

STANDARD INFORMATION

If the project requires a sample for evaluation and/or testing, then this SUN applies.

Standard: UL 61010-2-033

Standard ID: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-033: Particular Requirements for Hand-Held Multimeters for Domestic and Professional Use, Capable of Measuring Mains Voltage [UL 61010-2-033:2020 Ed.2]

Previous Standard ID: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-033: Particular Requirements for Hand-held Multimeters and other Meters, for Domestic and Professional Use, Capable of Measuring Mains Voltage [UL 61010-2-033:2014 Ed.1+R:05Nov2018]

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **January 1, 2023**

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: No action is required for currently certified products. If modifications to the product after the effective date require an evaluation and/or testing, then the product must undergo re-evaluation to the new requirements.

Overview of Changes:

- New requirements for measuring circuit terminals
- Additional requirements for hand-held multimeters not powered from the mains or the measuring circuit
- New requirements for probe assemblies and accessories
- New clause with test for Indicating devices
- New requirements added how test voltage values are determined
- New Annex covering 4-mm “banana” terminals

Specific details of new/revise requirements are found in table below.

Current Listings Not Active? – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records. We will do this at no charge as long as Intertek is notified in writing prior to the review of your reports.



STANDARD INFORMATION

CLAUSE	VERDICT	COMMENT
		<i>Additions to existing requirements are <u>underlined</u> and deletions are shown lined out below.</i>
4	Info	Tests
		<i>New clause added;</i>
		The following requirements apply.
4.3.2.5		a) The MAINS supply voltage shall be between 90 % and 110 % of any RATED supply voltage for which the equipment can be set or, if the equipment is RATED for a greater fluctuation, at any supply voltage within the fluctuation range. b) The MAINS frequency shall be any RATED frequency. c) Equipment for both a.c. and d.c. shall be connected to an a.c. or d.c. supply. d) Equipment powered by single-phase a.c. MAINS supply shall be connected both with normal and reverse polarity. e) If the means of connection permits reversal, battery-operated and d.c. equipment shall be connected with both reverse and normal polarity.
6	Info	Protection against electric shock
6.6	Info	Connections to external circuits
		The conductive parts of each unmated measuring circuit TERMINAL which could become HAZARDOUS LIVE when the highest RATED voltage is applied to other measuring circuit TERMINALS on the hand-held multimeter shall be separated by at least:
6.6.101		a) <u>for TERMINALS with voltage RATING up to 1 000 V a. c. or 1 500 V d. c., the applicable CLEARANCE and CREEPAGE DISTANCE of Table 101 from the closest approach of the test finger touching the external parts of the TERMINAL in the least favourable position (see Figure 1);</u> b) <u>for TERMINALS with voltage RATING exceeding 1 000 V a.c. or 1 500 V d.c., 2,8 mm for the CLEARANCE and CREEPAGE DISTANCE from the closest approach of the test finger touching the external parts of the TERMINAL in the least favourable position. These TERMINALS shall also withstand the voltage test of 6.8 with a test voltage equal to the RATED voltage of the TERMINAL multiplied by 1,25 applied between the closest approach of the test finger touching the external parts of the TERMINAL in the least favourable position and the other measuring circuit TERMINALS.</u> <u>Annex CC provides information regarding the recommended dimensions of 4-mm "banana" TERMINALS.</u> <u>Conformity is checked by inspection, by the determination of ACCESSIBLE parts, and by measurement of the applicable CLEARANCES and CREEPAGE DISTANCES and, if applicable, by the voltage test of 6.8.</u>



CLAUSE	VERDICT	COMMENT
		<p><i>New clause added;</i></p> <p>CREEPAGE DISTANCES</p> <p>Add the following two new paragraphs after the third paragraph:</p> <p>For hand-held multimeters not powered from the MAINS or the measuring circuit, CREEPAGE DISTANCES according to material group I are allowed to be used for other materials.</p> <p>For TERMINALS of hand-held multimeters intended to be connected only to a hand-held probe assembly complying with Part 031, CREEPAGE DISTANCES according to material group I are allowed to be used for the insulating materials of the TERMINALS.</p>
6.7.1.3		<p><i>New clause added;</i></p> <p>Requirements for insulation according to type of circuit</p> <p>Replace the text with the following:</p> <p>Requirements for insulation in particular types of circuits are specified as follows:</p> <ul style="list-style-type: none">a) in 6.7.2 for MAINS CIRCUITS of OVERVOLTAGE CATEGORY II with a nominal supply voltage up to 300 V;b) in 6.7.3 for secondary circuits separated from the circuits in a) only by means of a transformer;c) in Clause K.1 for MAINS CIRCUITS of OVERVOLTAGE CATEGORY III or IV or for OVERVOLTAGE CATEGORY II over 300 V;d) in Clause K.2 for secondary circuits separated from the circuits in c) only by means of a transformer;e) in Clause K.3 for circuits that have one or more of the following characteristics<ul style="list-style-type: none">1) the maximum possible TRANSIENT OVERVOLTAGE is above the level assumed for the MAINS CIRCUIT;2) the WORKING VOLTAGE is the sum of voltages from more than one circuit, or is a mixed voltage;3) the WORKING VOLTAGE includes a recurring peak voltage that may include a periodic nonsinusoidal waveform or a non-periodic waveform that occurs with some regularity;4) the WORKING VOLTAGE has a frequency above 30 kHz;5) the circuit is a measuring circuit where MEASUREMENT CATEGORIES do not apply;f) in Clause K.101 for measuring circuits RATED for MEASUREMENT CATEGORIES III and IV. <p>The TRANSIENT OVERVOLTAGE level for MAINS corresponds to the "required RATED impulse voltage of equipment" value specified in Table 443.2 of IEC 60364-4-44:2007/AMD1:2015.</p>
6.7.1.5		



CLAUSE	VERDICT	COMMENT
14	Info	Components and subassemblies <i>New clause added;</i> Probe assemblies and accessories Probe assemblies and accessories within the scope of IEC 61010-031, and current sensors within the scope of IEC 61010-2-032 shall meet the requirements thereof. At minimum, one set of the test leads supplied with the hand-held multimeter shall be RATED according to IEC 61010-031 for at least the highest voltage and MEASUREMENT CATEGORIES of the hand-held multimeter. Conformity is checked by inspection.
101	Info	Measuring circuits <i>New clause added;</i> Protection against MAINS overvoltages To ensure protection against arc flash or fire, measuring circuits RATED for measuring MAINS voltages shall have minimum CLEARANCES and CREEPAGE DISTANCES equivalent to BASIC INSULATION between MAINS connected conductive parts of opposite polarity. Conformity is checked by inspection and measurement. In addition, the measuring circuit TERMINALS of a voltage measuring circuit shall withstand the applicable TRANSIENT OVERVOLTAGE with the voltage measurement function selectors set for the proper function and range, without damage which could cause a HAZARD. Conformity is checked by the following impulse voltage test using the applicable impulse voltage of Table 102. The impulse voltage is applied between each pair of TERMINALS. The impulse voltage test shall be conducted for five impulses of each polarity spaced up to 1 min apart, from a hybrid impulse generator (see IEC 61180). The generator produces an open-circuit voltage waveform of 1,2/50 μ s, a short-circuit current waveform of 8/20 μ s, with an output impedance (peak open-circuit voltage divided by peak shortcircuit current) of 2 Ω . Resistance may be added in series if needed to raise the impedance. The impulse voltage is applied while the circuit is working under conditions of NORMAL USE, in combination with the MAINS voltage.



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		<p>The MAINS voltage used for the test is the maximum RATED line-to-neutral voltage of the MAINS being measured. For measuring circuits RATED for MAINS line-to-neutral voltages above 400 V a.c. r.m.s. or d.c., the test may be performed with an available MAINS voltage source that has a line-to-neutral voltage of at least 400 V a. c. r. m. s. or d. c. The MAINS voltage source does not, in this case, need to match the measuring circuit RATING, but circuits RATED for a.c. or a.c. plus d.c. shall be tested with an a.c. source, and circuits RATED for d.c. only shall be tested with a d.c. source.</p> <p>When verifying CLEARANCES within the hand-held multimeter by an impulse voltage test, it is necessary to ensure that the specified impulse voltage appears at the CLEARANCE.</p> <p>The wave shape of each impulse shall be observed (see Note 3). Distortions of the impulse voltage which do not change from impulse to impulse may be caused by operation of an overvoltage limiting device and do not indicate a (partial) breakdown of solid insulation.</p> <p>No HAZARD shall arise. No flashover of CLEARANCES or breakdown of solid insulation shall occur during the test, but partial discharges are allowed. Partial discharge will be indicated by a step in the resulting wave shape which will occur earlier in successive impulses. Breakdown on the first impulse may either indicate a complete failure of the insulation system or the operation of overvoltage limiting devices in the hand-held multimeter. If overvoltage limiting devices are present, they shall not rupture or overheat during the test. Tripping the circuit breaker of the MAINS installation is an indication of failure. If the results of the test are questionable or inconclusive, the test is to be repeated two more times.</p>
		<i>New section added;</i>
102		Indicating devices
		This section contains requirements for indicating devices. See standard for details.
Annex K	Info	Insulation requirements not covered by 6.7
K101	Info	Insulation requirements for measuring circuits RATED for MEASUREMENT CATEGORIES III and IV
		<i>New section added;</i>
K101.4.1.2		<p>Test voltage values for testing the long-term stress of solid insulation are determined as follows:</p> <p>The test voltage for BASIC INSULATION and SUPPLEMENTARY INSULATION is calculated with the following formula:</p> $U_T = A \times U_N + B$



CLAUSE	VERDICT	COMMENT
		<p>where U_T is the test voltage, U_N is the nominal a. c. r. m. s. line-to-neutral or d. c. voltage of MAINS being measured and A and B are parameters determined as follows:</p> <p>when $U_N \leq 1\,000\text{ V}$, $A = 1$ and $B = 1\,200\text{ V}$ when $U_N > 1\,000\text{ V}$, $A = 1,5$ and $B = 750\text{ V}$</p> <p>The a.c. test voltage is equal to U_T and the d.c. test voltage is equal to $1,414 \times U_T$. For REINFORCED INSULATION, the test voltage value is twice the value for BASIC INSULATION.</p> <hr/> <p><i>New annex added;</i></p>
Annex CC		<p>4-mm "banana" TERMINALS</p> <p>This annex contains requirements for 4-mm banana terminals. See standard for details.</p> <hr/>