1) The sensor manufacturer shall identify the gas type, gas concentration and the balance gas concentration(s) that the sensor is intended to be subject to during normal operation,

2) For balance gas identified as “clean air,” it shall be verified to consist of a composition not exceeding – 20.9 % O_2 (Oxygen) – Balance N_2 (Nitrogen). With a target gas concentration as specified in 33.4.2.2, the gas cylinder calibration certificates may be used to verify that the balance gas used in the gas tests defined in 33.4.2.1 (a) and (b) are representative of clean air or the manufacturer’s defined balance gas.

33.4.2.4 If the test gas concentrations and performance of the sensor are not altered or impaired, the sensor manufacture may provide alternative gas injection, gas maintenance, target gas and balance gas concentrations, methods, and ambient test conditions in addition to the requirements outlined within 33.4.

33.4.3 Sensor Data Collection

33.4.3.1 Each sensor shall be energized with the manufacturer’s recommended electronic circuit design. This electronic circuit shall be included as supporting hardware for each sensor. The analog and/or digital output measurements/data from the sensor/circuit and gas analyzer (when used) shall be recorded at least once every 3 hours for the test duration with the minimum data:

a) Recorded and maintained in a format that is agreed between the test organization and manufacturer, and

b) The test method and data collection shall be reviewed by the test organization at least once every thirty days (monthly) for the duration of the test program.

33.4.3.2 The sensor data shall include but may not be limited to:

a) All gas cylinder(s) calibration details that include gas supplier, cylinder identification, gas tolerance, gas concentration and balance gas concentration and,

b) All ambient environmental test conditions as specified in 33.4 and,

c) Unedited (raw), analog and/or digital output measurements/data from the sensor/circuit and,

d) Where applicable, converted data that correlates the sensor/circuit data to the intended gas concentration and,

e) Calibrated reference analyzer data (if applicable).

33.4.3.3 The manufacturer shall provide the necessary information to convert the analog and/or digital output measurements/data from the sensor to a correlated test gas concentrations. This information shall also be provided in the manufacturer’s specification documentation included with the sensor.

33.4.3.4 If the test gas concentrations and performance of the sensor are not affected, the sensor manufacturer may provide alternative data collection methods and equipment to those defined in 33.4.3.1 through 33.4.3.3.

33.4.4 Gas Sensor Sensitivity Test

33.4.4.1 At the start and end of the one-year test, and at least once monthly, the sensitivity of each sensor shall be checked and recorded as follows:

a) 0 ppm (clean air, 20.9 % O_2 – Balance N_2), and

b) Hydrocarbon sensors shall be exposed to the test gas concentrations as defined in the Detection Threshold Test from UL 1484, Residential Gas Detectors,

c) CO sensors shall be exposed to the test gas concentrations as defined in the Sensitivity Test from UL 2034, Single and Multiple Station Carbon Monoxide Alarms,

d) Toxic or asphyxiant gas sensors shall be exposed to three gas concentrations that align with the TWA specified in 33.4.1.1 (d) (3) (iv),

e) Maximum test gas concentration defined by the manufacturer.

33.4.4.2 The sensor shall be subjected to the test gas requirements specified in 33.4.1 through 33.4.4 and 33.4.4.1 for a minimum duration of one year.

33.4.4.3 The gas sensor drift for all sensors shall not exceed the gas sensors' specified tolerance ranges:

a) In clean air and/or,

b) When exposed to gas over the course of one year and/or,

c) When subjected to each ambient environmental condition.

33.4.4.4 The manufacturer's sensor documentation shall be provided with each sensor or with each batch of sensors and include the following:

a) The gas sensor's specified tolerance and/or

b) If applicable, a custom calculation method required to verify the sensor's sensitivity performance. This calculation method shall be used to verify that the test data collected during performance testing remains within the manufacturer's defined limits which are based on its custom sensitivity calculation method.

34 Temperature Test

34.1 The materials or parts employed in the construction of a gas or vapor detector or sensor shall not be adversely affected by the temperatures attained under any condition of intended operation.

34.2 A material or part is to be considered as being adversely affected if it is subject to a temperature rise greater than that indicated in Table 34.1.

Table 34.1
Maximum temperature rises

Device or material	Normal standby (continuous), °C	(°F)	Alarm condition (short term), °C	(°F)
A. MOTORS				
1. Class A insulation systems on coil windings of an alternating current motor:				
a) In an open motor and on vibrator coils				
Thermocouple or resistance method	75	135	75	135

Table 34.1 Continued on Next Page

Table 34.1 Continued

Device or material	Normal standby (continuous), °C	Normal standby (continuous), (°F)	Alarm condition (short term), °C	Alarm condition (short term), (°F)
b) In a totally enclosed motor				
Thermocouple or resistance method	80	144	80	144
2. Class B insulation systems on coil windings of an alternating current motor:				
a) In an open motor				
Thermocouple or resistance method	95	171	95	171
b) In a totally enclosed motor				
Thermocouple or resistance method	100	180	100	180
B. COMPONENTS				
1. Capacitors[a]	25	45	40	72
2. Fuses	25	45	25	45
3. Relays, transformers, and other coils with:				
a) Class 105 insulated windings				
Thermocouple method	65	117	65	117
Resistance method	75	135	75	135
b) Class 130 insulated windings				
Thermocouple method	85	153	85	153
Resistance method	95	171	95	171
4. Resistors[b]				
a) Carbon	25	45	25	45
b) Wire wound	50	90	325	585
5. Sealing compounds	See footnote c			
6. Solid state devices	See footnote a or d			
C. INSULATED CONDUCTORS[e]				
1. Appliance wiring material	25°C (77°F) less than the established temperature rating of the wire			
D. ELECTRICAL INSULATION – GENERAL				
1. Fiber used as electrical insulation or cord bushings	25	45	65	117
2. Phenolic composition used as electrical insulation or as parts where failure will result in a hazardous condition	25	45	125	225
3. Printed wiring boards	Based on maximum use temperature rating of printed wiring board material			
E. GENERAL				
1. Mounting surfaces	25	45	65	117
2. Wood or other combustible material	25	45	65	117
3. Enclosure surfaces	40	72	40	72

[a] In lieu of complying with these temperature limits, these components may be evaluated in accordance with the appropriate sections of Cat. No. RDH-376, Reliability Design Handbook (March 1976), IIT Research Institute.

[b] In lieu of complying with these temperature limits, a resistor may be acceptable if it dissipates not more than one-half of its maximum power rating under the test conditions specified.

[c] Unless a thermosetting material, the maximum sealing compound temperature, when corrected to a 25°C (77°F) ambient temperature, is 15°C (27°F) less than the softening point of the compound as determined by the Ball and Ring Apparatus, ASTM E28-67(1982).

Table 34.1 Continued on Next Page

Table 34.1 Continued

Device or material	Normal standby (continuous), °C	(°F)	Alarm condition (short term), °C	(°F)
[d] The temperature of a solid-state device, such as a transistor, SCR, integrated circuit, shall not exceed 50 percent of its rating during the Normal Standby Condition, or 75 percent of its rated temperature under the Alarm Condition or any other condition of operation which produces the maximum temperature dissipation of its components. For reference purposes, 0°C (32°F) shall be considered as 0 percent. For integrated circuits, the loading factor shall not exceed 50 percent of its rating under the Normal Standby Condition and 75 percent under any other condition of operation. Both solid-state devices and integrated circuits may be operated up to the maximum ratings under any one of the following conditions: 1) The component complies with the requirements of MIL-STD 883C. 2) A quality control program is established by the manufacturer consisting of inspection and test of 100 percent of all components, either on an individual basis, as part of a subassembly, or equivalent. 3) Each assembled production unit is subjected to a burn-in test, under the condition which results in the maximum temperatures, for 24 hours while connected to a source of rated voltage and frequency in an ambient of at least 49°C (120°F) followed by an operation test for normal signaling performance. [e] For standard insulated conductors other than those mentioned, reference should be made to the National Electrical Code, ANSI/NFPA 70, the maximum allowable temperature rise in any case is 25°C (77°F) less than the temperature limit of the wire in question.				

34.3 The classes of material used for electrical insulation referred to include the materials:

a) Class 105 – Impregnated cotton, paper, and similar organic materials when impregnated, and film coatings as applied to coil windings and

b) Class 130 – Inorganic materials such as mica.

34.4 The temperature of a component exceeding that indicated in Table 34.1 shall be employed only when reliability data is provided by the manufacturer to justify its use.

34.5 During intended operation, the temperature of a surface that is capable of being contacted by the user shall not exceed the value given in Table 34.2. When the test is conducted at a room temperature other than 25°C (77°F), the results are to be corrected to that temperature.

Exception: Surfaces other than handles or knobs that are accessible are not to exceed the surface temperature values in Table 34.2 when marked in accordance with 50.1.13.

Table 34.2
Maximum surface temperatures

Location	Composition of surface[a]			
	Metal, °C	(°F)	Nonmetallic, °C	(°F)
Handles, knobs or surfaces that are grasped for lifting, carrying or holding	50	122	60	144
Handles or knobs that are contacted but do not involve lifting, carrying, or holding, and surfaces subject to contact during intended use or maintenance	60	140	85	185
Other surfaces	70	148	95	203
[a] A handle, knob, or similar part made of a nonmetallic material that is plated or clad with metal having a thickness of 0.005 inch (0.13 mm) or less is to be considered a nonmetallic part.				

34.6 All values for temperature rises apply to equipment intended for use with ambient temperatures normally prevailing in occupiable spaces which usually are not higher than 25°C (77°F). When equipment is intended specifically for use with a prevailing ambient temperature constantly more than 25°C (77°F), the test of the equipment is made with the higher ambient temperature, and the allowable temperature rises specified in Table 34.1 are to be reduced by the amount of the difference between the higher ambient temperature and 25°C (77°F). A temperature is considered to be constant when three successive readings taken at intervals of 10 percent of the previously elapsed duration of the test, but not less than 5 minute intervals, indicate no change.

34.7 Temperature measurements on equipment intended for recessed mounting shall be made with the unit installed in an enclosure of 3/4-inch (19.1-mm) wood having clearances of 2 inches (50.8 mm) on the top, sides and rear, and the front extended to be flush with the unit's cover.

34.8 Except at coils, temperatures are to be measured by thermocouples consisting of wire not larger than 24 AWG (0.21 mm^2) or by the change-in-resistance method. The thermocouple method is not to be employed for a temperature measurement at any point where supplementary thermal insulation is employed.

34.9 Thermocouples consisting of 30 AWG (0.06 mm) iron and constantan wires and a potentiometer-type indicating instrument are to be used whenever referee temperature measurements by thermocouples are necessary.

34.10 The temperature of a copper coil winding is determined by the change-in-resistance method, wherein the resistance of the winding at the temperature to be determined is compared with the resistance at a known temperature by means of the formula:

$$T = \frac{R}{r}(234.5 + t) - 234.5$$

in which:

T is the temperature to be determined in degrees C,

R is the resistance in ohms at the temperature to be determined,

r is the resistance in ohms at the known temperature, and

t is the known temperature in degrees C

34.11 It is generally necessary to de-energize the winding prior to measuring R. The value of R at shutdown is determined by taking several resistance measurements at short intervals, beginning as quickly as possible after the instant of shutdown; a curve of the resistance values and time is plotted and extrapolated to give the value of R at shutdown.

34.12 The circuit of a current-regulating resistor or reactor, provided as a part of a control unit, is to be adjusted for the maximum resistance or reactance at normal current.

34.13 A control unit which provides only one circuit of series-connected audible signal appliances is to be tested with the current-regulating resistor or reactor adjusted for use with one appliance.

34.14 A control unit which provides more than one circuit of series-connected audible signal appliances is to be tested with the current-regulating resistor of all circuits adjusted for use with the number of appliances producing the maximum wattage dissipation by the resistor.

34.15 It is acceptable to test a control which provides one or more circuits of series-connected audible signal appliances for loads other than those specified above when the minimum number of appliances is indicated on the installation wiring diagram.

34.16 The duration of the test-operating condition is not to be less than:

a) Operation until constant temperatures are attained during the normal supervisory condition of any control unit.

b) Operation for 1 hour during the normal signaling condition of a control unit intended to be actuated by automatic devices such as fire-alarm thermostats, water flow detectors, and sprinkler-supervisory attachments. This test operation is considered to apply to a control unit which is intended to produce a continuous signal until an actuating device is restored to normal or until a circuit-resetting device is operated manually.

c) Operation until constant temperatures are attained during the normal signaling condition of a control unit intended for watchman's supervisory signaling service.

d) Operation for 15 minutes during the normal signaling condition of a control unit intended to be actuated by coded manual fire-alarm boxes.

e) Operation of a rectifier at its maximum rated output until constant temperatures are attained.

34.17 In a control unit having provision for multiple zones, 10 percent of the total number of zones shall be energized during the alarm condition.

34.18 For Zone systems with 3 or less zones, all zones are to be energized. In no case shall less than 3 zones be energized for zone systems greater than 3 zones.

34.19 A control unit which is intended to provide coded impulse signals is to be operated by a testing device, such as a timer switch, at a rate of 120 impulses per minute.

Exception: When the signal impulses are produced normally by a device which is part of the control unit assembly, the test impulses are to be at the rate of the intended operation of the device.

34.20 When a time-limit cutout is provided as a part of the control unit tested, and is not intended to limit the time of alarm-signal operation, it is to be shunted out of the circuit for the duration of the test.

34.21 To determine that a unit complies with the requirements in 34.1 it is to be connected to a supply circuit of rated voltage and frequency and operated continuously under representative normal service conditions that are intended to produce the highest temperatures.

35 Abnormal Operation Test

35.1 A device or control unit, although normally operated only for a limited period, shall be capable of being operated continuously under abnormal conditions without resulting in any risk of fire.

35.2 To determine that a control unit or device complies with the requirement in 35.1 it is to be operated under the most severe abnormal conditions that will be encountered in service while connected to a rated source of supply.

35.3 A unit designed for local system service, and intended to produce a continuous signal until the initiating device is restored to normal, or until reset manually, is to be operated:

a) Until constant temperatures are attained, when intended for use with automatically operated initiating devices, or

b) For 1 hour, when intended for use with noncoded manually operated initiating devices.

35.4 In determining that a control unit complies with the requirement in 35.1 with respect to installation-wiring circuit fault conditions, the fault conditions are to be maintained continuously until constant temperatures are attained, or until burnout occurs when the fault does not result in the operation of an overload-protective device.

35.5 A variable autotransformer used as means of output voltage adjustment is to be adjusted to a position corresponding to 50 percent of its maximum mechanical adjustment range, and a resistive or inductive load, as identified in the instruction manual is to be connected to the output or outputs of the power supply. This load is to be sufficient to draw either 125 percent of rated output current or the maximum current that the output delivers in the application, whichever is lower. The input of the power supply is to be connected to a voltage source in accordance with Table 14.1. The test is to be continued until ultimate results are obtained, such as burnout or stabilization of temperatures.

35.6 There shall not be emission of flame or molten metal or other manifestation of a fire, or risk of electrical shock, when each output circuit of a control unit is individually shorted. Accessible fuses shall be replaced with either a non-interchangeable type fuse of the same rating, or by an interchangeable fuse of the same size but having the highest available current rating for that size.

35.7 All openings of the unit enclosure are to be covered with surgical cotton. Metal enclosures are to be connected to ground through a fuse of the same rating as indicated by the marked rating of the control unit.

35.8 At the conclusion of the test the cotton shall not have ignited and the enclosure grounding fuse shall not have opened.

35.9 Products with provisions for connection to a telephone, telegraph, or outside wiring as covered by Article 800 of the National Electrical Code, ANSI/NFPA 70, the product shall comply with the overvoltage test described in the Standard for Telephone Equipment, UL 1459.

36 Overload Test

36.1 Control Panel, Detector or Alarm

36.1.1 A detector or alarm other than that operating from a primary battery shall operate as intended after being subjected to 50 cycles of alarm signal operation at a rate of not more than 6 cycles per minute with the supply circuit to the alarm at 115 percent of the rated test voltage. Each cycle shall consist of starting with the system or device energized in the standby condition, initiation of an alarm or alarm signal by exposure to an elevated gas concentration or equivalent means, and restoration of the alarm to standby.

36.1.2 Rated test loads are to be connected to those output circuits of the system or device which are energized from the control panel, detector or alarm power supply, such as remote indicators, relays, and the like. The test loads shall be those devices, or a device determined to be equivalent, normally intended for connection. If an equivalent load is employed for a device consisting of an inductive load, a power factor of 60 percent is to be employed. The rated loads are established initially with the alarm connected to a source of supply in accordance with 14.2 followed by increasing the voltage to 115 percent of rating.

36.1.3 For dc signaling circuits, an equivalent inductive test load is to have the required dc resistance for the test current and the inductance (calibrated) to obtain a power factor of 60 percent when connected to a

60 hertz ac voltage equal to the rated dc test voltage. When the inductive load has both the required dc resistance and the required inductance, the current will be equal to 0.6 times the current measured with the load connected to a dc circuit when the voltage of each circuit is the same.

36.2 Separately energized circuits

36.2.1 Separately energized circuits of a system or device such as dry contacts, shall be capable of operating as intended after being subjected for 50 cycles of signal operation at a rate of not more than 6 cycles per minute while connected to a source of supply in accordance with 14.2, with 150 percent rated loads at 60 percent power factor applied to output circuits which do not receive energy from the alarm. There shall not be electrical or mechanical failure of the switching circuit.

36.2.2 The test loads shall be set at 150 percent of rated current while connected to a separate power source of supply in accordance with 14.2.

37 Endurance Test

37.1 A signaling detector, alarm or control unit shall be capable of operating in the intended manner after being subjected to 6000 cycles of signal operation at a rate of not more than 15 cpm with the control unit supply circuit at rated voltage and frequency and with rated devices or equivalent loads connected to the output circuits. There shall not be electrical or mechanical failure or evidence of approaching failure of the device's components.

37.2 An operating device, such as a switch, relay or coding mechanism, except a time-limit cutout, supplied as part of a device, shall perform as intended when operated for the number of cycles and at the rate indicated in Table 37.1. When an electrical load is involved, the contacts of the device are to make and break the normal current at the rated voltage. The load is to represent that which the device is intended to control. It is not prohibited that the endurance tests of these devices be conducted in conjunction with the endurance test on a control unit.

Table 37.1
Endurance test cycles

Intended signaling performance of operating-device circuit	Impulse type	Signal impulses	
		Total number of impulses	Impulses per minute
Daily use	Coded[a]	1,000,000	60
	Noncoded[b]	30,000	Intended rate of impulse device
Occasional use	Coded[a]	250,000	60
	Noncoded[b]	6,000	Intended rate of impulse device

[a] Coded refers to a recognizable group of impulses defining location of source of signal.

[b] Noncoded refers to a repetitive or continuous stream of impulses that does not define location or source of signal.

37.3 A printer, whether separate or integral with a device or control unit, shall operate as intended after being subjected to 500,000 cycles of operation. A cycle shall consist of one full line of print or a status change recording if the printer is intended for use with a specific device.

37.4 When a time-limit circuit is provided as a part of a control unit tested, it is to be shunted out of the circuit for the duration of this endurance test.

37.5 A unit employing either power-supply circuitry or circuitry for the power-supply battery charger shall operate as intended following 6000 cycles operation as described below.

Exception: For a unit employing only a battery charger, the product shall operate as intended after 500 cycles as specified in 37.6 and 37.7.

37.6 With the input connected to a voltage source in accordance with Table 37.2, a load or loads drawing maximum rated output power are to be alternately applied and removed, or reduced to the manufacturer's specified minimum value, at a rate of no more than 15 cycles per minute. Each cycle is to consist of the load application followed by the load removal (or reduction) for an equal time.

Table 37.2
Values of test voltages

Control unit rated voltage, nameplate	Test voltage
110 – 120	120
220 – 240	240
Other	Marked rating
Battery circuit	Nominal battery voltage

37.7 For a unit employing battery charger circuitry, the input circuit is to be connected to a source having a rated voltage defined in Table 37.2. A load, drawing maximum charging current to a discharged battery as defined in 37.8 – 37.11 is to be applied to the charger circuitry for 5-second intervals for a total of 500 cycles.

37.8 The terminal voltage of a battery discharge as specified in 37.9 – 37.11 shall not be less than 85 percent of the marked ratings of the output circuits.

37.9 The battery is first to be charged by applying ac input power to the product for 48 hours, during which the product is to be operated continuously with normal standby load connected. Next the ac input is to be disconnected and terminal voltage of the battery is to be measured one minute after disconnection.

37.10 The battery is then to be discharged by maintaining the normal standby load connected to the output for the applicable period specified in (a), (b), or (c):

a) 24 hours, when the product is intended for use in a local, proprietary, or central station signaling system;

b) 60 hours when the product is intended for use in an auxiliary or remote station signaling system; or

c) 4 hours when standby power is intended to be used in conjunction with an engine-driven generator.

37.11 At the conclusion of the discharge period the maximum rated load is to be applied for 5 minutes. Battery terminal voltage of the discharged battery is then to be measured.

38 Burnout Test

38.1 A continuous-duty resistor shall not be burned out or adversely affected by carrying the full normal current on any step continuously. A resistor intended for intermittent use shall be able to carry its rated current on any step for as long a time as permitted by the character of the apparatus which it controls.

38.2 There shall not be manifestation of a risk of fire or electric shock when an unreliable component, such as an electrolytic capacitor, is opened or shorted. The device is to be connected to a source of rated voltage and frequency and with the enclosure grounded. Each fault is to be applied separately until temperatures stabilize or burnout occurs. Components operating at 50 percent or less of the manufacturer's ratings, or those known to be highly reliable, are not included under this requirement.

38.3 When a time-limit cutout or a mercury-tube switch is employed in such a manner that a fault, either a short circuit or a ground, will cause it to carry current in excess of its maximum normal load, the cutout or switch shall be capable of withstanding, without introducing a risk of fire, a short circuit as described in 38.4 – 38.6.

38.4 The time-limit cutout or mercury-tube switch is to be connected in series with a protective fuse(s) of the marked maximum rating with which it is intended to be used, as indicated by the marking of the control unit. The cutout or switch is to be tested while mounted normally in the control unit; all openings of the enclosure of the control unit are to be covered with surgical cotton, and the enclosure, if of metal, is to be connected to ground through a fuse of the same rating as the protective fuse mentioned in 38.10.

38.5 The open-circuit voltage of the test circuit is to be within 5 percent of the rated voltage of the control unit circuit in which the device is applied, except that a voltage of more than 105 percent of the rated voltage may be employed if agreeable to those concerned. The source of current and the test circuit are to be of sufficient capacity to deliver 1000 amperes when the system is short-circuited at the testing terminals.

38.6 There shall not be ignition of the cotton or of insulation on circuit conductors, emission of flame or molten metal (mercury excepted), from the enclosure, blowing of the fuse in the grounding conductor, damage to other parts of the control unit, or any manifestation of a risk of fire. The burnout of pigtail leads or of a thermal element, or the welding of contacts, is not prohibited.

38.7 The cutout or switch is to be tested while mounted normally in the device; all openings of the enclosure of the device are to be covered with surgical cotton, and the enclosure, when of metal, is to be connected to ground through a fuse of the same rating as the protective fuse mentioned in 38.10.

38.8 When a power transformer other than a transformer supplying a low-voltage circuit is operated as described below, there shall not be damage to the enclosure or emission of flame or molten metal.

38.9 The device is to be operated continuously at the voltage and frequency specified in 14.2 with the enclosure grounded. The load connected to the output terminals is to be a resistance of such value that three times the full-rated current will be drawn from the secondary winding of the device, and operation is to be continued until constant temperatures are attained on the enclosure or until burnout occurs.

38.10 A circuit on which a transformer is tested is to be protected by fuses rated at least ten times the primary current rating of the transformer. Opening of the fuses is not prohibited. The test is to be conducted with the output terminals short-circuited, when such a condition results in less than three times full-rated current being drawn from the secondary. When other means of limiting the load to less than three times normal is inherent in or provided as part of the device, these features are to be given consideration and the burnout test conducted at the maximum load permitted by the limiting features. These features may be external to the transformer and include, but are not limited to, the following:

a) Nonresettable thermal elements that are integral with the transformer windings;

b) Wire wound, or other types of resistors that limit the load current;

c) Positive temperature coefficient (PTC) resistors;

d) Inherent limitation due to impedance of the transformer windings; and

e) Nonreplaceable fusing elements that are soldered into the product.

38.11 A transformer supplying a low-voltage circuit is to be tested with output (secondary) wiring terminals short circuited.

39 Power Supply Tests

39.1 When a separate power supply, other than a battery, is used to provide energy to one or more alarms, it is to be subjected to the test in 39.2 and 39.3.

39.2 The volt-amperes capacity of the output circuit of a power supply that is separate from the alarms shall not be more than 100 volt-amperes and not more than 30 volts, 60 hertz, 42.4 volts peak or dc.

39.3 To determine compliance with the requirements in 39.2, a variable resistive load is to be connected to the output circuit of the power supply. With the power supply connected to a rated source of supply, the load is to be varied from open circuit to short circuit in an elapsed time of not less than 1-1/2 minutes and not more than 2-1/2 minutes. Voltage and current measurements are to be recorded for each value and the maximum volt-amperes is to be calculated. When an overcurrent device is provided it is not prohibited that it be shunted out during the test.

40 Tests of Thermoplastic Materials

40.1 General

40.1.1 Thermoplastic materials intended for the sole support of current-carrying parts or as an enclosure of a device shall be subjected to the following tests. Where possible a complete unit shall be used.

Exception No. 1: Parts that are molded from materials classified 5VA by the vertical burning tests described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, are not required to be subjected to the 3/4 inch flame test described in 40.3 or the 5 inch flame test described in 40.4.

Exception No. 2: Parts that are molded from materials that are classified 5VB, V-O, or V-2 by the vertical burning test described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, are not required to be subjected to the 3/4 inch flame test as described in 40.3. Such parts are required to be subjected to the 5 inch flame test described in 40.4.

40.2 Accelerated air-oven aging test

40.2.1 There shall not be excessive warping or exposure of un-insulated hazardous-voltage circuit parts so as to impair operation or provide access to un-insulated hazardous-voltage circuit parts when representative samples of a plastic material are aged for 7 days in a circulating-air oven maintained at 90°C (194°F), or for 28 days at a temperature of 70°C (158°F), and in both cases at a relative humidity of 0 – 10 percent.

40.2.2 At least three representative samples are to be mounted on a support as intended in service and placed in the oven. At the end of the aging period indicated in 40.2.1, the samples are to be removed, permitted to cool, and then examined for adverse distortion. It is not prohibited for the cover to fall off the unit during the test when no hazardous-voltage circuit parts are exposed and the cover can be replaced as intended.