



Australian Grain Industry – Code of Practice Technical Guideline Document

No. 2

TEST WEIGHT ASSESSMENT

**Compiled on behalf of the Australian Grain Industry by:
Grain Trade Australia**

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Technical Guideline Document

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Version Control

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March 2013	1.0	Original document development
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1. Application

For the assessment of Test Weight in all commodities.

1.1 What is Test Weight?

Test weight is a measure of the density of grain. It measures how much a specific volume of grain weighs.

1.2 Units

In Australia, Test Weight is expressed in kilograms per hectolitre (i.e. the weight of a hundred litres).

1.3 Methods of Analysis

There are a range of instruments used by industry for assessing test weight. The reference method/instrument is the Chondrometer.

1.4 NMI Regulatory Controls

All reference chondrometer instruments are to be certified and approved by the National Measurement Institute (NMI). The NMI specifies a General Certificate, requiring that for the trade of grain, the Test Weight assessment method must meet Maximum Permissible Error specifications. See <http://www.measurement.gov.au/Publications/CertificateOfApproval/GeneralCertificates/Pages/default.aspx> and refer to the document titled “4/10/0A/- Grain Density Measuring Instruments” for details.

1.5 Industry Reference Method

Reference chondrometers include the chondrometer types Franklin, Kern or Schopper. In Section 5 of all cereal Trading Standards booklets (e.g., wheat), reference methods for each reference chondrometer type are documented. Refer to the GTA website for details at: http://www.graintrade.org.au/commodity_standards

These methods should be used to verify instruments used in the field, that are not reference instruments.

1.5.1 Industry Rapid Methods

There are various instruments/methods used in the field or at other locations (referred to as “rapid methods”) for Test Weight assessment. Industry is free to use these rapid methods for the purposes of trade provided they meet the General Certificate requirements stipulated by the NMI.

A rapid method generally involves measuring Test Weight by weighing a 0.5L sample. The 0.5L sample may be obtained by using a height guide to fill the 0.5L container or a funnel device. While these rapid methods can be accurately done, a more accurate result is generally able to be obtained by using a chondrometer.

Pictured below are various instrument types for rapid methods used for Test Weight assessment:



When using rapid assessment methods, industry is strongly encouraged to:

- Certify the equipment a minimum of once a year (e.g., immediately prior to harvest);
- Any equipment failing certification should be replaced or the fault immediately rectified;
- Train staff in the correct method of use;
- Regularly monitor the condition of all equipment; and
- Audit results obtained via provision of samples to third parties or internal assessment using the verification procedure outlined by the NMI.

1.5.2 Overseas Methods of Assessment

Test Weight is a quality parameter listed in many international grain standards. Methods of analysis may differ from Australia but in general the main processes and equipment are similar.

The major difference between Australia's and Canada's grain grading specifications for example, is in Canada test weight is assessed after dockage is removed. Where there are large amounts of Foreign Material (FM), this may impact on the result obtained compared with the method used in Australia where FM is not removed before assessment.

Industry should note that generally marketing contracts do not stipulate which method is to be used and industry is free to use a suitable method.

1.6 What Errors can occur during Assessment

There are many errors that may occur when using equipment to measure Test Weight, whether using the reference or a rapid method. While each error may lead to only a minor variation in the result obtained, combined, they may be a significant factor in incorrectly determining the Test Weight of a grain sample.

Potential errors when assessing Test Weight and a potential impact on the result obtained may include the following:

Procedure	Potential Impact on Result Obtained		Potential Resolution
	Higher	Lower	
General - All Methods			
½ litre measure not the correct size	Y	Y	Replace
½ litre measure damaged/dented	Y	Y	Replace
Balance not calibrated or level	Y	Y	Re-calibrate, operate only on a level surface. Obtain balance with visible level indicator
Balance not sufficiently accurate (does not measure to 1 decimal place) or used incorrectly	Y	Y	Obtain appropriately accurate balance
½ litre measure following filling with grain not levelled off correctly	Y	Y	Follow correct procedure and ensure levelled
½ litre container containing grain not zeroed on balance prior to filling and/or ½ litre container incorrectly weighted with/without cutter bar	Y		Follow written procedure
½ litre measure not kept still or level during filling with grain	Y	Y	Set-up instrument prior to filling in a position that does not require moving (e.g., prior to inserting cutter bar)
Conversion from weight in grams to kg/hl not done correctly (multiply by 0.2 or divide by 5)	Y	Y	Develop and display conversion chart, ensure analytical balance in correct mode (if using conversion balance), purchase suitable type of conversion balance
Foreign Material, Unmillable Material etc. removed from some samples prior to Test Weight assessment as it is considered excessive, leading to variable results	Y	Y	Follow written procedure (in all instances sample to be assessed “as is”)
Sample to be used for Test Weight assessment not mixed properly nor is representative of grain to be assessed	Y	Y	Re-sample and divide sample following written procedure used on-site
Insufficient grain poured into height guide apparatus (i.e., ½ litre measure does not overflow)		Y	Pour grain into height guide using a “container” that holds required amount of grain (e.g., at least 1kg of grain)
Calculated result not rounded correctly to the nearest 0.1 decimal point	Y	Y	Apply correct procedure
Height Guide Method			
Height guide too short (i.e., not calibrated to the ½ litre measure)		Y	Replace, only used approved and verified equipment
Height guide too long (i.e., not calibrated to the ½ litre measure)	Y		Replace, only used approved and verified equipment
Grain poured from pouring jug into height guide at some point being too high above height guide	Y		Use consistent and repeatable procedure (e.g., rest pouring jug on top of height guide)
Grain poured from pouring jug into height guide at variable heights (inconsistent and non-repeatable height) above height guide	Y	Y	Use consistent and repeatable procedure (e.g., rest pouring jug on top of height guide)

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Procedure	Potential Impact on Result Obtained		Potential Resolution
	Higher	Lower	
Shaking, knocking, moving apparatus during or after filling and prior to removal of cutter bar	Y		Following commencing test do not move instrument until test completed
Pouring grain too slow into height guide	Y	Y	Follow written procedure, use consistent rate of pour
Pouring grain too fast into height guide	Y	Y	Follow written procedure, use consistent rate of pour
Pouring grain process interrupted due to inadequate sample in pouring jug		Y	Re-start test. Pour grain into height guide using a “container” that holds sufficient grain to overflow from height guide when full
Insufficient grain poured into test unit		Y	Pour enough grain into height guide for grain to overflow from height guide (capture “spillage” using large tray under unit)
Jerking, knocking, not smooth or single firm procedure for pushing cutter bar through sample	Y		Apply smooth procedure when inserting cutter bar. Gently toggle cutter bar into slot if a tight fit
Cutter bar removed too slowly		Y	Rapid withdrawal of cutter bar is required
Cutter bar not used		Y	Refer to correct operating procedures
Cutter bar either placed in unit before testing occurs or not placed in unit until half unit filled with grain	Y	Y	Varying models require the cutter bar to be inserted before or after grain filling. Refer to the operating procedures for each unit type
By holding the height guide at the very top, pushing grain on top of the height guide when inserting the cutter bar	Y		Hold height guide steady by holding on side of height guide, rather than exert pressure from the top
Funnel Method			
Funnel too high above ½ litre measure	Y		Re-calibrate height against reference chondrometer
Funnel too low above ½ litre measure		Y	Re-calibrate height against reference chondrometer
Funnel diameter not appropriate	Y	Y	Re-calibrate height against reference chondrometer
Grain poured into funnel too slowly, resulting in grain coming out of funnel slowly		Y	Pour grain into funnel rapidly and in one motion (e.g., “dump” all grain into funnel rather than “pour”)
Method used to fill ½ litre not calibrated according to commodity type	Y	Y	Review written procedure to ensure correct method used

1.7 Impact of Incorrect Assessment & Potential Actions to Rectify

There may be significant consequences arising from the incorrect assessment or a dispute between two parties on results of a Test Weight assessment. To minimise the occurrence of such events, or the impact, a range of measures as outlined in this Technical Guideline Document (TGD) can be undertaken. Other measures include:

- Verifying all sampling and testing equipment on a regular basis (e.g., pre-harvest), especially for that equipment used in Test Weight assessment (e.g., analytical balance);

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- Ensuring a representative sample is taken for assessment (e.g., sampling procedure followed, sampling equipment not contaminated with prior sample);
- Routine collection of audit samples, and cross-checking results with other parties (e.g., laboratory using a reference method);
- Documenting procedures involved in the sampling and assessment of grain (e.g., as part of the operating procedures for a grain receival site);
- Checking existing instruments to ensure compliance and that they continue to operate as per their specifications and intended purpose. Damaged equipment should be inspected prior to commencement of grain testing (e.g., equipment such as height guide not bent or damaged in any way);
- When upgrading or purchasing new equipment, only purchase suitable instruments and seek certificates from the suppliers that equipment meets any industry or regulatory requirements (e.g., complies with NMI General Certificate and has a verification label attached);
- Ensure all staff are adequately trained in use of equipment and that training is ongoing to ensure staff are deemed competent at all times (e.g., annual refresher training); and
- Have a documented dispute assessment procedure that outlines the processes to be followed when a result obtained is disputed. In the case of Test Weight:
 - Consider allowing a re-test if results are within a particular tolerance from the minimum standard;
 - Consider adoption of other measures such as allowable tolerances where the potential impact is fully known; and
 - Investigate all activities associated with the test, including those of the other party involved in any dispute. This includes equipment used, monitoring of the equipment etc. as outlined in this TGD.