight inconsistent	Change spool, check for knots
Fabric damage	Needle too large	Use smaller needle
Fabric damage	Thread too heavy	Use lighter thread



Machine jams	Thread too heavy for machine	Use lighter thread or upgrade machine
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APPENDIX C: THREAD STORAGE & CARE

Storage Conditions

- Temperature: 60–75°F (15–24°C)
- Humidity: 45–55% relative humidity
- Light: Store away from direct sunlight (UV degrades fibers)
- Dust: Keep in closed containers or cabinets

Shelf Life

Table

Fiber Type	Expected Shelf Life	Notes
Cotton	5–10 years	Absorbs moisture; check for mildew
Polyester	10–20 years	Very stable; color may fade
Silk	5–8 years	Sensitive to light and humidity
Nylon	10–15 years	Can become brittle with age
Metallic	3–5 years	Coating degrades over time
Monofilament	2–5 years	UV and heat sensitive



Spool Orientation

- Cross-wound spools: Place horizontally on pin
- Stack-wound spools: Place vertically on pin
- King spools/cones: Use cone stand behind machine
- Industrial cones: Always use external cone stand with proper thread guides