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JAPANESE INDUSTRIAL STANDARD

**General Rules for
Electricity Meters**

JIS C 1210—1979

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General Rules for Electricity Meters

C 1210-1979

1. Scope

This Japanese Industrial Standard specifies the general common requirements applied to separate type watt-hour meters and var-hour meters used for alternating current circuits, hereinafter referred to as the "meters", as well as those watt-hour, var-hour, and maximum demand electricity indication devices used in combination with such meters, hereinafter referred to as the "indication devices". However, meters and indicators having special use or particular requirements may be exempted from the application of this standard.

Remark: This standard specifies the general common requirements specified in the following standards:

- (1) JIS C 1211
- (2) JIS C 1216
- (3) JIS C 1263
- (4) JIS C 1281
- (5) JIS C 1283

2. Definitions

The main definitions used in the standards for electricity meters shall be as follows:

- (1) direct connection type meters Meters used singly not in combination with instrument transformers, hereinafter referred to as the "transformers".

Applicable Standards:

JIS C 1211-Alternating-Current Watt-Hour Meters (for Direct Connection)

JIS C 1216-Alternating-Current Watt-Hour Meters (for Connection through Instrument Transformer)

JIS C 1263-Var-Hour Meters

JIS C 1281-Weather-proof Performance of Electricity Meters

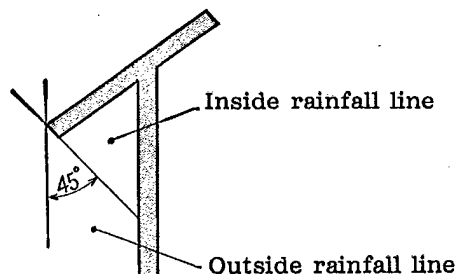
JIS C 1283-Watt-Hour, Var-Hour and Maximum Demand Indicators for Telemetry

JIS C 8306-Testing Methods for Wiring Devices

- (2) transformer operated meters Meters used in combination with transformers, provided not including such transformers.
- (3) transmitter incorporating meters Meters provided with transmitters.
- (4) normal weatherproof meters Meters having weatherproof constructions capable of outdoor use inside the rainfall line or indoor use.
- (5) reinforced weatherproof meters Meters having weatherproof constructions capable of use outside the rainfall line.
- (6) inside rainfall line In the outdoor side view of a building, the area inside the line drawn downward from the end of the eaves, penthouse, or the like at an angle of 45° against the vertical line toward the building.
- (7) outside rainfall line In the outdoor side view of a building, the area outside the line drawn downward from the end of the eaves, penthouse, or the like at an angle of 45° against the vertical line toward the building.

Remark: The areas inside and outside the rainfall line are as shown in Fig. 1.

Fig. 1



- (8) pulse composing system In a multi-circuit consisting of 2 to 4 circuits, a system which collectively measures active or reactive electric energy with a pulse synthesizer after converting the quantities of such electric energy of each circuit into number of pulses.
- (9) current composing system In a multi-circuit consisting of 2 or 3 circuits, a system which collectively measures the currents of those circuits by using a composite current transformer.

- (10) driving unit A series of mechanisms which drives the register, not including the transmitter.
- (11) element A set of operating devices which gives a driving torque to the rotor axis.
- (12) internal phase angle of element The phase difference between the effective magnetic fluxes of voltage and current when a voltage and current of the same phase are applied to the element, expressed as positive when the voltage flux is lagging.
- (13) voltage circuit The circuit to which the supplied voltage or a voltage corresponding thereto is applied, forming a circuit part between the meter terminals.
- (14) current circuit The circuit through which the load current or a current corresponding thereto passes, forming a circuit part between the meter terminals.
- (15) register A device which indicates the quantity of active electric energy or reactive electric energy.
- (16) transmitter A device which generates a specific number of electric pulses corresponding to one rotation of the rotor in the driving unit.
- (17) auxiliary devices Devices appended to the meter, such as the reversal preventing device, reverse measurement preventing device, and number of revolutions detecting device.
- (18) meter constant The number of revolutions of the rotor per 1 kWh or 1 kvarh of the meter, expressed in rev/kWh or rev/kvarh.
- (19) pulse constant The number of pulses of the input pulse or output pulse per 1 kWh or 1 kvarh of the transmitter and indication device (including the pulse composing device), expressed in pulse/kWh or pulse/kvarh.
- (20) total load The load at the rated current of the rated frequency, rated voltage, and power factor 1 for direct connection type meters, and the load at the rated current of the rated frequency, rated voltage, and power factor 1 measured on the primary side of the transformer for transformer operated meters (the rated current of power factor zero for var-hour meters) (for multi-element meters, the balanced load; and for meters which collectively measure multi-circuits and the indicators, the load of the whole circuit).

- (21) calculated time Where a meter is assumed to be free from errors, the time required to rotate the rotor of the meter by a given number of revolutions when a definite test power is applied to the meter.
- (22) calculated pulse Where a meter and precision standard watt-hour meter or precision standard watt-hour meter provided with an instrument phase inverter are supposed to be free from errors, the number of pulses generated from the precision standard watt-hour meter during the time required to rotate the meter rotor by a given number of rotations when a definite test power is applied to each of the meter and the precision standard watt-hour meter or that provided with an instrument phase inverter. In this case, the said precision standard watt-hour meter is assumed to generate a number of pulses proportional to the quantity of test electric energy.
- (23) composite transformation ratio The product of the nominal current transformation ratio of the current transformer and the nominal voltage transformation ratio of the instrument voltage transformer.
- (24) nominal current transformation ratio of current transformer The value obtained by dividing the rated primary current by the rated secondary current.
- (25) nominal voltage transformation ratio of instrument voltage transformer The value obtained by dividing the rated primary voltage by the rated secondary voltage.
- (26) resultant error The error produced by the influence given by the instrument transformer to the measured value of the meter, being the value composited of ratio error and error due to phase angle.
- (27) overall error The total error produced when a meter and transformer are combined, consisting of the algebraic sum of the error of the meter proper and the resultant error.

3. Classification

Meters shall be classified as follows according to their performance and the purpose of application.

(1) Classification by Precision

- (a) Normal Watt-hour Meters (Direct Connection Type Meters) Type III single-element direct connection type meters used mainly for measurement of electric energy for lighting demands in single-phase 2-line circuits, and Type III multi-element direct connection type meters used for measurement of electric energy for low-voltage lighting and power demands in single-phase 3-line, three-phase 3-line, and three-phase 4-line circuits.

- (b) Normal Watt-hour Meters (Transformer Operated Meters) Meters used in combination with transformer mainly for measurement of electric energy for low-voltage large-current demand and high-voltage small-current demand.
- (c) Precision Watt-hour Meters Meters used in combination with transformer mainly for measurement of electric energy at high-voltage and extra-high-voltage for large-amount power demands, capable of measuring electric energy with high precision, hereinafter referred to as the "precision meters".
- (d) Special Precision Watt-hour Meters Meters used in combination with transformer mainly for measurement of electric energy at extra-high-voltage for huge-amount power demands, capable of measuring electric energy with especially high precision, hereinafter referred to as the "special precision meters".
- (e) Reactive Volt-Ampere-Hour Meters Meters used in combination with transformer mainly for measurement of reactive electric energy in large power demands of high voltage and extra-high voltage, hereinafter referred to as the "var-hour meters".

- Remarks 1. Type III of 3. (1) (a) represents those meters whose precision is guaranteed for the range from the rated current to 3.3 % of the rated current.
- 2. Meters of 3. (1) (a) and 3. (1) (b) are generally termed as normal meters.
 - 3. Meters of 3. (1) (b) to 3. (1) (e) are generally termed as transformer operated meters.

- (2) Classification by Weatherproof Construction Meters shall be classified into normal weatherproof meters and reinforced weatherproof meters and further subdivided according to their kinds as shown in Table 1.

Table 1

Classification	Kind of meter
Normal weatherproof meters	Normal watt-hour meters (direct connection type meters)
	Normal watt-hour meters (transformer operated meters)
	Precision watt-hour meters
	Var-hour meters
Reinforced weatherproof meters	Normal watt-hour meters (direct connection type meters)

4. Normal Application Conditions

The normal application conditions for normal weatherproof meters and reinforced weatherproof meters shall be as follows:

- (1) The ambient temperature shall not exceed the range of 40°C at the highest to -10°C at the lowest, and the average ambient temperature during 24 h shall be not higher than 35°C.
- (2) Normal weatherproof meters shall be installed outdoor inside the rainfall line or indoors.
- (3) Reinforced weatherproof meters shall be installed outside the rainfall line.
- (4) Weatherproof meters shall be installed at locations where they are not exposed to the corroding action of chemicals, gases in hot spring resorts, or the like.

5. Conditions of Circuits Used

The conditions of circuits used in meters which collectively measure multi-circuits, hereinafter referred to as the "multi-circuit summation meters", and their indication devices, hereinafter referred to as the "multi-circuit summation indication devices", shall be as follows:

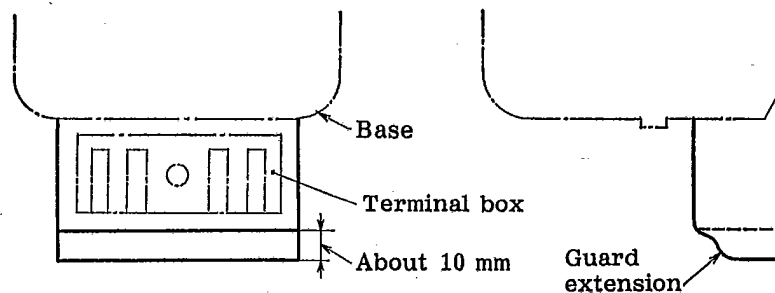
- (1) The phase-line systems, rated frequencies, and rated voltages on the primary side of the transformers of respective circuits shall be equal, and in addition, their nominal current transformation ratios shall be equal. However, for 2-circuit summation indication devices of the (5 + 5) A system in pulse composing systems, the circuits may be used within the range in which the ratio between the composite transformation ratios of both circuits is from 1:1 to 1:2.
- (2) In the case of the current composing system, the voltages of respective circuits shall be common.

6. Construction

6.1 General Requirements of Construction Meters and indication devices shall have sufficiently durable construction to ensure long-term service.

- (1) The respective parts of meters and indication devices shall be made of materials which practically do not cause trouble in long-term service, or materials sufficiently surface-treated (substrate treatment, painting, etc.) for preventing such trouble.
- (2) The respective parts of meters and indication devices shall be resistant to deterioration and deformation due to the influence of direct sunlight, and name plates, test marks, and registers shall have materials and constructions less susceptible to discoloration or color fading.
- (3) Such elastic packings as have no corrosive action on the other materials used and have long-term effectiveness shall be inserted between the cover of the meter and indication device and the base and between the terminal box and the base, and further the interior of the meter and indication device, excluding the terminal parts, shall be capable of being hermetically sealed.
The terminal parts of normal weatherproof meters and reinforced weatherproof meters shall have sufficiently waterproof constructions.
In reinforced weatherproof meters, the base and cover shall be fastened to each other with a torque in the prescribed range, such that the interior of the meter can be perfectly sealed by the fastening torque.
- (4) The terminal parts of reinforced weatherproof meters shall have extension-type terminal covers, with the guard part extended by about 10 mm, as shown in Fig. 2.

Fig. 2



6.2 Element Constitution Meters shall consist of a number of elements required theoretically according to the phase and line system of the circuits used.

6.3 Register The register of meters shall meet the following requirements:

- (1) The registers of normal meters and var-hour meters shall be of the cyclometer type or pointer type, and those of precision meters and special precision meters shall be of the pointer type.
- (2) The meter board of registers shall have a construction with easily readable indication, and the unit of the measuring quantity used shall be kWh or kvarh and this unit shall be clearly shown on the meter board as shown in Attached Fig. 1.

Remark: In special cases, MWh or Mvarh may be used.

- (3) The dial or cyclometer window in the meter board of registers shall be arranged as shown in Attached Fig. 1.
- (4) For cyclometer type registers, the lowest-place counting figure drum shall be of the continuous progress type with a construction which allows reading to 1/100 rotation.

The dimensions of the letters on the counting figure drum shall be 4 mm or larger in width and 5 mm or larger in height. However, the width of the lowest-place letters may be smaller than the above dimension irrespective of the lowest-place being integral or decimal. The direction of rotation of the pointer for the first integral place of pointer type registers shall be clockwise.

For normal meters and var-hour meters without decimal places, the lowest-place dial shall allow reading to 1/20 rotation, and for precision meters and special precision meters, it shall allow reading to 1/100 rotation.