



Australian Government

National Measurement  
Institute  
Trade Measurement



# GUIDE TO THE AVERAGE QUANTITY SYSTEM IN AUSTRALIA

JULY 2010

This Guide to the Average Quantity System (the Guide) contains general information only and should not be relied upon for the purposes of a particular matter. The Guide does not provide legal advice and is not to be relied upon as a source of legal advice. It is provided as a general guide only and as such any person reading this Guide should rely upon their own judgment and make their own inquiries including seeking relevant professional advice before entering into any arrangements or making any commitment on the basis of any of the material in this Guide. Nothing in this Guide shall be taken in any way to replace the provisions of the *National Measurement Act 1960* (Cth), the National Trade Measurement Regulations 2009 (Cth) and any other legislative instruments made pursuant to the *National Measurement Act 1960*.

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On 1 July 2010, the new national system of trade measurement commenced under the administration and regulatory oversight of the National Measurement Institute (NMI) a division of the Australian Government's Department of Innovation, Industry, Science and Research.

NMI is Australia's peak measurement organisation, responsible for maintaining the nation's primary standards of measurement and for providing the legal and technical framework for the dissemination of those standards. NMI is the only 'one-stop shop' for all disciplines of measurement in Australia – analytical, biological, chemical, physical and legal. We provide measurement expertise, calibration services, chemical and biological analyses and pattern approval testing.

Under the national system of trade measurement, and with the support of industry, the Australian Government introduced regulations which for the first time allow businesses the choice to adopt the Average Quantity System (AQS).

AQS is an internationally recognised system for sampling and testing of groups of packages to determine whether, on average, they contain the quantities with which they are marked.

NMI takes its responsibility for ensuring compliance with the trade measurement regulatory framework very seriously. We produce concise and timely communications on business obligations. This Guide provides a summary of new AQS regulations and will be useful for those who need to understand the AQS and how it affects them.

A handwritten signature in black ink, appearing to read 'V. Villière', written in a cursive style.

**Dr Valérie Villière**

General Manager, Legal Metrology Branch

## ABOUT THIS GUIDE

This guide has been prepared by the National Measurement Institute (NMI) to assist businesses in understanding the Average Quantity System (AQS) provisions of the new national trade measurement legislation introduced in 2009.

The *National Measurement Act 1960* establishes a national system of units and standards of measurement and provides for the uniform use of those units and standards throughout Australia. The National Measurement Regulations 2009 prescribe the Australian legal units of measurement, while the National Measurement Guidelines prescribe the basis on which units of measurement and prefixes may be combined to produce an Australian legal unit of measurement.

From 1 July 2010, businesses such as manufacturers, packers and importers will be able to apply AQS as a system of measurement and to label products accordingly as an AQS measure.

The guide is for general advice only and is not a substitute for the responsibility of users to consult the national trade measurement legislation

and to exercise their own skill and care, or seek professional advice, in considering both legal obligations and due diligence defences for their business.

### BACKGROUND

In recent decades, international trade in pre-packed foods and beverages has increased in scale and importance compared with trade in bulk food commodities and now accounts for over 75% of the global trade in agricultural foods. Accordingly, the issues of accurate measurement and labelling of these packages (known internationally as **prepackages**) is also becoming increasingly important.

The introduction of AQS in Australia allows businesses to align their practices more closely with those in other countries.



# WHAT IS AQS?

The Average Quantity System is an internationally agreed method of determining the measurement of pre-packed articles with a 'constant nominal content'. This means it provides confirmation of the measurement or quantity of goods sold by measure (weight, volume, length or area) or count (number of items).

AQS is based on recommendations developed by the International Organisation of Legal Metrology (OIML) and is intended for use in large-scale packaging plants where goods (for example, breakfast cereals) are packed in the same quantity in large numbers.

After extensive industry and consumer consultation, the Australian Government decided to introduce AQS on a voluntary basis. Under the national trade measurement legislation, manufacturers, packers and importers can choose to:

- continue with their current system of shortfall calculation based on the Uniform Trade Measurement Legislation (UTML) adopted by the states and territories, or
- adopt the AQS.

Note that the Australian AQS requirements align fully with OIML recommendations and may differ from those of some other countries that do not fully implement the OIML recommendations. Importers should be aware of these differences when importing products using AQS.

## HOW IS AQS DIFFERENT FROM THE UTML SYSTEM?

Under the existing UTML system:

- the average content in a sample of pre-packed articles of the same measurement can't be less than the stated quantity marked on the packages, and
- no pre-packed article can have a shortfall greater than 5% of the stated quantity.

Under the AQS, packers and importers must comply with three important rules:

- The average net content in a sample from the production run of pre-packed articles can't be less than the stated quantity marked on the packages.
- Allowance is made for a small number of prepackages to exceed a 'tolerable deficiency'.
- None of the prepackages in the sample can have more than twice the prescribed tolerable deficiency.

AQS provides a 97.5% assurance that goods are the correct quantity within the prescribed tolerances. These tolerances are proportional to the quantity of product and related difficulty of accurate filling.



# WHAT DOES AQS MEAN FOR MY BUSINESS?

AQS gives manufacturers and packers an opportunity to:

- reduce UTML compliance costs associated with packing substantially above the stated quantity to avoid rogue packages being included in the sample
- align with international trading partners using the AQS 'e-mark' – allowing for easier export
- use statistical sampling methods providing greater assurance that the packaged goods they sell and buy contain the quantity stated on the label
- have e-marked packaged goods to compete under the same rules as their international competitors in both domestic and international markets, and
- have greater confidence that exported products will not be rejected due to quantity issues.

## DUE DILIGENCE

Packers and importers have a duty to carry out sufficient checks to ensure that all batches of pre-packed articles meet the legislative requirements for correct measurement. The company does **not** need to follow the sampling requirements illustrated below for NMI inspectors, but **strongly recommend** implement testing procedures and practices that

provide a statistically robust and verifiable measure for compliance with these requirements.

When trade measurement inspectors visit premises to inspect pre-packed articles they will be checking what policies and procedures are in place to ensure the articles on the premises are the correct measurement.

Inspectors will request information about:

- your controls to ensure the production process is operating correctly
- sampling and check-measuring plans
- training relating to check-measuring and whether it ensures that staff are competent to conduct these checks
- records being kept and their appropriateness, including actions taken when non-conforming packaged articles are detected
- equipment being used for check-measuring and its suitability for these checks.

If inspectors decide that that they need to test products to assess the validity of these procedures, the testing will be performed at the manufacturing or packing site as outlined below.



# WHAT DOES AQS REQUIRE?

## THE AQS E-MARK

Because AQS and the UTML packaging systems will operate concurrently, trade measurement inspectors need to be able to identify which measurement system has been used.

If you choose to adopt the AQS in your business, you must mark the pre-packed articles with the AQS e-mark which is defined in the regulations as the letter 'e'. The shape, size and location of the e-mark must be:

- at least 3 mm high
- close in position to the stated quantity, and
- in the same field of vision.

In the case of imported products with an e-mark, the inspector would not normally have access to the production records from the overseas manufacturer, and may require the products to be tested from the warehouse. However, testing is not always required as Australia has mutual recognition agreements with some countries, and products manufactured in those countries may have been assessed by the relevant exporting government authority.

Australian manufactured pre-packed articles without an e-mark will be assessed for compliance with the current UTML system and tested by trade measurement inspectors accordingly. These packages may also be tested at the point of sale.

Packers must be aware that it is an offence to mark a package with a mark that is not an AQS e-mark but which is likely to give the impression of being one.

## SHORTFALL

'Shortfall' is a term used throughout the packaging sections of the national trade measurement legislation. It means the extent to which production or output falls short of expectation.

Where a package is tested in accordance with national single article test procedure, there is a shortfall simply if the measured quantity of a package's contents falls short of the declared quantity marked on the package.



In other cases, the term refers to the failure of a group of packages of the same kind when tested according to AQS or non-AQS (UTML) rules. While a large proportion of the packages in a group may be compliant, if a shortfall has occurred then the whole group of packages cannot be sold and the packer must take remedial action.

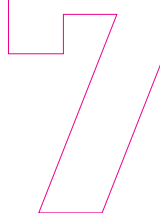
## AQS THRESHOLD

The AQS threshold is the lot size from which the sample number of prepackages is selected. The sample will be inspected to decide if the lot conforms with AQS requirements. These are the requirements stipulated for an NMI inspector to assess for compliance with regulation, as distinct from a testing program adopted by industry. These thresholds are given in Table 1.

Inspection lot thresholds (no. of packages)	Sample size requirements (no. of packages)	No. packages in sample allowed to exceed tolerable deficiency
100 – 500	50	3
501 – 3200	80	5
3201 or more	125	7

Table 1: Inspection lots and sampling requirements





## AQS SAMPLING PROCEDURES FOR NMI INSPECTORS

A trade measurement inspector will select a sample from a lot of packages at random in accordance with generally accepted statistical sampling practice.

If the sample selected from a lot of packages produced on a production line is collected from the production line, the size of the batch from which the sample is collected must be equal to the maximum hourly output of the production line.

If the sample selected from a lot of packages produced on a production line is **not** collected from the production line:

- where there is a maximum hourly output of *more than* 10,000 packages, the size of the batch from which the sample is collected must be equal to the maximum hourly output of the production line
- where there is a maximum hourly output of 10,000 packages *or less*, the size of the batch from which the sample is collected must not be more than 10,000 packages.

## AQS TEST PROCEDURES FOR NMI INSPECTORS

Testing for compliance with the AQS involves testing against the three AQS rules:

1. The average contents of the packages in the sample must not be less than the declared quantity marked on the packages.
2. The number of 'inadequate' packages (that is, packages with a deficiency **greater** than the tolerable deficiency listed in Table 2) in the sample does not exceed the number listed in column 3 of Table 1.
3. There must be **no** inadequate packages with a deficiency more than twice the tolerable deficiency.

WEIGHT OR VOLUME		
Nominal quantity of product ( $Q_n$ ) in g or mL	Tolerable deficiency (T)*	
	Percentage of $Q_n$	g or mL
0 – 50	9	–
50 – 100	–	4.5
100 – 200	4.5	–
200 – 300	–	9
300 – 500	3	–
500 – 1000	–	15
1000 – 10,000	1.5	–
10,000 – 15,000	–	150
15,000 – 50,000	1	–
*T values are to be rounded up to the next 1/10 of a g/mL for $Q_n$ for amounts equal to or less than 1000 g/mL and to the next whole g/mL when $Q_n$ is more than 1000 g/mL.		
LENGTH		
Nominal quantity of product ( $Q_n$ )	Percentage of $Q_n$	
$Q_n \leq 5$ m	No tolerable deficiencies allowed	
$Q_n > 5$ m	2	
AREA		
Nominal quantity of product ( $Q_n$ )	Percentage of $Q_n$	
All $Q_n$	3	
COUNT		
Nominal quantity of product ( $Q_n$ )	Percentage of $Q_n$	
$Q_n \leq 50$ items	No tolerable deficiencies allowed	
$Q_n > 50$ items	1 <sup>^</sup>	
<sup>^</sup> Compute the value of T by multiplying the nominal quantity by 1% and rounding the result up to the next whole number. The value may be larger than 1% due to the rounding but this is acceptable because whole items cannot be divided. <b>Note:</b> The figures in these tables are taken from regulation 4.36 (see <i>More information</i> ) and will be used when carrying out AQS checks on pre-packed articles.		

Table 2: Tolerable deficiencies in actual content of prepackages

# EXAMPLES OF AQS TESTING FOR NMI INSPECTORS

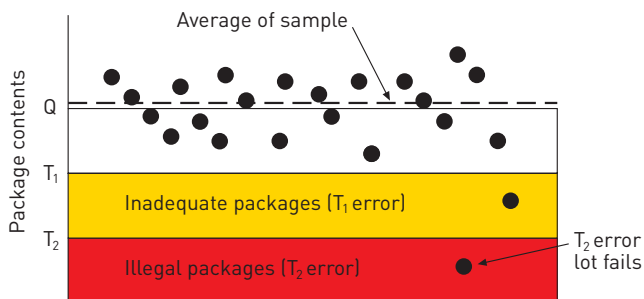


Figure 1: Typical measurements of packages illustrating the use of Q and T values

## AQS TESTS FOR WEIGHT AND VOLUME

In Table 3 shown below, 3500 packs of butter are identified as the lot. Using Table 1, 125 packs of butter are chosen at random as the sample or threshold. Table 2 shows that a 500 g net package is allowed a T of 3% or 15 g. Therefore an inadequate package ( $T_1$  error) is allowed to contain between 485 g and 470 g.

A package weighing less than 470 g would be more than twice the tolerable deficiency and would fail rule 3 ( $T_2$  error). The reference test identifies two inadequate packages, no packages with a  $T_2$  error, and an average net weight of 501 g. Therefore the packs of butter pass all three rules.

If potatoes had been chosen from Table 3, an inspection lot of 148 would have resulted in a sample or threshold size of 50 packages. Table 2 indicates a T of 1.5% (45 g) for a 3 kg bag. The reference test identifies no inadequate  $T_1$  packages and one inadequate  $T_2$  package. The lot fails the reference test because of the one inadequate  $T_2$  package when none are permitted under rule 3.

## AQS TESTS FOR NUMBER

Consider packages of oysters labelled '12 Pacific Oysters'. There are a total of 150 packs which make up the lot. Therefore, using Table 1, 50 packages must be chosen at random to form the sample.

Testing identifies that 49 out of 50 packages contain a dozen oysters, and one package contains 11 oysters. This means the lot fails, because under Table 2 no deficiency is allowed.

A second example involves the inspection of mild steel washers. Each of the 500 packages contains 200 washers, according to their labels. Therefore the sample size is 50 packages chosen at random. Testing identifies five packages that contain 197 washers. Table 2 shows that the tolerable deficiency for packages containing more than 50 items is the nominal quantity ( $Q_n$ ) x 1% ( $T=200 \times 1\%$ ) or two items. Because the number of inadequate  $T_1$  packages permitted would be three (using Table 1), the lot fails the reference test.

Product	Quantity	Lot size	Sample size	Sample average	Number of inadequate $T_1$ packs	Number of inadequate $T_2$ packs	Pass or fail
Butter	500 g	3500	125	501 g	2	0	P
Wine	750 mL	130	50	752 mL	0	1	F
Sugar	1.5 kg	5000	125	1.6 kg	4	0	P
Potatoes	3 kg	148	50	3.1 kg	0	1	F

Table 3: Examples of reference tests for weight or volume

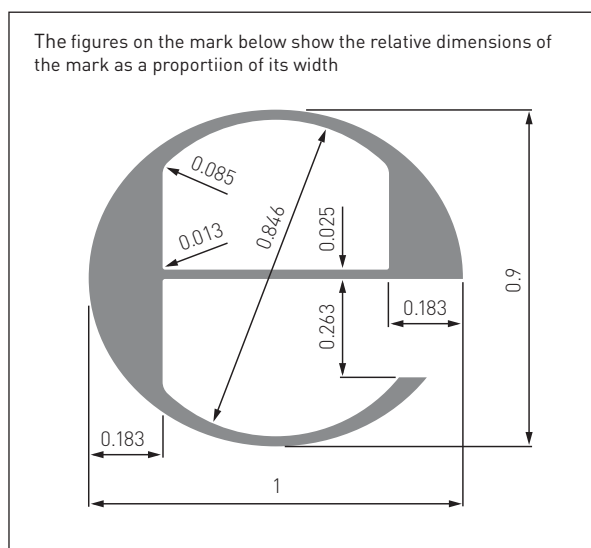


# GLOSSARY

**Actual quantity** – in relation to a prepackage, means the quantity of a product contained in the prepackage, as determined by measurement made by a trade measurement inspector in accordance with the *National Measurement Act 1960* and the *National Trade Measurement Regulations 2009*.

**AQS mark** – means a letter 'e':

- presented as a letter at least 3 mm high; and
- in the form set out in schedule 3 of the regulations.



**AQS threshold** – in relation to a prepackage, means the number of prepackages taken from an inspection lot that are to be inspected to provide information for a decision about the conformance of the inspection lot.

**Average Quantity System (AQS)** - The Average Quantity System is an internationally recognised system for sampling and testing groups of packages to determine whether, on average, they contain the quantities with which they are marked.

**Average error** – in relation to a prepackage, means the sum of individual errors in a sample divided by the number of prepackages in the sample.

**Individual prepackage error** – in relation to a prepackage, means the difference between the actual of the product in the prepackage and its nominal quantity.

**Inspection lot** – means a definite quantity of prepackages:

- that are produced at one time under conditions that are presumed uniform, and
- from which a sample is drawn and inspected to provide information for a decision about the conformance of the prepackages as a whole.

**Nominal quantity** – means the quantity of the product in a prepackage that is declared on the label by the packer.

**Organisation Internationale de Métrologie Légale (OIML)** is an intergovernmental body, established with the aim of achieving international harmonisation for legal metrology.

**Prepackage or pre-packed article** – means a single item:

- that consists of a product and the packing material into which it was put before being offered for sale, and
- that is prepared for presentation to a consumer:
  - as a single item, whether the packing material encloses the product completely or partially, and
  - in a way in which the quantity of the product cannot be altered without opening or perceptibly modifying the packing material, and
- in relation to which the quantity of the product has a predetermined value.

**Principal display panel** – in relation to a package, means the part of the package that is most likely to be displayed under normal and customary conditions of display.

**Shortfall** – is the extent to which the net contents of a prepackage falls short of the stated nominal quantity.

**Tare weight** – is the weight of empty packaging.

**Tolerable deficiency or tolerable negative error** – means the deficiency in a quantity of product permitted in a prepackage.

**Verification** – is a process of ensuring that measuring instruments operate accurately. A measuring instrument is verified if:

- a) either:
  - i. a verifier is satisfied that the measurement instrument complies with the requirements for verification set out in section 18GK of the *National Measurement Act 1960* when tested in accordance with the national instrument test procedures and the measuring instrument is marked with a verification mark, or
  - ii. if the measuring instrument is treated as one of a batch under the national instrument test procedures – a verifier is satisfied that the measuring instruments of that batch comply with the requirements for verification set out in section 18GK when tested in accordance with those procedures and the measuring instrument is marked with a verification mark, and
- b) the instrument is of a class for which a re-verification period is prescribed – the period since it was last verified or re-verified does not exceed the re-verification period.

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## MORE INFORMATION

■ MORE INFORMATION

The main laws covering trade measurement in Australia are the *National Measurement Act 1960* and the National Trade Measurement Regulations 2009. You can access this legislation at [www.comlaw.gov.au](http://www.comlaw.gov.au) or refer to the NMI website [www.measurement.gov.au](http://www.measurement.gov.au).

The International Organisation of Legal Metrology (OIML) has published two recommendations that are relevant to packaging:

- OIML R79 specifies the requirements for labelling of packages, and
- OIML R87 specifies the requirements for filling packages using AQS.

NMI has a presence in every state and territory in Australia. It is organised into five branches: chemical and biological metrology, physical metrology, analytical services, legal metrology and business services.

National Measurement Institute  
Bradfield Road,  
Lindfield, NSW 2070  
PO Box 264, Lindfield, NSW 2070

Tel: 1300 686 664  
Fax: (02) 8467 3715

**[infotm@measurement.gov.au](mailto:infotm@measurement.gov.au)**

**[www.measurement.gov.au](http://www.measurement.gov.au)**

