Australian Grain Industry – Code of Practice Technical Guideline Document

No. 16
CERTIFICATION of Grain Testing Equipment used for Trade

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

Version 2
This edition published May 2018

Australian Grain Industry – Code of Practice

http://www.graintrade.org.au/node/670

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Version Control

Date	Version	Amendments
February 2016	1.0	Original document development and release
May 2018	2.0	Revised document approved

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1. Application

This Technical Guideline Document (TGD) refers to Industry best practice for complying with trade certification requirements when assessing grain quality. It also outlines Industry recognised good practice where no prescribed certification procedures exist. This TGD complements the Australian Grain Industry – Code of Practice (GTA Code of Practice).

Industry should also have regard to National Measurement Institute (NMI) requirements, NMI M8 Pattern Approval Specifications for Protein Measuring Instruments for Grain and NITP 15.1 National Instrument Test Procedures for Measuring Instruments for Grain Quality (NITP 15.1).

The information contained in this TGD is for general guidance on Trade Certification only. Given the changing nature of laws, rules and regulations, there may be delays, omissions or inaccuracies in information relating to regulatory controls identified in this TGD.

2. Discussion on Trade Certification

2.1 What is Trade Certification

In terms of the grain industry, the definition of "trade" as outlined in the National Measurement Act 1960 (Act) is "those measurements of a quality parameter that may determine the price for that commodity being traded".

In practical terms, this means that when a sample of grain is tested for classification purposes, any analytical results that are used to classify the grain into a grade fall under the Act. Under related Trade Measurement Regulations there are additional requirements (metrological control systems) for grain protein measuring instruments for wheat and barley and there are efforts to extend that level of specificity to test weight.

Most commodity tests that determine the grade of grain have no legally prescribed verification/certification procedures but are still subject to the Act and are therefore required to be accurate and fair.

2.2 Who Sets Trade Certification Legislation

The National Measurement Institute (NMI) is Australia's principal legal metrology authority responsible for trade measurement.

The NMI therefore is a:

- Certifying authority for standards of measurement generally;
- Verifying authority for standards of measurement generally; and
- Verifying authority for reference standards of measurement.

2.3 Regulations relevant to the Grain Industry

Under the national measurement system, the processes relevant to the grain industry can be generally described as follows:

Pattern Approval Application
The instrument manufacturer applies to the NMI for pattern approval of its specific piece of equipment. This relates to a specific model used for assessing grain for a particular grain quality parameter(s) e.g. protein in

wheat. Pattern Approval is the process of determining whether the design of an instrument is suitable for use for trade. A range of information must be supplied in that application process.

Approving Authorities
The NMI appoints Approving Authorities to conduct pattern approval testing of a grain testing instrument. These Approving Authorities may include the NMI itself.

Pattern Approval Examination
During the pattern approval the NMI examines the pattern (design) of an instrument to ensure that it is fit for use for trade or other legal purposes. This examination involves a range of activities including but not limited to:

- Assessment of the operation of the instrument against requirements (usually based on international recommendations published by International Organization of Legal Metrology (OIML) and
- Performance testing to ensure that the instrument performs as intended (i.e. to within allowable maximum permissible errors) over a range of environmental and usage conditions specified in the requirements (e.g. temperature).

Pattern Approval
On successful completion of the pattern approval process, the instrument manufacturer is issued with a certificate of approval. This is valid for five years and contains an approval number. Production instruments must then be:

- Constructed as described in the documentation lodged with NMI and with the relevant certificate of approval and technical schedule;
- Marked with the pattern approval number; and
- Verified prior to use for trade.

Certifying Authority
The NMI appoints a Certifying Authority(s) to:

- Certify the measuring instrument (e.g. grain protein measuring instruments); and to
- Certify the Australian certified reference materials (e.g. whole grain barley and wheat).

The Certifying Authority may be approved to conduct either or both activities.

Refer to
- "Certifying Authorities – and click on a company to view the conditions applying" http://www.measurement.gov.au/measurementsystem/Pages/LegalMetrologyAuthoritiesAppointed.aspx#

Verifying Authority
The NMI appoints a Verifying Authority(s) to verify reference standards of measurement.

Australian Certified Reference Materials (ACRMs)
These are materials with known quality that are used to assess the "accuracy of an instrument" such as an ACRM for wheat with known protein content. The NMI recognises ACRMs for whole grain barley and wheat. ACRMs are used by the Verifying Authority as noted above. In addition, GTA encourages industry to purchase ACRMs and use them to check the accuracy of their instruments.

Servicing Licences
Individuals and organisations involved in verifying measuring instruments used for trade are required to hold a servicing licence. Servicing licensees have the responsibility to ensure verifiers are competent to verify measuring instruments.

Refer to
- http://www.measurement.gov.au/Industry/Licensees/Pages/I-need-a-servicing-licensee.aspx

Verifiers
Instruments that are used for trade must be manufactured in accordance with the relevant pattern and verified for use. Verification is the process of testing each and every instrument to ensure that it operates correctly and within its specified error limits. Verification is carried out by an NMI-appointed Servicing Licensee with an appropriate licence class for the instrument that they are verifying.

- Details of how to become a servicing licensee and the process for requesting a list of current servicing licensees can be found at http://www.measurement.gov.au/Industry/Licensees/Pages/default.aspx
- Servicing licensees must follow test procedures called National Instrument Test Procedures (NITPs) and they can be found at http://www.measurement.gov.au/Industry/business/Pages/Agriculture.aspx

A servicing licensee can only verify and place a verification mark on a measuring instrument that has been pattern approved, is compliant with the Certificate of Approval, and has a data-plate with the relevant markings.

Re-verification
After the initial verification, each instrument may need to be re-verified on a routine basis. A protein measuring instrument needs to be re-verified at least annually.

Instrument Grandfathering/Expired Certificates of Approval
Grandfathering is the process of granting an approval for types of measuring instruments in use. It is used to recognise existing and established instruments where other metrological controls are introduced. This allows the existing instruments to continue to be used where it is "not economic for the manufacturer to apply/re-apply for pattern approval due to limited sales etc." Instrument manufacturers apply for grandfathering and the NMI considers applications for grandfathering on a case by case basis.

Surveillance
The NMI conducts routine surveillance programs on those in industry involved in the use of instruments for trade. These surveillance programs occur routinely and check the compliance of industry with the minimum performance standards as set out in NMI trade measurement regulations.

2.4 Industry Involvement in Trade Certification

The grain industry liaises with the NMI through the NMI Grain Quality Measurements Committee (GQMC). Various industry members representing a range of sectors of the supply chain are participants on this committee.

The GQMC is the focal point for grain industry and NMI interaction and is responsible for providing leadership and direction on all activities related to trade measurement in the industry.

2.5 Grain Quality Parameters falling under NMI Influence

The following outlines the NMI's requirements for the industry and requirements of industry as determined by industry participants and outlined in the Australian Grain Industry Code of Practice. These can be found on the NMI website at http://www.measurement.gov.au/Industry/business/Pages/Agriculture.aspx.

2.5.1 Protein

NMI Requirements

The NMI has introduced a metrological control system for grain protein measuring instruments:

- This applies to all instruments assessing protein for the purposes of trade.
- The requirements apply to wheat and barley only.
- A national standard for protein measuring instruments applies, being NMI M8 "Pattern Approval Specifications for Protein Measuring Instruments for Grain". Refer to http://www.measurement.gov.au/Publications/PARequirements/Pages/default.aspx. This describes how protein measuring instruments must perform for them to be approved for use in trade and some procedures for monitoring their performance during use.
- All instruments used for protein assessment (e.g. classification of grain) must be pattern approved (unless grandfathering applies). That is, those instruments must be approved for use. A list of all instruments with a pattern approval (number NMI 15/1/-) is on the NMI website at http://www.measurement.gov.au/Publications/CertificateOfApproval/OtherInstruments/GrainProteinMeasuringInstruments/Pages/default.aspx
- National Instrument Test Procedures for Measuring Instruments for Grain Quality NITP 15.1 Part 1 describes the test procedures for the verification and in-service inspection of protein measuring instruments to assess they measure to within the maximum permissible errors specified in the National Trade Measurement Regulations 2009 (Cth) and that they comply with their certificate of approval. Refer to http://www.measurement.gov.au/publications/nmivdocuments/Pages/default.aspx
- NMI has developed a calibration infrastructure for protein testing instruments.
- The calibration has been developed based on development of Australian Certified Reference Materials (ACRMs) via a national collaborative survey.

Industry Requirements

These requirements as listed in the grain industry Code of Practice:.

- Industry must only use pattern approved instruments for trade.
- Instruments should be verified by an approved verifier prior to use (or at least once a year) according to NITP15/1. Each instrument should be marked appropriately to deem it suitable for use and verified.
- When using instruments, industry must comply with requirements of NMI M8 Pattern Approval, including:
    - Method for sampling of a truckload of grain tendered for delivery;
    - The number of ACRM samples to be put through an instrument each day;
    - The maximum permissible error (MPE) for wheat being 0.4%, and for barley being 0.5%; and
    - Methods for calibration/re-calibration.
- Use reference samples during instrument use to show compliance with the pattern approval MPE:
    - Either as per ACRM use outlined above; or
    - At a minimum, using other audit samples of known protein content.
    - The frequency of use of these samples should be appropriate to the frequency of use of the instrument e.g. more than once a day during periods of frequent use.

2.5.2 Test Weight

NMI Requirements

The NMI does not have a list of pattern approved instruments for the determination of test weight, nor does it have a national standard:

- A General Certificate of Approval (NMI 4/10/0A) exists for test weight instruments. Refer to http://www.measurement.gov.au/Publications/CertificateOfApproval/GeneralCertificates/GrainDensityMeasuringInstruments/Pages/default.aspx 4/10/- Grain Density Measuring Instruments.
- This General Certificate
    - Relates to the suitability of the pattern of the instrument for use for assessing test weight for the purposes of trade;
    - Requires instruments purporting to comply with this General Certificate to be marked with approval number 'NMI 4/10/0A';

- Applies to all grains where test weight is assessed;
- Lists design requirements of the instrument (height guide, 0.5L measure etc.);
- Requires a balance to appropriately calibrated with a scale interval of 0.1g.or better; and
- Outlines a test procedure for an instrument requiring three measurements on both the instrument and the reference chondrometer using the same test sample of grain. The mean value of the density should then be determined for each instrument. The discrepancy of the two mean values is to be within ±0.5 kg/hl.

Industry Requirements

These requirements apply as listed in the Australian Grain Industry Code of Practice:

- Industry should only use instruments complying with the design outlined in the General Certificate.
- Instruments should be verified by an approved verifier prior to use (or at least once a year). Each instrument should be marked appropriately to deem it suitable for use and verified.
- Analytical balances should comply with the General Certificate, including:
  - Being NMI approved; and
  - Capable of measuring to 0.1g or better.
- Use reference samples during instrument use to show compliance with the General Certificate "discrepancy of results":
  - Either as per ACRM use outlined above for protein; or
  - At a minimum, using other audit samples of known test weight.
  - The frequency of use of these samples should be appropriate to the frequency of use of the instrument e.g. more than once a day during periods of frequent use.

2.5.3 Moisture

This section does not apply to oven moisture assessment methods.

NMI Requirements

The NMI does not have a list of pattern approved instruments for the determination of moisture, nor does it have a national standard:

- An international standard is being developed and it is expected this will lead to"
  - Developing an Australian standard for cereal grains and oilseeds; and
  - Requiring the use of pattern approved instruments. Refer to http://www.measurement.gov.au/measurementsystem/Pages/moisture-meters-for-cereal-grain-and-oilseeds-feb-2015.aspx OIML R 59 Moisture Meters for Cereal Grain and Oilseeds.
- A range of MPEs will be developed under that international standard.
- The timeframe for development is unable to be determined at this stage.
- In the interim, the NMI encourages industry to monitor moisture testing instruments "where applicable as per protein outlined under 2.5.1".

Industry Requirements

These requirements prevail over the Australian Grain Industry Code of Practice:

- Industry may use any instruments for moisture assessment, recognising many also assess grain for protein and other parameters.
- Instruments that also test wheat and barley protein should be verified by an approved verifier prior to use (or at least once a year). Each instrument should be marked appropriately to deem it suitable for use and verified.
- Use reference samples during instrument use to show compliance with the MPEs outlined in the protein standard:

- Either as per ACRM use outlined above for protein; or
- At a minimum, using other audit samples of known moisture content.
- The frequency of use of these samples should be appropriate to the frequency of use of the instrument e.g. more than once a day during periods of frequent use

2.5.4 Grain Analysing Instruments

These instruments are those currently under development to analyse a grain sample for a range of quality parameters such as defects and contaminants.

NMI Requirements

The NMI does not have a national standard:

- There is a Certificate of Approval listed under "Certificates of Approval for Other Categories of Instruments". Refer to http://www.measurement.gov.au/Publications/CertificateOfApproval/OtherInstruments/GrainAnalysingInstruments/Pages/default.aspx 15/2/- Grain Analysing Instruments.
- This Certificate of Approval is no longer valid.

Industry Requirements

- Industry through the lead "developers" of these instruments is determining the calibrations and other associated requirements of the instruments in order for it to be potentially assessed by the NMI.
- A sub-committee of the GTA Standards Committee is working with the instrument manufacturers and developers to ensure the units will meet industry requirements prior to being fully commercialised and used for trade.
- In the interim, no action is required by industry.

2.6 Industry Tests without Prescribed Metrological Control Systems

Apart from the quality parameters listed above under 2.5, a range of other tests are conducted using instruments that fall under the definition of trade, but are not "regulated" by NMI. These include tests such as:

- Falling Number – wheat, barley, cereal rye;
- Rapid Visco Analyser – barley;
- Vitreous – durum; and
- Oil – various oilseeds.
- Screenings assessment including screens, any shaking device and balances

NMI encourages industry to "monitor all instruments used for trade". As such, the Australian Grain Industry Code of Practice at section 2.2 states a range of activities to be conducted, including:

- Equipment is to be routinely monitored, calibrated and checked to ensure correct operation as outlined in the company Sampling Manual or the Operating Procedures. The frequency of calibration and these checks will vary based on the type of equipment, frequency of use and operating procedures of the company.
- Checking of the calibration will be done by a person appropriately qualified to carry out such a task. Personnel may be external to the company or internal staff skilled in that task.

- Industry is committed to the use of all equipment of a standard for "use in trade" where the outcome of the grain classification process is a payment to the supplier of the grain. All other testing equipment that does not fall under this legislation is also to be checked under similar processes, as it is the desire of industry to ensure all equipment used for grain testing is suited to that purpose.

2.7 Industry Requirements Summary

The above means it is an industry requirement where possible and appropriate for particular instruments and tests, to:

- Use pattern approved instruments;
- Operate pattern approved instruments only under the conditions approved through the pattern approval process e.g. temperature range, moisture range etc.;
- Use authorised persons to verify an instrument:
    - To be done on a routine basis (minimum once a year for protein measuring instruments); and
    - Following "significant changes" to the instrument e.g. calibration, bias adjustment etc.
- Ensure each instrument has the appropriate markings to show the validity of the verification; and
- Obtain and use ACRMs on a routine basis to check instrument performance:
    - The rate of use of ACRMs depending on the frequency of use of the instrument; and
    - Review and modify instruments (calibration etc.) based on those findings and following NMI requirements.

In summary, the following should be done where possible:

Instrument / Test Type	Servicing	Check Samples	Cleaning
All Commodities			
All instruments	Minimum annually	Routinely used	Conducted frequently
Instrument / Test Type	**Pattern Approved Instruments Available**	**Annual Verification to be done**	**ACRM Available**
Wheat/Barley			
Protein	Yes	Yes	Use ACRM
Moisture – non oven methods	No	Yes	No ACRM available – use samples of known quality
Test Weight	Yes	Yes	No ACRM available – use samples of known quality
Screen	No	Yes	n/a, but should check with "go/no-go gauges"
Shaking Device	No	Yes	n/a
Analytical Balance	Yes	Yes	n/a, should check with "check weights" as required by NMI
Falling Number, RVA	No	Yes	No ACRM available – use samples of known quality
Other Commodities			
Oil	No	Yes	No ACRM available – use samples of known quality
Vitreous	No	Yes	No ACRM available – use samples of known quality

3. Further Information

- What is trade measurement
  http://www.measurement.gov.au/Publications/trademeasurement/Documents/What-is-Trade-Measurement.pdf

- How Australia's Measurement System Works
  http://www.measurement.gov.au/measurementsystem/Pages/HowAustraliasMeasurementSystemWorks.aspx