

Samtec
520 Park East Blvd.
New Albany, IN 47151
United States

The following sample(s) was/were submitted and identified by/on behalf of the client as:

Plastic Polymer – Opaque Light Yellow/Green
Model/Part No.: FR-4
Country of Destination: USA

Sample Received Date: **6/28/2018**

Testing Period: **6/29/2018 – 7/20/2018**

Test Requested : Please refer to the result summary.

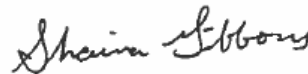
Test Method & Results : Please refer to next page(s).

Result Summary :

Test Requested	Comment
1. RoHS Directive 2011/65/EU Annex II	PASS
2. Directive (EU) 2015/863 of amending RoHS Directive 2011/65/EU	PASS
3. Halogen Content (Cl, Br, I, F) of the submitted sample(s) with reference to BS EN 14582:2016	See Test Results
4. Total Phosphorous Content (as requested by Client)	See Test Results

Signed for and on behalf of SGS North America, Inc.

Prepared By:

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1. RoHS Directive 2011/65/EU Annex II

Test Item(s):	Unit	Test Method	Results	MDL	Limit
			1		
Cadmium(Cd)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Cd and Pb by ICP-OES and /or ICP-MS)	ND	2	100
Lead (Pb)	mg/kg		3.21	2	1000
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013 (Determination of Hg by ICP-OES and/ or ICP-MS)	ND	2	1000
Hexavalent Chromium (CrVI)	mg/kg	With reference to IEC 62321; EPA 3060A (Determination of CrVI by UV-VIS)	ND*	2	1000
Sum of PBBs	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBB and PBDE by GC-MS)	ND	-	1000
Monobromobiphenyl	mg/kg		ND	5	-
Dibromobiphenyl	mg/kg		ND	5	-
Tribromobiphenyl	mg/kg		ND	5	-
Tetrabromobiphenyl	mg/kg		ND	5	-
Hexabromobiphenyl	mg/kg		ND	5	-
Pentabromobiphenyl	mg/kg		ND	5	-
Heptabromobiphenyl	mg/kg		ND	5	-
Octabromobiphenyl	mg/kg		ND	5	-
Nonabromobiphenyl	mg/kg		ND	5	-
Decabromobiphenyl	mg/kg		ND	5	-
Sum of PBDEs	mg/kg		ND	-	1000
Monobromodiphenyl ether	mg/kg		ND	5	-
Dibromodiphenyl ether	mg/kg		ND	5	-
Tribromodiphenyl ether	mg/kg		ND	5	-
Tetrabromodiphenyl ether	mg/kg		ND	5	-
Pentabromodiphenyl ether	mg/kg		ND	5	-
Hexabromodiphenyl ether	mg/kg		ND	5	-
Heptabromodiphenyl ether	mg/kg		ND	5	-
Octabromodiphenyl ether	mg/kg		ND	5	-
Nonabromodiphenyl ether	mg/kg	ND	5	-	
Decabromodiphenyl ether	mg/kg	ND	5	-	
Conclusion	/	/	PASS	/	/

Sample Description:

1. Plastic Polymer – Opaque Light Yellow/Green - Model No.: FR-4

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Note :

- (a) mg/kg = ppm ; 0.1wt% = 1000ppm
- (b) ND= not detected
- (c) MDL = Method Detection Limit
- (d) - = not regulated
- (e) * = Total Chromium analysis by ICP-MS and/or ICP-OES was not detected in submitted sample. Therefore, Hexavalent Chromium determination using UV-Visible Spectroscopy was not performed.
- (f) IEC 62321 series is equivalent to EN 62321 series
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2. Directive (EU) 2015/863 of amending RoHS Directive 2011/65/EU

Test Item(s):	Unit	Test Method	Results	MDL	Limit
			1		
Bis (2-ethylhexyl) Phthalate (DEHP)	mg/kg	IEC 62321-8:2017 (Determination of DEHP, BBP, DBP and DIBP by GC-MS)	ND	50	1000
Butyl benzyl Phthalate (BBP)	mg/kg		ND	50	1000
Dibutyl Phthalate (DBP)	mg/kg		ND	50	1000
Diisobutyl Phthalate (DIBP)	mg/kg		ND	50	1000
Conclusion	/	/	PASS	/	/

Sample Description:

1. Plastic Polymer – Opaque Light Yellow/Green - Model No.: FR-4

Note :

- (a) mg/kg = ppm ; 0.1wt% = 1000ppm
- (b) ND= not detected
- (c) MDL = Method Detection Limit
- (d) - = not regulated
- (e) IEC 62321 series is equivalent to EN 62321 series

http://www.cenelec.eu/dyn/www/f?p=104:30:1742232870351101:::FSP_ORG_ID,FSP_LANG_ID:1258637,25

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3. Halogen Content (Cl, Br, I, F) of the submitted sample(s) with reference to BS EN 14582:2016:

With reference to **BS EN 14582:2016** "Characterization of waste – Halogen and sulfur content – Oxygen Combustion in closed systems and determination methods". Analysis was performed by Ion Chromatography.

Test Items	Unit	Method Detection Limit	1
Halogen – Chlorine (Cl) CAS # 007782-50-5	mg/kg	50	347
Halogen – Bromine (Br) CAS # 007726-95-6	mg/kg	50	60100
Halogen – Fluorine (F) CAS # 007782-41-4	mg/kg	50	1440
Halogen – Iodine (I) CAS # 007553-56-2	mg/kg	50	ND

Sample Description:

1. Plastic Polymer – Opaque Light Yellow/Green - Model No.: FR-4

Note: 1. mg/kg = ppm
2. ND = Not Detected, reported when the reading is less than the detection limit value.

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4. Total Phosphorous Content (as requested by Client)

Method: EPA 3050B/EPA 3052 followed by analysis using Inductively Coupled Argon Plasma Spectrometry.

Test Item	Result (mg/kg)		Detection Limit (mg/kg)
	1		
Phosphorous (P)	38.4		20

Sample Description:

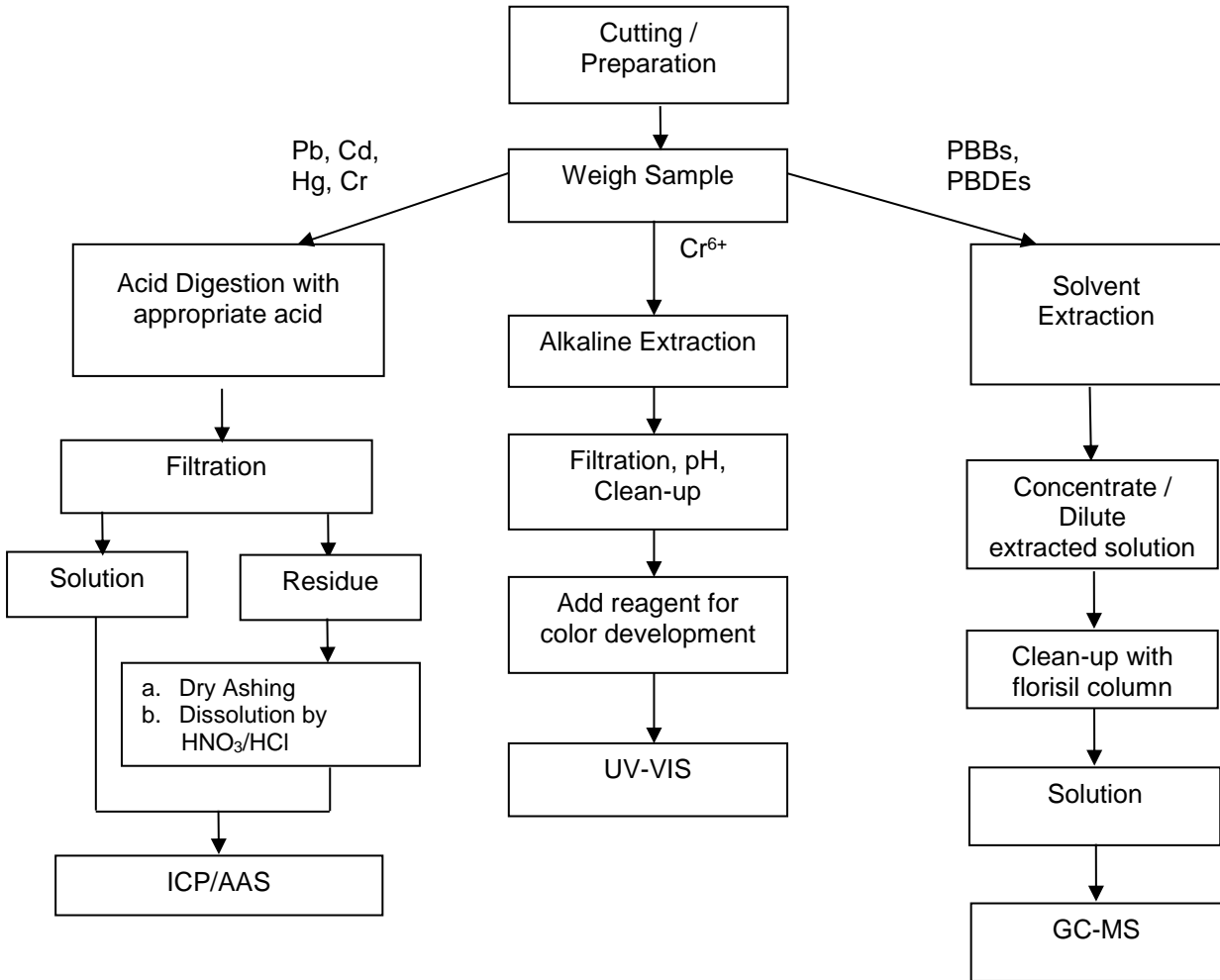
1. Plastic Polymer – Opaque Light Yellow/Green - Model No.: FR-4

Note :

1. ND = Not Detected = denoted less than reporting limit
2. 1 mg/kg = 1 ppm

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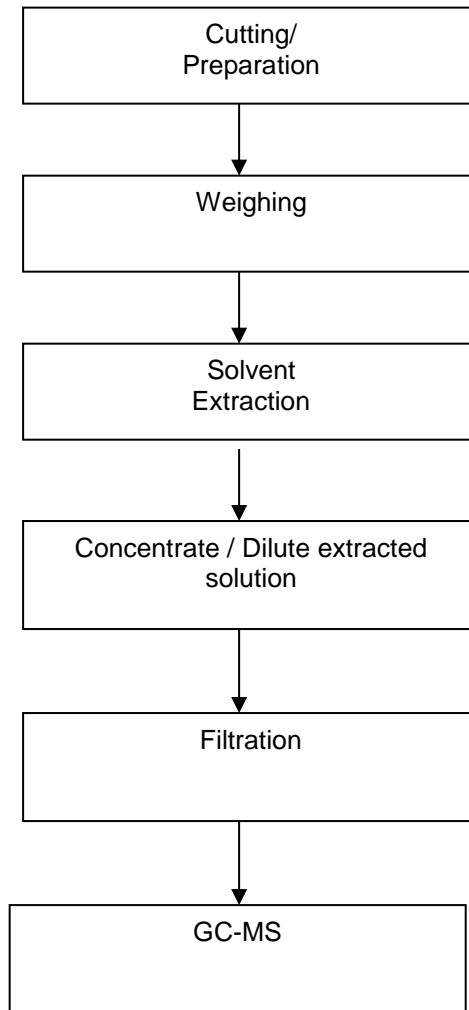
Flowchart for RoHS Testing:



- Note : 1. Cr⁶⁺ is performed only when total Cr is detected
 2. The Cr, Cd, Pb and Hg contents test on polymeric samples were dissolved totally by pre-conditioning method according to above flow chart.

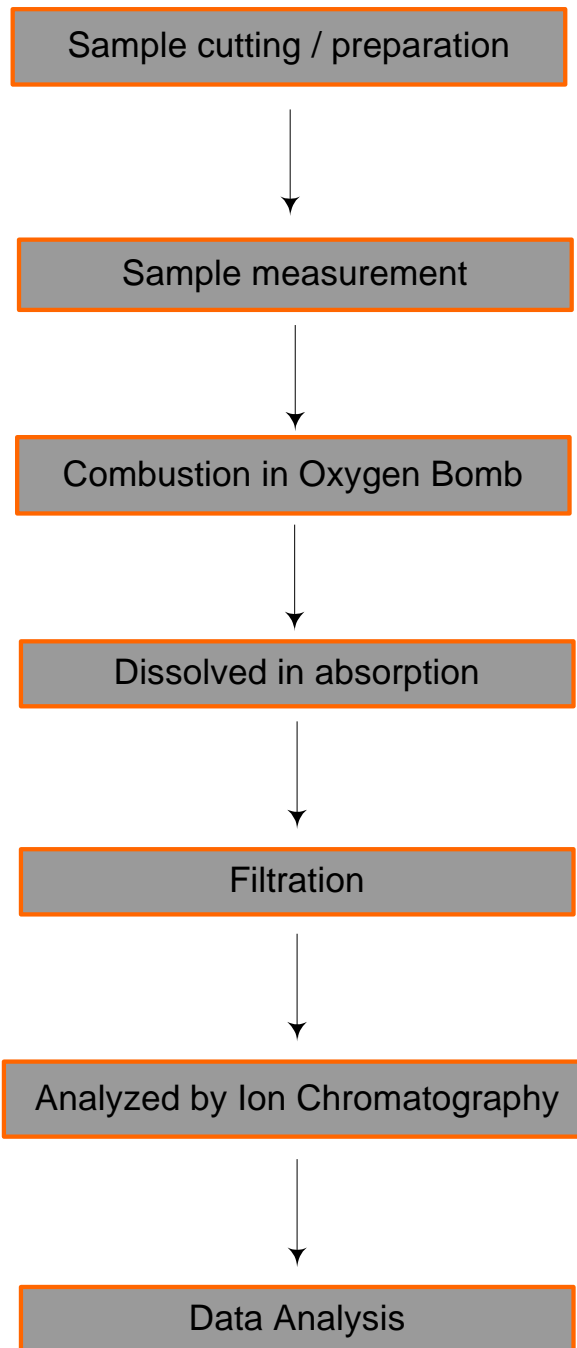
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Flowchart for Phthalates



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Halogen Testing Flow Chart



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Sample Photo(s):



SGS authenticates the photo(s) on the original report only

*** End of Report ***

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