WELMEC 11.5

2015

WELMEC

European Cooperation in Legal Metrology

Utility meters and ancillary devices

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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 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.

Published by:
WELMEC Secretariat

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1. Foreword

Today an increasing number of utility meters (gas measuring instruments, water measuring instruments, electricity measuring instruments, and heat measuring instruments) are connected to ancillary devices such as communication modules transmitting the totalized value by the measuring instrument to a server at the utility company.

Although many of these devices are by themselves not under the scope of the 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”.

Based on article 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. This needs to be evaluated by a Notified Body. This guide aims to provide guidance on the conditions needed to be specified to allow a measuring instrument to be connected to a 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 B, D, F and H1 of the MID, notifying authorities and market surveillance authorities, this document describes a best practice approach for describing the conditions under which devices can be connected to measuring instruments covered by the instrument specific annexes MI-001, MI-002, MI-003 and MI-004 of the MID in such a way that there will not have any inadmissible influence on these measuring instruments (see MID article 8.1 of Annex I) when correctly installed in accordance with the manufacturer's instructions.

It should be noted that the ability to demonstrate the conformity to all applicable requirements of the MID including conformity to article 8.1 of Annex I of the MID is the responsibilities of the manufacturer of the measuring instrument.

If specific annexes in the MID, which lay down the essential requirements for sub-assemblies exist, 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 ancillary devices that are connected to the measuring instrument, see also chapter 3 of this guide.

3. Terminology

Measuring instrument:

A measuring instrument is a meter or a meter with a sub-assembly covered by any of the following measuring instrument specific annexes: MI-001, MI-002, MI-003 or MI-004.

Ancillary device:

A device connected to a protective interface of the utility meter (as defined below) and which has an own power supply (not powered by the utility meter) and does not fulfil any functions that are under legal control.

Note 1: This definition is more restrictive than the one in R137-1.
Note 2: 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,
- It can have an inadmissible influence on the measuring instrument (see chapter 5).

A part of the measuring instrument shall be included in the conformity assessment procedure of the measuring instrument and probably needs to be secured (See WELMEC guide 11.3).

Protective interface:

An interface that complies with the requirements of P4 or U4 of WELMEC guide 7.2.

4. Requirements in case of ancillary devices

Annex I of the MID states the following requirements for the measuring instruments to be taken into account if the measuring instrument is connected to an ancillary device:

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, specifically under this guide with respect to the readability of the markings.

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 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 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.

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 to be displayed on the metrologically controlled display of the measuring instrument should not be confusing or misleading, see article 10.2 of Annex I of the MID.

In any case the metrologically controlled display shall be easily readable, clear and unambiguous, see article 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).

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 over the interface.

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.

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.

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

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.

- Voltage interruptions;
- Short voltage reductions;
- Voltage transients on supply lines and / or signal lines;
- Electrostatic discharge;
- Surges on supply lines and / or signal 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 EM phenomena.

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 EM phenomena.

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

Examples are that according to the manufacturer:

1. A line breaker may be connected under the terminal cover of the electrical energy measuring instrument, for those variants having a maximum current up to 80A.
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 line breaker may heat up the measuring instrument the temperature, self-heating and heating tests shall be carried out with the line breaker connected to the measuring instrument, in order to evaluate if the measuring instrument meets the essential requirements with the line-breaker connected (see EN 50470-3 par. 8.7.5.2 and 8.7.7.5 and also EN 50470-1 par. 7.2) .
- 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.
  Examples of those tests are e.g.
  - “operation of auxiliary devices”, stated in EN 50470-3, par. 8.7.7.13 or
  - “influences from ancillary devices”, stated in OIML R137-2 (2012), par. 12.6.16

5. Requirements in case of parts

A device that meets one of the 4 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 11.3.

In case one or all of the 3 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, see for example

article 5.2 of MI-002 of the MID.

Parts of the measuring instrument have to be documented, see article 10 of the MID, and described in the 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 EM phenomena 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, WELMEC guide 7.2 and WELMEC guide 11.4 on guidance regarding securing measuring instruments. The method of securing has to be described in the TEC.

6. TEC

The TEC should define whether it is possible to connect a device to a measuring instrument and under which conditions. See chapter 4.3 for examples.

- 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. Conclusion

The measuring instrument may be connected to ancillary devices provided that the connection of the devices has no inadmissible effect on the measuring instrument (see chapter 4) when correctly 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, software requirements and the possible influencing of the measuring instrument through the connection of such a device.

The Notified Body shall evaluate whether the measuring instrument meets the essential requirements under these conditions and defines these conditions in the 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 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.

In that case the device is a part of the measuring instrument and 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, WELMEC guide 7.2 and WELMEC guide 11.4 on guidance regarding securing measuring instruments. The method of securing has to be described in the TEC.