



EU Average Weight Legislation and Yamato checkweigher modes

Within Europe, a package printed with a 'e' mark indicates that the product has been packed in compliance with EU Average Weight legislation. This ensures that packages contain, on average, at least the quantity printed on the package, protecting consumers against short falls in weight.

A package, as defined by the Weights and Measures (Packaged Goods) Regulations 2006, is:

- A product combined with the packaging of whatever nature made up without the purchaser being present
- The quantity cannot be altered without the package being opened.

Average weight directives provide a regulatory framework for packers and apply to the majority of packages intended for sale in constant quantities between 5g or 5ml and 25kg or 25L. Some products such as biscuits are exempt below 50g. The regulations allow a small proportion of packages to fall below the stipulated quantity printed on the packaging, but only within certain defined tolerances, known as the Tolerable Negative Error (TNE).

The average weight regulations can be simplified into the "3 Packers Rules" which specify that packers must comply with the following:

- Rule 1.** The contents of packages must not, on average, be less than the amount marked on the label. This amount is known as the Nominal Quantity (Qn).
- Rule 2.** Not more than one package in forty may contain less than the nominal quantity by more than a specified amount called the Tolerable Negative Error (TNE). This varies according to the nominal quantity and batch size.
- Rule 3.** No packages may be inadequate contain less than the nominal quantity by more than twice the TNE.

The acceptable Tolerable Negative Error (TNE) for packages, in relation to the nominal quantity (Qn), is defined below:

Qn in grams	As % of Qn	Grams
5 – 50	9.0	-
50 – 100	-	4.5
100 – 200	4.5	-
200 – 300	-	9.0
300 – 500	3.0	-
500 – 1000	-	15.0
1000 – 10000	1.5	-
10000 – 15000	-	150.0
+ 15000	1.0	-

Table 1. The Weights and Measures (Packaged Goods) Regulations 2006.

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Packers of goods sold in Europe are required to comply with the three packers' rules and therefore must employ regular and thorough checks to ensure complete conformity. The quantity of packages can be checked either by taking a statistical sample of the production run and keeping records of the results for at least one year, or by checking every package on suitable equipment.

Checkweighers

Checkweighers provide a solution, allowing packers to implement a number of reject modes to be sure of total compliance with average weight legislation, as well as combining advanced hygiene with high accuracy and speed.

The following reject modes which can help with regulation compliance are available on Yamato Checkweighers:

T1-T2 Reject Mode

This mode allows the packer to pack to average weight legislation and below the nominal quantity (Qn) as long as the average quantity of all packs is at least that printed on the packaging. T1 and T2 are outlined below:

$$T1 = 1 \times TNE$$

$$T2 = 2 \times TNE$$

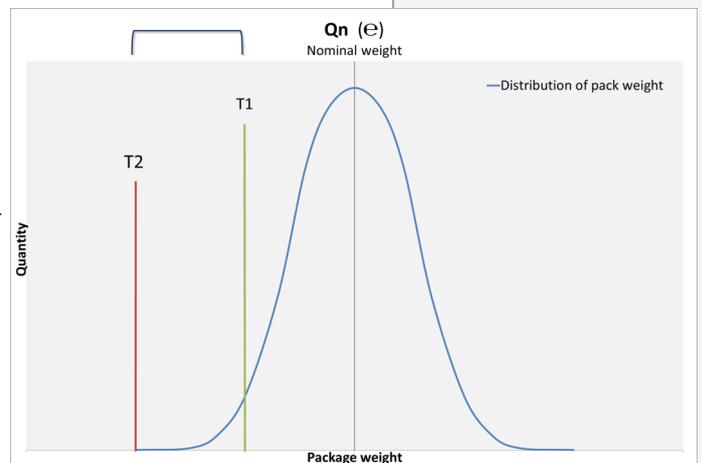
According to Average weight legislation, an unlimited number of packs can fall between Qn and T1. However, it is only acceptable to have 2.5% (1 in 40) of a production run between the quantities of T1 and T2. Packs below T2 are considered illegal and in flout of EU average weight directives.

All Yamato checkweighers automatically calculate these values when the reject mode T1-T2 is enabled. When a production run is started on the checkweigher, the reject point will be set at T1. After 40 acceptable packs, the reject point will automatically switch to T2, allowing one pack through that weighs between the values of T1 and T2. The reject point will then revert back to T1 ensuring that only 2.5% of the production run falls between T1 and T2 as required by EU legislation. On all Yamato checkweighers in normal operation, the display can be seen to switch between the two values.

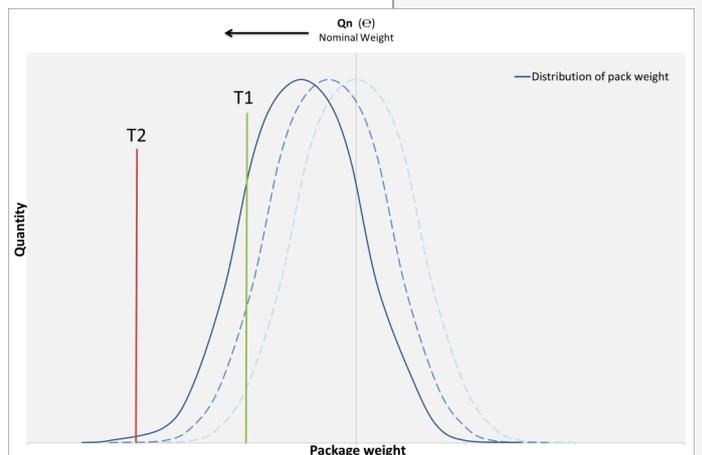
T1-T2-Qn

Over time the average weight of a production run may begin to shift below the stated quantity – this will result in an illegal production run as the average quantity of the packs in the run will be less than the average quantity stipulated upon the packaging.

The T1-T2-Qn reject mode operates much in the same way as T1-T2, but if the average weight of the production run falls below Qn, the reject point



Only 1:40 packages can fall between T1 and T2. Any packages below T2 will be rejected.



As any pack which weighs above T1 is classed as acceptable, over time the average weight of a production run may begin to shift towards T1 - this will result in an illegal production run as the average weight of the packs will fall below the stipulated quantity printed upon the pack (Qn).

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will switch from T1 to the nominal weight (Qn). This guarantees full compliance with average weight legislation at all times as it ensures a production run has an average weight at, or above, the declared weight printed on the pack.

The T1-T2-Qn reject mode is one of the most efficient and effective ways of implementing EU average weight legislation, ensuring the legality and cost-effectiveness of production runs.

IMPORTANT: Confusion can arise when packs are rejected then later accepted by the checkweigher. This is often perceived as a fault so it is vital to train operators so that they have a thorough understanding of the reject mode. When using T1-T2 & T1-T2-Qn reject modes, it is necessary to enter the **Shift Weight**. When the shift weight is entered into the program settings, it is added to the target weight by the checkweigher, also shifting the T1 and T2 values. The shift weight value is designed to accommodate inaccuracies inherent in checkweighing, as well as influences such as pack type, vibration from surrounding machinery, air movement and so on; this is known as the **Zone of Indecision (ZOI)**.

Example Nominal weight (Declared weight) = 100g
 T1 value = 4.5g (95.5g)
 T2 value = 9.0g (91.0g)
 Shift weight = 1.0g

The target weight (**Qt**) will be displayed as 101.0g (nominal + shift). The T1 value will remain at 4.5g, but it will now be 4.5g below the displayed target weight i.e. $101.0g - 4.5g = 96.5g$. T2 will now also be 9.0g below the displayed target weight.

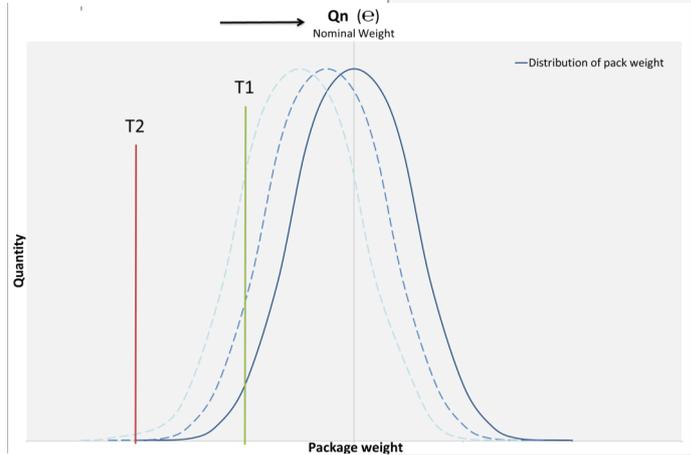
The value of the "Shift Weight" has to be calculated using the formula detailed further below. As the value is influenced by several factors, it is essential that it is calculated for each and every program, as well as checked on a regular basis or if any changes are implemented, in order to maintain accuracy. A worn bearing, a replaced belt or a change in the program settings could cause a change in accuracy and will result in the need to recalculate the shift weight.

Important: Please note that with Yamato checkweighers, the shift weight is automatically set to 0.5g – this will not be correct in the case of all product and should therefore be calculated accordingly so as to avoid illegal production runs.

The "Shift Weight" calculation

The following formula is given in the *Code of Practical Guidance for Packers and Importers* (Weights and Measures Act 1979) and *Evaluation and Testing of Automatic Checkweighing Machines (CBI)*.

$$\text{Shift weight} = (0.5 \times \text{ZOI}) - (0.125 \times \text{TNE})$$



The Yamato reject mode T1-T2-Qn ensures full compliance with Average Weight legislation. If the average weight of the production run begins to fall below Qn, the checkweigher will switch the reject point from T1 to Qn to ensure the legality of the run at all times.

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Where: ZOI Zone of Indecision = $SD \times 6$

SD Standard Deviation

TNE Tolerable Negative Value (T1)

Set up the checkweigher printer to print after 100 packs

1. Pass a sample pack over the checkweigher 100 times. The checkweigher will calculate the Standard Deviation value for this product/program *only*.
2. Calculate the T1 value for the declared weight of the pack as detailed by Table 1.
3. Enter these values into the equation (A spreadsheet which can be used to calculate the shift weight is available from Yamato Scale upon request. Please email service@yamatoscale.co.uk)
4. Enter the 'Shift Weight' into the checkweigher

Minimum and L-QT Reject Modes

Minimum

3 Values have to be entered and are fixed:

Target weight (Qt)	This is nominal weight + shift weight
High Limit	Any packs above this weight will be rejected
Low Limit	Any packs below this limit are rejected

L-Qt

This uses the same limits as the minimum reject mode, but the low reject mode switches between Low and Qt to maintain an average weight output equal to or above Qt.

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Glossary of Terms: -

Absolute Tolerance	Twice the TNE (T2). Any packages over the T2 limit are classed as illegal
“e” Mark	The “e” mark when placed on a package, is declaration by the packer that the contents comply with the Average System Directives (Directive 75/106/EEC and Directive 76/211/EEC)
Inadequate Package	A package whose contents are less than the absolute tolerance limit T2. Packages over the T2 limit are classed as illegal
Negative Error	The quantity by which the contents of a package are less than the nominal quantity
Nominal Quantity (Qn)	The weight or volume marked on or in respect of a package usually expressed in litres, centilitres or millilitres for liquids or in kilograms or grams for other products
Non-standard Package	A package whose contents are less than the Tolerable Negative Error (U.K. allowance 2.5% i.e. 1:40)
Package	A product and its individual protective wrapper or unit which is placed in another package (e.g. a case or box) without the purchaser being present
Reference Test	Statistical checking of batches of packages in order to meet the requirements of average weight legislation. (More information can be found in the Weights and Measures (Packaged Goods) Regulations 2006)
Standard Deviation	A measure of the Natural Distribution, dispersion or spread. Usually produces a "Bell" shape graph (6 x S.D. = Zone of Indecision)
Target Quantity (Qt)	The nominal quantity (Qn) + Shift Weight
Tolerable Negative Error (TNE)	The amount set out in Table 1. in relation to the nominal quantity of the package
Zone of Indecision	The extent, expressed in units of mass, of the zone within which a checkweigher may take two contrary decisions with respect to the same load. The value of the zone of indecision is taken as equal to 6xS.D. of the accept/reject distribution

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About Yamato Scale Dataweigh

Yamato Scale Dataweigh has been operating in the United Kingdom since 1994, offering its customers a range of high quality weighing machinery which includes multihead weighers, check weighers and case packers. Yamato Scale UK provide an exceptional after sales service and genuine spare parts, with qualified and experienced engineers available to repair actuator units, calibrate machines, and carry out commissioning.

Additionally, bespoke training programmes are available for all customers so they can maximise their Return on Investment and ensure optimum production levels at all times.

For further information on Yamato and their weighing solutions please visit www.yamatoscale.co.uk.

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This White Paper is intended to only provide a general outline of the Average Quantity System. Further information can be obtained by reference to:-

The Weights and Measures Act 1985

Weights and Measures (Packaged Goods) Regulations 2006.

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