

# WELMEC

European Cooperation in Legal Metrology

## Modular evaluation of Active electrical energy meters



*For information:*

This new guide is available to the Working Group Measuring Instruments for future reference on the Europa Website

# WELMEC

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. Foreword

Active electrical energy meters may be constructed from separate parts, such as a measuring and calculating part, an indicating part and a (communication) module. Those parts may be produced by different Original Equipment Manufacturers (OEMs), in this document referred to as “producers”.

This document provides guidance on the evaluation of the above mentioned parts of an active electrical energy meter.

This WELMEC guide 11.x is used in combination with

- WELMEC guide 8.8, which provides guidance on the general and administrative aspects of the voluntary system of modular evaluation of a measuring instrument.
- WELMEC guide 7.2, which provides guidance on software requirements and validation

Other references:

- EN 50470-1 “Electricity metering equipment (a.c.) – Part 1: General requirements, tests and test conditions – Metering equipment (class indexes A, B and C)”
- EN 50470-3 “Electricity metering equipment (a.c.) – Part 3: Particular requirements – Static meters for active energy (class indexes A, B and C)”
- EN 61000-4-19 “Electromagnetic compatibility (EMC) – Part 4-19: Testing and measurement techniques – Test for immunity to conducted, differential mode disturbances and signaling in the frequency range 2 kHz to 150 kHz at a.c. power ports”
- TR 50579 “Electricity metering equipment (a.c.) - Severity levels, immunity requirements and test methods for conducted disturbances in the frequency range 2 kHz - 150 kHz”

## 2. Scope

This guide covers parts of static Active electrical energy meters, as described in definition 3.1.2 of the EN 50470-1. The following parts are covered by this WELMEC guide: one measuring and calculating part, connected with one indicating part and a (communication) module, both intended for a wired connection and communication modules to be inserted into the meters.

The measuring and calculating part is identical to a complete static active electrical energy meter, but without an indicating device.

Measuring and calculating parts with external sensors and parts of electromechanical active electrical energy meters are not under the scope of this document.

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.

This guide covers only issues related to the MID. The part may 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 the EN 50470-1 apply to this guide together with the definitions given in WELMEC guide 8.8 and 7.2.

Abbreviations:

MI	Static active electrical energy meter, as described in definition 3.1.2 of the EN 50470-1 (under Annex V, MI-003 of the MID).
Part	A part of a MI which performs a specific function and can be evaluated separately.
Checking facility	facility incorporated in a measuring instrument which enables significant faults to be detected and acted upon
MID	MID, directive 2014/32/EU
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
EN 50470-1	EN 50470-1 “Electricity metering equipment (a.c.) – Part 1: General requirements, tests and test conditions – Metering equipment (class indexes A, B and C)”
EN 50470-3	EN 50470-3 “Electricity metering equipment (a.c.) – Part 3: Particular requirements – Static meters for active energy (class indexes A, B and C)”
61000-4-19	EN 61000-4-19 “Electromagnetic compatibility (EMC) – Part 4-19: Testing and measurement techniques – Test for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at a.c. power ports”

## 4. Evaluation procedure of the parts

For the evaluation the following procedure should be followed.

### 4.1 Application

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

- Producers name and address;
- A declaration that the part cannot be disturbed or fraudulently manipulated through its interfaces without being made evident;
- 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 18 of the MID, for example but not limited to:
  - General description of the type, and explanations necessary to understand the functioning of the part;
  - Technical documentation to ensure consistent production;
  - Description and characteristic data of the part;
  - Description of the checking facilities of the part;
  - Information on compatibility in respect to interfaces, power supply etc.
  - Software description, communication protocols, means for securing the software;
  - Information concerning special cases (if applicable), such as but not limited to:
    - Special operating conditions;
    - Reaction of the part to significant faults;
    - Functioning of the part after switch on.
  - A declaration of conformity stating that the hardware of the part complies with the relevant parts of the applicable directives, in particular with the EMC directive.

### 4.2 Test requirements

#### 4.2.1 Technical requirements

The part shall comply with the technical requirements as specified in Annex A and B.

#### 4.2.2 Requirements concerning software

The legally relevant software running on the part shall be tested in accordance with WELMEC guide 7.2: Software Guide (Measuring Instruments Directive 2014/32/EU), risk class C.

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

In the case that the part is not equipped with a display, the software identification should be transmitted to another part of the measuring instrument that has a display and can indicate the software identification on request.

### 4.2.3 Requirements concerning markings

The part should either be inscribed with the following markings or these marking should be permanently visible on 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

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

### 4.3 Evaluation

The test institute shall evaluate whether

- the documentation is confirmed to be in accordance with article 18 of the MID;
- the part is confirmed to be constructed in accordance with the documentation, in particular if the part is equipped, when applicable, with a clearly readable display, a properly operating legally relevant software, and the necessary checking facilities;
- the part is confirmed to be in accordance with the test requirements as specified in chapter 4.2.

During the examination the measuring and calculating part needs to be connected to the indicating part.

Possible communication features which may be implemented in either the measuring and calculating part or in the display part need to be taken into account during the examination.

The test institute shall 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 part complies with all the applicable requirements of this guide an EC or PC can 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 part, including its compatibility with other devices or parts
- environmental conditions
- rated operating conditions
- a description of how the software identification can be obtained
- a description of necessary sealing and securing provisions
- documentation that allows the conformity of the part including the software to be checked
- a reference to the EN 50470-1, the WELMEC 7.2 and this WELMEC 11.x including a date reference;
- a reference to the *Evaluation Report* or *Test Report* with the appertaining test data.

### 5.2 TEC

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

1. All references and complete description of a specific type of a part are included in the TEC of the measuring instrument, or
2. The modular approach is used
  - to allow the possibility of using parts (a measuring and calculating part, an indicating part and a (communication) module) with an EC or PC by making reference to that EC or PC
  - with the possibility of a general statement concerning the use of any indicting device with a PC, under the condition that the requirements for the compatibility of that part with other parts are met.

Option 2 is only possible in case the EC's or PC's are issued by a test institute that can also act as a Notified Body under module B of the MID for Active electrical energy meters (Annex V, MI-003).

#### 5.2.1 Wording in the TEC of the MI

In the application for a type-examination certificate the manufacturer of the MI may apply for the possibility of using any part evaluated under this guide.

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

- The part has a PC issued by a test institute that can also act as a Notified Body under module B of the MID for Active electrical energy meters (Annex V, MI-003);
- 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.
- The connection to the part is secured as mentioned in the TEC, and/or the PC.

### **5.3 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 or part 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 or part an addition to the TEC or revision of the EC or PC is necessary.

## Annex A – General requirements for static active electrical energy meters

The producer shall specify:

- environmental classes
- the maximum length of the cables between modules
- and the upper temperature limit and the lower temperature limit from any of the values in table mentioned down:

	Temperature limits			
Upper temperature limit	30 °C	40 °C	55 °C	70 °C
Lower temperature limit	5 °C	-10 °C	-25 °C	-40 °C

## **Annex B – Technical requirements for static active electrical energy meters**

The different parts of the static active electrical energy meter are examined as indicated below in chapter B.1 up to B.3

### **B.1 Measuring and calculating part**

The measuring and calculator part is examined in accordance with the EN 50470-1 and EN 50470-3 in full, except for EN 50470-1, chapter 5.10, which is specifically related to an indicating device and the presentation of the measured amount of energy.

Immunity to 2-150 kHz disturbances is examined in accordance with the EN 61000-4-19, for current only, while applying the performance criteria including the value of the disturbing current as laid down in chapter 7 of the document TR 50579.

During those examinations all wiring as described in the manufacturers specification is applied, including the connection to the indicating device.

The measurement data, the software that is critical for measurement characteristics and the metrologically important parameters stored or transmitted shall be adequately protected against accidental or intentional corruption (MID, Annex I, 8.4). In order to check this an examination of the software shall be performed in accordance with the requirements of the WELMEC 7.2 or EN 50470-3, chapter 11.

### **B.2 Indicating device**

The indicating device is examined in accordance with the following chapters of the EN 50470-1:

- Chapter 5 (except for 5.4, 5.5, 5.6)
- Chapter 6
- Chapter 7 (except for 7.1, 7.2, 7.3.3, 7.4.4)

During those examinations all wiring as described in the manufacturers specification is applied, including the connection to the measuring and calculating part.

A simulation setup can be used in order to simulate the measured amount of electrical energy, coming from the measuring and calculating part. During the above mentioned tests the indicating device shall clearly present the amount of energy, unless in the EN 50470-1 it is explicitly indicated that a temporary degradation or loss of function or performance is acceptable.

The measurement data, the software that is critical for measurement characteristics and the metrologically important parameters stored or transmitted shall be adequately protected against accidental or intentional corruption (MID, Annex I, 8.4). In order to check this an examination of the software shall be performed in accordance with the requirements of the WELMEC 7.2 or EN 50470-3, chapter 11.

### **B.3 Communication module**

The module is examined in accordance with the following chapters of the EN 50470-1:

- Chapter 5
- Chapter 6
- Chapter 7

The measurement data, the software that is critical for measurement characteristics and the metrologically important parameters stored or transmitted shall be adequately protected against accidental or intentional corruption (MID, Annex I, 8.4). In order to check this an examination of the software shall be performed in accordance with the requirements of the WELMEC 7.2 or EN 50470-3, chapter 11.

If applicable during the examination a critical change value is applied as described in EN 50470-1, chapter 7.4.3, with the following constants:

- number of measuring elements  $m = 1$
- reference voltage  $U_n = 230 \text{ V}$
- maximum current  $I_{\text{max}} = 100 \text{ A}$

resulting in a critical change value of 0,023 kWh.