Heat meters (HM), MID, Annex VI (MI-004), WELMEC Guide 11.1, some new requirements

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1. Statement, documents

- MID, 2014/32/EU, Annex VI, MI-004, not cooling
- EN 1434:2015, defined here lot of points from content before
- RI75 OIML:2006, not cooling
- WELMEC Guide 11.1, nothing
- WELMEC Guide 7.2 (SW, part for HM)
- Document MI-15-010 (cooling) ?

2. Actual requirements on HM coming out from praxis (generaly covered by EN 1434:2015)

As written on first page, content, there are actual some next important application, function and necessity of checking (at leats) on all modern HM .

From our experiences, by proceeding of certification and verification of HM, from metrological point of view, there are not fulfilled all requirements in this matter (realization of tests, suitable documentation, equipment of laboratories, etc.).

Internal document was elaborated in CMI.

Implementation of this particular items (or unified proposal) in the field of MID, resp. WELMEC is really important, our opinion

- Application in cooling, water, other substances, bifunctional HM
- Smart metering, checking of values for billing – energy power, statistical, tariff values, etc.)
- Checking of thermal power
- Checking of HM communication, statistical, tariff values
- Internal time of HM, checking

3. Application in cooling, liquids: water, other substances, bifunctional HM

Cooling application, condition of tests for certification, verification of HM is defined in standard EN 1434-4,5:2015. Nothing in MID.

Usual tests are proceeding for water (concerning thermodynamic parameters – enthalpy, etc.)

Substances for cooling (aircondition) systems are mixtures of water and other liquids (glycol, etc.). These substances have an other thermodynamic parameters – defined by different kinds – mostly by polynoms or by tables

Bifunctional HM handle by automatic switch on, off between heating and cooling application on base of Θhc temperature and tempereture difference

Application of HM by other substances of water must be only by precise defined substance (by its thermodynamic parameters). Other way, errors over MPE can arise by measurement (sometimes very large)

Laboratories which perfome a tests of HM (certification, next verification) shall have a precise information about condition of testing (mostly from manufacturers)

Question, f. inst. – is it suitable an actual documentation, is it necessary to test Θhc temperature, how to include this matter in MID, WELMEC more in detail, etc. ?

4. Smart metering, checking of values for billing – thermal power, statistical, tariff values, etc.

Smart metering, communication, data transmission, internal time of HM, limit of thermal power, SW of HM are included, resp. defined in EN 1434-1:2015

HM are in growing scale implementing in Smart metering systems, resp. in systems of automatic reading (long distance, mobile, datalogging)

Particular attributes – esp. thermal power (in defined time interval), statistical and tariff values (displayed, resp. transmitted) by HM are frequently used for billing purpose. All modern HM handle by these aditional functionalities (already some years before)

HM are meters covered by MID and national legislation of EU member states, e.g. mandatory certified and verified, but up today there is not fully clarified and specified a tests of these aditional functionalities

There are a repeated question of clients using a certified and verified HM about correct using of these functionalities, resp. of measured quantities

Also, testing of data communication (transmission) and testing of internal time of HM (which is very closed here) is not suitable clear.

5. Checking of thermal power

Thermal power, resp. max. (limited) thermal power in defined time interval (mostly used 15 minutes), it is a quantity used in growing scale by energy supplier for the price determination of delivered energy (price for MWh or GJ). It is an analogy with delivery of electric energy by using of different tariffs
Generally, testing of energy power is similar by testing of energy measured by HM (simulation of temperature difference and volume). These tests are clearly defined in documentation, f. inst. EN 1434

Still, some deviation and problems are here (at least, beside others, not fully defined):

- values of MPE – same as for energy quantity ?
- resolution of thermal power (unit kW) displayed by HM is mostly not suitable for correct error estimation (compared to possibility of fine energy value resolution by testing). SW of HM manufacturer could be helpful here
- possible variation of thermal power in defined time interval (f. inst. 15 minutes). How to define the test points – f. inst. same 3 values of reference temperature difference and reference volume like by energy testing ? In which time interval, here f. inst. 3 x 5 minutes ?
- How to manipulate by test equipments for suitable quick change over of reference values ?
- necessity of checking of internal time of HM, resp. of internal time uncertainty estimation (power is defined as energy/time)

6. Checking of HM communication, statistical, tariff values

Generally, over named items should be investigate by SW validation of HM (WELMEC Guide 7.2).

Communication of all modern HM permits an utilization lot of interfaces and protocols. F. inst.:

Typical possible interfaces (determined in standardized documents) :

RS 232, RS 485, M-BUS - serial

M-BUS wireless, radio (free frequences, low pover up to 10 mW)

Internet

Power line, etc.

Typical protocols for AMR - automatic meter reading (determined in standardized documents):

M-BUS, wire

M-BUS wireless

IP, GPRS protocols

PCL, power line protocol, etc.

Actual statement and opened question are here:

- responsible authority for SW validation in given nofied body is mostly oriented on legal relevant software (LRS), on its CRC, etc. of HM. It is performed by collaboration with manufacturer coming out from submitted documentation and from testing of submitted samples. Main subject of LRS for HM, it is a determination of thermal energy value, concerning the algorithm of HM by elaborating of temperatures and flow signals

- communication ability of HM can be included into LRV but it could be beside of it also. Mostly used interfaces and protocols come out from standardized documentation (page before). Authority for SW validation decides about checking of this point by use of documentation, resp. of submitted samples. Main quantity by communication checking of HM is a thermal energy again

- Placing (at least) of statistical and tariff values on display of HM, it is checked by LRS validation also

- checking of statistical values (in previous 12, resp. 16 month values, mostly: thermal energy, volume, temperature difference, power) on submitted samples can be better realized by laboratory of notified body which performes a metrological tests. This laboratory is able by use of simulation reference equipment to put into HM necessary quantities and by shifting of dates (end of every month before, f. inst. by help of manufacturer SW) to check a correct values displayed by HM. These values shall be checked also via possible communication interface and protocols of HM. Keeping of correct internal time of HM is very important again here (dates of particular month before). Question: is it necessary a checking of statistical values, how to put in into documentation more in detail, is it a correct proceeding, etc ?

- same question arise by checking of tariff values provide by HM (depending on values of selected quantities – f. inst. outlet temperature of water is higher as defined). Correct tariff value and putting into given register of HM must checked.

7. Internal time of HM, checking

As for the text before, internal time of HM is important quantity from the point
of view of aditional functionalities (thermal power, statistical values, etc.)
In the standard EN 1434-1,4:2015, there are defined a condition of deviation of HM
internal
3 possibilities are given: 1h/year, 6 minutes, 7s, concerning the period (f. inst. used
for billing). Deviation shall be less as 1%
There is not precisely defined kind of testing, only written: e.g. in period 24 hours, three
points
Problems, question concerning testing:
-    definition over, it is not enough, should be given more clearly
-    how to proceed a tests. Time resolution of time on HM display is mostly not in required
     values (unit s, or better)
-    which reference value (from which) shall be taken – electronic clock, time server from
     Internet (f. ex.) ?
-    how to determine a suitable short time interval for tests (f. inst. measured interval
     15 min = 900 s. Deviation of 1% = 9 s. Over required deviation 7 s is lower. Is it OK ?
-    how to decide a suitable fine resolution of internal time reading fro HM ? F. inst.
     by help of manufacturer SW ?
-    and exactly, is it necessary to check an internal time of HM. Is not sufficient to depend on
     information of manufacturer concerning internal frequency of CPU crystal ?

8. Equipment of laboratories

From text before aimed on aditional selected functionalities of HM, unambiguos fact arise concerning reference equipment of laboratories which perfome a certification, resp. verification of HM:

- „classical" equipment, only for temperature and volume (flow) simulation is not enough sufficient

It is necessary (at least) for laboratories:

- to have a supporting aditional SW from manufacturer for testing of particular functionalities
- in the field of cooling application, in application of different liquid substances, to have a SW which allow a reprogramming of thermodynamical parameters in internal legal relevant software of HM
- to have a supporting HW (from manufacturer again). Mostly for communication testing, for download of aditional SW application, etc.

This text concerning laboratories equipment is remark only, still, very important. Probably it is not a subject for penetration into some documentation.

9. What to upgrade in closed future here, WELMEC, MID ?

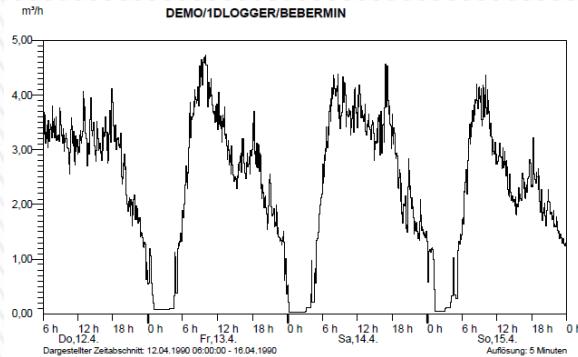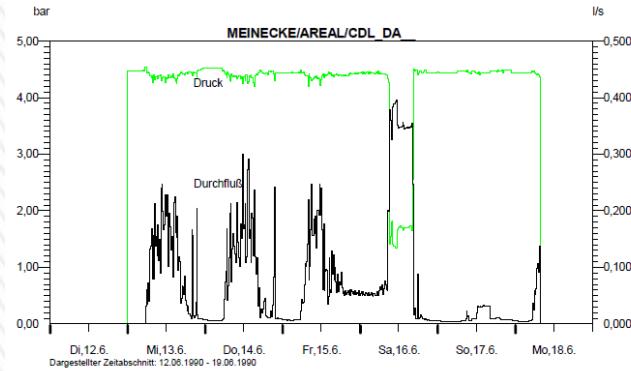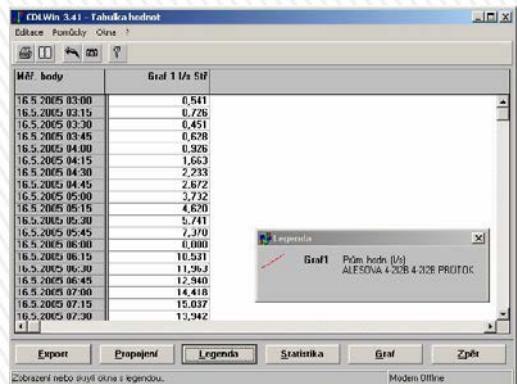As for the points before concerning HM, its importance ?

Should it be more in detail included (specified) in the the International documents.
In which ones ?

Should it be regulated on National level only ?

Should be these aditional functionality tests proceeded by MID B-module
certification and presented in issued Certificates ?

Other questions, proposals, explication ?

Thank you for your attention