ULC Standards
Normes ULC

JOINT CANADA-UNITED STATES
NATIONAL STANDARD

ANSI/CAN/UL/ULC 33:2022

STANDARD FOR SAFETY

Heat Responsive Links for Fire-Protection Service

Approved American National Standard
ANSI

ANSI/UL 33-2022

scc ccn

SCC FOREWORD

National Standard of Canada

A National Standard of Canada is a standard developed by a Standards Council of Canada (SCC) accredited Standards Development Organization, in compliance with requirements and guidance set out by SCC. More information on National Standards of Canada can be found at www.scc.ca.

SCC is a Crown corporation within the portfolio of Innovation, Science and Economic Development (ISED) Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts.

Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

UL Standard for Safety for Heat Responsive Links for Fire-Protection Service, ANSI/CAN/UL/ULC 33

Ninth Edition, Dated June 21, 2021

Summary of Topics

This revision of ANSI/CAN/UL/ULC 33 dated October 31, 2022 includes editorial changes and the Tolerance for Operating Temperature Bath Test, 9.1, 10.1, 10.4 and Figure 11.1

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 August 5, 2022.

No Text on This Page

ANSI/UL 33-2022

JUNE 21, 2021
(Title Page Reprinted: October 31, 2022)

ANSI/CAN/UL/ULC 33:2022

Standard for Heat Responsive Links for Fire-Protection Service

The first, second, and third editions were titled "Fusible Links for Fire-Protection Service."

First Edition – November, 1968
Second Edition – July, 1973
Third Edition – March, 1980
Fourth Edition – June, 1982
Fifth Edition – October, 1987
Sixth Edition – October, 1993
Seventh Edition – March, 2003
Eighth Edition – March, 2010

Ninth Edition

June 21, 2021

This ANSI/CAN/UL/ULC Safety Standard consists of the Ninth Edition including revisions through October 31, 2022.

The most recent designation of ANSI/UL 33 as an American National Standard (ANSI) occurred on October 31, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This standard has been designated as a National Standard of Canada (NSC) on October 31, 2022.

No Text on This Page

CONTENTS

No Text on This Page

Preface

This is the Ninth Edition of the ANSI/CAN/UL/ULC 33, Standard for Heat Responsive Links for Fire-Protection Service.

UL is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. ULC Standards is accredited by the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

Annex B, identified as normative, form a mandatory part of this standard.

Annex A, identified as informative, is for information purposes only.

This ANSI/CAN/UL/ULC 33 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This Joint American National Standard and National Standard of Canada is based on, and now supersedes, the Eighth Edition UL 33, Standard for Standard for Heat Responsive Links for Fire-Protection Service, and the First Edition ULC-S505, Standard for Fusible Links for Fire Protection Service.

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 http://csds.ul.com.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a "yes" or "no" answer based on the literal text of the requirement concerned.

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.

To purchase UL Standards, visit the UL Standards Sales Site at
http://www.shopulstandards.com/ HowToOrder.aspx or call tollfree 1-888-853-3503.

This Edition of the Standard has been formally approved by the UL Standards Technical Panel (STP) on Sprinkler Equipment for Fire Protection, STP 199.

This list represents the STP 199 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

STP 199 Membership

Name	Representing	Interest Category	Region
Joe Beagen	Flexhead Industries Inc.	Producer	USA
Kerry M. Bell	UL Solutions	Testing & Stds Org	USA
Art Black	Carmel Fire Protection Associates	AHJ	USA
Dale Bonn	Travelers Insurance	General Interest	USA
Chase Browning	Medford Fire Rescue	AHJ	USA
Ken Bush	Maryland State Fire Marshal's Office	AHJ	USA
Ronnie Conklin	Fort Worth Fire Department	AHJ	USA
Diane J. Haithcock	UL Standards & Engagement	Chair	USA
Kevin Hall	American Fire Sprinkler Association	General Interest	USA
Daniel Kaiser	Minnesota Department of Public Safety	AHJ	USA
Rick McCullough	R McCullough	General Interest	Canada
Maurice Pilette	Mechanical Designs Ltd.	General Interest	USA
Milosh Puchovsky	Worcester Polytechnic Institute	General Interest	USA
Scott Pugsley	Seneca College	General Interest	Canada
Richard Ray	Cybor Fire Protection Co.	Supply Chain	USA
Paul Sasser	Reliable Automatic Sprinkler Co Inc.	Producer	USA
Michael Savage	Marion Country, FL	AHJ	USA
Kevin Scott	KH Scott & Associates	AHJ	USA
David Sheppard	US Bureau of Alcohol Tobacco Firearms & Explosives	Government	USA
Manuel Silva	Johnson Controls Inc.	Producer	USA
Juergen Teschner	Job GMBH	Producer	USA
David Tiller	Office of the Fire Marshal & Emergency Management	AHJ	Ontario
Maarit Tuomisaari	Marioff Corp OY	Producer	USA
Tom Wancho	Victualic Co.	Producer	USA
Nicolette Weeks	UL Standards & Engagement	Project Manager	USA
Jingchuan Zheng	Shenzen Urban Public Safety and Technology Institute	Testing & Stds Org	China
Jeffrey Zwirn	IDS Research Development Inc.	General Interest	USA

International Classification for Standards (ICS): 13.220.01, 13.220.10, 13.220.20

For further information on UL standards, please contact:

Underwriters Laboratories Inc.
Telephone: (613)-755-2729
E-mail: ULCStandards@ul.com
Web site: ulse.org

This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

No Text on This Page

INTRODUCTION

1 Scope

1.1 These requirements cover heat responsive links used for fire-protection service. These links consist of devices intended for installation under load conditions such as for use with automatic fire suppression systems; or automatic closure devices for doors, windows, dampers or smoke relief vents.

1.2 Heat responsive links are categorized by temperature rating, type of coating or plating, minimum and maximum design load, and other factors which may have a bearing on their intended use.

2 Units of Measurement

2.1 Where values of measurement are specified in both SI and U.S. Customary units, it is the responsibility of the user of this standard to determine the unit of measurement appropriate for the user's needs.

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component.

3.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

3.3 A component shall be used in accordance with its rating established for the intended conditions of use.

3.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

4 Normative References

4.1 Any undated reference to a code or standard appearing in the requirements of this Standard shall be interpreted as referring to the latest edition of that code or standard.

4.2 The following standard is referenced in this standard, and portions of this referenced standard may be essential for compliance:

American Society for Testing and Materials (ASTM) Standards

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*

5 Glossary

5.1 For the purpose of this standard, the following definitions describe various types of heat responsive links.

5.2 BI-METALLIC TYPE – Two different metals mechanically fastened together. Each metal has different expansion characteristics which act to release a load when exposed to sufficient heat. This type of device may be resettable.

5.3 FUSIBLE-ALLOY TYPE – Two or more metallic parts having a solder element that fuses to release a load when exposed to sufficient heat.

5.4 GLASS BULB TYPE – Liquid-filled glass bulb that fractures to release a load when exposed to sufficient heat.

5.5 HEAT RESPONSIVE LINK – A device that includes a heat responsive element and other features that allow for the application of external installation loads.

5.6 QUICK RESPONSE TYPE – A heat responsive link that complies with the applicable requirements for such links as specified in Sensitivity – Oven Heat Test, Section 11.

CONSTRUCTION

6 Temperature Ratings

6.1 A heat responsive link shall be constructed for service where the maximum normal ambient air temperature at the point of installation does not exceed that specified in Table 6.1.

6.2 A heat responsive link shall have one of the temperature ratings specified in Table 6.1.

Table 6.1
Temperature Classifications and Ratings

Temperature classification	Temperature ratings		Maximum ambient temperature	
	°F	°C	°F	°C
Low	125 – 130	51 – 54	90	32
Ordinary	135 – 170	57 – 77	100	38
Intermediate	175 – 225	79 – 107	150	66
High	250 – 300	121 – 149	225	107
Extra High	325 – 375	163 – 191	300	149
Very Extra High	400 – 475	204 – 246	375	191
Ultra High	500 – 575	260 – 302	475	246

7 Coatings and Platings

7.1 The operation characteristics of a heat responsive link shall not be impaired by the application of any factory applied coating or plating when tested in accordance with these requirements.

7.2 A corrosion resistant coating or plating shall be uniformly applied.

7.3 A wax coating shall not be brittle when new and shall not become brittle with age.

7.4 A wax coating shall not crack, flake, slip, or flow when tested at the maximum temperature for which the link assembly may be installed. See High Temperature Exposure – Test for Wax Coated Heat Responsive Links, Section 13.

PERFORMANCE

8 Strength of Heat Responsive Element and Link Assembly Tests

8.1 Fusible-alloy and bi-metallic types

8.1.1 A heat responsive link assembly shall either:

a) Sustain a load of 5 times the maximum design load for a period of 150 h when tested in accordance with 8.1.2; or

b) Demonstrate the ability to sustain the maximum design load as specified in 8.1.3 when tested in accordance with 8.1.4 and 8.1.5.

8.1.2 At least ten sample link assemblies of the lowest temperature rating are to be loaded to five times the manufacturer's maximum design load for 150 h at an ambient temperature of 70 ±5 °F (21 ±3 °C). One attachment end of each sample is to be connected to the test supporting apparatus. The test load is to be applied to the other attachment end in the intended direction. All ten samples shall comply with the requirements specified in 8.1.1(a).

8.1.3 As an alternative to the requirements specified in 8.1.2, a heat responsive link assembly shall support a load for 1 min when tested as specified in 8.1.4; and comply with the requirements specified in 8.1.5.

8.1.4 At least ten sample link assemblies of the lowest temperature rating are to be loaded to five times the manufacturer's maximum design load for 1 min at an ambient temperature of 70 ±5 °F (21 ±3 °C). One attachment end of each sample is to be connected to the test supporting apparatus. The test load is to be applied to the other attachment end in the intended direction. All ten samples shall comply with the requirements specified in 8.1.1(b).

8.1.5 At least ten samples are to be loaded at various values in excess of the maximum design load up to 5 times the maximum design load to derive a least-square, full logarithmic regression curve of load as a function of time, from which the loads at 1 h and 1000 h are to be determined. At least one sample shall sustain a load for a time greater than 100 h. The test samples are to be loaded at a conditioned temperature of 70 ±5 °F (21 ±3 °C). The maximum design load shall then comply with the following:

$$L_d \leq \frac{1.02\,L_m^{\,2}}{L_o}$$

where:

L_m is the load at 1000 hours;

L_o is the load at 1 hour; and

L_d is the maximum design load.

8.2 Glass-bulb types

8.2.1 A heat responsive link assembly incorporating a glass bulb heat responsive element shall comply with the following:

a) Sustain a load of 5 times the maximum design load for a period of 150 h when tested in accordance with 8.1.2; and

b) The lower tolerance limit for bulb strength, based on calculations with a degree of confidence of 0.99 for 99 percent of samples, shall exceed twice the load applied to the bulb at maximum design load, based on calculations with the same degree of precision when tested in accordance with 8.2.2.

8.2.2 The bulb strength is to be measured by applying a steadily increasing load, using a compression testing machine, until the bulb breaks or fractures. This test is to be conducted with the bulb mounted in the seating parts used in the assembly and the load is to be applied at a rate not exceeding 245 N/s (55 lbf/s) or at a rate the deflects the bulb 0.02 in (0.51 mm) per min, whichever measurement is convenient for the test apparatus being used. Bulb seatings may be reinforced circumferentially in a manner not interfering with the bulb breakage. A minimum of 15 samples of each temperature rating and each bulb type are to be tested. Calculations are to be based on the Normal or Gaussian Distribution except where another distribution can be shown to be more applicable due to manufacturing or design factors. See Annex A.

9 Glass-Bulb Thermal Shock Test

9.1 A glass bulb type heat responsive element assembly shall withstand the thermal shock of rapid temperature changes having a range from less than its rated operating temperature to 50 °F (10 °C). At least five sample bulbs are to be conditioned for 5 min in a liquid bath at 20 °F (11 °C) less than the rated operating temperature. The samples then are to be removed and immediately submerged in another liquid bath at 50 °F (10 °C). There shall be no breakage or fracture of the glass bulb.

10 Operating Temperature (Bath) Test

10.1 The operating temperature of heat responsive links, when bath tested, shall operate within the range having a maximum temperature not in excess of 10 °F (5 °C) or 107 percent of the minimum Fahrenheit temperature of the range, whichever is greater. For the purpose of this determination, the marked temperature rating is to be included as one of the ranged values, making a total of 11 values in the range. Table 6.1 defines temperature ratings.

10.2 Link operation for this test includes the intended functioning of the eutectic elements or any rupture of the glass bulb heat responsive element. If partial fracture of the glass bulb in the liquid environment occurs which does not result in link operation, the temperature at which the bulb fracture occurred shall be considered the operating temperature.

10.3 Not less than ten heat responsive links of both coated and uncoated types of each temperature rating are to be subjected to this test. All ten samples shall comply with the requirements of 10.1.

10.4 The heat responsive links are to be placed in an upright position under a load equal to the manufacturer's minimum design load, but not less than 1 lbf (4 N), and completely immersed in the water or oil bath. The bath vessel is to be provided with a source for heating the liquid at the prescribed rate and with means to agitate the liquid and measure the temperature of the liquid bath.

10.5 Water is to be used in bath tests of heat responsive links which have operating temperature ratings of 175 °F (79 °C) or lower. Samples having operating temperature ratings of 176 – 575 °F (80 – 302 °C) are to be bath-tested in an oil having a flash point exceeding the test temperature.

10.6 An agitator is to be used as an aid in obtaining uniformity in temperature of the liquid in the bath.

10.7 A calibrated temperature-measuring device is to be used to determine temperature of the liquid in bath tests. The sensing element of the temperature measuring device is to be held level with the heat responsive link by a support member.

10.8 The temperature of the bath liquid is to be raised until the liquid is within 20 °F (11 °C) of the temperature rating of the device for a device having a temperature rating of 300 °F (149 °C) or less, and within 30 °F (17 °C) for a device having a temperature rating of 325 °F (163 °C) and higher. The temperature rise then is to be controlled at a rate not exceeding 1 °F (0.5 °C) per min until operation or until a temperature 20 °F (11 °C) above the rated temperature is reached. The temperature of the liquid and the time of operation, as each heat responsive link operates, are to be recorded.

11 Sensitivity – Oven Heat Test

11.1 A link shall have the following operating time characteristics when tested in the sensitivity test oven as specified in 11.2 – 11.5:

a) For a QR link, each sample shall have a maximum operating time as specified in Table 11.1. If the link temperature rating is not shown in Table 11.1, the maximum operating time for each sample is to be determined by using the formula specified in 11.5 based on a Response Time Index (RTI) value of 90 $(ft \cdot s)^{1/2}$ [50 $(m \cdot s)^{1/2}$], and the marked temperature rating of the link.

b) For a standard response link, each sample shall have a maximum operating time as specified in Table 11.1. If the link temperature rating is not shown in Table 11.1, the maximum operating time for each sample is to be determined by using the formula specified in 11.5, based on a RTI value of 630 $(ft \cdot s)^{1/2}$ [350 $(m \cdot s)^{1/2}$] and the marked temperature rating of the link.

c) The mean operating time shall be equal to or less than a 1.30 multiple of the mean operating time of the link tested in accordance with (a) and (b) after being subjected to the exposure tests specified in Section 15, 10-Day Corrosion Test, and Section 16, 30-Day Corrosion Test.

Table 11.1
Operating Time for Links in Sensitivity-Oven Heat Test

Temperature rating		Oven temperature		Quick response type, s	Standard response type, s	Coated standard response type, s[a]
°F	°C	°F	°C	Max.	Max.	Max.
135	57.2	275	135	11.2	78.0	180
140	60.0	275	135	12.3	86.1	180
155	68.3	275	135	12.3	86.1	180
160	71.1	275	135	17.4	121.3	180
165	73.9	275	135	18.8	131.1	180
175	79.4	386	197	12.1	84.8	180
200	93.3	386	197	16.1	112.4	180
212	100.0	386	197	18.2	127.1	180
220	104.4	386	197	19.6	137.3	180
250	121.1	555	291	14.3	99.3	180
286	141.1	555	291	18.1	126.8	180
300	148.9	555	291	19.8	138.5	180
360	182.2	765	407	16.7	117.0	180
400	204.4	765	407	20.0	139.9	180
450	232.2	765	407	24.6	172.3	180
500	260.0	765	407	30.0	210.3	210.3

[a] Corrosion resistant links with coated heat responsive elements including wax, lead, Teflon, wax over lead, and polyester coating. Coated quick response links shall comply with 11.1(a).

Table 11.2
Sensitivity Oven Temperatures

Temperature rating		Oven temperature	
°F	°C	°F ±2 °F	°C ±1 °C
135 – 170	57 – 77	275	135
175 – 225	79 – 107	386	197
250 – 300	121 – 149	555	290
325 – 375	163 – 191	765	407
400 – 475	204 – 246	765	407
500 – 575	260 – 302	765	407

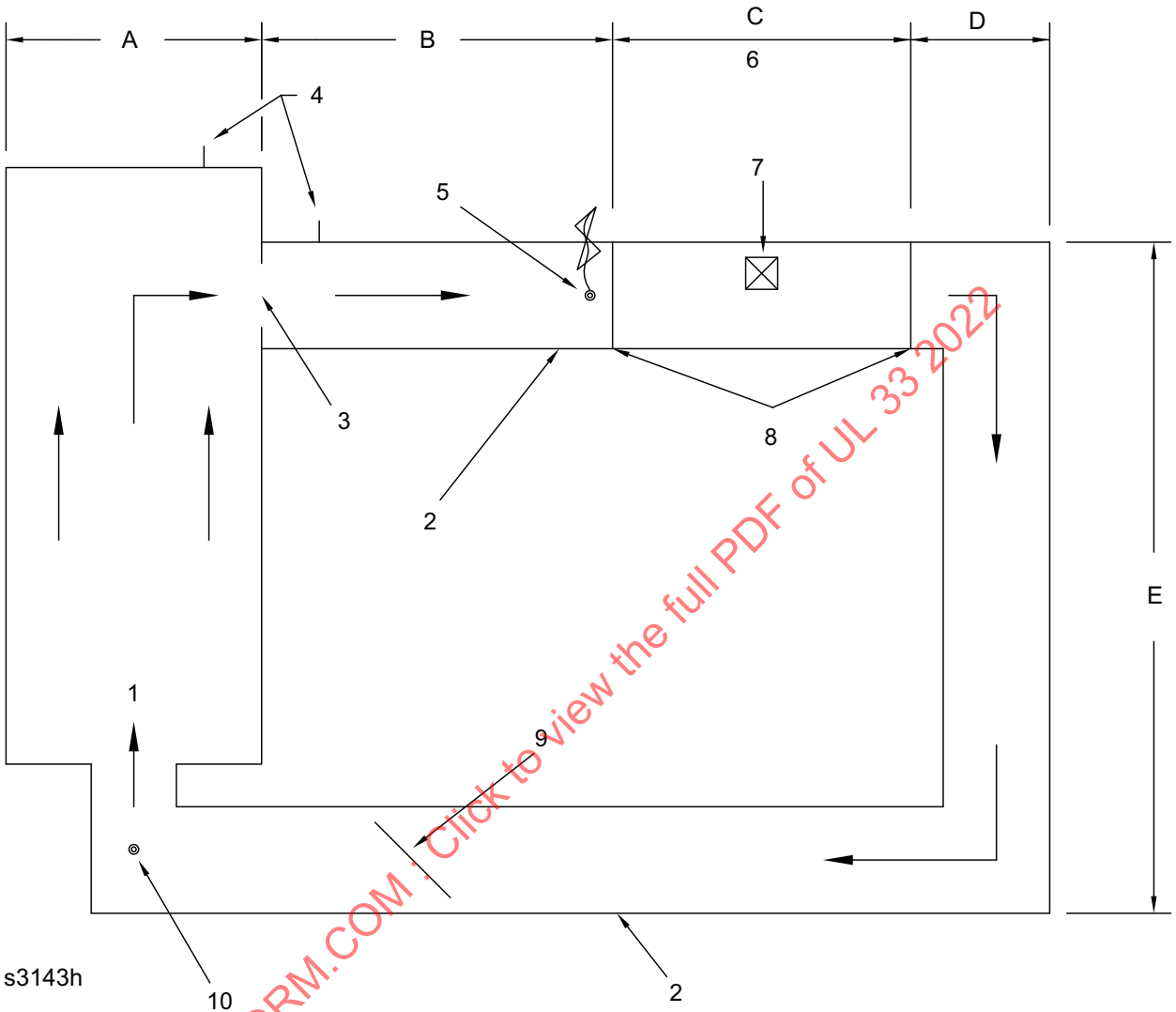
11.2 Ten samples of heat responsive links of each type are to be placed in the sensitivity test oven with the heat responsive element located at least 1 in (25.4 mm) away from the inside surfaces of the oven and with the broadest part of the link, or with the heat responsive element of the link, facing toward the air flow. The samples are to be at the minimum load specified by the manufacturer.

11.3 The samples are to be conditioned at 75 ±2 °F (24 ±1 °C) for at least 2 h. The samples are then to be quickly plunged into the sensitivity test oven in the vertical position. Each link is to be observed to determine if operation occurs within the time specified in 11.1.

11.4 The sensitivity test oven is to consist of a 8-in (203-mm) square stainless steel chamber as shown in Figure 11.1. A constant air velocity of 8.33 ±0.05 ft/s (2.54 ±0.01 m/s) and an air temperature as specified in Table 11.2 for each temperature rating are to be established. Air velocity is to be measured using an orifice plate and a manometer or a bidirectional probe and a velometer. The air temperature is to be measured by use of a 30 AWG (0.05 mm^2) thermocouple centered upstream from the sample as shown in Figure 11.1.

Figure 11.1

Sensitivity Test Oven



Key

1 – Heating Plenum
2 – 8 in x 8 in (203 mm x 203 mm) Square Duct
3 – Orificer
4 – Air Velocity Pressure Taps
5 – 30 AWG Thermocouple
6 – Test Section
7 – Sprinkle
8 – Fine Mesh Screens
9 – Air Velocity Damper
10 – Blower

A – 14 in (356 mm)
B – 50 in (1270 mm)
C – 16 in (406 mm)
D – 12 in (305 mm)
E – 54 in (1372 mm)

11.5 The required link operating time values specified in 11.1 shall be calculated by using the following equation:

$$t_o = \frac{-RTI * In\left[1 - \left[\frac{(T_m - T_u)}{T_g - T_u}\right]\right]}{\sqrt{u}}$$

Where:

RTI is Response Time Index [(ft·s)$^{1/2}$; (m·s)$^{1/2}$]

t_o is Operating time of the link (s)

u is Nominal as velocity in the test section of the wind tunnel (8.33 ft/s; 2.54 m/s)

T_m is Marked temperature rating of the link (°F; °C)

T_g is Nominal gas temperature in test section in Table 11.2 (°F; °C)

T_u is Nominal ambient air temperature (75 °F; 24 °C)

12 High Temperature Exposure – Test (90-Day) Heat Responsive Links

12.1 A heat responsive link not having a wax coating shall withstand the maximum design load for 90 days, without evidence of weakness or operation, an exposure to the temperature specified in Table 12.1. After the exposure, each heat responsive link shall comply with the Sensitivity – Oven Heat Test, Section 11.

12.2 An automatically controlled, circulating-type, constant-temperature oven is to be used for this test. Five previously untested heat responsive links of each operating temperature are to be placed in an oven at the specified temperature and under the maximum design load.

12.3 Each sample is to be examined weekly for weakness as evidenced by its inability to withstand the load for the test duration.

Table 12.1
High-Temperature Exposure Test Conditions

	Temperature rating		Test temperature	
	°F	°C	°F ±2 °F	°C ±1 °C
Low	125 – 130	52 – 54	110	43
Ordinary	135 – 140	57 – 60	120	49
	141 – 170	61 – 77	125	52
Intermediate	175 – 195	79 – 91	155	68
	196 – 225	91 – 107	175	79
High	250 – 270	121 – 132	230	110
	271– 300	133 – 149	250	121
Extra High	325 – 375	163 – 191	300	149
Very Extra High	400 – 474	204 – 246	375	191
Ultra High	500 – 575	260 – 302	475	246

13 High Temperature Exposure – Test for Wax Coated Heat Responsive Links

13.1 A wax coated heat responsive link shall withstand the maximum design load, for 90 days without evidence of weakness, operation, or exposure of the base material, an exposure to the maximum ambient temperature specified in Table 6.1. Following the exposure, the coating shall not show evidence of deterioration such as cracking, flaking, or flowing. After the exposure, each heat responsive link shall comply with the Sensitivity – Oven Heat Test, Section 11.

13.2 An automatically controlled, circulating-type, constant-temperature oven is to be used for this test. Five previously untested heat responsive links with each type of coating are to be placed in the oven, the air of which is to be maintained constantly at the specified temperatures.

13.3 Each sample is to be examined weekly for wax coating degradation or link weakness as evidenced by its inability to withstand the load for the test duration.

14 Evaporation Test for Wax Coatings

14.1 When tested as specified in 14.3, a protective coating containing volatiles such as wax or similar material shall not shrink, harden, crack, or flake.

14.2 When tested as specified in 14.3, the loss of volatiles in a wax coating shall not exceed 5 percent of the weight of the original sample.

14.3 A 50 ml sample of the protective coating is to be placed in a metal or glass cylindrical container having a flat bottom, an inside diameter of 1.4 in (55 mm), and an inside height of 0.89 in (35 mm). The container, without any lid, is to be placed in an automatically controlled, circulating-air, constant-ambient-temperature oven. The oven temperature is to be controlled as described in High Temperature Exposure – Test for Wax Coated Heat Responsive Links, Section 13. The test is to be conducted for 90 days. During the test, the sample is to be removed from the oven at 7-day intervals and allowed to cool for 2 – 4 h. During this cooling time, the sample is to be examined for evidence of shrinking, hardening, cracking, or flaking. The sample is to be weighed before and after the 90-day exposure to determine loss of volatiles.

15 10-Day Corrosion Test

15.1 A heat responsive link shall withstand an exposure to salt spray, hydrogen sulfide, and sulfur dioxide-carbon dioxide atmospheres as specified in 16.1.2 – 16.4.1 for 10 days each. After the exposures, each sample shall comply with the Sensitivity – Oven Heat Test, Section 11.

16 30-Day Corrosion Test

16.1 General

16.1.1 A heat responsive link intended for use in corrosive atmospheres shall withstand an exposure to salt spray, hydrogen sulfide, and carbon dioxide-sulfur dioxide atmospheres as specified in 16.1.2 – 16.4.1 for 30 days. After the exposure, each test sample shall comply with the Sensitivity – Oven Heat Test, Section 11.

16.1.2 Three groups, each consisting of five sample heat responsive links, are to be assembled. One group is to be exposed to 20 percent salt spray, the second to hydrogen sulfide, and the third to sulfur dioxide-carbon dioxide.

16.1.3 Each sample heat responsive link is to be subjected (see 16.1.1) to the Sensitivity – Oven Heat Test, Section 11 for 1 – 5 days after the exposure period.