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Designation: D 2260 – 02

Standard Tables of Conversion Factors and Equivalent Yarn Numbers Measured in Various Numbering Systems[1]

This standard is issued under the fixed designation D 2260; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These tables include (*1*) a series of conversion factors required to convert the number of a yarn measured in a specific system to the equivalent number measured in various other systems (see Table 1), and (*2*) specific equivalent numbers for yarns measured in various systems (see Table 2).

1.2 The content is basically consistent with recommendations of the International Organization for Standardization (ISO) Standard 2947.

2. Referenced Documents

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles[2]

D 861 Practice for Use of the Tex System to Designate Linear Density of Fibers, Yarn Intermediates, and Yarns[2]

D 3888 Terminology Related to Open-End Spinning[3]

D 3990 Terminology Relating to Fabric Defects[3]

D 4849 Terminology Relating to Fibers and Yarns[3]

SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System[3]

2.2 *ISO Standard:*

ISO 2947, Textiles–Integrated Conversion Table for Replacing Traditional Yarn Numbers by Rounded Numbers in the Tex System[4]

2.3 *NIST Standard:*

NBS–M–121–January, 1936[5]

3. Terminology

3.1 *Definitions:*

3.1.1 *American grain count*—a direct yarn numbering system for expressing linear density, equal to the mass in grains per 120 yd of sliver or roving.

3.1.2 *cotton count*, *n*—an indirect yarn numbering system generally used in the cotton system equal to the number of 840–yd lengths of yarn per pound.

3.1.3 *cut*, *n—in asbestos and glass yarns*, the number of 100-yd lengths of yarn per pound; an indirect yarn numbering system.

3.1.4 *cut*, *n—in wool yarns*, the number of 300-yd lengths of yarn per pound; an indirect yarn numbering system.

3.1.5 *denier*, *n*—the unit of linear density, equal to the mass in grams of 9000 m of fiber, yarn, or other textile strand that is used in a direct yarn numbering system. (See also **linear density**).

3.1.6 *direct yarn numbering system*, *n*—a system that expresses the linear density of yarn in mass per unit length.

3.1.6.1 *Discussion*—The preferred units of measurements for the direct yarn measuring system are grams and meters. Tex (weight in grams for 1000 metres) and Denier (weight in grams for 9000 metres) are recommended to show linear density in the direct numbering system. These can be calculated by dividing the mass of a yarn by its length. Conversion factors to convert between direct and indirect numbering systems can be found in Standard Tables D 2260. **D 1059, D 1907, D 2260**

3.1.7 *grain*, *n—in yarn spinning*,a direct yarn numbering system sometimes used for expressing linear density in which the yarn number is equal to the mass in grains of 120 yd of sliver, top, or roving.

3.1.8 *grain*, *n—in measuring mass*, 1/7000 lb avoirdupois.

3.1.9 *grex*, *n*—an obsolete direct numbering system for fiber yarn or other textile strand equal to the the mass in grams per 10 000 m.

3.1.10 *indirect yarn numbering system*, *n*—a system that expresses the linear density of yarn in length per unit mass.

3.1.10.1 *Discussion*—The preferred units of measurements for the indirect yarn measuring system are yards and pounds. Cotton count (number of 840 yard lengths per pound), worsted count (number of 560 yard lengths per pound), metric count (number of 1000 metre lengths per kilogram), woolen run (number of 1600 yard lengths per pound) and number of yards per pound are commonly used in the indirect numbering

[1] These tables are under the jurisdiction of ASTM Committee D13 on Textiles and are the direct responsibility of Subcommittee D13.58 on Yarn and Fiber Test Methods.

Current edition approved Nov. 10, 2002. Published January 2003. Originally approved in 1964. Last previous edition approved in 2001 as D2260 – 01.

[2] *Annual Book of ASTM Standards*, Vol 07.01.

[3] Excerpts from SI 10, Standard for Use of the International System of Units (SI): The Modern Metric Syste, can be found in the *Annual Book of ASTM Standards*, Vols 07.01 and 07.02. The standard is available as a separate publication and appears in its entirety in Vol 14.02.

[4] American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

[5] Available from National Institute of Standards and Technology, Gaithersburg, MD 20899.

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TABLE 1 Conversion Factors for Converting from One Yarn Numbering System to Another[A]

System for Which Yarn Number is Needed		System for Which Yarn Number is Known								
		Tex[B]	Denier	American Grain Count	Cotton Count	Worsted Count	Woolen Run	Metric Count	Linen Lea Woolen Cut	Yd/lb
Tex[B] (g/1000 m)	tex =	...	$\frac{\text{den}}{9}$	$\frac{0.590\ 541}{\text{gr}}$	$\frac{590.541}{\text{cc}}$	$\frac{885.812}{\text{wc}}$	$\frac{310.034}{\text{wr}}$	$\frac{1\ 000}{\text{mc}}$	$\frac{1\ 653.52}{\text{lea}}$	$\frac{496\ 055}{\text{y}}$
Denier (g/9000 m)	den =	9 × tex	...	$\frac{5.314\ 87}{\text{gr}}$	$\frac{5\ 314.87}{\text{cc}}$	$\frac{7\ 972.31}{\text{wc}}$	$\frac{2\ 790.31}{\text{wr}}$	$\frac{9\ 000}{\text{mc}}$	$\frac{14\ 881.6}{\text{lea}}$	$\frac{4\ 464\ 492}{\text{y}}$
American Grain Count (grains/120 yd)	gr =	$\frac{\text{tex}}{0.590\ 541}$	$\frac{\text{den}}{5.314\ 87}$	...	$\frac{1\ 000}{\text{cc}}$	$\frac{1\ 500}{\text{wc}}$	$\frac{525}{\text{wr}}$	$\frac{1\ 693.36}{\text{mc}}$	$\frac{2\ 800}{\text{lea}}$	$\frac{840\ 000}{\text{y}}$
Cotton count (840 yd lengths/lb)	cc =	$\frac{590.541}{\text{tex}}$	$\frac{5\ 314.87}{\text{den}}$	$\frac{1\ 000}{\text{gr}}$	...	$\frac{\text{wc}}{1.5}$	$\frac{\text{wr}}{0.525}$	$\frac{0.590\ 541}{\times\ \text{mc}}$	$\frac{\text{lea}}{2.8}$	$\frac{\text{y}}{840}$
Worsted count (560 yd lengths/lb)	wc =	$\frac{885.812}{\text{tex}}$	$\frac{7\ 972.31}{\text{den}}$	$\frac{1\ 500}{\text{gr}}$	1.5 × cc	...	$\frac{\text{wr}}{0.35}$	$\frac{0.885\ 812}{\times\text{mc}}$	$\frac{\text{lea}}{1.866\ 67}$	$\frac{\text{y}}{560}$
Woolen run (1600 yd lengths/lb)	wr =	$\frac{310.034}{\text{tex}}$	$\frac{2\ 790.31}{\text{den}}$	$\frac{525}{\text{gr}}$	0.525 × cc	0.35 × wc	...	$\frac{0.310\ 034}{\times\ \text{mc}}$	$\frac{0.187\ 5}{\times\text{lea}}$	$\frac{\text{y}}{1\ 600}$
Metric count (1000 m/kg)	mc =	$\frac{1\ 000}{\text{tex}}$	$\frac{9\ 000}{\text{den}}$	$\frac{1\ 693.36}{\text{gr}}$	$\frac{\text{cc}}{0.590\ 541}$	$\frac{\text{wc}}{0.885\ 812}$	$\frac{\text{wr}}{0.310\ 034}$	...	$\frac{\text{lea}}{1.653\ 52}$	$\frac{\text{y}}{496.055}$
Linen lea (300 yd lengths/lb)	lea =	$\frac{1\ 653.52}{\text{tex}}$	$\frac{14\ 881.6}{\text{den}}$	$\frac{2\ 800}{\text{gr}}$	2.8 × cc	1.866 67 × wc	0.187 5 × wr	1.653 52 × mc	...	$\frac{\text{y}}{300}$
Yards per pound (yd/lb)	y =	$\frac{496\ 055}{\text{tex}}$	$\frac{4\ 464\ 492}{\text{den}}$	$\frac{840\ 000}{\text{gr}}$	840 × cc	560 × wc	1600 × wr	496.055 × mc	300 × lea	...

[A] The conversion factors are based on the following relationships given in Metric Practice SI 10: 1 yard = 0.9144 m, exactly, and 1 lb (avoirdupois) = 0.453 592 37 kg, exactly. The conversion factors in Table 1 containing fewer than six significant digits are exact values.

[B] Multiples and submultiples of this basic unit may be used as a convenience to avoid large numbers or decimal fractions. For example, decitex (dtex) or tex × 10 is suitable for fine yarns and fibers; millitex (mtex) or tex × 1000 is suitable for fibers; while kilotex (ktex) or tex/1000 is often used for ropes, cords, rovings, tops, and slivers.

Examples of Table 1 use:

1) The English worsted count equivalent to a cotton count of 10 is 1.5 times 10, or 15 English worsted count.
2) The cotton count equivalent to 30 tex is 590.54 divided by 30, or 19.7 cotton count.

system. These can be calculated by dividing the number of specified lengths of a yarn by its unit of mass. (See also *cotton count; metric count; worsted count; cut, hank, lea, run, and typp).*

3.1.11 *linear density , n—for fiber and yarn*mass per unit length.

3.1.12 *linen lea, n*—the number of 300-yd lengths of yarn per pound; an indirect yarn numbering system.

3.1.13 *metric count, n*—an indirect yarn numbering system for sliver roving, and yarn, equal to the number of kilometers per kilogram (1000 m/kg).

3.1.14 *run, n—in the American woolen system,* the number of 1600-yd lengths of yarn per pound; an indirect yarn numbering system generally used for yarns spun on the woolen system.

3.1.15 *tex, n*—the unit of linear density, equal to the mass in grams of 1000 meters of fiber, yarn, or other textile strand, that is used in a direct yarn numbering system. (See also **linear density and direct yarn numbering system)**.

3.1.16 *typp, n*—an obsolete indirect yarn numbering system equal to the number of 1000-yd lengths per pound..

3.1.17 *worsted count, n*—an indirect yarn numbering system in theworsted system equal to the number of 560–yd lengths per pound. (Syn. English worsted count. Compare **woolen run**).

3.1.18 *yarn number, n*—a measure of the linear density of a yarn expressed as "mass per unit length" or "length per unit mass," depending upon the yarn numbering system used. (Syn. yarn count.) (See*yarn numbering system.*)

3.1.19 *yarn numbering system, n*—a system that expresses the size of a yarn as a relationship between its length and associated mass. (See also *direct yarn numbering system* and *indirect yarn numbering system.*)

3.1.20 For definitions of other textile terms used in these Tables, refer to Terminologies D 123D 3888D 3990D 4849.

4. Conversion Factors for Equivalent Yarn Numbers

4.1 Calculate any equivalent value using the appropriate factor listed in Table 1.

5. Use of Previously Calculated Equivalent Yarn Numbers

5.1 For a specific number in a stated system, read the equivalent in the various other systems from Table 2.

5.2 With a few exceptions, fractional traditional indirect counts have been omitted from Table 2; the rounded tex system values for most fractional traditional indirect counts can be obtained by interpolation.

6. Implementation of the Tex Yarn Numbering System

6.1 In Table 2, to encourage the implementation of the tex system in the United States, rounded tex values were chosen to accommodate as many yarn numbers as possible for the traditional yarn numbering systems without encroaching on established tolerances. In addition to the rounded tex system values, the decitex (dtex) equivalents have been included because they can be used throughout most of the count range without employing decimal fractions. The choice of unit is entirely a matter to be determined by each sector of the trade; decitex, for example, is particularly suitable for fine yarns (whether spun or filament) and tex for medium and coarse yarns.

7. Derivation of Data in Table 2

7.1 Tables 1 and 2 are based on the following exact equivalents:

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7.1.1 1 yd = 0.9144 m.

7.1.2 1 lb = 453.592 37 g.

7.1.3 1 lb = 7000 grains.

7.2 The following conversion factors have been computed where *y* = yards per pound.

7.2.1 Woolen run (wr) = *y*/1600.

7.2.2 cotton count (cc) = *y*/840.

7.2.3 denier (den) = 4 464 492/*y*.

7.2.4 Worsted count (wc) = *y*/560.

7.2.5 American grain count per 120 yd (gr) = 840 000/*y*.

7.2.6 linen lea (lea) = *y*/300.

7.2.7 metric count (mc) = *y*/496.055.

7.2.8 tex (tex) = 496 055/*y*.

7.2.9 For the *woolen* system, use the column and row headed *linen lea*.

7.3 The data in Table 2 was derived using the National Institute of Standards and Technology values in the NIST Circular M121, January, 1936. Based on current values, when calculating yards per pound for a specified denier, the table will understate the value by 12 yd out of 4.5 million yd or 11 m out of 4.1 million m. When calculating yards per pound for a specified tex value, the table will understate the value by 5 yd out of 0.5 million yd or 4.6 m out of 0.46 million m. Therefore, those who need more precise data for denier and tex should recalculate the data needed using the current values in Table 1.

8. Keywords

8.1 yarn number; yarns per pound

TABLE 2 Equivalent Yarn Number Conversion Table

NOTE 1—In any row with a boldface type number, the other equivalents are computed from the boldface value to the nearest four significant figures.

Exact Equivalent	yd/lb for Rounded Tex-Value[A]	Cotton Count	Indirect Systems				Direct Systems				Deviation[B]
			Worsted Count	Woolen Run	Linen Woolen Cut	Metric Count	American Grain Count	Denier	Rounded Value	Rounded Value	
dtex	yd/lb	cc	wc	wr	lea	mc	gr	den	tex	dtex	%
1.111	4 465 000	C	C	C	C	C	0.188	1.00	0.11	1.1	−1.0
1.333		C	C	C	C	C		1.2	0.13	1.3	−2.5
1.444		C	C	C	C	C		1.3	0.14	1.4	−3.1
1.667		C	C	C	C	C		1.5	0.17	1.7	+2.0
1.889		C	C	C	C	C		1.7	0.19	1.9	+0.6
2.000	2 232 000	C	C	C	C	C		1.8	0.20	2.0	0.0
2.222		C	C	C	C	C	0.376	2.00	0.22	2.2	−1.0
2.444		C	C	C	C	C		2.2	0.24	2.4	−1.8
2.556		C	C	C	C	C		2.3	0.26	2.6	+1.7
2.778		C	C	C	C	C		2.5	0.27	2.8	+0.8
3.000		C	C	C	C	C		2.7	0.30	3.0	0.0
3.333		C	C	C	C	C		3.00	0.33	3.3	−1.0
3.556		C	C	C	C	C		3.2	0.36	3.6	+1.2
4.000		C	C	C	C	C		3.6	0.40	4.0	0.0
4.111		C	C	C	C	C		3.7	0.41	4.1	−0.3
4.444		C	C	C	C	C		4.00	0.44	4.4	−1.0
4.667		C	C	C	C	C		4.2	0.47	4.7	+0.7
5.000		C	C	C	C	C		4.5	0.50	5.0	0.0
5.555	893 000	C	C	C	C	C	0.941	5.00	0.56	5.6	+0.7
6.111		C	C	C	C	C	0.9406	5.5	0.61	6.1	−0.2
6.667		C	C	C	C	C		6.00	0.67	6.7	−0.5
7.778		C	C	C	C	C		7.00	0.78	7.8	+0.3
7.889		C	C	C	C	C		8.00	0.89	8.9	+0.1
10.00	496 055	C	C	C	C	C	1.693	9.00	1.0	10	0
11.00	450 959	C	C	C	C	C	1.881	10.00	1.1	11	−1.0
12.22	413 379	C	C	C	C	C		11	1.2	12	−1.8
13.33	381 581	C	C	C	C	C		12	1.3	13	−2.5
15.56	310 034	C	C	C	C	C		14	1.6	16	+2.8
16.67	291 797	C	C	C	C	C		15	1.7	17	+2.0
20.00	248 028	C	C	C	C	C	3.387	18.00	2.0	20	0
22.22	225 480	C	C	C	C	C	3.763	20.00	2.2	22	−1.0
25.56	190 790							23	2.6	26	+1.7
27.78	177 162							25	2.8	28	+0.8
30.00	165 352	196.8	295.3	103.3	551.1	333.3	5.080	27.00	3.0	30	0
31.11	160 018							28	3.1	31	−0.4
33.33	150 320	177.1	265.7	93.00	496.0	300.0	5.645	30.00	3.3	33	−1.0
35.56	141 730							32	3.5	35	−1.6
38.89	124 014							35	4.0	40	−2.9

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TABLE 2 *Continued*

Exact Equivalent	yd/lb for Rounded Tex-Value[A]	Cotton Count	Indirect Systems			Direct Systems					Deviation[B]
			Worsted Count	Woolen Run	Linen Woolen Cut	Metric Count	American Grain Count	Denier	Rounded Value	Rounded Value	
dtex	yd/lb	cc	wc	wr	lea	mc	gr	den	tex	dtex	%
40.00	121 191	147.6	221.4	77.51	413.4	250.0	6.774	36.00	4.0	40	0
44.44	112 740	132.9	199.3	69.75	372.0	225.0	7.527	40.00	4.4	44	−1.0
45.00	110 200	131.2	196.8	68.89	367.4	222.2	7.620	40.50	4.5	45	0
47.78	103 345							43	4.8	48	+0.5
49.21	100 800	120.0	180.0	63.00	336.0	203.2	8.333	44.29	4.9	41	+1.6
50.00	99 211	118.1	177.2	62.01	330.7	200.0	8.466	45.00	5.0	50	0
50.04		118									−0.1
50.91	97 266	116							5.1	51	+0.2
51.35		115									+1.3
51.80	95 395	114							5.2	52	+0.4
52.22								47			−0.4
52.72	93 595	112							5.3	53	+0.5
53.68		110									−1.3
54.68	90 192	108							5.5	55	+0.6
50.91		116.0	174.0	60.90	324.8	196.4	8.621	45.82	5.1	51	
53.69		110.0	165.0	57.75	308.0	186.3	9.091	48.32	5.4	54	
55.00		107.4	161.1	56.37	300.6	290.9	9.314	49.50	5.5	55	
55.56		106.3	159.5	55.81	297.7	180.0	9.406	50.00	5.6	56	+0.8
55.71	88 581	106							5.6	56	+0.5
56.24		105									−0.4
56.78	87 027	104							5.7	57	+0.4
57.78								52			+0.4
57.89		102									+0.2
58.00	85 527								5.8	58	0
59.05	84 077	100.0	150.0	52.50	28.00	169.3	10.00	53.15	5.9	59	−0.1
60.00		98.42	147.6	51.67	275.6	166.7	10.16	54.00	6.0	60	0
60.26	82 676	98							6.0	60	−0.4
61.10		96.64	145.0	50.74	270.6	163.7	10.35	55.00	6.1	61	0
61.51		96									+0.8
62.16	80 009	95							6.2	62	−0.3
62.22								56			−0.4
62.82	78 739	94							6.3	63	+0.3
64.18	77 509	92							6.4	64	−0.3
65.00		90.85	136.3	47.70	254.4	153.8	11.01	58.50	6.5	65	0
65.61	75 160	90.00	135.0	47.25	252.0	152.4	11.11	59.06	6.6	66	+0.6
67		88.59	132.9	46.51	248.0	150.0	11.29	60.00	6.7	66.66	
67.10	74 038	88							6.7	67	−0.1
69.47	71 892	86							6.9	69	+0.7
69.47		85									+0.8
70.00	70 865	84.36	126.5	44.29	236.2	142.29	11.85	63.00	7.0	70	0
70.30		84									−0.4
72.01	69 867	82							7.1	71	−1.4
72.22	68 897	81.98	122.7	42.94	229.0	138.5	12.23	65.00	7.2	72	−0.3
73.82	67 034	80.00	120.0	42.00	224.0	135.5	12.50	66.44	7.4	74	+0.3
74.75	66 141	79							7.5	75	+0.3
75.00		78.74	118.1	41.34	220.5	133.3	12.70	67.50	7.5	75	4
75.07		78.67	118.0	41.30	220.3	133.2	12.71	67.57	7.5	75	4
75.16		78.57	117.9	41.25	220.0	133.0	12.73	67.65	7.5	75	4
75.62		78.10	117.1	41.00	218.7	132.2	12.80	68.06	7.6	76	4
75.71	65 270	78.00	117.0	40.95	218.4	132.1	12.82	68.14	7.6	76	+0.4
76.34		77.36	116.0	40.61	216.6	131.0	12.93	68.71	7.6	76	2
76.55		77.14	115.7	40.50	216.0	130.6	12.96	68.90	7.7	77	2
76.69	64 423	77.00	115.5	40.42	215.6	130.4	12.99	69.03	7.7	77	+0.4
77.78		75.93	113.9	39.86	212.6	128.6	13.17	70.00	7.8	78	+0.3
77.70		76.00	114.0	39.90	212.8	128.7	13.16	69.94	7.8	78	+0.4
78.00	63 597	75.72	113.6	39.75	212.0	128.2	13.21	70.20	7.8	78	0
78.74	62 792	75.00	112.5	39.38	210.0	127.0	13.33	70.87	7.9	79	+0.3

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