Document Cover Sheet

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The document to which this cover statement is attached is submitted to a Formulating Group or sub-element thereof of the Telecommunications Industry Association (TIA) in accordance with the provisions of Sections 6.4.1–6.4.6 inclusive of the TIA Engineering Manual dated March 2005, all of which provisions are hereby incorporated by reference.

Abstract

The following text is proposal for power cross tests for the new Hazard-Based Standard, IEC 62368. It is based on a US proposal revised by a couple of TC 108 members. It is expected to be included in the next draft of fire clause of IEC 62368 released for National Committee comment.

14.1 INTERNATIONAL ELECTROTECHNICAL COMMISSION

TECHNICAL COMMITTEE NO. 108: SAFETY OF ELECTRONIC EQUIPMENT WITHIN THE FIELD OF AUDIO/VIDEO, INFORMATION TECHNOLOGY AND COMMUNICATION TECHNOLOGY

Draft proposal for power cross requirements

14.2 Proposal

14.3 6.6 Power Contact between EXTERNAL CIRCUITS and a.c. MAINS or MEDIUM VOLTAGE DISTRIBUTION SYSTEM

The objective is to help avoid fire hazard in the equipment or associated wiring in case of a.c. MAINS contact or MEDIUM VOLTAGE DISTRIBUTION SYSTEM contact/coupling to an EXTERNAL CIRCUIT.

14.4 6.6.1 General

Equipment intended to be connected to EXTERNAL CIRCUITS may be subject to the following local power distribution conditions.

Power distribution Condition	Description of Power distribution Condition
1	Systems where the conditions of power distribution are such that conductive contact between MEDIUM VOLTAGE DISTRIBUTION SYSTEM conductors and an EXTERNAL CIRCUIT is not a concern (system typical in Europe and Japan). Such systems are tested at local mains voltage only.
2	Systems where the conditions of power distribution are such that conductive contact between MAINS or MEDIUM VOLTAGE DISTRIBUTION SYSTEM and EXTERNAL CIRCUIT is a concern (systems in US and Canada). Such systems are tested at mains voltage and at maximum longitudinal voltage of 600 V that can occur on inside wiring that is protected with primary protectors. Asymmetrical operation of primary protectors can result in a transverse voltage of up to 600 V when the longitudinal voltage is high enough to operate one protector but not the other (minimum 285 V peak). The tests for power distribution condition 2 (MAINS contact and MEDIUM VOLTAGE DISTRIBUTION SYSTEM contact) are more severe than the tests for power distribution condition 1 (MAINS contact only).

14.5

14.6 6.6.2 Requirement

Ports intended for connection to EXTERNAL CIRCUITS that run partly or entirely outside the building shall be provided with adequate protection so that accidental contact between the a.c. MAINS supply or MV distribution and the EXTERNAL CIRCUIT is unlikely to create a fire hazard.

Equipment compliant with tests for power distribution condition 2 is considered compliant for tests for power distribution condition 1.

14.7 6.6.3 Test conditions

14.8 6.6.3.1 Equipment evaluation

Equipment is to be evaluated in the configurations allowed by the user manual and/or installation instructions, and while in each operating state that affects compliance.

Equipment which functions as either terminal or series equipment is to be evaluated for both functions.

PLUGGABLE EQUIPMENT TYPE A that is not installed by SKILLED PERSON is to be evaluated with and without the power-supply cord earthing lead connected to earth if that earthing can affect compliance.

14.9 6.6.3.2 Equipment Set-up

Equipment is to be mounted as intended for its use. Tests may be conducted on either the equipment as an assembly, on individual subassemblies, or on a partial assembly containing those components that may be exposed to an overvoltage condition. Two single plies of cheesecloth are to be wrapped tightly around the assembly, subassembly or partial assembly.

NOTE 1 – Bleached cotton cheesecloth of approximately 40g/m2 is considered suitable for this purpose.

Equipment that has a removable line cord intended to be connected to an external circuit is to be connected to the test circuit with a line cord having 0,4 mm (No. 26 AWG) or larger copper wire conductors and not more than 1 Ω total resistance.

Equipment that has a permanently attached line cord intended to be connected to an external circuit (one that requires use of a tool to remove) or a permanently attached handset cord that can be subjected to overvoltage conditions, and for which these cords have not been approved as component parts shall be tested as a part of the equipment (equipment port to external circuit).

Functional equipment is to be used for each test. Circuitry that is damaged during testing may be either repaired or replaced for subsequent tests. After any of the specified tests, equipment may be returned to ambient temperature before performing any additional tests. Alternatively, separate samples may be used for each test.

14.10 6.6.4 Test Circuits

Test voltages are to be applied to a representative pair or pairs of the EXTERNAL CIRCUIT terminals of the EUT as follows (T indicates differential mode, L indicates common mode and F indicates 4-wire test mode):

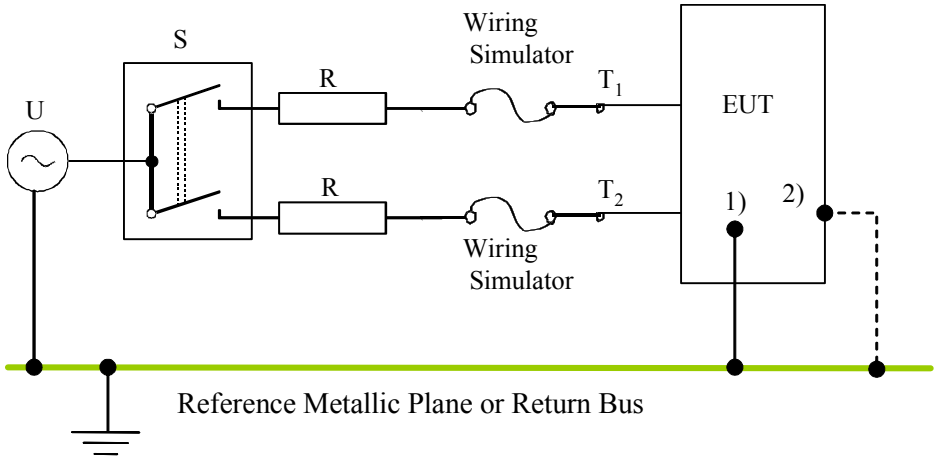
- Terminal equipment is to be tested as follows:
  - Equipment with an earthing connection is to be subjected to common mode (longitudinal) L-type overvoltage test conditions using the test circuit described in figure 6.1. The test voltage is applied between: the EXTERNAL CIRCUIT terminals and the earthing connection of the EUT (see Figure 6.1).
  - Equipment shall be subjected to differential mode (transverse) T-type overvoltage test conditions using the test circuit described in figure 6.2. The test voltage is applied between the EXTERNAL CIRCUIT terminals of the EUT. The transverse tests are then repeated after

reversal of the connections to the EUT terminals, unless it is verified that the line circuit of the EUT is symmetrical, or the EUT has no earthing conductor, nor provision for it.

- Equipment which connects to a 2-pair (4-wire) EXTERNAL CIRCUIT is to be subjected to pair-to-pair F-type overvoltage test conditions using the test circuit described in figure 6.3.

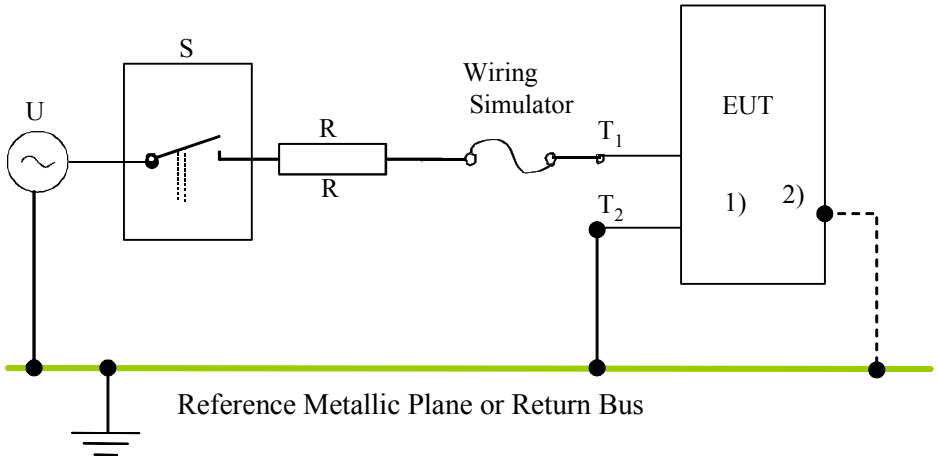
- Series equipment is to be subjected to:
  - all common mode, differential mode and 4-wire tests without terminal equipment being connected; and
  - differential mode tests with terminal equipment connections short-circuited.

For an EUT having provision for a protective earthing conductor or functional earthing conductor, or for earthing through a signal port, the tests are conducted without a connection to earth and repeated with a connection to earth. As an exception, if the equipment installation instructions state that the equipment shall not be earthed for a dedicated system, the tests are not repeated with a connection to earth.



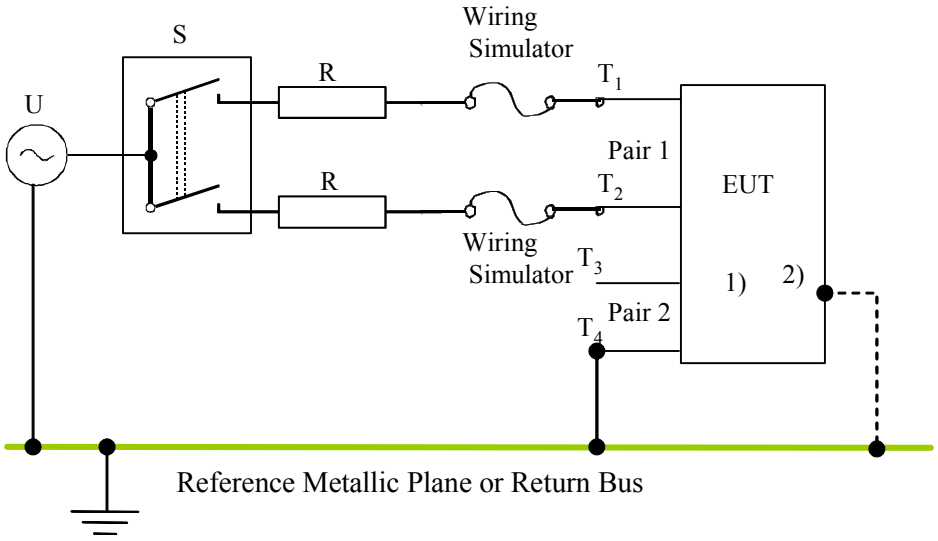
1) User-accessible conductive parts
2) Only for an EUT having provision for protective or functional earthing

Figure 6.1 – Power contact – longitudinal test circuit



1) User-accessible conductive parts
2) Only for an EUT having provision for protective or functional earthing

Figure 6.2 – Power contact - transverse test circuit



1) User-accessible conductive parts
2) Only for an EUT having provision for protective or functional earthing

Figure 6.3 – Power contact – four-wire test circuit

14.11 6.6.4.1 Wiring Simulator

The wiring shall be used where required in the test sequences.

- the conductor in the line cord intended to be connected to an external circuit supplied with the equipment is less than 0,4 mm diameter or
- the conductor specified for the equipment is less than 0,4 mm diameter.

The wiring simulator shall be

- a 50 mm length of 0,2 mm (No. 32 AWG) bare or enameled solid copper wire; or
- a fuse having a time-current characteristic comparable to a 0,2 mm wire [Bussman Mfg. Co. Type MDL-2 A fuse or equivalent]; or
- for test condition 13 in Installation Condition 2 only, a current probe consisting of a 300 mm length of at least 0,5 mm (No. 24 AWG) copper wire to determine the I^2t imposed on the connecting wiring.

14.12 6.6.5 Test sequence

6.6.5.1 Power distribution Condition 1

The open-circuit voltage is 50 or 60 Hz. Switch S is closed for each of eight tests, using the following resistors

Test	For equipment intended to be installed in an area where the nominal AC MAINS SUPPLY voltage exceeds 130V			For equipment intended to be installed in an area where the nominal AC MAINS SUPPLY voltage does not exceed 130V			Wire Simulator
	U	R	Test Type	U	R	Test Type	
1	230 V_{rms}	*1000 Ω ± 10%;*	*L, T*	120 V_{rms}	*500 Ω ± 10%;*	*L*	*No*
2	230 V_{rms}	*600 Ω ± 10%;*	*L, T*	120 V_{rms}	*300 Ω ± 10%;*	*L*	*No*
3	230 V_{rms}	*320 Ω ± 10%;*	*L, T*	120 V_{rms}	*150 Ω ± 10%;*	*L*	*No*
4	230 V_{rms}	*160 Ω ± 10%;*	*L, T*	120 V_{rms}	*80 Ω ± 10%;*	*L*	*No*
5	230 V_{rms}	*80 Ω ± 10%;*	*L, T*	120 V_{rms}	*40 Ω ± 10%;*	*L*	*No*
6	230 V_{rms}	*40 Ω ± 10%;*	*L, T*	120 V_{rms}	*20 Ω ± 10%;*	*L*	*Yes*
7	230 V_{rms}	*20 Ω ± 10%;*	*L, T*	120 V_{rms}	*10 Ω ± 10%;*	*L*	*Yes*
8	230 V_{rms}	*10 Ω ± 10%*	*L, T*	120 V_{rms}	*5 Ω ± 10%*	*L*	*Yes*

6.6.5.2 Power distribution Condition 2

Switch S is closed for each of the following tests, using the following procedure. The test begins by the application of 50-Hz or 60-Hz source at a short-circuit value of 3.0 A_{rms} for 15 minutes and continues by repeating the 15-minute application of the 50-Hz or 60-Hz source with each subsequent value of the short-circuit current until one of the following occurs:

- Tests at all specified current values are performed.
- The equipment interrupts the current up or reduces the applied current to a value less than 50 mA. In this case, the test continues by proceeding to the application of the 50-Hz or 60-Hz source at a short-circuit current of 7 and 30 A_{rms} for 15 minutes.

Test Condition	U See 6.6.1	R chosen to achieve the following short-circuit current (measured before the test)	Wire Simulator	Test Configuration
1	600 V_{rms}	3/2.2 [1)]	No	L, T, F
2	600 V_{rms}	3,75	Yes	L, T, F
3	600 V_{rms}	5	Yes	L, T, F
4	600 V_{rms}	7	Yes	L, T, F
5	600 V_{rms}	10	Yes	L, T, F
6	600 V_{rms}	12,5	Yes	L, T, F
7	600 V_{rms}	20	Yes	L, T, F
8	600 V_{rms}	25	Yes	L, T, F
9	600 V_{rms}	30	Yes	L, T, F
10	120 V_{rms}	25	No	L

1) The 2.2A applies to equipment intended for home and consumer use. The 3A applies to equipment intended for installation in buildings with equipotential bonding under control of network operators or service providers and similar facilities.

Test Condition 11: If an open circuit condition occurred during Test Condition 1, an additional test is to be conducted at 600 V, at a current no greater than 3 A, whose value does not result in an open circuit condition and is intended to produce maximum heating, applied per Test Duration.

NOTE Where a fuse causes the open circuit in Test Condition 3, as an alternative to testing the equipment with its fuse in place, a short-circuit current value of up to 135 percent of the fuse rating, with the fuse bypassed, may be used.

Test Condition 12: If a voltage limiter, rated by the manufacturer to conduct at 285 V

(Should this value be harmonized with IEC 60950-1 clause 6.1.2) ?

peak or more, operated during the test, the following test is to be conducted:

A voltage whose peak value is below the conduction voltage, at a current no greater than 3.0 A, whose value does not result in an open circuit condition and is intended to produce maximum heating, applied per Test Duration.

NOTE – A voltage limiting device that does not have a breakdown characteristic (such as a VDR) is considered to be conducting when the current through it exceeds 5 mA.

Test Condition 13: 600 V, 40 A, applied for 1,5 s in L, T, and F mode. Wire simulator is required.

14.13 6.6.6 Equipment intended to be protected by Primary protectors

Equipment installed by a SKILLED PERSON and intended for use only with a specified primary protector that complies with the IEC 61643-1, U, where required to be 600 V, may be adjusted based on the 3-sigma breakdown voltage over life for the protector. Since the test voltage is based on the maximum voltage that will not break down the protector, these tests are performed without the actual protector in place.

NOTE Primary protectors are generally under the exclusive control of the service providers, not the equipment manufacturer. Therefore, unless the equipment is intended to be installed by a service provider and it can be ensured that the manufacturer's recommendation for a specific primary protector will be followed, or the primary protector is provided as part of the equipment construction, equipment is to be evaluated without a primary protector in the test circuit.

14.14 6.6.7 Test Duration

For all tests except Test Condition 12 for Test Sequence for Power distribution Condition 2 the test duration shall fulfill the following:

The tests are terminated when either the relevant conditions of the EUT have stabilized or 15 minutes have elapsed, which ever occurs first. The relevant conditions of the EUT include the current in the external circuit cable and the temperature. If at the end of 15 minutes it appears possible that a risk of fire, electric shock or injury to persons will result eventually, the test is to be continued until ultimate results are obtained – maximum 7 hours.

14.15 6.6.8 Compliance criteria

There shall be no ignition or charring of the cheesecloth indicator. Charring is deemed to have occurred when threads have been reduced to char by a glowing or flaming condition.

When used in the test circuit as appropriate, the wiring simulator shall meet the following criteria:

- the fuse or the 50 mm length of wire used as the wiring simulator shall not interrupt the current during the test; or
- for Test Condition 13 for Installation Condition 2, integral I^2t measured with the current probe shall be less than 100 A^2-s.

New Definition

MEDIUM VOLTAGE DISTRIBUTION SYSTEM: An a.c. power system using voltages above 600 V for transmission and distribution of electric power.