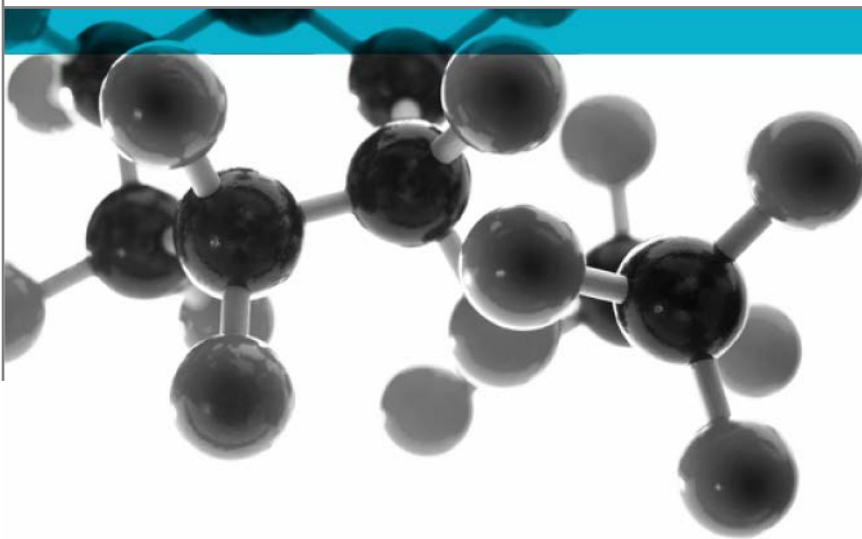


ISO 5659-2:2017



Smoke Assessment

ISO 5659-2: 2017; Plastics – Smoke Generation. Part 2 Determination of Optical Density by a Single Chamber Method

A Report To: Wenzhou Longhua Daily Electron Co. Ltd.

Document Reference: 419290

Date: 31st October 2019

Issue No.: 1

Page 1



0249

Executive Summary

Objective To determine the optical density produced from the following product when tested in accordance with ISO 5659-2: 2017. The sole test mode used was an irradiance level of 25kW/m² with a pilot flame.


Generic Description	Product reference	Thickness	Density
Stainless steel based cable tie	"LH-SS-S/LH-SS-H/LH-SS-EH"	0.25mm	7.87g/cm ³ *
*Determined by Warringtonfire			
Please see page 6 of this test report for the full description of the product tested			

Test Sponsor Wenzhou Longhua Daily Electron Co. Ltd., No. 3 Building, Part C, Xixi Industry Zone, Hongqiao Yueqing Zhejiang, China


Summary of Test Results:
The average Ds(max) value determined within 10 minutes was 0.
The average Ds(max) value determined within 20 minutes was 0.

Date of Test 24th October 2019

Signatories



Responsible Officer
 S. Jones *
 Technical Officer



Authorised
 T. Mort *
 Senior Technical Officer

* For and on behalf of [Warringtonfire](#).

Report Issued: 31st October 2019

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Test Details

Scope of test

To determine the performance of specimens of a product when they are subjected to the conditions of the test specified in ISO 5659-2: 2017, Plastics – Smoke Generation – Part 2: Determination of optical density by a single chamber test.

The test was performed in accordance with the procedures specified in ISO 5659-2 and this report should be read in conjunction with this and other related standards.

Test procedure

The tests were performed in accordance with the procedure specified in EN ISO 5659-2: 2017 and it is advised that this report is read in conjunction with that Standard.

A 75mm x 75mm specimen was mounted horizontally inside a smoke chamber of the design specified in EN ISO 5659-2: 2017, 25mm below a cone shaped, radiant electric heater capable of producing a uniform irradiance of 50kW/m² on the specimen surface. A premixed propane/air pilot flame of length 30mm may be applied 10mm above the specimen surface.

The attenuation of a light beam passing through the evolved smoke is measured and the results are reported in terms of the maximum Specific Optical Density attained during the test, given by the equation:

$$D_s = (V/(A*L)) * \log_{10} (100/T)$$

Where:

V	=	total volume of the chamber (m ³)
A	=	exposed area of the specimen (m ²)
L	=	optical length (m) of smoke measurement
T	=	% light transmitted.

Test method

Specimens were tested in a horizontal position by exposure to the heating arrangement specified in ISO 5659-2. As per LUL S1180, LUL S1085 and EN 45545-2, the test was only performed in one mode. The mode required for these tests heat flux 25kW/m^2 . The change in optical density of the smoke produced when dispersed within a fixed volume of air is recorded throughout the period of test utilising the Concept software in order to determine information relating to the smoke density.

The test method provides a means for the comparative assessment of products, however, it does not model a real fire situation and the results cannot therefore be used to describe the fire hazard of materials under actual fire conditions.

Fire test study group/EGOLF

Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group and EGOLF have identified a number of such areas and have agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Groups. Where such Resolutions are applicable to this test they have been followed.

Instruction to test

The test was conducted on the 24th October 2019 at the request of Smart Products Service Co., Ltd., a representative of the sponsor of the test.

Provision of test specimens

The specimens were supplied by the sponsor of the test. Warringtonfire was not involved in any selection or sampling procedure.

Test face

One of two identical faces of the specimen was exposed to the heating conditions.

Condition of specimen edges

Homogeneous product

Photograph of specimen**Conditioning of specimens**

The specimens were received on the 23rd September 2019.

The specimens were conditioned at temperatures of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50 \pm 5\%$ RH, for a minimum period of 24 hours prior to testing.

Description of Test Specimens

The description of the system given below has been prepared from information provided by the sponsor of the test. This information has not been independently verified by [Warringtonfire](#). All values quoted are nominal, unless tolerances are given.

Generic type	Stainless steel based cable tie
Product reference	"LH-SS-S/LH-SS-H/LH-SS-EH"
Detailed description	304/316 stainless steel
Name of manufacturer	Wenzhou Longhua Daily Electron Co.,Ltd.
Thickness	0.25mm (stated by sponsor) 0.26mm (determined by Warringtonfire)
Density	7.87g/cm ³ (determined by Warringtonfire)
Colour reference	"Natural"
Flame retardant details	The product is inherently flame retardant
Brief description of manufacturing process	Stainless steel sheet-split into requested width-cut into requested length-punch with the hook (and head)-assembly the head and the body of the cable ties

Test Results

Applicability of test results

The test results relate only to the behaviour of the specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential smoke hazard of the product in use.

The test results relate only to the specimens of the product in the form in which they were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and will therefore invalidate the test results. It is the responsibility of the supplier of the product to ensure that the product which is supplied is identical with the specimens which were tested.

Smoke Density

EN 45545-2, test method referenced "T10.03" requires the Ds(max) to be calculated. That is the maximum specific optical density within the first 10 minutes test duration.

The maximum specific optical density within the first 20 minute test duration is also reported in case this is required by an alternative specification (e.g. LUL S1085 & LUL S1180).

	Specimen 1	Specimen 2	Specimen 3	Mean Average
Ds(max) within 10 minutes	0	0	0	0
Ds(max) within 20 minutes	0	0	0	0

Additional Test Data

Additional smoke density data along with observations obtained throughout the duration of the test is tabulated in Appendix I of this test report.

A graph of the results obtained is illustrated in Appendix II of this test report.

Summary of results

The average Ds(max) value determined within 10 minutes was 0.

The average Ds(max) value determined within 20 minutes was 0.

Validity

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. Where this report is used to confirm compliance for use on European rolling stock as per the Technical Specification for Interoperability (LOC&PAS TSI (Commission Regulation (EU) No. 1302/2014)), all tests must have been conducted within the last 5 years or the test reports must have been reviewed within the last five years. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

These results relate only to the behaviour of the specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential smoke obscuration hazard of the product in use.

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Appendix I

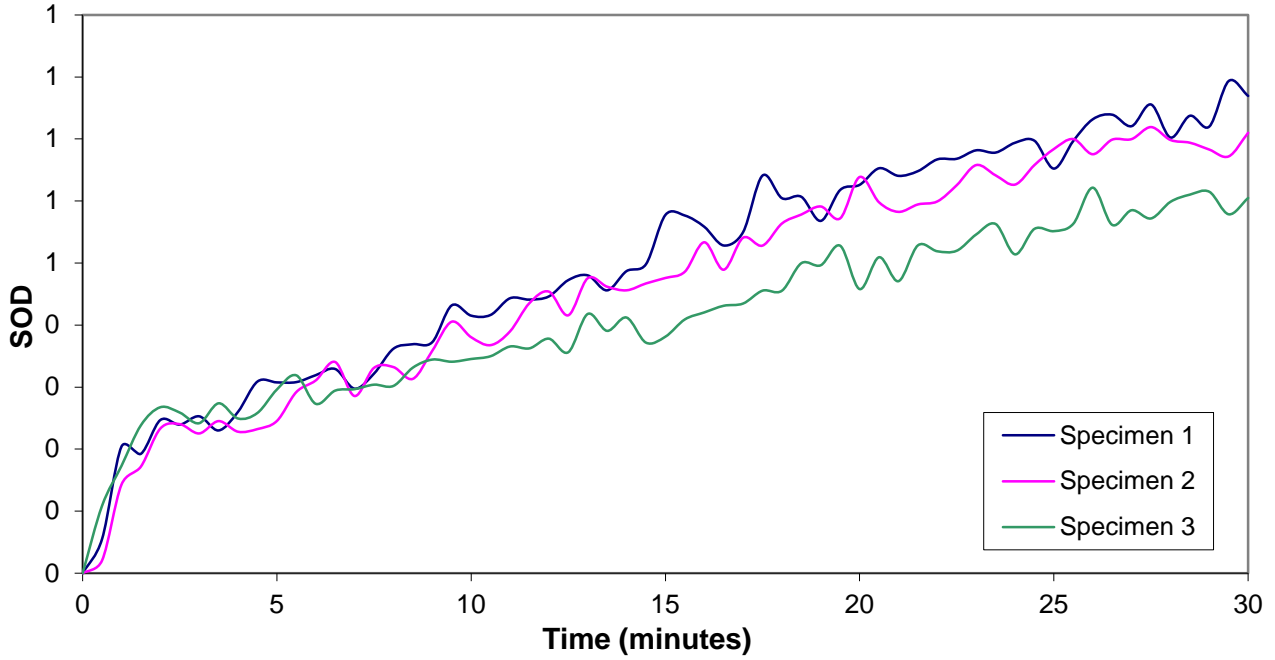
	SPECIMEN NUMBER			Mean
	1	2	3	
Clear Beam Correction Factor (D_c)	1	1	1	
Specific Optical Density at 10 minutes (D_{s10})	0	0	0	0
Specimen thickness	0.26	0.26	0.25	0.26
Initial specimen weight (g)	348.3	339.7	347.1	345.0
Final specimen weight (g)	348.1	339.6	346.9	344.9
Mass Loss (g)	0.2	0.1	0.2	0.2
Wire Grid (if applicable)	N/A	N/A	N/A	N/A
Neutral-density correction factor (C_i) (if applicable)	N/A	N/A	N/A	N/A
Test Duration (s)	1800	1800	1800	N/A
Chamber back wall temperature (°C)	38	40	41	N/A
Test Operator	K. Deluce			-

Observations:

	25kW/m ² In The Presence Of A Pilot Flame		
	1	2	3
Specimen No.	1	2	3
Colour of smoke produced	N/A	N/A	N/A
Expansion distance towards heater (mm)	N/A	N/A	N/A
Type of expansion	N/A	N/A	N/A
Specimen to heater distance (mm)	N/A	N/A	N/A
Ignition time in seconds	N/A	N/A	N/A
Extinction time in seconds	N/A	N/A	N/A
N/A = Not Applicable			

Appendix II

25kW/m² in the presence of a pilot flame



Revision History

Issue No :	Re - Issue Date:
Revised By:	Approved By:
Reason for Revision:	

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Revised By:	Approved By:
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