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General considerations regarding the measurement and the harmonization of the national system of standards in the field of the public domain of measuring electric energy, according to the requirements of the European and international standardization organizations

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Abstract: The paper presents the efforts made in order to accurately measure electrical energy, an activity belonging to the public domain. The electric energy meters are instruments submitted to the mandatory metrological control of the state, in order to assure the consumer protection in this field. Some matters of concern for the state regarding the transposing of European and international norms in view of the accession of our country to the European Union are also presented.

Key words: static meter

I. INTRODUCTION

The importance of the accurate measurement of electrical energy used by low energy consumers (household consumers and small companies) increased in the latest years as a result of a new legislation, aiming at providing consumer protection in this field.

The Ordinance of the Government (OG) No. 20/1992 regarding metrology, approved and amended by Law No. 11/1994, with other subsequent amendments, stipulates in Chapter 1, Art. 3, as follows: "in order to protect natural and legal persons against the harmful effects of incorrect or fake measurements in the public domain activities, such as trade relations and

commercial transactions, work safety and environment protection, (...), are subjected to the mandatory metrological control of the state."

The manufacturers of measuring instruments in our country such as AEM and Luxten Lighting from Timisoara, Electromagnetica from Bucharest, are interested in providing quality products, that meet the requirements of international standards, and especially of the European ones, in order to comply with the rigours of the European Union.

II. WAYS TO PROVIDE CONSUMER PROTECTION IN RELATIONSHIP WITH THE MEASUREMENT OF ELECTRICAL ENERGY

The issuing in the latest years of a legislation regarding the quality of services and the consumer protection led to steps towards reaching these objectives undertaken by the state bodies that are responsible with the enforcement of these laws.

In order to protect the consumer, the metrological control of the state is exerted upon the instruments in several ways, as for example [1]:

- a) pattern approvals;
- b) calibrations;
- c) initial metrological verifications;
- d) periodic metrological verifications;

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- e) metrological verifications after the repair or modification of an instrument;
- f) metrological surveillance of measuring instruments.

IEC 13251:1996:
International vocabulary of basic and general terms in metrology

According to the provisions of OG No. 20/1992. the Romanian Bureau of Legal Metrology (BRML), a specialised body of the state central public administration, responsible with the co-ordination of the metrology activities in Romania, identifies the measuring instruments used in the public domain and nominates them in the Official List of measuring instruments submitted to the mandatory metrological control of the state.

This list is published, and periodically updated, in the Official Journal of Romania.

Among the measuring instruments submitted to the mandatory metrological control of the state, there are:

- measuring rules and tapes;
- meters for cold water up to DN 800 and hot water up to DN 400;
- electronic converters for gas volume;
- programmable clocks for watt-hour meters;
- load cells;
- single phase active/reactive electric energy meters;
- gas analysers;
- medical monitoring equipment for patients, etc.

Using its specialised departments, BRML establishes the appropriate metrological control mechanisms, applicable to each type of measuring instrument, as well as the maximum permissible interval between two subsequent metrological verifications [1].

The measurement of electric energy belongs to the public domain and, therefore, electric energy meters are instruments submitted to the mandatory metrological control of the state.

The metrological assessment of these instruments is carried out according to the Legal Metrology Norm (NML) No. 5-02-97, currently in force.

This norm has been prepared in compliance with the international regulations applicable to this field, namely:

IEC 60687:1992:

Alternating current static watt-hour meters for active energy (classes 0.2 S and 0.5 S)

IEC 60387:1992:

Symbols for alternating current electricity meters

IEC 60521:1988:

Class 0.5, 1 and 2 alternating-current watt-hour meters

IEC 61036:1996:

Alternating current static watt-hour meters for active energy (classes 1 and 2)

and specifies the metrological and technical conditions for the following types of control: pattern approval, initial verification, verification after repair and periodic verification. The norm applies to induction and static single phase and three-phase active electric energy meters of accuracy classes 0.2; 0.5; 1 and 2, used in AC networks.

III. MODERN INSTRUMENTS FOR THE MEASUREMENT OF THE ELECTRICAL ENERGY

There is a variety of instruments that may be used to measure electric energy. Beside the classical watt-hour meters for active electric energy, whose operation is based on the electromagnetic induction principle, a wide variety of electronic meters has been developed in the latest years at a rapidly increasing rate, along with the development of microelectronics, based on the following measurement principles:

- the double amplitude and duration modulation principle;
- the Hall multiplier principle;
- the thermoelectric multiplier principle.

The rapid modernization of the electric energy meters is also a result of the manufacturers efforts to meet the current requirements of the consumers regarding the technical, structural and metrological characteristics of these measuring instruments used in the public domain.

Due to the fact that these measuring instruments are involved in the commercial transactions between the suppliers and the consumers, they are submitted to the mandatory control of the state and, therefore, they are part of the regulated area, with specific aspects related to the consumer protection that are to be dealt with.

Based on its role and competence and accumulated experience, at the National Institute of Metrology, within the AC Measurements workgroup of its Electrical Measurements Laboratory, a large number of electric energy meters for low energy consumers were assessed, within their type testing for the pattern approval certificates granted by the Pattern Approval Department (SAM) of BRML, as well as within their initial verification, their subsequent periodic verification and their verification after repair.

The active electric energy meters for household and industrial consumers are tested in metrology laboratories where all the tests required by the specialized norms in force are carried out in order to assess the meters.

A new issue that has to be currently dealt with is the quality of the electric energy.

Tests such as:

- impulse voltage tests for circuits and between the circuits;
- tests for electromagnetic compatibility (EMC);
- tests of immunity of electrostatic discharges;
- tests of immunity to electromagnetic HF fields;
- fast transient burst test;
- radio interference measurement;

stipulated in the European norms are now also stipulated in the Romanian standards, and are meant to lead to a correct assessment of the behaviour of the electric energy measuring instruments.

The importance of accurate measurement of electric energy used by small energy consumers tends to increase.

It is now possible to collect the data regarding the energy used by each customer directly into the memory of a central computer, instead of sending each month an employee of the electricity distributing company to read the meter installed at each individual consumer.

The development of the static energy meters should also be mentioned, as these enable the consumer to pay for the electric energy using a card (similar to the card used to pay for the subway fare).

The measurement accuracy, the low own energy consumption, the possibility to programme hourly tariffs, the possibility to be connected to a computer via a built-in interface and to store information, the reduced volume and weight, as well as other advantages provided by the electronic meters, makes it possible to successfully use these instruments to measure electric energy.

IV. PRESENT CONCERNS REGARDING THE DEVELOPMENT AND HARMONIZATION OF THE NATIONAL SYSTEM OF STANDARDS IN COMPLIANCE WITH THE REQUIREMENTS OF THE EUROPEAN AND INTERNATIONAL STANDARDIZATION ORGANIZATIONS

Within the efforts of our country to accede to the European Union, the state institutions are organising their activities accordingly, in order to reach this goal. In this context, adopting European standards that may interest various branches of the Romanian industry represents a permanent preoccupation the Romanian Standardization Association (ASRO). Thus, in 2003, ASRO and INM collaborated within the CALIST 2003 Programme (quality and standardization) in carrying out the project "Adopting European Standards as Romanian Standards for various branches of Electrotechnics."

The technical committee TC 164 of ASRO, supported by INM, whose main topic is "Equipment for measuring electric energy and load control," is involved in translating and adopting European norms as Romanian standards. Thus, in the framework of the

CALIST 3 Programme, nine European norms were translated and adopted as Romanian standards within TC 164, such as:

IEC 61358:1996:

Acceptance inspection for direct connected alternating current static watt-hour meters for active energy (classes 1 and 2)

IEC 62053-31:2001:

Electricity metering equipment (a.c.)

Particular requirements

Part 3: Pulse output devices for electromechanical and electronic meters (two wires only).

IEC 62053-61:2001:

Electricity metering equipment (a.c.)

Particular requirements,

Part 31: Power consumption and voltage requirements

IEC 62056-2:2001:

Electricity metering

Particular requirements

Data exchange for meter reading, tariff and load control

Part 21: Direct local data exchange

Also to be mentioned is the fact that the international norms on which NML 5-02-97 was based, as mentioned above, subsequently became European norms that have already been adopted as Romanian standards as well.

V. CONCLUSIONS

Romania is very much interested in producing high quality goods and services that comply both with international and with European standards. Providing consumer protection in all the fields of the public domain besides being a constant topic for mass media proved to be a beneficial activity not only for the consumers, but also for the producers of goods and services.

BRML is constantly concerned with organizing metrology in Romania on modern principles, as well as with the maintenance and development of the national system of measurement standards, as a basis for uniform and correct measurements. When approving investment projects, BRML aims at purchasing highly accurate measuring equipment, that would support the quality systems in compliance with the ISO/IEC 17025: 1999 implemented in all its subordinate laboratories.

The ISO/IEC 17025: 1999 standard. "General requirements for the competence of testing and calibration laboratories," which, was adopted in 2000, without any changes, as an European standard was translated and adopted in 2001 as a Romanian standard.

All these actions, that were carried out and are still going on at the institutional level of metrology, as well as the continuous efforts of the manufacturers to improve the quality of their products intended for use in the public domain, together with the programmes initiated by the Romanian government, in order to harmonise the Romanian laws and regulations with the EU legislation, are all aiming at facilitating the accession to the European Union of our country.

REFERENCES

- [1] *** Ordinance of the Government No. 20/1992 regarding Metrology
- [2] *** SR 13251/1996, International vocabulary of Basic and General Metrological Terms