

Guidelines for the Verification of
Non-automatic Weighing Instruments
(NAWI)

Final

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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 in order to contribute in the realization of 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 and strengthen ASEAN cooperation at relevant international fora.

The ACCSQ WG 3 has agreed to collaborate on the harmonization of verification of non-automatic weighing instruments using the International Organization of Legal Metrology (OIML) Recommendation 76-1, 2006 Edition as the basis for harmonization. A workshop on Verification of Non-automatic Weighing Instrument (NAWI) Class III was organized in Viet Nam in August 2008 in coordination with ASEAN Secretariat and the Physikalisch-Technische Bundesanstalt (PTB) with the end goal of developing a document for the common requirements for the verification control of NAWI. The document has evolved and becomes the Guidelines for Verification Control of Non-Automatic Weighing Instrument upon the endorsement and approval of the ACCSQ.

The Guidelines serve as the common reference document by ASEAN Member States in performing verification of non-automatic weighing instruments. This will assist the industry in ASEAN in reducing the cost of doing business and gaining better market access for its products in local, regional and international markets at the same time ensuring better protection for the consumers and improved social benefits.

ASEAN Member States with existing or developing metrological control of Non-automatic Weighing Instruments (NAWI) used for trade or for other purposes, where appropriate, are obliged to apply or use the relevant parts of these Guidelines in order to achieve control procedures which are harmonized and in conformity to the current international requirements.

2 Scope

2.1 General considerations

2.1.1 Background

Verification is not only a metrological and technical activity, but it is also an official act that is part of public administration.

The Guidelines for the verification of NAWI can only take effect if they are embedded in a larger corpus of legislation which comprises the necessary obligations, authorizations, responsibilities, and sanctions. The Guidelines are in some ways or other present already, or will be installed in the legislation of AMS intending to implement these Guidelines.

2.1.2 Objective of Harmonization

This document provides guidance, rules and procedures for the verification of non-automatic weighing instruments (NAWI) within the ASEAN Member States (AMS). It is based on OIML Recommendation R 76-1 (2006) "Non-automatic Weighing Instruments – Requirements – Tests" (R76) and serves to harmonize procedures for the verification of NAWI within the AMS.

2.1.3 Application

This document applies mainly to the verification of NAWI used for trade purposes, in particular, NAWI used for direct sales to the public. Such NAWI normally belong to the accuracy Class III, with Classes II and III being acceptable under national regulation of an AMS. It is however, not limited to the verification of such instruments but may, at the discretion of any AMS, be applied to the verification of NAWI for other uses as well.

2.1.4 Kinds of verification

Verification is performed based on 2 types of work:

- A) Initial verification of
 - A1) a new NAWI,
 - A2) a NAWI already in use, where verification was not required previously,
 - A3) a previously been verified NAWI, but has undergone substantial repair or modification (e. g., replacement of a load cell, change of an electronic indicator etc.);
- B) Subsequent verification, either of each instrument, or by sampling or by the user of the instrument

2.1.5 Parts of a verification procedure

Any part of verification work is considered as an official act, consisting of:

- a) administrative examination,
- b) technical examination,
- c) metrological examination,
- d) stamping (marking) to confirm compliance with the requirements, and

e) securing appropriate sealing mechanism to avoid alteration of the NAWI after verification successfully completed.

2.1.6 Service inspection / Service control

Upon service inspection normally only inspection and tests according to 4.2 and 4.3 shall be performed, the error limits being twice those on initial verification. Stamping and securing shall remain unchanged, or renewed according to Section 5.

2.2 Structure of the document

2.2.1 Structure in general

The Guidelines (cf. Table of Contents) comprises of - six Sections, two Useful References offering assistance and background to the Guidelines, and Supplements augmenting Section 4 on Verification Process.

2.2.2 Presentation of the Guidelines

Section 3 covers the terminology used in these Guidelines by stating all terms and abbreviations etc. which are not part of R 76 or other OIML publications referenced in Section 6.

In Section 4, the procedures for the administrative examination, technical examination and metrological examination of a NAWI are presented. Any single operation is described as an element of a "verification". Where an element does not apply to all kinds of verification, this exception shall be clearly highlighted.

Some elements, in particular the technical examinations and metrological tests have to be applied in various ways according to the different construction or function of the NAWI. Details for such variations are presented in the Supplements to Section 4.

Stamping and securing seal(s) of the verified NAWI are dealt with in Section 5.

Section 6 gives the references to documents obtained from OIML publications that pertain to these Guidelines.

2.2.3 Useful references

Verification is performed using weights that meet certain level of accuracy and fulfill quality requirements. Weights may also be used to counter balance the load on simple mechanical NAWI. It is a worldwide practice to use weights that conform to R 111 specifications. The minimum requirements are set out in A.I on "Information on Weights related to NAWI" under Useful References.

In initial verification of modern NAWI, particularly those NAWIs that are self-indicating and/or associated with electronic devices, it shall be based on its previous type of evaluation, as confirmed in the Type Approval Certificate (TAC) issued by the manufacturer or as stated in the OIML Certificate of Conformity (CoC). The technical examination of a NAWI for initial verification then includes the checking of the conformity of the individual instrument based on TAC or CoC issued. A.II in Useful References presents more information on this.

3 Terminology

The Guidelines make use of the terminologies contained in the relevant OIML publications that are listed in Section 6 References. It is not feasible to reproduce all the definitions here, as the terminology in R 76-1 alone comprises 18 pages.

The following table lists all abbreviations used in these Guidelines together with references where applicable.

Abbreviation	Term in full	Definition in OIML document	Used in this Guidelines
AI	NAWI with analogue indication	R 76: T.5.1.2	S.2
AMS	ASEAN Member State		throughout
CoC	Certificate of Conformity	B3: 2.11	throughout
Class	Accuracy class	R 76: 3.1.1; R 111: 2.1	2.1.2; 4.1; A.II.2.8; S.2
DI	NAWI with digital indication	R 76: T.5.1.3	S.2
DSP	NAWI for direct sales to the public	(R 76: 4.13)	A.II.2; S.1
mpe	Maximum permissible error (of a NAWI)	R 76: T.5.5.4	S.2
NAWI	Non-Automatic Weighing Instrument	R 76: T.1.2	throughout
NSI	Non-self-indicating NAWI	R 76: T.1.2.5	S.2
PTB	Physikalisch-Technische Bundesanstalt, Braunschweig, Germany		6
R 111	OIML R 111-1 (2004) "Weights of classes E ₁ , E ₂ , ...M ₃ – Part 1: Metrological and technical requirements"	---	2.2.3; 3; 4.3; 6; A.I.1; A.I.2; A.I.3; A.I.4; A.II.2
R 76	OIML Recommendation R 76-1 (2006) "Non-automatic Weighing Instruments – Requirements – Tests"	---	throughout
TAC	Type Approval Certificate	VIML: 2.6 and 3.2	throughout

4 Verification Process

4.1 Administration Examination

A NAWI to be verified shall be checked for the following formal requirements:

- 4.1.1 easily legible identification of the NAWI – manufacturer’s name or mark, type designation;
on a self-indicating NAWI: sign of TAC .
- 4.1.2 markings of metrological characteristics¹ on the NAWI:
Accuracy Class, *Max*, *Min*, *e*:
 - a) are the markings easily legible?
 - b) are the markings conform to regulations?
- 4.1.3 further markings as listed in a TAC
- 4.1.4 verification marks:
 - a) are verification mark(s) not violated?
 - b) is subsequent control overdue in accordance with national requirements of the AMS?
(not applicable for initial verification)

Where 4.1.1 and/or 4.1.2 do not meet the requirements, the procedure shall be discontinued until the flaws in inscriptions have been properly rectified.

Where 4.1.4 is not in satisfactory manner, appropriate action(s) shall be taken according to harmonised regulations of the AMS.

¹ The characteristics of Classes II, III, and IIII are taken from R 76, Table 3:

Accuracy Class	Verification scale interval, <i>e</i>	Number <i>n</i> of verification scale intervals <i>e</i> , $n = Max/e$		Minimum capacity, <i>Min</i> (lower limit)
		minimum	maximum	
High (II)	$0.001\text{ g} \leq e \leq 0.05\text{ g}$ $0.1\text{ g} \leq e$	100 5000	100 000 100 000	20 <i>e</i> 50 <i>e</i>
Medium (III)	$0.1\text{ g} \leq e \leq 2\text{ g}$ $5\text{ g} \leq e$	100 500	10 000 10 000	20 <i>e</i>
Ordinary (IIII)	$5\text{ g} \leq e$	100	1000	10 <i>e</i>

Specifications for multi-interval instruments and instruments with $d < e$: see R 76, 3.1 to 3.4

4.2 Technical Examination

A NAWI shall be checked and examined for the following criteria:

- 4.2.1 installation, operation of NAWI conforming to requirements – tilt, visibility of results to the customer,
- 4.2.2 sealing/securing marks not violated?
(not applicable for initial verification)
- 4.2.3 conformity of NAWI to TAC and/or CoC, where applicable,
- 4.2.4 general condition(s) of the instrument and any indication(s) of damage, dirt, or wear (if any)
- 4.2.5 completeness of printouts of computing scales so as to include weight, unit price, and total price
- 4.2.6 potential or anticipated arrangements for fraud associated with an instrument and fraudulent practices related to its use

Further, as far as applicable:

- 4.2.7 composition of modules according to TAC or CoC,
- 4.2.8 conformity of peripheral devices when connected, including data processing, to any applicable requirements as stipulated in TAC and/or CoC,
- 4.2.9 software: actual version, and status of securing elements,
- 4.2.10 consistency of place of installation with sufficient information about gravity adjustment (if necessary);

Where 4.2.2 is not in satisfactory manner, appropriate action(s) shall be taken according to national requirements of the AMS.

Points 4.2.3 and 4.2.6 apply mainly to an initial verification, but shall be spot-checked at subsequent verifications as well.

Points 4.2.7 through 4.2.10 will normally not be applicable to NAWI in use for direct sales to the public but may be relevant for other NAWI installations subject to verification, e. g., if used for trade.

Initial verification would in most cases be performed on a new NAWI. Where in special situations it is performed on a NAWI that is already in use, therefore some of the examinations may not be necessary. Details to this are found in Supplement S.1.

4.3 Metrological Examination

For the verification of a NAWI, the following metrological tests are performed, as far as applicable in view of the construction of the NAWI:

- 4.3.1 accuracy of zero-setting and tare devices,

- 4.3.2 repeatability,
- 4.3.3 effect of eccentric loading,
- 4.3.4 errors of indication,
- 4.3.5 for NAWI with analogue indication: discrimination,
- 4.3.6 for non-self-indicating NAWI: test of sensitivity.
- 4.3.7 for self-indicating instruments without TAC or CoC: effect of tilting,
- 4.3.8 for mobile instruments (*see definition R 76, T.1.2.11*): effect of tilting.

Details to the tests and the applicable requirements from R 76 are presented in Supplement S.2.

Other tests may be performed in addition and as appropriate, in cases of unusual construction, of doubtful results, or of special advice in the relevant TAC/CoC.

The maximum permissible errors are those on initial verification², except when a Service Control is performed (cf. 2.16, case B) where twice these values apply.

According to R 76, point 3.7.1 the standard weights used for the tests shall not have an error greater than 1/3 of the mpe of the NAWI for the applied load. Their accuracy shall conform to R 111 and shall be certified by calibration, verification or equivalent procedure.

Initial verification shall be done at the place of installation of the instrument. It may be done at the manufacturer's premises or at any other suitable location, if transportation of the instrument to the location of use will not impair its metrological quality, because

- it has not to be dismantled for shipping, and/or
- the local gravity value at the intended place of installation is taken into account.

Note 1: test 4.3.4 above may be performed in a simplified manner whereby the actual errors are not determined, it is only checked whether all indications are within the maximum permissible errors. This procedure is described in Supplement S.3.

² The maximum permissible errors for NAWI of Classes II, III, and IIII are taken from R 76, Table 6

Maximum permissible errors on initial verification	For loads m expressed in verification scale intervals e		
	Class II	Class III	Class IIII
$\pm 0.5 e$	$0 \leq m \leq 5\,000$	$0 \leq m \leq 500$	$0 \leq m \leq 50$
$\pm 1.0 e$	$5\,000 < m \leq 20\,000$	$500 < m \leq 2\,000$	$50 < m \leq 200$
$\pm 1.5 e$	$20\,000 < m \leq 100\,000$	$2\,000 < m \leq 10\,000$	$200 < m \leq 1\,000$

For instruments of Class I see Table 6 in R 76, for multi-interval instruments refer to R 76, point 3.3

5 Marking and Securing

After the verification, a NAWI shall, according to harmonized regulation of the AMS and to R 76, point 8.3, be marked (stamped) and secured by

- 5.1 application of a verification mark (“stamping”); this may include the date (year or month) of verification and/or the deadline for subsequent control,
- 5.2 securing/sealing against unauthorized adjustment or dismantling of components which might alter the metrological performance, in obvious situations and/or according to advice in TAC/CoC,
- 5.3 monitoring of the status/setting of software according to advice in the relevant TAC/CoC, if applicable

6 References

Note: all OIML documents may be downloaded free of charge, from www.oiml.org/publications

- [1] OIML R 76-1 (2006) Non-automatic weighing instruments – Part 1: Requirements - Tests
- [2] idem, previous edition of 1992
- [3] OIML R 76-2: 2007 Non-automatic weighing instruments – Part 2: Test report format
- [4] OIML R 111-1 (2004) Weights of classes E_1 , E_2 , ... M_3 – Part 1: Metrological and technical requirements
- [5] OIML D 1: 2004 Elements for a Law on Metrology
- [6] OIML D 9: 2004 Principles of metrological supervision
- [7] OIML B 3:2011 OIML Basic Certificate System for OIML Type Evaluation of Measuring Instruments
- [8] OIML G 15: 1992 Guidelines for the establishment of simplified metrology regulations
- [9] Gravity Information System, PTB, Braunschweig 2006
<http://www.ptb.de/cartoweb3/SISproject.php>
- [10] VIML: International Vocabulary of Terms in Legal Metrology, OIML 2013

Useful References A.I

Information on weights related to NAWI

A.I.1 General Information

Any metrological qualification of weights, whether by calibration or by verification, shall only be done according to the Recommendation OIML R 111-1 (2004): Weights of classes E₁, E₂, ...M₃ – Part 1: Metrological and technical requirements.

Some essentials of R 111 are explained hereafter.

The document covers – cf. R 111, point 1.3.1 - weights for use

- as standards for the verification of weighing instruments,
- as standards for the verification or calibration of weights of a lower accuracy class, and
- with weighing instruments, to balance the load to be measured.

Nominal values m_0 are defined from 1 mg to 5000 kg, in steps of 1×10^n kg, 2×10^n kg, or 5×10^n kg with n being a positive or negative integer or zero.

The maximum permissible errors δm apply to the “conventional (value of) mass”, not to the mass of the weight. For a weight taken at a reference temperature of 20 °C, the conventional mass m_c is the mass of a reference weight of a density ρ_{ref} of 8000 kg/m³ which it balances in air of a reference density ρ_0 of 1.2 kg/m³.

Accuracy classes are defined from E₁ with a relative maximum permissible error $\delta m/m_c = 0.5 \times 10^{-6}$ to M₃ with $\delta m/m_c = 0.5 \times 10^{-3}$, for nominal values of $m_0 \geq 100$ g. For smaller nominal values, the values of $\delta m/m_c$ are increasing considerably in all accuracy classes.

Table 1 of R111 lists all nominal values and maximum permissible errors.

Sets of weights – cf. R 111, point 4.3 - shall be composed of sequence(s) of weights which together allow to combine weights for any value from zero load to maximum capacity.

A sequence may consist of the values

$$\begin{aligned} &(1; 1; 2; 5) \times 10^n \text{ kg} \\ &(1; 1; 1; 2; 5) \times 10^n \text{ kg} \\ &(1; 2; 2; 5) \times 10^n \text{ kg, or} \\ &(1; 1; 2; 2; 5) \times 10^n \text{ kg} \end{aligned}$$

where n is a positive or negative integer or zero.

Additionally, a set may contain multiples of some values³.

R111 also addresses the shape, density and hardness of the material, surface condition, and magnetic properties of weights.

Weights shall be marked with their class and nominal value, either on the weight itself or on the case – details are given in R 111, sections 13 and 16.

³ For metrological tests of NAWI with digital indication, 10 small weights of 1/10 of the verification scale interval e are useful (at least 5 are needed). These weights need not satisfy the R 111 requirements, any artefacts made of metal, adjusted to an error $\leq 1\%$ of the nominal value, will serve the purpose.

A.1.2 Weights for the verification of a NAWI

R 76, point 3.7.1 requires that weights according to R 111 shall be used for the verification tests. They shall not have an error greater than $1/3$ of the mpe of the NAWI for the applied load. For simplicity's sake, the maximum permissible error δm of the weight is normally taken as the error of the test weights.

Example: For NAWI of Class III, weights of class M_1 are adequate, as long as the maximum capacity is not more than 5000 verification scale intervals: $Max \leq 5000 e$. For NAWI with $Max > 5000 e$, the M_1 weights must be controlled immediately before testing the NAWI, and their actual error must be taken into account; otherwise weights of class F_2 have to be used. For NAWI of class IIII, test weights of class M_2 or even class M_3 are sufficient – it is however not feasible for an inspector to carry with him test weights of too many different classes. For NAWI of higher capacity, special weights with nominal values of 50 kg to 5000 kg are listed in R 111, Table 1.

Test loads may to some extent be made up of other constant loads which substitute standard weights – to reduce the amount of standard weights to be transported to the place of testing. The conditions are laid down in R 76, point 3.7.3.

A.1.3 Weights to be used with NAWI

With some simple mechanical types of NAWI, weights are used by the operator to balance the load. These weights must be verified weights of appropriate accuracy class, with nominal values suitable for the capacity of the instrument.

In R 111, point 1.3.1 the accuracy classes are assigned to the classes of NAWI:

NAWI class	Weights of class
I	E_2, F_1
II	F_1, F_2
III	$M_1, M_2, M_3,$ and for weights ≥ 50 kg: M_{1-2}, M_{2-3}
IIII	M_3

Sets of weights – cf. R 111, point 4.2.1 - shall be composed of sequence(s) of weights which together allow a combination of weights for any value from zero load to maximum capacity in steps of the verification scale interval e of the instrument.

A.1.4 Verification of weights

In general, a weight is verified by comparison with a standard weight of a higher accuracy class, applying a procedure of comparison that achieves a sufficiently small uncertainty of measurement.

The essential metrological requirements, quoted from R 111 are:

5.2 Expanded uncertainty

For each weight, the expanded uncertainty U , for $k = 2$, of the conventional mass, shall be less than or equal to one-third of the maximum permissible error in Table 1.

$$U \leq 1/3 \delta m$$

5.3 Conventional mass

5.3.1 For each weight, the conventional mass m_c (determined with an expanded uncertainty, U , according to 5.2) shall not differ from the nominal value of the load, m_0 , by more than the maximum permissible error, δm , minus the expanded uncertainty:

$$m_0 - (\delta m - U) \leq m_c \leq m_0 + (\delta m - U)$$

The expanded uncertainty depends on several influences, as dealt with at large in R 111: uncertainty of mass of the standard weight, air buoyancy, uncertainty of the balance or mass comparator, magnetic effects, convection due to temperature differences.

For the verification of class M_3 weights which are mostly used with class III NAWIs, most of the influences can be neglected. It is sufficient to use class M_1 weights as standards, and a NAWI (with digital indication for convenience) the standard deviation s of which has been established to be at most 15 % of the maximum permissible error δm_v of the weight to be verified:

$$s < 0.15 \delta m_v.$$

The uncertainty of the M_1 standard is $u_{st} = \delta m_{st} / \sqrt{3} = 0.1 \delta m_v / \sqrt{3}$, which makes the expanded uncertainty of the conventional mass of the verified weight

$$U(m_{cv}) = 2 \cdot \sqrt{(s^2 + \delta m_{st}^2/3)} \leq \delta m_v 2 \cdot \sqrt{(0,15^2 + 0,1^2/3)} = 0,31 \delta m_v < \delta m_v/3$$

thus conforming to the requirement above.

Verified weights shall be marked either on the weight itself or on the case, with the control mark according to harmonized regulations – see R 111, section 16.

Useful References A.II

Recommendations for a system of legal metrological control

A.II.1. Legal Metrological Control

The system of legal metrology installed in an AMS shall comprise these elements in a manner as appropriate:

- A.II.1.1 legally binding document(s) to install the system, as Acts by parliament, Decrees or Ordinances from the government, etc.;
- A.II.1.2 agencies or organisation(s), official or private, with the responsibility, duty and power to enforce the system throughout the country;
- A.II.1.3 metrological infrastructure to ensure traceability of measurements;
- A.II.1.4 financial resources for personnel and equipment;
- A.II.1.5 regulations in detail (may be part of A.II.1.1 above) for:
 - a) liability of measuring instruments to metrological control,
 - b) responsibility to have metrological control performed,

- c) metrological requirements for measuring instruments subject to metrological control,
 - d) kinds of measuring instruments for which type evaluation is required as prerequisite for initial verification – see S.4,
 - e) realization of metrological control by verification or other forms of control,
 - e1) authorization of agencies/inspectors,
 - e2) powers to enforce metrological control (i. e. access to premises where instruments are being used, or are likely to be used, sanctions against users, seizure of instruments etc.)
 - f) period of validity of a verification or other form of control,
 - g) conformity marking of instruments that comply with the requirements,
 - h) responsibility of a manufacturer or importer for conformity of an instrument bearing the identification mark of a TAC, to the conditions and requirements in that document,
 - i) consequence of an instrument not meeting the requirements,
 - j) inhibition of exploitation of tolerances of controlled instruments,
 - k) fees to be paid for metrological control,
 - l) sanctions in case of non-compliance with the regulations,
 - m) means of appeal against actions/decisions made under the system;
- A.II.1.6 period of transition and exceptions for instruments already in use, at the time when new or modified regulations come into force
- A.II.1.7 Information about the relevant regulations, for anybody who manufactures, trades, repairs, or uses measuring instruments.

Note 1: Further advice can be found in OIML Documents D1 (2004): Elements for a Law on Metrology, Chapters V and VI, and D9 (2004): Principles of Metrological Supervision.

A.II.2 Liability of NAWI to metrological control.

This section offers details to point A.II.1.5 above, with respect to NAWI.

The following provisions shall be legally binding as far as suitable, in an AMS.

Note: While metrological control may be performed in other ways than by verification, from now on only the term “verification” is used, it stands for any form of metrological control.

- A.II.2.1 Any NAWI shall be verified, and be stamped accordingly, when it is being used, or may readily be used, for the determination of the mass of a product for trade purposes, i.e.:

- a) buying or selling, where one of the parties is not a professional trader (direct sales to the public)⁴,
- b) buying or selling between professional parties.

The following uses of NAWI may, by regulation of an AMS, also be included in "trade purposes":

- c) any treatment or service which is to be paid for (as dry cleaning, transportation and the like),
- d) raising public expenses such as tolls, customs, taxes and the like,
- e) preparing medicines or pharmaceutical substances,

A.II.2.2 A verified NAWI must meet the requirements of R 76.

A.II.2.3 Where a NAWI can be operated only together with standard weights to balance the load, these must be certified (verified, calibrated) to the requirements of R 111.

A.II.2.4 Whosoever uses, or holds ready for use, a NAWI for one of the purposes under A.II.2.1, shall be responsible for

- a) the instrument – and the accompanying set of weights, where applicable - being verified and stamped,
- b) the verification being valid (where periodic subsequent control is established), and having the instrument re-verified in due course,
- c) proper use and maintenance of the instrument, as required by regulations and/or the manual for the instrument,
- d) taking the instrument out of use if and when it ceases to function correctly,
- e) taking the instrument out of use if and when any verification mark, stamp or sealing of the instrument is damaged or destroyed,
- f) notification of the competent agency, when a NAWI is taken into use, or is significantly modified or repaired, or the validity of its verification is expired.
- g) supplying personnel and/or equipment for the verification, including test loads, on demand of the verification inspector

A.II.2.5 The provisions of A.II.2.4 a) and b) shall as far as possible also apply to whosoever sells or lends out NAWI to be used for one of the purposes under A.II.2.1.

⁴ National regulations may specify in detail the circumstances of a transaction that constitute "direct sales to the public"

- A.II.2.6 For direct sales to the public, the user of the NAWI shall in particular be responsible to:
- a) install and use the instrument on a stable support in a leveled position,
 - b) install and operate the instrument in such a manner that the customer can readily observe the weighing procedure and the result,
 - c) read the result only when the instrument is in stable equilibrium,
 - d) compensate for the weight of any container or wrapping material so that only net quantities are being sold.
- A.II.2.7 Peripheral devices - e.g. printers, data storage devices, computer terminals etc - connected to a NAWI are subject to the same requirements and regulations as far as applicable.
- A.II.2.8 In addition to A.II.2.1 it may be advisable to prescribe or prohibit certain accuracy classes for given uses of NAWI:
- NAWI for trade purposes shall belong to Class III, with some exceptions like:
- accepting Class III for weighing low-price mass produce, such as building materials, sand, gravel etc., or garbage,
 - prescribing at least Class II for weighing precious stones and metals, and for pharmaceutical laboratories.

Supplementary Information to Section 4

S.1 Guidance on visual inspections for verification, according to status of the instrument

- A) Initial verification, of
- A1) a new NAWI,
 - A1a) NAWI for which no TAC is required (e.g. non-self-indicating NAWI, or others exempt by national regulation,
 - A1b) NAWI for which a TAC has been issued,
 - A1c) NAWI for which a CoC has been issued,
 - A2) a NAWI already in use, where previously verification was not required,
 - A3) a verified NAWI after substantial repair or modification (e. g. replacement of a load cell, change of an electronic indicator etc.);
- B) Subsequent verification

Kind of verification as per point 2.1.4						Item	Details of visual inspection according to point 4.2	Requirements in R 76-1
A1a	A1b	A1c	A2	A3	B			
-	-	-	+	-	+	4.2.1	DSP: NAWI for direct sales to the public, Suitable installation, operation of NAWI conforming to requirements DSP: leveled position; visible for the customer: indication of results, zero before loading, tare device in use, reading result in stable equilibrium,	4.1.1.1 4.13 4.14
+	+	+	+	-	-	4.2.2	Positions for sealing/securing sealing/securing marks not violated	4.1.2.4, 7.2
-	+	-	+	+	-	4.2.3	TAC legally valid?	3.1, 3.2, 3.3, 4.1.2, 4.5, 4.6, 4.7, 4.13, 4.14
-	-	+	+	-	-		CoC acceptable under national regulations for NAWI without TAC?	
-	+	+	(+)	+	-		conformity of NAWI to TAC and/or CoC, and to some general requirements:	
+	+	+	+	+	(+)		metrological characteristics: class, <i>Max</i> , <i>e</i> , <i>n</i> , multi-interval or multiple-range, construction of NAWI, built-in devices, e.g. zero-setting and tare devices, requirements for DSP instruments	

S.1 Guidance on visual inspections for verification, according to status of the instrument, continued

Kind of verification as per point 2.1.4						Item	Details of visual inspection according to point 4.2	Requirements in R 76-1
A1a	A1b	A1c	A2	A3	B			
							DSP: instrument for direct sales to the public	
+	+	+	+	+	(+)	4.2.4	conformity to technical requirements of R 76 for presentation of results: indications prices to pay printed results data processing by peripheral devices	4.2, 4.3, 4.4, 4.6.12, 4.13.1 4.14.1, 4.14.3, 4.14.4 4.4.5, 4.6.11, 4.14.4 5.5.2, 5.5.3
-	+	+	+	+	-	4.2.5	composition of modules: Declaration of conformity from manufacturer, check identity of declared modules	3.10.2, Annex F,
-	+	+	+	+	(+)	4.2.6	conformity of peripheral devices to applicable requirements in TAC and/or CoC	T.2.3.5, 2.4, 5.3.6, 5.5.2
	+	+	+	+	(+)	4.2.7	software: actual version, and status of securing elements	4.1.2.4, 5.5.1, 5.5.3, 7.1.4
-	+	+	+	-	-	4.2.8	consistency of place of installation with information about gravity adjustment	4.1.2.6,

Supplementary Information to Section 4

S.2 Additional information to the verification tests, section 5, with references to R 76

Abbreviations: AI = NAWI with analogue indication, DI = NAWI with digital indication, NSI = non-self-indicating NAWI,
mpe = maximum permissible error

Item	Test	Test procedure in short	Requirements R 76-1	Procedure R 76-1, Annex A
4.3.1	Accuracy of zero-setting and tare devices	NSI: no test, manual setting to zero as prescribed in R76	6.4.2; 6.5.3; 6.6.2.3; 6.7.2; 6.8.3; 6.9.5;	---
		AI: no test, check whether device is sensitive enough to be set to zero to within 0.2 <i>e</i>	(4.2.1)	---
		DI: load to a changeover point, initiate zero-setting or tare device, determine zero error by adding small weights until indication switches to 1 <i>e</i>	Zero-setting device: 4.5.2; tare device: 4.6.3	A.4.2.3; A.4.6.2
4.3.2	Repeatability	Set indication to "exact zero", apply test load of $\approx 0.8 \text{ Max}$, read indication, reset to zero after unloading where necessary; class III and IIII: perform 3 times class II: perform 6 times. All individual indications shall be within mpe, the largest difference between any two results shall be $\leq mpe $. Where the test load of $\approx 0.8 \text{ Max}$ cannot be made up of test weights (on high capacity instruments), it is acceptable to apply an unknown load	3.6.1	A.4.10

S.2 Additional information to the verification tests, section 4.3, with references to R 76-1, 2006 edition, continued

Abbreviations: AI = NAWI with analogue indication, DI = NAWI with digital indication, NSI = non-self-indicating NAWI,
mpe = maximum permissible error

Item	Test	Test procedure in short	Requirements	Procedure
4.3.3	Effect of eccentric loading	Set indication to "exact zero", apply test load of 1/3 of the sum of maximum capacity and additive tare, in the center of 4 sections of the load receptor (refer to Figure 9 in A.4.7.1) all indications shall be within mpe. Procedure to be modified for special load receptors: with more than 4 points of support, as tank or hopper, or for rolling loads	3.6.2 3.6.2.1 3.6.2.2 3.6.2.3 3.6.2.4	A.4.7
4.3.4	Errors of indication	Set indication to "exact zero", apply 5 test loads from zero to Max and down to zero, steps shall include Min, Max, and loads close to but not greater than values where the maximum permissible error changes, NSI: error is sum of extra weights applied to obtain equilibrium, AI: error is difference between indication and nominal value DI: determine error of indication prior to rounding; perform test also after activating tare device where present; all indications shall be within mpe. Substitution of test weights by other loads is possible on high capacity NAWI, 50 % to 80 % of Max, depending on repeatability test	3.5.1 3.5.3.3 and 3.5.3.4 3.7.3	A.4.4 A.4.4.1 A.4.4.3 A.4.6.1, A.4.6.3

S.2 Additional information to the verification tests, section 4.3, with references to R 76-1, 2006 edition, continued

Abbreviations: AI = analogue indication, DI = digital indication, NSI = non-self-indicating NAWI, mpe = maximum permissible error

Item	Test	Test procedure in short	Requirements	Procedure
4.3.5	Discrimination	NSI and AI: apply loads of Min, 0.5 Max and Max, at equilibrium; then apply or withdraw small extra load: on NSI: extra load of 0.4 of mpe corresponding to the load, displacement of indicator shall be visible; on AI: load of mpe according to the load, indication must change by at least 0.7 of the extra load on DI: load of $1.4 \times e$ must change indication by $1 e$	3.8 3.8.1 3.8.2.1 3.8.2.2	A.4.8.1
4.3.6	Sensitivity	Only for NSI: apply loads of Min (or zero) and Max, at equilibrium apply small additional load of mpe according to the load, observe displacement of the indicator: class III and IIII, Max ≤ 30 kg: ≥ 2 mm, class III and IIII, Max > 30 kg: ≥ 5 mm,	6.1	A.4.9
4.3.7	Tilting, if not performed at type evaluation	Exemptions: NSI, class I instruments, instruments installed in a fixed position, suspended instruments. NAWI is leveled and set to "exact zero", is then tilted to both sides and back and forth to the limiting value of tilt, in tilted position indication at no load is determined, and 2 loads are applied: close to the smallest load where the mpe value changes and close to Max. Class III and IIII: deviation of no load indication shall be $\leq 2 e$; Classes II, III, and IIII: all indications shall be within mpe	3.9.1.1	A.5.1.1
4.3.8	Tilting	Only for "mobile instruments" - see T.1.2.11! special tests in view of tilt limiting sensor and load receptor!	3.9.1.1.d, 4.18.1	A.5.1.3

Supplementary Information to Section 4

S.3 Simplified procedure to check for correct indication of a NAWI with digital indication

Procedure: NAWI indication to be set accurately to zero, by applying small additional loads up to change-over point, then removing $0.5 e$
NAWI loaded with test load(s) L or $L + 0.5 e$ as appropriate for the maximum permissible error
Indication I is read, pass/fail decision as per table below (actual errors are not determined)

Max. perm. error	Test load	Error = $I - L$ (= Indication minus nominal value of test load)							
		$< -2 e$	$-2 e$	$-1 e$	0	$1 e$	$2 e$	$3 e$	$> 3 e$
$\pm 0.5 e$	L	-	-	-	+	-	-	-	-
$\pm 1 e$	$L + 0.5 e$	-	-	-	+	+	-	-	-
$\pm 1.5 e$	L	-	-	+	+	+	-	-	-
$\pm 2 e$	$L + 0.5 e$	-	-	+	+	+	+	-	-
$\pm 3 e$	$L + 0.5 e$	-	+	+	+	+	+	+	-

Supplementary Information to Section 4

S.4 Information on type approval of NAWI

S.4.1 Concept of Type evaluation

Any self-indicating NAWI contains a special device to convert the force exerted by the load on the load receptor into the indication of the weight. Regardless of the physical principle used for this device, the NAWI is to some extent sensitive to other influences such as temperature, humidity, electromagnetic fields, local gravity acceleration and the like. If the effect of these influences on a NAWI cannot be tested at the time and place of verification, it has to be evaluated by competent test laboratories with suitable test equipment.

NAWI with electronic devices contain special software programs for the generation of the indication and other actions such as operating the NAWI via keys, price computing, printing and storing results, communication with other electronic devices and the like. To prevent the use of this software for fraudulent use of the NAWI, its structure and programming has to be examined. Often a declaration is required from the manufacturer whereby he confirms that the software complies with the rules and restrictions laid down in R 76.

It is common practice to test and evaluate one or a few samples representative of a type of NAWI.

S.4.2 Type Approval

A successful type evaluation results in a formal approval which is certified in a Type Approval Certificate (TAC) or in an OIML Certificate of Conformity (CoC), issued to the manufacturer for a type of NAWI.

One "type" may mean a whole "family" of instruments and may comprise several variants of NAWI with:

- different capacities Max,
- different verification scale intervals e ,
- different combinations of "modules",
- different versions of data processing
- and the like.

A TAC or a CoC may therefore attest the approval of a limited type or a comprehensive family of NAWI.

For the significance of the terms mentioned above, see R 76: T.2.2 Module; T.3.4 Type; T.3.5 Family; point 3.10.2; Annexes C, D, E, F.

S.4.3 Relevance of TAC and CoC

A TAC normally entitles the holder to submit a NAWI produced under the TAC directly to initial verification, in the State or group of States for which the TAC is valid.

A CoC (only) states that the type conforms to the relevant requirements of R 76, it may be used by any State for issuing a national TAC without repeating the type evaluation procedure.

These Guidelines require in Sections 4 to 6 that an initial verification of a self-indicating NAWI be performed only on presentation of a TAC or CoC for the type.

Where an AMS does not wish to perform type evaluation, this State may choose:

- to issue a national TAC to a manufacturer on presentation of a TAC or at least, of a CoC issued to him in another AMS, or
- to recognize a TAC issued in another AMS or in another country worldwide, as equivalent to a national TAC, or
- to require the manufacturer – or the representative or importer, under certain conditions – of a NAWI submitted for initial verification, to present a CoC issued to him in another AMS or in another country worldwide, and to sign a Declaration of Conformity to the CoC for the instrument(s) submitted.

S.4.4 Contents of a TAC or a CoC

A TAC or CoC contains the following information:

1. Designation of the pattern (name used by the applicant)
2. Kind of instrument (Counter scale, industrial scale etc.)
3. Metrological characteristics - (Range of) *Max, n, e*, accuracy class
4. Functional description of the instrument, including:
 - design and construction
 - list of devices/functions
 - schematic views and/or photographs,
 - software version and its identification where applicable
5. Technical data, including:

- list of drawings of mechanical constructions,
 - table of load cells, where the concept of modules is applied
 - data of indicator, where the concept of modules is applied
6. Interfaces and conditions for connection of peripheral devices
 7. Special conditions for the approval
 8. Special conditions for verification (mainly for initial verification)
 9. Location of seals and verification marks
 10. Location of prescribed markings and inscriptions

S.4.5 Responsibility of the manufacturer

A manufacturer – or his responsible agent in the AMS – shall be held responsible for the conformity of any individual NAWI to the TAC or CoC under which it is submitted for initial verification.

National regulations of an AMS which make these Guidelines compulsory shall have binding provisions for the responsibility of the manufacturer or his agent, and provide sanctions in case of failure to comply.

Note: the responsibility of the manufacturer or his agent is also addressed in Useful References All.