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Projects K1 & K2: The Grey Fabrics

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1. Introduction

The main overall objective of the projects K1 and K2 is to discover and quantify a systematic basis for predicting the knitting constructional details and finishing processes required for producing single-jersey cotton outerwear fabrics of given performance specifications.

To achieve this, it is first necessary to develop a systematic and comprehensive data base relating manufacturing and processing parameters to final specifications and performance (K1) and, secondly, to discover and quantify the changes in fabric specifications and performance which are caused by using different types of dyeing and mercerising processes (K2).

Details of the fabric constructions, yarns and finishing routes included in these investigations can be found in the project planning document, *Appendix F/G* of the *Report to the TPI Steering Committee*, and a report on the fabric production in *Research Record No. 114*, Appendix W.

In order that realistic comparisons can be made, and therefore, any changes identified, it is first essential to bring all the fabrics to the same physically stable state for evaluation by removing any tensions and distortions imposed during knitting and finishing. Earlier work has shown that such a stable state is only reliably and reproducibly achieved when the fabrics have been 'fully relaxed'. The IIC established method for achieving full relaxation is to submit all samples to a one-wash-and-tumble-dry cycle, followed by four wet-out-and-tumble-dry cycles. Only with the fabrics in a 'fully relaxed' condition can any changes in structure identified be considered to be real changes and not influenced by residual processing distortions.

Note for the digital version: The terminology was later changed to “The Starfish Reference Relaxation Procedure” and “The Starfish Reference State”
In what follows, “fully-relaxed” should be read as “Reference-State”.

Before any detailed analysis of the results is carried out, it is first beneficial to examine the grey fully relaxed structure. This is important for two reasons. Firstly, it enables the general trends and relationships, (e.g. the interaction of stitch length and yarn count and their effect on relaxed dimensions) to be identified before they are modified by dyeing and finishing and, secondly, it helps to focus attention on certain other important areas of interaction, namely:

1. The effect of yarn twist and twist direction on spirality and relaxed dimensions.
2. The effect of using singles or two-fold yarn on spirality and relaxed dimensions.
3. The effect of machine gauge.

As this report is only intended to be a preliminary analysis, the number of properties examined have been limited to four: spirality, courses per unit length, wales per unit length, weight per unit area. For completeness, however, all of the grey fabric test data have been tabulated (Tables 1 - 28) and are included as an Appendix. For convenience, the main data are arranged according to machine gauge and yarn type - either singles or two-fold - and the fabrics included in the supplementary spirality trial are grouped together with their controls.

2. General Trends

Previous work carried out by TRD has indicated certain general relationships which link yarn count and stitch length to certain physical properties of plain single-jersey fabrics, knitted from singles yarn. An examination of the results obtained from the fabrics included in

projects K1 and K2 appears to confirm these earlier results and they can be summarised as follows.

2.1. Spirality (*Figures 1-3*)

The angle of spirality developed in the grey fully relaxed fabric increases as stitch length increases and yarn count gets finer.

2.2. Course Density (*Figures 4-6*)

The number of courses per unit length increases as stitch length decreases.

2.3. Wale Density (*Figures 7-9*)

The number of wales per unit length increase as stitch length decreases.

2.4. Weight (*Figures 10-12*)

The fabric weight per unit area increases as stitch length decreases and yarn count gets heavier.

These trends apply to all of the fabrics knitted from singles yarns of one twist direction irrespective of yarn twist factor or machine gauge. They also apply to all of the fabrics knitted from two-fold yarn with the exception of spirality. Fabrics knitted from two-fold yarn develop only small spirality angles (*Figures 13-15*), with no apparent systematic interaction of yarn count and stitch length.

Although in general terms the same trends apply to all of the fabrics in the grey fully-relaxed state, a closer examination of the individual results indicates certain areas where differences in the relaxed structure can be detected.

3. The Effect Of Changing Yarn Twist Factor And Twist Direction

The supplementary spirality trial included in K1 was devised primarily to enable the effects of changing yarn twist factor and twist direction on the angle of spirality to be examined. In addition, fabrics knitted from alternate ends of 'S' and 'Z' twist yarn were also included for comparison because, although this method is known to reduce spirality in the fabric to commercially acceptable levels, the effect on other physical properties has not been quantified.

For this investigation, the mid-range yarn count on each gauge of machine having standard 'Z' twist and a twist factor of 3.5 was taken as control. Additional fabrics were then knitted on all three gauges of machine with alternate ends 'S' and 'Z' (yarn count and twist factor kept constant) and, on the 24 gauge machine, fabrics were knitted from all 'S' twist (yarn count and twist factor kept constant), and from yarn with 3.0 twist factor and 4.0 twist factor (yarn count and twist direction, i.e. 'Z', kept constant).

The results from the grey fully relaxed fabrics can be summarised as follows.

3.1. Spirality (*Figure 16*)

- The same general trend applies for both 'S' and 'Z' twist yarns. As stitch length increases, spirality increases.
- 'Z' twist yarn with a twist factor of 4.0 develops higher angles of spirality in the fabric than the standard control 3.5 twist factor.
- 'Z' twist yarn with a twist factor of 3.0 develops lower angles of spirality in the fabric than the standard control 3.5 twist factor.

- ‘S’ twist yarn with standard 3.5 twist factor develops similar angles of spirality as the control standard ‘Z’ twist 3.5 twist factor, but the fabric spirals in the opposite direction. This is represented as negative spirality in *Figure 16*.
- Fabrics produced from alternate ends of ‘S’ and ‘Z’ twist yarn develop only very small angles of spirality and the angle does not appear to be influenced by yarn count or stitch length.

NB: If *Figures 13-15* are re-examined, it can be seen that fabrics produced from two-fold yarn develop small angles of spirality in both positive and negative directions. *Figure 16* shows that fabrics produced from alternate S and Z twist yarns always spiral in a positive direction.

3.2. Course Density (*Figures 17-18*)

- General trend applies for both ‘S’ and ‘Z’ twist yarns. As stitch length decreases, courses increase.
- Fabrics from 4.0 twist factor yarn tend to have slightly more courses, and from 3.0 twist factor, fewer.
- Both ‘S’ 3.5 twist factor and ‘Z’ 3.5 twist factor yarn give similar course levels.
- Fabrics from alternate S and Z have significantly more courses. This is apparent on all three gauges of machine and is, at first sight, a surprising result.

3.3. Wale Density (*Figures 19-20*)

General trend applies for both 'S' and 'Z' twist yarns.

- As stitch length decreases, wales increase.
- There is a tendency towards more wales from 4.0 twist factor yarn and fewer wales from 3.0 twist factor yarn compared to both ‘S’ and ‘Z’ twist factor 3.5, which are similar.
- Fabrics from alternate S and Z have significantly fewer wales and this is apparent on all three gauges of machine. There also appears to be less of a yarn count interaction with alternate S and Z than with 3.5 Z standard.

3.4. Weight (*Figures 21-22*)

- General trend applies: as stitch length decreases and yarn count increases, fabric weight increases.
- Fabric from 4.0 twist factor tends to be heavier than from 3.5 standard; 3.0 twist factor tends to be lighter.
- Fabric from S and Z alternate tends to be heavier than 3.5 S or 3.5 Z, but lighter than 4.0 twist factor.

4. Effect Of Using Singles Or Two-Fold Yarns

Both two-fold and singles yarn are commonly used in the production of single jersey fabric and it is not unusual for the same fabric specifications to be applied regardless of which type of yarn is used.

To establish whether or not the same specifications should apply, all the fabric constructions knitted for K1 and K2 in singles yarn were repeated using two-fold yarn of the same resultant count. An examination of the results of the grey fully-relaxed structure indicates that there

may be significant differences between the fabrics and that perhaps the same specifications should not be applied. The results can be summarised as follows.

4.1. Spirality (*Figures 23-25*)

The figures illustrate the results obtained for 18, 24, and 28 gauge fabrics.

In all cases, spirality developed in fabrics knitted from two-fold yarn is very small, as previously discussed, and this is the most well-known difference between the two.

4.2. Course Density (*Figures 26-28*)

Although the same general trend applies as detailed in 2.1., there is a tendency on all three gauges of machine for there to be fewer courses in the fabric knitted from two-fold yarn than from singles yarn.

4.3. Wale Density (*Figures 29-31*)

Similarly with wales, although the same general trend applies as detailed in 2.3., there is a tendency towards fewer wales in the fabrics knitted from two-fold yarn than from singles yarn.

4.4. Weight (*Figures 32-34*)

Predictably, as there are fewer courses and wales in the fabrics knitted from two-fold yarn, they also tend to weigh less than the corresponding fabrics from singles yarns, and the discrepancy appears to be greater in the finer counts. However, there is a degree of scatter in the data and, therefore, caution should be exercised before placing too great a degree of significance on this apparent trend at this stage.

5. Effect Of Machine Gauge

Previous work carried out by IIC, and reported in *Research Record 100, Appendix P*, has suggested that machine gauge does not appear to have an independent effect on the relaxed dimensional properties of grey single jersey fabrics. However, there were deficiencies in certain parts of the previous experiments and a cautionary note was recorded in the conclusions advising the need for confirmation from further investigations. Consequently, when the fabric constructions and yarn counts were being discussed for the projects K1 and K2, overlaps of yarn count between machine gauges were planned to allow the possible effects of machine gauge to be investigated more systematically.

An examination of the grey fully-relaxed data justifies this approach as there appears to be some evidence that machine gauge can have an effect on relaxed dimensions. The results can be summarised as follows.

Figures 35-42 illustrate the areas of overlap between the gauges, singles and two-fold are treated separately.

5.1. Spirality (*Figures 35-36*)

Between 18 and 24 gauge it is difficult to detect an effect of gauge, but there does appear to be a difference between 24 and 28 gauge. The 1/32's yarn on 28 gauge appears to develop less spirality than the same 1/32's yarn on 24 gauge. This can not be simply explained by differences in the number of feeders on each machine. The 18 gauge has 36 feeders, the 24 gauge has 60 feeders, and the 28 gauge has 68 feeders.

For two-fold yarn there does not appear to be a systematic effect of gauge.

5.2. Course Density (*Figures 37-38*)

There does appear to be an effect of machine gauge on the number of courses in the fabrics for both singles and two-fold yarns. The 18 gauge results tend to lie to the right of the 24 gauge results and the 28 gauge results to the left. The interaction appears to be more significant at the tightest stitch lengths.

5.3. Wale Density (*Figures 39-40*)

For wales, there is a less obvious effect of gauge. *Figure 39* shows singles yarns and although there is an obvious difference between the 1/24 and the 1/32 yarns, this could have been expected because of count interaction, the existence of a gauge effect is less clear. *Figure 40*, however, for two-fold yarns, seems to indicate that there is a distinct difference between the gauges.

5.4. Weight (*Figures 41-42*)

The separation of the yarn counts is again predictable, as yarn count has a direct effect on fabric weight. Although there is scatter in the data, the possibility of an independent effect of machine gauge can not be excluded.

6. Conclusions

Although this examination of the grey fully-relaxed structure was only intended to be a preliminary analysis, and no attempt has been made to explain the results at this stage, certain points have emerged which should be kept in mind when the more detailed analysis of finished fabrics is carried out.

- Yarn twist factor, and the mixing of yarns of opposite twist in the fabric, can affect the fully-relaxed dimensions, other than the angle of spirality.
- The fully-relaxed dimensions of similar fabrics knitted from singles and two-fold yarn may be different.
- The possibility of an independent effect of machine gauge on relaxed dimensions cannot be discounted on the evidence of the grey-relaxed dimensions alone.

Figure 1

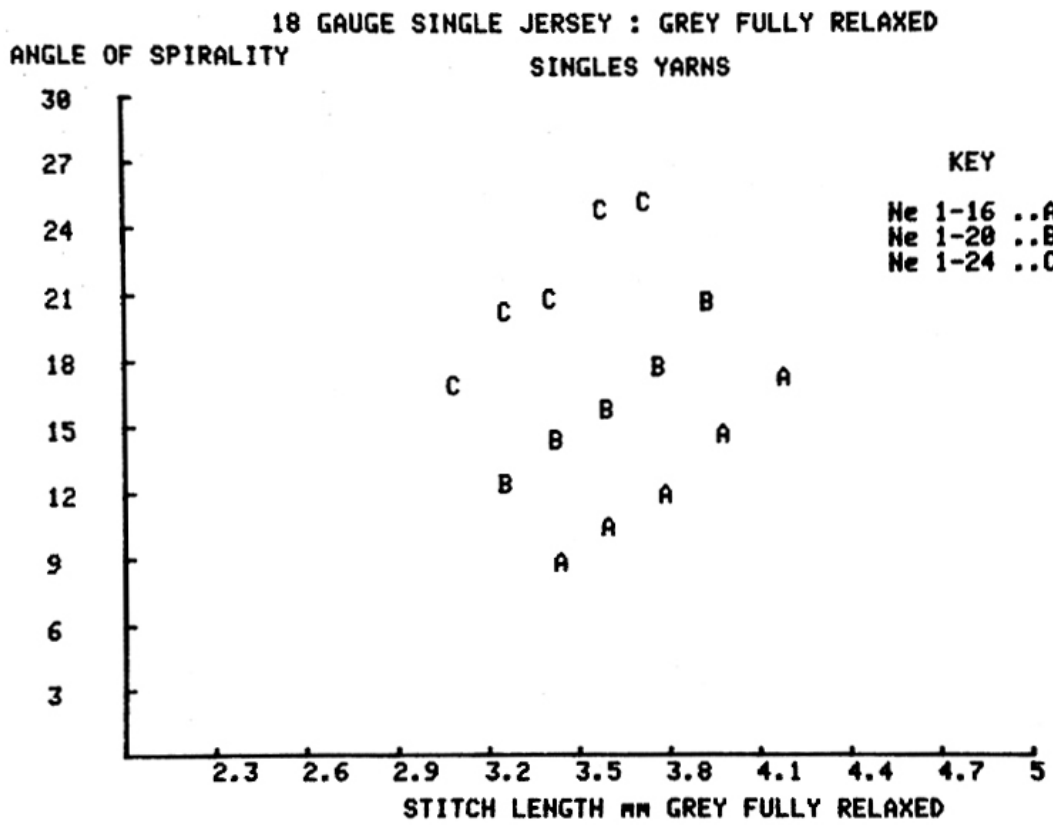


Figure 2

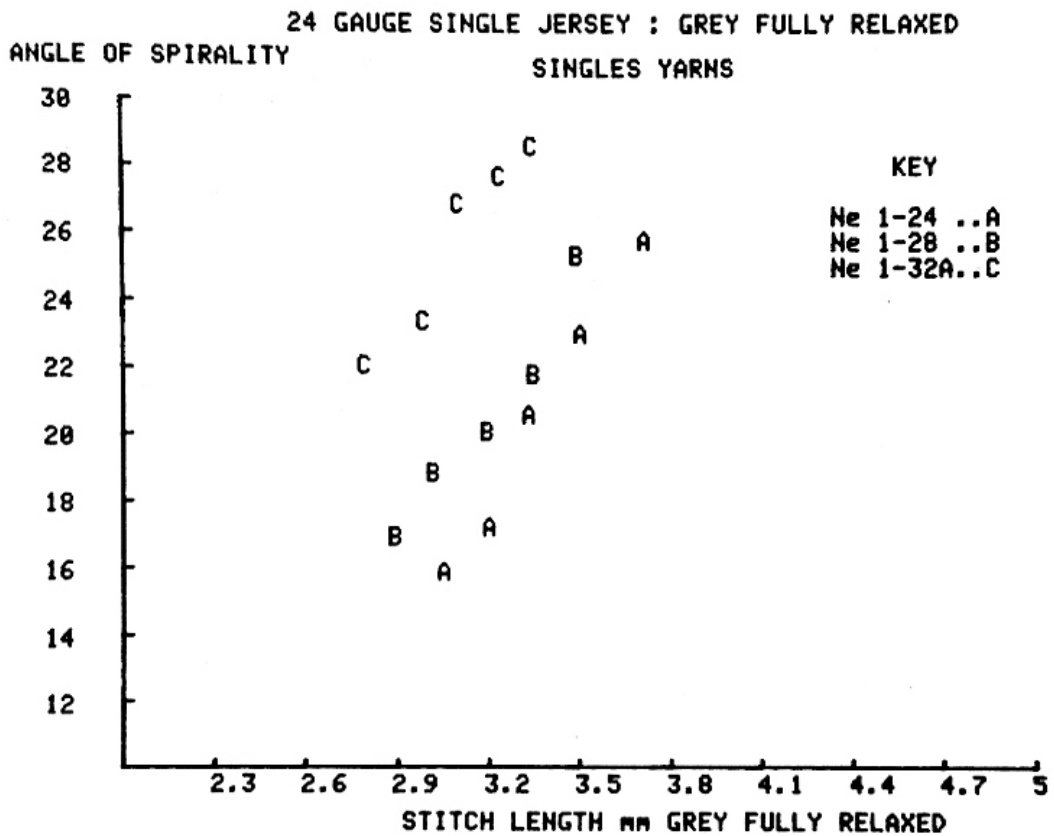


Figure 3

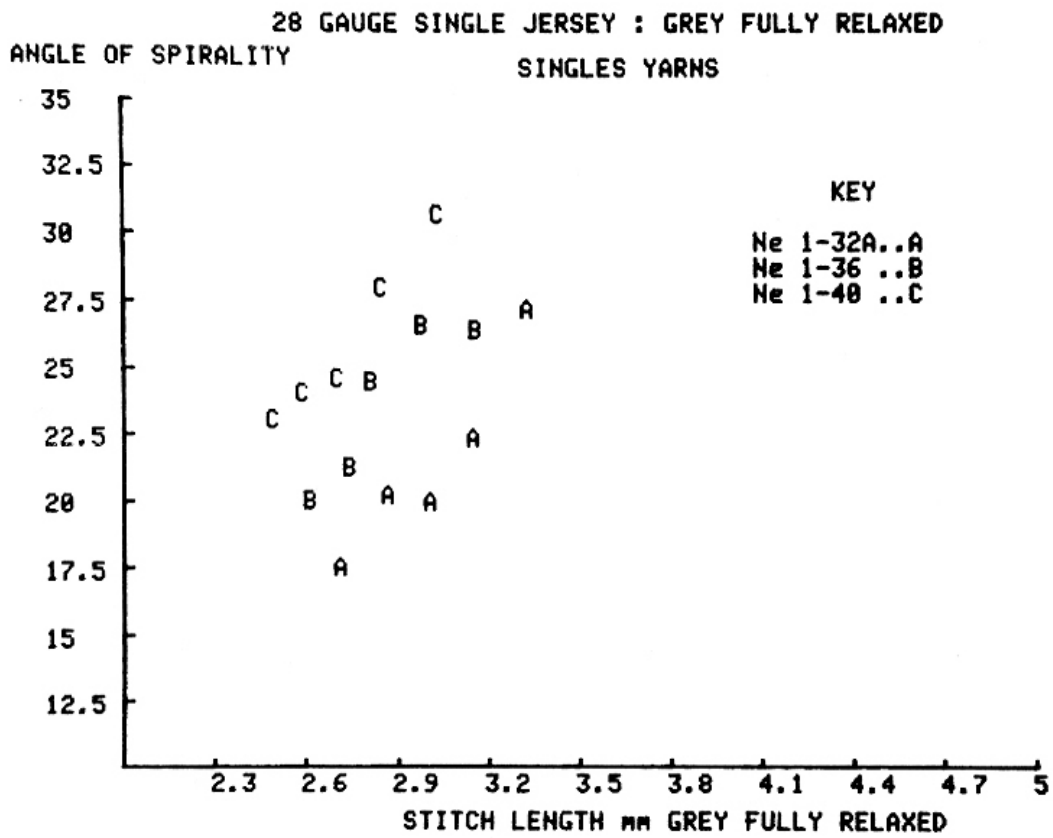


Figure 4

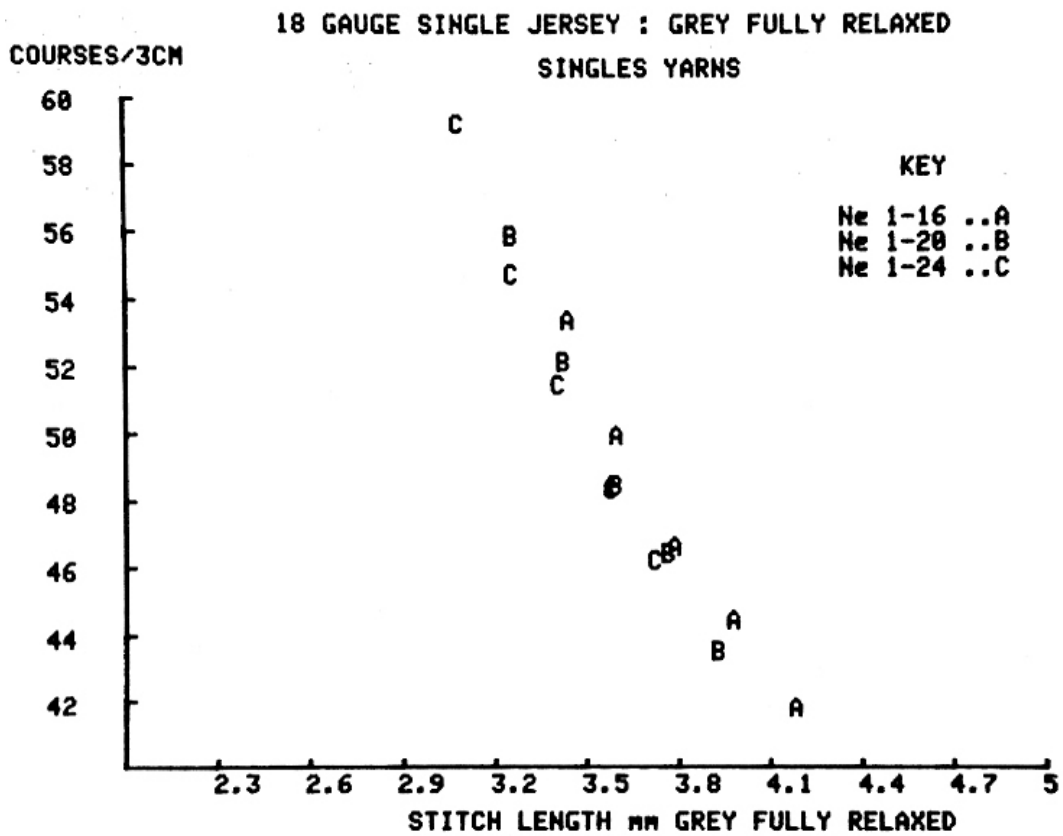


Figure 5

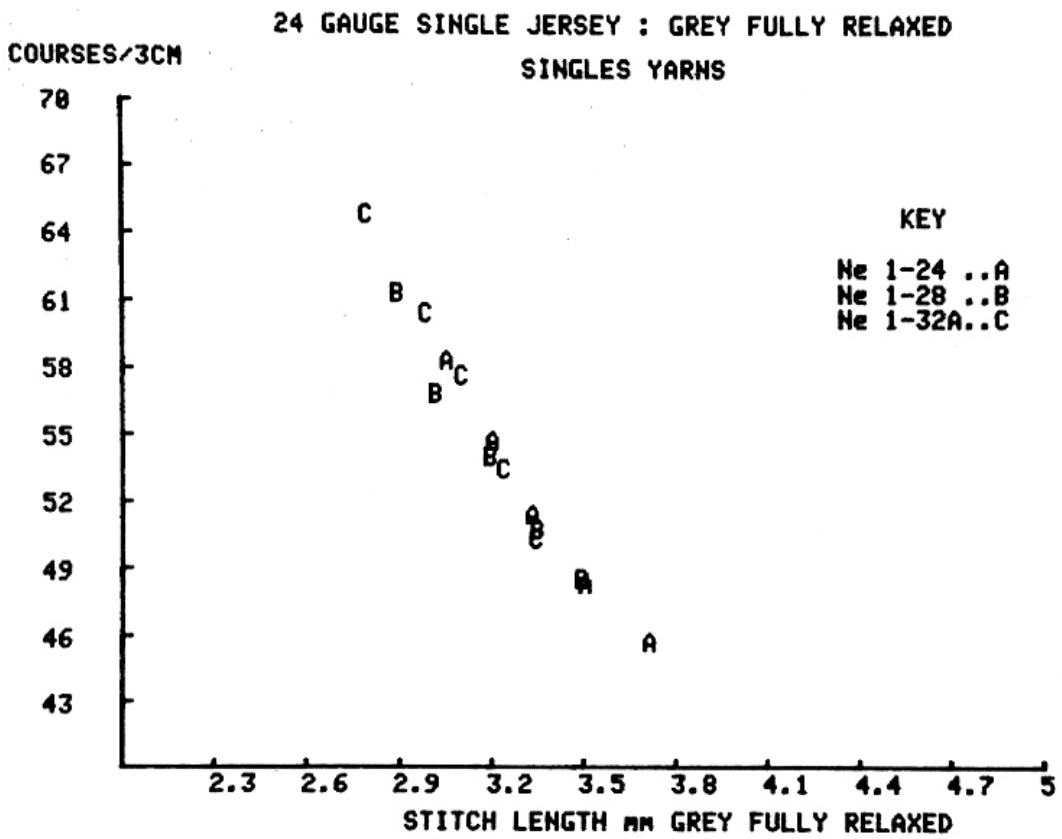


Figure 6

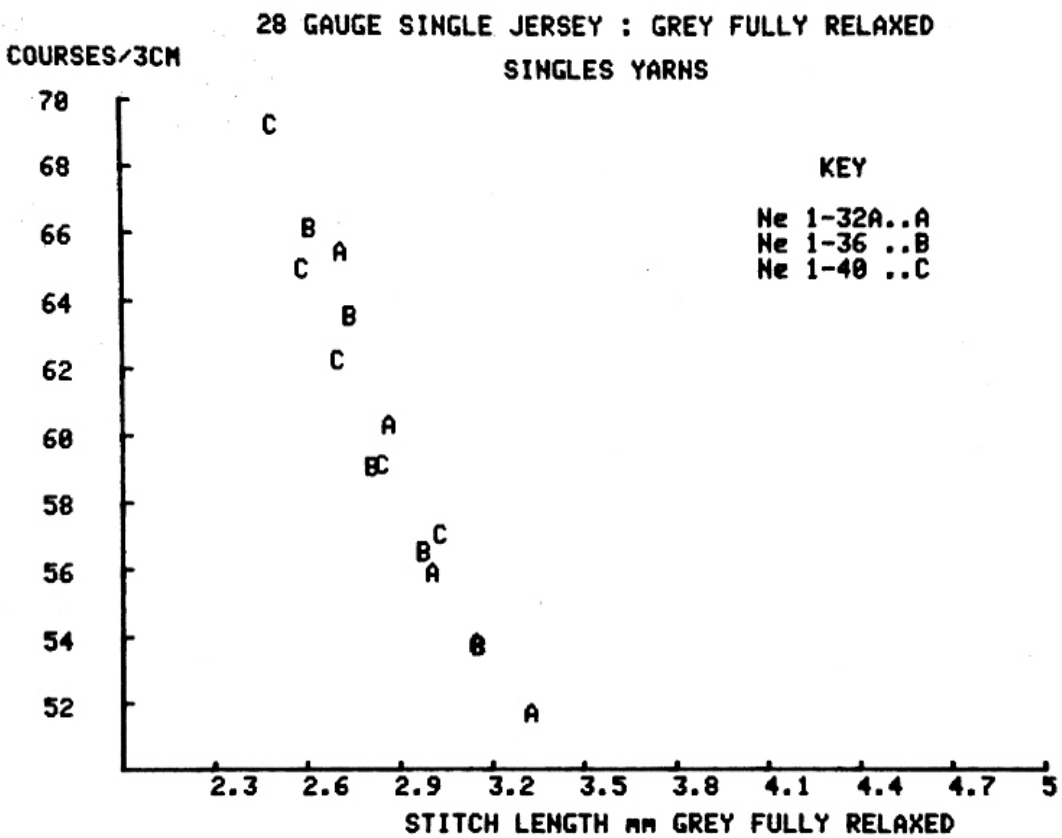


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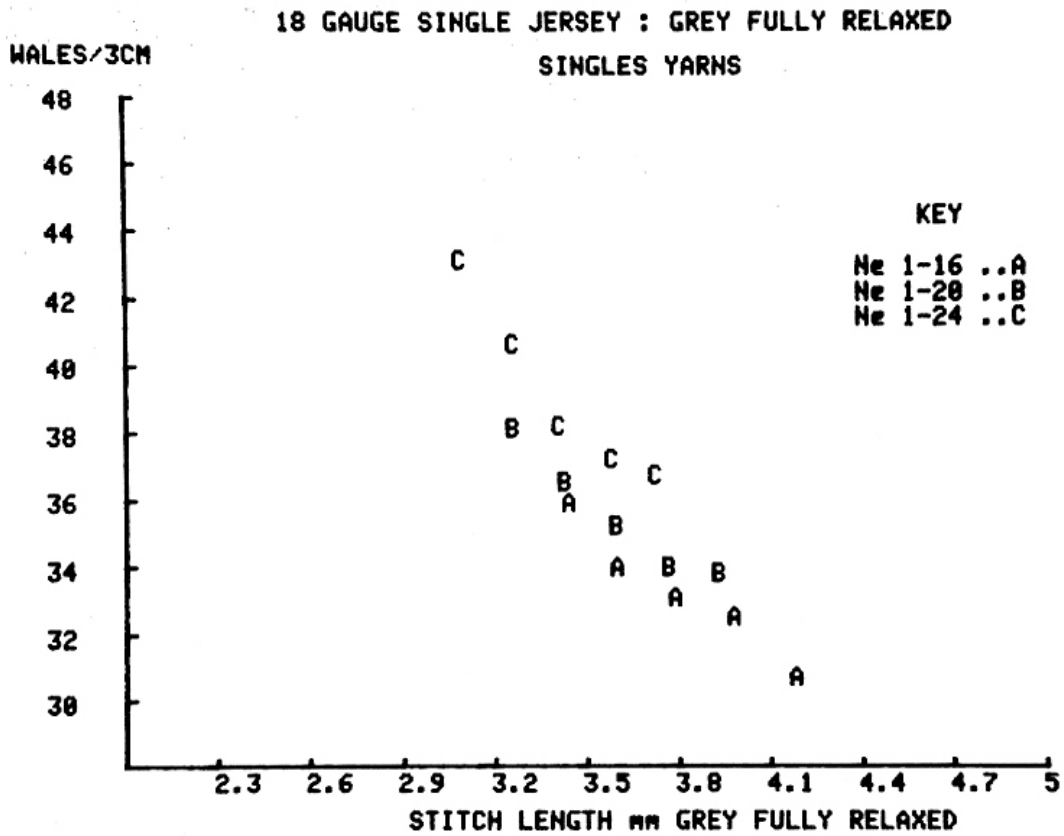


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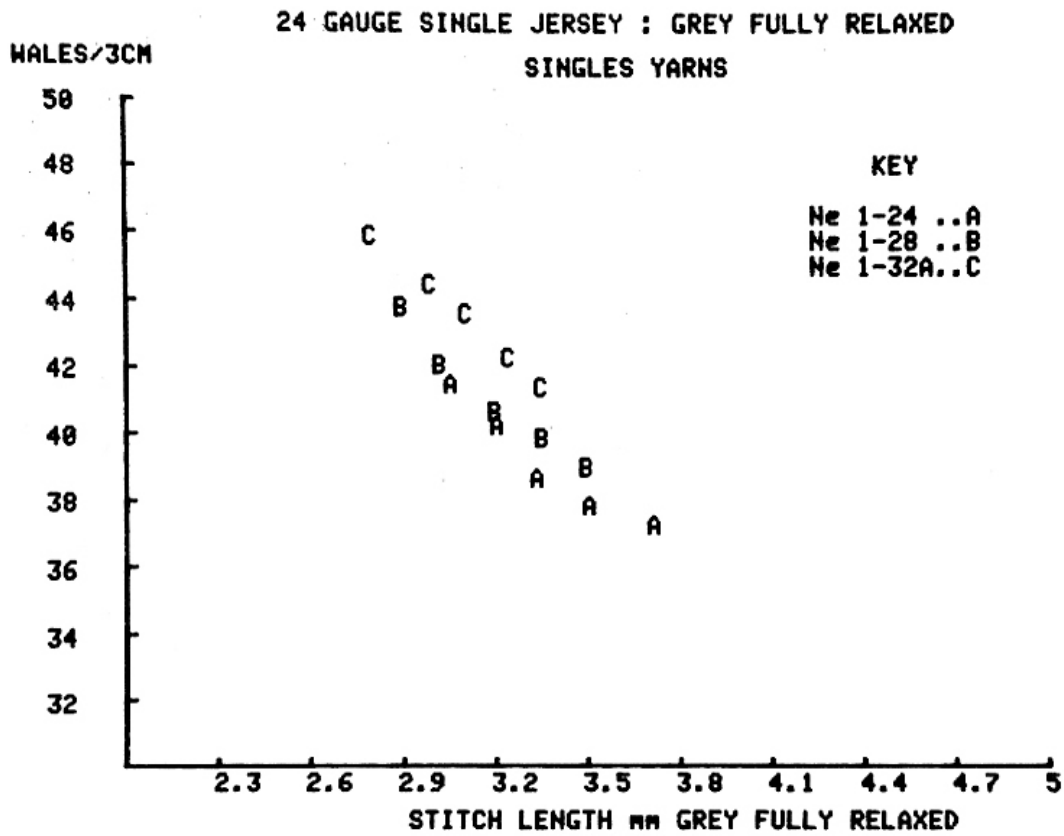


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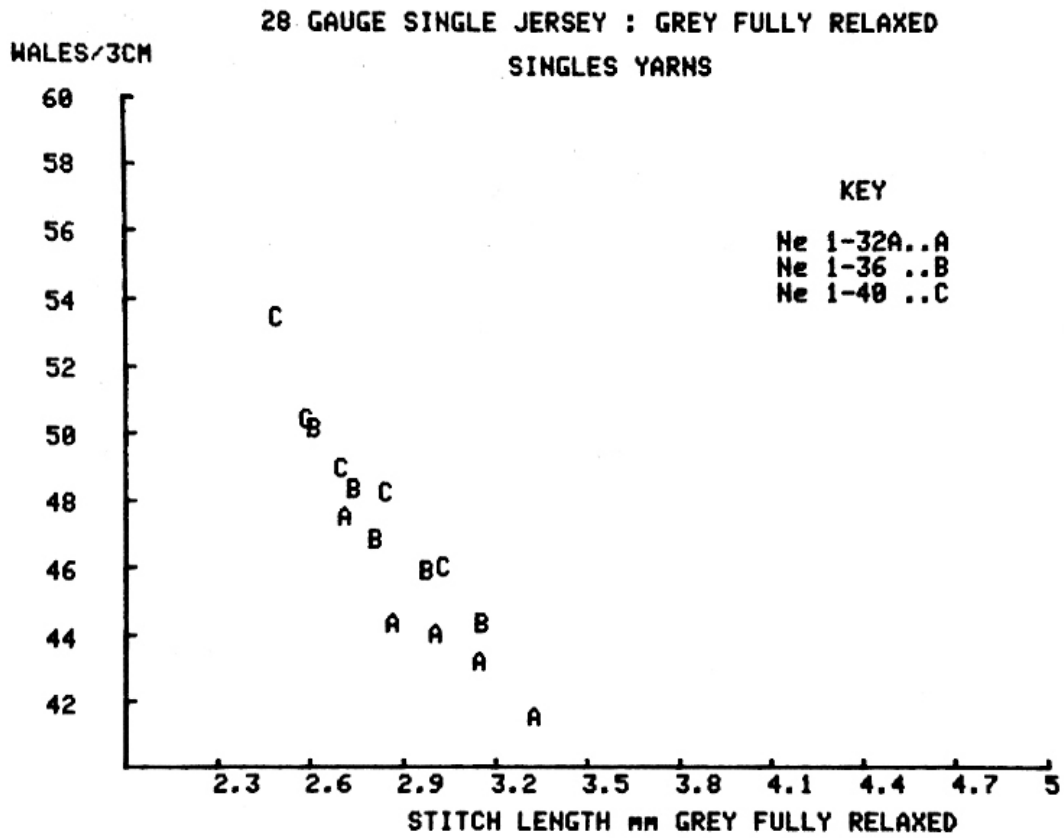


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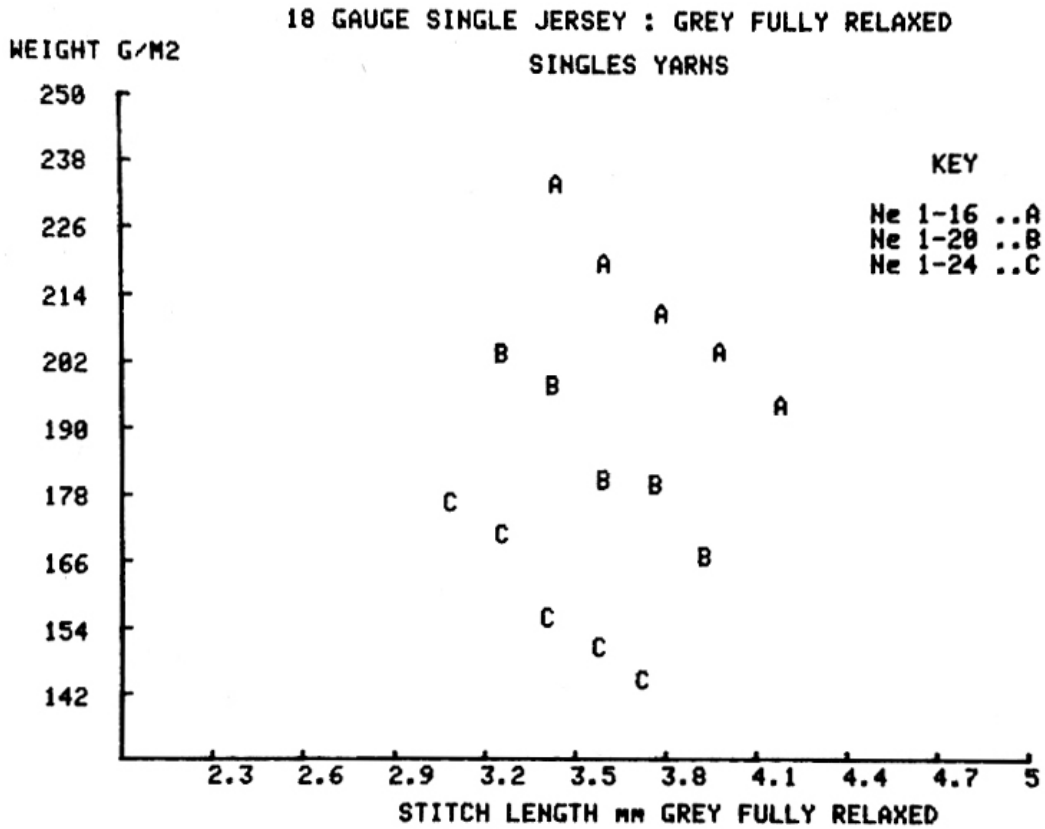


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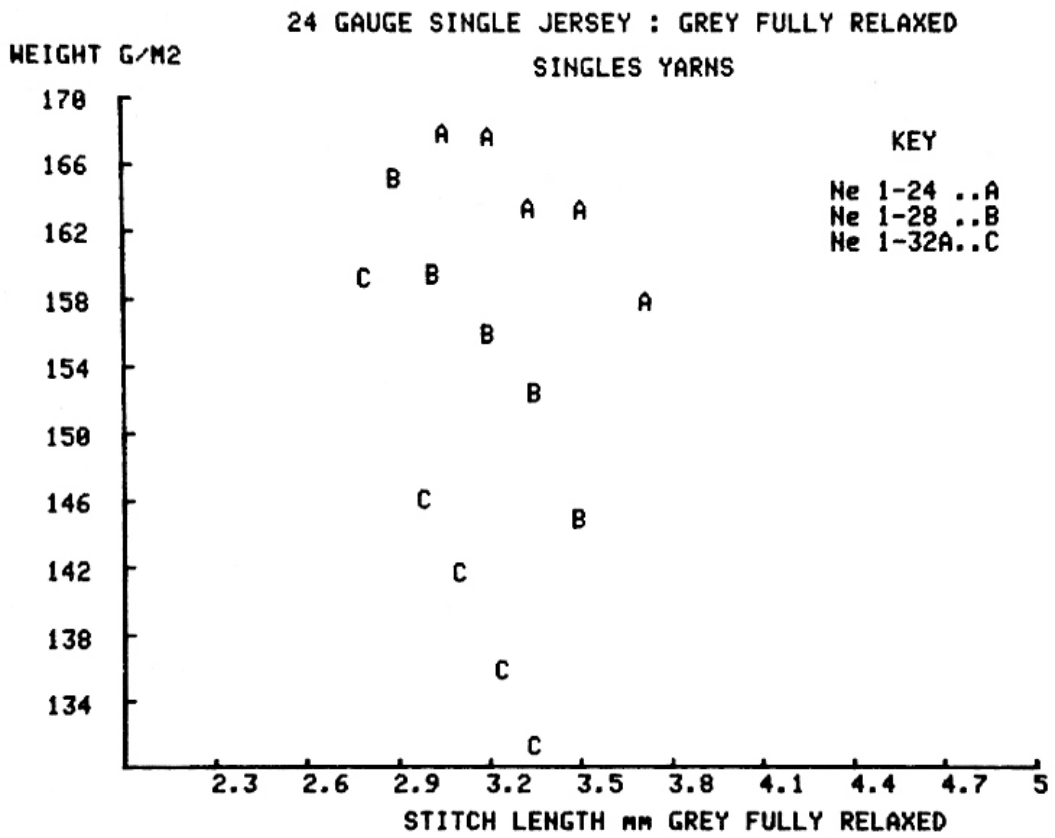


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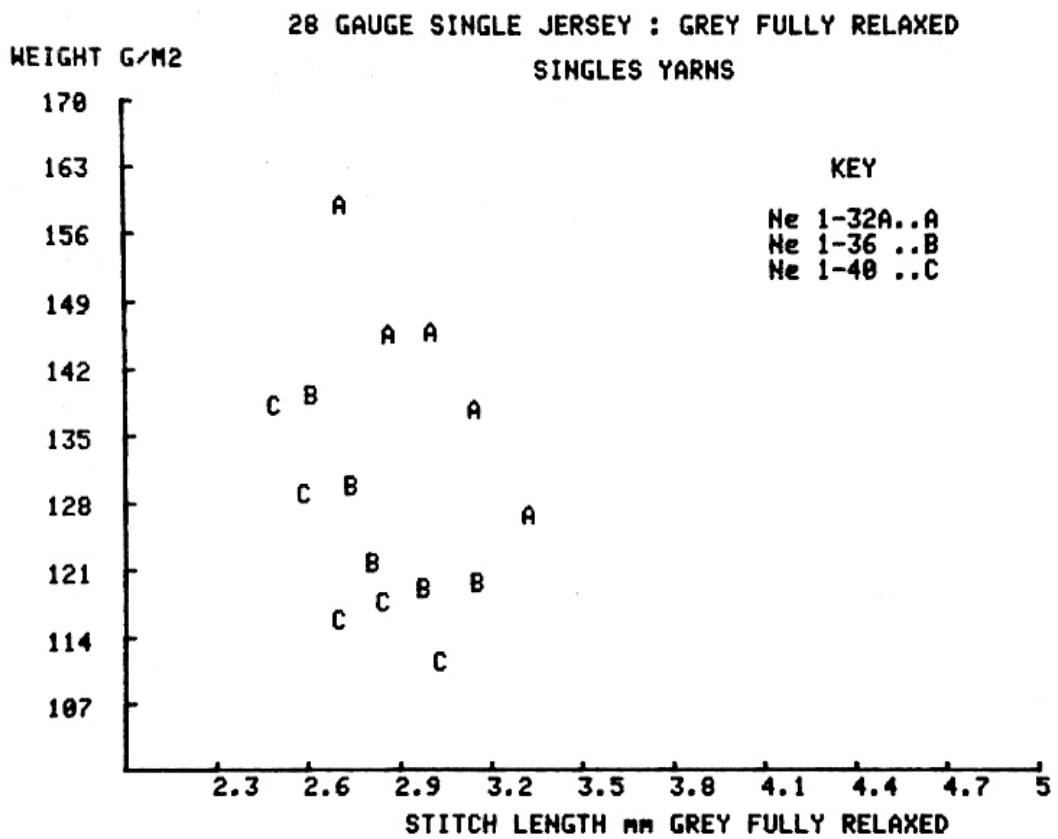


Figure 13

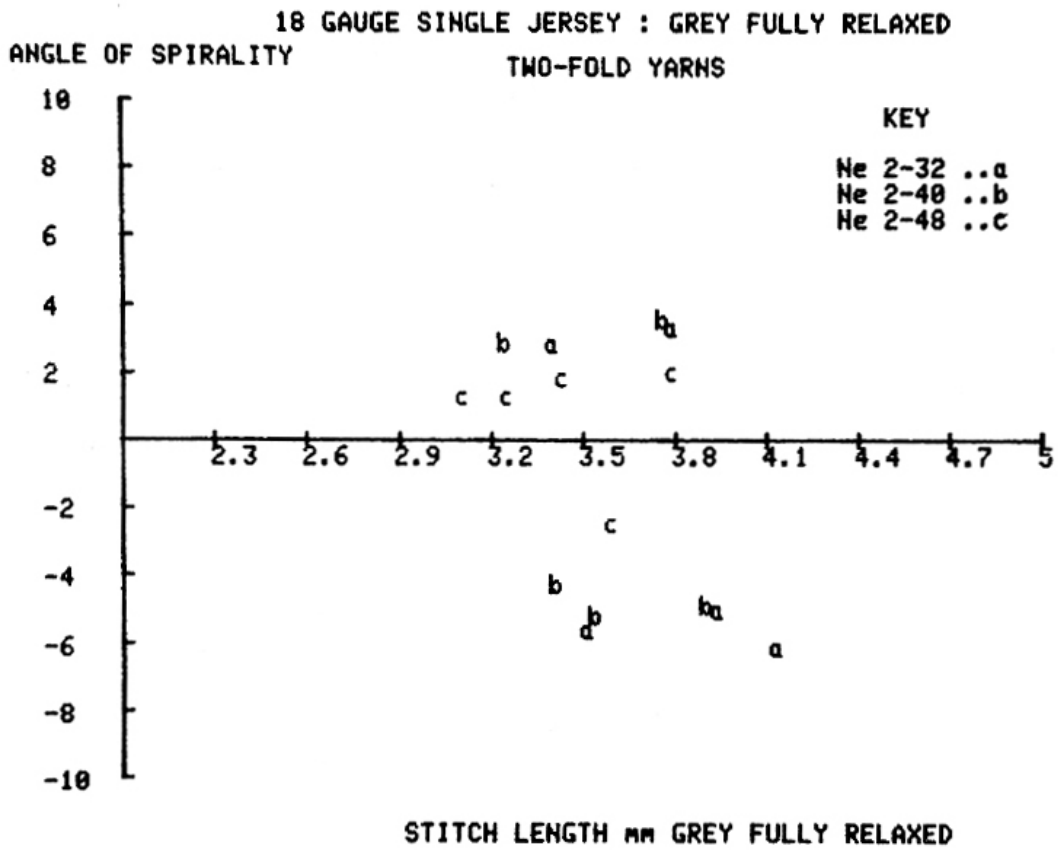


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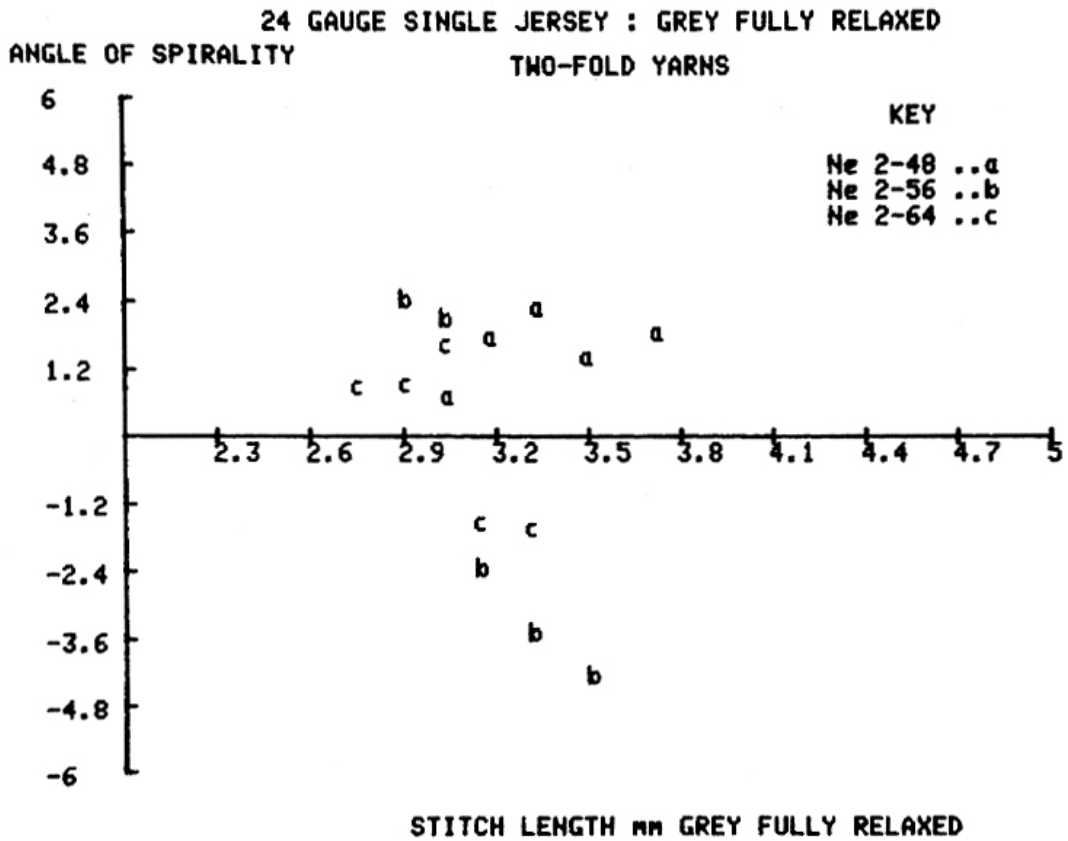


Figure 15

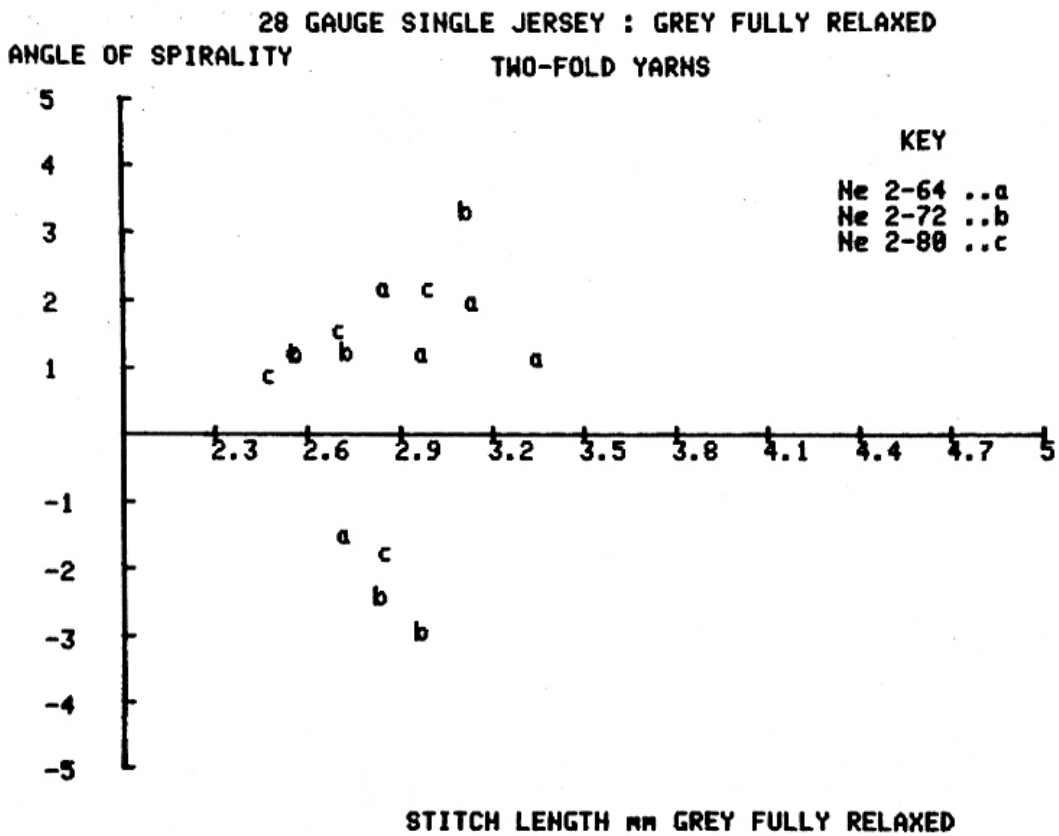


Figure 16

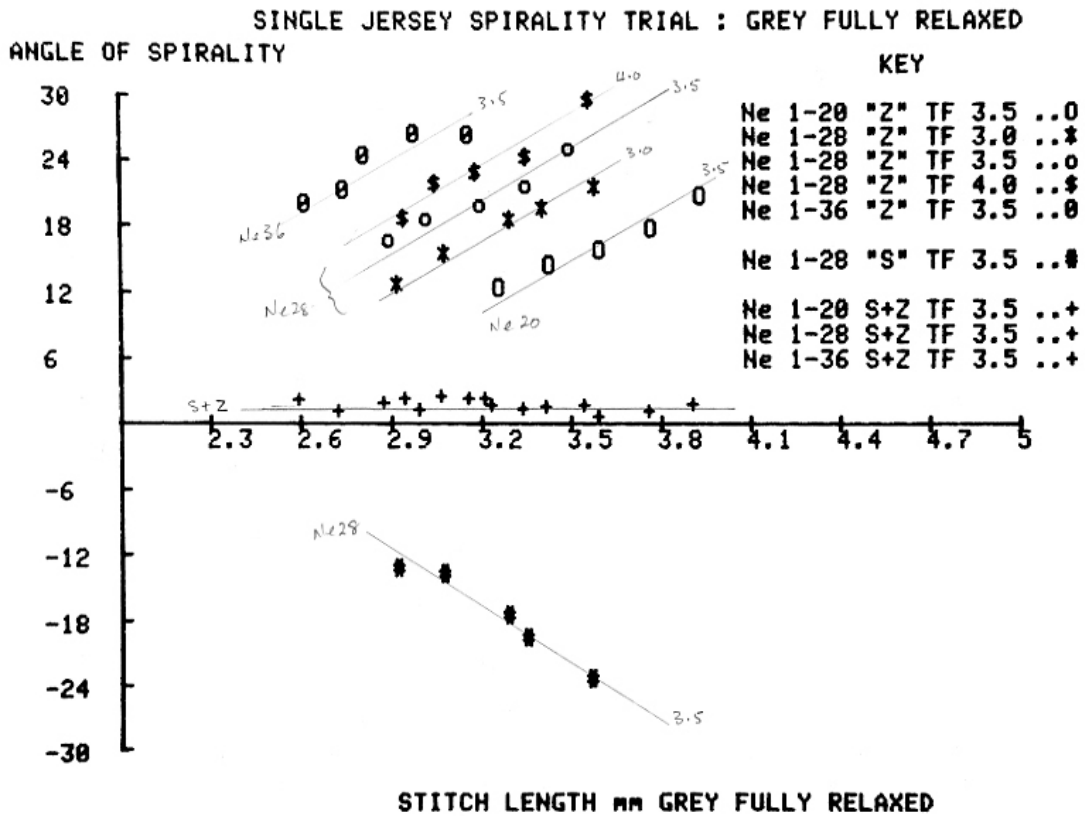


Figure 17

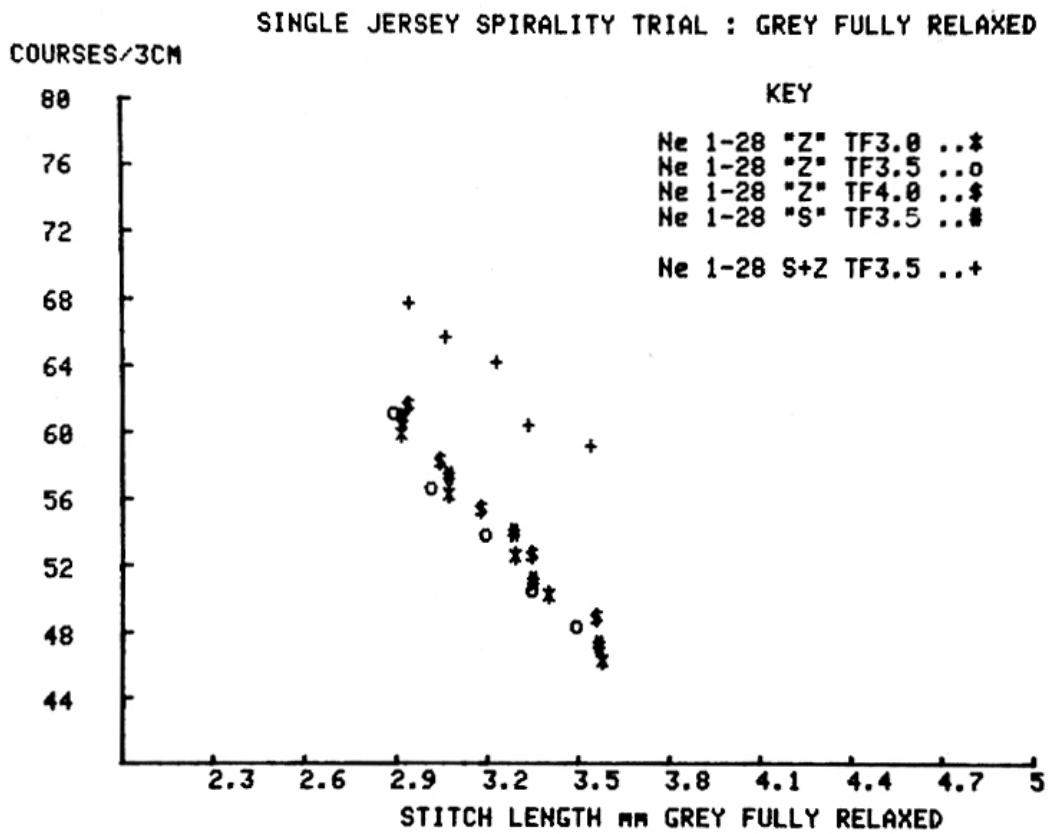


Figure 18

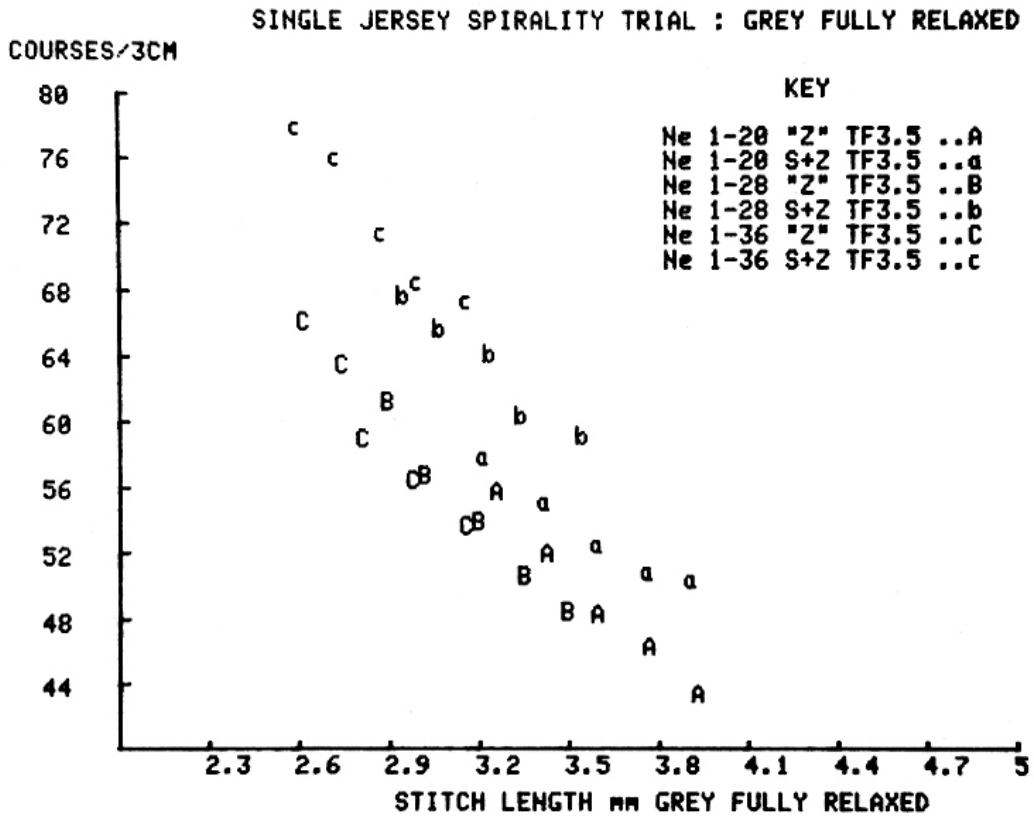


Figure 19

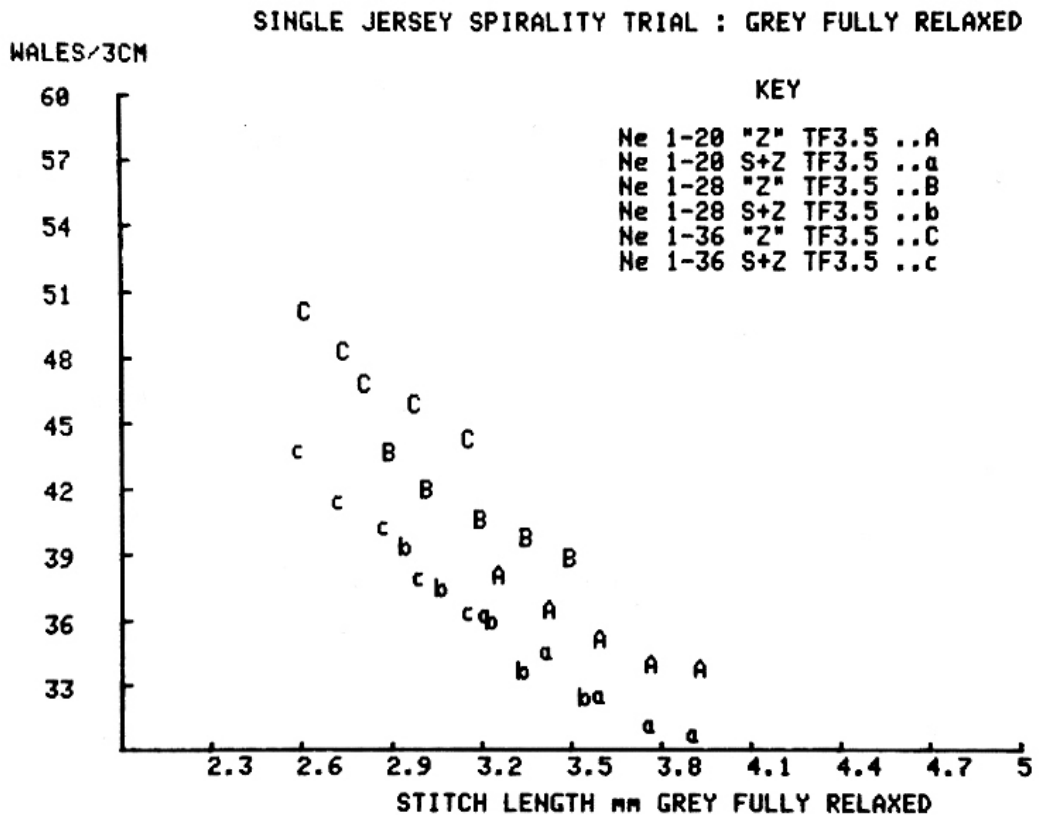
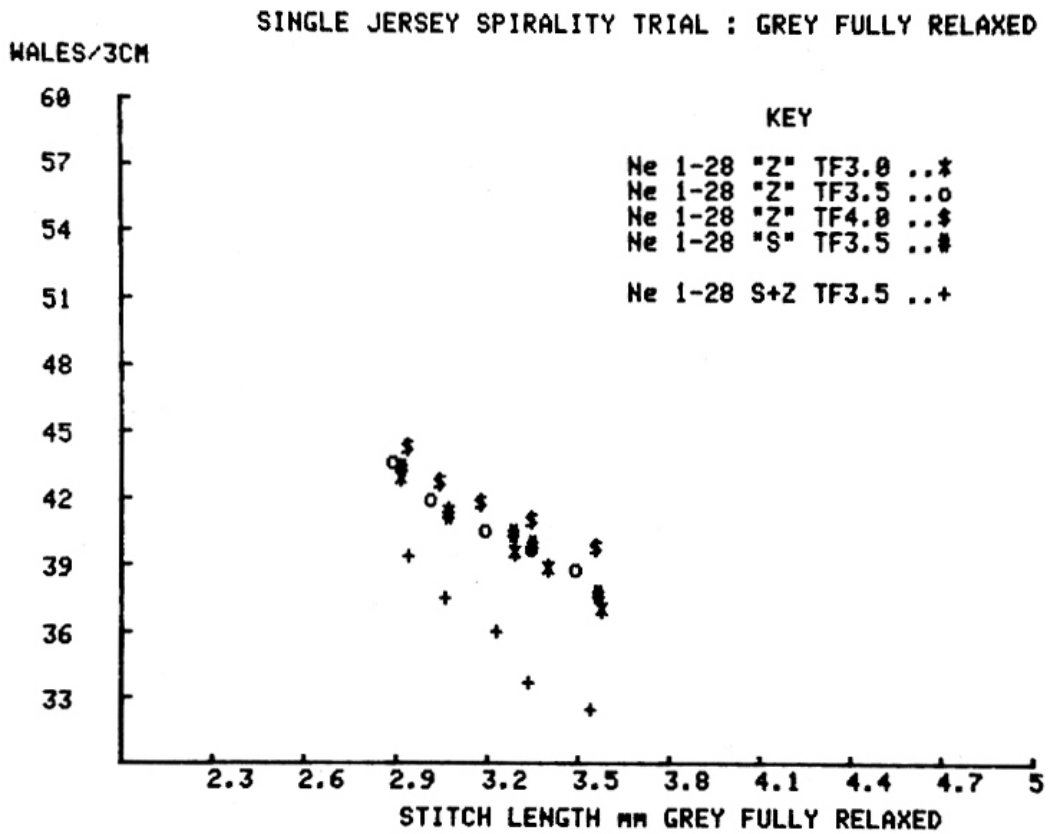


Figure 21

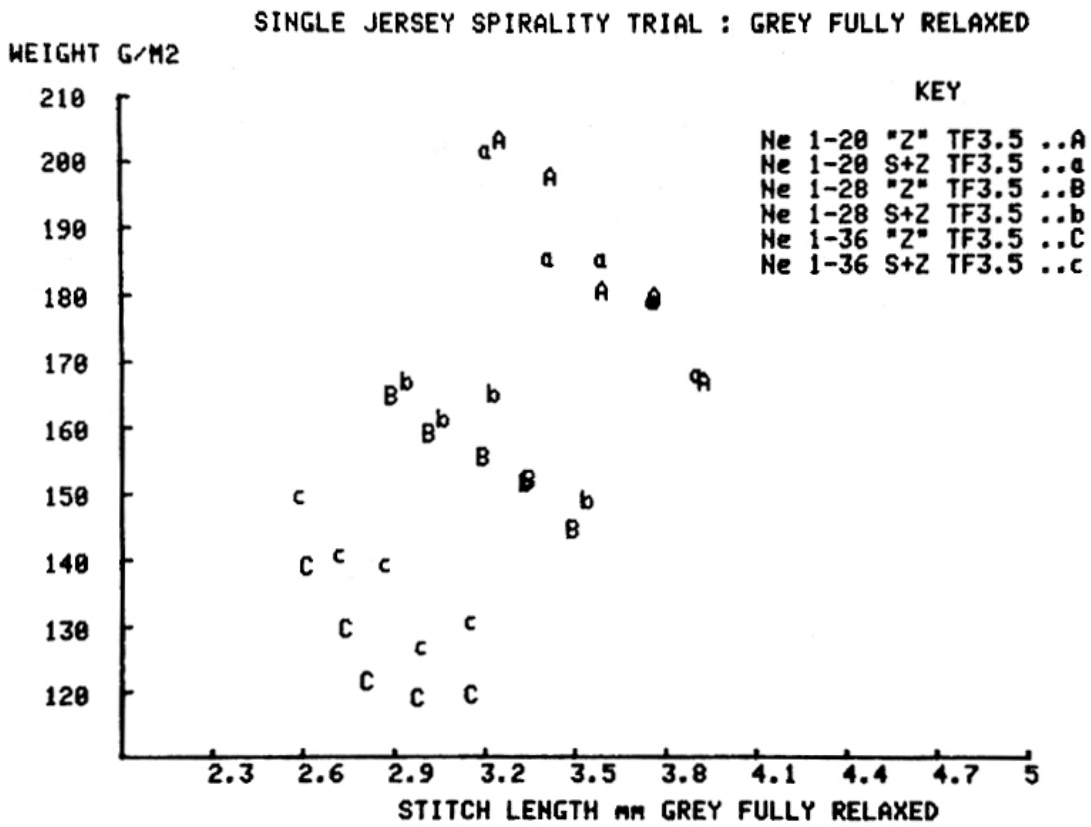


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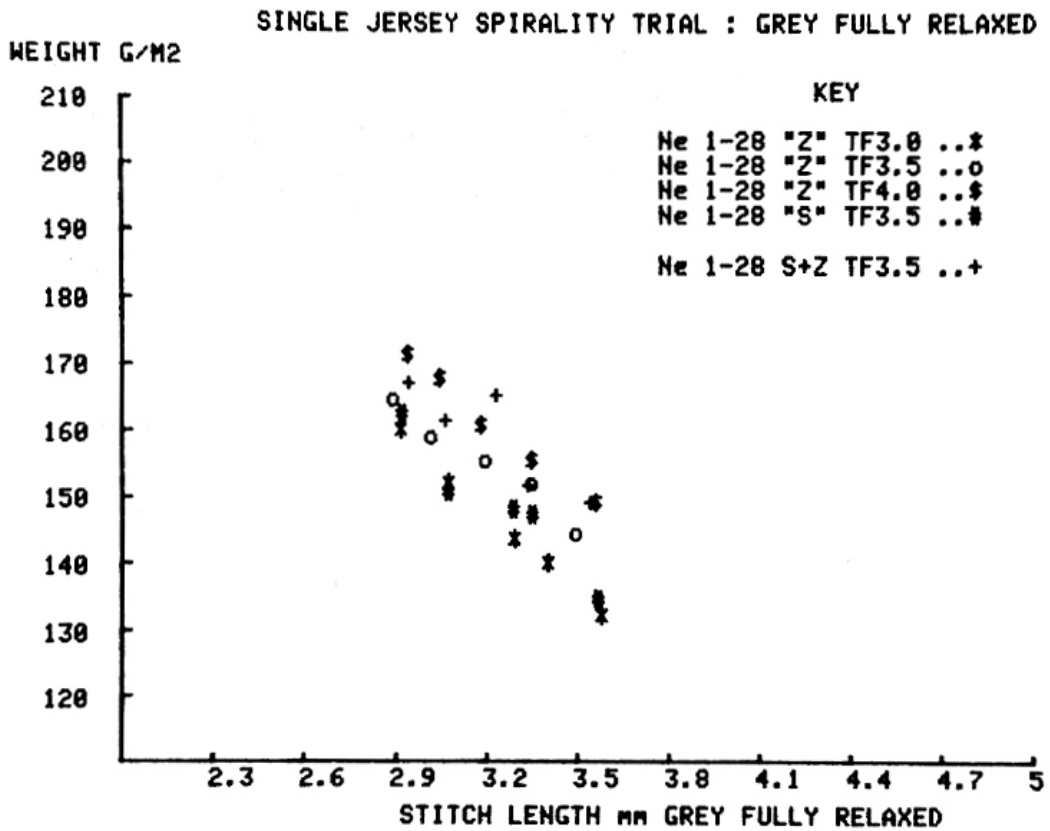


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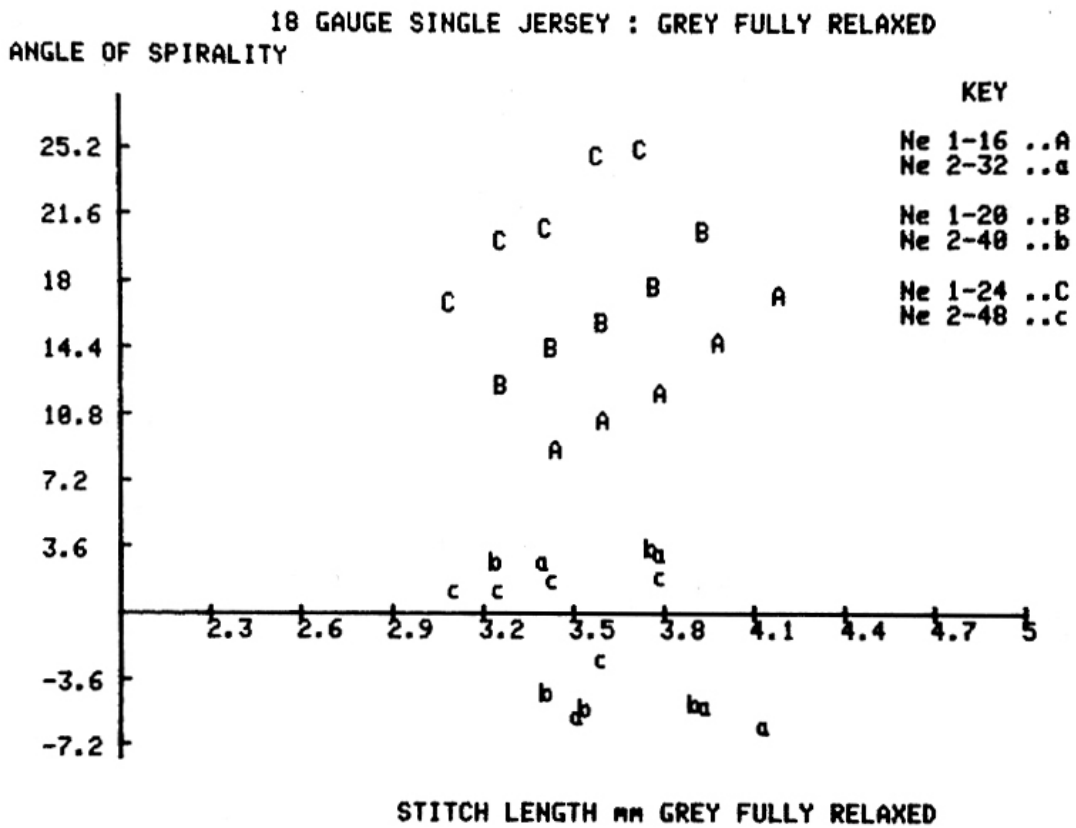


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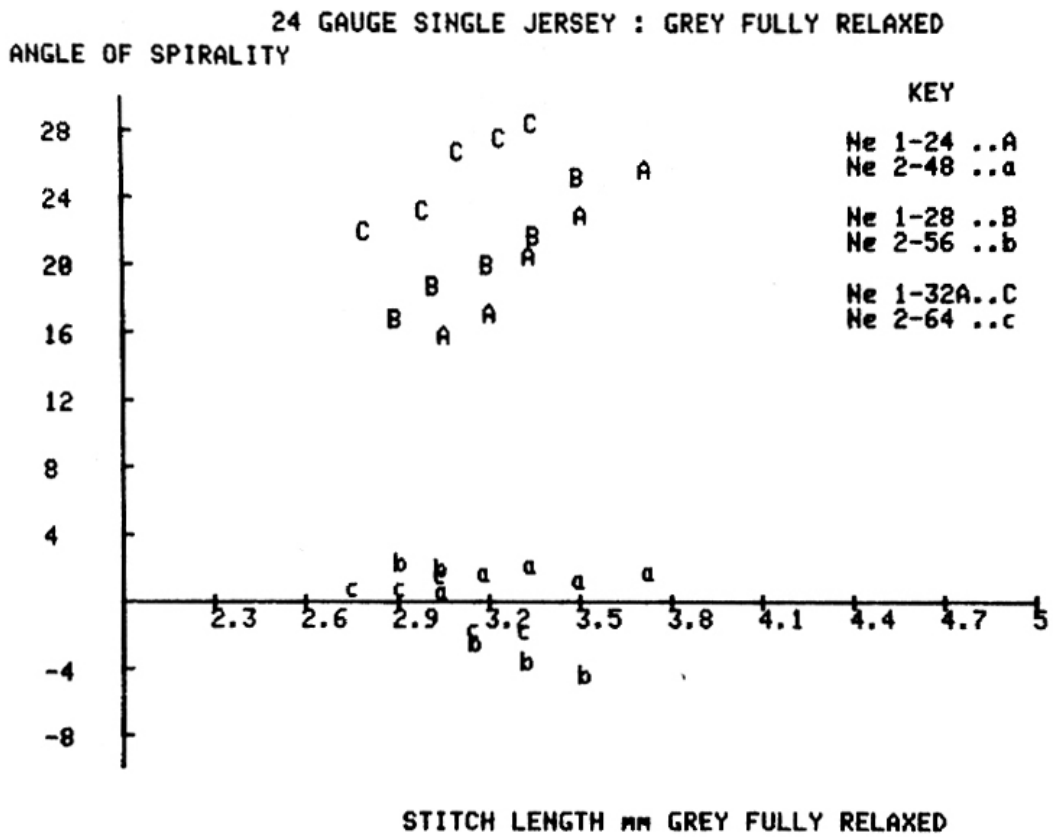


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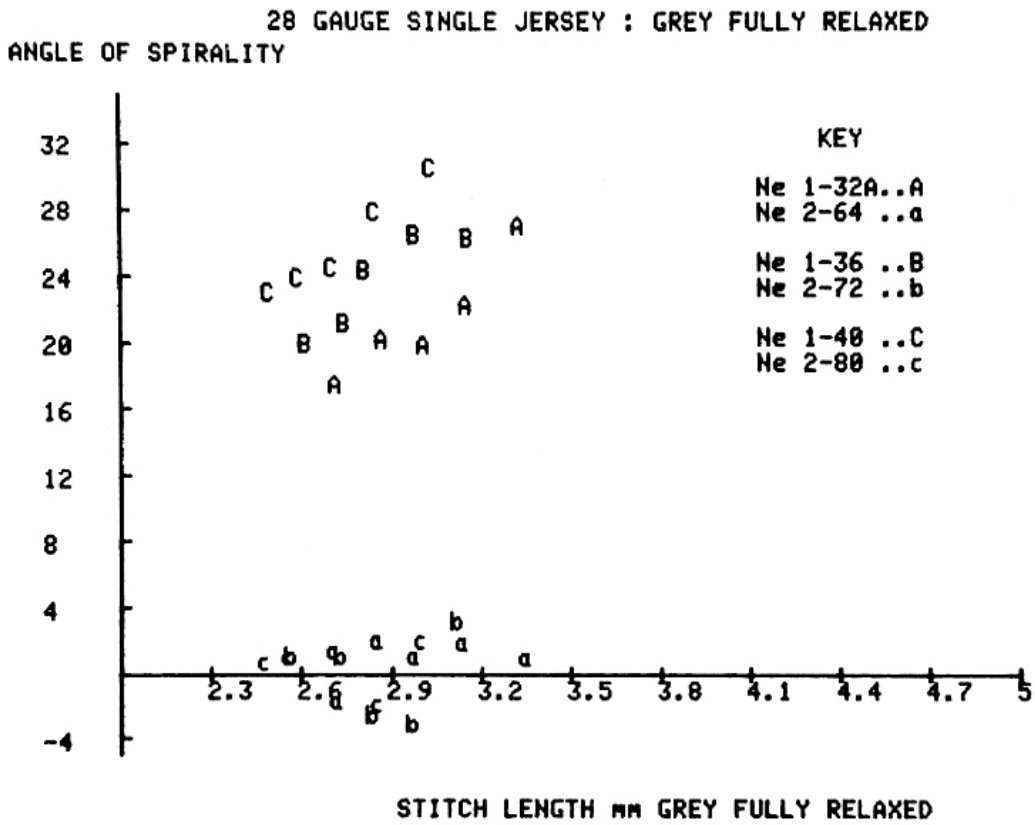


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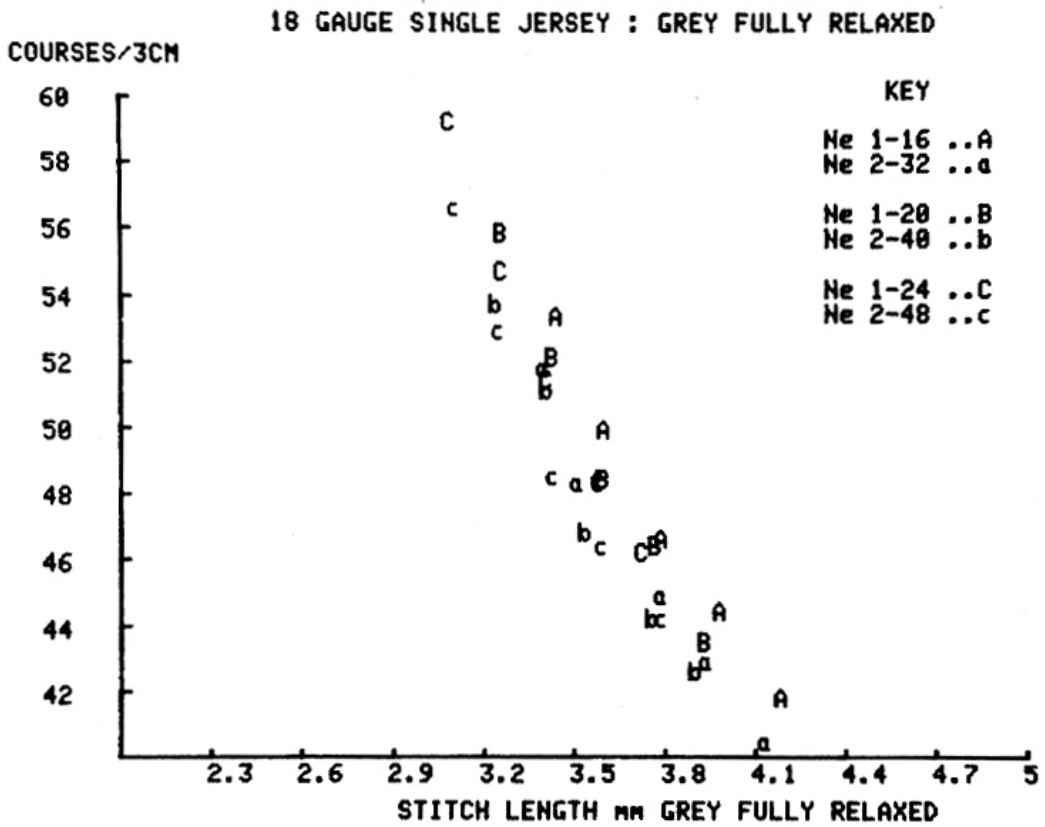


Figure 27

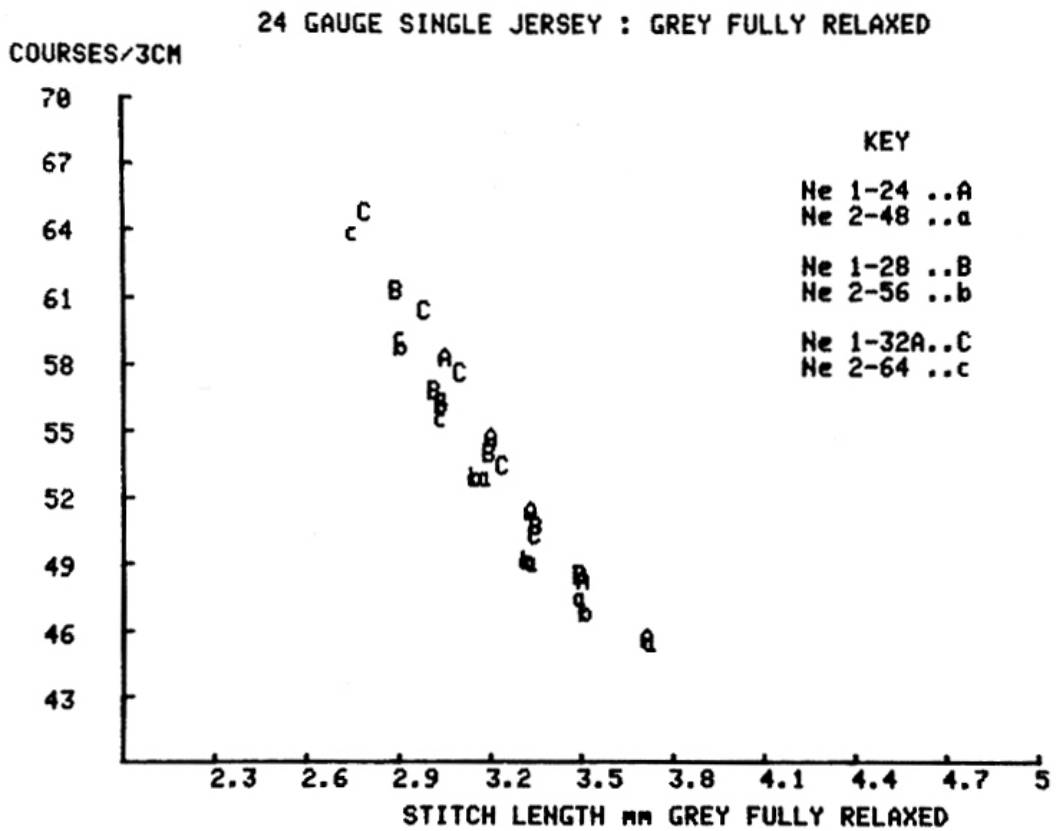


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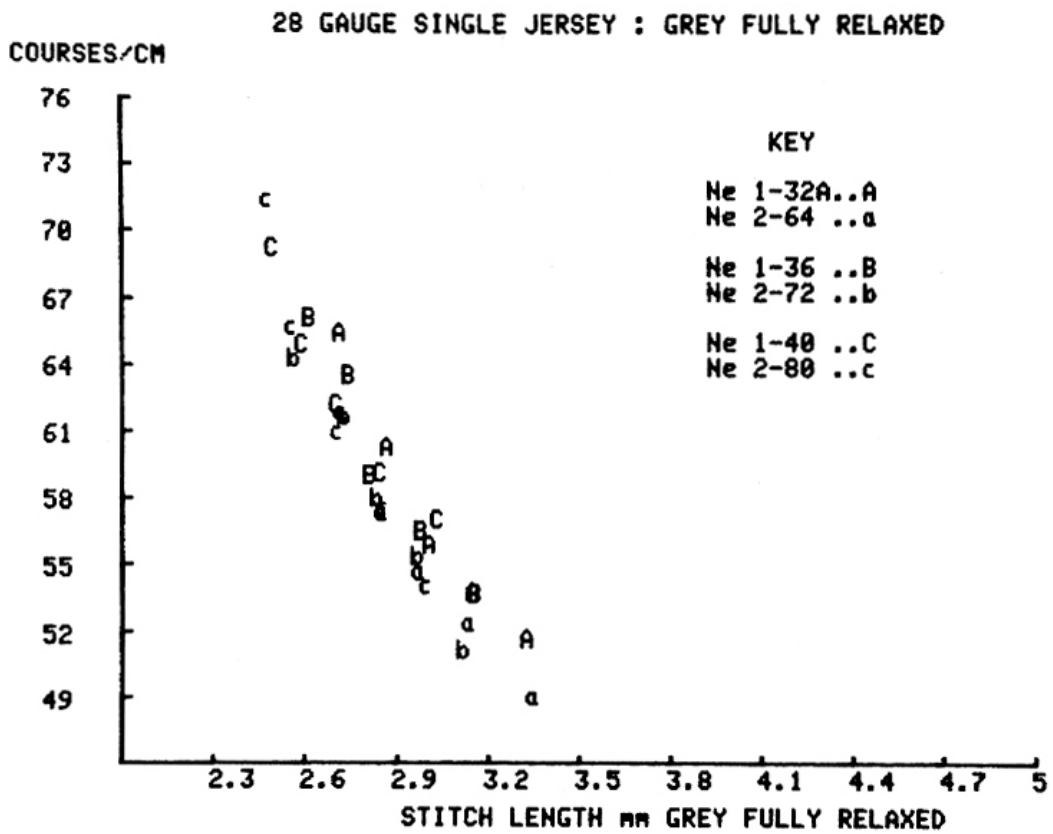


Figure 29

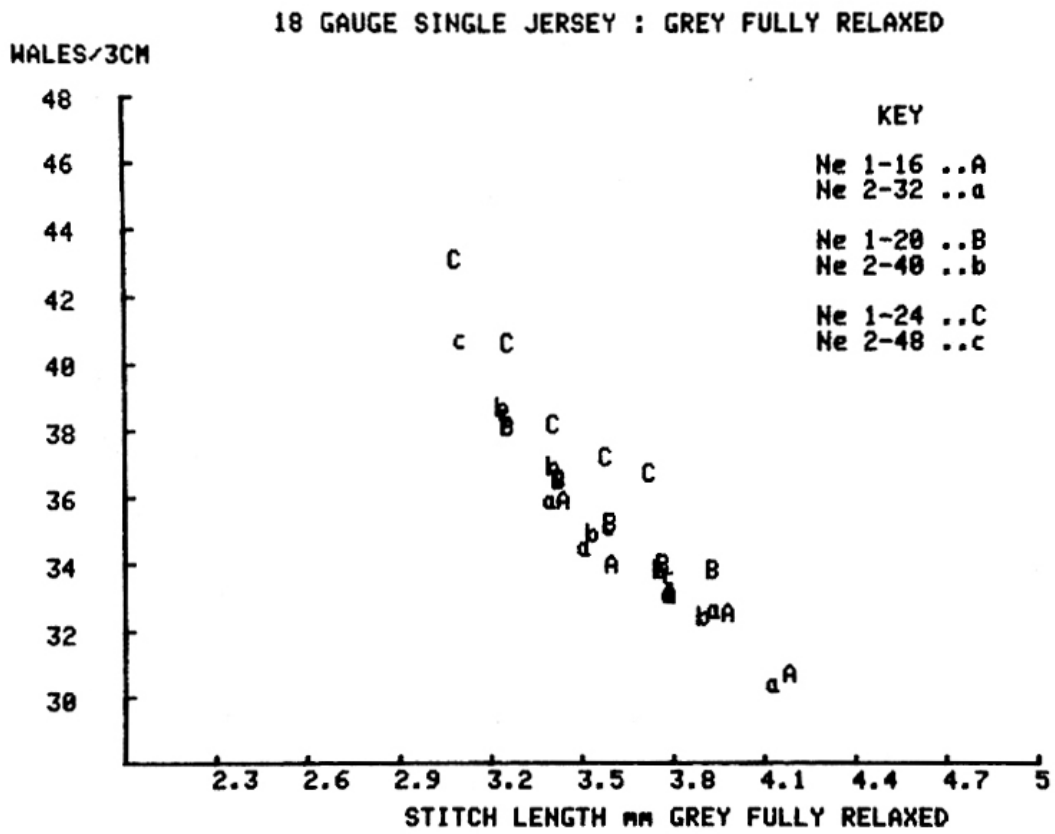


Figure 30

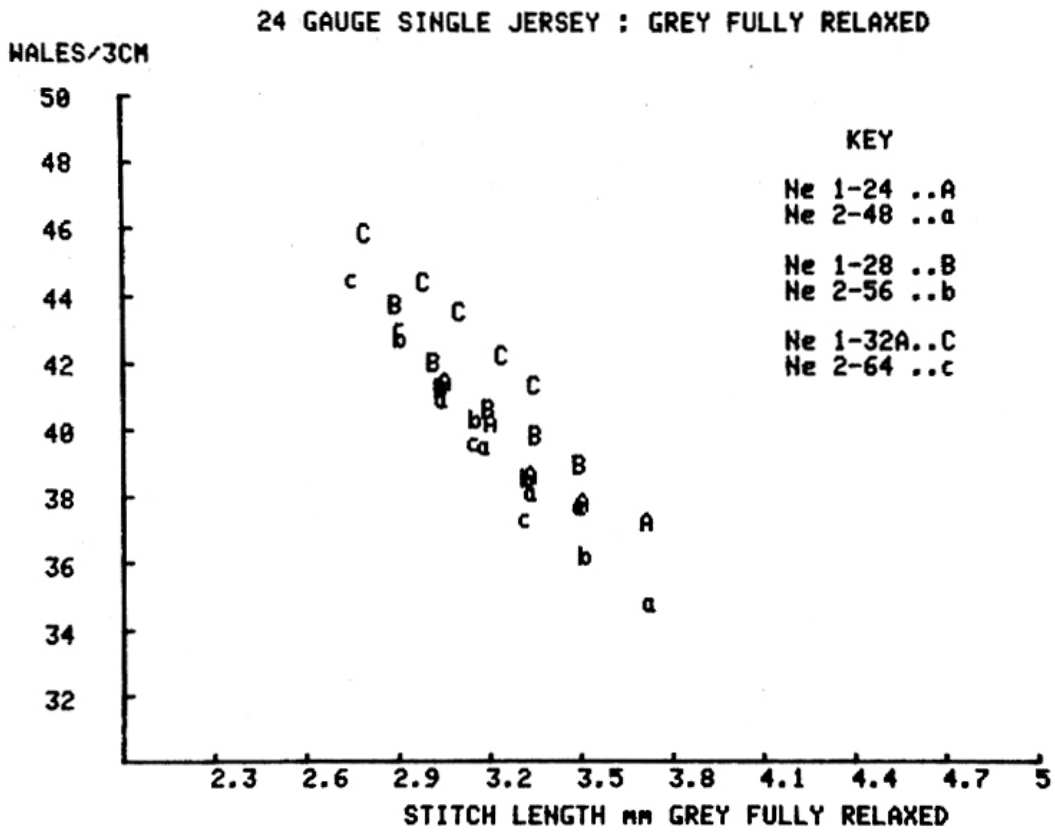


Figure 31

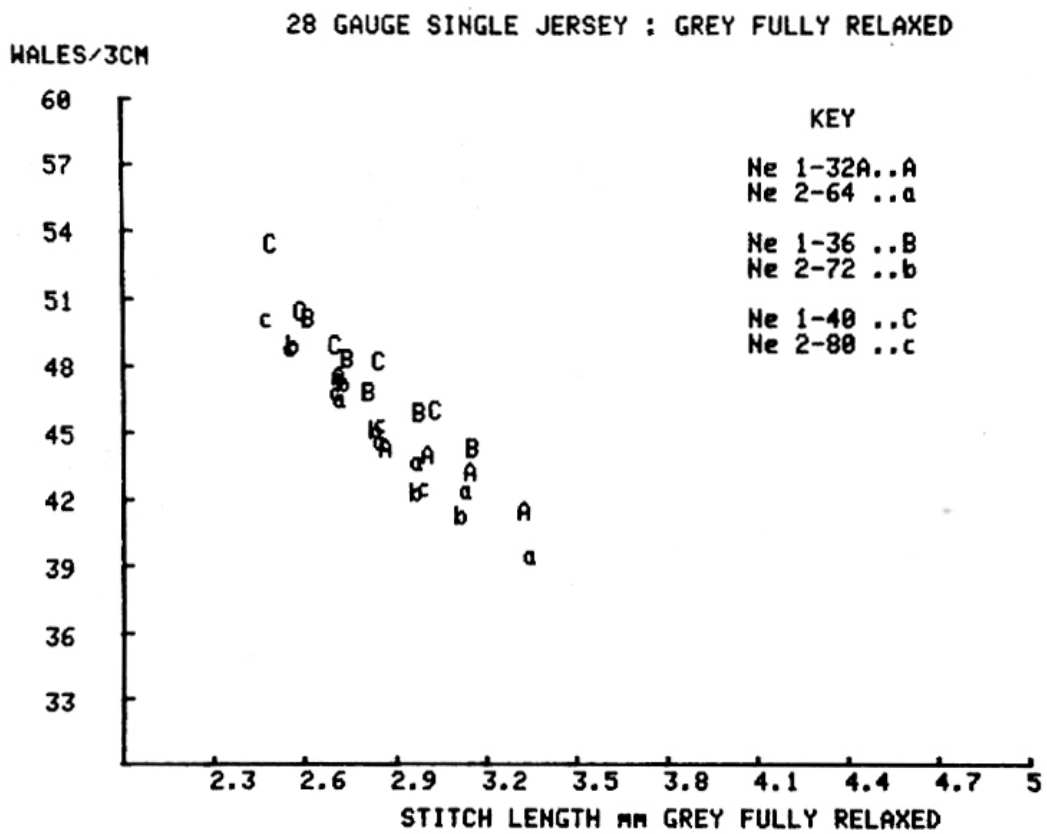


Figure 32

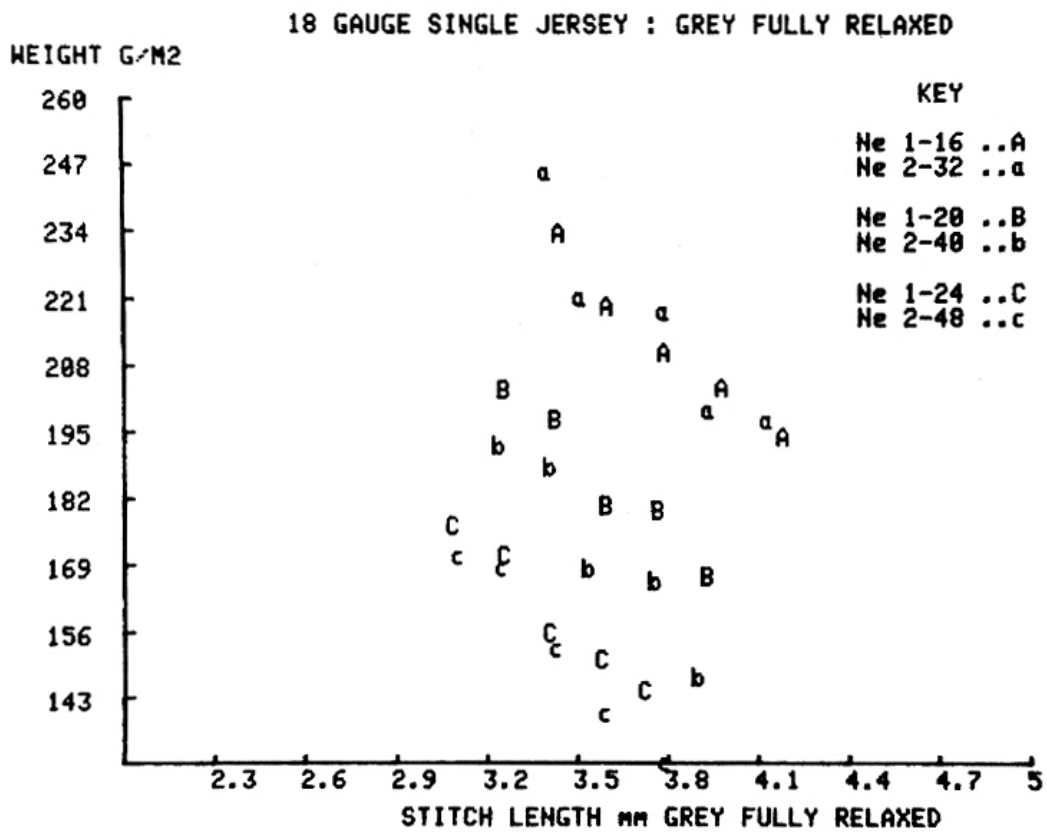


Figure 33

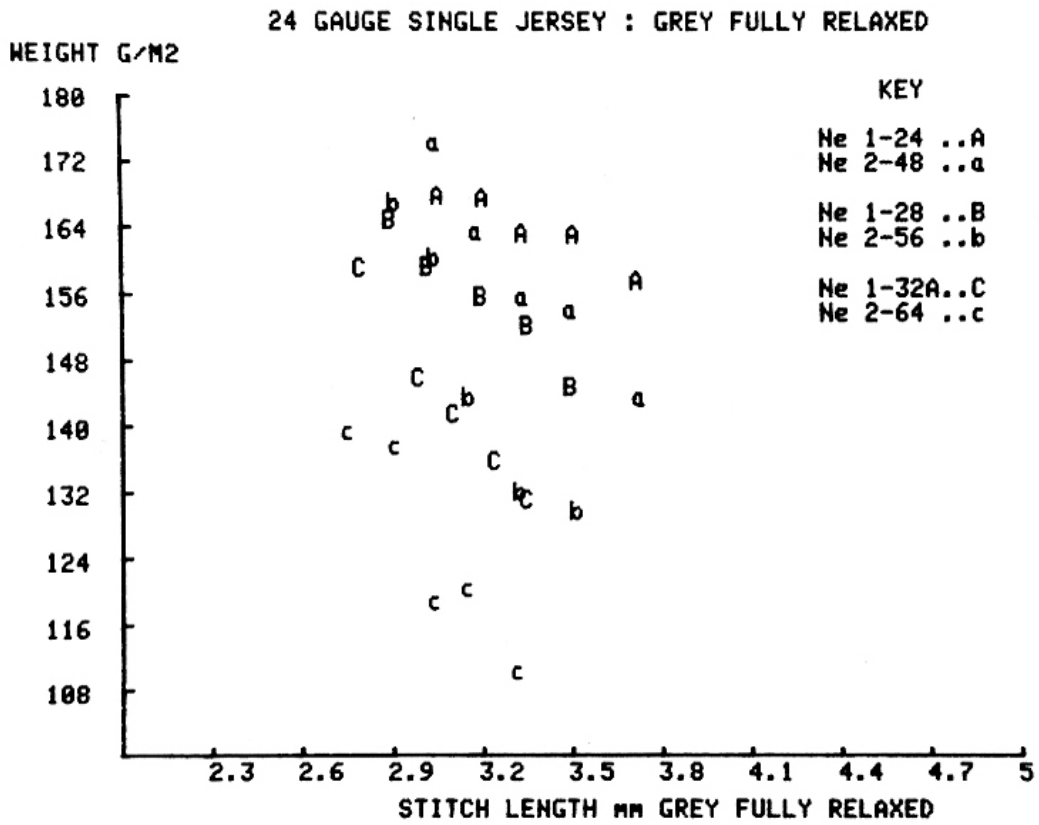


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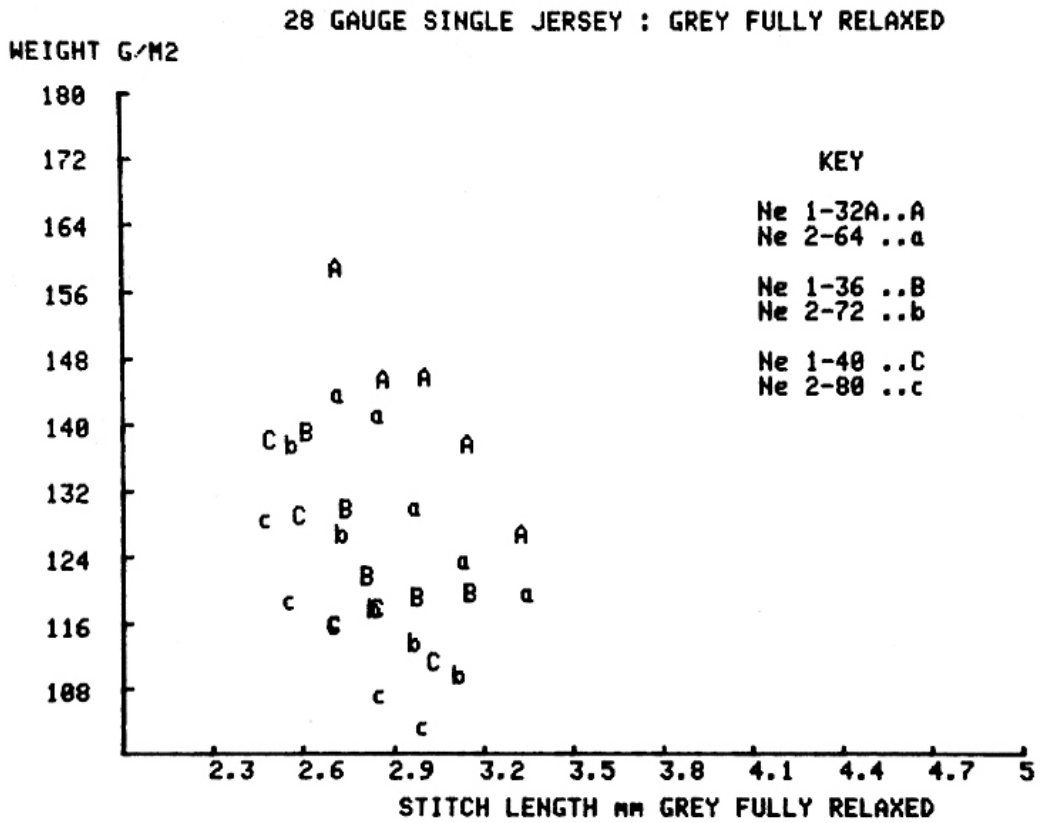


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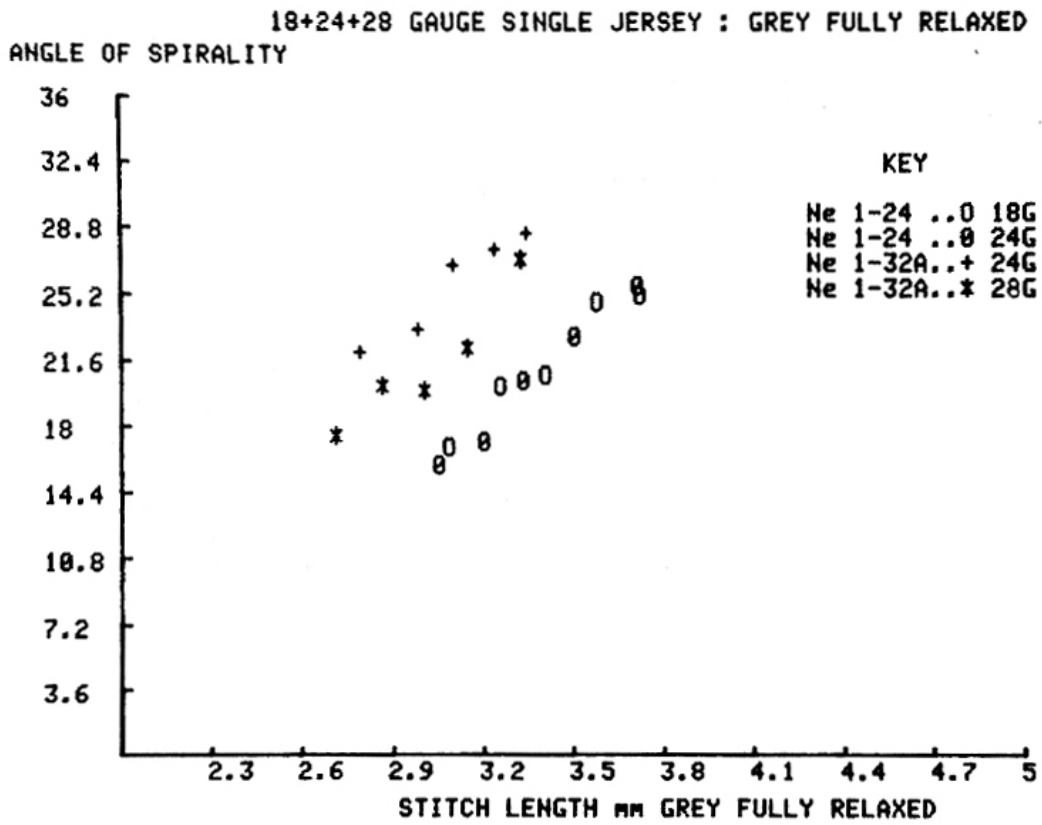


Figure 36

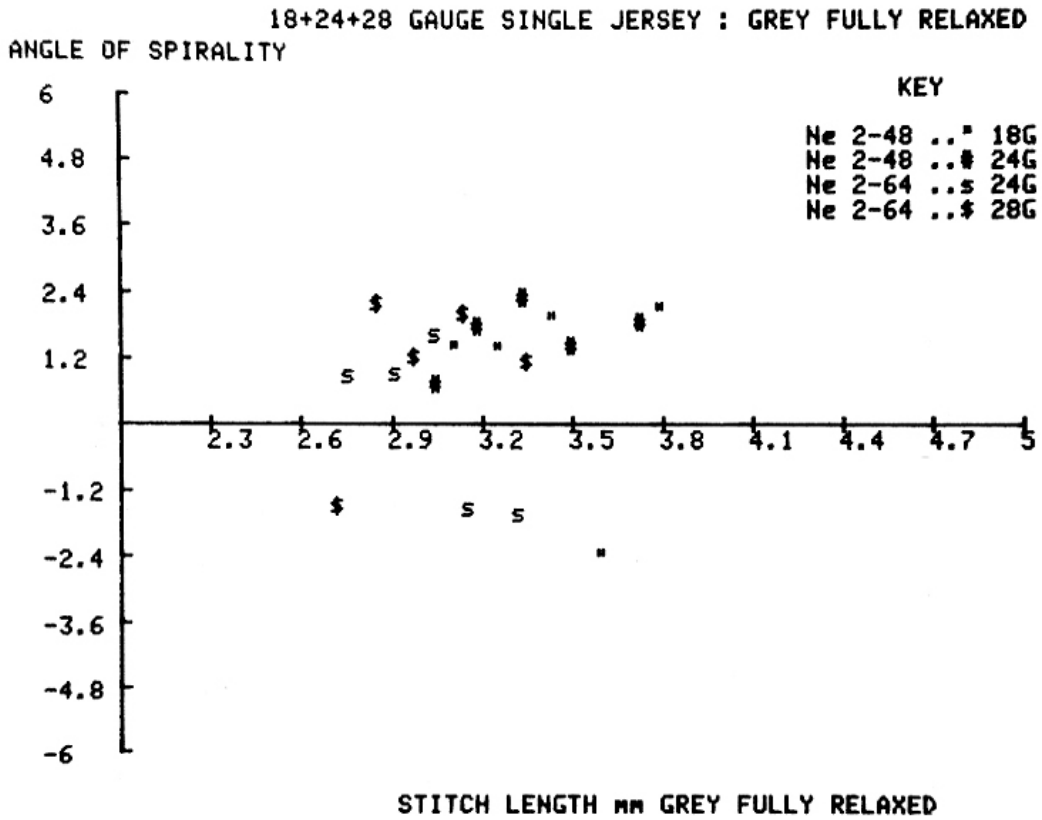


Figure 37

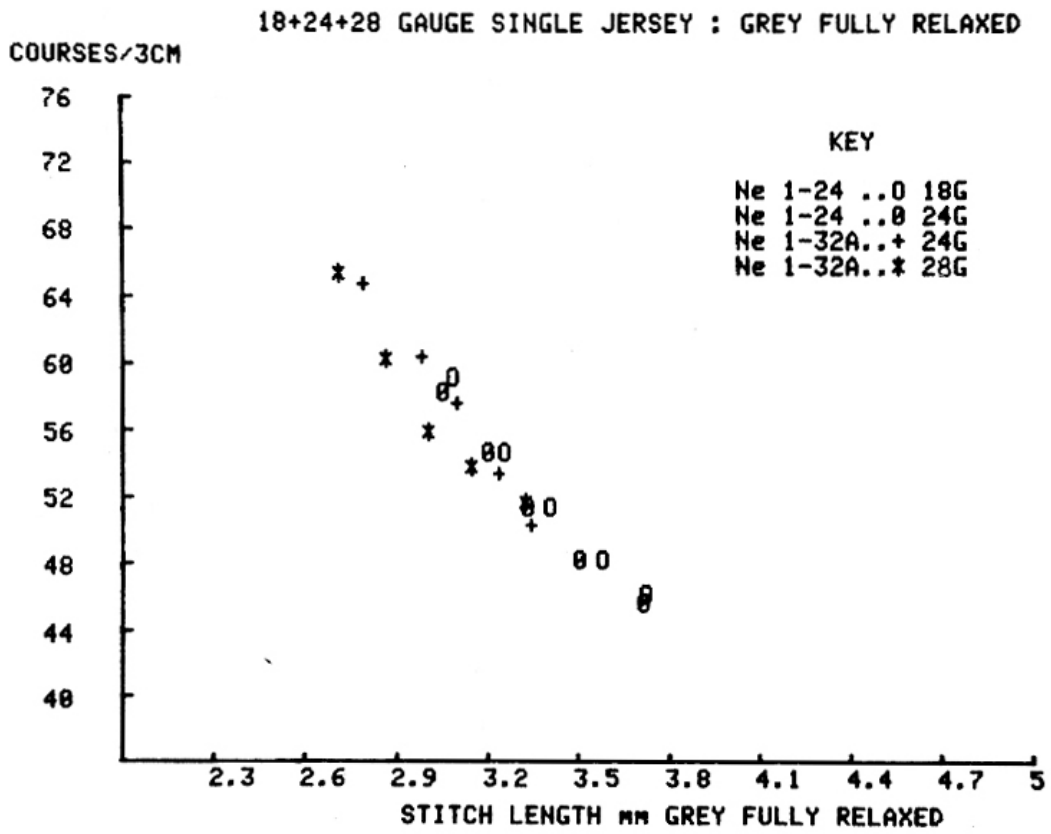


Figure 38

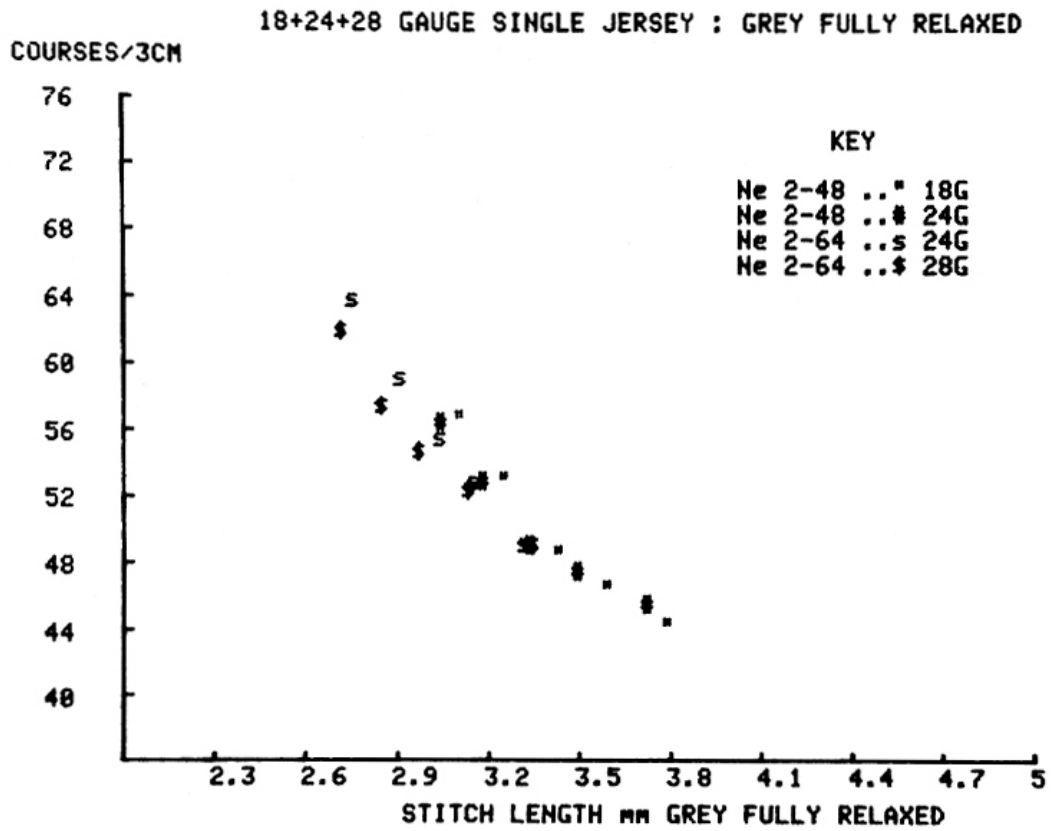


Figure 39

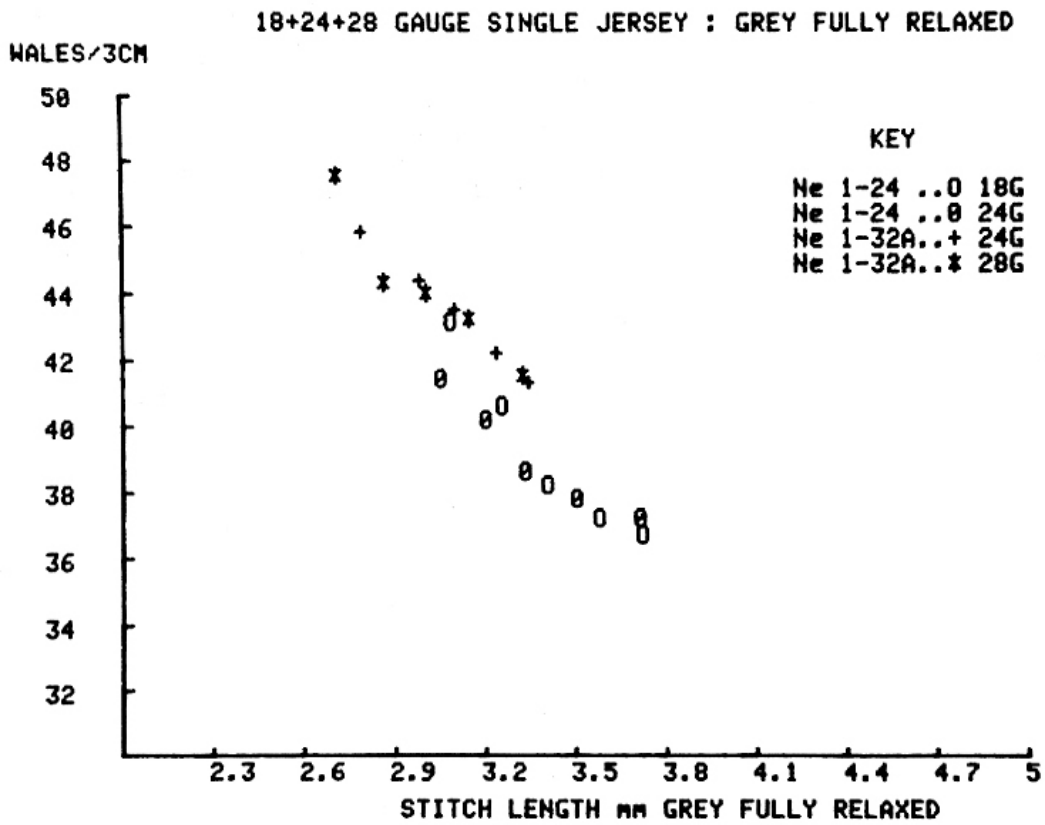


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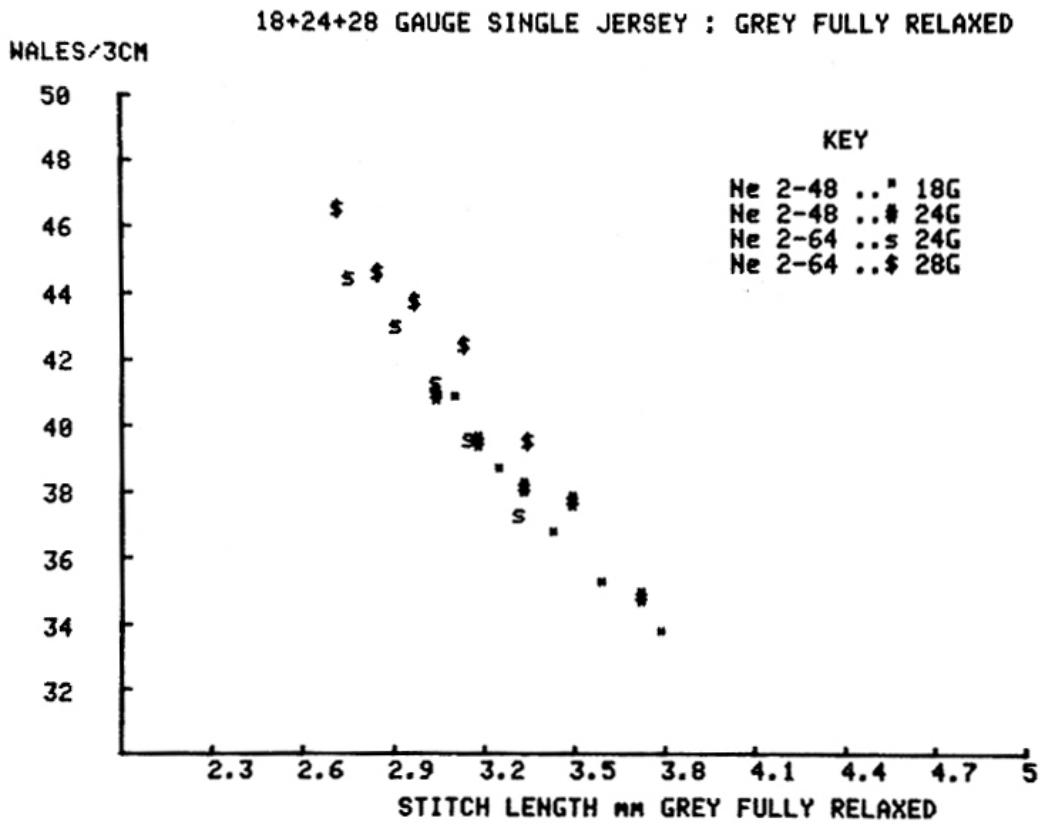


Figure 41

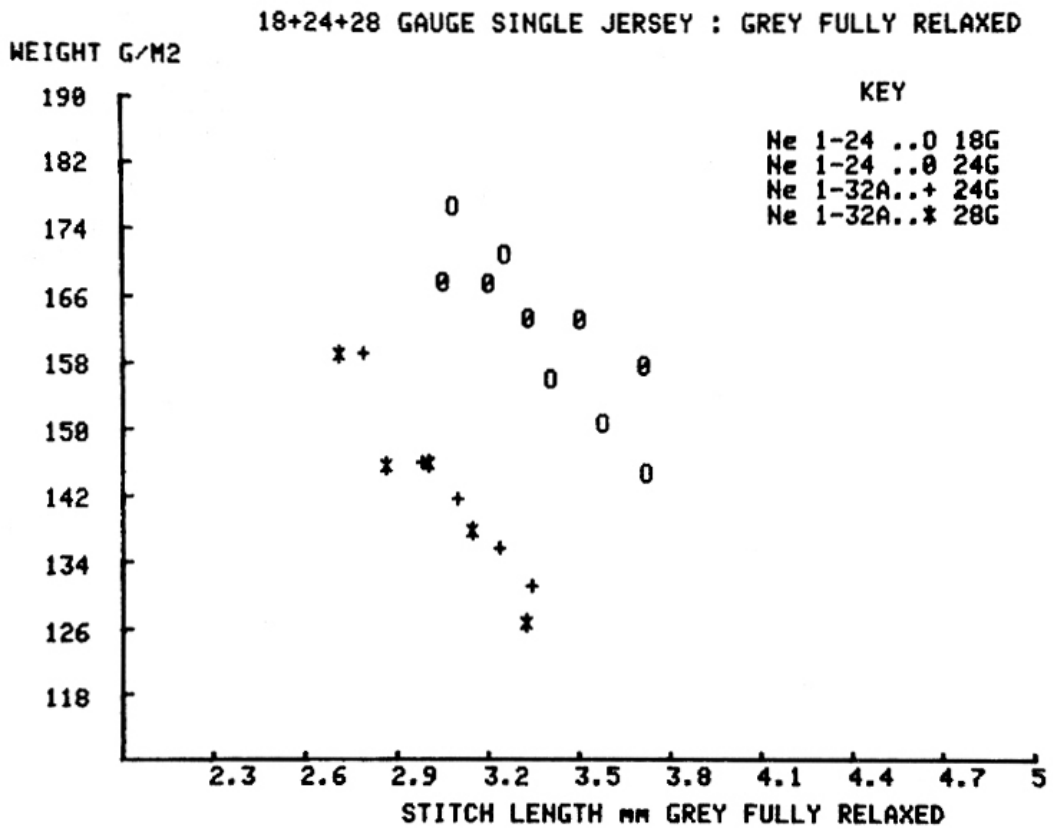
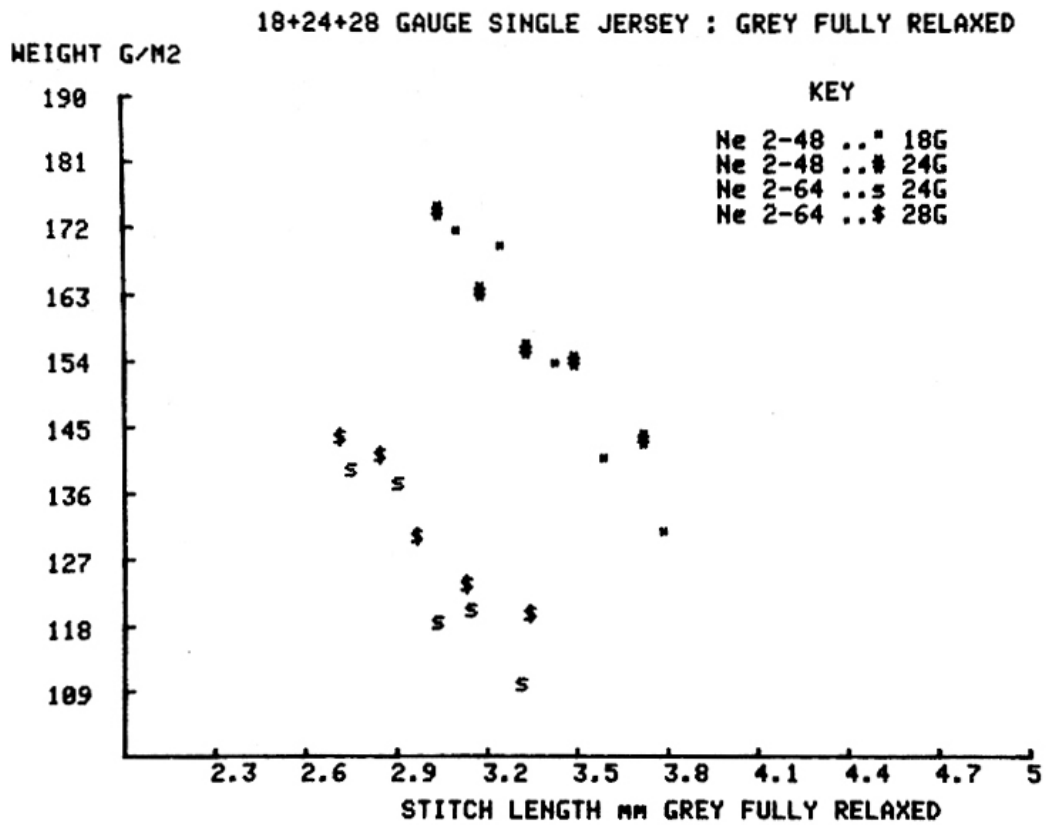


Figure 42



Appendix - Data Tables

Table 1

18 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY BEFORE WASH

SAMPLE	StL.BW G	Spr.BW G	C/3cmB G	W/3cmB G	Wt.BW G	Mid.BW G
18/1-16/344/	3.476	5.73	51.9	27.3	178.2	80.82
18/1-16/362/	3.612	5.99	46.4	27.1	165.5	82
18/1-16/380/	3.837	7.48	41.5	27.2	165	80.93
18/1-16/399/	4.104	9.06	38.6	27.3	149.8	82.8
18/1-16/419/	4.209	11.32	35.2	27.4	145.8	83.2
18/1-20/327/	3.289	7.8	55.1	27.5	142.6	81.63
18/1-20/344/	3.497	10.45	49.4	27.6	147.4	81.9
18/1-20/362/	3.664	9.63	45.5	28.1	137	81.36
18/1-20/380/	3.785	12.18	40.8	27.8	125	83.1
18/1-20/399/	4.052	16.25	38	27.7	123	82.8
18/1-24/311/	3.127	9.49	57.5	28.3	121.4	77.27
18/1-24/327/	3.257	11.77	53	28.9	113.6	78.63
18/1-24/344/	3.55	13.67	47	27.7	112.4	82.53
18/1-24/362/	3.62	13.92	43.1	28.9	106	81.45
18/1-24/380/	3.822	11.04	39	27.5	92.4	82.3

Table 2

18 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY FULLY RELAXED

SAMPLE	StL.AW G	Spr.AW G	C/3cmA G	W/3cmA G	Wt.AW G	%Shr.L G	%Shr.W G
18/1-16/344/	3.439	8.98	53.4	36	234	3.97	21.89
18/1-16/362/	3.596	10.55	50	34.1	220	7.2	19.87
18/1-16/380/	3.786	12.05	46.7	33.2	211	10.91	17.23
18/1-16/399/	3.98	14.83	44.5	32.6	204.2	14.22	14.27
18/1-16/419/	4.183	17.36	41.9	30.8	194.5	16.18	12.08
18/1-20/327/	3.258	12.49	55.9	38.2	203.8	1.04	26.79
18/1-20/344/	3.425	14.52	52.2	36.6	198	4.8	22.97
18/1-20/362/	3.593	15.86	48.5	35.3	181	10.28	21.86
18/1-20/380/	3.766	17.83	46.5	34.1	180.2	11.71	18.74
18/1-20/399/	3.931	20.77	43.6	33.9	167.4	14.6	16.36
18/1-24/311/	3.085	16.95	59.3	43.2	177	0.38	29.54
18/1-24/327/	3.258	20.3	54.8	40.7	171.2	4.05	28.32
18/1-24/344/	3.408	20.92	51.5	38.3	156.3	8.76	25.57
18/1-24/362/	3.58	24.89	48.4	37.3	151	12.64	24.58
18/1-24/380/	3.721	25.25	46.3	36.8	145	16.36	20.25

Table 3

18 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY BEFORE WASH

SAMPLE	Bst.BW G	DistBW G	ThknsB G	Y.NeBW G	Y.StrBW G	%extBW G
18/1-16/344/	n.a.	n.a.	761	n.a.	504.6	9.2
18/1-16/362/	n.a.	n.a.	804	n.a.	527.6	9.62
18/1-16/380/	n.a.	n.a.	817	n.a.	517.1	11.26
18/1-16/399/	n.a.	n.a.	749	n.a.	497.5	7.83
18/1-16/419/	n.a.	n.a.	751	n.a.	494.2	8.05
18/1-20/327/	n.a.	n.a.	707	n.a.	392.7	8.62
18/1-20/344/	n.a.	n.a.	739	n.a.	411.4	9.37
18/1-20/362/	n.a.	n.a.	738	n.a.	390.3	9.39
18/1-20/380/	n.a.	n.a.	792	n.a.	375.4	9.76
18/1-20/399/	n.a.	n.a.	703	n.a.	405.7	7.97
18/1-24/311/	n.a.	n.a.	709	n.a.	312.4	8.58
18/1-24/327/	n.a.	n.a.	690	n.a.	329.45	8.78
18/1-24/344/	n.a.	n.a.	646	n.a.	327.8	8.41
18/1-24/362/	n.a.	n.a.	681	n.a.	331	8.24
18/1-24/380/	n.a.	n.a.	617	n.a.	329.1	7.58

Table 4

18 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY FULLY RELAXED

SAMPLE	Bst.AW G	DistAW G	ThknsA G	Y.NeAW G	Y.StrAW G	%extAW G
18/1-16/344/	851.2	15.11	947	16.71	505.4	9.15
18/1-16/362/	838.7	18.86	1077	16.8	527.6	10.17
18/1-16/380/	804.2	20.4	1110	16.55	502.6	11.63
18/1-16/399/	750.9	20.13	1132	16.52	491.2	10.01
18/1-16/419/	738.4	19.35	1106	16.68	489.7	10.5
18/1-20/327/	752	16.1	997	20.6	393.5	9.64
18/1-20/344/	665.4	15.5	944	20.2	363.9	8.52
18/1-20/362/	664.3	15.62	1074	20.1	368.9	16.93
18/1-20/380/	649.7	19.1	1129	20.42	386.8	11.3
18/1-20/399/	608.8	19.86	1125	20.18	384.6	10.48
18/1-24/311/	624.5	15.81	935	25.32	311.35	11.38
18/1-24/327/	604.7	16.3	929	25.55	297.65	11
18/1-24/344/	571.1	15.81	887	25.4	306.8	8.58
18/1-24/362/	547	15.7	1019	26.09	295.1	10.81
18/1-24/380/	513.9	19.8	1048	25.59	292.5	9.65

Table 5

18 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY BEFORE WASH

SAMPLE	StL.BW G	Spr.BW G	C/3cmB G	W/3cmB G	Wt.BW G	Wid.BW G
18/2-32/344/	3.442	0.82	51.6	27.4	187.9	81.43
18/2-32/362/	3.594	1.36	46.7	27.2	171	82.4
18/2-32/380/	3.801	1.97	41.6	27.1	163	82.13
18/2-32/399/	3.975	-2.42	38.7	26.8	149.6	82.8
18/2-32/419/	4.175	1.35	34.4	27.1	148.6	83.3
18/2-40/327/	3.213	2	53.5	28.1	139.2	79.53
18/2-40/344/	3.432	1.54	48.2	28.2	130	79.77
18/2-40/362/	3.607	1.9	43.8	27	123	82.7
18/2-40/380/	3.771	2.41	39.6	27.2	109.5	81.4
18/2-40/399/	3.996	1.33	36.6	26.8	106.4	83.7
18/2-48/311/	3.079	2.67	58.6	28.4	119.1	79.77
18/2-48/327/	3.306	1.61	50.4	28.3	115.3	78.33
18/2-48/344/	3.444	2.57	44.6	28.3	105.5	78.83
18/2-48/362/	3.611	2.15	42.9	28.4	101.6	81.27
18/2-48/380/	3.768	2.59	38.4	28.1	89.2	82.3

Table 6

18 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY FULLY RELAXED

SAMPLE	StL.AW G	Spr.AW G	C/3cmA G	W/3cmA G	Wt.AW G	%Shr.L G	%Shr.W G
18/2-32/344/	3.397	2.88	51.9	36	246	1.29	23.63
18/2-32/362/	3.508	-5.56	48.4	34.6	222	4.77	22.05
18/2-32/380/	3.785	3.34	45	33.2	219	7.7	18.21
18/2-32/399/	3.934	-4.97	43	32.7	199.8	10.75	16
18/2-32/419/	4.126	-6.07	40.5	30.5	197.9	13.55	13.2
18/2-40/327/	3.237	2.92	53.8	38.8	192.8	0.36	26.58
18/2-40/344/	3.408	-4.23	51.2	37	188.6	5.18	23.07
18/2-40/362/	3.535	-5.14	46.9	35	169	7.91	22.82
18/2-40/380/	3.754	3.61	44.3	33.9	166.5	11.19	19.25
18/2-40/399/	3.898	-4.83	42.7	32.5	147.6	14.81	17.52
18/2-48/311/	3.103	1.36	56.7	40.8	171.2	3.1	30.12
18/2-48/327/	3.249	1.33	53	38.6	169.2	5.16	25.78
18/2-48/344/	3.428	1.88	48.6	36.7	153.3	9.66	23.76
18/2-48/362/	3.59	-2.4	46.5	35.2	140.4	10.63	23.01
18/2-48/380/	3.786	2.06	44.3	33.7	130.4	16.75	20.35

Table 7

18 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY BEFORE WASH

SAMPLE	Bst.BW G	DistBW G	ThknsB G	Y.NeBW G	Y.StrBW G	%extBW G
18/2-32/344/	n.a.	n.a.	788	n.a.	891.5	8.1
18/2-32/362/	n.a.	n.a.	778	n.a.	982	8.9
18/2-32/380/	n.a.	n.a.	790	n.a.	934.5	7.42
18/2-32/399/	n.a.	n.a.	744	n.a.	924.6	7.02
18/2-32/419/	n.a.	n.a.	754	n.a.	978.6	7.12
18/2-40/327/	n.a.	n.a.	693	n.a.	689.4	8.26
18/2-40/344/	n.a.	n.a.	722	n.a.	690	7.94
18/2-40/362/	n.a.	n.a.	698	n.a.	671.2	7.66
18/2-40/380/	n.a.	n.a.	698	n.a.	733.9	8.42
18/2-40/399/	n.a.	n.a.	661	n.a.	673.5	6.58
18/2-48/311/	n.a.	n.a.	694	n.a.	541.5	7.82
18/2-48/327/	n.a.	n.a.	671	n.a.	547	8.8
18/2-48/344/	n.a.	n.a.	632	n.a.	577.4	7.56
18/2-48/362/	n.a.	n.a.	623	n.a.	570.3	6.19
18/2-48/380/	n.a.	n.a.	594	n.a.	565.8	6.21

Table 8

18 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY FULLY RELAXED

SAMPLE	Bst.AW G	DistAW G	ThknsA G	Y.NeAW G	Y.StrAW G	%extAW G
18/2-32/344/	1192.5	15.17	932	16.29	897.76	11.03
18/2-32/362/	1141.2	17.77	1026	16	941.12	9.19
18/2-32/380/	1115	18.12	1055	15.99	866.2	8.09
18/2-32/399/	1045.3	19.24	1053	15.75	850.9	9.27
18/2-32/419/	983	18.35	1033	15.89	880.7	9.4
18/2-40/327/	987.5	15.62	892	20.61	645.9	9.08
18/2-40/344/	925.1	15.14	888	20.58	666.92	10.89
18/2-40/362/	905	18.22	971	20.5	681.3	9.84
18/2-40/380/	870.7	18.4	963	20.67	666.3	7.62
18/2-40/399/	815.9	19.5	1007	20.61	663.1	9.2
18/2-48/311/	830.9	15.21	863	24.79	527.5	8.82
18/2-48/327/	771.1	15.21	826	24.22	521.28	8.75
18/2-48/344/	746.5	15.32	864	24.66	534.96	11.39
18/2-48/362/	731	18.6	965	24.3	545.7	7.48
18/2-48/380/	712	18.6	945	24.05	563	7.77

Table 9

24 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY BEFORE WASH

SAMPLE	StL.BW G	Spr.BW G	C/3cmB G	W/3cmB G	Wt.BW G	Wid.BW G
24/1-24/306/	3.086	9.2	50.7	32.3	116	0
24/1-24/321/	3.209	16.1	49	32.2	119.9	90.1
24/1-24/337/	3.444	13.76	43.8	31.8	112.2	90.7
24/1-24/354/	3.565	13.85	39.2	31.6	123	90.3
24/1-24/372/	3.751	19.3	37.7	32	98.4	92.83
24/1-28/291/	2.936	13.09	61.2	33.2	116.2	89.37
24/1-28/306/	3.071	7.73	49.2	32.3	105.3	87.8
24/1-28/321/	3.216	17.54	47.1	33.1	99	88.43
24/1-28/337/	3.397	15.25	42.9	33.2	94.6	89.9
24/1-28/354/	3.573	11.53	37.6	32	100	89.5
24/1-32/276A	2.82	11.15	61.2	31.6	103.4	90.73
24/1-32/291A	2.958	16.13	55	33	95.2	88.4
24/1-32/306A	3.09	20.37	50.1	33.7	96.2	89.4
24/1-32/321A	3.228	20.05	45.3	33.3	88.2	91.03
24/1-32/337A	3.389	17.28	42.6	32.5	92	91
24/1-32/276/	2.774	14.75	63.5	33.4	106.7	86.8
24/1-32/291/	2.991	11.15	57.9	33	100.2	88
24/1-32/306/	3.066	15.24	48.8	33.4	89.5	85.57

Table 10

24 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY FULLY RELAXED

SAMPLE	StL.AW G	Spr.AW G	C/3cmA G	W/3cmA G	Wt.AW G	%Shr.L G	%Shr.W G
24/1-24/306/	3.051	15.96	58.4	41.5	168	11.57	21.16
24/1-24/321/	3.202	17.29	54.8	40.3	167.8	11.56	20.37
24/1-24/337/	3.335	20.63	51.5	38.7	163.5	15.83	18.8
24/1-24/354/	3.506	23.01	48.4	37.9	163.4	17.5	15.2
24/1-24/372/	3.713	25.77	45.8	37.3	158	18.71	12.99
24/1-28/291/	2.89	16.95	61.4	43.8	165.2	2.69	25.62
24/1-28/306/	3.015	18.88	56.9	42.1	159.6	14.99	21.15
24/1-28/321/	3.196	20.12	54.1	40.7	156	13.94	19.37
24/1-28/337/	3.35	21.8	50.8	39.9	152.5	18.21	18.26
24/1-28/354/	3.496	25.32	48.6	39	145	23.13	14.8
24/1-32/276A	2.792	22.09	64.9	45.9	159.4	6.75	30.74
24/1-32/291A	2.983	23.37	60.5	44.5	146.2	9.23	25.95
24/1-32/306A	3.099	26.87	57.7	43.6	141.8	10.58	23.06
24/1-32/321A	3.239	27.69	53.5	42.3	136	14.79	21.69
24/1-32/337A	3.346	28.61	50.4	41.4	131.4	18.9	19.4
24/1-32/276/	2.758	18.33	66.1	46.1	150.8	2.76	27.02
24/1-32/291/	2.923	19.75	60.2	45.3	146.8	6.02	26.7
24/1-32/306/	3.046	20.77	57	43.1	143	14.59	21.64

Table 11

24 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY BEFORE WASH

SAMPLE	Bst.BW G	DistBW G	ThknsB G	Y.NeBW G	Y.StrBW G	%extBW G
24/1-24/306/	n.a.	n.a.	618	n.a.	333.9	8.43
24/1-24/321/	n.a.	n.a.	680	n.a.	314.4	9.65
24/1-24/337/	n.a.	n.a.	619	n.a.	313.2	7.03
24/1-24/354/	n.a.	n.a.	669	n.a.	312.7	7.4
24/1-24/372/	n.a.	n.a.	628	n.a.	306	8.58
24/1-28/291/	n.a.	n.a.	618	n.a.	270.5	9.14
24/1-28/306/	n.a.	n.a.	593	n.a.	266.2	7.59
24/1-28/321/	n.a.	n.a.	668	n.a.	271.8	8.07
24/1-28/337/	n.a.	n.a.	650	n.a.	265.8	7.76
24/1-28/354/	n.a.	n.a.	628	n.a.	252.6	6.7
24/1-32/276A	n.a.	n.a.	589	n.a.	227.7	7.4
24/1-32/291A	n.a.	n.a.	591	n.a.	242.9	8.21
24/1-32/306A	n.a.	n.a.	590	n.a.	253.4	8.45
24/1-32/321A	n.a.	n.a.	586	n.a.	244.9	7.77
24/1-32/337A	n.a.	n.a.	612	n.a.	226.3	6.2
24/1-32/276/	n.a.	n.a.	628	n.a.	229.2	7.68
24/1-32/291/	n.a.	n.a.	630	n.a.	235.9	7.8
24/1-32/306/	n.a.	n.a.	627	n.a.	258.8	7.03

Table 12

24 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY FULLY RELAXED

SAMPLE	Bst.AW G	DistAW G	ThknsA G	Y.NeAW G	Y.StrAW G	%extAW G
24/1-24/306/	699.8	18.58	934	25.77	306.69	11.99
24/1-24/321/	654.3	18.5	969	25.47	296.3	10.2
24/1-24/337/	590	18.44	964	25.53	301.7	8.67
24/1-24/354/	572.2	19.6	872	25.7	295.1	7
24/1-24/372/	536.5	18.98	979	25.03	301.8	9.03
24/1-28/291/	607.6	15.75	867	29.6	275.95	9.48
24/1-28/306/	575.8	18.48	952	29.2	256.87	8.94
24/1-28/321/	534.8	18.84	965	28.91	236.3	7.14
24/1-28/337/	494	19.31	957	29.11	252.08	9.99
24/1-28/354/	471.1	19.5	849	28.89	249.2	7.8
24/1-32/276A	530.1	18.44	897	33.58	234.7	8.89
24/1-32/291A	515.1	18.32	883	33.11	237.6	8.63
24/1-32/306A	504.9	18.49	903	33.22	238.8	8.99
24/1-32/321A	486.5	18.5	884	33.42	230.9	9.01
24/1-32/337A	436.9	19.5	840	33.38	216.4	7.15
24/1-32/276/	520	15.36	836	32.53	228.65	10.74
24/1-32/291/	511.8	15.79	850	32.92	224.7	9.82
24/1-32/306/	473.2	18.4	918	33.66	206.3	6.77

Table 13

24 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY BEFORE WASH

SAMPLE	StL.BW G	Spr.BW G	C/3cmB G	W/3cmB G	Wt.BW G	Wid.BW G
24/2-48/306/	3.066	3.34	51.4	32.1	122	0
24/2-48/321/	3.189	4.57	47.6	32	117	89.1
24/2-48/337/	3.325	3.23	42.6	30.9	107.2	89.43
24/2-48/354/	3.576	4.21	39.8	31.4	111	91.3
24/2-48/372/	3.728	3.98	37.5	31.1	106	94.03
24/2-56/291/	2.91	2.34	56.8	32.4	115.3	87.23
24/2-56/306/	3.105	2.63	49.9	31.6	102.2	88.3
24/2-56/321/	3.225	2.66	45.5	31.4	92.2	90.3
24/2-56/337/	3.373	1.19	41.1	32.2	92.2	88.5
24/2-56/354/	3.538	2.12	38.8	31.5	90	91.7
24/2-64/276/	2.745	3.56	61.1	32.5	97.2	87.1
24/2-64/291/	2.938	3.35	55.7	31.9	94	89.57
24/2-64/306/	3.079	2.73	48.6	32.4	86	88.07
24/2-64/321/	3.212	2.37	44.4	31.7	83	89.6
24/2-64/337/	3.395	1.91	41.1	31.7	85.8	91.1

Table 14

24 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY FULLY RELAXED

SAMPLE	StL.AW G	Spr.AW G	C/3cmA G	W/3cmA G	Wt.AW G	%Shr.L G	%Shr.W G
24/2-48/306/	3.042	0.73	56.6	41	174.5	9.9	20.8
24/2-48/321/	3.179	1.79	53	39.6	163.8	10.67	19.99
24/2-48/337/	3.334	2.32	49.2	38.2	156	14.38	18.2
24/2-48/354/	3.495	1.44	47.6	37.8	154.4	15.2	14.61
24/2-48/372/	3.722	1.86	45.6	34.9	143.8	17.32	11.02
24/2-56/291/	2.906	2.47	58.9	42.8	167.2	6.78	24.72
24/2-56/306/	3.038	2.12	56.3	41.3	160.6	11.22	21.73
24/2-56/321/	3.15	-2.31	53	40.4	143.8	14.13	21.78
24/2-56/337/	3.322	-3.46	49.3	38.6	132.4	17.12	16.11
24/2-56/354/	3.512	-4.21	46.9	36.3	130	20.89	13.61
24/2-64/276/	2.753	0.93	64	44.6	139.8	4.96	27.17
24/2-64/291/	2.907	0.97	59.3	43.1	138	7.84	25.86
24/2-64/306/	3.039	1.66	55.7	41.4	119.1	11.54	21.3
24/2-64/321/	3.149	-1.5	53	39.7	120.8	15.36	19.79
24/2-64/337/	3.316	-1.6	49.3	37.4	110.6	17.69	16.54

Table 15

24 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY BEFORE WASH

SAMPLE	Bst.BW G	DistBW G	ThknsB G	Y.NeBW G	Y.StrBW G	%extBW G
24/2-48/306/	n.a.	n.a.	618	n.a.	564.7	6.51
24/2-48/321/	n.a.	n.a.	661	n.a.	575.5	9.2
24/2-48/337/	n.a.	n.a.	606	n.a.	581.3	6.9
24/2-48/354/	n.a.	n.a.	649	n.a.	572.9	7.12
24/2-48/372/	n.a.	n.a.	654	n.a.	598.6	7.54
24/2-56/291/	n.a.	n.a.	621	n.a.	466	7.16
24/2-56/306/	n.a.	n.a.	585	n.a.	488.2	7.4
24/2-56/321/	n.a.	n.a.	574	n.a.	496.52	6.94
24/2-56/337/	n.a.	n.a.	587	n.a.	516.14	6.88
24/2-56/354/	n.a.	n.a.	604	n.a.	473.2	6.65
24/2-64/276/	n.a.	n.a.	583	n.a.	396.35	7.62
24/2-64/291/	n.a.	n.a.	565	n.a.	405.8	8.34
24/2-64/306/	n.a.	n.a.	564	n.a.	410.4	7.35
24/2-64/321/	n.a.	n.a.	551	n.a.	426.2	7.4
24/2-64/337/	n.a.	n.a.	557	n.a.	425.9	7.22

Table 16

24 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY FULLY RELAXED

SAMPLE	Bst.AW G	DistAW G	ThknsA G	Y.NeAW G	Y.StrAW G	%extAW G
24/2-48/306/	896	17.98	860	24.3	551	8.07
24/2-48/321/	860.6	17.6	930	24.75	540.7	10.8
24/2-48/337/	779.8	17.91	885	24.11	510.3	8.33
24/2-48/354/	753.4	18	832	24.19	553.7	6.43
24/2-48/372/	695.2	18.22	797	24.48	542.9	7.28
24/2-56/291/	761.7	15.13	789	27.64	453	8.911
24/2-56/306/	712.2	14.75	774	28	469.3	7.82
24/2-56/321/	702.9	18.77	882	27.85	440.9	9.77
24/2-56/337/	685.1	19.02	888	28.09	446.9	9.5
24/2-56/354/	653.4	18.23	836	26.97	470.2	9.42
24/2-64/276/	685.1	15.13	771	32.35	385.85	9.38
24/2-64/291/	644	14.63	733	31.98	400.6	8.2
24/2-64/306/	609.7	14.77	737	32.6	375.6	6.96
24/2-64/321/	587.7	18.73	855	32.32	379.5	9.44
24/2-64/337/	547.4	18.71	843	31.91	394.8	8.61

Table 17

28 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY BEFORE WASH

SAMPLE	StL.BW G	Spr.BW G	C/3cmB G	W/3cmB G	Wt.BW G	Wid.BW G
28/1-32/273A	2.758	16.67	56.7	39.5	133.3	84.03
28/1-32/287A	2.918	11.9	51	37.1	101.6	84.27
28/1-32/301A	3.045	10.67	46.1	38.1	90.4	84.7
28/1-32/316A	3.192	14.45	43.6	37.7	90.4	86.6
28/1-32/332A	3.35	23.71	41	39	99	88
28/1-36/259/	2.61	12.67	56.4	38.1	91.3	82.03
28/1-36/273/	2.77	11.87	51.6	37.8	88.5	n.a.
28/1-36/287/	2.871	17.96	48.5	37.3	85.5	84.7
28/1-36/301/	3.046	19.96	44.8	38.4	78.4	86.2
28/1-36/316/	3.188	15.39	42.8	37.9	81	86.97
28/1-40/246/	2.488	15.55	63.3	38.6	83.6	83.17
28/1-40/259/	2.61	13.01	56.8	38.6	80	83.35
28/1-40/273/	2.719	13.21	50.9	38.4	81.8	83.4
28/1-40/287/	2.877	17.23	48.2	38	76	85.6
28/1-40/301/	3.049	14.02	44.5	37.3	74	85.87
28/1-32/273/	2.779	10.17	53.4	39.4	102.5	82.13

Table 18

28 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY FULLY RELAXED

SAMPLE	StL.AW G	Spr.AW G	C/3cmA G	W/3cmA G	Wt.AW G	%Shr.L G	%Shr.W G
28/1-32/273A	2.71	17.6	65.5	47.6	159.2	12.58	18.4
28/1-32/287A	2.865	20.31	60.4	44.4	145.8	16.06	17.64
28/1-32/301A	3.006	20.01	56	44.1	146	20.42	16.31
28/1-32/316A	3.149	22.41	53.9	43.3	138	19.78	14
28/1-32/332A	3.327	27.2	51.8	41.6	127	20.36	9.2
28/1-36/259/	2.614	20.08	66.2	50.2	139.4	15.76	22.71
28/1-36/273/	2.742	21.32	63.6	48.4	130	19.71	20.04
28/1-36/287/	2.809	24.53	59.1	46.9	122	20.02	15.81
28/1-36/301/	2.976	26.61	56.6	46	119.4	19.5	15.73
28/1-36/316/	3.153	26.45	53.8	44.4	120	21.96	14.81
28/1-40/246/	2.488	23.12	69.3	53.5	138.4	10.7	26.78
28/1-40/259/	2.586	24.07	65	50.5	129.2	15.15	22.99
28/1-40/273/	2.702	24.65	62.3	49	116	21.89	17.19
28/1-40/287/	2.844	28	59.2	48.3	118	20.95	17.93
28/1-40/301/	3.029	30.69	57.1	46.1	111.7	22.11	15.88
28/1-32/273/	2.735	15.86	64.3	47.1	154	19.39	17.83

Table 19

28 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY BEFORE WASH

SAMPLE	Bst.BW G	DistBW G	ThknsB G	Y.NeBW G	Y.StrBW G	%extBW G
28/1-32/273A	n.a.	n.a.	575	n.a.	258.7	7.92
28/1-32/287A	n.a.	n.a.	554	n.a.	238.2	7.14
28/1-32/301A	n.a.	n.a.	594	n.a.	242.1	8.18
28/1-32/316A	n.a.	n.a.	618	n.a.	240.2	7.98
28/1-32/332A	n.a.	n.a.	597	n.a.	245.5	7.02
28/1-36/259/	n.a.	n.a.	537	n.a.	191.3	7.82
28/1-36/273/	n.a.	n.a.	517	n.a.	204.7	8.1
28/1-36/287/	n.a.	n.a.	571	n.a.	190.69	7.08
28/1-36/301/	n.a.	n.a.	528	n.a.	198.3	8.28
28/1-36/316/	n.a.	n.a.	578	n.a.	208.7	9.27
28/1-40/246/	n.a.	n.a.	529	n.a.	175.75	7.06
28/1-40/259/	n.a.	n.a.	479	n.a.	172.8	6.9
28/1-40/273/	n.a.	n.a.	520	n.a.	171.56	6.94
28/1-40/287/	n.a.	n.a.	545	n.a.	182.2	6.67
28/1-40/301/	n.a.	n.a.	519	n.a.	182.6	6.43
28/1-32/273/	n.a.	n.a.	547	n.a.	242.88	7.24

Table 20

28 GAUGE SINGLE JERSEY, SINGLES YARNS. GREY FULLY RELAXED

SAMPLE	Bst.AW G	DistAW G	ThknsA G	Y.NeAW G	Y.StrAW G	%extAW G
28/1-32/273A	574.3	17.95	750	33.03	214.6	6.53
28/1-32/287A	507.8	17.89	881	33.14	227	8.59
28/1-32/301A	457.7	19.04	868	33	226.24	9.23
28/1-32/316A	457.6	18.94	875	33.76	224.5	8.63
28/1-32/332A	439.7	18.5	754	33.29	227.4	5.74
28/1-36/259/	483.8	15	787	37.58	182.6	9.36
28/1-36/273/	483.5	18.59	796	37.23	197.6	9.44
28/1-36/287/	456.1	17.97	876	37.9	188.35	9.34
28/1-36/301/	412	18.87	869	37.96	184.2	9.71
28/1-36/316/	390.6	18.83	860	38.42	189.9	11.12
28/1-40/246/	473.3	15.06	779	41.37	171.35	8.94
28/1-40/259/	457.2	15.16	787	42.19	179.95	7.96
28/1-40/273/	423.2	17.84	866	42.3	178.8	8.61
28/1-40/287/	411.1	17.8	869	42.1	183.01	10.12
28/1-40/301/	364.1	17.7	853	41.38	171.2	7.95
28/1-32/273/	532.5	14.95	859	32.75	230.3	9.85

Table 21

28 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY BEFORE WASH

SAMPLE	StL.BW G	Spr.BW G	C/3cmB G	W/3cmB G	Wt.BW G	Mid.BW G
28/2-64/273/	2.72	4.44	53.7	38.7	101	82.55
28/2-64/287/	2.834	1.66	48.3	37.2	88.5	83.5
28/2-64/301/	3.026	1	45.2	37.4	92.4	84.1
28/2-64/316/	3.171	3.99	42.9	36.5	95	86.3
28/2-64/332/	3.344	3.31	39	36.4	102	88.47
28/2-72/259/	2.55	2.8	59.1	37.4	95.8	83.63
28/2-72/273/	2.734	3.62	53.4	37.7	95	89.57
28/2-72/287/	2.844	2.81	44.6	38.2	84.8	82.13
28/2-72/301/	3.02	1.42	43.6	36.7	79.2	84.5
28/2-72/316/	3.192	1.59	41	37	82	86
28/2-80/246/	2.439	2.74	63.7	38.2	86.4	82.57
28/2-80/259/	2.593	3.7	56.7	37.6	83.6	83.32
28/2-80/273/	2.74	6.3	51.8	37.6	83	83.25
28/2-80/287/	2.859	4.92	47	37	68.5	82.6
28/2-80/301/	3	4.4	43	36.3	66	84.4

Table 22

28 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY FULLY RELAXED

SAMPLE	StL.AW G	Spr.AW G	C/3cmA G	W/3cmA G	Wt.AW G	%Shr.L G	%Shr.W G
28/2-64/273/	2.714	-1.47	62	46.6	144	15.13	19.12
28/2-64/287/	2.848	2.2	57.5	44.7	141.5	16.93	17.16
28/2-64/301/	2.97	1.23	54.8	43.8	130.4	18.07	13.53
28/2-64/316/	3.133	2.01	52.5	42.5	124	17.89	11.44
28/2-64/332/	3.344	1.16	49.2	39.6	120	22.03	8.63
28/2-72/259/	2.563	1.22	64.4	49	137.9	11.44	23.56
28/2-72/273/	2.727	1.25	61.8	47.3	127	14.35	19.52
28/2-72/287/	2.833	-2.39	58.1	45.2	118	22.97	15.69
28/2-72/301/	2.964	-2.92	55.5	42.4	114	21.65	15.89
28/2-72/316/	3.114	3.34	51.3	41.4	110	21.46	13.11
28/2-80/246/	2.475	0.9	71.5	50.2	128.8	10.42	25.53
28/2-80/259/	2.556	1.25	65.8	48.9	119	15.65	23.82
28/2-80/273/	2.703	1.57	61.1	46.9	116.5	17.62	20.14
28/2-80/287/	2.852	-1.74	57.7	45.5	107.6	20.13	16.87
28/2-80/301/	2.995	2.2	54.2	42.6	103.6	20.76	14.28

Table 23

28 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY BEFORE WASH

SAMPLE	Bst.BW G	DistBW G	ThknsB G	Y.NeBW G	Y.StrBW G	%extBW G
28/2-64/273/	n.a.	n.a.	545	n.a.	378.7	8.61
28/2-64/287/	n.a.	n.a.	572	n.a.	418.8	6.74
28/2-64/301/	n.a.	n.a.	534	n.a.	433.3	8.01
28/2-64/316/	n.a.	n.a.	555	n.a.	398	6.8
28/2-64/332/	n.a.	n.a.	557	n.a.	416.4	7.53
28/2-72/259/	n.a.	n.a.	559	n.a.	376.3	9.02
28/2-72/273/	n.a.	n.a.	521	n.a.	355.4	7.43
28/2-72/287/	n.a.	n.a.	520	n.a.	363.6	8.73
28/2-72/301/	n.a.	n.a.	498	n.a.	352.8	6.25
28/2-72/316/	n.a.	n.a.	521	n.a.	364.6	6.7
28/2-80/246/	n.a.	n.a.	522	n.a.	299.5	7.66
28/2-80/259/	n.a.	n.a.	477	n.a.	310.2	6.15
28/2-80/273/	n.a.	n.a.	479	n.a.	315.9	6.5
28/2-80/287/	n.a.	n.a.	514	n.a.	309.7	7.97
28/2-80/301/	n.a.	n.a.	513	n.a.	298.6	7.7

Table 24

28 GAUGE SINGLE JERSEY, TWO-FOLD YARNS. GREY FULLY RELAXED

SAMPLE	Bst.AW G	DistAW G	ThknsA G	Y.NeAW G	Y.StrAW G	%extAW G
28/2-64/273/	716.4	14.64	797	32.81	390.6	11.07
28/2-64/287/	713.4	17.52	846	32.49	382.9	7.36
28/2-64/301/	639.8	18.39	846	32.34	381	8.76
28/2-64/316/	607.7	17.79	710	32.59	308	6.72
28/2-64/332/	600.2	17.73	710	32.73	408.9	7.24
28/2-72/259/	641.6	14.9	719	36.21	325.78	9.36
28/2-72/273/	624.6	14.37	682	37.19	349.7	7.33
28/2-72/287/	620.5	19.18	812	36.22	334.9	9.46
28/2-72/301/	560.1	18.67	809	36.48	338.8	10.03
28/2-72/316/	544	17.6	757	37.39	354.2	9.14
28/2-80/246/	604.5	14.54	722	40.52	295.05	9.48
28/2-80/259/	550.1	14.11	669	40.2	301.9	7.05
28/2-80/273/	525.3	14.5	673	39.95	307.8	7.11
28/2-80/287/	515.3	17.67	790	40.04	295.2	9.54
28/2-80/301/	508.2	17.63	790	40.86	283.4	8.04

Table 25

SAMPLE	StL.BW G	Spr.BW G	C/3cmB G	W/3cmB G	Wt.BW G	Mid.BW G
18/1-20/327/	3.289	7.8	55.1	27.5	142.6	81.63
18/1-20/344/	3.497	10.45	49.4	27.6	147.4	81.9
18/1-20/362/	3.664	9.63	45.5	28.1	137	81.36
18/1-20/380/	3.785	12.18	40.8	27.8	125	83.1
18/1-20/399/	4.052	16.25	38	27.7	123	82.8
18/1-20/327/11	3.298	3.04	56.8	28.1	141.8	81.97
18/1-20/344/11	3.516	2.35	50.2	26.8	133.8	82.77
18/1-20/362/11	3.628	1.76	46.1	25.6	124	n.a.
18/1-20/380/11	3.795	1.99	42.9	25.4	125.3	87.8
18/1-20/399/11	4.033	1.27	40.3	25	113.2	90.1
20/1-36/259/	2.61	12.67	56.4	38.1	91.3	82.03
20/1-36/273/	2.77	11.87	51.6	37.8	88.5	n.a.
20/1-36/287/	2.871	17.96	48.5	37.3	85.5	84.7
20/1-36/301/	3.046	19.96	44.8	38.4	78.4	86.2
20/1-36/316/	3.188	15.39	42.8	37.9	81	86.97
20/1-36/259/11	2.616	4.31	63.1	36.2	95	84.07
20/1-36/273/11	2.725	4.04	55.8	36.2	86.5	85.5
20/1-36/287/11	2.878	3.29	54.2	35	82.5	88.2
20/1-36/301/11	3.046	1.95	51.9	34	82.6	93.2
20/1-36/316/11	3.209	2.89	46.2	32.2	80.7	93.1
24/1-28/291/	2.936	13.09	61.2	33.2	116.2	89.37
24/1-28/306/	3.071	7.73	49.2	32.3	105.3	87.8
24/1-28/321/	3.216	17.54	47.1	33.1	99	88.43
24/1-28/337/	3.397	15.25	42.9	33.2	94.6	89.9
24/1-28/354/	3.573	11.53	37.6	32	100	89.5
24/1-28/291/11	2.957	2.55	57.8	31.7	112	87.5
24/1-28/306/11	3.064	4.46	57.5	31.3	107.8	92.3
24/1-28/321/11	3.248	3.97	51.3	30.6	104.8	93.47
24/1-28/337/11	3.413	2.82	50.8	28.3	95.4	97.53
24/1-28/354/11	3.571	3.66	47.6	27.6	96	98.93
24/1-28/291/12	2.948	-7.69	53.6	33.3	109.7	85.17
24/1-28/306/12	3.07	4.36	49.7	33.5	100.2	85
24/1-28/321/12	3.23	-12.54	46.4	33.3	101.6	88.4
24/1-28/337/12	3.388	-7.89	42.7	31.7	88.4	89.1
24/1-28/354/12	3.579	-9.66	38.7	31.7	92.3	89.03
24/1-28/291/13	2.957	6.1	53.4	31.7	104.8	88.33
24/1-28/306/13	3.076	8.43	49.1	33	97.6	87.2
24/1-28/321/13	3.25	14.91	46	32.7	97.2	90.17
24/1-28/337/13	3.432	14.14	41.8	31.7	90	91.37
24/1-28/354/13	3.568	16.94	39.8	32.1	93	90.5
24/1-28/291/14	2.946	16.39	55.2	33.5	118.4	86.5
24/1-28/306/14	3.078	14.65	49	34	101.6	86
24/1-28/321/14	3.236	23.65	47.3	34.6	110	87.53
24/1-28/337/14	3.371	26.16	43.9	33.8	104	90.2
24/1-28/354/14	3.56	25.49	40.7	35.8	109.6	88.8

Table 26

SINGLE JERSEY SPIRALITY TRIAL. GREY FULLY RELAXED

SAMPLE	StL.AW G	Spr.AW G	C/3cmA G	W/3cmA G	Wt.AW G	%Shr.L G	%Shr.W G
18/1-20/327/	3.258	12.49	55.9	38.2	203.8	1.04	26.79
18/1-20/344/	3.425	14.52	52.2	36.6	198	4.8	22.97
18/1-20/362/	3.593	15.86	48.5	35.3	181	10.28	21.86
18/1-20/380/	3.766	17.83	46.5	34.1	180.2	11.71	18.74
18/1-20/399/	3.931	20.77	43.6	33.9	167.4	14.6	16.36
18/1-20/327/11	3.211	2.35	58	36.4	202.2	4.24	25.02
18/1-20/344/11	3.413	1.65	55.3	34.7	186	9.64	21.84
18/1-20/362/11	3.591	0.8	52.7	32.7	185.8	13.13	22.15
18/1-20/380/11	3.757	1.29	51.1	31.3	179.6	15.34	20.04
18/1-20/399/11	3.906	1.86	50.6	30.8	168.6	19.84	17.65
28/1-36/259/	2.614	20.08	66.2	50.2	139.4	15.76	22.71
28/1-36/273/	2.742	21.32	63.6	48.4	130	19.71	20.04
28/1-36/287/	2.809	24.53	59.1	46.9	122	20.02	15.81
28/1-36/301/	2.976	26.61	56.6	46	119.4	19.5	15.73
28/1-36/316/	3.153	26.45	53.8	44.4	120	21.96	14.81
28/1-36/259/11	2.591	2.26	78.1	43.9	150.1	21.2	17.38
28/1-36/273/11	2.721	1.25	76.2	41.6	141.2	27.44	14.55
28/1-36/287/11	2.873	1.93	71.6	40.4	140	25.19	14.07
28/1-36/301/11	2.99	1.34	68.7	38.1	127.5	27.21	14.02
28/1-36/316/11	3.154	2.4	67.5	36.5	131.2	32.1	11.5
24/1-28/291/	2.89	16.95	61.4	43.8	165.2	2.69	25.62
24/1-28/306/	3.015	18.88	56.9	42.1	159.6	14.99	21.15
24/1-28/321/	3.196	20.12	54.1	40.7	156	13.94	19.37
24/1-28/337/	3.35	21.8	50.8	39.9	152.5	18.21	18.26
24/1-28/354/	3.496	25.32	48.6	39	145	23.13	14.8
24/1-28/291/11	2.941	2.42	67.9	39.5	167.4	16.22	19.44
24/1-28/306/11	3.063	2.6	65.8	37.6	161.7	16.13	19.41
24/1-28/321/11	3.231	1.74	64.3	36.1	165.4	20.01	15.36
24/1-28/337/11	3.337	1.46	60.6	33.8	152	20.96	16.65
24/1-28/354/11	3.542	1.74	59.3	32.6	149.5	22.98	14.55
24/1-28/291/12	2.919	-13.12	61	43.4	162.8	13.54	22.59
24/1-28/306/12	3.074	-13.59	57.5	41.3	151	15.4	20.64
24/1-28/321/12	3.288	-17.38	54.1	40.5	148.4	15.08	18.13
24/1-28/337/12	3.351	-19.48	51.2	40	147.6	19.89	18.02
24/1-28/354/12	3.567	-23.24	47.4	37.8	135	21.85	10.47
24/1-28/291/13	2.918	12.83	60	43	160.3	11.51	24.86
24/1-28/306/13	3.075	15.63	56.4	41.5	152.4	15.81	21.23
24/1-28/321/13	3.294	18.71	52.7	39.7	144	13.1	19.88
24/1-28/337/13	3.404	19.63	50.4	39	140.4	17.63	18.76
24/1-28/354/13	3.579	21.68	46.4	37.1	132.5	15.58	13.34
24/1-28/291/14	2.94	18.77	61.7	44.4	171.6	12.19	23.52
24/1-28/306/14	3.046	21.9	58.4	42.8	168	18.79	21.56
24/1-28/321/14	3.178	22.89	55.5	41.9	161	15.48	17.7
24/1-28/337/14	3.348	24.35	52.8	41.1	155.8	17.36	16.63
24/1-28/354/14	3.561	29.72	49	39.9	149.5	17.98	12.18

Table 27

SINGLE JERSEY SPIRALITY TRIAL. GREY BEFORE WASH

SAMPLE	Bst.BW G	DistBW G	ThknsB G	Y.NeBW G	Y.StrBW G	%extBW G
18/1-20/327/	n.a.	n.a.	707	n.a.	392.7	8.62
18/1-20/344/	n.a.	n.a.	739	n.a.	411.4	9.37
18/1-20/362/	n.a.	n.a.	738	n.a.	390.3	9.39
18/1-20/380/	n.a.	n.a.	792	n.a.	375.4	9.76
18/1-20/399/	n.a.	n.a.	703	n.a.	405.7	7.97
18/1-20/327/11	n.a.	n.a.	713	n.a.	413.4	8
18/1-20/344/11	n.a.	n.a.	698	n.a.	422.8	8.83
18/1-20/362/11	n.a.	n.a.	694	n.a.	389.5	9.16
18/1-20/380/11	n.a.	n.a.	749	n.a.	398.8	9.35
18/1-20/399/11	n.a.	n.a.	698	n.a.	396	7.23
28/1-36/259/	n.a.	n.a.	537	n.a.	191.3	7.82
28/1-36/273/	n.a.	n.a.	517	n.a.	204.7	8.1
28/1-36/287/	n.a.	n.a.	571	n.a.	190.69	7.08
28/1-36/301/	n.a.	n.a.	528	n.a.	198.3	8.28
28/1-36/316/	n.a.	n.a.	578	n.a.	208.7	9.27
28/1-36/259/11	n.a.	n.a.	557	n.a.	208	7.78
28/1-36/273/11	n.a.	n.a.	525	n.a.	200.5	6.56
28/1-36/287/11	n.a.	n.a.	587	n.a.	212.8	7.17
28/1-36/301/11	n.a.	n.a.	539	n.a.	217	6.54
28/1-36/316/11	n.a.	n.a.	543	n.a.	198.9	6.19
24/1-28/291/	n.a.	n.a.	618	n.a.	270.5	9.14
24/1-28/306/	n.a.	n.a.	593	n.a.	266.2	7.59
24/1-28/321/	n.a.	n.a.	668	n.a.	271.8	8.07
24/1-28/337/	n.a.	n.a.	650	n.a.	265.8	7.76
24/1-28/354/	n.a.	n.a.	628	n.a.	252.6	6.7
24/1-28/291/11	n.a.	n.a.	628	n.a.	273.75	8.3
24/1-28/306/11	n.a.	n.a.	632	n.a.	282.2	6.26
24/1-28/321/11	n.a.	n.a.	625	n.a.	279.1	8.38
24/1-28/337/11	n.a.	n.a.	628	n.a.	253.7	8.81
24/1-28/354/11	n.a.	n.a.	622	n.a.	286.16	9.15
24/1-28/291/12	n.a.	n.a.	607	n.a.	289.1	8.36
24/1-28/306/12	n.a.	n.a.	582	n.a.	285.6	6.92
24/1-28/321/12	n.a.	n.a.	604	n.a.	305	8.72
24/1-28/337/12	n.a.	n.a.	588	n.a.	290.4	8.05
24/1-28/354/12	n.a.	n.a.	595	n.a.	307.2	8.52
24/1-28/291/13	n.a.	n.a.	608	n.a.	224.25	7.74
24/1-28/306/13	n.a.	n.a.	574	n.a.	201.79	5.67
24/1-28/321/13	n.a.	n.a.	595	n.a.	205.2	7.13
24/1-28/337/13	n.a.	n.a.	583	n.a.	219.5	7.48
24/1-28/354/13	n.a.	n.a.	627	n.a.	226.7	8.07
24/1-28/291/14	n.a.	n.a.	629	n.a.	309.5	9.76
24/1-28/306/14	n.a.	n.a.	571	n.a.	307.24	6.72
24/1-28/321/14	n.a.	n.a.	611	n.a.	304.5	9.18
24/1-28/337/14	n.a.	n.a.	612	n.a.	310.9	8.56
24/1-28/354/14	n.a.	n.a.	638	n.a.	314.1	9.69

Table 28

SINGLE JERSEY SPIRALITY TRIAL. GREY FULLY RELAXED

SAMPLE	Bst.AW G	DistAW G	ThknsA G	Y.NeAW G	Y.StrAW G	%extAW G
18/1-20/327/	752	16.1	997	20.6	393.5	9.64
18/1-20/344/	665.4	15.5	944	20.2	363.9	8.52
18/1-20/362/	664.3	15.62	1074	20.1	368.9	16.93
18/1-20/380/	649.7	19.1	1129	20.42	386.8	11.3
18/1-20/399/	608.8	19.86	1125	20.18	384.6	10.48
18/1-20/327/11	715.9	16.52	986	20.4	384.85	11.28
18/1-20/344/11	664.7	16.33	935	20.5	403.9	8.66
18/1-20/362/11	613.2	20.06	1005	21.19	401.22	11.9
18/1-20/380/11	582.5	20.6	1125	21.26	398.2	11.4
18/1-20/399/11	500.7	21.4	1161	21.11	352.6	9.44
28/1-36/259/	483.8	15	787	37.58	182.6	9.36
28/1-36/273/	483.5	18.59	796	37.23	197.6	9.44
28/1-36/287/	456.1	17.97	876	37.9	188.35	9.34
28/1-36/301/	412	18.87	869	37.96	184.2	9.71
28/1-36/316/	390.6	18.83	860	38.42	189.9	11.12
28/1-36/259/11	429.7	16.63	780	37.92	200.22	9.34
28/1-36/273/11	399.1	20.00	909	38.2	196.91	9.15
28/1-36/287/11	404.2	20.3	944	37.75	184.7	6.45
28/1-36/301/11	350.6	21.05	913	37.99	191.3	8.7
28/1-36/316/11	333.5	22.3	843	37.41	183.2	6.6
24/1-28/291/	607.6	15.75	867	29.6	275.95	9.48
24/1-28/306/	575.8	18.48	952	29.2	256.87	8.94
24/1-28/321/	534.8	18.84	965	28.91	236.3	7.14
24/1-28/337/	494	19.31	957	29.11	252.08	9.99
24/1-28/354/	471.1	19.5	849	28.89	249.2	7.8
24/1-28/291/11	521.6	16.57	850	29.16	276.58	10.77
24/1-28/306/11	502.8	21	1015	29.14	243.5	6.99
24/1-28/321/11	458.3	20.76	975	28.69	284.1	9.47
24/1-28/337/11	431.8	20.38	929	29.33	280.3	11.88
24/1-28/354/11	406.4	21.35	939	28.46	251	11.38
24/1-28/291/12	587.5	15.75	848	29.21	265.7	10.28
24/1-28/306/12	523.6	19.02	934	28.97	282.4	7.51
24/1-28/321/12	502.2	18.9	917	28.14	295.6	8.99
24/1-28/337/12	493.8	19.4	946	28.79	296.4	10.44
24/1-28/354/12	473.4	18.58	878	28.96	284.8	12.04
24/1-28/291/13	542	15.2	851	29.17	195.61	12.82
24/1-28/306/13	518	17.9	975	29.55	213.4	6.37
24/1-28/321/13	508.9	18.01	921	30.11	216.8	7.56
24/1-28/337/13	471.8	18.57	972	29.8	207.6	9.42
24/1-28/354/13	454.1	18.11	902	29.3	224.4	10.38
24/1-28/291/14	584.5	16.68	863	29.66	282.36	9.99
24/1-28/306/14	566.1	19.4	978	28.49	268.7	7.28
24/1-28/321/14	534.4	19.81	935	28.35	294.1	11.4
24/1-28/337/14	509.8	19.65	959	29.15	294.9	11.16
24/1-28/354/14	482.7	19.47	911	28.64	299.2	11.96