

# Key Comparison of Safety Requirements in Europe, North America and Australia for Electronic Products

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# Presentation Agenda

Intertek

## Standards For Audio/Video Product

### Europe

- EN 60065

### U.S.A.

- ANSI/UL 60065

### Australia

- AS/NZS 60065

(Refer to IEC 60065)



# Principles of Safety

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The application of the standard is intended to prevent injury or damage due to the following hazards:

- Electric shock
- Excessive temperatures
- Radiation
- Implosion
- Mechanical hazards
- Fire hazards

# Scope



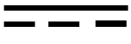


In addition to cover household use Audio/Video product, commercial apparatus (apparatus for use in trades, professions or industries and which is not intended for sale to the general public) and professional apparatus (video and audio apparatus operated and maintained by trained personnel under conditions of controlled access) are covered by ANSI/UL60065 also.



AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>-Marking shall be permanent, comprehensible and easily discernible on the apparatus when ready for use; rubbing test is required – rubbing the marking by hand for 15s with a piece of cloth soaked with water and then another sample for 15s with a piece of cloth soaked with petroleum spirit.</b></p> <p><b>-The marking plate shall be located at the exterior of the apparatus, excluding the bottom. However, for a portable apparatus or apparatus with a mass not heavier than 7kg, the marking can be located at the bottom of apparatus provided that this location is mentioned in user manual.</b></p>	

# Marking and Instruction


- a. Trade name or trade mark.
- b. Model number
- c. Class II symbol,  , if applicable
- d. Nature of supply,  and / or 
- e. Rated supply voltage (e.g. AC230V, AC120-240V or AC110/230V )
- f. Rated mains frequency, (e.g. 50Hz, 50-60Hz, 50/60Hz )
- g. Rated current/Power consumption which can be supplied by the sample for general use. (For AS/NZS 60065 and EN 60065, The information can be shown in user manual as alternative)
- i. **RATED CURRENT / POWER CONSUMPTION**

The following items are in additional for standard ANSI/UL60065:

- **Date code - code of manufacture and shall have a minimum 10 year repetition cycle.**
- **A distinctive identification - when the same apparatus is produced at more than one factory (may be our control no.)**
- **Graphic symbols and supplemental marking -**



**“CAUTION – RISK OF ELECTRIC SHOCK – DO NOT OPEN”**

AS/NZS 60065, EN 60065	ANSI/UL 60065
 <p><b>the symbol can be used in circuit diagrams or put adjacent to the relevant component, but <u>not</u> on components.</b></p>	
<p><b>Not required</b></p>	<p><b>The instruction shall include an illustration of the graphical symbols and an explanation of their meaning of safety related graphical symbols used.</b></p>
<p><b>Not required</b></p>	<p><b>Important Safety Instruction shall be included where applicable. (items 1-14)</b></p>





AS/NZS60065, EN 60065	ANSI/UL 60065
<p><b>“The apparatus shall not be exposed to dripping and splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.” shall be added in the instruction for use.</b></p>	<p><b>”WARNING – To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.” shall be used instead</b></p>
<p><b>Some safety statements are recommended to add in instruction manual where applicable</b></p>	<p><b>Not required</b></p>

# Hazardous Radiations



## Ionizing radiation

AS/NZS60065, EN 60065	ANSI/UL 60065
<p><b>Conduct the following measurement under <u>normal and fault</u> conditions according to test method in the standard:</b></p> <ul style="list-style-type: none"><li>- all adjusted controls are set to give maximum radiations maintaining for 1 hour</li><li>- measure the exposure rate at a distance of 5cm from any point of outer surface</li><li>- the exposure rate shall not exceed 36pA/kg</li></ul>	<p><b>Checked with the requirements in the United States Code of Federal Regulations, Title 21, Chapter 1, subchapterJ, Sections 1010.2, 1010.3 and 1020.10</b></p>

# Hazardous Radiations



## Laser radiation

AS/NZS 60065, EN 60065	ANSI/UL 60065
<ul style="list-style-type: none"><li>- Should refer to standard IEC60825-1:1993+A1+A2</li><li>- Laser system incorporated inside the apparatus should within the limit of class 1 under normal operation; class 3R (for <math>\lambda</math> out of 400-700nm) OR 5 times the limit of class 1 (for <math>\lambda</math> within 400-700nm) under fault condition</li><li>- Further measurement on the laser radiation will be required if above item failed</li></ul>	<p>Should be classified and labeled in accordance with the United States Code of Federal Regulations, Title 21, Chapter 1, subchapter J, Sections 1010.2, 1010.3, 1040.10 and 1040.11</p>

# Heating under Normal and Fault Conditions



## Temperature rise limit of winding wires

AS/NZS 60065, EN 60065	ANSI/UL 60065
<b>Based on the type of its insulated material</b>	<b>Based on its insulation class</b>






## Different requirements on fault condition

AS/NZS 60065, EN 60065	ANSI/UL 60065
<b>If the temperature is limited by fuse-link, additional test shall be required in relation to the characteristic of the fuse-link and the current passing through it under relevant fault condition</b>	<b>No such consideration on standard ANSI/UL 60065</b>

## Leakage current measurement

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>touch current measured in accordance with IEC60990, with the measuring network as shown below</b></p> <p><b>Measuring network for TOUCH CURRENTS</b></p> <p>While the limit are <b>AC: <math>U1 \leq 35V_{peak}</math> and <math>U2 \leq 0.35V_{peak}</math> and DC: <math>U1 \leq 1.0V</math></b></p>	<p><b>touch current carried out in accordance with UL101, with the measuring network as shown below</b></p> <p><b>Measuring network for TOUCH CURRENTS</b></p> <p><b>While the measured value shall not exceed 0.5MIU</b></p>

## Openings

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p data-bbox="271 603 763 995"><b>Jointed finger - probe B of IEC61032 is used to determine hazardous live parts through opening, including bottom enclosure</b></p> 	<p data-bbox="1146 603 1570 703"><b>Figure 14 is used instead</b></p> 
<p data-bbox="271 1027 741 1362"><b>Small finger probes 18 and 19 is used if the apparatus is intended to be accessed by children</b></p> 	<p data-bbox="1146 1027 1615 1129"><b>This requirement is deleted.</b></p>

## Insulation requirement – Surge Test

AS/NZS 60065, EN 60065

ANSI/UL 60065

**For class II apparatus, the insulation between:**

- **Terminals for the connection of antenna and mains supply terminals and between**
- **mains supply terminals and any other terminals in case of apparatus providing supply voltages to other apparatus with antenna terminals**

**should be subjected to 50 discharges at a maximum rate of 12/min, from a 1nF capacitor charged to 10kVdc in a test circuit.**





Insulation requirement  
Humidity treatment and insulation resistance

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>The condition for humidity treatment and requirement of insulation resistance are exactly identical between these two standards.</b></p> <p><b>Temperature: 28-30°C</b></p> <p><b>Humidity: 90-95%</b></p>	

## Insulation requirement – Dielectric strength test

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>The test voltage for Basic, Supplementary and Reinforced Insulation should refer to curve A and B of figure 7 only.</b></p>	<p><b>For the apparatus with mains voltage in the range of 105-130Vrms, the test voltage is 1414Vpeak for Basic and Supplementary Insulation and 2828Vpeak for Reinforced Insulation.</b></p> <p><b>The test voltage for other mains voltage should refer to curve A and B of figure 7.</b></p>

# Mechanical Test



## Bump test

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>Test criteria:</b> Apparatus with mass exceeding 7kg</p> <p><b>Test method:</b> Placed the apparatus on a horizontal support of wood and allowed to fall 50 times from a height of 5cm onto the wood</p> <p><b>Compliance:</b> Apparatus shall show no damage in the sense of standard</p>	

## Vibration test

AS/NZS 60065, EN 60065

ANSI/UL 60065

**Test criteria:** Transportable apparatus intended to be used for audio amplification of musical instruments, portable apparatus and apparatus having a metal enclosure.

**Test method:** Subjected to a vibration endurance conditioning by sweeping according to the following condition in vertical direction:

- Duration: 30min;
- Amplitude: 0.35mm;
- Frequency range: 10Hz ... 55Hz ... 10Hz
- Sweep rate: approximately 1 octave/min

**Compliance:** Apparatus shall show no damage in the sense of standard

# Mechanical Test



## Impact test – Impact hammer

AS/NZS 60065, EN 60065	ANSI/UL 60065
<ul style="list-style-type: none"><li>- <b>Subjected to three blows from a spring-operated impact hammer to every point of the exterior of the apparatus</b></li><li>- <b>used kinetic energy: 0.5J</b></li><li>- <b>Shall comply with dielectric strength test, show no damage in the sense of standard and live parts shall not become accessible</b></li></ul>	<p><b>Not require for standard ANSI/UL 60065</b></p>



# Mechanical Test



## Impact test – Ball impact test

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>Test criteria:</b> The area of enclosure that protect hazardous live parts</p> <p><b>Test method:</b> Single impact caused by a solid and smooth steel ball of 50mm diameter and 500g mass to fall freely from rest through a vertical distance in a direction perpendicular to the surface of the enclosure.</p> <p><b>Compliance:</b> Shall comply with dielectric strength test, show no damage in the sense of standard and live parts shall not become accessible</p>	





## Drop test

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>Test criteria:</b> Portable apparatus having a mass of 7kg or less</p> <p><b>Test method:</b> A complete sample is subjected to 3 impacts that result from being dropped through a distance of 1m onto a horizontal surface.</p> <p><b>Compliance:</b> Shall comply with dielectric strength test, live parts shall not become accessible, insulating barriers not be damaged and creepage and clearance shall not be reduced</p>	

## Stress relief test

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>Test criteria:</b> Apparatus with moulded enclosure of formed by thermoplastic materials.</p> <p><b>Test method:</b> Placed the apparatus into a circulating air oven to a temperature 10K higher than the max. temperature observed on the enclosure during normal temperature test but not less than 70°C for a period of 7 hours, then permitted to cool to room temperature.</p> <p><b>Compliance:</b> Hazardous live parts shall not become accessible.</p>	



# Mechanical Test



## Handle strength test

AS/NZS 60065, EN 60065	ANSI/UL 60065
<b>Not required for AS/NZS 60065 or EN 60065</b>	<b>The weight of apparatus plus a weight that exerts a force of three times the weight of the apparatus is to be uniformly applied over a 75mm width at the centre of the handle.</b>  <b>The handle or that portion of the enclosure shall not break or crack and the handle shall not detach.</b>

# Mechanical Test



## Telescoping or rod antennas

AS/NZS 60065, EN 60065	ANSI/UL 60065
<ul style="list-style-type: none"><li>- A telescoping or rod antenna shall be provided with a minimum 6mm diameter button or ball on the end.</li><li>- 20N force shall be subjected at the end piece of the antenna along its major axis for a period of 1 min.</li><li>- If the end piece of the antenna is attached by screw threads, a loosening torque is to be applied to that end piece of 5 samples.</li></ul>	





## Wall or ceiling mounting means

AS/NZS 60065, EN 60065	ANSI/UL 60065
<ul style="list-style-type: none"><li>- <b>The apparatus is mounted in accordance with the manufacturer's instructions.</b></li><li>- <b>A force in addition to the weight of the apparatus is applied downwards through the geometric center of the apparatus for 1 min.</b></li><li>- <b>The additional force shall be equal to 3 times the weight of the apparatus but not less than 50N.</b></li><li>- <b>The apparatus and its mounting means shall remain secure during the test.</b></li></ul>	

## Stability and mechanical hazards

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>Apparatus having a mass of 7kg or more shall be subjected to the following tests and shall not overturn.</b></p> <ul style="list-style-type: none"><li>- Apparatus placed on a 10° inclined plate to horizontal and then rotated slowly through an angle of 360°</li><li>- Apparatus placed on a non-skid surface with angle &lt; 1° to horizontal and a force 100N applied vertically downwards</li></ul>	

# Component standard for power supply and transformer



AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>No such considerations in standard AS/NZS 60065 and EN 60065</b></p>	<p><b>Component power supplies and their power transformers complying with the constructions and test requirements of standard UL 1310, UL 1950 3<sup>rd</sup> Edition, UL 60950 or UL60950-1 are considered to fulfill the relevant test requirement.</b></p>

# Evaluations on Critical Components



AS/NZS 60065, EN 60065	ANSI/UL 60065
<b>Components should comply with test method mentioned in standard and/or comply with relevant IEC/ EN/ AS/ NZS standard for component.</b>	<b>Components should comply with test method mentioned in standard and/or comply with relevant UL standard for component.</b>



## Mains supply flexible cord

AS/NZS 60065, EN 60065	ANSI/UL 60065
<p><b>- The color for wires used for protective earthing connections should be GREEN/YELLOW</b></p>	<p><b>- The color for wires used for protective earthing connections should be GREEN or GREEN/YELLOW</b></p>

# Flammability Requirement



## PCB

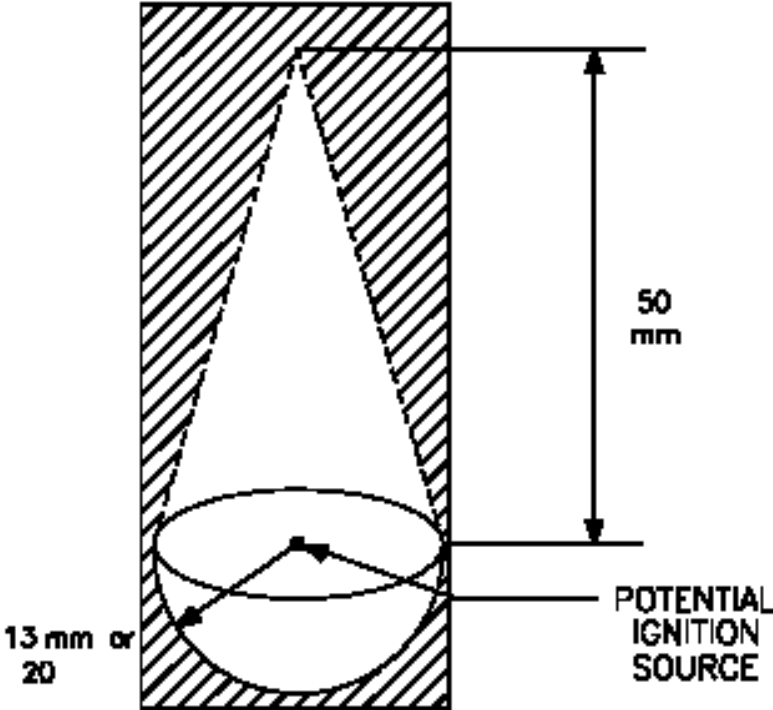
EN 60065/ as/NZS 60065	ANSI/UL 60065
<p>- should be V-1 or better for PCB with power &gt; 15W operating at a voltage exceeding &gt; 50V and ≤ 400Vpeak a.c. or d.c. under normal operating condition</p>	<p>- should be V-1 or better for PCB with power &gt; 15W OR operating at a voltage &gt; 50Vpeak a.c. or d.c. under normal operating condition</p>
<p>- should be V-0 for PCB with power &gt; 15W operating at a voltage &gt; 400Vpeak a.c. or d.c. under normal operating condition</p>	



# Flammability Requirement



Distance from a potential ignition source



# Flammability Requirement



## Thermo-plastic materials – AS/NZS 60065

For apparatus containing voltage not exceeding 4kV:

Open-circuit voltage of Potential Ignition Source (PIS) $V_{peak}$ a.c. or d.c.	Min. distance from PIS to thermo-plastic materials		Flammability category of the components	Min. distance from PIS to non-metallic barrier / flammability category of barrier
	Down-wards	Up-wards		
> 50 and $\leq$ 400	13mm	50mm	V-1	V-1
> 400 and $\leq$ 4000	13mm	50mm	V-1	5mm / V-1

**Wood and wood-based material with a thickness of  $\geq$  6mm is fulfilled V-1**

# Flammability Requirement



## Thermo-plastic materials – EN 60065

For apparatus containing voltage not exceeding 4kV:

Open-circuit voltage of Potential Ignition Source (PIS) $V_{peak}$ a.c. or d.c.	Min. distance from PIS to thermo-plastic materials		Flammability category of the components	Min. distance from PIS to non-metallic barrier / flammability category of barrier
	Down-wards	Up-wards		
> 50 and $\leq$ 400	13mm	50mm	HB75	No requirement
> 400 and $\leq$ 4000	13mm	50mm	V-1	5mm / V-1

**Wood and wood-based material with a thickness of  $\geq$  6mm is fulfilled V-1**

# Flammability Requirement



## Thermo-plastic materials –ANSI/UL 60065

Parts	Flammability category
<b>Grille covering material, cloth and reticulated foam</b>	<b>Tablet</b>
<b>Internal barriers with voltage exceeding 4kVpeak</b>	<b>V-2, V-1, V-0, VTM-2, VTM-1, VTM-0</b>
<b>Polymeric and fiber materials in contact with potential ignition source circuit</b>	<b>V-2, V-1, V-0, HF-2, HF-1, HF-0, VTM-2, VTM-1, VTM-0</b>
<b>Sound-deadening material in contact with speaker connections capable of producing greater than 240W audio power</b>	<b>V-2, V-1, V-0, HF-2, HF-1, HF-0</b>
<b>Polymeric and fiber materials used in applications other than those specified above</b>	<b>HB, V-2, V-1, V-0, HBF, HF-2, HF-1, HF-0, VTM-2, VTM-1, VTM-0</b>

# Resistance to candle flame ignition

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## AS/NZS 60065, EN 60065

A television set shall be so designed that the likelihood of ignition and the spread of fire caused by a candle flame is reduced.

Wood and WOOD-BASED MATERIAL with a thickness of at least 6 mm is considered to fulfil the V-1 requirement when applying CLC/TS 62441.

*Compliance is checked according to CLC/TS 62441.*

# Resistance to candle flame ignition

Candle flame accessible areas are considered to be the following exterior surfaces of an individual item:

- surfaces that are vertical to or overhanging the supporting surface and are located between 10 mm and 150 mm directly above the supporting surface [see Figure 1 for examples]; and
- the bottom of the individual item, unless it rests directly on the supporting surface or is within 10 mm of the supporting surface in its normal position of use.

# Resistance to candle flame ignition

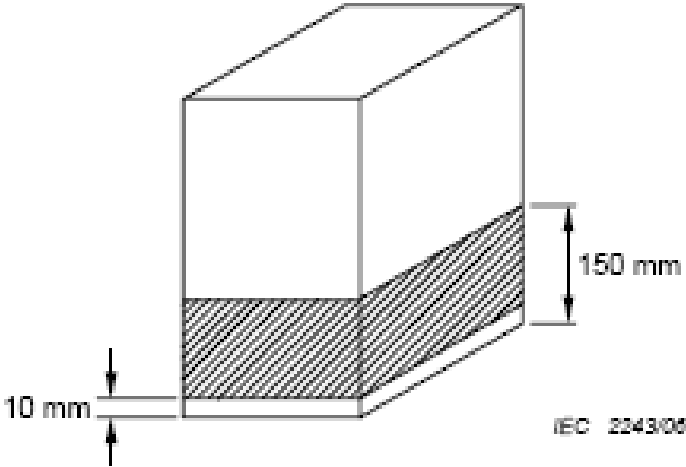


Figure 1a – Equipment illustrating straight vertical sides

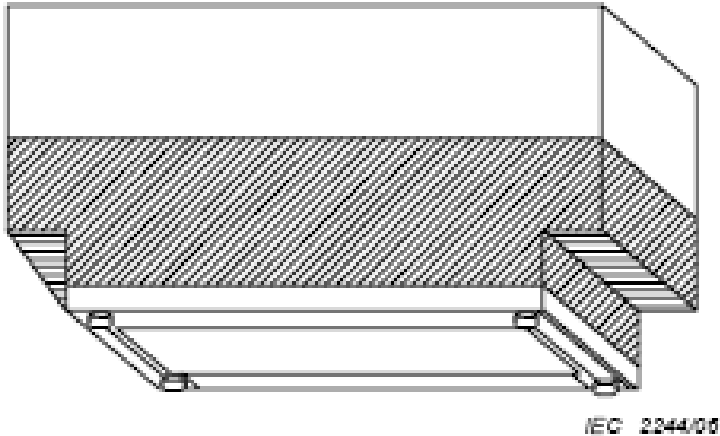
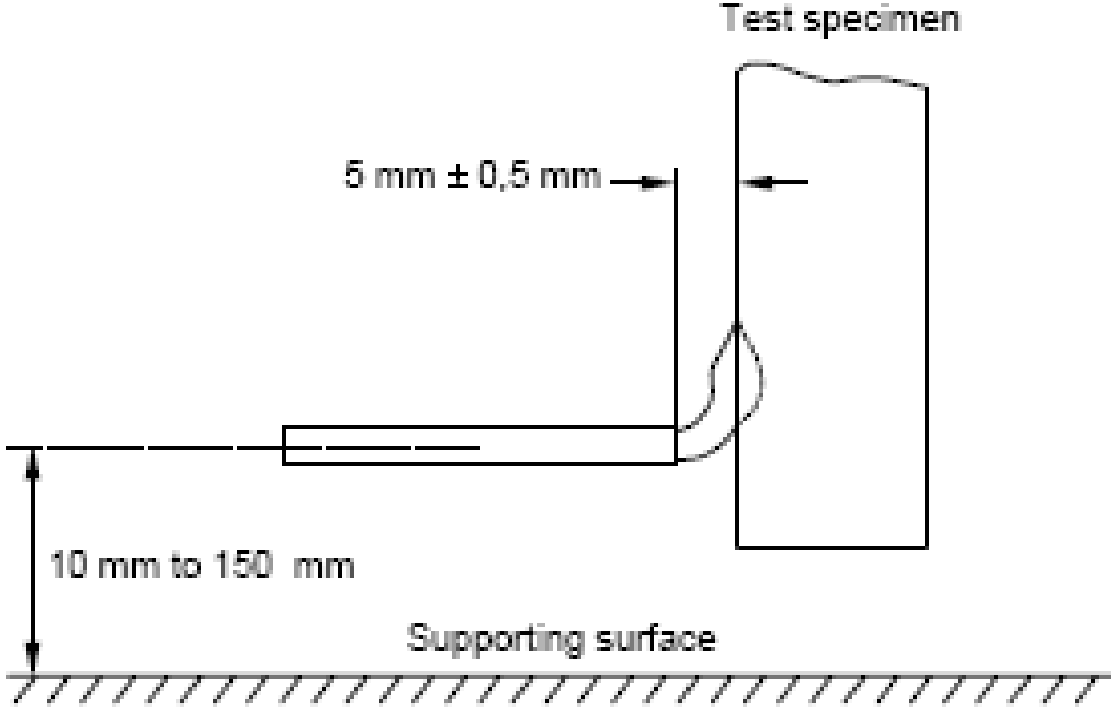


Figure 1b – Equipment illustrating a raised or stepped portion

Figure 1 – Examples of candle flame accessible areas

# Resistance to candle flame ignition



IEC 2245/00

Figure 2 – Positioning of the needle flame burner



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