



A simple guide to

TENSILE TESTING

Recommendations for accurate &
repeatable strength testing

Table of Contents

Introduction

What is Tensile Testing?

Recommendations:

Number 1

Number 2

Number 3

Number 4

Number 5

Number 6

Number 7

Number 8

Number 9

Number 10

Number 11

Number 12

Number 13

Final Thoughts

Titan10 twin column



Introduction

Thank you for downloading our eBook. We've compiled this document in collaboration with our Technical Specialists to give you a comprehensive list of recommendations for accurate and repeatable strength testing.

Expert insights

A big part of our development process for any product we make involves our Technical and Textile Specialists.

The [Titan10 Universal Strength Tester](#), our highest capacity model in the Titan range, required months of strength testing work during its developmental stage, before it was considered complete.

With this in mind, we asked the team for some do's and don'ts for this field of testing. Using their years of laboratory experience, and looking through frequently asked questions to our Applications Support KnowledgeHub, they have compiled a list of common mistakes and best practices for strength testing.

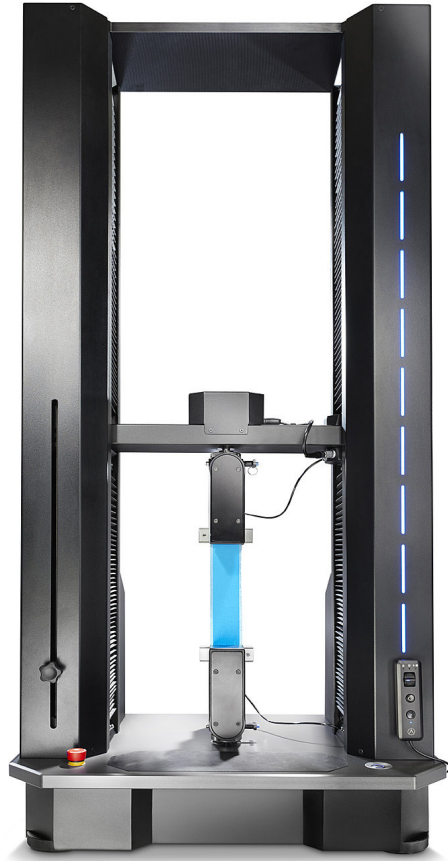


What is Tensile Testing?

“Tensile testing is one of the most widely used physical tests for textiles and other materials. By measuring the force required to elongate a specimen to breaking point, the textile properties can be determined. This allows designers and quality managers to predict how fibres, yarns and fabrics will behave in their intended end-use.”

Peter Goodwin, Technical Specialist - James Heal

Recommendation 1:



Use the correct type of strength testing instrument

Nowadays, the most widely specified type is the Constant Rate of Extension (CRE) type.

Other types are constant rate of traverse (CRT) and constant rate of loading (CRL). The standard will specify the type to be used.

Recommendation 2:

Ensure the testing instrument and Loadcells are calibrated by the manufacturer.

This service is available through most reputable testing instrument manufacturers, including James Heal. Typically, a 12 month guarantee is given as standard.

Our calibrations for Titan test five things on the instrument:

- **Jaw parallelism**
- **Speed**
- **Extension**
- **Displacement**
- **Computer timer**

These five things are tested, as well as 10 different force readings on each load cell.

Recommendation 3:

Carry out frequent verifications between calibrations using Check Weights and In- house Verification Fabric(s).

A verification procedure performed at set intervals throughout the year, using a fabric that you know is reliable, could be the difference between accurate and inaccurate results.

"We recommend you doing these tests every week." explains Technical Specialist Peter Goodwin.

This routine verification testing allows you to keep track of the performance your instrument, and help to prove the efficacy of your test results.

Recommendation 4:

Use a Loadcell which has the appropriate range for the application.

Having a fundamental understanding of the composition and properties of the textile or material that needs to be tested, can help to inform you on the appropriate loadcell for the test.

Use a loadcell which will give results between 20% and 80% of the expected result.

For instance, were we to test a standard medium weight cotton denim fabric, we would use a load cell between 600- 1000N.

Recommendation 5:

Utilise the correct grips and jaw faces for the application - the grips should not damage the specimen and hold it without slippage.

The incorrect jaw face might mean the surface of the jaw won't grip your material correctly. Additionally, using too high a clamping pressure could cause the specimen to break at the jaws.

Double checking your grips before testing is initiated means that this variable is controlled.

Recommendation 6:

Ensure the Testing Instrument is setup with all the parameters required to carry out the test procedure according to the specified standard (norm).

These may include the gauge length, test speed, preload (pretension), force and extension units.

This might seem like an obvious one, but it is worth remembering when troubleshooting if you are not getting the results you would expect to see.

Even one parameter being slightly out could cause variance in your results.

Recommendation 7:

Prepare specimens from fabric which is free from folds, creases and other faults which may affect the results.

Fabric with a fault or flaw would behave differently to one without, so there is no guarantee of consistency of results.

Ensure that during specimen preparation, proper procedure is followed as stated in the standard being used. Most standards detail how to prepare a specimen for testing.



Recommendation 8:

Ensure the dimensions of specimens are correct.

For strip tests ensure threads are removed to give the correct width. For grab tests ensure the same threads are tested in the top and bottom grips.

A frequent issue we see through our Applications Support service, is specimens that are not cut and prepared correctly, often not accounting for distortion of the warp and weft of the fabric.

This easy mistake to make can impact the accuracy of your results, so as always we recommend referencing the standard you are using.

Recommendation 9:

Condition specimens at the correct temperature and relative humidity, and for the time specified in the norm.

The strength of many fibres can be affected by environmental conditions and this effect should not be under-estimated.

Making sure your test instrument is set up in a conditioned laboratory is crucial.

Technical Specialist Peter Goodwin explains “If you are carrying out physical testing, a controlled environment equipment will ensure your results are consistent. If you are processing things like cotton, wool and viscose, these fibres absorb/desorb moisture, and your results will not be correct if you do not control the environment they are conditioned and tested in.”

Recommendation 10:

Position the specimen in the grips so that it is aligned centrally, vertically and/or horizontally.

A specimen not being aligned correctly has the potential to change the direction that it is being pulled in, or that the same threads are not being tested at the top and the bottom.

For consistency of results, ensure that the specimen is lined up to the grips as level as possible. This can be easier to do on more obvious weave structures that clearly show the warp and weft yarns.

Recommendation 11:

Pneumatic grips offer strong and consistent gripping, while simultaneously taking less time to open and close.

If you are buying a new Universal Strength Tester this feature is worth considering, as it can impact both your results and the time taken to set up the test.

Our Titan range of instruments have pneumatic grips as we feel this is the best for routine and regular strength testing.

Recommendation 12:

When the test is in progress, make a note of any abnormal modes of failure such as 'jaw break'.

This is useful information to refer back to once your results have been analysed. Detailing this information can have significant impacts on the results should there be consistent or inconsistent 'jaw breaks'.

Any outliers which are also 'jaw breaks' should be excluded.

Recommendation 13:

After testing is completed, ensure the results are analysed as specified in the standard and correct terminology used to avoid confusion when reading the test report.

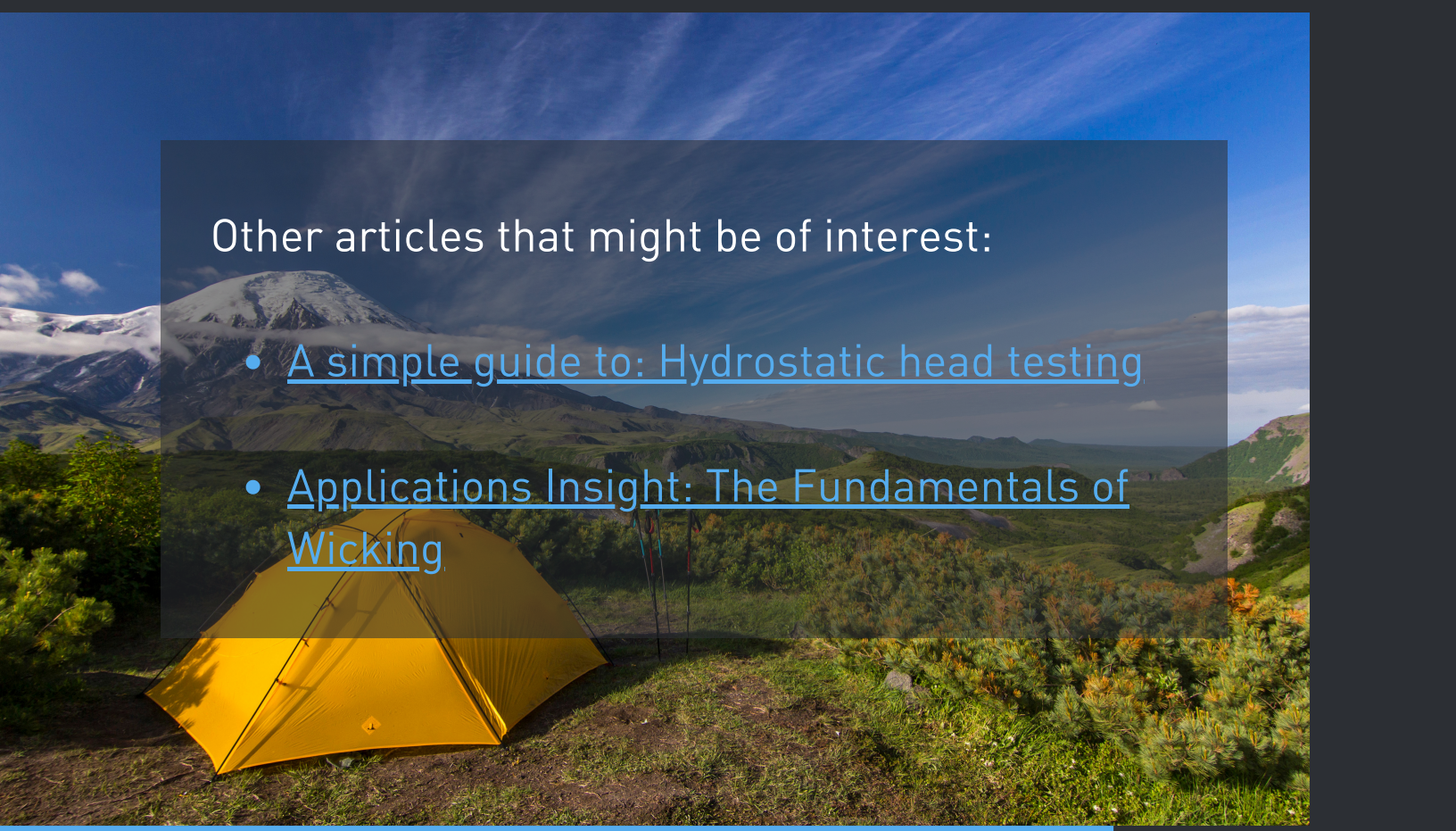
Get familiar with the standard you are testing and the terminology it uses – each standard body may explain things slightly differently, and will often have a different way of expressing the results.



Final Thoughts

If you have further questions about tensile testing, our [Applications Support KnowledgeHub](#) is the best place to start.

You can search our [FAQs](#) or submit a ticket to our Textile Technologists.



Other articles that might be of interest:

- [A simple guide to: Hydrostatic head testing](#)
- [Applications Insight: The Fundamentals of Wicking](#)

Titan10 twin column instrument for testing larger samples and a diverse range of applications

To find out more about our Universal Strength
Testers, including the Titan10, click below!

[Discover Titan10](#)

