INTRODUCTION

Aim of the Directive and conformity demonstration

The MID, intended to facilitate the placing on the market of a wide range of measuring instruments, will apply to electricity meters. The MID is a ‘New Approach’ directive, amongst other things setting basic Essential Requirements (ERs). The MI-003 annex gives the particular requirements for electricity meters. The directive does not give the test conditions and the level of the external influences to be applied. One way for manufacturers to be able to demonstrate conformity of their products with the directive is to make use of standards that interpret the requirements, such standards having been produced as a result of a mandate issued by the European Commission. The CENELEC has received such a mandate and is drawing up a suitable standard. Another reference paper (IR46) is prepared by OIML. As both papers can be taken into account to demonstrate conformity, they have to be close to one another to keep the global approach credible.

APPLICATION OF MID AND ITS REFERENCE DOCUMENTS

Applying the MID

The MID has to be applied in the member states for end October 2006 at the latest. Nevertheless, a further 10 years transition period is allowed for the phasing out of existing products.

Which part of the electricity sector shall be effected by the publication of the MID?

The Directive applies to active electrical energy meters intended for residential, commercial and light industrial use and does not cover instrument transformers and reactive energy meters. The aim of the MID is to protect small customers against powerful administrations and companies.

That means MID will mostly affect the DNO meters market. It does not deal with the relations between big companies as power station owners, Transmission network companies, Distribution network companies and between them and their big industrial customers.

Impact on the type of meters to be used

As written in the MID in point (7) “Putting into use” of its specific annex MI-003 about “ACTIVE ELECTRICAL ENERGY METERS”: “Where a Member State imposes measurement of residential use, it shall allow such measurement to be performed by means of any Class A meter. For specified purposes the Member State is allowed to require any Class B meter.”

One can conclude that the National authorities have received a degree of liberty in the transposition of the Directive for its application by defining what are the “specified purposes”. So the way the National authorities will transpose the European Directive into national rules will have an important impact on the choice of future types of meters to be used in residential applications.

Accuracy classes and mpe

The A, B and C accuracy classes are not defined in the MID in the same way as 2, 1 and 0.5 classes are defined in the present European standards. In the formula from the MID and as explained in the draft of the future EN standard, the Maximum Permissible Error is defined as follow:

\[ mpe = \sqrt{e^2(I,\cos \varphi) + e^2(U) + e^2(f) + e^2(T)} \]

where:

\( e(I,\cos \varphi) \) = the intrinsic error of the meter (percentage error at reference conditions). The largest absolute value measured in the operating range shall be taken into account.

\( e(U) \) = the variation of error due to the variation of the voltage. The largest absolute value measured at the extremes of the operating voltage range shall be taken into account.

\( e(f) \) = the variation of error due to the variation of the frequency. The largest absolute value measured at the extremes of the operating frequency range shall be taken into account.

\( e(T) \) = the variation of error due to the variation of the temperature. The largest absolute value calculated form the temperature coefficients for the extremes of the operating temperature range (alternatively: measured at the extremes...
of the operating temperature range) shall be taken into account.

In the MID table of allowed errors, the limit values are calculated by this quadratic average of the maximal errors of these 4 factors of the present European standards. As we know, all the effective errors are lower than the individual maximum. So if the requirements of the MID are purely applied without any detailed application documents, the accuracy for a class A meter could be worse that of a class 2 one. Furthermore, the formula includes the influence of temperature in the maximum allowed error. So this approach allows the maximum error in the whole chosen temperature range.

It is reasonable to think it was not in the intention of the European legislator to reduce the presently used accuracy of residential meter and consequently to decrease the protection of the residential customer.

The CENELEC working group WG1 as the OIML WG, designed to prepare the future reference documents for the control of the meters conformity with the MID by type tests, interpret it in the same way. They both include in their documents the individual maximum error due to each influence value of class 2 meter so that the class A meters can only be as good as or better than a previous class 2 meter.

In order to have a good idea of the quality of the presently sold class 2 Ferraris meters in Europe, Laborelec, an ISO 17025 certified laboratory for Metrological tests, has proceeded to a comparative test of the currently used meters. 15 class 2 Ferraris 10/60A meters of 3 different European manufacturers were tested in the range of 5-30°C for currents of 1A, 10A and 60A at power factor 1. The results in the figures hereunder show, that most of them should be in the accuracy class of a class B meter, and this is the case even if you include the errors due to voltage and frequency variations.

The here above diagrams show that:
The max error at 23°C = 1.36 %, most of meters having an error lower than 1%.

Two meters out of 15 have the intrinsic error, also the variation due to temperature and the mpe value for the current of 1A exceeding the permissible values of a class B meter.

Two other meters have only the intrinsic error for 10A higher than 1% but lower than 2%

Two other meters have only the variation due to temperature for a current of 1A higher than 0.08%/°K and were even higher than 0.2%/°K

**Other Influence quantities**

In the present standards, the influence quantities applied on static or Ferraris meters are not equivalent for all types of disturbances. For example, one can mention the influence of harmonics, where the levels and ranks applied to both types of meters are not the same: 10% of third harmonic in the current is considered for Ferraris meters, and 40% of fifth harmonic in the current and 10% in the voltage for static meters. Such differences are not consequent; influences from network disturbances (principally in voltage) and from users (principally in current) do not depend on the used meter.

The MID mention the types of influences to be applied, mostly the same for both types of meters, without many
details, and the limits of variation permitted for these influences, but do not specify the levels of influence quantities to apply for the test. So such levels and test conditions have to be defined in the relevant reference documents.

In the present standards, some influences were not tested on Ferraris meters, or not in the same way. That is why Laborelec has presented a project of collective research to the Belgian federal authorities. This project intends to verify performances of both types of meters perturbed by the same levels of influence quantities. If accepted, the results should be available before the applying MID.

CONCLUSION

The Measuring Instrument Directive needs reference documents in order to verify that meter types are in conformity. They are being prepared in the ad hoc working group of CENELEC and OIML.

Tests in the Laborelec laboratory show that the presently manufactured class 2 Ferraris meters are close to the class B meters defined by the Directive, but the impact of same influence quantities are to be further checked. That is why Laborelec had proposed a collective research project to verify the influence test quantities to be applied in accordance with the actual network, and in particular, to know the actual errors induced by the influence quantities on Ferraris meters which were not tested in the past.

REFERENCES


[2] WG1 of CENELEC TC13, 2004, First Draft of EN 62053-12 Electricity metering equipment (AC) – Particular requirements, – Part 12: Electromechanical meters for active energy (class indexes A, and B)

[3] WG1 of CENELEC TC13, 2004, First Draft of EN 62053-12 Electricity metering equipment (AC) – Particular requirements – Part 26: Static meters for active energy (class indexes A, B and C)