

Australian/New Zealand Standard™

Wool—Fleece testing and measurement

Method 4: Measurement of mean fibre diameter and determination of fibre diameter distribution using the SIROLAN-LASERSCAN measuring system

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TX/12, Wool to supersede AS/NZS 4492.4(Int):1997. It is based on the method of testing core samples by the SIROLAN-LASERSCAN measuring system in IWTO 12, *Measurement of the mean and distribution of fibre diameter using the SIROLAN-LASERSCAN fibre diameter analyser*.

The measurements should be regarded as relative, not absolute values, and they should only be used for within-flock comparisons.

The term 'normative' has been used in this Standard to define the application of the appendix to which it applies. A 'normative' appendix is an integral part of a Standard.

METHOD

1 SCOPE This Standard sets out a procedure for obtaining the mean and distribution of fibre diameter in a sample of fleece wool. Included are requirements for drawing subsamples and preparing test specimens.

2 OBJECTIVE The objective of this Standard is to provide the wool industry with a method of determining mean fibre diameter and diameter distribution by the SIROLAN-LASERSCAN measuring system, for the purpose of ranking sheep or, in the case of mean fibre diameter, for classing fleeces according to diameter.

3 PRINCIPLE Snippets are cut from samples of fleece wool, using a minicorer and cleaned, where required. The snippets are dispersed as a dilute suspension in a mixture of isopropanol (propan-2-ol) and water (8% by volume). The suspension of snippets is transported through a measuring cell which is positioned in a beam of laser light. The reduction in intensity of the laser beam as the individual snippets pass through the beam of light, approximately 500 µm in diameter, is sensed by a detector and transformed, using a calibration look-up table, into a diameter in micrometres. A computer is used to collect and summarize the individual measurements to give statistics such as mean and standard deviation of fibre diameter for the specimen.

4 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS/NZS

4492 Wool—Fleece testing and measurement

4492.2 Method 2: Determination of washing yield and clean fleece weight

IWTO

12 Measurement of the mean and distribution of fibre diameter using the SIROLAN-LASERSCAN fibre diameter analyser

5 APPARATUS The following apparatus is required:

- (a) A fibre diameter analyser which consists of a SIROLAN-LASERSCAN measuring system in accordance with IWTO 12.
- (b) A minicorer with a cutting diameter of 1.8 to 2.0 mm for cutting fibre snippets. A typical minicorer is described in IWTO 12.

NOTE:

- 1 A minicorer is required rather than a guillotine to cut snippets, as the use of a guillotine will result in the selection of snippets which are representative of the location of the site where the snippets were taken instead of being representative of the whole sample.

The guillotine is normally used for research purposes, e.g. to measure fibre diameter changes along the staple.

- 2 Snippet lengths appreciably longer than 2.0 mm may give biased results. Long snippets may cause blockages in the instrument.

- (c) A room with a temperature of between 17°C and 23°C to house the instrument.
- (d) A means of determining the moisture content of isopropanol.
- (e) A means of measuring the temperature of the isopropanol/water mixture.

6 CALIBRATION The SIROLAN-LASERSCAN measuring system shall be calibrated according to the procedures described in IWTO 12.

NOTE: Snippets prepared from Standard tops should be prepared by the same method used to prepare samples (see Clause 5(b)).

7 SAMPLE PREPARATION

7.1 Atmospheric conditions Where an aqueous scoured and dried subsample is to be measured, the subsample shall be left open in a well-ventilated room for at least 1 h prior to measurement.

7.2 Snippet preparation The following procedure shall apply:

- (a) *For scoured subsamples:*
 - (i) One subsample of approximately 10 g shall be drawn so as to be representative of the sample. Where the available material has a mass of less than 10 g, the subsample shall comprise the whole sample.
 - (ii) If the subsample is to be scoured, scouring shall be in accordance with AS/NZS 4492.2.
 - (iii) Take one test specimen by placing the scoured, dried, conditioned subsample in the minicorer. If the whole subsample cannot be accommodated in the minicorer, select a representative portion of suitable mass for the machine and minicore this portion.

- (iv) Take sufficient snippets for a measurement of at least 1000 counts. A mass of 0.2 g should be adequate for one test specimen.
- (b) *For greasy subsamples:*
 - (i) Proceed as specified in Step (a), placing the greasy subsample in the minicorer.
 - (ii) Clean the test specimen of grease and extraneous matter including fibre released during snippet preparation. A suitable method is defined in Appendix A.

8 PROCEDURE

8.1 Pre-measurement checks To ensure that the instrument settings remain stable:

- (a) Any repeat measurements on a sample taken more than 2 h apart should be within 0.5 μm for both mean and standard deviation.
- (b) The temperature within the instrument cabinet should be maintained within $\pm 1^\circ\text{C}$ of a set value of 20°C in order to keep the circulating isopropanol at a constant temperature during operation.
- (c) The average water content of the isopropanol shall be maintained at $8 \pm 1\%$ by volume. This may be checked by using a hydrometer for the specific gravity range 0.800 to 0.900. Checks at weekly intervals are recommended.

8.2 Measurement The following procedure shall apply:

- (a) Select a test specimen and remove any large pieces of vegetable matter and excessively long fibres, as they may cause blockages.
NOTE: Handling of the specimen must be kept to a minimum during any such removal to avoid preferential separation of fibres of differing diameter.
- (b) Place the whole test specimen into an emptied bowl which is free of fibres. Continue measurement until at least 1000 individual measurements have been obtained.

NOTES:

- 1 A SIROLAN-LASERSCAN instrument can operate up to a count rate of 100 counts per second. Above 100 counts per second the instrument stops counting until the count rate falls to a satisfactory level.
- 2 If anything other than mean fibre diameter, standard deviation and coefficient of variation is needed, this minimum number of snippet measurements may be inadequate.

9 PRECISION Precision limits have not been established for the above procedure. However, data from round trials* covering the major fleece measurement laboratories have indicated that for wools in the 20 to 24 micron range, the following 95% confidence limits for mean fibre diameter apply:

A single test within a laboratory	$\pm 0.9 \mu\text{m}$
A single test in any laboratory	$\pm 1.0 \mu\text{m}$

* AAABG Paper by P.D. Morgan to AWTALtd.