

Singapore Weights and Measures Programme

Information Booklet 2006 (Second Edition)

Weights and Measures Office
(WMO)
SPRING Singapore

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Section I: Introduction

1.1 Preface

Having a uniform and accurate weights and measures system is important to all consumers and traders. At SPRING Singapore, the Weights and Measures Office (WMO) plays an important role in protecting consumers and traders by regulating the use of weighing and measuring instruments used for trade and pre-packaged goods.

This **Information Booklet 2006** is the second edition on the Singapore Weights and Measures Programme, administered by WMO. It serves as a guide for traders, repairers, installers, authorised verifiers (AVs), registered suppliers and meter-proving companies and provides the requirements on weighing and measuring instruments for trade use.

In addition to this publication, WMO also conducts training courses for AVs who plan to familiarise themselves with the verification requirements for weighing and measuring instruments. Those interested can register with WMO via telephone, fax or e-mail.

WMO welcomes feedback to ensure that we continually make improvements to this publication. Please send your feedback to:

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SPRING Singapore
5th Storey Podium Block
2 Bukit Merah Central
Singapore 159835

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Fax: +65 6458 1441
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Website: www.spring.gov.sg/wmo

The **Information Booklet 2006** is also available online at www.spring.gov.sg/wmo

While every effort is taken to present the information as accurately as possible, WMO shall not be held liable for any inaccuracy or omission in this publication. WMO reserves the right to amend and introduce new requirements to the Weights and Measures Programme.

1.2 Overview of the Singapore Weights and Measures Programme

Ensuring Fair Weights and Measures in Singapore

WMO ensures that a uniform and accurate system of weights and measures is used in Singapore thereby ensuring fair trade and correct measurement for excise tax computation. WMO is responsible for the legal metrology of all weighing and measuring instruments used for trade, such as mass, length and volumetric measurements of food, fuel and other essential commodities including pre-packaged goods.

What We Do

WMO's functions can be categorised under two broad areas:

- **Uniform and accurate system of weights and measures** in commercial transactions of goods such as sand, gravel, scrap metal, weighing of containers for the computation of freight charges and determining excise tax on fuel.
- **Fair weights and measures** at retail level to consumers.

To carry out its functions, WMO performs the following:

- Designating AVs (qualified private sector companies) of weighing and measuring instruments for trade use
- Ensuring that weighing and measuring instruments provided by AVs and registered suppliers are of approved patterns (types suitable for trade use) and meet the required standards
- Verifying (for accuracy) and stamping/sealing (to indicate fit for trade use and prevent tampering) all new or repaired weighing and measuring instruments for trade use
- Inspecting weighing and measuring instruments for trade use for inaccuracies and tampering
- Inspecting pre-packaged goods or goods sold by weight or measure for short weight or measure
- Investigating complaints on weights and measures matters

1.3 What You Need to Know about this Programme

Accurate and Uniform System for Traders and Consumers

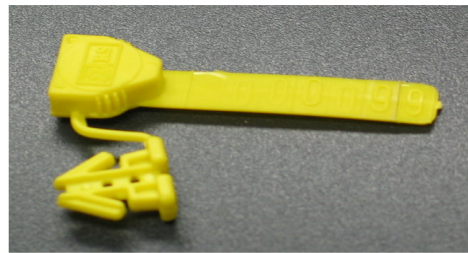
WMO has a system of verification in place to ensure accurate weights and measures. This system uses uniform procedures when dealing with weighing and measuring instruments for trade use. The requirements ensure that the buying and selling of goods based on weights or measures are fair. It is thus important that all weighing and measuring instruments used are type approved and registered by WMO and thereafter verified by WMO or AVs.

Verification Seals

All new or repaired instruments which have been verified by WMO or AVs as accurate and fit for trade use are sealed either with the verification seal or tamper proof paper adhesive seals bearing the letters "RS" (Republic of Singapore) and Republic Shield with a verification number affixed as shown below.



Tamper proof paper adhesive seal



Plastic seal

Verification certificates are issued by WMO only if the new or repaired weighing or measuring instruments are passed by WMO inspector as fit for trade use. However, under the AV Scheme, WMO plans to cease issuing verification certificates with effect from 1 Jan 2009 as by then there would be sufficient number of AVs carrying out the verifications on weighing and measuring instruments.

A weighing or measuring instrument will not be passed as fit for trade use if it:

- Is not suitable for use in trade or
- Does not fall within the limits of error specified for the prescribed instrument. Please refer to Appendix B of the AV Information Booklet 2006 (downloadable from www.spring.gov.sg/wmo.aspx) on Key Sections of the Weights and Measures Act and Penalties for infringement.

Unstamped or Unjust Instruments

If the seal is broken or an instrument is not accurate, the trader must immediately stop using the instrument. The instrument should be sent to a repairer and thereafter for verification by WMO or an AV. Please refer to Appendix B of the Authorised Verifier Information Booklet 2006 (downloadable from

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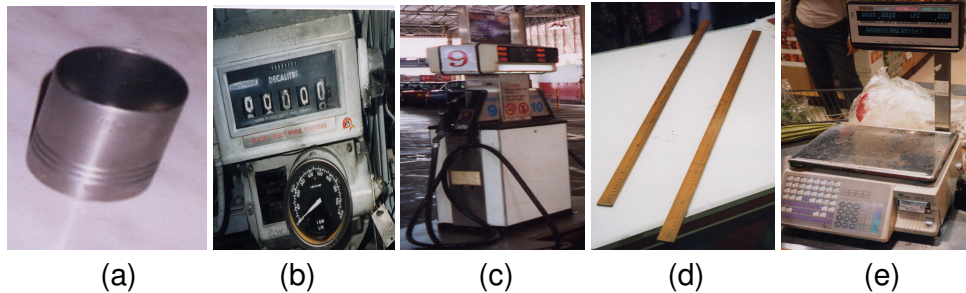
www.spring.gov.sg/wmo.aspx) on Key Sections of the Act and Penalties for Infringement.

About the Weights and Measures Office (WMO)

Did you know WMO has an interesting history that is as old as Singapore? WMO started as a unit of the Police Force in 1889 when Singapore was a British colony. Five years after Singapore achieved independence, WMO was transferred from the Police to the Trade Division of the Ministry of Finance in 1970. Later in April 2000, WMO was transferred from the Ministry of Trade and Industry to SPRING Singapore (Standards, Productivity and Innovation Board).

2 Weighing and Measuring Instruments for Trade Use

The instruments prescribed for trade use are shown below.



- (a) Instrument for the measurement of liquor
- (b) Flow meter
- (c) Oil dispensing pump
- (d) Linear measures
- (e) Non-automatic weighing instrument

2.1 Prescribed Limits of Error

The details for the types of prescribed limits of error for the instruments mentioned in above item 2 are available in [Appendix H of the Authorised Verifier Scheme Information Booklet 2006 \(downloadable from \[www.spring.gov.sg/wmo\]\(http://www.spring.gov.sg/wmo\)\)](#).

2.2 Maintenance of Weighing and Measuring Instruments

Traders should ensure that their weighing or measuring instruments are:

- Accurate and in correct working order at all times
- Easy for consumers to read the scales or measuring instruments, e.g by using dual-faced indicator type instrument
- Instruments that come with a level indicator must be adjusted by setting the height adjustments of the instrument to ensure that the bubble is at the centre of the level indicator.
- Zeroed before goods are weighed or measured
- Clean and free from foreign particles on the weighing pan. The WMO seal must be affixed onto the instrument at all times
- Sent for annual re-verification to prevent short weights or measures.

2.3 Disqualification (Cancellation) of Stamps

How should Stamps be Cancelled?

Stamps should be cancelled according to the requirements of these regulations by means of punches of a six pointed star design as shown in the following illustration.



When should Stamps be cancelled?

Stamps should be cancelled under the following circumstances:

- When any weight, measure, weighing or measuring instrument falls outside the prescribed limits of error
- When any weight, measure, weighing or measuring instrument has been damaged and cannot be adjusted properly
- When there is evidence that weighing and measuring instrument has been tampered with.

No person should use for trade any weight, measure, weighing or measuring instrument in which the stamp has been cancelled.

Notice to Correct and Stamp Equipment

WMO may require any person or company in possession of any weighing or measuring instrument used for trade to have the equipment corrected and submitted for stamping within a period specified in the notice.

Section II: Technical Requirements

Chapter 3 Registration of Approved Patterns of Weighing and Measuring Instruments

Weighing or measuring instruments which are manufactured for trade use must have in their instruction or operation manuals/leaflets, a statement advising users to seek approval from their national weights and measures authority before these instruments can be used for trade purposes.

Under Section 8 of the Weights and Measures Act, all weighing or measuring instruments must be of approved patterns (types suitable for trade use). The WMO approves and registers the patterns of weighing and measuring instruments used for trade in Singapore. Please refer to Annex B for flowchart on Registration of Approved Patterns of Weighing and Measuring Instruments for trade use.

The metrological, technical and construction requirements for registration and approval, testing and examining procedures of non-automatic weighing instruments are based on international practice established by the International Organisation of Legal Metrology (OIML) under publication OIML R 76-1.

An applicant wishing to seek approval and registration for a weighing or measuring instrument has to submit the following documents to WMO.

- Completed Registration of Weighing and Measuring Instruments Application Form 101 (Refer to Annex D)
- OIML Certificate of Approval, which is issued to attest the pattern of a new weighing or measuring instrument for trade use
- Instrument test report, which is linked to pattern approval certificate
- Circuit Diagram with key components part list
- Photographs showing external view of instrument, rating label and internal view with key components
- User's instruction manual with safety and calibration instructions.

WMO may accept pattern approval certificate and test data issued by the national authorities of any weighing or measuring instrument which was tested and in accordance with the relevant OIML Recommendations.

Only weighing and measuring instruments with registered patterns will be allowed to be verified for trade purposes in Singapore.

Chapter 4 Supply / Repair of Weighing and Measuring Instruments

No licence is required for the supply of weighing and measuring instruments.

Standard Weights Greater than One Ton

When testing instruments with the maximum weight greater than one ton, any other calibrated load may be used instead of standard weights, provided that calibrated standard weights of one ton or 50 percent of the maximum (whichever is greater) are used. Standard weights are subject to yearly verification and stamping by WMO.

Take for example the testing of a 40 ton Weighbridge. If the maximum capacity of weighbridge is 40 tons, the calibrated cast-iron weight required would be 20 tons and the other 20 tons can be of other constant weights. The 20 tons calibrated cast-iron weight can be made up of 20 pieces of one ton cast-iron block weight or 10 pieces of one ton cast-iron block weight and 40 pieces of 250 kg (total 10 tons) cast-iron roller weights.

Chapter 5 Verification of Weighing and Measuring Instruments

5.1 Weighing Instruments

The verification and re-verification of a non-automatic weighing instrument involves a process to ensure that the instrument is functioning correctly and sealed to prevent tampering so as to protect both consumer and trader interests. The AV or the user of weighing instruments may use the following sequence of procedures based on OIML R76-1 to verify or to inspect a weighing instrument already in service.

- Allow electronic instrument to warm up for about half an hour
- Check the documentation and note whether any supplementary tests are required
- Inspect instrument and make a note of the instruments metrological characteristics
- Conduct a repeatability test using this test as a pre-load or to exercise the machine. During the repeatability test for a mechanical instrument, check the accuracy of the zero-setting device
- Conduct eccentric loading to check that the readings for the same load when placed at various points of the instrument's weighing area are within the prescribed limits of error.
- Check the accuracy of zero
- Determine the loads for the weighing test then carry out the weighing test. You can combine the weighing test and discrimination test at one or more of the test loads during the weighing test
- Conduct an accuracy of tare setting on electronic instruments
- Conduct a price indication test during the weighing test
- Carry out any other test to complete the verification, or re-verification of instrument.

5.2 Measuring Instruments

Operators of fuel dispenser pumps have to submit quarterly calibration reports on all oil dispensing pumps to WMO.

Repairers and AVs are allowed to break the seals on oil dispensing pumps to carry out repairs using the following procedure.

- Take three readings from each nozzle using a verified 25 litre standard tank measure
- Disconnect any metering unit that are beyond the Maximum Permissible Error (MPE)
- Padlock the pump after breaking the seal and keep the keys to prevent the operator from using the pump. A signboard/sticker is required to be displayed prominently to indicate the pump is under repair/service

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- The repairers or AVs will repair the pump. The repairers need to arrange a verification appointment with WMO or an AV. One day before the appointment, the repairer must submit the break seal report together with the last weights and measures stamping plates to WMO or an AV
- Indicate the operator's name, location, pump number, pump product grade, weights and measures verification number and the pump volume totaliser reading (at the time of break seal) in the break seal report
- Ensure that the repair/re-adjustment of the pump is carried out properly as only one adjustment is allowed during the verification by WMO or an AV. If the pump is found to exceed the - 75 ml or + 75 ml mark for a 25 litre delivery, the pump will be considered unfit for stamping and the repairer will have to arrange another appointment with WMO or the AV.

Chapter 6 Proving of Custody Transfer Meter / Flow Meter

6.1 Frequency of Proving

All flow meters should be serviced and stamped at least once a year. A meter must be proved:

- In situ (applicable only for volumetric flowmeter) by reference to either a:
 - Prover loop or proving tank certified by an authorised meter proving company, or
 - Master meter which for this purpose, is defined as a meter proved against a certified prover loop and proving tank using the same product (or one of similar viscosity and density) to prove the meter under the test

When proved in a calibration laboratory,

- The verification of the flow meter may be conducted by the gravimetric / volumetric method, or with a master meter, or other suitable methods, provided that the requirements are met
- The uncertainty (at a 95 percent confidence level) in determining the error of flow meter under test should not exceed 1/3 of the maximum permissible error to be applied:
 - At a flow rate which is not above the maximum or below the minimum level of operation
 - Within the normal operating range of pressure and temperature.

6.2 Accuracy

- For class 0.3 meters (such as meter systems in pipework and truck loading and terminal meters), the prescribed limits of error is ± 0.2 percent of the measured quantity for initial verification and ± 0.3 percent of the measured quantity for in-service inspection
- For class 0.5 meters (such as meters used generally for trade), the prescribed limits of error for initial verification and in-service inspection is ± 0.5 percent of the measured quantity
- Two or three points of test flow rates should be optional within a specified flow range including a point of normal flow rate
- Minimum of three test runs for each test flow rate
- An average of three runs to be used as the certified value of the meter's accuracy for each test flow rate

6.3 Repeatability

For class 0.3 meters, three consecutive results must lie within a band of ± 0.12 percent of the measured quantity. Individual results must be within the prescribed limits of error stated above.

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For class 0.5 meters, three consecutive results must lie within a band of ± 0.2 percent of the measured quantity. Individual results must be within the prescribed limits of error stated above.

6.4 Proving Standards

- All methods, procedures concerning calibration, facilities on *volumetric proving* should be in line with the international code of practice or any standards which are acceptable by WMO
- All methods, procedures concerning calibration, facilities on *gravimetric proving* should be aligned with the International Organisation of Legal Metrology (OIML) or any standards which are accepted by WMO
- Measuring instruments used for testing equipment for a custody transfer should be periodically calibrated by comparing with the following standards which are traceable to the international standards (Refer to Figure 1 and 2).

Figure 1 : Volumetric Standards

Type of volumetric standards	Validity of calibration
Proving tank (permanently in a fixed location)	Five years
Proving tank (portable, movable or mobile)	One year
Pipe prover or compact prover	One year
Master meter	One year

Figure 2 : Gravimetric Standards

Type of gravimetric standards	Validity of calibration
Deadweights (class E2)	Three years
Weighing balance	One year

6.5 Viscosity

A custody transfer flow meter should not be provided with automatic viscosity compensation. However, when testing flow meters (class 0.3 and 0.5), the testing liquid should be selected according to the viscosity range of a liquid to be measured as specified in the following table.

Viscosity Range	Testing liquid
Less than 3 centi-Poise (cP)	Gasoline, kerosene or actual liquid
3 cP to 6 cP	Diesel or actual liquid
Above 6 cP	Fuel oil or actual liquid

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When a turbine meter is used for custody transfer of white petroleum products such as gasoline or kerosene, the meter should be calibrated with the actual liquid to be metered by the authorised meter proving companies. Presently there are four meter proving companies proving flow meters and turbine meters on behalf of WMO. They are:

1. Flowmeter Calibration Services

Blk 1 #02-141
Marsiling Industrial Estate Road 4
Singapore 739229
Tel: +65 6368 5304
Fax: +65 6269 7406

2. SGS Testing & Control Services Singapore Pte Ltd

26 Ayer Rajah Crescent
#03-07 Ayer Rajah Industrial Estate
Singapore 139944
Tel: +65 6778 1550
Fax: +65 6779 0527

3. Singapore Test Services Pte Ltd

249 Jalan Boon Lay
Singapore 619523
Tel: +65 6660 7316
Fax: +65 6261 2617

4. MOGAS Flow Lab Pte Ltd

22 Tuas South Street 5
Singapore 637822
Tel: +65 6898 9763
Fax: +65 6898 9761

Based on the reports issued by the above proving companies, WMO or authorised verifier will check and authorise the proving reports, issue verification certificates and affix seals or stamps and approve the meters as fit for trade use.

Section III Annexes

ANNEX A

Definitions

Accuracy

The closeness between the result of a measurement and the true (conventional) value of the measured quantity.

Adjustment

Alteration of the measurement parameters to bring the dispenser within the allowable maximum permissible errors permitted in service.

Automatic

Instrument that does not require the intervention of an operator during the weighing process.

Electronic instrument

Instrument equipped with electronic devices.

Instrument

Instrument means a weighing and measuring instrument.

Instrument test report

Based on the performance of a module or a complete instrument and may or may not take into account the pattern approval specifications.

Initial verification

The verification of a new instrument, which does not bear WMO's mark and has never been verified before.

Load receptor

The part of an instrument intended to receive the load.

Mass

The amount of matter of an object, regardless of location.

Maximum Permissible Error (MPE)

Maximum difference, positive or negative, allowed by regulation between the indication of an instrument and the corresponding true value, as determined by reference standard weights with the instrument being at zero with no-load, in the reference position.

Non-automatic weighing instrument

Instrument that requires the operator to remove the load from the weighing area of the weighing instrument during the weighing process. For example, to obtain the result by depositing on or removing from the receptor the load to be measured.

Pattern of an instrument

The definitive design of an instrument of which all the components affecting its metrological properties are suitably defined.

Price-computing instrument

Instrument that calculates the amount to pay on the basis of the indicated mass and the unit price.

Repeatability

The ability of an instrument to provide results which agree with each other when the same load is deposited several times and in a practically identified way on the load receptor under reasonably constant test conditions.

Re-verification

Any verification of a weighing or measuring instrument which follows the initial verification, because for some reason the stamp is no longer valid due to conditions such as:

- Repairs or adjustment to the instrument
- The stamp has been removed
- At the request of the user.

The verification involves an examination of an instrument carried out by WMO or authorised verifier with the aim of checking that the instrument has not been modified in any way after verification, and errors do not exceed the maximum permissible error permitted for re-verification.

Stamping

All operations for the purpose of applying to an instrument to indicate that it conforms to the requirements of verification and re-verification. It can be a stamp plug, a stamping label or a wire seal.

Standard weight

A mass which is calibrated against a reference standard weight, and is used to verify ordinary weighing instruments of a lower accuracy than itself.

Verification

The examination of an instrument by a WMO inspector or an authorised verifier (AV) in order to indicate that the instrument conforms to the requirements outlined in the WMO Information Booklet

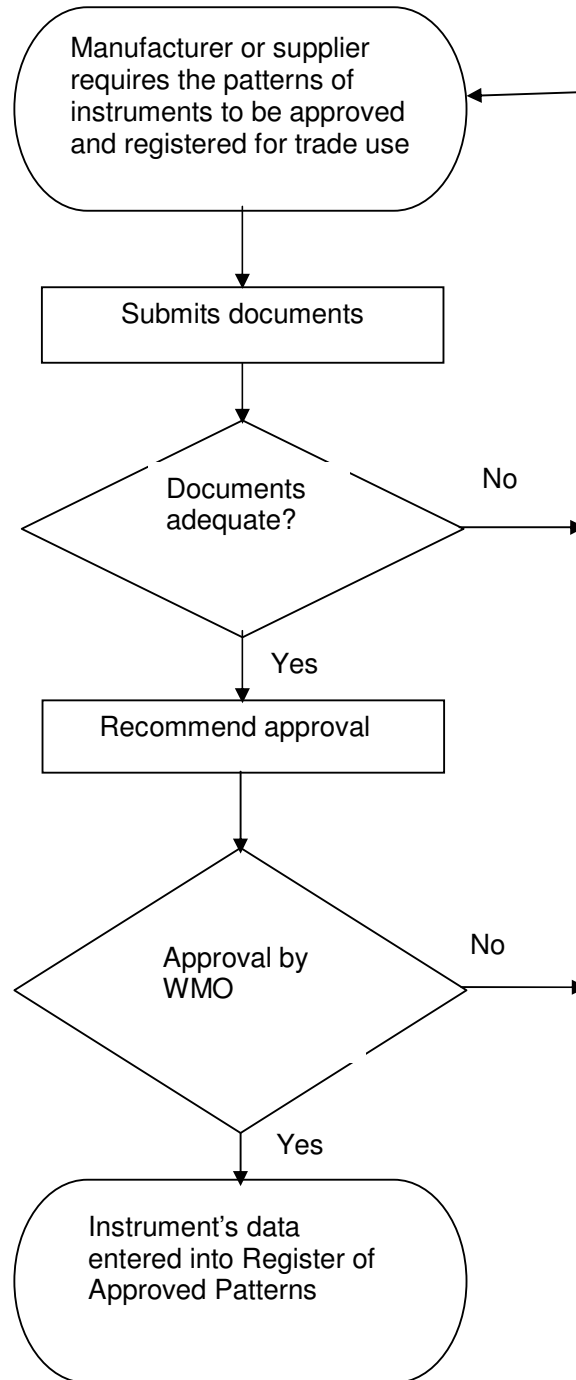
Weighbridge

A weighing instrument that is of a capacity of three metric tonnes or more and has a platform through which the weighing instrument is capable of determining the mass of a vehicle or product.

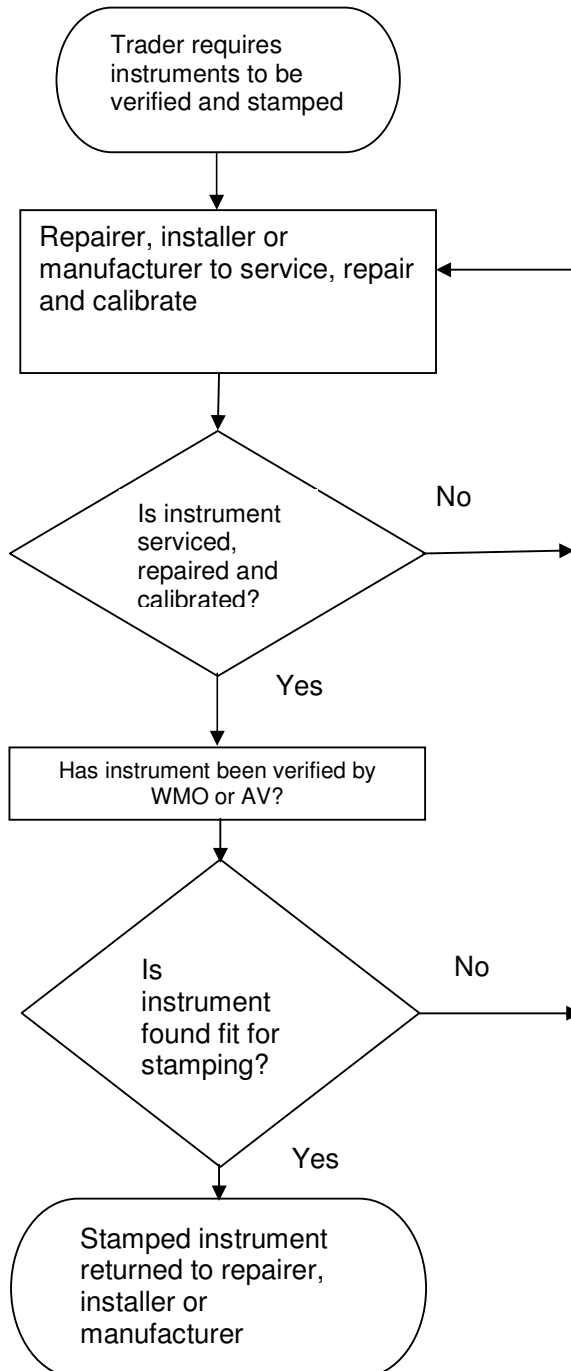
Weighing instrument

An instrument that serves to determine the mass of a body by using the action of gravity on this body. The instrument may also be used to determine other quantities, magnitudes, parameters or characteristics related to mass. According to its method of operation, a weighing instrument may be classified as automatic or non-automatic.

Flow Chart for Registration of Approved Patterns of Weighing and Measuring Instruments



**Flow Chart for Verification of Weighing and Measuring Instruments
by WMO or an AV**



**Application for the Weighing and Measuring Instruments
Pattern Registration Scheme**

PART 1 – COMPANY DATA

Company Name:

Company Address:

Tel no:

Fax no:

Name:

Designation:

PART II – INSTRUMENT DATA

Please tick type of instrument:

- | | |
|--|--|
| <input type="checkbox"/> Electronic Weighing Scale | <input type="checkbox"/> Electronic/Digital Balance |
| <input type="checkbox"/> Indicator | <input type="checkbox"/> Loadcell |
| <input type="checkbox"/> Fuel Dispenser | <input type="checkbox"/> Flowmeter (Turbine/Positive Displacement/Coriolis Mass Flowmeter) |

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Name and Model no:

Capacity:

Accuracy Class:

Name of Manufacturer

PART III – INTERNATIONAL ORGANISATION OF LEGAL METROLOGY (OIML) CERTIFICATE OF CONFORMITY AND PATTERN EVALUATION / TEST REPORT

OIML Certificate of Conformity No.:

Pattern Evaluation / Test Report No.:

OIML Certificates Issuing Authorities:

PART IV - CHECKLIST

(Please tick and attach the following documents)

- Copy of OIML Certificate of Conformity
- Copy of Pattern Evaluation / Test Report(s)
- Circuit Diagram (Supported with key component part list)
- Photographs (1 external view, 1 with rating label and 1 internal view with key components)
- User Instruction Manual (with safety and calibration instructions)

PART V – DECLARATION BY APPLICANT

We hereby apply to Weights and Measures Office, SPRING Singapore, 2 Bukit Merah Central, Singapore 159835, for registration of weighing or measuring instruments in accordance with Weights and Measures Act Chapter 349. We certify that all statements made and information given in this application are true to the best of our knowledge and belief.

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We declare that all the required documents of this application are attached. We realise that our application will be delayed in the event the required documents are incomplete.

Signature:

Name:

Date:

Designation:

Guidelines for Completing the Application for the Weighing and Measuring Instruments Pattern Registration Scheme

1. Applicant's details

- (i) Name of the company applying for the approval
- (ii) Address of the company
- (iii) Name and Title (designation) of the person appointed by the company to be in-charge of submission of application as well as to liaise with WMO.

2. Instrument details

- (i) Name and short description of the instrument to be approved
- (ii) Brand name and model number of the instrument
- (iii) Capacity, e-value and class of the instrument. State the various ranges used on the instrument
- (iv) Name of the company that manufactures the instrument
- (v) Country of origin and the manufacturer's address.

3. OIML Certificate of Approval and pattern evaluation test report

Fill in all the certificates and test report reference numbers, the issue date and name of the certifying body that issued the certificate and test report. The OIML Certificate of Approval must be issued from a weights and measures authority whose country is a full member of OIML. In addition, the tests must conform to relevant OIML Recommendations.

4. Ensure the following documents are attached

Tick against the boxes to ensure that all documents are in order. Application for registration of new weighing or measuring instrument that does not come with the required documents will not be processed.

5. Applicant's legal statement

Fill in the name of the company [as stated in Item 1(i)]. The person (who represents the Singapore company) will be responsible for the application. He will sign the application and endorse it with the company's seal or rubber stamp (if a seal is not available). The name, title (designation) of the signatory and date should also be put down.