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(JEMIMA/JSA)

Circuit Testers

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by the Japan Electric Measuring Instruments Manufacturers Association (**JEMIMA**)/the Japanese Standards Association (**JSA**) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law. Consequently **JIS C 1202 : 1986** is replaced with this Standard.

In this revision items relating to safety and to digital circuit tester are added and conformity with **JIS C 1102** *Electrical indicating instruments* which has been revised for international conformity is planned.

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Circuit testers

1 Scope This Japanese Industrial Standard specifies analog circuit testers, digital circuit testers which are designed to measure electrical quantities of three or more kinds from among d.c. voltage, d.c. current, a.c. voltage, a.c. current and resistances and testing leads as the standard accessory. However, circuit testers which utilizes an external power supply for the measurement of such quantities, those designed to measure a voltage exceeding 1 200 V, probes for high voltage measurement and analog circuit testers which accommodate amplifiers are excluded.

Remarks : A circuit tester may provide additional scales (or functions) for low frequency output, temperature, closed-circuit voltage of dry cell, load voltage, load current, d.c. amplification of transistor, etc. by utilizing its functions for measuring voltages, currents or resistances.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of coming into effect is given to these referred standards, only the edition of indicated year constitutes the provision of this Standard but the revision and amendment made thereafter are not applied.

JIS C 0040 : 1995	<i>Basic environmental testing procedures Part 2 : Tests Test Fc and guidance : Vibration (sinusoidal)</i>
JIS C 0041 : 1995	<i>Basic environmental testing procedures Part 2 : Tests Test Ea and guidance : Shock</i>
JIS C 0066 : 1993	<i>Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source</i>
JIS C 0301 : 1990	<i>Graphical symbols for electrical apparatus</i>
JIS C 1010-1 : 1998	<i>Safety requirements for electrical equipment for measurement, control, and laboratory use—Part 1 : General requirements</i>
JIS C 1010-2-31 : 1998	<i>Safety requirements for electrical equipment for measurement, control, and laboratory use—Part 2-31 : Particular requirements for hand-held probe assemblies for electrical measurement and test</i>
JIS C 1102 : 1997	<i>Direct acting indicating analogue electrical measuring instruments and their accessories</i>
JIS C 5111 : 1995	<i>General rules of fixed plastic film capacitors for use in electronic equipment</i>

JIS C 6443 : 1995	<i>Carbon potentiometers for general use</i>
JIS C 6575 : 1975	<i>Cartridge fuses for electronic equipment</i>
JIS Z 8202 : 1985	<i>Quantity symbols, unit symbols and chemical symbols</i>

3 Definitions

3.1 Items relating to structure

3.1.1 terminal A component which has been provided for connection of a device with an external conductor.

3.1.2 barrier A part of a device which protects the device from direct contact of foreign matter from all normal directions of approach.

3.1.3 mechanical zero The position at which a pointer stops when the measuring element (controlled mechanically) is not excited.

This position may or may not coincide with the zero scale mark. In an instrument in which the mechanical zero is shifted to outside of the scale, the mechanical zero does not corresponds to scale mark. In an instrument which has no mechanical resetting torque, the mechanical zero is indefinite.

3.1.4 mechanical zero adjuster A mechanism which serves for such adjustment that the mechanical zero coincides with a prescribed scale mark.

3.2 Items relating to performances

3.2.1 scale This means a series of marks and numerals by the measured values obtained in combination with the pointer.

3.2.2 scale division The spacing between adjacent scale marks.

3.2.3 scale length The length of a line (curve or straight line) which passes through the centers of the shortest scale marks over the both ends of the scale marks. The scale length is expressed in the unit of length.

3.2.4 measuring range (effective measuring range) This means the range determined by two measured values, within which the limits of error of an instrument (and/or an accessory) are specified.

3.2.5 response time This means such a time that the indication stays within a specific width whose center is the final stationary position of indication when the measurand rapidly changes from zero (without input) to such a value that the final stationary position becomes the prescribed position.

3.2.6 fiducial value The specified value as the reference point for measuring error, for defining the precision an instrument and/or an accessory.

Remarks : For example, the upper limit of measuring range, span or other clearly stated value.

3.2.7 influence quantity A quantity which is generally outside of the instrument and/or the accessory, and possible to influence the performances of the instrument.

3.2.8 reference conditions The value or range of influence quantity determined for the purpose of specifying the allowable error of an instrument and/or its accessory.

The reference conditions of each influence quantity are expressed by either of the reference value or reference range.

3.2.9 intrinsic error The error of an instrument and/or its accessory under the reference conditions.

3.2.10 variation The difference in the indicated value or in the true value of accessory corresponding to the same value of measurand when only one influence quantity is made to two specified values consecutively in the nominal working range.

3.3 Items relating to safety

3.3.1 double insulation An insulation comprising both basic insulation and supplementary insulation.

3.3.2 reinforced insulation An insulation which provides a degree of protection against electric shock at least equivalent to double insulation. The reinforced insulation may comprise several layers which cannot be tested singly as supplementary insulation or fundamental insulation.

3.3.3 installation category (overvoltage category) A category of installed system or part of circuit which has a standardized limit value for transient over voltage dependent on the nominal voltage to earth.

3.3.4 pollution degree It is approved in JIS C 1010-1 to use the two pollution degrees under micro-environment stated below for evaluation of the clearance.

- | | | | |
|---------|---|--------------------|---|
| Remarks | 1 | Pollution degree 1 | No pollution or only dry non-conductive pollution occurs. The pollution has no influence. |
| | 2 | Pollution degree 2 | Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected. |

3.3.5 clearance The shortest distance in air between two conductive parts.

3.3.6 creepage distance The shortest distance along the surface of the insulating material between two conductive parts.

3.4 Other item

3.4.1 type test The test which is carried out on the apparatus (or parts of apparatus) to be tested, for the specific design to demonstrate that the design and construction comply with the requirements stated in this Standard.

4. Classification

4.1 Category Testers are categorized as analog type and digital type according to the type of indication.

4.2 Grade Testers are classified into grade AA and grade A as shown in Table 1A for analog type and in Table 1B for digital type according to the grades. The grades are classified according to the intrinsic error, number of measuring ranges, scale length (excluded for digital type) and circuit constant as shown in Tables 1A and 1B.

Table 1A Classification by grade (analog type)

Classification			Grade AA	Grade A
Intrinsic error	D.C. voltage	% to maximum scale value	± 2	± 3
	D.C. current			
	A.C. voltage ⁽¹⁾	% to maximum scale value	± 3	± 4 ⁽²⁾
	Resistance	% to scale length	± 3	± 3
Number of measuring ranges ⁽³⁾			20 min.	10 min.
Scale length mm			70 min.	40 min.
Circuit constant	D.C. voltage Ω/V ⁽⁴⁾		20 k min.	10 k min.
	A.C. voltage Ω/V ⁽⁵⁾		9 k min.	4 k min.

Notes ⁽¹⁾ Not applicable to a.c. voltage measured by means of series capacitor terminals.

⁽²⁾ This is ± 6 % for a measuring range with the maximum scale value not exceeding 3V.

⁽³⁾ Additional scale shall not be included in the number of scale ranges.

⁽⁴⁾ This expresses the ratio of the internal resistance value to the maximum scale value in Ω/V over an arbitrary d.c. voltage measuring range.

⁽⁵⁾ This expresses the ratio of the internal impedance (50 Hz or 60 Hz) to the maximum scale value in Ω/V over an arbitrary a.c. voltage measuring range.

Table 1B Classification by grade (digital type)

Classification		Grade AA	Grade A
Intrinsic error	D.C. voltage	$\pm (0.2\% \text{ of indicated value} + 0.25\% \text{ of maximum indication value})$	$\pm (1.5\% \text{ of indicated value} + 0.5\% \text{ of maximum indication value})$
	A.C. voltage ⁽⁶⁾	$\pm (1\% \text{ of indicated value} + 0.25\% \text{ of maximum indication value})$	$\pm (2.5\% \text{ of indicated value} + 0.5\% \text{ of maximum indication value})$
	D.C. current ⁽⁷⁾	$\pm (1\% \text{ of indicated value} + 0.25\% \text{ of maximum indication value})$	$\pm (2.5\% \text{ of indicated value} + 0.5\% \text{ of maximum indication value})$
	A.C. current ^{(6) (7)}	$\pm (2\% \text{ of indicated value} + 0.25\% \text{ of maximum indication value})$	$\pm (3\% \text{ of indicated value} + 0.5\% \text{ of maximum indication value})$
	Resistance	$\pm (1\% \text{ of indicated value} + 0.25\% \text{ of maximum indication value})$	$\pm (2\% \text{ of indicated value} + 0.5\% \text{ of maximum indication value})$
Number of measuring ranges ⁽⁸⁾		20 min.	15 min.
Circuit constant ⁽⁹⁾	A.C. voltage D.C. voltage	9 M Ω min.	9 M Ω min.

Notes ⁽⁶⁾ Not applicable to a tester with a measuring range less than 10% of the maximum indication value if the tester is effective value detection type.

⁽⁷⁾ Not applicable to a measuring range in which the maximum indication value exceeds 1A.

⁽⁸⁾ Measurements other than those of d.c. voltage, d.c. current, a.c. voltage, a.c. current and resistance shall not be included in the number of measurement ranges.

⁽⁹⁾ In this constant the internal impedance (measured by using direct current in d.c. measurement range, and 50 Hz or 60 Hz in a.c. measuring range) in an arbitrary voltage measurement range has been obtained under the operating conditions of the tester.

5 Standard conditions and intrinsic error

5.1 Reference conditions The reference conditions for testing apparatus are given below:

- a) External conditions
- | | |
|-------------------------|---------------------------------------|
| Ambient temperature | : 23 °C $\pm$ 2 °C |
| Relative humidity | : 45 % to 75 % |
| Posture | : horizontal $\pm$ 5° for analog type |
| External magnetic field | : terrestrial magnetism |
| Battery voltage | : effective range of battery |