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European cooperation in legal metrology

Guideline on time depending consumption
measurements for billing purposes (interval
metering)



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European cooperation in legal metrology

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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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Recommendations on time depending consumption measurements (interval metering) for billing purposes

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Foreword

The introduction of interval metering and its use for billing for residential, commercial and light industrial customers increases the need for ensuring consumer protection by the proper design of the meters and their functions.

The following generic recommendations will be an input of WELMEC to the standardisation of smart utility meters (electricity, gas, water and heat) and could be in part a suggestion for a future MID-annex with essential requirements for smart meter functionalities.

If a decision on MID or a harmonised standard on this issue is taken this Guide shall be revised accordingly.

1 Scope

The recommendations laid down in this document relates to time depending measuring functions which can be used for billing purposes but where no special provisions are available in the instrument specific annexes of MID.

They are applicable in the field of utility measurements (electricity, gas, water and heat) and are applicable in addition to the recommendations described in the software guide WELMEC 7.2 for software controlled devices.

The time depending measuring functions can be realised as a part of the firmware of an instrument used for measuring the values covered by instrument specific annexes of MID or can be realised as a separate device with its own display. In the following, independent of the applied solution, the term auxiliary device or additional function is used.

The listed recommendations have been elaborated with respect to interval metering, but they shall be applied to the results of other additional functions in the same way if

applicable. Examples of such functions are the maximum (peak) demands on a daily or weekly base and so on.

Interval data can be used to allocate the consumption of a client at different rates during a billing period in accordance to WELMEC 11.1, 2.2.3. It is up to the utility (or the body which sells the electricity, gas etc.) to inform the client in advance which rate applies in a certain period of a day, week etc. or in the case of a remote activation of different rates, which conditions apply. This information can be part of the contract.

An interval meter can be used also to indicate the currently active rate (for instance by a number or character) but this recommendation does not cover this issue.

The used terms are in agreement with the terms used in the software guide WELMEC 7.2.

The guide is based on the requirements given by MID Annex 1 clause 10.1 and 10.5. This means that the legally relevant display has to be part of the instrument which will be delivered by the manufacturer.

A solution, where for instance a PC allows the access to the data via internet is not in accordance with MID, Annex1, clause 10.5, even if the data are protected by extension T described in WELMEC guide 7.2.

2 Definitions, see also EN 13757-1

Measuring interval

Time interval in which the consumption of electricity, gas etc. is determined by the auxiliary device (or auxiliary function). To each measuring interval belongs a single consumption value.

Interval values

Data set of subsequently measured consumption values derived from indication of a measuring instrument.

Data of additional measurands (for instance back delivery temperature in the case of heat meters) may be part of an interval value.

Remote reading

Reading of data by an authorised body using a communication interface without physically connecting a connection line, an optical head etc.

Rate register

Cumulating register for the consumption during the time in which one rate is activated.

Setting of Clock

Adjustment of the clock by a time difference which is larger than a certain limit.

Synchronisation of Clock

Adjustment of the clock by a time difference which is smaller than a certain limit.

Definitions in accordance to WELMEC 7.2

Communication interface

Electronic, optical, radio or other technical interface that enables information to be passed between *measuring instruments, sub-assemblies or external devices*.

User interface

Interface forming part of the instrument that enables information to be passed between a human user and the measuring instrument or its hardware or software components, as, e.g. switch, keyboard, mouse, display, monitor, printer, touch-screen etc.

3 Clock

- 3.1. The meter or auxiliary device shall incorporate a clock if it is intended for measuring time depending consumption values.
- 3.2. For the accuracy of the clock the requirements of EN 62054-21 for crystal controlled time switches apply.
- 3.3. The clock shall be settable via user interface and communication interface and external synchronisation shall be possible via a communication interface. For the synchronisation the requirements of EN 62054-21 apply.
- 3.4. If the time of the clock deviates by more than 10 s from legal time, the clock shall be synchronised immediately after recognition. This can be done on site by the legally designated person via the user interface or a communication interface or it can be done automatically via a communication interface.
- 3.5. If the auxiliary devices will be read remotely on a regularly base, the clock shall be synchronised sufficiently often to ensure that the deviation from legal time is not greater than 10 s.
- 3.6. Synchronisation is allowed only once during a measuring interval.
- 3.7. If the time of the clock in the meter or auxiliary device deviates by more than 30 s from legal time, a setting of the clock shall be carried out.
- 3.8. Setting of the clock – manually or via interfaces – in which the adjustment exceeds 30 s shall be handled by the software, e.g. by changing a protected parameter. Information about setting of the clock e. g. in an audit trail shall be available as long as the affected measurement values are available in the memory of the auxiliary device.
Note: It is not necessary to save the information about all time settings until the following verification or inspection of the instrument if the memory of the instrument does not contain the relevant interval data anymore.
- 3.9. The clock shall be provided with a standby power source (Back-up battery) if it is supplied by mains. The design of the back up power supply shall guar-

antee a deviation from legal time which is within the limits for time synchronisation during the specified capacity of the stand-by power source.

- 3.10. After having resumed normal operation (for instance after power failure) the instrument shall recognise whether the stand-by power source was sufficient for maintaining the clock accuracy. If not, this event shall be handled as specified in 3.8.

4 Measuring Intervals

- 4.1. A load profile shall consist of a fixed number of results per day, depending on the chosen measuring interval, e.g.:
 - 96 intervals of 15 min per day (common practice for electricity meters)
 - 24 intervals of 1 hour per day (common practice for gas meters)
- 4.2. The raster of measuring intervals shall be synchronous to the legal time and the requirements of EN 62054-21 for time switches with digital displays apply.
Note: E.g. for an measuring interval of fifteen minutes this recommendation is fulfilled if each forth interval starts at the beginning of a full hour.
- 4.3. The nominal value of the measuring interval is a legally relevant parameter. A change of the measuring interval remotely may be possible if registered in an audit trail (log book) and if the traceability of all interval values is still given for a billing period.
- 4.4. The interval values shall be stored in a non volatile memory of the interval meter.
- 4.5. The interval values shall be accessible by user interface (display) and communication interface of the interval meter for an appropriate time period in order to allow an appeal in respect to the billing.
Note 1: An appropriate access time can be realised by an appropriate memory depth of the non-volatile memory.
Note 2: For a billing period of 1 month a memory which allows to display the interval data of 10 weeks is seen as sufficient.
- 4.6. The time frame of the measuring intervals (i.e. the number of intervals per day) shall be preserved in spite of synchronising or setting of the clock. Intervals skipped because of setting of the clock shall be marked invalid.
- 4.7. The measurement value of the current interval during setting of time shall be marked invalid.
- 4.8. The design of the interval functionality shall guarantee that the sum of interval values will be equal the change of the main register.
Note: Due to different resolutions of interval registers and main index, it could be that fractional parts are taken into the next period. This may lead to an inequality which should be not more than the last fractional part of the last interval value (or the main index respectively).

5 Indication

In addition to the requirements of WELMEC 7.2 in respect to the indication of parameters etc., the following is required:

- 5.1. It shall be possible to indicate the interval values, the time of the clock and all legally important parameters on a legally controlled device. This indication shall be part of the instrument. In addition all data shall be accessible via a communication interface on site (for battery operated meters not needed).
Note: The opportunity to change parameters via the user interface is not necessary. The change of parameters can be possible only by an external device connected by a communication interface (e. g. a PC with certified software).
- 5.2. The client shall be enabled to check the invoice based on the interval values. The access to the data shall be possible by the user interface in an acceptable way (not more than 100 key actions shall lead to the wished specific value).
- 5.3. If the user interface is not convenient, external software shall be available for the consumer. This software shall read the relevant data and perform the calculation necessary for checking an invoice.
- 5.4. During the conformity assessment it shall be proved that the software and, where applicable, the hardware necessary for reading the data in accordance to 5.3 is fit-for-purpose
- 5.5. In each case, the time shall be provided by the instrument in such a way that transformation to legal local time can be easily accomplished (e.g. indication of UTC).
- 5.6. The time since the beginning of an interval or the rest of the interval shall be indicated as well as the measurand (consumption) since the beginning of a time interval. This value shall be available remotely if an appropriate interface is available.
Note: This recommendation is important if a billing based on power figures (like peak demand) is intended.
- 5.7. If the display for the cumulative counter of a meter is also used for the indication of interval data, the display shall switch back to the cumulative counter after no key actions happened over an appropriate time.
Note: After this time the display may be switched off in order to save power

6 Influences

- 6.1. In order to fulfil the MPE requirements of MID for interval meters, restrictions in respect to the internal meter resolution, the permitted meter interfaces or permitted length of intervals have to be respected.

Note 1: In the frame of an interval the communication between the meter and the interval meter may lead to a difference between the consumed measurand (for instance the energy) and the measurand memorised in an interval. The above recommendation is seen as fulfilled if the difference does not exceed 0,3 % of the maximum possible measurand. The maximum possible measurand is the maximum flow rate/ power of the meter multiplied by the measuring interval.

For instance, if a pulse interface is used, the meter has to deliver at least 333 pulses at Q_{\max} (P_{\max}) in the time interval.

Note 2: For a billing based on power figures (like peak demand) an interval value shall be used only if a sufficient resolution (pulses, internal meter increments) of the result is given. This recommendation is seen as fulfilled if at least 100 increments are collected during the time of the interval.

- 6.2. If applicable, the technical solution for the communication of an auxiliary device with the utility meter shall guarantee an undisturbed connection in respect to 6.1 and it shall be possible to check the data communication (for instance by an additional repeat register if a pulse interface is used).
- 6.3. If applicable, a wireless communication between the auxiliary device and the utility meter shall meet the requirements of extension T of WELMEC 7.2 risk class D.
- 6.4. If applicable, the communication interfaces of the auxiliary device and the utility meter used for communication shall be sealable.