USTER® ZWEIGLE
TWIST TESTER 5

APPLICATION REPORT

USTER® STATISTICS for twist measurement

THE YARN PROCESS CONTROL SYSTEM
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1 Introduction

The amount of twist placed in a staple spun yarn is important from a technical viewpoint because of its effect on physical properties and performance and on finished product appearance. It is of course also important from a production standpoint because with every rotation there is an accompanying loss in productivity and an increase in cost. Twist also impacts fabric appearance, fullness, hand, and strength (see also Application Report SE 631).

With the integration of a twist tester in the product range of Uster Technologies, we are now able to provide USTER® STATISTICS also for the important quality parameter of the twist. Besides the absolute twist of the yarn, which is usually given by the end use, the variation of the twist plays a important role in the evaluation of the yarn quality. Therefore, when looking at the following chapters, the absolute twist should not be interpreted as a quality parameter of the yarn, but as a guideline, which twist levels are used in the textile industry.

In this first edition of the USTER® STATISTICS for twist, we can present benchmarks for 14 different materials:

- 100% CO, ring yarn, combed & carded, knitting and weaving, bobbins
- 50/50%, PES/CO, ring yarn, bobbins
- 50/50%, 67/33%, 65/35% PES/CO, ring yarn, carded & combed, bobbins
- 100% PES, ring yarn, bobbins
- 100% WO, ring yarns, worsted, bobbins
- 55/45% PES/WO, worsted, bobbins
- 100% CV, ring yarn, bobbins
- 50/50%, 70/30%, PES/CV, ring yarn, bobbins

2 Explanation of twist

The twist of a yarn can be described by the twist per unit length (per meter or per inch) and by the twist multiplier.

For the twist character of a yarn only the twist multiplier is decisive, as it describes the angle of the twist in the yarn. A fine yarn needs more twist than a coarse yarn in order to have the same twist character. Therefore, the twist of a yarn is usually given as the coefficient of twist, also called twist multiplier in order to be able to compare different yarn counts.

Fig. 1 shows the illustration of a yarn. It can be seen that although the twist per unit length is the same, the twist multiplier (the angle of the twist) varies, depending on the yarn count.
3 Test conditions & standards

3.1 Test conditions

The turns of the yarn and its variation were measured with 10 bobbins and 10 measurements within each bobbin, resulting in an overall number of tests of 100 for each sample. All tests were carried out with test method 1 of the USTER® ZWEIGLE TWIST TESTER AUTOMATIC.

3.2 Standard measurement

The twist measuring method used is the untwist-retwist method. This method is based on the premise that the contraction of a specified length of single yarns is the same for any amount of twist. A 50-cm length is untwisted under pretension, and then is retwisted in the opposite direction. The retwisting is continued until the contracted length is the same as the original specimen length. The total twist is the sum of the untwisted and retwisted turns. Since the specimen length is 0.5 m, the number of rotations with the untwist-retwist method is equivalent to the yarn twist per meter.

The measurement of the twist for the USTER® STATISTICS is done according to the standard ISO 17202:2002.

4 Conversion

The conversion of turns per meter into turns per inch can be done according to the following formula:

Turns per inch = \( \frac{\text{Turns per meter}}{39.37} \)

Turns per m = \( \text{Turns per inch} \times 39.37 \)

The following formula shows the conversion for the twist multiplier:

English twist multiplier: \( \alpha_e = \frac{\text{turns per inch}}{\sqrt{N_e}} \)

Metric twist multiplier: \( \alpha_m = \frac{\text{turns per meter}}{\sqrt{N_m}} \)
The twist per meter of a yarn is dependent on the yarn count. A fine yarn requires more twist than a coarse yarn for the same application. Therefore, the English twist multiplier takes this into account, e.g. a statement such as: “The twist multiplier of combed cotton yarn should not exceed the value of 3.7” is valid for the entire count range.

5 USTER® STATISTICS graphs

5.1 100% CO, ring yarn, carded, knitting, bobbins

Fig. 2
Twist per meter

Fig. 3
Variation of twist
5.2 100% CO, ring yarn, carded, weaving, bobbins

Fig. 4
Twist per meter

Fig. 5
Variation of twist
5.3 100% CO, ring yarn, combed, knitting, bobbins

![Fig. 6](image)
**Twist per meter**

![Fig. 7](image)
**Variation of twist**
5.4 100% CO, ring yarn, combed, weaving, bobbins

**Fig. 8**
Twist per meter

**Fig. 9**
Variation of twist
5.5  100% CO, ring yarn, compact, combed, bobbins

Fig. 10  Twist per meter

Fig. 11  Variation of twist
5.6 PES/CO, 50/50%, ring yarn, carded, bobbins

Fig. 12 Twist per meter

Fig. 13 Variation of twist
5.7 PES/CO, 67/33%, 65/35%, ring yarn, carded, bobbins

Fig. 14
Twist per meter

Fig. 15
Variation of twist
5.8 PES/CO, 67/33%, 65/35%, ring yarn, combed, bobbins

Fig. 16 Twist per meter

Fig. 17 Variation of twist
5.9  100% PES, ring yarn, bobbins

Fig. 18  Twist per meter

Fig. 19  Variation of twist
5.10  100% WO, ring yarn, worsted, bobbins

Fig. 20  Twist per meter

Fig. 21  Variation of twist
5.11  PES/WO, 55/45%, ring yarn, bobbins

![Graph of Twist per meter](image)

Fig. 22  
Twist per meter

![Graph of Variation of twist](image)

Fig. 23  
Variation of twist
5.12 100% PAN, ring yarn, bobbins

[Graph 1: Twist per meter (Fig. 24)]

[Graph 2: Variation of twist (Fig. 25)]
5.13  100% CV, ring yarn, bobbins

Fig. 26
Twist per meter

Fig. 27
Variation of twist
5.14  PES/CV, 50/50%, 70/30%, ring yarn, bobbins

Fig. 28
Twist per meter

Fig. 29
Variation of twist