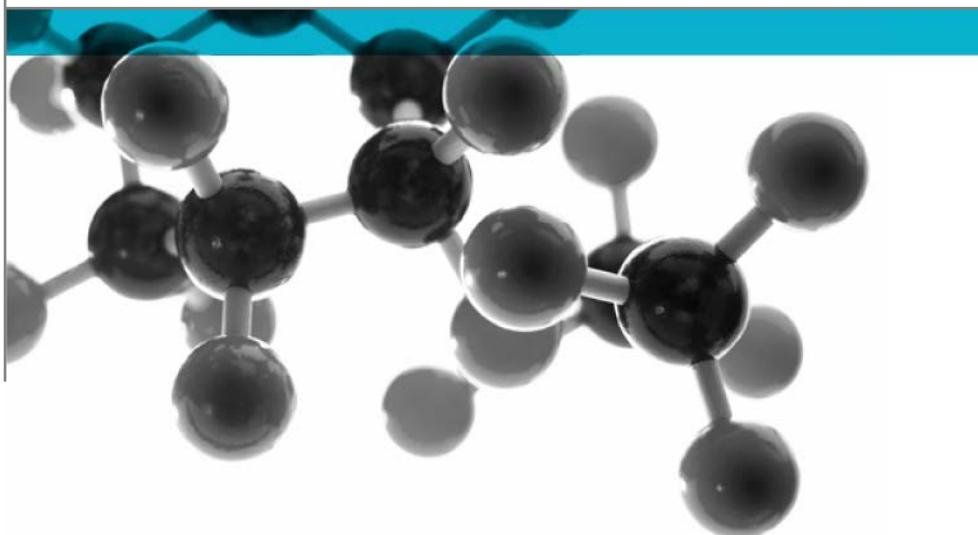


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BS EN ISO 4589-2: 1999



Determination of Burning Behaviour By Oxygen Index

A Report To: Weidmüller Interface GmbH & Co. KG

Document Reference: Additional Test Report 386711

Date: 28th July 2017

Issue No.: 1

Page 1

Testing
Advising
Assuring

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Executive Summary

Objective To determine the oxygen index of the following product when tested in accordance with BS EN ISO 4589-2: 1999

Generic Description	Product reference	Thickness	Density
Heat shrink tubing	"HSS-HF" & "HS-HF"	0.2 to 1mm	1.4g/ml ³

Please see page 5 of this test report for the full description of the product tested

Test Sponsor Weidmüller Interface GmbH & Co. KG, Klingenbergstraße 16, 32758 Detmold, Germany

Test Results: When tested in accordance with the procedure specified in BS EN ISO 4589 - 2: 1999 the material shows an oxygen index of 35.2%

Date of Test 11th February 2016

This test report is additional to that issued as 361587 dated the 12th February 2016 and has been issued at the request of the sponsor. The original test report remains valid and is not replaced by this additional test report. The product referred to in the original report and this additional test report has not been re-tested since the original test and neither has a technical review of the original test report resulting in any technical changes been carried out.

The original product reference of the product has been removed and the reference "HSS-HF" & "HS-HF" has been inserted and the original sponsor name and address details have been removed and those of "Weidmüller Interface GmbH & Co. KG" have been inserted. The sponsor of the test has stated that the material described in this additional report is identical to the material which was tested. Both the original and the alternative trade names of the product and the original and alternative sponsor details have been documented and the documentation is maintained in the confidential file covering this investigation.

Signatories

Responsible Officer

T. Mort *

Senior Technical Officer

Authorised

S. Deeming *

Business Unit Head

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 28th July 2017

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Author: T. Mort

Issue Date:

28th July 2017

Client: Weidmüller Interface GmbH & Co. KG.

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Test Details

Purpose of test	To assess the performance of a material when it is tested in accordance with BS EN ISO 4589 - 2: 1999 "Plastics - Determination of burning behaviour by oxygen index".
	The test was performed in accordance with the procedure specified in BS EN ISO 4589-2:1999 - Plastics - Determination of burning behaviour by oxygen index, and this report should be read in conjunction with that BS EN ISO Standard.
Scope of test	BS EN ISO 4589 – 2: 1999 specifies test methods for determining the minimum concentration of oxygen, in a mixture with nitrogen that will support combustion of small vertical test specimens under specified test conditions. The results are defined as oxygen index values.
Instruction to test	The test was conducted on the 11 th February 2016 at the request of the original sponsor of the test.
Provision of test specimens	The specimens were supplied by the original sponsor of the test. Exova Warringtonfire was not involved in any selection or sampling procedure.
Conditioning of specimens	<p>The specimens were received on the 23rd January 2016.</p> <p>Prior to test the specimens were conditioned to equilibrium with air at $23 \pm 2^{\circ}\text{C}$ and a relative humidity of 50 ± 5 per cent for at least 88 hours.</p>
Method of testing	Specimens measuring nominally 100mm long by 6.70mm wide by 2.89mm thick were used. The thickness of the specimens used conforms with the requirements specified in Table 2 of the standard for test specimen Form IV for alternative size for self supporting moulding or sheet material, for electrical purposes. The specimens were tested in accordance with the test procedure specified in Clause 8 of the Standard using the Concept Equipment Limiting Oxygen Index apparatus.
Ignition procedure	Ignition procedure A - top surface ignition, was used to initiate burning on the top surface of the upper end of the specimen.

Description of Test Specimens

The description of the specimens given below has been prepared from information provided by the original sponsor of the test. All values quoted are nominal, unless tolerances are given.

General description	Heat shrink tubing
Product reference	“HSS-HF” & “HS-HF”
Detailed description	Moisture cross-linked polymer filled with non-halogenated flame retardants
Name of manufacturer	ECS Cable Protection
Thickness	Between 0.2 and 1mm (stated by sponsor) 2.89mm (determined by Exova Warringtonfire)
Density	1.4g/ml ³ (stated by sponsor) 1.53g/cm ³ (determined by Exova Warringtonfire)
Colour reference	“Yellow”
Trade name of flame retardant	“HFX500P”
Generic type of flame retardant	Non halogenated
Amount of flame retardant	See Note 1 Below
Brief description of manufacturing process	Extrusion process, crosslinking reaction in humid chamber, expansion

Note 1: The sponsor was unwilling to provide this information.

Test Results

Applicability of test results	The test results relate only to the behaviour of the specimens under the particular conditions of this test, they should not be used to infer the fire hazards of the material in other forms or under other fire conditions. 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 may therefore invalidate the test results. Care should be taken to ensure that any product which is supplied or used is fully represented by the specimens which were tested.
	In accordance with Sections 8 and 9 of the Standard, the results obtained are given in appendix A.
Conclusion	When tested in accordance with the procedure specified in BS EN ISO 4589 - 2: 1999 the material shows an oxygen index of 35.2%
Validity	The specification and interpretation of fire test methods is 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. 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. This report may only be reproduced in full. Extracts or abridgements shall not be published without permission of Exova Warringtonfire .

Appendix A

MATERIAL TESTED

Part 1 - Preliminary oxygen concentration

Oxygen Concentration (%)	35.0	38.0	36.0
Burning Period (s)	32.5	177.5	>180
Length Burnt (mm)	<10	>50	40
Response ('X' or 'O')	O	X	X

Part 2 - Determination of the oxygen index value

N _T series measurements										
N _L series measurements (8.5)						(8.6.2)				
Oxygen Concentration (%)	35.0	35.2	35.4			35.4	35.2	35.0	35.2	35.0
Burning Period (s)	39	57	>180			>180	>180	42	>180	47.5
Length Burnt (mm)	10	10	30			30	40	10	25	10
Response ("X" or "O")	O	O	X			X	X	O	X	O
Column (2,3,4 or 5)	3					Row (1 to 16)				11
k value from table 4	0.94									

Hence k = 0.94

Oxygen index value OI = C_f + kd
d is oxygen concentration increment

OI = 35.0 + (0.94 x 0.2)

Oxygen index value = 35.2 (to one decimal place for reporting)
= 35.19 (to two decimal places, for calculation of and verification
of d as required in Part 3)

Standard Deviation = 0.15 Therefore, the test result is valid.

Part 3 – Burning characteristics of the material

No relevant ancillary characteristics or behaviour such as, charring, dripping, severe shrinkage, erratic burning, or after-glow were observed during the test.

Revision History

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

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