



---

# **UL 268**

## **STANDARD FOR SAFETY**

### **Smoke Detectors for Fire Alarm Systems**

This is a preview. Click here to purchase the full publication.

This is a preview. Click [here](#) to purchase the full publication.

UL Standard for Safety for Smoke Detectors for Fire Alarm Systems, UL 268

Seventh Edition, Dated January 11, 2016

### ***Summary of Topics***

***The revisions of ANSI/UL 268 dated November 11, 2021 include the following changes:***

- ***Correction to Combustible Section; [31.1.2.1](#)***
- ***Alternate Corrosion Test; [54.1](#)***
- ***Correction of Formula in [72.2\(c\)](#)***
- ***Editorial change to heading in [Table D3.1](#)***

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated July 17, 2020, January 22, 2021, and April 30, 2021.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

No Text on This Page



**ULC Standards**  
**CAN/ULC-S529:2016-REV3**  
**Fourth Edition**



**Underwriters Laboratories Inc**  
**UL 268**  
**Seventh Edition**

## **Smoke Detectors for Fire Alarm Systems**

January 11, 2016

(Title Page Reprinted: November 11, 2021)



**ANSI/UL 268-2021**



This is a preview. Click [here](#) to purchase the full publication.

## **Commitment for Amendments**

This Standard is issued jointly by Underwriters Laboratories Inc. (UL) and ULC Standards. Amendments to this Standard will be made only after processing according to the Standards writing procedures by UL and ULC Standards.

UL and ULC Standards are separate and independent entities and each is solely responsible for its operations and business activities. The UL trade names and trademarks depicted in this document are the sole property of Underwriters Laboratories Inc. The ULC Standards trade names and trademarks depicted in this document are the sole property of ULC Standards.

---

### **ISSN 0317-526X Copyright © 2021 ULC Standards**

All rights reserved.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, whatsoever without the prior permission of the publisher.

Comments or proposals for revisions on any part of the Standard may be submitted at any time. Proposals should be submitted via a Proposal Request in the On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com/canada>.

---

### **Copyright © 2021 Underwriters Laboratories Inc.**

UL's Standards for Safety are copyrighted by UL. Neither a printed nor electronic copy of a Standard should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

This ANSI/UL Standard for Safety consists of the Seventh Edition including revisions through November 11, 2021. The most recent designation of ANSI/UL 268 as an American National Standard (ANSI) occurred on November 11, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

To purchase UL Standards, visit UL's Standards Sales Site at  
<http://www.shopulstandards.com/HowToOrder.aspx> or call toll-free 1-888-853-3503.

---

This is a preview. Click here to purchase the full publication.

**CONTENTS**

Preface .....	9
---------------	---

**INTRODUCTION**

1 Scope .....	11
2 General .....	12
2.1 Assembly .....	12
2.2 Components .....	12
2.3 Units of measurement .....	13
2.4 Reference publications .....	13
3 Glossary .....	14
4 Detector reliability prediction .....	17
5 Manufacturer's Published Instructions .....	18
6 Automatic drift compensation for smoke sensing .....	18
6A Silencing Feature (optional) .....	19

**CONSTRUCTION****ASSEMBLY**

7 General .....	19
7.1 Remote accessories .....	19
7.2 Smoke sensitivity indicating means .....	19
7.3 Radioactive materials .....	20
7.4 Insect guards .....	20
7.5 Supplementary heat sensor .....	21
7.6 Maintenance (Field Cleaning) .....	21
8 Compatibility information .....	21
8.1 General .....	21
8.2 Method of evaluation .....	22
8.3 Changes affecting compatibility .....	22
9 Servicing and maintenance protection .....	22
10 Enclosure .....	23
10.1 General .....	23
10.2 Cast metal enclosures .....	24
10.3 Sheet metal enclosures .....	24
10.4 Nonmetallic enclosures .....	24
10.5 Ventilating openings .....	25
10.6 Covers .....	25
10.7 Glass panels .....	26
11 Corrosion protection .....	26
12 Field wiring connections .....	27
12.1 General .....	27
12.2 Field wiring compartment .....	27
12.3 Field wiring terminals (general) .....	28
12.4 Special field-wiring terminals (qualified application) .....	29
12.5 Field wiring leads .....	29
12.6 Grounding terminals and leads .....	29
12.7 Grounded supply terminals and leads .....	30
12.8 Isolated (nongrounded) detectors .....	30
13 Internal wiring .....	31
13.1 General .....	31
13.2 Wireways .....	31

This is a preview. Click here to purchase the full publication.

13.3 Splices.....	32
13.4 Barriers.....	32
13.5 Strain relief.....	32
14 Bonding for grounding .....	32

## COMPONENTS

15 General .....	33
15.1 Mounting of components .....	33
15.2 Operating components.....	34
15.3 Current-carrying parts .....	34
16 Bushings .....	34
17 Electrical insulating material .....	35
18 Lampholders and lamps.....	35
19 Photocell illuminating lamps and light emitting diodes (LEDs) – Quality assurance program ....	36
19.1 Light emitting diode (LED) .....	36
19.2 Smoke detector manufacturer.....	36
20 Motors .....	37
21 Protective devices .....	37
22 Printed wiring boards .....	37
23 Switches.....	37
24 Transformers and coils .....	37
25 Dropping resistors .....	38
26 Batteries .....	38
26.1 General.....	38
26.2 Battery connections .....	38
27 Spacings .....	39

## PERFORMANCE

28 General .....	40
28.1 Test units .....	40
28.2 Accessories .....	40
28.3 Performance of single sensor components of multi-criteria detectors .....	41
28.4 Test voltages .....	41
28.5 Test samples and data .....	41
28.6 Component reliability data .....	42
28.7 Smoke Detector guards.....	42
28.8 Test conditions .....	43
28.9 Tests and analysis .....	43
29 Normal operation test .....	43
29.1 General.....	43
29.2 Standardized alarm signal .....	44
29.3 Sensitivity shift criteria.....	45
30 Electrical supervision test.....	45
30.1 General.....	45
30.2 Component Failure .....	46
30.3 Photocell illuminating lamps and light emitting diodes (LEDs).....	46
30.4 Battery powered units .....	47
30.5 Smoke Chamber monitoring (Required only when the detector employs a chamber monitoring feature) .....	47
30.6 End-of-life signal.....	47
30.7 Multi-criteria smoke detector with gas sensor .....	48
31 Sensitivity test .....	49
31.1 Sensitivity test – smoke sensor .....	49

31.2 Sensitivity test – gas sensor of a multi-criteria detector .....	52
31.3 Sensitivity test – heat sensor .....	52
31.4 Sensitivity test - sensors other than smoke, gas or heat .....	53
32 Automatic drift compensation for smoke sensing.....	53
32A Alarm Silenced Test (optional).....	53
33 Directionality Test.....	53
34 Velocity-sensitivity Test.....	54
34.1 Smoke sensor .....	54
34.2 Multi-criteria detector with gas sensor.....	54
35 Smoke Entry (Stack Effect) Test .....	54
36 Lamp Interchangeability Test (Photoelectric) .....	55
37 Reduction in Light Output Test.....	55
38 Stability Test .....	55
39 Stability tests – multi-criteria detectors incorporating gas sensor(s) .....	58
39A Stability Tests for Multi-Criteria Smoke Alarms Incorporating CO Gas Sensor(s) .....	58
40 Test for effect of air velocity .....	58
41 Fire tests .....	59
41.1 General.....	59
41.2 Paper fire .....	60
41.3 Wood fire (United States only) .....	61
41.4 Flammable liquid fire (Canada only) .....	62
41.5 Igniter assembly (Canada only).....	63
41.6 Test method .....	63
42 Smoldering smoke test .....	64
43 Smoldering smoke test – maximum obscuration without alarm (United States only).....	66
44 Selectivity Test – Multi-criteria Detectors Incorporating Gas Sensor(s).....	66
45 Circuit Measurement Test .....	67
45.1 General.....	67
45.2 Battery trouble voltage determination .....	67
46 Overvoltage and Undervoltage Tests .....	69
46.1 Overvoltage test .....	69
46.2 Undervoltage test .....	69
46.3 Two-wire smoke detectors .....	69
47 Temperature Test .....	69
48 Vibration Test .....	71
49 Replacement Test, Head and Covers .....	71
50 Jarring test.....	71
51 Variable Ambient Temperature Tests.....	72
51.1 Operation in high and low ambients.....	72
51.2 Effect of shipping and storage – Single and Multi-criteria Detectors .....	73
51.3 Effect of shipping and storage – Multicriteria Detectors Incorporating Gas Sensor(s)....	73
52 Humidity Test .....	73
52.1 High humidity .....	73
52.2 Low humidity (multi-criteria detectors with gas sensors) .....	74
53 Corrosion Tests .....	74
54 Alternate Corrosion Test (21 day) .....	74
55 Transient Tests.....	75
55.1 General.....	75
55.2 Internally induced transients .....	75
55.3 Extraneous transients .....	75
55.4 Supply line (ring wave surge voltage) transients .....	76
55.5 Supply line (extra-low-voltage circuit) transients .....	77
56 Static Discharge Test.....	77
57 Dust Test .....	78
58 Overload Tests.....	78
58.1 Detector .....	78

58.2 Separately energized circuits .....	79
59 Endurance Test .....	79
60 Audible signaling appliance .....	79
61 Fire Test – Smoke Detector with supplementary heat detection .....	79
62 Abnormal Operation Test .....	80
63 Locked Rotor Test .....	80
63.1 Motors .....	80
63.2 Thermal or overcurrent protection (United States only) .....	81
63.3 Impedance protection (United States only) .....	81
64 Dielectric Voltage-Withstand Test .....	82
65 Polarity Reversal Test .....	83
66 Tests on Polymeric Materials .....	83
66.1 General .....	83
66.2 Temperature test .....	83
66.3 Flame test – 19 mm (3/4-inch) .....	84
66.4 Flame test – 127 mm (5-inch) .....	85
67 Strain Relief Test .....	86
67.1 General .....	86
67.2 Special field-wiring terminals .....	86
67A Mechanical Push Test for Push-Type Features .....	86
68 Non-compulsory Fire and Smoldering Smoke Tests (United States Only) .....	87
69 Survivability Test .....	87
70 Audibility test .....	87
70.1 General .....	87
70.2 Sound output measurement (United States only) .....	88
70.3 Sound output measurement (Canada only) .....	88
70.4 Low frequency <i>alarm signal</i> format .....	89
71 Field Service Tests .....	89
71.1 Go/no-go field test (for the smoke sensor) .....	89
71.2 Go/No-Go field test (gas sensors used in multi-criteria smoke detectors) .....	89
71.3 Maintenance (Cleaning) .....	90
72 Battery Tests .....	90
72A Firmware Update (if provided) .....	91
72A.1 General .....	91
72A.2 Firmware update .....	91
73 Conformal Coatings on Printed Wiring Boards .....	92
73.1 General .....	92
73.2 Low voltage printed wiring boards .....	93
73.3 High voltage printed wiring boards .....	93
73A Evaluation of Reduced Spacings on Printed-Wiring Boards .....	94
74 Air duct detectors (Canada Only) .....	95

## MANUFACTURING AND PRODUCTION

75 General .....	95
76 Sensitivity calibration tests .....	95
77 Smoke tests .....	95
78 Photocell illuminating lamp test .....	96
79 Production line dielectric voltage-withstand tests .....	96
80 Measurement of in-service reliability for multi-criteria detectors with gas sensor(s) .....	97
80.1 Required in-service reliability .....	97
80.2 Sample frequency and sample size .....	97
80.3 Test results and record keeping .....	97

**MARKING**

81	General .....	97
82	Packaging marking (United States Only) .....	100

**INSTRUCTIONS**

83	Installation Instructions – Wiring Diagram .....	101
83.1	All detectors .....	101
83.2	Four-wire detectors .....	102
83.3	Two-wire detectors .....	102
83.4	Manufacturer's Published Instructions – RF Equipment .....	103
83.5	Special Applications .....	103
84	Technical bulletin .....	103
Tables	.....	104
Figures	.....	113

**ANNEX A (INFORMATIVE) – TYPICAL CANADIAN SENSITIVITY SMOKE TEST CHAMBER CONSTRUCTION**

A1	Chamber Configurations .....	145
A2	Outer Cabinet .....	145
A3	Inner Compartment .....	145
A4	Chamber Equipment .....	145

**ANNEX B (INFORMATIVE) – TYPICAL UNITED STATES SENSITIVITY SMOKE TEST CHAMBER CONSTRUCTION**

B1	Construction .....	147
----	--------------------	-----

**ANNEX C (NORMATIVE) – OBSCURATION CALCULATIONS**

C1	Equations For Calculation Of Obscuration And Optical Density .....	151
C2	Meter reading v. obscuration .....	152

**ANNEX D (NORMATIVE) – RELIABILITY PREDICTION AND CRITERIA FOR ACCEPTANCE****INSTRUCTIONS FOR DETERMINING A RELIABILITY PREDICTION OF ELECTRONIC COMPONENTS AND MICROELECTRIC CIRCUITS**

D1	Methods Of Determining Failure Rate .....	155
----	---	-----

**CRITERIA FOR ACCEPTANCE OF MICROELECTRONIC DEVICES**

D2	General .....	163
D3	Part I – Quality Assurance Screening Program .....	163
D4	Part II – Determination of Failure Rate Number Supplemented by Burn-In Test .....	164
D4.1	General .....	164
D4.2	Determination sequence .....	165
D4.3	Test calculations and procedures .....	165
D4.4	Test conditions .....	165
D4.5	Failure rate number calculation .....	168

**ANNEX E (INFORMATIVE) – STANDARDS FOR COMPONENTS**

This is a preview. Click here to purchase the full publication.