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WELMEC

European cooperation in legal metrology

Guide on evaluating purely digital self-service devices for direct sales to the public

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WELMEC

European cooperation in Legal metrology

WELMEC is a co-operation 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 EC 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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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 self-service devices, produced by different Original Equipment Manufacturers (OEMs), in this document referred to as “producers”.

This document provides a guide for evaluating purely digital self-service devices (SSD) for direct sales to the public. The digital SSD as defined under this guide is not required to ensure correct measurement or intended to facilitate the measuring operations, or could not in any way affect the measurement.

Note: The general and administrative aspects of the voluntary system of modular evaluation of measuring instrument are given in WELMEC guide 8.8.

This guide states that for an Evaluation Certificate (EC) or Part Certificate (PC) to be issued a test institute only has to perform the functional and software tests on purely digital SSD under the following conditions:

- The hardware of the SSD bears the CE-mark;
- The purely digital SSD does not include the power supply for the MI;
- The price calculation is performed by the fuel dispenser.

If these conditions are not met the SSD cannot be evaluated according to this guide.

If during evaluation it is also established that not all of the checking facilities are present then an EC or PC under this guide cannot be issued.

2 SCOPE

This guide is only applicable for purely digital SSD for direct sales to the public which are not required to ensure correct measurement or intended to facilitate the measuring operations, or could not in any way affect the measurement.

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.

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

The guide only covers digital self-service devices for direct sales to the public used in a measuring instrument for liquids other than water that has to comply with the MID.

The part should bear the CE marking according to Directives other than the MID and 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) can bear the supplementary metrology marking and Notified Body number relating to conformity to the MID.

3 DEFINITIONS, ABBREVIATIONS AND SYMBOLS

The definitions of OIML R117-1, edition 2007 apply to this guide together with the definitions given in WELMEC guide 8.8.

Abbreviations:

SSD	self-service device(s)
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	MID, directive 2004/22/EC of the European parliament and of the council of 31 March 2004 on measuring instruments

4 EVALUATION OF THE SSD

4.1 Application

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

- Producers name and address;
- A declaration that the SSD cannot be disturbed or fraudulently manipulated through the interface of the SSD;
- A declaration that the producer is aware of the requirements put on him 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:
    - General description of type, and explanations necessary to understand the functioning of the SSD;
    - List of descriptions and characteristic data of all devices incorporated in the SSD, such as but not limited to:
        - Interfaces;
        - Indicating devices;
        - Printing devices;
        - Data storage devices.

- List and description of the checking facilities of the SSD[1] (see paragraph 4.2.2 and chapter 6, section 4.3 for the required checking facilities);
- Software description, communication protocols, means for securing the software;
- Information concerning special cases, such as but not limited to:
    - Special operating conditions;
    - Reaction of the SSD to significant faults;
    - Functioning of the SSD after switch on.
- A declaration of conformity stating that the hardware of the SSD complies with the applicable directives, in particular the EMC directive and a declaration that the SSD bears the CE-mark.
- A declaration that the purely digital SSD does not include the power supply for the MI and that the price calculation is performed by the fuel dispenser.

4.2 Test requirements

4.2.1 Requirement concerning the technical documentation

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

4.2.2 Technical requirements

The SSD shall comply with

- the technical requirements, where applicable, according to OIML R117-1, edition 2007 unless specified otherwise in this guide, see chapter 4.2.2.2 and
- WELMEC guide 7.2: Software Guide (Measuring Instruments Directive 2004/22/EC).

For the applicable technical requirements see annex A, chapter 6.4 “abstract from R117-1, edition 2007 (E) with requirements relevant for SSD”, of this guide.

For the software requirements according to WELMEC guide 7.2 see annex A, chapter 6.5 “Software tests”.

If the SSD is a purely digital device and is not required to ensure correct measurement or intended to facilitate the measuring operations, or could not in any way affect the measurement, has a CE marking, and does not include the power supply for the MI and is equipped with the necessary checking facilities (see chapter 4.2.2.1), under this guide no tests need to be performed on the hardware of the SSD except when those tests are needed to fulfil the checks in the checklist.

[1] If during evaluation it is established that not all of the checking facilities as defined in chapter 4.2.2.1 are present then an EC or PC under this guide cannot be issued.

4.2.2.1 Checking facilities

The necessary checking facilities are

- a checking facility of type I or P. The object of this checking facility is to verify the presence of the calculator and to verify the correct transmission of data from the calculator to the SSD.
- a checking facility for the printing device. The object of this checking facility is to ensure 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:
    - presence of paper;
    - transmission of data; and
    - the electronic control circuits (except the driving circuits of the printing mechanism itself).
- a checking facility for the memory device. In the case the SSD is fitted with several memory devices all memory devices shall be fitted with checking facilities. The aim of the checking facilities is to ensure that stored data corresponds to the data provided by the calculator and that restored data corresponds to stored data.

See also chapter 6, section 4.3.

4.2.2.2 Allowed deviations from OIML R117-1

SSD for unattended delivery do not need to be equipped with both a printing device and memory device as stated in OIML R117-1 but can be equipped according to the MID with only:

- a printing device or
- a memory device,

in accordance with article 10 and 11 of Annex 1 of the MID, by which the following data are printed or recorded: identification of the measuring system, measurement data, time and date of delivery and if applicable the ID of the customer in the case of a delayed payment.

Both parties shall have access either to the memorized or printed registration of the corresponding transaction.

Note: In the case where only a data storage device is used for unmanned stations to store the transaction, information in a visible place on the SSD should be available to the customer who to contact in the case of a dispute regarding the transaction.

However both a printing or memory device in line with OIML is of course allowed.

Other deviations from OIML R117-1 are marked in green in the test report in Annex A, chapter 6.4 of this guide.

4.3 Evaluation

The test institute should evaluate if

- the documentation is confirmed to be in accordance with article 10 of the MID;
- the SSD is confirmed to be constructed in accordance with the documentation and can be evaluated, see also chapter 4.3.1.
- the SSD is confirmed to be in accordance with the test requirements as specified in this guide.

If the SSD is a purely digital device and is not required to ensure correct measurement or intended to facilitate the measuring operations, or could not in any way affect the measurement, 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 SSD 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, see chapter 8.

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 the guide.

If the SSD complies with all the applicable requirements, as specified in this guide, an EC or PC can be issued.

4.3.1 Set-up for evaluation

For evaluation the SSD software should run on a computer platform which is in conformity to the relevant directives, in particular 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.

The SSD should be equipped with a clearly readable display, properly operating legally relevant software and the necessary checking facilities[2].

It shall be ensured that in the test set-up, all functionalities have been catered for. For example but not limited to, price display, price rounding and sales stacking during attended post-payment, prepayment in attended mode, delayed-payment and prepayment in unattended mode.

[2] If during evaluation it is established that not all of the checking facilities as defined in chapter 4.2.2.1 are present then an EC or PC under this guide cannot be issued.

5 CERTIFICATES

5.1 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 SSD, including its compatibility with other devices and
- a set of documentation that allows the conformity of the part including the software to be checked.

See Annex B of this guide.

5.2 TEC

There are two administrative ways of including self-service devices in the TEC:

1. The complete description of a specific type of SSD is included in the TEC of the MI, or
2. The modular approach is used
    - to allow the possibility of using an SSD 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 SSD with a PC *(see also chapter 5.2.1 and 5.2.2)*,

    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)

5.2.1 Conditions for the general statement

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

1. The MI shall transmit data relating to indications of results only in such a manner that the SSD can meet the requirements.
2. The connection to the SSD shall not allow the metrological functions of the MI to be inadmissibly influenced by or through the SSD.
3. The connection of the SSD shall not lead to an instrument having other metrological characteristics than those specified in the TEC for the MI.
4. The interfaces and protocols of the MI are compatible with the interfaces and protocols of the SSD.

5.2.2 Wording general statement in the TEC of the MI

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

If the manufacturer requests a general statement for the connection of any SSD with a PC, the following conditions should be stated in the TEC after the NB has checked if the conditions of chapter 5.2.1 are met:

- The SSD 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, whether it is an indicated, printed or memorised result, meets the essential requirements of the MID;
- The interfaces and protocols of the MI are compatible with the interfaces and protocols of the SSD; and
- The connection shall be made through the interfaces with the specified protocols as mentioned in the TEC and/or the PC.

6 Annex A: Evaluation report

Issued by	:	
Applicant	:	
Submitted	:	Purely digital self-service device for direct sales to the public
Designation	:	
Producer	:	
Scope of evaluation	:	Functional evaluation on the above mentioned purely digital self-service device for compliance with WELMEC guide 10.7 on evaluating purely digital self-service devices, the relevant parts of OIML International Recommendation R117-1 (Edition 2007) "Measuring systems for liquids other than water" and WELMEC guide 7.2 "Software testing".
Results	:	
Evaluation period	:	
Signatures	:	
Date	:	

6.1 General information concerning the evaluation set-up

Application Number :

Applicant :

Producer :

Representative :

self-service device

Pattern designation :

Software version :

Setup :

Reasoning for the particular evaluation set-up :

6.1.1 Legally relevant files of the software used at evaluation:

Name	Date	Size	Version	Checksum

6.1.2 List of documents used at evaluation:

title	identification number	date	Remarks

6.1.3 Identification of the equipment used for evaluation[3]

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

6.1.4 Pictures of the SSD during the functional evaluation

6.1.5 List of communication protocols

6.1.6 Pictures of used peripheral equipment

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

6.2 Scope

This report concerns the evaluation of a purely digital self service device for compliance with WELMEC guide 10.7 and the relevant requirements of OIML International Recommendation R117-1 "Measuring systems for liquids other than water", Edition 2007 (E) and the WELMEC guide 7.2 “software testing”.

6.2.1 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 R117-1 (Edition 2007) “Measuring systems for liquids other than water”

6.3 Conclusion of the evaluation

Numbe	Description	+	-	Remarks
	Technical documentation in accordance to article 10 of the MID			
	The hardware of the SSD bears the CE-mark			
	The SSD is purely digital			
	The SSD is not part of the measuring chain of the MI and does not include the power supply for the MI			
	The price calculation is not performed by the SSD but will be performed by the fuel dispenser to which the SSD will be connected.			
	The SSD is equipped with all the necessary checking facilities (see chapter 6.4, paragraph 4.3.5)[4]			
6.4	Relevant parts of the checklist R117-1			

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			

[4] If during evaluation it is established that not all of the checking facilities as defined in chapter 4.2.2.1 are present then an EC or PC under this guide cannot be issued.

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:

6.4 Abstract from R117-1, Edition 2007 (E) with requirements relevant for SSD

§ (R117-1)	Requirement	+	-	Remarks
2	General requirements			
2.9	**Indications**			
2.9.1	The volume shall be indicated in: cm^3, ml, dm^3, □ or in m^3.			
	The mass shall be indicated in grams (g), kilograms (kg), or metric tons (tonnes)			
	The name of the unit or its symbol shall appear in the immediate vicinity of the indication. For mass according to the case, the name of the unit or its symbol shall be accompanied by the term “mass” (actual mass) or “conventional mass” (comparison to weights).			
	The SSD should be provided with an identification of the software in line with WELMEC guide 7.2: Software Guide (Measuring Instruments Directive 2004/22/EC)			For example, display of the checksum
2.9.3	A SSD may have several devices indicating the same quantity. Each shall meet the requirements. 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).			
	For totalizers, this requirement applies to the difference in indication before and after the measurement.			

2.9.5	Subject to specific provisions for certain types of measuring systems, use of the same indicating device for the indications of several measuring systems (which then have a common indicating device) is permitted provided that one of the following conditions is met: • it is impossible to use any two of these measuring systems simultaneously;			
	• the indications relating to a given measuring system are accompanied by a clear identification of that measuring system, and the user may obtain the indication corresponding to any of the measuring systems concerned, using a simple command.			
2.19	**Markings**			
2.19.1	Each SSD shall bear the following information[5]: • EC or PC number of the SSD • Producers identification mark, trademark or name • Type designation • Serial number • Identification of the connected fuel dispenser(s)			
	This information shall be put on one or several data plates on a part not likely to be removed in normal conditions of use.			
2.20	**Sealing devices and stamping plate**			
2.20.1	General			
	Sealing may be carried out with metal, plastic or other suitable means as long as it is sufficiently durable and provides evidence of tampering			
	The seals shall, in all cases, be easily accessible.			

[5] For markings on the fuel dispenser and the Self Service Device refer also to Guide 10.5. With respect to the identification of the connected fuel dispenser WELMEC guide 10.5 states that the connected fuel dispensers will be identified with their numbers, for example: "numbers 1, 2, 3 at night; numbers 1,2,3,4, 5 at daytime".

3	**Requirements for a SSD of a measuring device**			
3.2	**Indicating device**			
3.2.1	General provisions			
3.2.1.1	Reading of the indications is 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 appears distinctly.			
3.2.1.2	The scale interval is in the form of $1*10^n$, $2*10^n$ or $5*10^n$ authorised units of quantity, where n is a positive or negative whole number, or zero			
3.2.1.3	Non-significant scale-intervals should be avoided. This does not apply to price indications.			
3.2.1.4	The scale interval shall satisfy the following requirements: • 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.			
3.3	**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.			
3.3.2.1	The selected unit price shall be displayed by an indicating device before the start of the measurement.			
	The unit price shall be adjustable; changing the unit price may be carried out either directly on the measuring system or through ancillary devices.			
3.3.3	The provisions in point 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.			

3.3.6	The scale interval shall satisfy the following requirements • 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 the value less than that of the smallest coin in circulation in the country in which the equipment is used.			
3.4	**Printing device**			
3.4.1	The printed scale interval shall be • in the form of $1 * 10^n$, $2 * 10^n$ or $5 * 10^n$ 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 must 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".			

3.4.7	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 $1 * 10^n$, $2 * 10^n$ or $5 * 10^n$ 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 below.			
	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.			
3.4.10	Electronic printing devices are also subject to the requirements in 4.3.5.			

3.5	**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 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.			
3.5.4	After section 3.5.3 requirements 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.			
3.6	**Pre-setting device**			
3.6.1	The pre-set quantity shall be indicated before the start of the measurement.			
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.			
3.6.5	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 case of a pre-paid 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.			

4	**MEASURING SYSTEMS EQUIPPED WITH ELECTRONIC DEVICES**			
4.1	**General Requirements**			
4.3	**Checking facilities**[6]			
4.3.5	Checking facilities for ancillary devices			
	A self-service device 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.			
	All memory devices shall be fitted with checking facilities. The aim of the checking facilities is to ensure that stored data corresponds to the data provided by the calculator and that restored data corresponds to stored data. (see 3.5.6)			
	The printing device shall be fitted with a checking facility. The checking of the 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: • 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.			

[6] If during evaluation it is established that not all of the checking facilities as defined in chapter 4.2.2.1 are present then an EC or PC under this guide cannot be issued.

5.	**Requirements specific to certain types of measuring systems**			
5.10	**self-service arrangements with fuel dispensers**			
5.10.1	**General requirements**			
5.10.1.2	Where the self-service device serves two or more dispensers, each dispenser shall be provided with a dispenser identification that shall accompany any primary indication provided by the self-service device.			
5.10.1.3	The primary indications on indicating devices and printing devices of the self-service-arrangement shall not indicate any mutual differences.			
	Scale intervals of the primary indication on indicating devices and the printing devices and memory devices of the self-service arrangements shall be the same.			
	However, in case the data transmission between the fuel dispenser and self-service device is in the form of pulses, all primary indications provided by the self-service device shall not indicate any mutual differences for any measured quantity relating to the same measurement.			
	The indications provided by the self-service device shall not deviate from (each of) the primary indications on the fuel dispenser by more than one scale interval or the greater of the two scale intervals if they differ.			
5.10.1.4	Printing devices of the self-service arrangement shall not reproduce the indications of a dispenser as the difference between two printed values.			
5.10.1.5	Indication of information that is not subject to metrological control is allowed, provided that it cannot be confused with metrological information.			
5.10.1.6	A change of type of payment and/or mode of operation shall not be effective before the end of the current measurement operation.			

5.10.1.7	The self-service arrangement, including provisions related to clearly defined methods of operation, shall be such that at least one primary indication for the benefit of the customer must be available at least up to the settlement of the transaction to enable the delivered quantity and the price to pay to be checked.			
5.10.1.8	In the case of a self-service arrangement that totalizes the delivered quantities for different registered customers over the course of time, the minimum measured quantity is not affected by the scale interval used for such totalizations.			
5.10.2	**Attended service mode**			
	If the dispenser indicating device provides the only primary indication, it shall bear a legend, which is clearly visible to the customer which states that the net authorization of a particular dispenser can only be given by the supplier after settlement of the current transaction and that in case of dispute, the primary indication on the indicating device of the fuel dispenser is correct. Notes: • In attended service mode, the settlement of the transaction takes place before the customer leaves the site of the delivery. • In attended service mode, the measurement operation ends at the moment settlement of the transaction takes place.			
5.10.2.1	**Attended post-payment**			
5.10.2.1.1	Where the self-service arrangement includes a device that provides an additional primary indication (additional to those of the indicating device of the dispenser), it shall consist of at least one installation for the reproduction of the quantity and the price (if calculated) indicated by the primary dispenser indicating device, consisting of at least:			
	a) an indicating device for the benefit of the supplier; and			
	b) a display, or a printing device for the issue of a receipt, for the benefit of the customer			

5.10.2.1.2	For self-service devices with temporary storage (temporary storage mode) of measurement data of dispensers the following requirements apply:			
	a) Temporary storage of measurement data shall be restricted to one delivery for each dispenser, that is, a dispenser may be authorized for a net delivery before the previous transaction on the same dispenser has been settled;			
	b) the mandatory primary indication for the benefit of the supplier shall be accompanied by a clear mark representing the sequence (for example, the numbers 1 or 2, or the letters A or B); and			
	c) when a mandatory primary indication of the self-service device is out of service, the self service arrangement may continue its operation provided that it no longer uses any temporary storage and that the dispenser indicating device remains the primary indication. In such a case, the fuel dispensers shall bear a legend, which is clearly visible to the customer which states that in case of dispute, the primary indication on the indication device of the fuel dispenser is correct.			
5.10.2.1.3	Where the mandatory primary indication for the benefit of the customer is provided by a device in the form of a separate constructional unit and this unit becomes uncoupled, or if the checking facilities detect a malfunction, the temporary storage mode shall be prohibited and the dispenser indicating device remains the primary indication.			
5.10.2.1.4	The self-service device should be capable of indicating the status of the dispensers (e.g. running authorized or unauthorized) that are connected to the self-service device and in the case of multiple modes of service and/or type of payment, also that particular status of the measuring system.			
5.10.2.2	**Pre-payment in attended service mode**			
5.10.2.2.1	The requirements in 3.6 are applicable.			

5.10.2.2.2	A printed or hand-written receipt of the pre-paid amount shall be provided.			

5.10.3	**Unattended service mode**			
5.10.3.1	General In unattended service mode, the end of the measurement operation is the end of the registration (printing and/or memorizing) of information concerning the measurement operation.			
5.10.3.1.1	The self-service arrangement shall provide additional primary indications by means of:			
	• a printing device[7] and / or			
	• a memory device[7],			
	in accordance with article 10 and 11 of Annex 1 of the MID, by which the following data are printed or recorded: identification of the measuring system, measurement data, time and date of delivery and if applicable the ID of the customer in the case of a delayed payment.			
	Both parties shall have access either to the memorized or printed registration of the corresponding transaction.			
	Note: In the case only a data storage device is used for unmanned stations to store the transaction, information on a visible place on the Self Service Device should be available to the customer whom to contact in the case of a dispute regarding the transaction.			

[7] SSD for unattended delivery do not need to be equipped with both a printing device and memory device as stated in OIML R117-1 but can be equipped according to the MID with only:

- a printing device or
- a memory device.

However both a printing or memory device in line with OIML is of course allowed.

5.10.3.1.2	When the printing device or memory device, as required by 5.10.3.1.1, are not able to provide any indication of become unserviceable, the customer shall be clearly warned by automatic means before the operation commences.			
	Passing from attended to unattended mode shall not be possible before correct operation of the arrangement is concluded as feasible by checking facilities, including compliance with the above provision.			
	Memorized data older than 3 months may be automatically deleted.			
5.10.3.1.3	Where the self-service arrangement is provided with individual volume totalizers, one for each registered customer and visible to the customer, the requirements of 5.10.3.1.1 and 5.10.3.1.2 do not apply.			
5.10.3.1.4	Self-service devices shall be provided with a means for controlling the continuity of the calculation program (“watchdog”) for ensuring the discontinuation of the current delivery when the continuity of the processor program is no longer ensured.			
	The net effective acceptance of notes, cards or other equivalent mode of payment shall only take place if the continuity of the processor program is re-established.			
5.10.3.1.5	When a power supply failure occurs, the delivery data shall be memorized. The requirements of 5.1.9 apply.			
5.10.3.2	**Delayed payment**			
	The printed and/or memorized indications as mentioned in 5.10.3.1 shall contain sufficient information for further checking and at least, the measured quantity, the price to pay (if calculated) and information to identify the particular transaction (e.g. dispenser number, location, date, time).			

5.10.3.3	**Pre-payment in unattended service mode**			
5.10.3.3.1	Following the termination of each delivery, the printed and/or memorized indications as intended in 5.10.3.1. shall be made available, clearly indicating the amount which has been pre-paid and the price corresponding to the liquid obtained.			
	These printed and/or memorized indications may be divided into two parts as follows: a) one part provided prior to the delivery on which the pre-paid amount is shown and re-cognizable as such,			
	b) one part provided following the termination of delivery provided that is clear from the information provided on both parts that they are related to the same delivery.			
5.10.3.3.2	The requirements of 3.6 are applicable.			

6.5 Software tests

6.5.1 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)

6.5.2 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?			

6.5.3 Checklist of basic software

6.5.3.1 Requirements for type P instruments

Req.	Test	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.*						

6.5.3.2 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.*						

6.5.3.3 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.*						

6.5.3.4 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.*						

6.5.3.5 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.*						

6.5.3.6 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 is adequately traceable within the instrument for subsequent controls?				
* *Explanations are needed if there are deviations from software requirements.*						

6.5.3.7 Specific software requirements for SSD (taken from 10.5.3 in 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: 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. b. The instrument does not have any interface to communicate the software identification. 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.				

7 Annex B: EC or PC

Issued by	:	
In accordance with	:	The WELMEC guide 8.8, WELMEC guide 10.7 and WELMEC guide 7.2.
Producer	:	
In respect of	:	A model of a self-service device for use as a purely digital self-service device of a fuel dispenser, LPG dispenser and/or other liquid dispensers (e.g. AdBlue) Brand:
Designation	:	
Characteristics	:	Software version :
Description and Documentation	:	
Remarks	:	

Test Institute

Name, date

Signatory

7.1 General information on the self-service device

This Evaluation Certificate is the positive result of the applied modular approach under the

- WELMEC guide 8.8, General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID;
- WELMEC guide 10.7 Testing purely digital self-service devices for use as a purely digital ancillary device of a fuel dispenser, LPG dispenser and/or other liquid dispensers (e.g. AdBlue);
- WELMEC guide 7.2, Software guide.

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

7.2 Design of the SSD

7.2.1 Hardware

The hardware of the self-service device should comply with the EMC-directive and other applicable directives as specified in the Declaration of Conformity of the self-service device.

The part shall bear the CE marking according to Directives other than the MID, but it cannot 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.

7.2.2 Software

7.2.2.1 Software description

Software specification (refer to WELMEC guide 7.2):

- Software type :
- Risk Class :
- Extension :
- Software securing :

7.2.2.2 Legally relevant software components:

Devices	Identification number (checksum)	Remarks

7.2.2.3 Software identification:

7.2.2.4 Means to display software versions and software identification:

7.2.2.5 Software functions

7.3 Interfacing and compatibility issues

The self-service 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 7.1 of this document.

Type Interface / Converter	Protocol

7.4 Markings[8]

- EC or PC number of the SSD
- Producers identification mark, trademark or name
- Type designation
- Year of manufacture
- Serial number
- Identification of the connected fuel dispenser(s)

[8] For markings on the fuel dispenser and the Self Service Device refer also to Guide 10.5.

7.5 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.

7.5.1 Functional tests

Numbe	Description	+	-	Remarks
6.4	Relevant part of checklist R117-1			

7.5.2 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			

8 Informative annex

The purpose of this Informative Annex is to present guidance on how to test the presence and correct operation of checking facilities, without the need to perform disturbance or influence factor tests.

8.1 Technical background

A purely digital device consists, in all known cases, of (a set of) printed circuit boards onto which a variety of components are fitted. These are mounted in one or multiple housings. Typically each of the boards performs a specific function / specific functions, after which the data are sent to another board. Both the processes inside a single board and the transmission between boards are checked by some form of built-in checking facility. An example of such a specific function is the conversion of one communication protocol into another; e.g. internal bus into RS485 for connection to external devices. However, these processes can also be of a different nature, like for instance a check on the presence of paper in a printer.

8.2 Legal background

Presumption with the essential requirements of the Measuring Instruments Directive can be met by the application of the requirements of OIML R117-1. Compliance with the software requirements can be assumed by application of the WELMEC Software Guide 7.2 which requires the presence and correct operation of a number of checking facilities to be evaluated. Based on the assigned Software Risk Class, “black box testing” is considered to be sufficient for this type of Measuring Instrument / components thereof.

Note: “black box testing” is a term used to describe a test method in which typically the response of an output is observed, when an input is manipulated. This is supported by descriptions / documentation provided by the manufacturer. In other words, it is not necessary to evaluate the source code and / or actually monitor all the bits and bytes as they are processed and transmitted inside the device under test. Please know that complex test equipment is needed to perform such tests.

Below, a number of test methods are described that can be applied alone or in combination to determine all required checking facilities are present in proper working order.

8.3 Test software / test equipment

In its simplest form this can be a Laptop computer acting as a printer, thus collecting electronic versions of printouts. It could also be used as an input to generate input data for an SSD thus allowing a higher number of measurements to be processed by the device.
One step further is using either special software on the device under test (provided by the manufacturer) or on the Laptop to simulate inputs or look into what is transmitted from one board to the other. Typically such devices or software can also be used to introduce erroneous data into the process, thus allowing seeing if alarms are generated.

8.4 Disconnecting parts

Usually by far the simplest method of testing the presence and operation of checking facilities is to temporarily disconnect[9] some of the boards during operation. Disconnection should lead to the generation of an alarm.

8.5 Summary

Two types of errors can occur in a digital device (due to disturbance and/or influence factor tests):

1 (temporary) failure or shutdown of a component of the SSD;

2 Incorrect data, for example due to a transmission failure or program error.

The first type can be detected by the same checking facilities that would be activated when disconnecting parts.

The second can be simulated by test software, upon which the checking facilities should detect an error.

Therefore the above methods can be applied to prove that all required checking facilities are present. When they are, a similar error introduced by for example electro static discharge (a bit "falls") will also be noticed, thus eliminating the need for performing this test.

[9] Extreme care should be observed when disconnecting parts. Preferably an engineer from the manufacturer should be present as a safeguard against possible dangerous situations.