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WELMEC

European Cooperation in Legal Metrology

Guide on evaluation of Purely Digital Parts



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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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1 Introduction

Measuring systems for liquids other than water (MI) are often constructed from typical parts, such as gas separators, measurement transducers, electronic calculating / indicating devices, conversion 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 parts of a measuring system.

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

2 Scope

This guide covers devices as specified by OIML R117-1, edition 2007 and purely digital parts as specified by this guide; both categories are named purely digital parts hereafter.

This guide only covers separate purely digital parts used in measuring instruments for liquids other than water.

- By separate is meant that the part under evaluation has its own housing and power supply.
- By purely digital is meant that the electronic part only performs digital functions and provides a digitized output or display.
 - The fact that the purely digital part should only “perform digital functions” means that the part does not have analogue inputs and does not include time dependant data acquisition for the measurement and thus that the disconnection of the part during the measurement does not impact the measurement results.
 - The fact that disconnection of the part should not impact the measurement results means that 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.

The purely digital part can only be evaluated according to this guide under the following conditions:

- The part is defined in OIML R117-1, edition 2007 and there exist requirements for this part in this guide, or the relevant requirements of OIML R117-1, edition 2007 can be applied to the part;
- The hardware of the part bears the CE-mark according to at least the EMC directive.

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

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.

The part shall bear the CE marking according to European 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 in the MID) may bear the supplementary metrology marking and Notified Body number relating to the declaration of 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:

MI	Measuring instrument for liquids other than water (under MI-005 of the MID)
Part	A part of a MI which performs a specific function and can be evaluated separately. This also includes devices, modules, software and peripherals, for example but not limited to: printers, data storage devices and personal computers
PDP	Purely Digital Part
SSD	Self-service device(s), a SSD can be a particular PDP
MID	MID, directive 2004/22/EC of the European parliament and of the council of 31 March 2004 on measuring instruments
NB	Notified Body
TEC	Type- or Design examination certificate
EC	Evaluation Certificate as defined in WELMEC guide 8.8
PC	Parts Certificate as defined in WELMEC guide 8.8
R117-1	OIML R117-1, edition 2007

4 Special cases of purely digital parts

4.1 Combinations

The device of a measuring system for liquids other than water could, on request of the producer and/or the manufacturer, be separated in an “analogue and time dependant” part and a digital part provided that both the “analogue and time dependant” part and the digital part perform a specific function and do not share the power-supply or housing and can be evaluated separately.

- For example the conversion device could be separated into “analogue and time dependant” part, namely the associated measuring instruments which give a digital output (for example: average temperature), and a digital part, namely the PC with software that convert the actual measurement value into a converted value.

Together, the associated measuring instruments with the PC make up the conversion device as defined under T.c.4 of OIML R117, Edition 2007.

- For example the calculator could be separated into an “analogue and time dependant” “metering” calculator with a digital output and a purely digital “operational” calculator that process the digital outputs of the “metering” calculator, stores the results in memory until they are used.

Together, the “metering” calculator part and the “operational” calculator part make up the Calculator as defined under T.c.1 4 of OIML R117, Edition 2007.

Other combinations are possible provided the conditions above are met.

4.2 Simple recipient printer

By exception, 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 PDP 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 R117-1, edition 2007

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

4.3 SSD

Special deviations of technical requirements from R117-1 are allowed for SSD: see 5.2.2.1.

5 Evaluation procedure of the PDP

For evaluation the following procedure should be followed.

5.1 Application

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

- Producers name and address;
- A declaration that the PDP cannot be disturbed or fraudulently manipulated through its interfaces ;
- 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:
 - General description of type, and explanations necessary to understand the functioning of the PDP;
 - Manufacturing procedures to ensure consistent production;
 - List of descriptions and characteristic data of all components, such as but not limited to:
 - Interfaces;
 - Indicating devices;
 - Printing devices;
 - Data storage devices.
 - List and description of the checking facilities of the PDP;
 - 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 PDP to significant faults;
 - Functioning of the PDP after switch on.
 - A declaration of conformity stating that the hardware of the PDP complies with the relevant parts of the applicable directives, in particular with the EMC directive.

5.2 Test requirements

5.2.1 Requirement concerning the technical documentation

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

5.2.2 Technical requirements

The PDP shall comply with the technical requirements, where applicable, according to R117-1 unless satisfying the allowed deviations from R117-1 as given below.

Allowed deviation from OIML R117-1: see 5.10.3.1.1.

SSD's for unattended delivery need to be equipped with at least one of the following:

- a printing device for the consumer and a memory device for the vendor, or
- a memory device for the benefit of both parties.

In the case of a memory device however, a durable proof of the measurement result and the information to identify the transaction shall be available on request at the time the measurement is concluded. Typically the durable proof is a printout.

In accordance with article 10 and 11 of Annex 1 of the MID, by which the following data are printed and 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.

Note: This section is not intended to allow electronic tickets as the only durable proof. For that topic specific guidance will need to be developed. The memory acts as the decisive registration. The applicable Certificate shall clearly describe the configuration and functions of the SSD.

5.2.3 Requirements concerning software

The legally relevant software running on the PDP shall be tested in accordance with WELMEC guide 7.2: Software Guide (Measuring Instruments Directive 2004/22/EC).

With respect to the checking facilities, article 4.3.5 of R117-1 applies.

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.

For the software requirements, risk class C applies.

In the case that the PDP is not equipped with a display, the software identification should be transmitted to a device or part under legal control that has a display and can indicate the software identification on request.

5.2.4 Requirements concerning markings

The PDP should either be inscribed with the following markings or these marking should be permanently visible in the display or a combination of both:

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

The EC should state the position of the markings or refer to drawings that indicate the position.

5.3 Evaluation

The test institute that can also act as a Notified Body under the MID for Conformity Assessment Annex B for MI-005 should evaluate whether

- the documentation is confirmed to be in accordance with article 10 of the MID;

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

If the PDP 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 PDP except when those tests are needed to fulfill the checks in the checklist.

In the case where the PDP is fitted with a printing device, 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 R117-1, 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 PDP is fitted with memory storage devices 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. 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.

The correct functioning of the checking facilities may be tested by means of simulation.

5.3.1 Set-up for evaluation

For evaluation the PDP software may be run on the PDP 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. In the case of a SSD 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.

If the PDP has no display then means shall be provided to indicate the necessary data, information and results on a separate device.

5.3.2 Evaluation report

The test institute that can also act as a Notified Body under the MID for Conformity Assessment Annex B for MI-005 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.

If the PDP complies with all the applicable requirements of this guide an EC or PC can be issued.

6 Certificates

6.1 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 PDP, including its compatibility with other devices or parts, and
- a description how the software identification can be obtained and
- a description of the sealing provisions and in case of software securing, how to check this and
- documentation that allows the conformity of the PDP including the software to be checked and
- A reference to the test report with the appertaining test data.
- A reference to this guide and WELMEC 7.2, and if appropriate a statement that the software can be implemented in any CE-marked hardware.

6.2 TEC

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

1. All references and complete description of a specific type of PDP are included in the TEC of the measuring instrument, or
2. The modular approach is used
 - to allow the possibility of using a PDP 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 PDP with a PC,

Option 2 is only possible in case 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 PDP evaluated under this guide, with 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 PDP and
2. The MI shall transmit data relating to presentation of results only in such a manner that the PDP can meet the requirements and
3. The connection to the PDP shall not allow the metrological functions of the MI to be inadmissibly influenced by or through the PDP and
4. The connection of the PDP shall not lead to an instrument having metrological characteristics other than those specified in the TEC for the MI.

6.2.1 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 PDP evaluated under this guide, to his MI.

If the manufacturer requests a general statement for the connection of any PDP evaluated under this guide with a PC, the following conditions should be stated in the TEC:

- The PDP 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 (see 4.2 above):

- 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 PDP or any part 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 R117-1, edition 2007.

6.3 Revision of certificates

The applicant shall keep the notified body that has issued the TEC or EC or PC informed of all modifications to the instrument that may affect the conformity of the instrument with the (essential) requirements or the conditions for validity of the certificate.

Where such changes influence conformity with the essential requirements or the prescribed conditions for use of the instrument an addition to the TEC or revision of the EC or PC is necessary.

- Modification of the existing software, i.e. bug fixes and or security patches, not already covered by the certificate can be handled by an addition to the TEC or revision of the EC or PC. In any case the certificate should state the nature of the bug fix or security patch.
- Adding functionality to the existing software can be handled by an addition to the TEC or revision of the EC or PC. In any case the certificate should state which functionality is added to the existing software.
- In case the essential parts of the software are rewritten a new certificate should be issued.