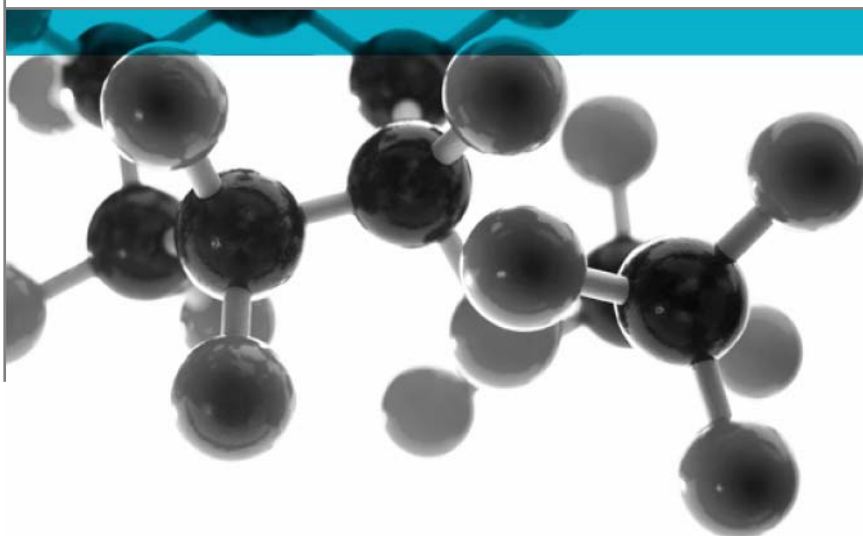


NF X 70-100-1: 2006 & NF X 70-100-2: 2006



**Fire tests, Analysis of gaseous effluents. Part 1:
Methods for analysing gases produced by
thermal degradation. Part 2: Tubular furnace
thermal degradation method.**

A Report To: Xiamen Wain Electrical Co., Ltd

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Date: 2nd September 2011

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Page 1

Testing
Advising
Assuring



Executive Summary

Objective To determine the performance of the following product when tested in accordance with the procedure specified in NF X 70-100-1: 2006 & NF X 70-100-2: 2006.

Generic Description	Product reference	Thickness	Density
Fibre glass reinforced polycarbonate material	Material used to produce "Heavy Duty Connector"	6mm	1.33g/cm ³
Individual components used to manufacture composite:			
Polycarbonate	"PC"	Not stated	Not stated
GRP	"GF20"	Not stated	Not stated
Please see page 5 of this test report for the full description of the product tested			



Test Sponsor Xiamen Wain Electrical Co., Ltd, 759-3 Chengbei Industrial Zone, Chaoyuan Road, Tongan District, Xiamen, China

Summary of Test Results: When tested in accordance with the procedure specified in NF X 70-100-1: 2006 & NF X 70-100-2 at a temperature of 600°C, the test results indicate a C.I.T value of 22.04.

When tested in accordance with the procedures specified in NF X 70-100-1: 2006 & NF X 70-100-2 as modified by BS 6853: 1999: Annex B.1 at a temperature of 600°C, the R-value, calculated in accordance with Annex B of BS 6853: 1999, is determined to be 1.41. It must be noted that this R value must only be used to demonstrate compliance against the requirements specified in Tables 7 & 8 (minor use materials), Table 11 (textiles) and Tables 13 & 14 (cables) of BS 6853: 1999. Should an R value be required to demonstrate compliance against any other table in BS 6853: 1999, then a test in accordance with BS 6853: 1999: Annex B.2 must be performed.

Date of Test 12th July 2011

Signatories

	
Responsible Officer B. Dean * Fire Scientist	Authorised T. Mort * Senior Technical Officer

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

Report Issued: 2nd September 2011

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Test Details

Purpose of test	<p>To determine the performance of specimens of a material when they are subjected to the conditions of test specified in NFX 70 - 100: 2006 "Analysis Of Gaseous effluents, Part 1: Methods for analysing gases produced by thermal degradation and Part 2: Tubular furnace thermal degradation method".</p> <p>The tests were performed in accordance with the procedure specified in NFX 70-100-1: 2006 and NF X 70-100-2: 2006 at a temperature of 600°C and this report should be read in conjunction with that Standard.</p>
Scope of test	<p>NFX 70-100-1: 2006 and NF X 70-100-2: 2006 specifies a method of test for carrying out quantitative analysis of certain gases produced under specified conditions of thermal degradation in the presence of air.</p>
Fire test study group/EGOLF	<p>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.</p>
Instruction to test	<p>The test was conducted on the 12th July 2011 at the request of Xiamen Wain Electrical Co., Ltd, the sponsor of the test.</p>
Provision of test specimens	<p>The specimens were supplied by the sponsor of the test. Exova Warringtonfire was not involved in any selection or sampling procedure.</p>
Conditioning of specimens	<p>The specimens were received on the 20th June 2011.</p> <p>Prior to test the specimens were conditioned to constant mass at temperatures of $23 \pm 2^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$ RH, for a minimum period of 48 hours prior to testing.</p>

Description of Test Specimens

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

General description		Fibre glass reinforced polycarbonate material
Product reference		Material used to produce "Heavy Duty Connector"
Name of manufacturer		Xiamen Wain Electrical Co., Ltd
Colour reference		"Grey"
Overall thickness		6mm (stated by sponsor) 5.96mm (determined by Exova Warringtonfire)
Overall density		1.36g/cm ³ (stated by sponsor) 1.33g/cm ³ (determined by Exova Warringtonfire)
Polycarbonate	Generic type	Polycarbonate
	Product reference	"PC"
	Name of manufacturer	See Note 1 below
	Trade name of flame retardant	See Note 1 below
	Generic type of flame retardant	Non-halogen flame retardant See Note 1 below
	Amount of flame retardant	0.5 to 5%
Glass fibre	Type	Fibrous glass
	Product reference	"CAS Number - 65997-17-3"
	Name of manufacturer	See Note 1 below
Resin to glass ratio (by weight)		4 : 1
Percentage glass reinforcement (by weight)		20%
Brief description of manufacturing process		Design mould → Injection moulding → Deburring → Semi-finished products (reinforced PC body in practice)

Note 1. The sponsor of the test was unable to provide this, or further information, as their supplier is unwilling to provide this information.

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 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.

Expression of Gas Content

C.I.T. calculation utilising the reference values provided in NF F 16-101

The contents "ti" of gases (CO, CO₂, HCl, HBr, HF and SO₂) are expressed in milligrams of gas per gram of material. From these values of "ti", and the corresponding values of critical concentrations "cc_i", a conventional index of toxicity, designated "C.I.T", is determined using the following equation:-

$$C.I.T = 100 \times \sum \frac{ti}{cc_i}$$

R value calculation utilising the reference values provided in BS 6853 Annex B.1

The contents of gases (CO, CO₂, HCl, HBr, HF, SO₂, NO₂) are expressed in milligrams of gas per gram of material. From these values of "cx" and the corresponding values of reference values "fx", a weighted summation of toxicity, designated "R", is determined using the following equation:-

$$R_x = cx/fx$$

$$R = \sum R_x$$

The individual results obtained are given in table 1.

Conclusion

When tested in accordance with the procedure specified in NF X 70-100-1: 2006 & NF X 70-100-2 at a temperature of 600°C, the test results indicate a C.I.T value of 22.04.

When tested in accordance with the procedures specified in NF X 70-100-1: 2006 & NF X 70-100-2 as modified by BS 6853: 1999: Annex B.1 at a temperature of 600°C, the R-value, calculated in accordance with Annex B of BS 6853: 1999, is determined to be 1.41. It must be noted that this R value must only be used to demonstrate compliance against the requirements specified in Tables 7 & 8 (minor use materials), Table 11 (textiles) and Tables 13 & 14 (cables) of BS 6853: 1999. Should an R value be required to demonstrate compliance against any other table in BS 6853: 1999, then a test in accordance with BS 6853: 1999: Annex B.2 must be performed.

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. 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.

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Table 1

GASES	Concentration (mg/g)	NF F 16-101 reference values, cc_i (mg/m³)	BS 6853 reference values, Fx (mg/g)	CIT (per 100 gram)	r value (BS 6853 Annex B.1)
CARBON MONOXIDE	372.20	1750	280	21.27	1.33
CARBON DIOXIDE	642.28	90000	14000	0.71	0.05
HYDROGEN CHLORIDE	0.08	150	15	0.05	0.01
HYDROGEN BROMIDE	ND	170	20	0.00	0.00
HYDROGEN CYANIDE	ND	55	11	0.00	0.00
HYDROGEN FLUORIDE	ND	17	4.9	0.00	0.00
SULPHUR DIOXIDE	0.02	260	53	0.01	0.00
NITROUS OXIDES	0.25	N/A	7.6	N/A	0.03

Where ND indicates non-detected
 N/A indicates not applicable

Observations

In the case of each specimen the test duration was 40 minutes and the volume of the gas sampled was 80 litres. In each case the air was circulated using a suction method.

In the case of each specimen a nominally 1g sample was obtained which was representative of the substance or material as used in practice.

Specimen No.	1	2	3	1	2	3	1	2	3	1	2	3
Gases	HCN			HCl / HBr / SO ₂			HF			NO _x		
Mass (g)	1.0015	1.0004	1.0015	1.0029	1.0072	1.0051	0.9959	N/A	N/A	0.9989	0.9976	0.9969
Mass loss (g)	0.8101	0.7991	0.8017	0.8114	0.7977	0.8046	0.8001	N/A	N/A	0.7990	0.7943	0.7993
Mass loss (%)	80.89	79.88	80.05	80.91	79.20	80.05	80.34	N/A	N/A	79.99	79.62	80.18
Ignition time (min:secs) (if applicable)	02:30	02:27	02:29	02:29	02:34	02:24	02:30	N/A	N/A	02:28	02:40	02:21
Extinction time (min:secs) (if applicable)	03:20	03:29	03:48	03:48	03:55	03:16	03:36	N/A	N/A	03:31	03:34	03:18
Key:												
N/A = Not applicable												

Revision History

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