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WELMEC

European Cooperation in Legal Metrology

Water Meters or Thermal Energy Meters equipped with additional Functionalities and Ancillary Devices

For information:
This guide is available to the Working Group Measuring Instruments for future reference on the Europa Website.

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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 ancillary 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. Foreword

Today an increasing number of water meters and thermal energy meters may be connected to ancillary devices such as communication modules transmitting the totalized value by the measuring instrument to a server at the utility company or equipped with additional functionality.

Ancillary devices or additional functionalities covered by this guide are not under the scope of the Measuring Instrument Directive, 2014/32/EU (MID). Article 8.1 of Annex I of the MID states that the metrological characteristics of the measuring instrument shall not be influenced in any inadmissible way by connecting it to any other device, by any feature of the connected device itself or by any remote device that communicates with the measuring instrument and article 7.6 states that when “a measuring instrument has associated software which provides other functions besides the measuring function, the software that is critical for the metrological characteristics shall be identifiable and shall not be inadmissibly influenced by the associated software”.

Based on article 7.6 and 8.1 of Annex I of the MID the manufacturers should therefore define conditions under which ancillary devices can be connected to the measuring instrument or be equipped with additional functions. The validity of these conditions needs to be evaluated by a Notified Body.

This guide aims to provide guidance on the conditions needed to be specified for measuring instrument to be equipped with additional functionalities or connected to an ancillary device and the evaluation based on those conditions by the Notified Body.

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2. Scope

For the benefit of manufacturers, and all other stakeholders, e.g. bodies notified for annex II, conformity assessment procedures, module B, D, F and H1 of the Measuring Instrument Directive, 2014/32/EU (MID), notifying authorities and market surveillance authorities, this document describes a best practice approach for describing the conditions under which instrument covered by annex IV (MI-002), and annex V (MI-003) of the MID can be equipped with additional functionality and ancillary devices in such a way that they will not have any inadmissible influence on these measuring instruments (see MID article 7.6 and 8.1 of Annex I) wheninstalled in accordance with the manufacturer's instructions.

Conformity to all applicable requirements of the MID including conformity to article 7.6 and 8.1 of Annex I of the MID is the responsibility of the manufacturer of the measuring instrument.

If specific annexes in the MID exist which lay down the essential requirements for sub-assemblies, the provisions of this guide shall apply mutatis mutandis to such sub-assemblies as it does for the complete measuring instruments under the MID.

The guidance in this guide is limited to additional functionalities and ancillary devices that are connected to water or thermal energy meters, see also chapter 3 of this guide.

3. Terminology

MID:	Measuring Instrument Directive, 2014/32/EU (MID)
Measuring instrument:	A measuring instrument covered by either Annex III (MI-001) or Annex VI (MI-004) or a sub-assembly covered by Annex VI (MI-004).
Ancillary device:	A device connected to a protected interface (as defined below) of the measuring instrument and which has an own power supply (not powered by the measuring instrument) and does not fulfil any functions that fall under the scope of the MID. *Note 1: In WELMEC 8.8 the definition of a part is different than the one in this guide*
Part of the measuring instrument:	A device is considered a part of the measuring instrument if it fulfils one or all of the following characteristics • It is powered by the measuring instrument (by means of the power supply or battery of the measuring instrument) and / or • It is connected to a non-protective interface of the measuring instrument (as defined below) and / or • It performs functions that are under legal control and / or • It is mounted in the same housing as other (internal) parts of the measuring instrument and / or • It can have an inadmissible influence on the measuring instrument (see chapter 4). A part of the measuring instrument has to be included in the conformity assessment procedure of the measuring instrument and probably needs to be secured (See WELMEC guide 13.3).
Additional functionalities:	Functionalities that does not fall under the scope of the MID, i.e. management software or software that produces graphs of water consumption.
Legally relevant software:	Software that is critical for the metrological characteristics.
Protective interface:	An interface that complies with the requirements of P4 or U4 of WELMEC guide 7.2.
Software separation:	The unambiguous separation of software into legally relevant software and legally non-relevant software, see WELMEC guide 7.2, in particular extension S.

EU-TEC:	An EU-type examination or EU design examination certificate.
EMC:	Electromagnetic Compatibility

4. Requirements in case of ancillary devices or additional functionalities with software separation

Annex I of the MID states the following requirements for the measuring instruments that shall be considered if the measuring instrument is connected to an ancillary device or equipped with additional functionalities:

Article 7.1: A measuring instrument shall have no feature likely to facilitate fraudulent use, whereas possibilities for unintentional misuse shall be minimal.

Article 7.6: A measuring instrument shall be designed so as to allow the control of the measuring tasks after the instrument has been placed on the market and put into use. If necessary, special equipment or software for this control shall be part of the instrument. The test procedure shall be described in the operation manual.
When a measuring instrument has associated software which provides additional functions besides the measuring function, the software that is critical for the metrological characteristics shall be identifiable and shall not be inadmissibly influenced by the associated software.

Article 8.1: The metrological characteristics of a measuring instrument shall not be influenced in any inadmissible way by the connection to it of another device, by any feature of the connected device itself or by any remote device that communicates with the measuring instrument.

Article 10.2: The indication of any result shall be clear and unambiguous and accompanied by such marks and inscriptions necessary to inform the user of the significance of the result. Easy reading of the presented result shall be permitted under normal conditions of use. Other indications may be shown provided they cannot be confused with the metrologically controlled indications.

Article 10.5: Whether or not a measuring instrument intended for utility measurement purposes can be remotely read it shall in any case be fitted with a metrologically controlled display accessible without tools to the consumer. The reading of this display is the measurement result that serves as the basis for the price to pay.

From the above the following requirements with respect to connecting ancillary devices to a measuring instrument or equipping a measuring instrument with additional functionalities can be derived:

1. The connection should not influence the readability of the metrologically controlled display or markings (see chapter 4.1);
2. By means of the connection or by means of the additional functionalities it should not be possible to influence the legally relevant software, the legally relevant data or the legally relevant parameters of the measuring instruments (see chapter 4.2);
3. The connection should not influence the correct functioning of the measuring instrument or influence the measuring results (see chapter 4.3).

In case one of the above mentioned requirements cannot be fulfilled the device is deemed to be a part of the measuring instrument, see chapter 5 of this guide. In that case sufficient securing means should prevent other devices to be connected to the measuring instrument, as indicated in chapter 5 of this guide.

If no software separation exists, see WELMEC guide 7,2, the whole software is to be consider as legally relevant and also the additional functionality provided by the associated software need to pass conformity assessment procedures.

4.1 Readability of indication and markings

The metrologically controlled display shall always be accessible without tools to the consumer, see article 10.5 of Annex I of the MID. The connection of the ancillary device shall therefore be done in such a way that this does not influence the readability of the display.

Furthermore, information coming from the ancillary device or the additional functionality to be displayed on the metrologically controlled display of the measuring instrument should not be confusing or misleading, see article 7.1 and 10.2 of Annex I of the MID.

In any case the metrologically controlled display shall be easily readable, clear and unambiguous, see article 7.1, 10.2 and 10.5 of Annex I of the MID.

The connection of the ancillary device shall be done in such a way that this does not influence the readability of the markings, see article 7.6 of Annex I of the MID.

4.2 Software requirements

By connecting any device to the measuring instrument it should not be possible to influence the legally relevant software, legally relevant data or the legally relevant parameters (type- or device specific parameters instruments), see article 8.1 of Annex I of the MID.

If the instrument is equipped with additional functionalities the software that is critical for the metrological characteristics shall be identifiable and shall not be inadmissibly influenced by the associated software, see article 7.6 of Annex I of the MID.

It is recommended to apply WELMEC guide 7.2 to evaluate whether the legally relevant software, legally relevant data and legally relevant parameters of the measuring instrument are sufficiently protected against changes.

The use of a protective interface (fulfilling the requirements of P4 or U4 of WELMEC guide 7.2) in the measuring instrument is deemed sufficient for ensuring that the legally relevant software, the legally relevant data and the legally relevant parameters (type – and device specific parameters instruments) of the measuring instrument cannot be inadmissible influenced by the connection of any other device to that interface.

It is also recommended to apply WELMEC guide 7.2 to evaluate if the software that is critical for the metrological characteristics is identifiable and not inadmissibly influenced by the associated software, in particular Extension S of WELMEC guide 7.2.

4.3 Protection against influences

The manufacturer of the measuring instrument shall specify under which conditions an ancillary device is allowed to be connected to the measuring instrument without having

an inadmissible effect on the measuring instrument, see article 8.1 of Annex I of the MID.

The Notified Body shall evaluate whether the measuring instrument with this ancillary device meets the essential requirements of the MID when applying these conditions.

Influence and disturbance tests should always be tested with ancillary device. However it is assumed that if the measuring instrument complies with the tests specified below that the connection of any device will not have an inadmissible effect on the functioning or measuring results of the measuring instrument with regard to disturbances:

- Voltage interruptions;
- Short voltage reductions;
- Voltage transients on supply lines;
- Surges on supply lines;
- Voltage variations.

It is therefore not necessary to repeat the above mentioned tests with any ancillary device to evaluate if the connection of the ancillary device has an inadmissible effect on the functioning of the measuring instrument.

However, the following influence quantities need special considerations:

- Climatic and mechanical conditions,
- Conditions with respect to the EMC.

The manufacturer shall specify the conditions under which a device can be connected to the measuring instrument taken into account the extremes of climatic and mechanical conditions and the conditions with respect to the EMC.
Based on ancillary device and meter design examination, the Notified Body proposes the related test program.

The Notified Body shall evaluate the measuring instrument under these conditions.

Examples are that according to the manufacturer:

1. The measuring instrument may be equipped with an interface to communicate with a server over the internet.
2. The measuring instrument may be connected to a radio device with its own power supply, having a maximum output power of 3 Watt and emitting at a frequency of 2,4 GHz.

The evaluation shall be carried out under the extreme conditions, i.e.

- due to the fact that the above mentioned communication interface may heat up the measuring instrument the temperature, self-heating and heating tests shall be carried out with the communication interface connected to the measuring instrument, in order to evaluate if the measuring instrument meets the essential requirements with the communication interface connected.
- due to the fact that the above mentioned radio module influences the EM susceptibility of the measuring instrument the EMC tests shall be carried out with a functional communication module.

5. Requirements in case of parts of a measuring instrument

A device that meets one of the five characteristics described in the definition in chapter 3 is considered a part of the measuring instrument and shall be included in the conformity assessment procedure of the measuring instrument and probably needs to be secured, see WELMEC guide 13.3.

In case one or morel of the three requirements stated in chapter 4 cannot be fulfilled, the device is also considered a part of the measuring instrument and therefore should also be included in the conformity assessment procedure of the measuring instrument and probably needs to be secured.

With respect to parts that share the battery power supply of the measuring instrument special attention should be addressed to the life time of the battery.

Parts of the measuring instrument have to be documented, see article 18 of the MID, and described in the EU-TEC.

However, typically with respect to parts of the measuring instrument that do not change the metrological characteristics of the instruments, i.e. communication modules, the documentation and description should focus on the possible effect on the measuring instrument and not the functionality of the part itself.

- If for example an ancillary part uses the battery of the measuring instrument and is connected to the protective interface of the measuring instrument, the power consumption of the ancillary device and hardware requirements with respect to temperature and EMC have to be considered.
- However, if the ancillary part is connected to a non-protective interface of the measuring instrument, it shall be ensured that through the software of the part legally relevant software, data or parameters instruments of the measuring instrument cannot be inadmissibly influenced.

It might be necessary to secure a part or a non-protective interface, see article 8.2 of Annex I of the MID.
See WELMEC guide 7.2 and WELMEC guide 13.3 on guidance regarding securing measuring instruments.
The method of securing has to be described in the EU-TEC.

6. Requirements in case of no software separation

If no software separation exists, see WELMEC guide 7.2, the whole software is to be considered as legally relevant and also the additional functionality provided by the associated software needs to pass conformity assessment procedures.

The legally relevant software, including the software that provides the additional functionality, has to be secured and evidence of an intervention shall be available for a reasonable period of time.

The method of securing has to be described in the EU-TEC.

7. EU-TEC

7.1 Ancillary devices

The EU-TEC should define whether it is possible to connect a device to a measuring instrument and under which conditions.
In case the device does not fall under the scope of the MID, it needs not to be described or documented unless inadmissible influencing of the measuring instrument may be possible through the connection of such a device. However, in that case the device is deemed to be a part of the measuring instrument, see chapter 5 of this guide.

7.2 Additional functionalities

The EU-TEC shall also include a list of the additional functionalities with a clear description of the functions and the additional information that these functions do not influence the metrological characteristics of the measuring instrument.

Although additional functionalities fulfilling the conditions stated in this guide, in particular the requirements concerning software separation, are not under the scope of the MID, they can be nationally regulated in a particular Member State. For that reason, it might be helpful to refer to documents that can assist in the national evaluation.

Reference documents can be listed in the EU-TEC, for example National Type-Approval Certificates, OIML Certificates or test reports covering the additional functionality provided that it is clear that these documents are not part of the conformity assessment procedures under the MID.

For that purpose, the heading "Reference documents" with regard to additional functionalities could be included in the EU-TEC with a note stating: The document listed here refers to the additional functionalities that are not under the scope of the MID.

8. Conclusion

The measuring instrument may be connected with ancillary devices or equipped with additional functionality provided that the additional functionality or connection of the devices have no inadmissible effect on the measuring instrument (see chapter 4) when installed and used in accordance with the manufacturer's instructions.

The manufacturer of the measuring instrument has to define under which conditions an ancillary device may be connected, taken into account the readability of indications and markings and software requirements.
The manufacturer of the measuring instrument also has to specify which additional functionalities the measuring instrument can be equipped.

The Notified Body shall evaluate whether the measuring instrument meets the essential requirements under these conditions and specifies these conditions in the EU-TEC.

Provided that the ancillary device does not fall under the scope of the MID, it needs not to be described or documented in the EU-TEC unless the device may allow the measuring instrument to be influenced in such a way that the measuring instrument does not meet the essential requirements.

The EU-TEC shall include a list of the allowed additional functions with a clear description of these additional functions.

In case the associative software that provides the additional functionality is part of the legally relevant software or the device is a part of the measuring instrument then they should be included in the conformity assessment.

It might be necessary to secure a part or a non-protective interface, see article 8.2 of Annex I of the MID.
See WELMEC guide 7.2 and WELMEC guide 13.3 on guidance regarding securing measuring instruments.
The method of securing has to be described in the EU-TEC.