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ASEAN GUIDELINE

Verification of Automatic Catchweighing Instruments – Version 2.0

Association of Southeast Asian Nations

ASEAN Consultative Committee for Standards and Quality

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1 INTRODUCTION

ASEAN Cooperation on Legal Metrology is aimed at facilitating the removal of technical barriers to trade associated with legal metrology to contribute with the realization of the ASEAN Economic Community. The ASEAN Legal Metrology Authorities have joined together through the ASEAN Consultative Committee for Standards and Quality (ACCSQ) Working Group on Legal Metrology (ACCSQ WG 3) to align legal metrology requirements amongst ASEAN Member States (AMS) and strengthen ASEAN cooperation at relevant international fora. The ACCSQ WG 3 has agreed to collaborate on the harmonization of procedures for the verification of automatic catchweighing instruments using the International Organization of Legal Metrology (OIML) Recommendation R51-1, 2006. Edition as the basis for harmonization. These Guidelines serve as the common reference document by AMS in performing verifications of automatic catchweighing instruments. This will assist industry in ASEAN to reduce the cost of doing business and gain better market access for its products in local, regional and international markets, while at the same time ensuring better protection for consumers and improved social benefits. AMS with existing or developing metrological controls over automatic catchweighers used for trade or for other purposes, where appropriate, are obliged to apply or use the relevant parts of these Guidelines to achieve control procedures which are harmonized and in conformity with current international requirements.

Remark: All requirements in this guideline can be adapted according to national regulations within each AMS.

2 SCOPE

This guideline outlines the testing procedures for laboratory and in-situ verification of automatic catchweighing instruments to ensure accuracy, reliability, and compliance with regulatory standards. The aim is to ensure the accuracy and dependability of these systems used by AMS. It is assumed that the automatic catchweighing instruments described in this document have obtained type approval. This guideline applies to automatic catchweighing instruments, class Y(a) and Y(b), operating in trade transactions within ASEAN. It defines the procedures for testing based on:

- International standards, specifically **OIML R51 – Automatic Catchweighing Instruments**; and
- NMI,A NITP 6.7 National Instrument Test Procedures for Automatic Packaging Conveyor Weighers.

3 TERMINOLOGIES

The following terms apply in the context of this guideline:

Weighing instrument:
Measuring instrument that serves to determine the mass of an amount of material by using the action of gravity on this material.

Automatic weighing instrument:
Instrument that weighs and follows a pre-determined program of automatic processes characteristic of the instrument.

Automatic catchweighing instrument (catchweigher):
Automatic weighing instrument that weighs pre-assembled discrete loads or single loads of loose material.

Automatic Operation:
A weighing process that occurs without intervention by the operator, following a programmed cycle.

Dynamic Weighing:
A weighing mode where the item is weighed while in motion across the load receptor, such as on a conveyor.

Static Weighing:
A weighing mode where the item remains at rest on the load receptor during measurement.

Verification:
The process of assessing and confirming that a catchweigher meets defined metrological and technical requirements.

Initial Verification:
Verification performed before a catchweigher is first put into service.

Subsequent Verification:
Verification after repair, adjustment, or relocation of the catchweigher.

Maximum Permissible Error (MPE):
The largest allowable deviation between the measured value and the reference value under specified conditions.

Reference Mass:

A known calibrated mass used to assess weighing performance.

Scale Interval:

The smallest difference in mass that the instrument can display or record.

Verification Scale Interval (e):

Value expressed in unit of mass, used for the classification and verification of an instrument.

Load Receptor:

The part of the instrument that receives and supports the item during weighing.

Sealing:

A means of securing components or parameters of the instrument to prevent or indicate unauthorised access or adjustment.

Type Approval:

A decision of legal relevance, based on the evaluation report, that the type of measuring instrument complies with the relevant statutory requirements and is suitable for use in the regulated area in such a way that it is expected to provide reliable measurement results over a defined period of time. (International Organization of Legal Metrology, 2013)

4 AUTOMATIC CATCHWEIGHING INSTRUMENTS (ACWIS)

4.1 Principle of Measurement

ACWIs work based on the gravitational force acting on an item. As the item passes over the weighing platform (also called the load receptor), a load cell senses the weight and converts it into an electronic signal. This signal is processed and displayed as the weight of the item.

Weighing happens dynamically while the item is in motion. The system automatically resets and continues the process for the next item, allowing continuous, high-speed weighing. Several factors can influence the accuracy of the instrument, such as:

- speed of the conveyor belt;
- size and position of the load;
- temperature and air movement;

- local gravity conditions.

The weighing result is expressed in units of mass, such as grams or kilograms.

4.2 Types of Automatic Catchweighing Instruments

There are different types of ACWIs based on their function:

1) Checkweigher
   - Verifies if the product weight is within a specified tolerance
   - Often used to reject underweight or overweight items automatically
2) Sorting Catchweigher
   - Weighs and sorts products into different categories based on weight
   - Common in food processing and packaging industries
3) Weight Labelling Instruments (Price-Labellers)
   - Weigh the item and print a label showing weight, price, or other product information
   - Used in retail packaging
4) Postal and shipping scales
5) Instruments that weigh single loads of loose material

5 EQUIPMENT REQUIRED

a) Valid Certificate(s) of approval for instrument
b) Standard weights, traceable to national or international standards
c) Valid calibration certificates for standard weights
d) Suitable material to make test objects for testing
e) A control instrument, capable of higher accuracy (minimum 3 times more accurate

than the catchweigher) with an MPE ±0.5e or better

f) A device to measure the environmental conditions

g) Official test report forms

6 VISUAL INSPECTION

A visual inspection shall be conducted prior to any testing. The following information shall be recorded:

6.1 Required Information

1) Test report reference number
2) Date of inspection
3) Owner/username and address
4) Equipment location (if different)
5) Instrument manufacturer, model, and serial number
6) Certificate of approval number
7) Maximum capacity (Max)
8) Minimum capacity (Min)
9) Verification Scale Interval (e)
10) Accuracy class

6.2 Instrument Characteristics

1) Compliance with certificate of approval
2) Catchweigher is used according to its capacity
3) All mandatory markings (Max, Min, accuracy class, approval number) are present and permanent
4) The data plate is securely attached
5) The instrument is complete, undamaged, clean, and functional
6) The catchweigher is installed on a stable and level base
7) No external factors (dust, air drafts, vibration) are interfering with operation
8) Any peripheral devices (e.g., printers, displays) function correctly and match primary indications

7 STANDARD PROCEDURE

The following standard procedure is referenced frequently throughout the dynamic testing procedures.

7.1 Maximum Permissible Error (MPE)

The maximum permissible errors applicable to dynamic testing during verification are specified in **Table 1**.

Maximum permissible errors	**Load (m) expressed in verification scale intervals (e)**	
	Class Y (a)	**Class Y (b)**
± 1.0e	0 < m ≤ 500	0 < m ≤ 50
± 1.5e	500 < m ≤ 2 000	50 < m ≤ 200
± 2.0e	2 000 < m ≤ 10 000	200 < m ≤ 1 000

Table 1: MPEs for dynamic testing

Maximum permissible errors	**The indication (*I*) will PASS if:**	**Applied load (*L*)**
± 1.0e	(*L*) ≤ *I* ≤ (*L*+1e)	Test object + 0.5e
± 1.5e	(*L*–1e) ≤ *I* ≤ (*L*+1e)	Test object
± 2.0e	(*L*–1e) ≤ *I* ≤ (*L*+2e)	Test object + 0.5e

Table 2: Pass condition and applied load

To determine whether the indication complies with the MPE for the applied load, the following procedure shall be followed:

1) Identify the MPE for the applied load from Table 1.
2) If the MPE is **± 1.0e or ± 2.0e**, an additional **0.5e** shall be added to the test object before applying it to the conveyor system, consisting of a feed-in belt, weighing component, and feed-out belt.
3) If the applied load (***L***) equals the indication (***I***), no further analysis is required, and the result shall be deemed compliant.
4) If the applied load differs from the indication, refer to Table 2 to determine whether the result is within the permissible range.

8 TEST PROCEDURES

The following test procedures are intended to determine whether the performance of the catchweigher meets the verification requirements or whether adjustment is necessary. Each procedure is described separately but may be combined for efficiency. The suggested testing sequence is outlined in Clause 9.

If the catchweigher is intended for use in a different geographical location, corrections for gravitational differences must be applied in accordance with the manufacturer's instructions. Consult the relevant national metrology authority to ensure compliance with local requirements before certification.

8.1 Environmental Conditions

The Instrument and working environment must be clean and free of dust. The environmental conditions (temperature and humidity) should meet with the instrument's operating conditions.

8.2 Control Instrument

A control instrument to determine the conventional true value mass of each test object is used during dynamic testing. The control instruments may either be separate (an instrument other than the instrument being tested) or integral (when a static weighing mode is provided by the instrument being tested).

is

8.2.1 Requirements

Control instrument is typically a non-automatic weighing instrument or the catchweigher operating in static mode.

The control instrument shall meet the following requirements:

1) Be pattern approved.
2) Possess an accuracy at least three times greater than the catchweigher under test.
3) Have an MPE not exceeding ± 0.5e.
4) Have a maximum capacity that is at least equal to or greater than the heaviest load to be tested.
5) Be capable of placing standard weights on the load receptor.

8.2.2 Static Testing

The control instrument shall undergo static testing in accordance with the procedures specified in ASEAN Guideline for Non-automatic Weighing Instruments (NAWI). The results shall be documented in a test report**.** The zero-tracking function, if present, shall be disabled during testing.

If a separate control instrument is required because the NAWI within the catchweigher does not meet the requirements in 8.2.1 then static testing must be performed on both the control instrument and the catch weigher and two test reports provided.

8.3 Preparing Test Objects

Test objects shall represent typical items handled by the catchweigher. The length or width of any test object shall not exceed one-third of the load transport system's length or width.

8.3.1 Selection Criteria

1) A minimum of **five test objects**, covering a range from **Min to Max** in approximately equal steps.
2) One test object of 1/3 Max for eccentricity and weighing performance testing.
3) A test object of Max plus 10e for the over-range blanking test.
4) Test objects at each point where the MPE changes.
5) For multi-interval instruments, avoid using test objects at scale interval change points; instead, select a weight 5e below that point.
6) For multi range instruments, each range should be tested as a separate instruments.

8.3.2 Preparation Procedure

1) Set the control instrument to zero.
2) Place the test material on the control instrument and determine its weight.
   a) If the control instrument has a scale interval greater than or equal to 10 times the scale interval of the catchweigher, record the indication as test object on the test report and proceed to step 3).

b) If the control instrument has a scale interval less than 10 times the scale interval of the catchweigher, apply adjustments to ensure the reading is centered according to the specified procedure as below:

i. Apply 0.5e to the load receptor.

ii. Apply additional standard weights of 0.1e with the test material until the indication changes up and stabilizes.

iii. Remove 0.5e leaving the additional standard weights with the load.

iv. Record the indication as test object on the test report.
Note: The standard weights added in step ii will remain with the test material to form the test object.

v. Remove the test material along with any additional standard weights (if applicable) as a single load.

3) Ensure that the catchweigher returns to zero after the test object has been removed. If the indication does not return to zero, repeat steps 1) to 2) until a correct zero reading is achieved.

4) Repeat steps 1) to 3) for each test object.

8.4 Dynamic Testing

Dynamic testing shall be conducted while the conveyor system is in operation.

8.4.1 Eccentricity Test

To verify the effect of eccentric loading, an automatic weighing test shall be conducted using a test object equivalent to one-third of the maximum capacity (including additive tare, if applicable) at two positions: halfway between the center and the rear and halfway between the center and the front of the load transport system. The test shall be carried out during automatic operation. Zero-setting and zero-tracking functions shall be in operation. Dynamic settings may be performed before each new value of test load is used.

1) Set the catchweigher to zero prior to testing.

2) Set the load transport system at the operating speed, record the speed on the test report.

3) Place a test object of 1/3 Max (plus the additive tare capacity, if applicable) at Band 1 which is halfway between the center and the rear of the load transport system as shown in Figure 1

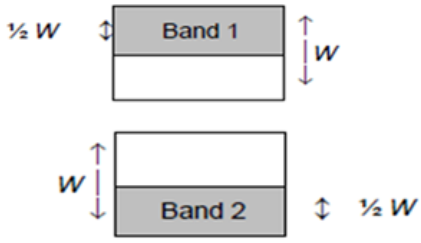

Figure 1

4) Record the indication on the test report.
5) After the test object has passed through the load transport system, ensure that the instrument returns to zero.
6) Determine whether the weighing result from step 3) is within the Maximum Permissible Error (MPE) for the applied test object, as specified in Clause 7.1.
7) Repeat steps 3) to 6) two additional times.
8) Conduct the same test sequence steps 3) to 7) with the test object placed at Band 2, located halfway between the center and the front of the load transport system.
9) If the load transport system operates at variable speeds, repeat steps 1) to 8) at both the minimum and approximately mid-range speeds.
10) For multi-range instruments, repeat steps 1) to 9) for the other weighing ranges.

8.4.2 Weighing Performance

This test procedure is conducted to determine the weighing performance of the catchweigher while the load transport system is in operation.

1) Set the catchweigher to zero prior to testing.
2) Set the load transport system at the operating speed, record the speed on the test report.
3) Place the test object onto the feed-in belt and record the indication on the test report.
4) After the test object has passed through the load transport system, ensure that the instrument returns to zero.

5) Determine whether the weighing result is within the Maximum Permissible Error (MPE) for the applied test object as specified in Clause 7.1.
6) Repeat the weighing process described in steps 3) to 5) a further nine times using the same test object.
7) Perform the complete test sequence from steps 3) to 6) for every test object prepared as specified in Clause 8.3.
8) Conduct an additional test using a test object with a mass equal to Max+10e to verify that the over-range blanking function is operating correctly.
9) For multi-range instruments, repeat steps 1) to 8) for the other weighing ranges.

8.4.3 Item Separation Test

Appropriate measures should be implemented to prevent incorrect weighing results caused by insufficient spacing between items passing through the catchweigher. Such measures may include feed-in systems or detection devices designed to identify and manage inadequate spacing between packages.

The procedure below shall be used to assess the catchweigher's performance when test objects are introduced without spacing between them:

1) Set the catchweigher to zero prior to testing.
2) Set the load transport system at the operating speed, record the speed on the test report.
3) Place two test objects, with a combined mass exceeding three-quarters of the maximum capacity but remaining below the maximum limit, onto the feed-in belt without any separation between the items.
4) Record the indication on the test report.
5) Verify whether the recorded result is within the Maximum Permissible Error (MPE) for the applied load, as specified in Clause 7.1.
6) Repeat steps 3) to 5) two more times.
7) Conduct the same test sequence steps 2) to 6) by placing the two test objects (swap the position) onto the feed-in belt.
8) For multi-range instruments, repeat steps 1) to 7) for the other weighing ranges.

9 SUGGESTED TESTING SEQUENCE

The following steps are recommended to ensure the proper verification of the catchweigher:

a) Ensure that all electronic components of the instrument have been allowed to stabilize by warming up for approximately 30 minutes before testing.

b) Review the certificate(s) of approval for any specific additional tests that may be required, and ensure these tests are included in the overall testing procedure.

c) Conduct a thorough visual inspection of the catchweigher and document all relevant metrological characteristics.

d) Determine whether the catchweigher operating in static mode will serve as the integral control instrument. If not, chose a NAWI to serve as a separate control instrument. Ensure that the selected control instrument meets the criteria outlined in Clause 8.2.

e) Perform verification of the control instrument in accordance with the procedures specified in Asean Guideline for Non-automatic Weighing Instruments (NAWI).

f) Identify the required test objects and prepare them according to the procedures described in Clause 8.3.

g) Ensure that the catchweigher along with the feed-in and feed-out belts, is fully prepared and ready for operation. Set the load transport system to its operating speed.

h) Perform the eccentricity test as specified in Clause 8.4.1.

i) Perform the weighing performance test as specified in Clause 8.4.2.

j) Perform the item separation test as specified in Clause 8.4.3.

k) Evaluate the test results to determine whether the catchweigher has passed or failed the verification.

l) Complete all necessary test reports ensuring that all information is accurately recorded.

m) Conduct any remaining actions required to finalize the verification process. These actions may include removing previous verification, certification, or control marks, and applying the appropriate verification stamp where applicable.

APPENDIX A. TEST REPORTS

Even though the format of the test reports may differ based on the specific needs and preferences of trade measurement authorities and third-party verifiers, the following reports include the minimum required information that must be documented. If additional tests are mandated by the certificate of approval, include supplementary pages that detail the outcomes of these tests.

TEST REPORT FOR AUTOMATIC CATCHWEIGHER

Test report reference number:
Date of test:
For in-service inspection record the verification/certification mark:
Name of owner/user:
Address of owner/user:
Name of contact on premises:
Address of catchweigher location:
Description of catchweigher
Manufacturer/s:
Model:
Serial number:
Certificate/s of approval number:
Max.:
Min.:
Verification scale interval, (e):
Accuracy class:

Does the catchweigher comply with its certificate/s of approval?	yes/no
Is the catchweigher being used at its capacity?	yes/no/na
Are all mandatory descriptive markings clearly and permanently marked on the data plate?	yes/no
Is the data plate fixed on the catchweigher?	yes/no
Is the catchweigher complete?	yes/no
Is the catchweigher broken?	yes/no
Is the catchweigher clean?	yes/no
Is the catchweigher operational?	yes/no
Is the level-indicating device (if fitted) secured and functional?	yes/no/na
Is the catchweigher level?	yes/no
Are there any apparent obstructions to the operation of the catchweigher?	yes/no

Is the catchweigher mounted on a firm base?	yes/no
Is the catchweigher adequately protected against abnormal dust, air movement, vibrations, atmospheric conditions and any other influence likely to affect its performance?	yes/no
For additional indicating devices: do they exactly repeat the information on the primary indication and does any device for price computation and/or ticket/label printing comply with applicable requirements?	yes/no/na

TEST REPORT FOR STATIC TESTING

Zero setting

Load < 4% of Max	ΔL till change point	Set to Zero	+10e	+0.25e	+0.5e

☐ Pass ☐ Fail

Repeatability

$E = I + 1/2\ e - \Delta L - L$

	Load, L	Indication, I	Add. load, ΔL	Error, E
First reading				
Second reading				
Third reading				
Difference (Emax – Emin)				

Check if : $E \leq$ MPE

$E_{max} - E_{min} \leq$ MPE

☐ Pass ☐ Fail

Eccentricity

No. supports :

Applied load, L :

$E = I + 1/2\ e - \Delta L - L$

Position	Indication, I	Add. load, ΔL	Error, E	MPE ± kg
1				
2				
3				
4				

☐ Pass ☐ Fail

Weighing Performance

$E = I + 1/2\ e - \Delta L - L$

Load, L	Indication, I		Add. load, ΔL		Error, E	MPE ± kg
	↓	↑	↓	↑		
Min						

☐ Pass ☐ Fail

Overall result ☐ Pass ☐ Fail

TEST REPORT FOR DYNAMIC TESTING

Test object weight					

Eccentricity

Applied load, L (1/3 Max)									
Belt Speed	Max: m/s			Mid: m/s			Min: m/s		
Band 1									
Band 2									

☐ Pass ☐ Fail

Weighing performance

Belt speed: m/s

	Applied load, *L*	1	2	3	4	5	6	7	8	9	10
Min											

□ Pass □ Fail

Over-range blanking □ Pass □ Fail

Item separation

Belt Speed: m/s

Position	Test object 1			Test object 2		
1						
2						

□ Pass □ Fail

Overall result □ Pass □ Fail