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Productivity, Innovation, and Certification for  
Enterprises in Food Processing in Western  
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**National Metrology Laboratory**

# Boosting Seller and Consumer Confidence through Legal Metrology

Fair Trade: When LGUs are in control of the  
use of Weighing Scales, Fuel Dispensers  
and Pre-packaged Products

# Overview

- The National Metrology Laboratory
- What is Legal Metrology?
- Why is Legal Metrology important?
- What is the difference between Calibration and Verification?
- What is traceability?
- What is the IDEAL set-up of a legal metrology system?
- What is the CURRENT set-up of the legal metrology system in the Philippines?
- What are the laws, regulations, and international agreements governing measurements in the Philippines?
- Conclusion

# The National Metrology Laboratory of the Philippines

## national metrology institute

A national metrology institute or NMI is a national institute designated by national decision to develop and maintain national measurement standards for one or more quantities and their respective traceabilities.



NMIA-Australia

NPL-India



NIMT-Thailand



A-Star-Singapore



Philippines



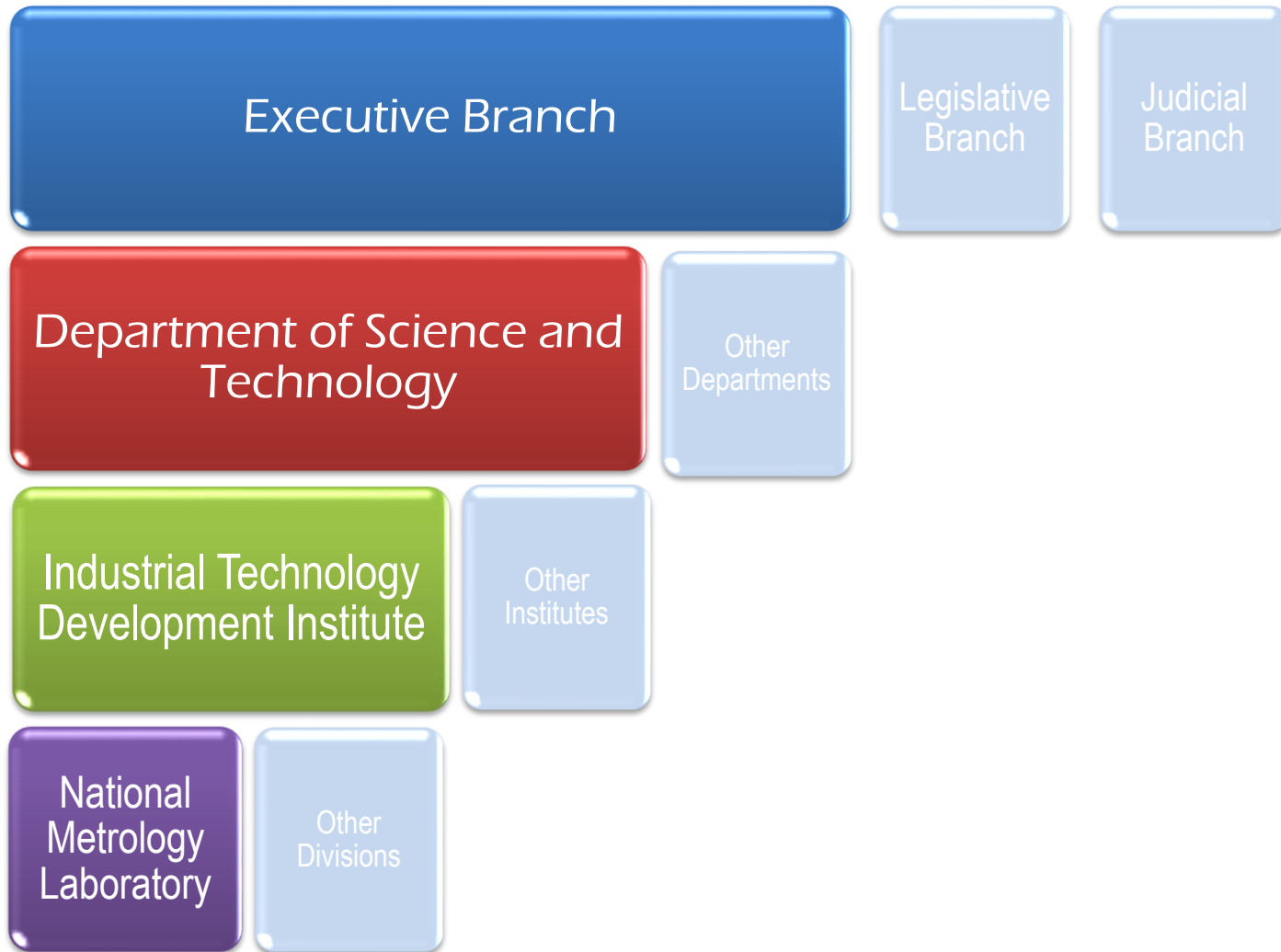
MSL-New Zealand



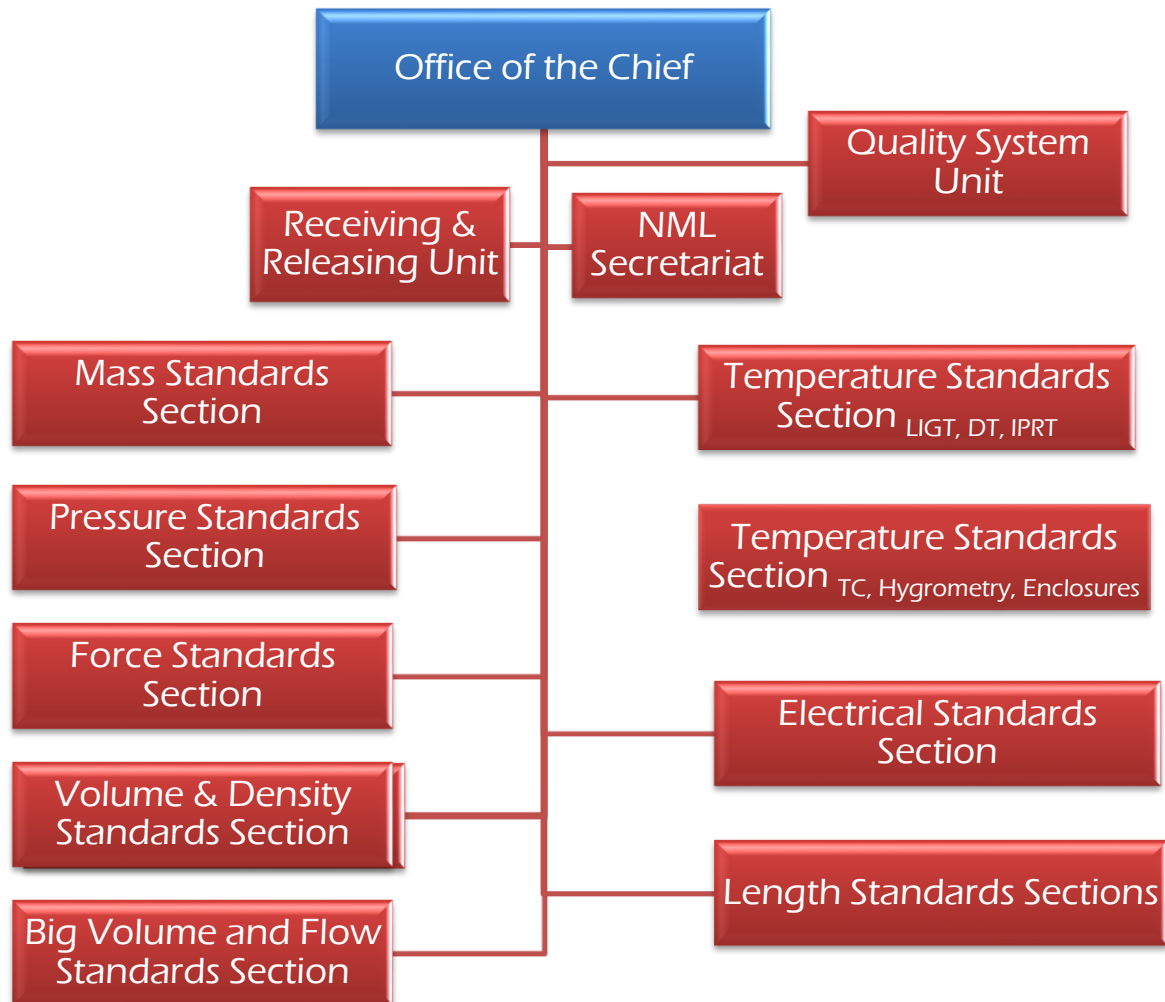
PTB-Germany



# The National Metrology Laboratory of the Philippines



# The National Metrology Laboratory of the Philippines

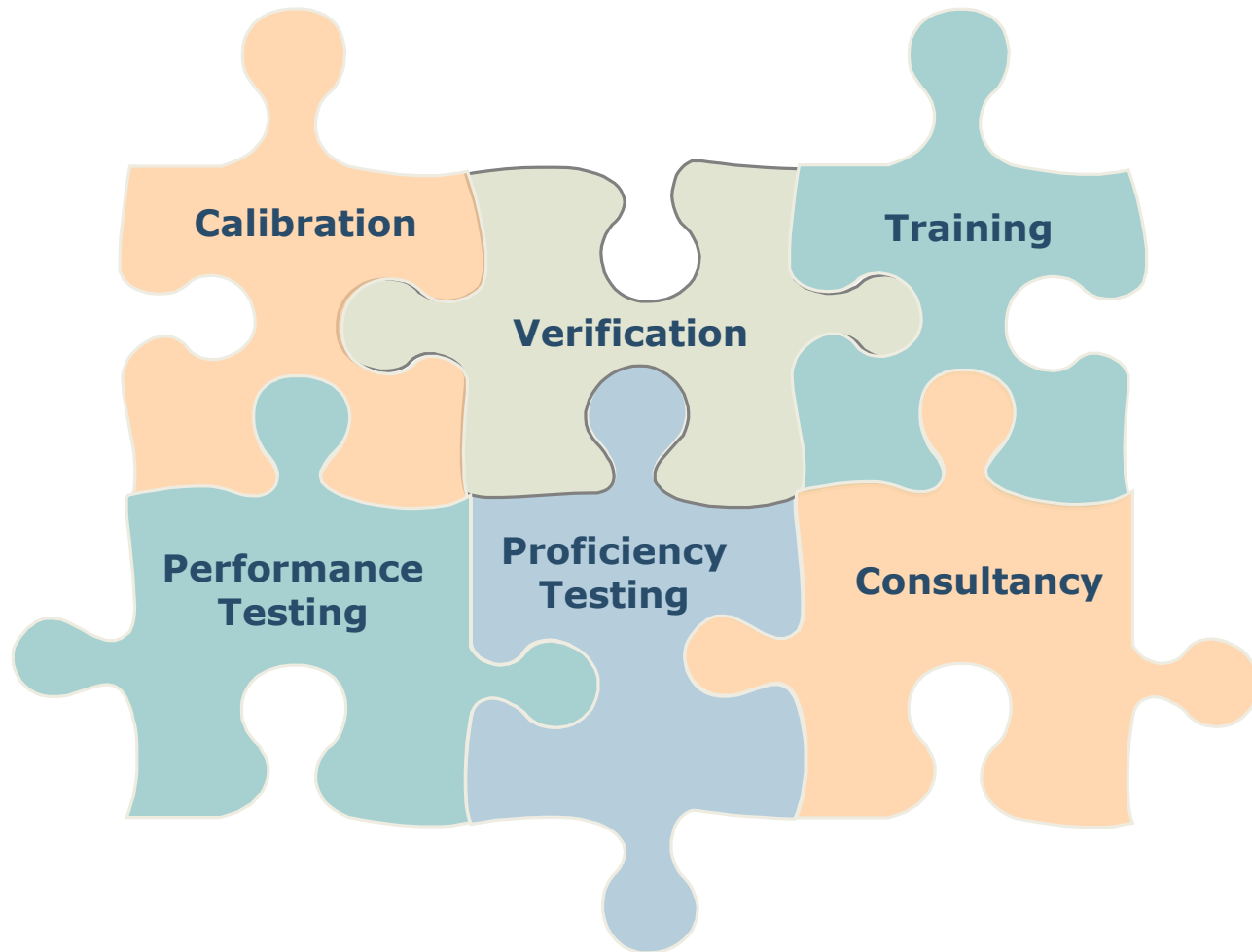


# The National Metrology Laboratory of the Philippines



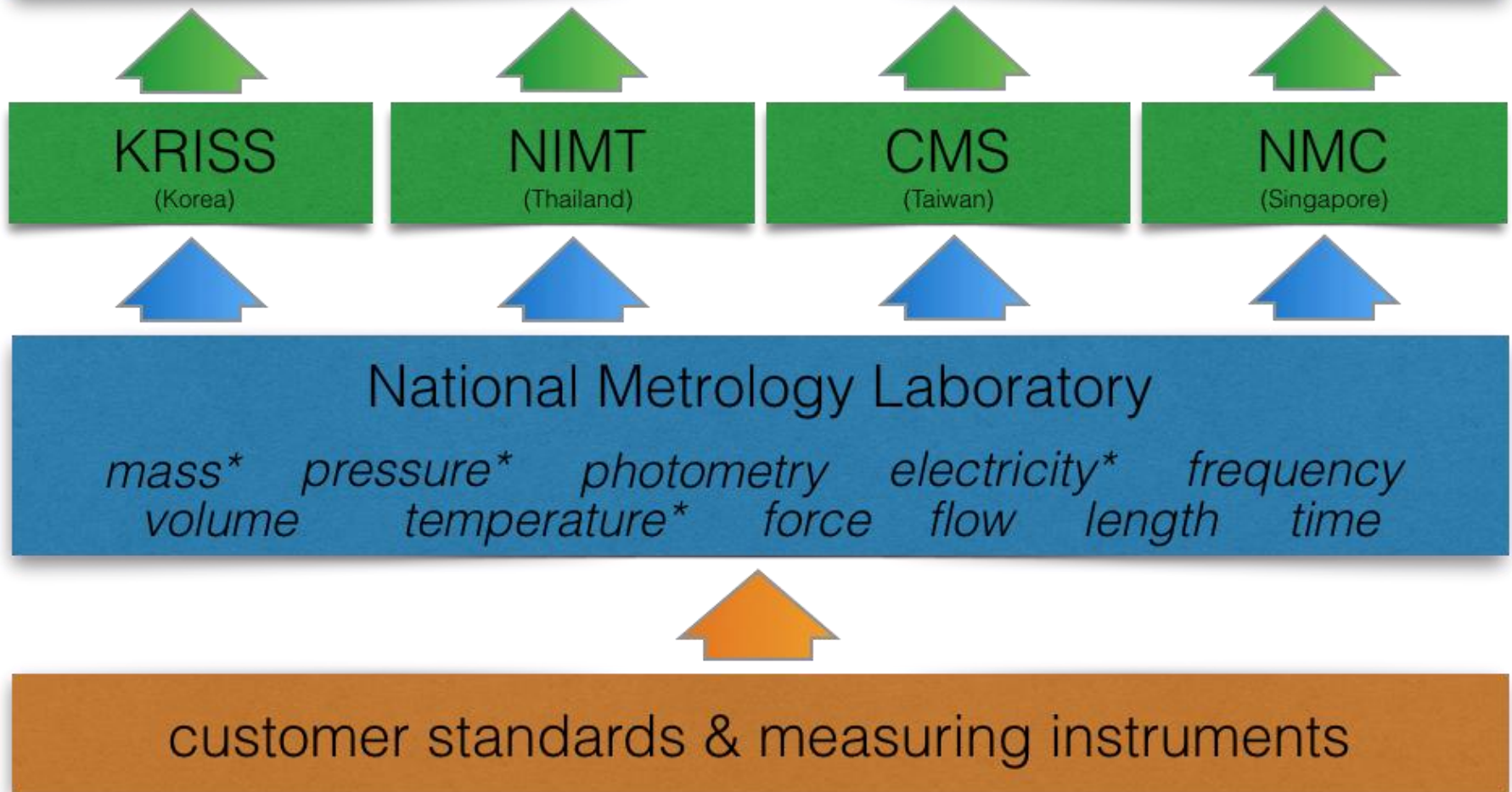
Mass  
Pressure  
Temperature  
Electricity

# The National Metrology Laboratory of the Philippines



# The National Metrology Laboratory of the Philippines

Realization of the International System of Units





# What is Legal Metrology?



# What is Legal Metrology?

metrology

science of measurement

scientific & industrial  
metrology

legal metrology

**non-regulated**/voluntary

**area**

**regulated**/mandatory

conformity assessment of  
measuring instruments  
conducted by **user**

**principle**

conformity assessment of  
measuring instruments  
conducted by the **government**

# What is Legal Metrology?

metrology

science of measurement

scientific & industrial  
metrology

legal metrology

**internal** quality/  
measurement control  
system (ISO)

**basis**

**legal** requirements for  
measuring instruments for  
specific applications (law,  
regulations, international  
agreements)

National Metrology  
Laboratory, Philippine  
Accreditation Bureau, Bureau  
of Philippine Standards

**infrastructure**

National Metrology  
Laboratory, Department  
Regulators & Inspectors, Local  
Government Units

# What is Legal Metrology?

metrology

science of measurement

scientific & industrial  
metrology

legal metrology

calibration

most  
important  
activities

type approval, verification,  
inspection

# What is Legal Metrology?

Legal metrology comprises all measurements carried out that are subject to regulation by law or government regulation for fair trade, environmental protection, safety, health and other official measurements.



# Why is Legal Metrology important?



safety



health



environmental  
protection



official  
measurements



fair trade





fair trade



# What is the difference between Calibration and Verification?

Calibration, in its purest sense, is the determination of the value of a sample by comparison with a known standard. The standard must be at least 3 times more accurate than the sample.

# What is the difference between Calibration and Verification?



**NML  
standard  
test weight**



**NML  
Measuring Equipment**



**LGU test  
weight**

# What is the difference between Calibration and Verification?



**LGU test weight**



**market vendor's weighing scale**

Capacity	Applied Error	Permissible Error
30 kg or less	¼ capacity or less	± ½ graduation
	Over ¼ capacity	± 1 graduation
Over 30 kg	½ capacity or less	± ½ graduation
	Over ½ capacity	± 1 graduation

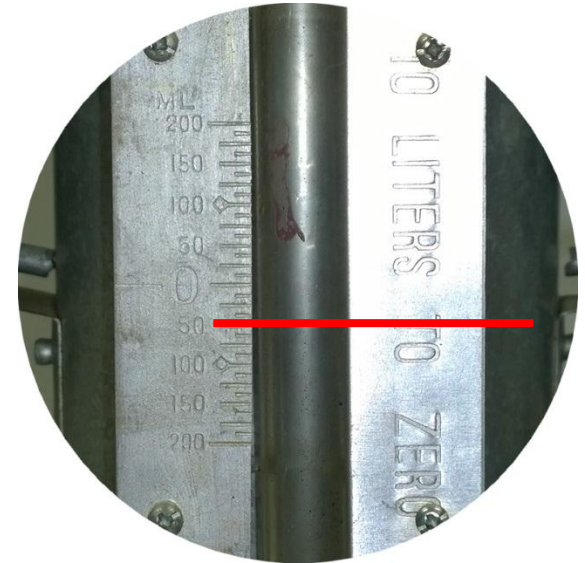
**PNS 238:1989**  
**PROCEDURE FOR THE**  
**VERIFICATION, INSPECTION**  
**AND SEALING OF**  
**WEIGHING SCALES**

# What is the difference between Calibration and Verification?



retailer's fuel  
dispenser

LGU test  
measure



DOE Department Circular  
No. 2003-11-010  
PROVIDING FOR THE RULES AND  
REGULATIONS GOVERNING THE  
BUSINESS OF RETAILING LIQUID  
PETROLEUM PRODUCTS

# What is the difference between Calibration and Verification?

**maximum permissible error**

Extreme value for an error permitted by a law, regulation, decree or recommendation.

# What is the difference between Calibration and Verification?

## verification

perform legally required **test/s** & **calibrations** then compare the results with a law, regulation or requirement to determine whether it **passed** or **failed**

## calibration

compare a sample with a known standard

## adjustment

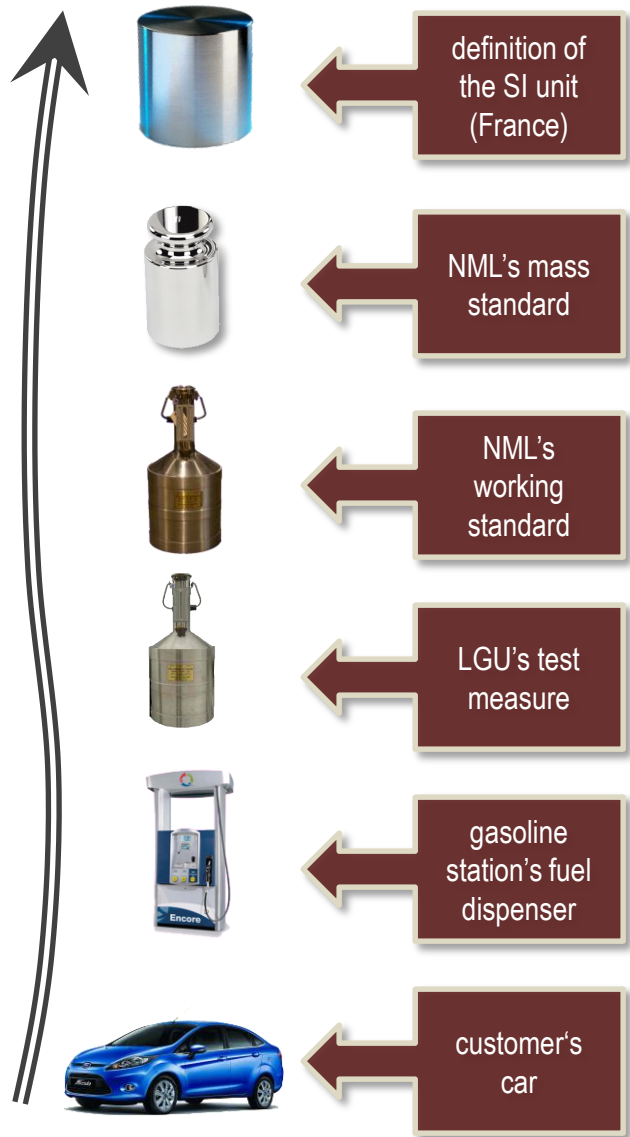
alter the performance of an instrument to ensure that the values it indicates are correct within specified limits

## testing

determine the **characteristics** of a product, a process or a service, according to certain procedures, methodologies or requirement

# What is traceability?

Property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty.



Proper calibration involves use of a traceable standard — one that has paperwork showing it compares correctly to a chain of standards going back to a international standard



What is the IDEAL set-up of a legal metrology system?

type approval



initial verification



subsequent verification



inspection/supervision

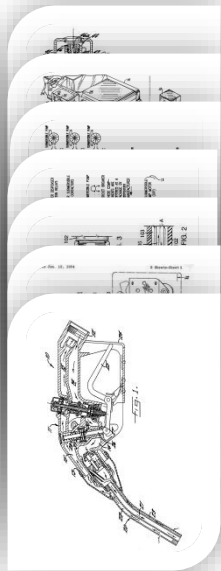
What is the IDEAL set-up of a legal metrology system?

type approval

This is the general process undertaken to confirm that the design of a measuring instrument complies with legal requirements.

# What is the IDEAL set-up of a legal metrology system?

## type approval



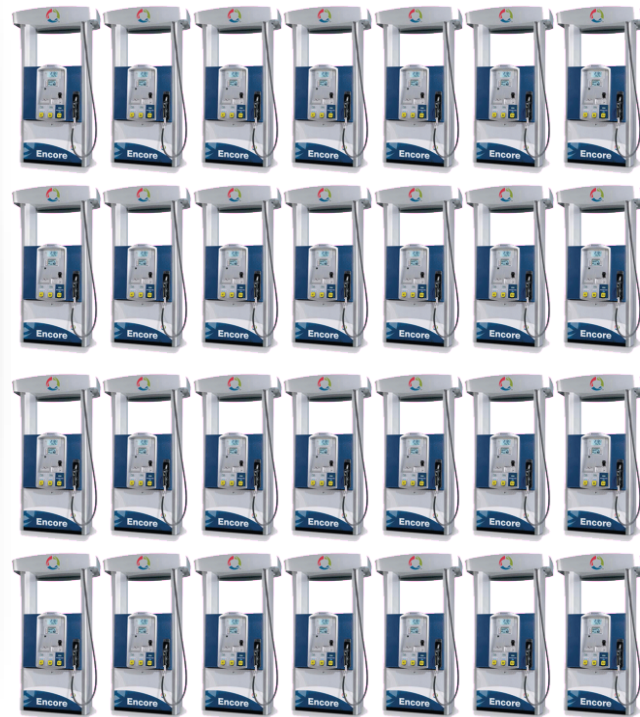
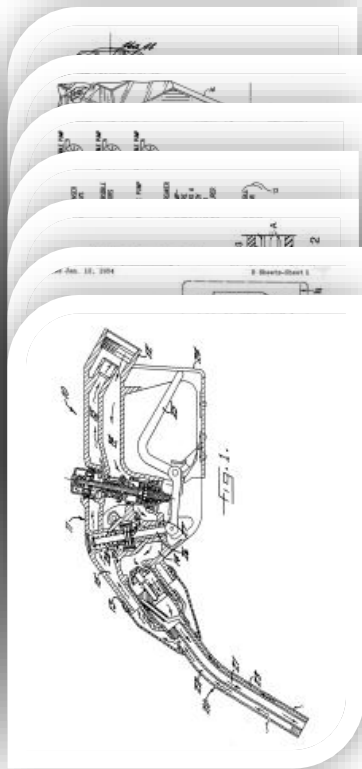
What is the IDEAL set-up of a legal metrology system?

## initial verification

Each measuring instrument is tested and verified to ensure it is working correctly before it can be used for trade or before it can be sold.

# What is the IDEAL set-up of a legal metrology system?

## initial verification



What is the IDEAL set-up of a  
legal metrology system?

subsequent verification

What is the IDEAL set-up of a  
legal metrology system?

subsequent verification



What is the IDEAL set-up of a legal metrology system?

## inspection/supervision

It is the control exercised in order to check whether the metrology law/regulations are properly complied with. Inspection is an important element of metrological control from the consumer protection viewpoint. Inspections are carried out without notice and are very often initiated as a result of complaints from the public.



What is the IDEAL set-up of a  
legal metrology system?

inspection/supervision



What is the IDEAL set-up of a legal metrology system?

## inspection/supervision

Inspection ascertains all or some of the following (depending on the regulation)

- verification mark and/or certificate is valid;
- no sealing marks are damaged;
- after verification the instrument suffered no obvious modification;
- its errors do not exceed the maximum permissible in-service errors.

What is the IDEAL set-up of a legal metrology system?

type approval



initial verification



subsequent verification



inspection/supervision

What is the CURRENT set-up of the legal metrology system in the Philippines?

subsequent calibration



inspection/supervision

What are the laws, regulations, and international agreements governing measurements in the Philippines?

Republic Act No. 9236

also known as the  
“The National Metrology Act of  
2003”

This is the  
National Metrology Law of the  
Philippines.

What are the laws, regulations, and international agreements governing measurements in the Philippines?

## Republic Act No. 9236

SEC. 8. System of Units. – The system of unit based on the International System of Units (SI) shall be mandatory throughout the country in regulated areas of application. The use of other units on meritorious cases may be allowed by the Board: Provided, That measuring equipment used for measuring quantities in regulated areas of application shall give results expressed in either SI or Board - Authorized Units:

Provided finally, That all measurement standards and measuring equipment use in the regulated areas of application shall be subject to metrological control.

What are the laws, regulations, and international agreements governing measurements in the Philippines?

amount of substance

mole

kelvin

candela

ampere

luminous intensity

second

length

thermodynamic temperature

metre

time

kilogram

mass

electric current

# concepts in metrology – the SI

## The SI Base Units

### writing unit symbols and names

The value of a quantity is written as a number followed by a space (representing a multiplication sign) and a unit symbol;

e.g., 2.21 kg or  $7.3 \times 10^2 \text{ m}^2$  or 22 K

This rule explicitly includes the percent sign (%). Exceptions are the symbols for plane angular degrees, minutes and seconds ( $^\circ$ , ' and " ), which are placed immediately after the number with no intervening space.



concepts in metrology – the SI

# The SI Base Units

writing unit symbols and names

Symbols for derived units formed by multiplication are joined with a centre dot ( $\cdot$ ) or a non-break space.

e.g.  $\text{N}\cdot\text{m}$  or  $\text{N m}$

# concepts in metrology – the SI

## The SI Base Units

### writing unit symbols and names

Symbols for derived units formed by division are joined with a solidus ( $\diagup$ ), or given as a negative exponent.

e.g the "metre per second" can be written  $\text{m/s}$  or  $\text{m s}^{-1}$  or  $\text{m}\cdot\text{s}^{-1}$

Only one solidus should be used

e.g.,  $\text{kg}/(\text{m}\cdot\text{s}^2)$  or  $\text{kg}\cdot\text{m}^{-1}\cdot\text{s}^{-2}$  are acceptable but  $\text{kg}/\text{m}/\text{s}^2$  is ambiguous and unacceptable.

# concepts in metrology – the SI

## The SI Base Units

### writing unit symbols and names

In both English and French modifiers, such as “squared” or “cubed” are used in the names of units raised to powers and they are placed after the unit name.

e.g. the unit  $\text{m s}^2$  is written (in full) or read as  
“metre per second squared”

However, in the case of area or volume, as an alternative the modifiers “square” or “cubic” may be used, these modifiers are placed before the unit name.

e.g. square centimeter, kilogram per cubic meter

concepts in metrology – the SI

# The SI Base Units

writing unit symbols and names

Symbols are mathematical entities, not abbreviations, and do not have an appended period/full stop (.).

Symbols of units are not pluralised e.g., 25 kg not 25 kgs

# concepts in metrology – the SI

## The SI Base Units

### writing unit symbols and names

The 10th resolution of CGPM in 2003 declared that "the symbol for the decimal marker shall be either the *point* on the line or the *comma* on the line.

Spaces may be used as a thousands separator (*1000000*) in contrast to commas or periods (*1,000,000* or *1.000.000*) in order to reduce confusion resulting from the variation between these forms in different countries.

# concepts in metrology – the SI

## The SI Base Units

### writing unit symbols and names

Symbols are written in upright (Roman) type (m for metres, s for seconds), so as to differentiate from the italic type used for variables (*m* for mass, *s* for displacement). By consensus of international standards bodies, this rule is applied independent of the font used for surrounding text.

Names of units start with a lowercase letter (e.g., newton, hertz, pascal), even when the symbol for the unit begins with a capital letter. This also applies to 'degrees Celsius', since 'degree' is the unit.

concepts in metrology – the SI

# The SI Base Units

writing unit symbols and names

Symbols for units are written in lower case

e.g., m, s, mol

except for symbols derived from the name of a person.

e.g., the unit of pressure is named after Blaise Pascal, so its symbol is written "Pa", whereas the unit itself is written "pascal".

# concepts in metrology – the SI

## The SI Base Units

### writing unit symbols and names

Symbols for units are written in lower case

e.g., m, s, mol

except for symbols derived from the name of a person.

e.g., the unit of pressure is named after Blaise Pascal, so its symbol is written "Pa", whereas the unit itself is written "pascal".

The one exception is the litre (L), whose original symbol "l" is unsuitably similar to the numeral "1" or the uppercase letter "I" (depending on the typeface used), at least in many English-speaking countries.



# concepts in metrology – the SI

## The SI Base Units

### writing unit symbols and names

A prefix is part of the unit, and its symbol is prepended to the unit symbol without a separator

e.g. k in km, M in MPa, G in GHz

All symbols of prefixes larger than  $10^3$  (kilo) are uppercase.

When the name of a unit is combined with the name of a multiple or sub-multiple prefix, no space or hyphen is used.

e.g. kilopascal **AND NOT** kilo-pascal

# What are the laws, regulations, and international agreements governing measurements in the Philippines?

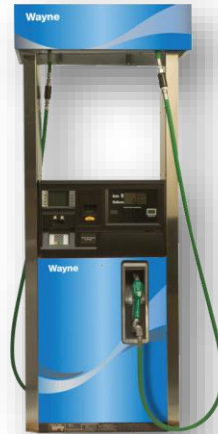


Chapter II of the Consumer Act of the Philippines

**PNS 238:1989**

PROCEDURE FOR THE  
VERIFICATION, INSPECTION AND  
SEALING OF WEIGHING SCALES

**ASEAN**  
**Guidelines on the**  
**Verification of Non-**  
**Automatic Weighing**  
**Instruments**



DOE Department Circular No.

**2003-11-010**

PROVIDING FOR THE RULES AND  
REGULATIONS GOVERNING THE BUSINESS OF  
RETAILING LIQUID PETROLEUM PRODUCTS



**ASEAN**  
**Common Requirements**  
**of Pre-packaged**  
**Products**

# Conclusion

- Make sure your standards are regularly calibrated by an accredited laboratory or by the National Metrology Laboratory.
- Take good care of your standards.
- Take good care of the calibration certificates of your standards.
- Regularly attend trainings and workshops on metrology.
- Keep and maintain records of your verification activities.
- Know your procedure/s.
- Know your mandate/responsibility.
- Be confident.
- Be brave.

rahmat  
 Баярлалаа  
 спасибо  
 danke  
 謝謝  
 ngiyabonga  
 teşekkür ederim  
 tapadh leat  
 mersi  
 kua ora  
 barka  
 welalin  
 tack  
 misaotra  
 matondo  
 paldies  
 grazzi  
 mahalo  
 hвала  
 asante  
 manana  
 ebrigada  
 murakoze  
 tenki  
 enkosi  
 nanni  
 nandri  
 kiitos  
 dankie  
 dhanyavad  
 maafetai lava  
 vinaka  
 спасибо  
 blagodarom  
 dank je  
 dankon  
 aciū  
 gracias  
 moichakkeram  
 djiere dieuf  
 tau  
 дякую  
 mamnun  
 hvala  
 maururu  
 koszonom  
 chnorakaloutioun  
 gratias ago  
 gracias  
 sulpay  
 go raibh maith agat  
 dziękuję  
 sobodi  
 dekuji  
 sagolun  
 sukriya  
 kop khun krap  
 taiku  
 arigatō  
 takk  
 dakujem  
 trugarez  
 obligado  
 mesi  
 didi madoba  
 kam sah hamnida  
 rahmat  
 terima kasih  
 najs tuke  
 ありがとう  
 tanemirt  
 rahmet  
 diolch  
 dhanyavadagalu  
 shukriya  
 merce  
 мерси  
 তোমাকে ধন্যবাদ  
 감사합니다  
 xiexie  
 ευχαριστώ  
 merci