COUNCIL DIRECTIVE

of 4 November 1976

on the approximation of the laws of the Member States relating to electrical energy meters

(76/891/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament (1),

Having regard to the opinion of the Economic and Social Committee (2),

Whereas, in the Member States, both the construction of and the methods of testing electrical energy meters are the subject of strict regulations which differ from one Member State to another and consequently hinder trade in these meters; whereas it is, therefore, necessary to approximate these regulations;

Whereas Council Directive 71/316/EEC of 26 July 1971 on the approximation of the laws of the Member States relating to common provisions for both measuring instruments and methods of metrological control (3), as last amended by Directive 72/427/EEC (4), laid down the procedures for EEC type approval and EEC initial verification; whereas, in accordance with that Directive, it is necessary to specify the technical requirements for the design and functioning of electrical energy meters,

HAS ADOPTED THIS DIRECTIVE:

Article 1

This Directive shall apply to new direct connected induction meters, with single or multiple tariffs, designed to measure active energy single-phase or polyphase current at 50 Hz frequency.

Article 2

The electrical energy meters which may be given EEC marks and signs are described in the Annex to this Directive.

They shall be the subject of EEC type approval and shall be submitted for EEC initial verification.

Article 3

Member States may not prevent, prohibit or restrict the placing on the market or entry into service of electrical energy meters if such meters bear the EEC type-approval sign and the EEC initial verification mark.

Member States which use maximum permissible errors smaller than those set out in the Directive for initial verification may continue to use such maximum permissible errors during a period of five and a half years from the notification of this Directive.

In the light of experience gained in this period of derogation and of the results obtained in international bodies, the appropriate measures shall be taken before the end of this five and a half year period, according to the procedure set out in Article 19 of Directive 71/316/EEC.

Article 4

1. Member States shall put into force the laws, regulations and administrative provisions needed in order to comply with this Directive within eighteen months of its notification and shall forthwith inform the Commission thereof.

2. Member States shall ensure that the text of the provisions of national law which they adopt in the field covered by this Directive is communicated to the Commission.

Article 5

This Directive is addressed to the Member States.

Done at Brussels, 4 November 1976.

For the Council
The President
Th. E. WESTERTERP

(1) OJ No C 23, 8. 3. 1974, p. 51.
(2) OJ No C 101, 23. 11. 1973, p. 6.
(3) OJ No L 202, 6. 9. 1971, p. 1.
(4) OJ No L 291, 28. 12. 1972, p. 156.

ANNEX

CHAPTER I — DEFINITIONS

1. DEFINITION OF CERTAIN TERMS USED IN THIS ANNEX

1.1. Influence quantity or factor

Any quantity, or any factor other than the measured quantity, the effects of which may modify the result of the measurement.

1.2. Variation of error as a result on an influence quantity

Difference between the errors of the meter when a single influence quantity assumes two specified values in succession.

1.3. Reference value of an influence quantity

Value of this quantity on the basis of which certain characteristics of the meter are fixed.

1.4. Basic current (I_b)

Value of current in accordance with which the relevant performance of the meter is fixed.

1.5. Maximum current (I_{max})

Maximum value of the current at which the meter shall satisfy the requirements of this Directive.

1.6. Distortion factor

Ratio of the effective value of the harmonic content obtained by subtracting the fundamental factor from a non-sinusoidal alternating quantity to the effective value of the non-sinusoidal quantity. The distortion factor is usually expressed as a percentage.

1.7. Basic speed

The nominal speed of rotation of the rotor expressed in revolutions per minute when the meter is under reference conditions and carries basic current at unity power factor.

1.8. Basic torque

The nominal value of the torque on the rotor to maintain it stationary with the meter under reference conditions and carrying basic current at unity power factor.

1.9. Type

Expression used to define all meters with single or multiple tariff, manufactured by the same manufacturer, to which correspond:

— similar metrological properties,

— uniformity of construction of the parts which determine these qualities,

— the same number of ampere-turns of the current windings for the basic current and the same number of turns per volt of the voltage windings for the reference voltage,

— the same ratio between maximum current and basic current.

The type may include different basic current and reference voltage values.

Remarks

(a) These meters shall be designated, by the manufacturer, by one or more groups either of letters or numbers, or of a combination of letters and numbers. Each type shall have one designation only.

(b) The type shall be represented by three sample meters intended for type approval tests, the characteristics of which (basic current and reference voltage) shall be chosen by the metrological service concerned from among those appearing in the tables proposed by the manufacturer (clause 6.1.1).

(c) In the case of special productions of the same type, the product of the number of turns of the windings and the value of the basic current may differ from that of the meters representing the type. The nearest value of the product immediately above or below should be chosen in order to have a whole number of turns.

For this reason only, the number of turns per volt of the voltage windings may differ by not more than 20 % from that of the sample meters representing the type.

(d) The ratio of the highest to the lowest basic speed of rotation of the rotor of each meter of the same type must not exceed 1:5.

CHAPTER II — TECHNICAL SPECIFICATIONS

2. MECHANICAL SPECIFICATIONS

2.1. General

Meters shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

— personal safety against electric shock;

— personal safety against effects of excessive temperature;

— safety against spread of fire.

All parts which are subject to corrosion under normal working conditions shall be effectively protected. Any protective coating shall not be liable to damage by ordinary handling nor injuriously affected by exposure to air, under ordinary conditions of service.

The meter shall have adequate mechanical strength and shall be able to withstand the elevated temperature which is likely to occur in normal operating conditions.

The components shall be reliably fastened and secured against loosening during transport or in normal use.

The electrical connections shall be such as to prevent any opening of the circuit, including any overload conditions specified in this Directive.

The construction of the meter shall be such as to minimize the risks of short-circuiting of the insulation between live parts and accessible conducting parts due to accidental loosening or unscrewing of a winding, screws, etc.

2.2. Case

The meter case shall be virtually dustproof and shall be capable of being sealed in such a way that the internal parts of the meter are accessible only after the seals are broken.

The cover shall not be removable without the use of a tool, coin or similar device.

The case shall be so constructed and arranged that any non-permanent deformation cannot prevent the meter from operating satisfactorily.

Meters intended for connection to the mains the voltage of which is more than 250 V in relation to earth and the case of which contains accessible metal parts shall be provided with a protective earth terminal.

For meters intended for connection to the mains with a reference voltage of 250 V or less in relation to earth and having a case wholly or partly made of metal, suitable provision shall be made for connecting the case to earth.

2.3. **Windows**

If the meter cover is not transparent, it shall include one or more windows to permit reading of the register and observation of the rotor movement. These windows shall be covered by plates of transparent material which it shall be impossible to remove without breaking the seals.

2.4. **Terminals — terminal blocks**

The terminals shall be grouped in one or more terminal blocks of sufficient mechanical strength to enable rigid conductors or cables to be fixed to them.

It shall be possible to disconnect the voltage terminals from the current input terminals without difficulty.

Connection of the conductors to the terminals shall be made in such a way as to ensure sufficient and durable contact, so that there is no risk of loosening or excessive heating. The holes which are an extension of the terminal holes in the insulating material shall be large enough to allow the easy insertion of the insulation of the conductors.

Note

The material of which the terminal plate is made shall satisfy the test laid down in ISO recommendation R 75 (1958), section 6, for a temperature of 135 °C.

2.5. **Terminal cover**

The terminals of the meter must be covered by a terminal cover which it shall be possible to seal independently of the meter cover. When the meter is mounted on its board, it shall not be possible to reach the terminals without breaking the seals on the terminal cover. The terminal cover shall therefore cover the terminal plate, the screws which hold the conductors in the terminals and, if necessary, a sufficient length of the connecting conductors and their insulation.

2.6. **Register (counting mechanism)**

Registers may be of the drum or pointer type.

The unit of the register shall be the kilowatt hour.

In drum-type registers, the units shall be marked adjacent to the set of drums.

In pointer type registers, the dials (except the dial indicating the lowest value) shall be marked off into 10 equal divisions and numbered from zero to nine. The units dial shall be marked in divisions of 1 d $\widehat{=}$ 1 kWh and near each of the other dials there shall be marked the number of kilowatt hours corresponding to one division of that dial, i.e. 10, 100, 1 000 and 10 000.

The dial of pointer-type registers, or the drum of drum-type registers, which indicates one-tenth of the reading unit, shall be edged in colour or coloured.

In addition, the dial or the continuous rotating drum indicating the lowest values shall include a scale of 100 equal divisions or any other arrangement giving similar accuracy of reading.

The register shall be able to record, from zero and for a minimum of 1 500 hours, the energy corresponding to the maximum current at the reference voltage and unity power factor.

All the indications appearing on the register shall be indelible and easily legible.

2.7. **Direction of rotation of the rotor and marking of the rotor**

The edge of the rotor nearest an observer viewing a meter from the front, shall move from left to right. The direction of rotation shall be marked by a clearly visible and indelible arrow.

The edge or the edge and the upper surface of the disc shall carry a main mark with a width of between 1/20th and 1/30th of the circumference of the disc to facilitate the counting of the number of revolutions.

The disc may also carry marks permitting stroboscopic or other tests to be made. These marks shall not impede the use of the main mark when it is employed for photo-electric counting of the number of revolutions of the disc.

3. ELECTRICAL SPECIFICATIONS

3.1. Power losses

3.1.1. *Voltage circuits*

The loss in each voltage circuit at reference voltage, at reference frequency and at reference temperature shall not exceed 2 W and 8 VA for single phase meters and 2 W and 10 VA for polyphase meters.

3.1.2. *Current circuits*

For meters having a basic current lower than 30 A, the apparent power taken by each circuit at basic current, at reference frequency and at reference temperature shall not exceed 2·5 VA. For higher basic current, it shall not exceed 5 VA.

3.2. Heating

In the usual conditions of use, the windings and insulation shall not reach a temperature liable adversely to affect the functioning of the meter.

When each circuit is supplied at its maximum current and each voltage circuit (and auxiliary circuits supplied for periods longer than their thermal time constant) is supplied at a voltage 1·2 times greater than reference voltage, the temperature rise (Δ t) of the various parts of the meter shall not exceed that indicated in the table below, at an ambient temperature of not more than 40 °C.

The meter shall be tested for a period of two hours and shall not be exposed to draughts or direct sunlight.

Parts of the meter	Δ_t in °C
Windings	60
External surface of the case	25