# WELMEC

European Cooperation in Legal Metrology

# Guide on evaluating purely digital ancillary devices (MI-005)

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European Cooperation in Legal Metrology

WELMEC is a cooperation between the legal metrology authorities of the Member States of the European Union and EFTA.

This document is one of a number of Guides published by WELMEC to provide guidance to manufacturers of measuring instruments and to Notified Bodies responsible for conformity assessment of their products.

The Guides are purely advisory and do not themselves impose any restrictions or additional technical requirements beyond those contained in relevant EU Directives.

Alternative approaches may be acceptable, but the guidance provided in this document represents the considered view of WELMEC as to the best practice to be followed.

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# Contents

# 1  Introduction

Measuring instruments for liquids other than water (MI) are often constructed from typical parts, such as gas separators, measurement transducers, electronic calculating / indicating devices and ancillary devices, produced by different Original Equipment Manufacturers (OEMs), in this document referred to as "producers".

This document provides guidance on the evaluation of purely digital ancillary devices other than self-service devices for fuel dispensers that takes no part in the measuring chain of the measuring instrument.

*Note: WELMEC guide 8.8 provides guidance on the general and administrative aspects of the voluntary system of modular evaluation of measuring instrument.*

# 2  Scope

This guide only covers separate purely digital ancillary devices used in measuring instruments for liquids other than water, which are not a self-service device[1] for use with fuel dispensers and takes no part in the determination of the measuring value of the MI. This excludes for example but not limited to, calculator/indicator and conversion devices[2].

By purely digital is meant that the electronic device only performs digital functions and provides a digitized output or display.

The fact that the digital ancillary device should only "perform digital functions" means that the device does not have analogue inputs and does not include time dependant data acquisition for the measurement and thus that the disconnection of the device during the measurement does not impact the measurement results.

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[1] The purely digital self-service device for fuel dispensers is covered by WELMEC guide 10.7
[2] Electronic Calculators with Conversion Function and Conversion Devices are covered by WELMEC guide 10.4

# 3  Definitions, abbreviations and symbols

The definitions of OIML R 117-1, edition 2007 apply to this guide together with the definitions given in WELMEC guide 8.8.

Abbreviations:

DAD  Digital ancillary device (i.e. purely digital ancillary device)
SSD  Self-service device
TEC  Type-examination certificate
NB  Notified Body
MI  Measuring instrument for liquids other than water (under MI-005)
EC  Evaluation Certificate as defined in WELMEC guide 8.8
PC  Part Certificate as defined in WELMEC guide 8.8
MID  directive 2004/22/EC of the European Parliament and of the Council of 31 March 2004 on measuring instruments

# 4  Conditions of use of this guide

Even if modular evaluation is used, the manufacturer shall apply for a conformity assessment procedure for the complete measuring instrument.

It should be noted that it is the responsibility of the manufacturer of the complete instrument to be able to demonstrate the conformity to all applicable requirements of the MID even in case the modular evaluation is used.

A device incorporated in the same housing of an additional device or ancillary device shall be tested together with the additional or ancillary device.

The part shall bear the CE marking according to Directives other than the MID and after evaluation the EC or PC number, but it cannot bear the supplementary metrology marking and Notified Body number relating to the MID.

Only a complete measuring instrument or sub-assembly if foreseen by the MID (although not applicable for MI-005) can bear the supplementary metrology marking and Notified Body number relating to conformity to the MID.

# 5  Ancillary device

An ancillary device is a device intended to perform a particular function, directly involved in elaborating, transmitting or indicating[3] measurement results[4].
Main ancillary devices[5] are:

- zero-setting device,

- repeating indicating device,

- printing device,

- memory device,

- price indicating device,

- totalizing indicating device,

- correction device,

- pre-setting device

- self service devices for applications other than fuel dispensers.

It should be noted that if the ancillary device is incorporated in the same housing as the additional – or ancillary device it should be tested together with that additional – or ancillary device.

If the hardware of the DAD:

- bears a CE marking showing conformity to for example the EMC directive

- does not include the power supply for the MI and

- is equipped with the necessary checking facilities, as referred to in this guide, no tests need to be performed on the hardware of the DAD except in the case where those tests are needed to fulfil the checks in the checklist.

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[3] The indication may be a display or hard copy

[4] See T.a.6 Ancillary device of OIML R 117-1, edition 2007.

[5] Self-service devices for fuel dispensers are not covered by this guide. Self-service devices for fuel dispensers are covered by WELMEC guide 10.7.

## 5.1  Simple recipient printers

Any simple recipient printing device that:

- bears the CE marking of conformity to the applicable directives, i.e. EMC and LV directive, and

- is not capable of transmitting any data or instructions towards the MI, SSD or DAD other than to release a printout or to check for correct data transmission, and

- cannot modify or further process the measuring result other than needed to produce a print-out, and

- complies with the applicable requirements of article 3.4 and 4.3.5 of OIML R 117-1, edition 2007

may be connected to a MI, SSD or DAD without a EC or PC provided that a statement to that extent is included in the TEC.

## 5.2  Hardware

If a DAD is made of hardware[6] with a CE mark of conformity to at least the requirement(s) of the EMC directive, the software of the DAD needs only to be evaluated with one type of hardware. When the software complies with the applicable requirements the EC or PC can state that any hardware may be used, provided that the hardware has a CE mark of conformity to at least the requirement(s) of the EMC directive.

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[6]  This includes all types of hardware, for example but not limited to special for purpose computers or universal computer systems.

# 6 Evaluation of the DAD

Any simple recipient printing device, see 5.1 of this guide, may be connected to a MI, or SSD or DAD without a EC or PC, provided that a statement to that extent is included in the TEC and that the simple recipient printer meets the requirements of 5.1 of this guide.

## 6.1 Application

There shall be a written application from the producer of the DAD for an EC or PC. The application shall contain the following:

- Producer's name and address;

- A declaration that the DAD cannot be disturbed or fraudulently manipulated through the interface of the DAD;

- A declaration that the producer is aware of his obligations as specified in WELMEC guide 8.8, specifically related to the availability of the technical documentation;

- Complete technical documentation in accordance with article 10 of the MID, for example but not limited to:

    o General description of type, and explanations necessary to understand the functioning of the DAD;

    o List of descriptions and characteristic data of all devices incorporated in the DAD, such as but not limited to:

        ▪ Interfaces;
        ▪ Indicating devices;
        ▪ Printing devices;
        ▪ Data storage devices.

    o List and description of the checking facilities of the DAD;

    o Software description, communication protocols, means for securing the software;

    o Information concerning special cases, such as but not limited to:

        ▪ Special operating conditions;
        ▪ Reaction of the DAD to significant faults;
        ▪ Functioning of the DAD after switch on.

    o A declaration of conformity stating that the hardware of the DAD complies with the relevant parts of the applicable directives, in particular with the EMC directive.

## 6.2    Test requirements

### 6.2.1    Requirement concerning the technical documentation

The technical documentation should be in accordance with article 10 of the MID.

### 6.2.2    Technical requirements according to OIML R 117-1, edition 2007

The DAD shall comply with the technical requirements, where applicable, according to OIML R 117-1, edition 2007.  See Annex A, chapter A.4, Checklist for DAD of this guide.
If the DAD is a purely digital device, has a CE marking mark of conformity to at least the requirement(s) of the EMC directive, does not include the power supply for the MI and is equipped with the necessary checking facilities, under this guide no tests need to be performed on the hardware of the DAD except when those tests are needed to fulfil the checks in the checklist.
A DAD shall include a checking facility of type I or P. The object of this checking facility is to verify the presence of the ancillary device (when it is a necessary device) and to verify the correct transmission of data from the calculator to the ancillary device and enables significant faults to be detected and acted upon.
With regard to acting upon significant fault the necessary checking facilities should ensure that

- any failure, stop, power interrupt or accident will make software resuming routine to check that any engaged action before such event had the expected termination it was seeking, or that no further action will be allowed to take place till remedy has been brought.
- data chain integrity is secured by making sure that any information used upstream by a software module is kept retrievable till proper completion of expected actions engaged by the software module.

In case of a printer the following shall be checked as well:
- presence of paper; and
- the electronic control circuits (except the driving circuits of the printing mechanism itself).

it shall be possible during the evaluation to ensure that the checking facility of the printing device is functioning by an action that forces a printing malfunction. This action should be a simulated incorrectness in the generation, transmission (taking into account R 117-1, 4.3.2.1), processing, or indication of measurement data but also data link cut, missing paper and power supply cut.

In the case where the DAD is fitted with memory storage devices[7] to store measurement results until their use or to keep a record of commercial transactions, providing proof in the event of a dispute, all of the memory storage devices shall be fitted with checking facilities. See also Annex A (ref: 4.3.5) of this guide.

### 6.2.3    Requirements concerning software

The legally relevant software added to the hardware for performing the ancillary device functions, shall be tested in accordance with WELMEC guide 7.2: Software Guide (Measuring Instruments Directive 2004/22/EC).  For the software requirements, risk class C applies.
See Annex A, chapter A.5 Software tests of this guide.

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[7] OIML R 117-1 article 3.5 defines the memory storage device

## 6.3  Evaluation

The test institute should evaluate whether

- the documentation is confirmed to be in accordance with article 10 of the MID;
- the DAD is confirmed to be constructed in accordance with the documentation, in particular if the DAD is equipped, when applicable, with a clearly readable display, properly operating legally relevant software, and the necessary checking facilities;
- the DAD is confirmed to be in accordance with the test requirements.

If the DAD is a purely digital device, has a CE marking, and does not include the power supply for the MI, no tests need to be performed on the hardware of the DAD except when those tests are needed to fulfil the checks in the checklist.
The correct functioning of the checking facilities may be tested by means of simulation.

### 6.3.1  Set-up for evaluation

For evaluation the DAD software may be run on the DAD or on a computer platform which is in conformity to the relevant directives, in particular the requirement(s) of the EMC directive, and shall be connected, through an appropriate interface, to either: a simulator; or a complete MI; or a combination of a simulator and parts of a MI.
Note:      It shall be ensured that in the test set-up, all functionalities have been catered for.

### 6.3.2  Evaluation report

The test institute should issue an Evaluation Report (ER) that specifies the examinations and tests that have been performed and what the outcome of the examinations and tests were. See Annex A of this guide.
If the DAD complies with all the applicable requirements of this guide an EC or PC can be issued.

# 7 Certificates

## 7.1 EC or PC

The EC or PC should be in compliance with WELMEC guide 8.8.
In particular the EC or PC should contain:

- a description of the legally relevant characteristics of the DAD, including its compatibility with other devices, and

- documentation that allows the conformity of the part including the software to be checked.

See Annex B of this guide.

## 7.2 TEC

There are two administrative ways for including a DAD in the TEC:

1. All references and complete description of a specific type of DAD are included in the TAC of the measuring instrument, or

2. The modular approach is used

    - to allow the possibility of using a DAD with an EC or PC by making reference to that EC or PC,

    - with the possibility of a general statement concerning the connection of any DAD with a PC,

    provided that the EC or PC are issued by a test institute that can also act as a Notified Body under module B of the MID for measuring instruments for liquids other than water (MI-005)

A general statement in the TEC concerning the connection of any DAD comprising a PC to a MI is only possible if all of the following conditions are met:

1. The interfaces and protocols of the MI are compatible with the interfaces and protocols of the DAD and

2. The MI shall transmit data relating to presentation of results only in such a manner that the DAD can meet the requirements and

3. The connection to the DAD shall not allow the metrological functions of the MI to be inadmissibly influenced by or through the DAD and

4. The connection of the DAD shall not lead to an instrument having metrological characteristics other than those specified in the TEC for the MI.

## 7.3  Wording in the TEC of the MI

The manufacturer of the MI, in the application for type-examination, shall request the possibility of connecting any DAD to his MI.

If the manufacturer requests a general statement for the connection of any DAD with a PC, the following conditions should be stated in the TEC:

- The DAD has a PC issued by a test institute that can also act as a Notified Body under module B of the MID for measuring instruments for liquids other than water (MI-005);

- The connection shall be made in such a way that the presentation of the results meets the essential requirements of the MID  and

- The connection shall be made through the interfaces with the specified protocols as mentioned in the TEC and/or the PC.

With regard to a simple recipient printer the following should be stated in the TEC:
Any simple recipient printing device may be connected to the measuring instrument provided that the simple recipient printer:

- bears the CE marking of conformity to the applicable directives, i.e. EMC and LV directive, and

- is not capable of transmitting any data or instructions towards the MI, SSD or DAD other than to release a printout or to check for correct data transmission, and

- cannot modify or further process the measuring result other than needed to produce a print-out and

- complies with the applicable requirements of article 3.4 and 4.3.5 of OIML R 117-1, edition 2007.

# Annex A: Evaluation report

Issued by : 

Applicant : 

Submitted : 

Designation : 

Producer : 

Scope of evaluation : Functional evaluation on the above mentioned purely digital ancillary device for compliance with the applicable requirements of the OIML International Recommendation R 117-1 (Edition 2007) "Measuring systems for liquids other than water" and WELMEC guide 7.2 "Software Guide".

Results : 

Evaluation period : 

Signatures : 

Date :

# Annex A: Evaluation report

## A.1   General information concerning the evaluation set-up

Application Number        :


Applicant                 :


Producer                  :


Representative            :


xxxx device

    Pattern designation    :

Software version          :

Setup                     :

Reasoning                                     for                                              the
particular evaluation set-up   :

# Annex A: Evaluation report

## A.1.1 Legally relevant files of the software used at evaluation:

| Name | Date | Size | Version | Checksum |
|------|------|------|---------|----------|
|      |      |      |         |          |
|      |      |      |         |          |
|      |      |      |         |          |

## A.1.2 List of documents used at evaluation:

| Title | identification number | date | Remarks |
|-------|----------------------|------|---------|
|       |                      |      |         |
|       |                      |      |         |
|       |                      |      |         |
|       |                      |      |         |

## A.1.3 Identification of the equipment used for evaluation[8]

| nr. | Type | manufacturer | model | conn. to nr. | hardware I/F | certificate no. |
|-----|------|--------------|-------|--------------|--------------|-----------------|
| 1   |      |              |       |              |              |                 |
| 2   |      |              |       |              |              |                 |
| 3   |      |              |       |              |              |                 |
| 4   |      |              |       |              |              |                 |

## A.1.4 Digital pictures of DAD during the functional evaluation

## A.1.5 List of communication protocols

## A.1.6 Pictures of peripheral equipment used

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[8]   This concerns the equipment of the laboratory used for the evaluation, for example the used simulators.

# Annex A: Evaluation report

## A.2   Scope

This report concerns the evaluation of a purely digital xxxx device for compliance with the relevant requirements of OIML International Recommendation R 117-1 "Measuring systems for liquids other than water", Edition 2007 (E) and the WELMEC guide 7.2 "Software Guide".

### A.2.1   Legend

The symbols used in this Check List are:

    **+**    = Passed
    **-**    = Failed
    /    = Not applicable
    V    = applicable but not covered in this evaluation report

For each test, the "checklist" has been completed according to this example:

| + | - | |
|---|---|---|
| * | | the instrument fulfils the requirement |
| | * | the instrument doesn't fulfil the requirement |
| / | / | the requirement is not applicable |
| V | V | Applicable but not covered in this evaluation report. Reference to the applicable evaluation report should be made in the remarks. |

Note:   Item numbering refers to International Recommendation OIML R 117-1 (Edition 2007) "Measuring systems for liquids other than water"

# Annex A: Evaluation report

## A.3   Conclusion of the evaluation

| Number | Description | + | - | Remarks |
|--------|-------------|---|---|---------|
|  | Technical documentation in accordance to article 10 of the MID |  |  |  |
| 6.4 | Checklist R 117-1 |  |  |  |

| Number | Extension | Description | + | - | Remarks |
|--------|-----------|-------------|---|---|---------|
| 6.5.3.1 | Type P | Requirements on basic configuration |  |  |  |
| 6.5.3.2 | Type U | Requirements on data storage |  |  |  |
| 6.5.3.3 | Extension  L | Requirements on interfaces |  |  |  |
| 6.5.3.4 | Extension  T | Requirements on software separation |  |  |  |
| 6.5.3.5 | Extension  S | Requirements on software download |  |  |  |
| 6.5.3.6 | Extension  D | Instrument type specific requirements |  |  |  |
| 6.5.3.7 | Extension  I | Specific software requirements |  |  |  |

Observers:

# Annex A: Evaluation report

## A.4 Checklist for DAD

### A.4.1 Zero-setting device

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for zero-setting device.
3.2.4.1 A quantity indicating device may be provided with an ancillary device for setting the indication to zero either by manual operation or by means of an automatic system.
3.2.4.2 Once the zeroing operation has begun, it shall be impossible for the quantity indicating device to show a result different from that of the measurement which has just been made, until the zeroing operation has been completed.
Indicating devices on fuel dispensers and electronic measuring systems shall not be capable of being reset to zero during measurement. On other measuring systems, either this provision shall be fulfilled or a clearly visible notice shall be provided on the indicating device stating that this operation is prohibited.
3.2.4.3 Not applicable.

3.2.4.4 On digital indicating devices, the quantity indication after return to zero shall be zero without any ambiguity.

3.2.4.5 In the case of direct selling to the public, and except for fuel dispensers, the following provisions apply:
- The next delivery shall be inhibited until the indicating device has been reset to zero;

or
- When the zeroing operation is not automatic, the measuring system shall bear legible and indelible information inviting the customer to reset the indication before the delivery.

### A.4.2 Repeating indicating device

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for repeating indicating device

9.3 A measuring system may have several devices indicating the same quantity. Each shall meet the requirements of this Recommendation. Scale intervals of the various indications may be different.

2.9.4 For any measured quantity relating to the same measurement, the indications provided by various devices shall not deviate one from another by more than one scale interval or the greatest of the two scale intervals if they differ, except otherwise provided in clause 5 (see 5.10.1.3).
3.2.1.1 Reading of the indications shall be precise, easy and non-ambiguous whatever position the indicating device comes to rest; if the device comprises several elements, it shall be arranged in such a way that the reading of the measured quantity can be made by simple juxtaposition of the indications of the different elements. The decimal sign shall appear distinctly.

3.2.1.2 The scale interval shall be in the form $1 \times 10^n$, $2 \times 10^n$ or $5 \times 10^n$ authorized units of quantity, where n is a positive or negative whole number, or zero.

3.2.1.3 Non-significant minimum increments of registration should be avoided. This does not apply to price indications.

3.2.1.4 The scale interval shall satisfy the following requirements:

# Annex A: Evaluation report

• NOT APPLICABLE;
• for digital indicating devices, the quantity corresponding to two minimum increments of registration shall be less than or equal to the minimum specified quantity deviation.

3.2.2 NOT APPLICABLE

3.2.3 Electronic indicating device
The continuous display of quantity during the period of measurement is only mandatory in the case of direct selling to the public. However, if interrupting the display of quantity interrupts the action of some checking facilities that are mandatory or necessary to ensure correct measurement, the quantity passing through the meter during each interruption shall be smaller than or equal to the minimum measured quantity.
If the device is capable of hiding a small number of "minimum increments of registration" at the beginning of a measurement, it must be possible during type approval and initial verification to easily switch off this feature.

4.3.5 Checking facilities for ancillary devices
An ancillary device (repeating device, printing device, self-service device, memory device, etc.) shall include a checking facility of type I or P. The object of this checking facility is to verify the presence of the ancillary device (when it is a necessary device) and to verify the correct transmission of data from the calculator to the ancillary device.

## A.4.3    Printing device,

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for printing device

3.4.1 The printed scale interval shall be in the form of $1 \times 10^n$, $2 \times 10^n$ or $5 \times 10^n$ authorized units of quantity, n being a positive or negative whole number, or zero, and shall not be greater than the minimum specified quantity deviation.
The printed scale interval shall not be less than the smallest scale interval of the indicating devices.

3.4.2 The quantity printed shall be expressed in one of the units authorized for the indication of quantity and expressed in the same units as the indicating device.
The figures, the unit used or its symbol and the decimal sign, if any, shall be printed unambiguously on the ticket.

3.4.3 The printing device may also print information identifying the measurement such as: sequence number, date, identification of the dispenser, type or name of liquid, etc.
If the printing device is connected to more than one measuring system, it shall print the identification of the relevant system.

3.4.4 If a printing device allows repetition of the printing before a new delivery has started, copies shall be clearly marked as such, for example by printing "duplicate".

3.4.5 If the quantity is determined by the difference between two printed values, even if one is expressed in zeros, it shall be impossible to withdraw the ticket from the printing device during measurement.

# Annex A: Evaluation report

3.4.6 Where the printing device and quantity indicating device each have a zeroing device, these devices shall be designed so that resetting one of them to zero also resets the other.

3.4.7 The printing device may print, in addition to the measured quantity, the corresponding transaction price, or this price accompanied by the unit price.
Any value shall be printed as a repeated value from the measuring system.
The figures, the monetary unit used or its symbol, and the decimal sign, if any, shall be printed unambiguously on the ticket.

3.4.8 The printed price scale interval shall be in the form $1 \times 10n$, $2 \times 10n$ or $5 \times 10n$ monetary units, n being a positive or negative whole number, or zero; it shall not exceed the minimum specified price deviation. However, it need not be less than the smallest coin in circulation in the country in which the equipment is used.

3.4.9 If the quantity indicating device is not fitted with a price indicating device, the difference between the printed price and the price calculated on the basis of the indicated quantity and the printed unit price shall comply with the requirements in 3.3.7.

3.4.10 Electronic printing devices are also subject to the requirements in 4.3.5.

4.3.5 Checking facilities for ancillary devices
An ancillary device (repeating device, printing device, self-service device, memory device, etc.) shall include a checking facility of type I or P. The object of this checking facility is to verify the presence of the ancillary device (when it is a necessary device) and to verify the correct transmission of data from the calculator to the ancillary device.

## A.4.4    Memory device

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for  memory device

3.5.1 Measuring systems may be fitted with a memory device to store measurement results until their use or to keep a record of commercial transactions, providing proof in the event of a dispute. Devices used to read stored information are considered as included in the memory devices.
It is not required that the parties interested in a transaction shall be provided continuously with the results of measurement, but only that they shall have access to these results (for example, in the event of a dispute).
In addition, in the case of self-service (filling station, truck filling station) the owner of the measuring system is considered to have access to the indications of the measuring system even when he does not use this possibility in practice.

3.5.2 The medium on which data are stored must have sufficient permanency to ensure that the data are not corrupted under normal storage conditions. There shall be sufficient memory storage for any particular application.

3.5.3 Stored data may be deleted if either:
• the transaction is settled; or
• these data are printed by a printing device subject to legal control.

# Annex A: Evaluation report

3.5.4 After the requirements in 3.5.3 are fulfilled and when the storage is full, it is permitted to delete memorized data when both the following conditions are met:
• data are deleted in the same order as the recording order and the rules established for the particular application are respected;
• deletion is carried out either automatically or after a special manual operation.

3.5.5 Memorization shall be such that it is impossible in normal use to modify stored values.
The data memorized must be protected against unintentional and intentional changes with common software tools.

3.5.6 Memory devices shall be fitted with checking facilities according to 4.3.5. The aim of the checking facility is to ensure that stored data correspond to the data provided by the calculator and that restored data correspond to stored data.

4.3.5 Checking facilities for ancillary devices
An ancillary device (repeating device, printing device, self-service device, memory device, etc.) shall include a checking facility of type I or P. The object of this checking facility is to verify the presence of the ancillary device (when it is a necessary device) and to verify the correct transmission of data from the calculator to the ancillary device.

## A.4.5    Price indicating device,

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for price indicating device

3.3.1 A quantity indicating device with aligned figures and zero-setting may be complemented with a price indicating device, also with aligned figures and zero-setting.

3.3.2 The unit price may be displayed before the delivery (3.3.2.1) or the unit price may be keyed in after the delivery (3.3.2.2).

3.3.2.1 The selected unit price shall be displayed by an indicating device before the start of the measurement (unless the option in 3.3.2.2 is used). The unit price shall be adjustable; changing the unit price may be carried out either directly on the measuring system or through ancillary devices.
The indicated unit price at the start of the measurement operation shall be valid for the whole transaction. A new unit price shall only be effective at the moment of a new measurement operation.
A time of at least 5 seconds shall elapse between indicating a new unit price and before the next measurement operation can start, if the unit price is set from ancillary devices.

3.3.2.2 (This section is a different option from 3.3.2.1 and is not applicable to fuel dispensers.) In the case of price indicating devices for measuring systems other than fuel dispensers, it is permitted to display only the quantity before and during the delivery. Neither unit price nor total price is displayed before and during the delivery. After the measurement operation is complete, the unit price is selected (or keyed in) to process the total price calculation to conclude the transaction; this unit price shall be valid for the whole transaction.
In the case of direct selling to the public, the unit price shall be displayed or printed.

# Annex A: Evaluation report

3.3.3 The provisions in 3.2 relating to quantity indicating devices apply also, by analogy, to the price indicating devices.

3.3.4 The monetary unit used, or its symbol, shall appear in the immediate vicinity of the indication.

3.3.5 The zero-setting devices of the price indicating device and of the quantity indicating device shall be designed in such a way that zeroing either indicating device automatically involves zeroing the other.

3.3.6 The scale interval shall satisfy the following requirements
• for analog indicating devices, NOT APPLICABLE
• for digital indicating devices, the price corresponding to two minimum increments of registration, shall be less than or equal to the minimum specified price deviation.
However, the interval of one-fifth of the scale interval or of 2 mm in the case of the first bullet or the scale interval in the case of the second bullet needs not correspond to a value less than that of the smallest coin in circulation in the country in which the equipment is used.

3.3.7 The difference between the indicated price and the price calculated from the unit price and the indicated quantity shall not exceed the minimum specified price deviation. However, this difference need not be less than the smallest coin in circulation in the country in which the equipment is used.
Moreover, this requirement does not apply when the unit price has been changed between two measurements.

3.3.8 The significant fault on price indication (the difference in 3.3.7) is the price corresponding to the significant fault for the quantity as specified in 2.5.4.

3.3.9 On analog indicating devices, NOT APPLICABLE.

3.3.10 On digital indicating devices, the price indication after zeroing shall be zero without any ambiguity.

4.3.5 Checking facilities for ancillary devices
An ancillary device (repeating device, printing device, self-service device, memory device, etc.) shall include a checking facility of type I or P. The object of this checking facility is to verify the presence of the ancillary device (when it is a necessary device) and to verify the correct transmission of data from the calculator to the ancillary device.

## A.4.6    Totalizing indicating device,

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for totalizing indicating device

2.9.3 A measuring system may have several devices indicating the same quantity. Each shall meet the requirements of this Recommendation. Scale intervals of the various indications may be different.

2.9.4 For any measured quantity relating to the same measurement, the indications provided by various devices shall not deviate one from another by more than one scale interval or the greatest of the two scale intervals if they differ, except otherwise provided in clause 5 (see 5.10.1.3).

# Annex A: Evaluation report

For totalizers, this requirement applies to the difference in indication before and after the measurement.

3.2.1.1 Reading of the indications shall be precise, easy and non-ambiguous whatever position the indicating device comes to rest; if the device comprises several elements, it shall be arranged in such a way that the reading of the measured quantity can be made by simple juxtaposition of the indications of the different elements. The decimal sign shall appear distinctly.

3.2.1.2 The scale interval shall be in the form $1 \times 10n$, $2 \times 10n$ or $5 \times 10n$ authorized units of quantity, where n is a positive or negative whole number, or zero.

3.2.1.3 Non-significant minimum increments of registration should be avoided. This does not apply to price indications.

3.2.1.4 The scale interval shall satisfy the following requirements:
• NOT APPLICABLE;
• for digital indicating devices, the quantity corresponding to two minimum increments of registration shall be less than or equal to the minimum specified quantity deviation.

3.2.2 NOT APPLICABLE

3.2.3 Electronic indicating device
The continuous display of quantity during the period of measurement is only mandatory in the case of direct selling to the public. However, if interrupting the display of quantity interrupts the action of some checking facilities that are mandatory or necessary to ensure correct measurement, the quantity passing through the meter during each interruption shall be smaller than or equal to the minimum measured quantity.
If the device is capable of hiding a small number of "minimum increments of registration" at the beginning of a measurement, it must be possible during type approval and initial verification to easily switch off this feature.

4.3.5 Checking facilities for ancillary devices
An ancillary device (repeating device, printing device, self-service device, memory device, etc.) shall include a checking facility of type I or P. The object of this checking facility is to verify the presence of the ancillary device (when it is a necessary device) and to verify the correct transmission of data from the calculator to the ancillary device.

## A.4.7    Correction device,

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for correction device

3.1.4.1 Meters may be fitted with correction devices; such devices are always considered as an integral part of the meter. The whole of the requirements which apply to the meter, in particular the maximum permissible errors specified in 3.1.2.1, are therefore applicable to the corrected quantity (at metering conditions).

3.1.4.2 In normal operation, the non-corrected quantity shall not be displayed. The non-corrected quantity shall, however, be available for test purposes.

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3.1.4.3 The correction device shall only be used to reduce the errors to as close to zero as possible.

3.1.4.4 All the parameters which are not measured and which are necessary for correcting shall be contained in the calculator at the beginning of the measurement operation. The type approval certificate may prescribe the possibility of checking parameters that are necessary for correctness at the time of verification of the correction device.

3.1.4.5 For transactions that involve direct selling to the public, applying a correction is allowed only by selecting the name or the type of the liquid at the beginning of the measurement operation. For transactions that do not involve direct selling to the public, it is allowed to select or enter the name or type of the liquid or any other data, when this data participates in the correction of the quantity. This other allowed data is that which characterizes the name or type of the measured liquid without any ambiguity.
All cases are subject to the following conditions:
• A printing device subject to legal metrological control is mandatory;
• This data and a note explaining that this data has been entered manually shall be printed at the same time as the measuring results;
• The name or type of the liquid shall be known and printed without any ambiguity.

For transactions that do not involve direct selling to the public (especially transactions governed by specific contracts), a printing device is not required when the following conditions exist:
• when the correction is stored by a memory device accessible to all parties involved; or
• when both parties have the possibility to be present to conclude the transaction, by any appropriate means, and the two parties are informed of the conditions of the correction.
The type approval certificate may indicate how to gain access to the memorized data.

3.1.4.6 The correction device shall not allow the correction of a pre-estimated drift (such as in relation to time or total quantity).

3.1.4.7 The associated measuring devices, if any, shall comply with the applicable International Standards or Recommendations. Their accuracy shall be good enough to permit the requirements on the meter to be met, as specified in 3.1.2.1.

3.1.4.8 Associated measuring devices shall be fitted with checking facilities, as specified in 4.3.6.

4.3.6 Checking facilities for the associated measuring devices
Associated measuring devices shall include a checking facility of type P. The aim of this checking facility is to ensure that the signal given by these associated devices is inside a pre-determined measuring range.
Data from associated measuring devices shall be read at least 5 times during a quantity equal to the minimum measured quantity. Each time the data is read there shall be a check.

## A.4.8    Pre-setting device.

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for pre-setting device

3.6.1 The preset quantity shall be indicated before the start of the measurement.

# Annex A: Evaluation report

3.6.2 Where pre-setting is effected by means of several controls which are independent of each other, the scale interval corresponding to one control shall be equal to the pre-setting range of the control of the next lower order.
Pre-setting devices with push-buttons or similar means to pre-set fixed quantities are allowed, provided that these fixed quantities are equal to a whole number of units of volume or mass.

3.6.3 Pre-setting devices may be so arranged that the repetition of a selected quantity does not require a new setting of the controls.

3.6.4 Where it is possible to view simultaneously the figures of the display device of the pre-setting device and those of the quantity indicating device, the former shall be clearly distinguishable from the latter.

3.6.5 Indication of the selected quantity may, during measurement, either remain unaltered or return progressively to zero. However, for an electronic pre-setting device it is acceptable to indicate the preset value on the indicating device for quantity or price by means of a special operation with the restriction that this value shall be replaced by the zero indication for quantity or price before the measurement operation can start.

3.6.6 In the case of a prepaid or pre-ordered delivery:
• the difference found under normal operating conditions between the pre-set quantity and the quantity shown by the quantity indicating device at the end of the measurement operation shall not exceed the minimum specified quantity deviation;
• the difference found under normal operating conditions between the prepaid amount and the price shown by the price indicating device at the end of the measurement operation shall not exceed the minimum specified price deviation.

3.6.7 The pre-set quantities and the quantities shown by the quantity indicating device shall be expressed in the same unit. This unit (or its symbol) shall be marked on the pre-setting mechanism.

3.6.8 The scale interval of the pre-setting device shall not be less than the scale interval of the indicating device.

3.6.9 Pre-setting devices may incorporate a device to permit the flow of liquid to be stopped quickly when necessary.

3.6.10 Measuring systems with a price indicating device may also be fitted with a price pre-setting device which stops the flow of the liquid when the quantity delivered corresponds to the pre-set price.
The requirements in 3.6.1 to 3.6.9 apply by analogy.

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**A.4.9 Electronic devices**

Abstract from the R 117-1, Edition 2007 (E) with requirements relevant for electronic devices

| 4 | ELECTRONIC DEVICES | | | |
|---|---|---|---|---|
| 4.1 | **General Requirements** | | | |
| 4.3 | **Checking facilities** | | | |
| No | Requirement | True | False | Remarks |
| 4.3.5 | Checking facilities for ancillary devices | | | |
| | A DAD shall include a checking facility of type I or P. The object of this checking facility is to verify the presence of the ancillary device (when it is a necessary device) and to verify the correct transmission of data from the calculator to the ancillary device.. | | | |
| | In particular, the checking of a printing device aims at ensuring that the data received and processed by the printing device correspond to the data transmitted by the calculator. At least the following shall be checked:<br>• presence of paper; | | | |
| | • transmission of data; and | | | |
| | • the electronic control circuits (except the driving circuits of the printing mechanism itself). | | | |
| | While not a requirement for initial and subsequent verification, it shall be possible during type approval to ensure that the checking facility of the printing device is functioning by an action that forces a printing malfunction. This action should be a simulated incorrectness in the generation, transmission (taking into account 4.3.2.1), processing, or indication of measurement data. | | | |
| | Where the action of the checking facility is a warning, this warning shall be given on the ancillary device concerned or on another visible part of the measuring system. | | | |

# Annex A: Evaluation report

## A.5    Software tests

### A.5.1    Determination on Instrument Type and Required Extensions

| No | Requirement | True | False | Remarks |
|---|---|---|---|---|
| 1 | Is the entire application software constructed for the measuring purpose? | | | |
| 2 | There is no general-purpose software accessible by or visible to the user? | | | |
| 3 | Is the user prevented from accessing the operating system if it is possible to switch to an operating mode not subject to legal control? | | | |
| 4 | Are the implemented programs and the software environment invariable (apart from updates)? | | | |
| 5 | There are no means for programming? | | | |

Instrument Type: ☐    (Type P if all questions above are answered with true, otherwise type U)

Risk class: ☐    (See extension I of WELMEC guide 7.2)

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## A.5.2    Decision on Required Extensions

| No. | Requirement | Yes | No | Remarks |
|---|---|---|---|---|
| L | Does the device have the ability to store the measurement data either on an integrated storage or on a removable storage? | | | |
| T | Does the device have interfaces for transmission of data to devices subject to legal control OR is the device receiving data from another device subject to legal control? | | | |
| S | Are there software parts with functions not subject to legal control AND are these software parts desired to be changed after approval? | | | |
| D | Is loading of legally relevant software possible or desired? | | | |

## A.5.3    Checklist of basic software

### A.5.3.1        Requirements for type P instruments

| Req. | Test proc | Requirement | Passed | Failed | N.A. | Remarks * |
|---|---|---|---|---|---|---|
| P1 | | Does the required manufacturer documentation fulfil the requirement P1 (a-g)? | | | | |
| P2 | | Is a software identification realised as required in P2? | | | | |
| P3 | | Are commands entered via the user interface prevented from inadmissibly influencing the legally relevant software and measurement data? | | | | |
| P4 | | Are commands input via non-sealed communication interfaces of the instrument prevented from inadmissibly influencing the legally relevant software and measurement data? | | | | |
| P5 | | Are legally relevant software and measurement data protected against accidental or unintentional changes? | | | | |
| P6 | | Is legally relevant software secured against the inadmissible modification, loading or swapping of hardware memory? | | | | |
| P7 | | Are Parameters that fix legally relevant characteristics of the measuring instrument secured against unauthorized modification? | | | | |
| *Explanations are needed if there are deviations from software requirements.* | | | | | | |

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## A.5.3.2    Requirements for type U instruments

| Req. | Test proc. | Requirements | Passed | Failed | N.A. | Remarks * |
|------|------------|--------------|--------|--------|------|-----------|
| U1 | | Does the required manufacturer documentation fulfil the requirement U1 (a-h)? | | | | |
| U2 | | Is a software identification realised as required in U2? | | | | |
| U3 | | Are commands entered via the user interface prevented from inadmissibly influencing the legally relevant software and measurement data? | | | | |
| U4 | | Is it prevented that commands inputted via non-sealed communication interfaces of the instrument inadmissibly influence the legally relevant software and measurement data? | | | | |
| U5 | | Are legally relevant software and measurement data protected accidental or unintentional changes? | | | | |
| U6 | | Is legally relevant software secured against inadmissible modification? | | | | |
| U7 | | Are legally relevant parameters secured against unauthorised modification? | | | | |
| U8 | | Are means employed to ensure the authenticity of the legally relevant software and is the authenticity of the results that are presented guaranteed? | | | | |
| U9 | | Is the legally relevant software designed in such a way that other software does not inadmissibly influence it? | | | | |
| *Explanations are needed if there are deviations from software requirements.* | | | | | | |

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**A.5.3.3**     **Requirements for extension L**

| Req. | Test proc. | Requirement | Passed | Failed | N.A. | Remarks * |
|---|---|---|---|---|---|---|
| L1 | | Does the stored measurement data contain all relevant information necessary to reconstruct an earlier measurement? | | | | |
| L2 | | Is stored data protected against accidental and unintentional changes? | | | | |
| L3 | | Is the stored measurement data protected against intentional changes carried out with simple common software tools (for risk classes B&C) or with special sophisticated software tools (for risk classes D&E)? | | | | |
| L4 | | Is the stored measurement data capable of being authentically traced back to the measurement that generated them? | | | | |
| L5 | | B&C) Are keys treated as legally relevant data and kept secret and protected against compromise with simple software tools? | | | | |
| | | D&E) Are keys and accompanying data treated as legally relevant data and kept secret and protected against compromise with sophisticated software tools? Are appropriate methods equivalent to electronic payment used? Is user able to verify the authenticity of the public key? | | | | |
| L6 | | Does the software used for verifying stored measurement data sets display or print the data, check the data for changes, and warn if a change has occurred? Are there means to prevent data detected as having been corrupted to be used? | | | | |
| L7 | | Is the measurement data stored automatically when the measurement is concluded? | | | | |
| L8 | | Does the long-term storage have a capacity which is sufficient for the intended purpose? | | | | |
| *\* Explanations are needed if there are deviations from software requirements.* | | | | | | |

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**A.5.3.4** **Requirements for extension T**

| Req. | Test proc. | Requirements | Passed | Failed | N.A. | Remarks * |
|------|-----------|-------------|--------|--------|------|-----------|
| T1 | | Does transmitted data contain all relevant information necessary to present or further process the measurement result in the receiving module? | | | | |
| T2 | | Is transmitted data protected against accidental and unintentional changes? | | | | |
| T3 | | Is legally relevant transmitted data protected against intentional changes carried out with simple common software tools (for risk classes B&C) or with special sophisticated software tools (for risk classes D&E)? | | | | |
| T4 | | Is it possible for the program that receives transmitted relevant data to verify its authenticity and to assign the measurement values to a particular measurement? | | | | |
| T5 | | B&C) Are keys treated as legally relevant data and kept secret and protected against compromise with simple software tools? | | | | |
| | | D&E) Are keys and accompanying data treated as legally relevant data and kept secret and protected against compromise with sophisticated software tools? Are appropriate methods equivalent to electronic payment used? Is user able to verify the authenticity of the public key? | | | | |
| T6 | | Is data that has been detected as being corrupt, prevented from being used? | | | | |
| T7 | | Is it ensured that the measurement is not inadmissibly influenced by a transmission delay? | | | | |
| T8 | | Is it ensured that no measurement data get lost if network services become unavailable? | | | | |
| *Explanations are needed if there are deviations from software requirements.* | | | | | | |

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## A.5.3.5 Requirements for extension S

| Req. | Test proc. | Requirements | Passed | Failed | N.A. | Remarks * |
|---|---|---|---|---|---|---|
| S1 | | Does the software that is subject to legal control contain all legally relevant software and parameters? | | | | |
| S2 | | Is it ensured that additional information generated by the legally non relevant software part, shown on a display or printout, cannot be confused with the information that originates from the legally relevant part? | | | | |
| S3 | | Is the data exchange between the legally relevant and non-legally relevant software performed via a protective software interface that comprises controls, the interactions and data flow? | | | | |
| *	Explanations are needed if there are deviations from software requirements.* | | | | | | |

## A.5.3.6 Requirements for extension D

| Req. | Test proc. | Requirements | Passed | Failed | N.A. | Remarks * |
|---|---|---|---|---|---|---|
| D1 | | Is downloading and the subsequent installation of software automatic? Is it ensured that the software protection environment  is at the approved level on completion? | | | | |
| D2 | | Are means employed to guarantee that the downloaded software is authentic, and to indicate that the downloaded software has been approved by an NB? | | | | |
| D3 | | Are means employed to guarantee that the downloaded software has not been inadmissibly changed during download? | | | | |
| D4 | | Is it guaranteed by appropriate technical means that downloads of legally relevant software are adequately traceable within the instrument for subsequent controls? | | | | |
| *	Explanations are needed if there are deviations from software requirements.* | | | | | | |

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### A.5.3.7 Specific software requirements for measuring systems for liquids other than water (10.5.3 in the WELMEC guide 7.2)

| Req. | Test | proc | Requirements | Passed | Failed | N.A. | Remarks * |
|---|---|---|---|---|---|---|---|
| I5-1 | | | The software identification is usually presented on a display. As an exception for components of a measuring system for liquids other than water, an imprint of the software identification on the type plate of the component shall be an acceptable solution if the following conditions A, B and C are fulfilled:<br>a. The user interface does not have any control capability to activate the indication of the software identification on the display or the display does not allow technically showing the identification of the software or there is no display at the component.<br>b. The instrument does not have any interface to communicate the software identification.<br>c. After production of the component a change of the software is not possible or only possible if also the hardware or a hardware component is changed. | | | | |

# Annex B:EC or PC

Issued by             :

In accordance with   :  The WELMEC guide 8.8 "General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring Instruments" issue xx, WELMEC guide 10.9 "Guide on testing digital ancillary devices" issue xx and WELMEC guide 7.2 "Software Guide", issue xx.

Producer           :

In respect of      : A model of a digital ancillary device

Brand              :

Designation        :

Characteristics     : Software version:          identification:

Description and
Documentation     :

Remarks          :

Test Institute
Name, date

Signatory

# Annex B:EC or PC

## B.1 General information on the xxx device

This Evaluation Certificate is the positive result of the applied modular approach under the
- WELMEC guide 8.8 version xx, General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID;

- WELMEC guide 10.9 version xx, Guide on testing digital ancillary devices;

- WELMEC guide 7.2 versions xx, Software guide.

The complete measuring system shall be subject to a conformity assessment procedure as described by the MID.

## B.2 Conditions of use

The hardware of the xxxx device should comply with the EMC-directive as specified in the Declaration of Conformity of the xxx device and should be marked accordingly.

The device may bear the CE marking according to Directives other than the MID, and the EC or PC certificate reference, but is not allowed to bear the supplementary metrology marking and Notified Body number relating to the MID. Only a complete measuring instrument can bear the supplementary metrology marking and Notified Body number relating to conformity to the MID or NAWI Directive.

## B.3 Interface board and Protocols

The xxxx device with the following interface boards and protocols as stated in the table below was tested and found in compliance with the WELMEC guides specified under chapter 8.1 of this document.

| Type Interface / Converter | Protocol |
|---|---|
|  |  |

## B.4 Software description

Software specification (refer to WELMEC guide 7.2):
- Software type :

- Risk Class :

- Extension :

- Software securing :

# Annex B:EC or PC

**B.4.1 Legally relevant software components:**

| Devices | Identification number (checksum) | Remarks |
|---------|----------------------------------|---------|
|         |                                  |         |
|         |                                  |         |

**B.4.2 Software identification:**

**B.4.3 Means to display software versions and software identification:**

**B.4.4 Software functions**

## B.5 Markings

- *EC or PC number of the DAD*
- *Producers identification mark, trademark or name*
- *Type designation*
- *Year of manufacture*
- *Serial number*
- *Identification of the connected measuring instrument*

The markings are placed on the DAD on the following position: (The EC should state the position of the markings or refer to drawings that indicate the position)

# Annex B:EC or PC

## B.6  Evaluations carried out for this Evaluation or Part Certificate

The evaluation under this certificate is recorded in Evaluation Report number ####.
A summary of the evaluation tests is given below.

### B.6.1  Functional tests

| Numbe | Description | + | - | Remarks |
|-------|-------------|---|---|---------|
| 6.4 | Checklist R 117-1 | | | |

### B.6.2  Software tests

| Number | Extension | Description | + | - | Remarks |
|--------|-----------|-------------|---|---|---------|
| 6.5.3.1 | Type P | Requirements on basic configuration | | | |
| 6.5.3.2 | Type U | Requirements on data storage | | | |
| 6.5.3.3 | Extension  L | Requirements on interfaces | | | |
| 6.5.3.4 | Extension  T | Requirements on software separation | | | |
| 6.5.3.5 | Extension  S | Requirements on software download | | | |
| 6.5.3.6 | Extension  D | Instrument type specific requirements | | | |
| 6.5.3.7 | Extension  I | specific software requirements | | | |