

Test Report

No. TSNEC2100253011

Date: 04 Mar 2021

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TIANJIN LAIRD LTD.

C3&C4 BUILDING, HONGTAI INDUSTRY PARK, NO.87 TAIFENG ROAD, TEDA, TIANJIN, CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : PHASE CHANGE THERMAL INTERFACE MATERIAL

SGS Job No. : TP21-000773 - TJ
Main Substance : CERAMIC+SYNTHETIC HYDROCARBON RESINS AND METALLIC FILLERS
Model No. : TPCM 5000
Client Ref. Info. : Other Model No.:TPCM 5125, TPCM 5200, TPCM 5250, TPCM 5300, TPCM 5400, TPCM 5500
Date of Sample Received : 22 Feb 2021
Testing Period : 22 Feb 2021 - 04 Mar 2021
Test Requested : Selected test(s) as requested by client.
Test Method : Please refer to next page(s).
Test Results : Please refer to next page(s).
Conclusion : Based on the performed tests on submitted sample(s), the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBBs), Polybrominated diphenyl ethers (PBDEs) and Phthalates such as Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP), Dibutyl phthalate (DBP), and Diisobutyl phthalate (DIBP) comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of
SGS-CSTC Standards Technical Services (Tianjin) Co., Ltd.



Reabeca Zhou
Approved Signatory

scan to see the report



TSNEC2100253011



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Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
SN1	TSN21-002530.006	gray sheet

Remarks :

- (1) 1 mg/kg = 0.0001%
- (2) MDL = Method Detection Limit
- (3) ND = Not Detected (< MDL)
- (4) "-" = Not Regulated

RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU

Test Method : With reference to IEC 62321-5:2013, IEC 62321-4:2013+AMD1:2017, IEC 62321-7-2:2017, IEC 62321-6:2015 and IEC 62321-8:2017, analyzed by ICP-OES, UV-Vis and GC-MS.

Test Item(s)	Limit	Unit	MDL	006
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1000	mg/kg	2	ND
Mercury (Hg)	1000	mg/kg	2	ND
Hexavalent Chromium (Cr(VI))	1000	mg/kg	8	ND
Sum of PBBs	1000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND



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<u>Test Item(s)</u>	<u>Limit</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND
Dibutyl phthalate (DBP)	1000	mg/kg	50	ND
Butyl benzyl phthalate (BBP)	1000	mg/kg	50	ND
Bis (2-ethylhexyl) phthalate (DEHP)	1000	mg/kg	50	ND
Diisobutyl Phthalates (DIBP)	1000	mg/kg	50	ND

Notes :

(1) The maximum permissible limit is quoted from RoHS Directive (EU) 2015/863.

IEC 62321 series is equivalent to EN 62321 series

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

(2) The restriction of DEHP, BBP, DBP and DIBP shall apply to medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, from 22 July 2021.

Halogen

Test Method : With reference to EN 14582: 2016, analysis was performed by Ion Chromatograph (IC).

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Fluorine (F)	mg/kg	50	ND
Chlorine (Cl)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

Element(s)

Test Method : SGS in house method -TJChemLab-TOP-004-2 (With reference to US EPA 3052:1996 、 US EPA 3051A:2007 、 US EPA 6010C:2007), analyzed by ICP-OES.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Antimony (Sb)	mg/kg	10	ND



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Elementary analysis

Test Method : SGS In-house method (GZTC CHEM-TOP-111-02,with reference to US Method EPA3052:1996),analysis was performed by ICP-OES.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Sulfur(S)	mg/kg	10	ND

Notes :

(1) The test was subcontracted to SGS Guangzhou chemical lab.

Red Phosphorus

Test Method : SGS in house method(SHTC- CHEM- SOP -342-T), Analysis was performed by ICP-OES and Pyrolysis-GC/MS

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Red Phosphorus	mg/kg	500	ND

Notes :

(1) For Positive result, the testing result is based on the worst-case scenario,and confirmed by Pyrolysis-GC-MS

(2) The test was subcontracted to SGS Shanghai chemical lab.

Hexabromocyclododecane (HBCDD)

Test Method : SGS in house method-TJChemLab-TOP-059 (With reference to US EPA 3550C:2007 、 US EPA 8270D:2014), analyzed by GC-MS.

<u>Test Item(s)</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

Phthalates

Test Method : With reference to IEC 62321-8:2017, determination of phthalates by GC-MS.



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<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Diisononyl Phthalate (DINP)	28553-12-0/ 68515-48-0	% (w/w)	0.005	ND
Di-n-octyl Phthalate (DNOP)	117-84-0	% (w/w)	0.005	ND
Diisodecyl Phthalate (DIDP)	26761-40-0/ 68515-49-1	% (w/w)	0.005	ND
Dimethyl Phthalate (DMP)	131-11-3	% (w/w)	0.005	ND
Diethyl Phthalate (DEP)	84-66-2	% (w/w)	0.005	ND
Diisooctyl Phthalate (DIOP)	27554-26-3	% (w/w)	0.005	ND
Bis(2-methoxyethyl) Phthalate (DMEP)	117-82-8	% (w/w)	0.005	ND
Diisopentyl Phthalate (DIPP)	605-50-5	% (w/w)	0.005	ND
n-pentyl Isopentyl phthalate (nPIPP)	776297-69-9	% (w/w)	0.005	ND
Di-n-hexyl Phthalate (DnHP)	84-75-3	% (w/w)	0.005	ND
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters (DHNUP)	68515-42-4	% (w/w)	0.005	ND
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich (DIHpP)	71888-89-6	% (w/w)	0.005	ND
1,2-Benzenedicarboxylic acid, dipentylester, branched and linear (DPP)	84777-06-0	% (w/w)	0.005	ND
Di-n-pentyl Phthalate (DnPP)	131-18-0	% (w/w)	0.005	ND
1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear (DHP)	68515-50-4	% (w/w)	0.005	ND
Dicyclohexyl Phthalate (DCHP)	84-61-7	% (w/w)	0.005	ND
Diisohexyl phthalate (DIHP)	71850-09-4	% (w/w)	0.005	ND

Perfluorooctane Sulfonates (PFOS) and its derivatives and Perfluorooctanoic Acid (PFOA) and its salts

Test Method : With reference to CEN/TS 15968:2010, analysis was performed by LC/MSMS.

<u>Test Item(s)</u>	<u>CAS NO.</u>	<u>Unit</u>	<u>MDL</u>	<u>006</u>
Perfluorooctane Sulfonates (PFOS) and its derivatives		mg/kg	-	ND
Perfluorooctane Sulfonates (PFOS) ^	1763-23-1	mg/kg	0.01	ND
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	mg/kg	0.01	ND
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	mg/kg	0.01	ND
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol (EtFOSE)	1691-99-2	mg/kg	0.01	ND
2-(N-methylperfluoro-1-octanesulfonamido)-ethanol (MeFOSE)	24448-09-7	mg/kg	0.01	ND
Perfluorooctane sulfonamide (PFOSA)	754-91-6	mg/kg	0.01	ND
Perfluorooctanoic Acid (PFOA) and its salts+		mg/kg	0.01	ND



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Notes :

- (1) ^ PFOS refer to its derivatives including PFOS-K (CAS No.: 2795-39-3), PFOS-Li (CAS No.: 29457-72-5), PFOS-NH₄ (CAS No.: 29081-56-9), PFOS-NH(OH)₂ (CAS No.: 70225-14-8), PFOS-N(C₂H₅)₄ (CAS No.: 56773-42-3), PFOS-DDA(CAS No.:251099-16-8) and POSF (CAS No.: 307-35-7)
- (2) + PFOA refer to its salts including PFOA-Na (CAS No.: 335-95-5), PFOA-K (CAS No.: 2395-00-8), PFOA-Ag (CAS No.: 335-93-3), PFOA-F (CAS No.: 335-66-0) and APFO (CAS No.: 3825-26-1).

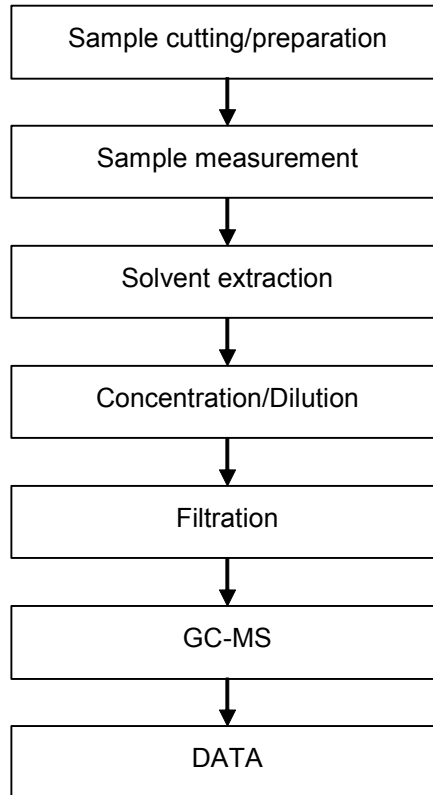


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HBCDD Testing Flow Chart



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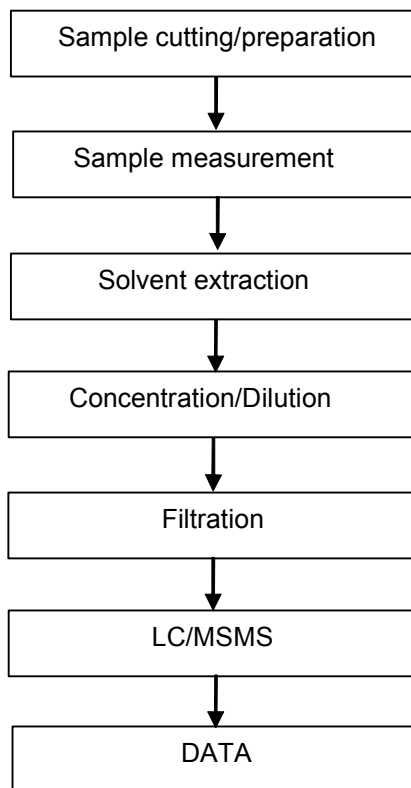
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PFOS/PFOA Testing Flow Chart



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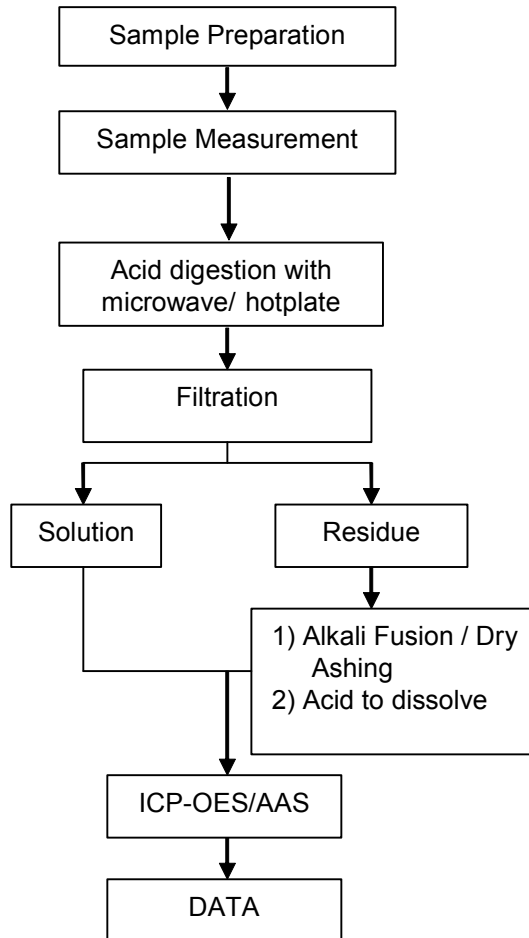
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Elements (IEC62321) Testing Flow Chart

1) These samples were dissolved totally by pre-conditioning method according to below flow chart.



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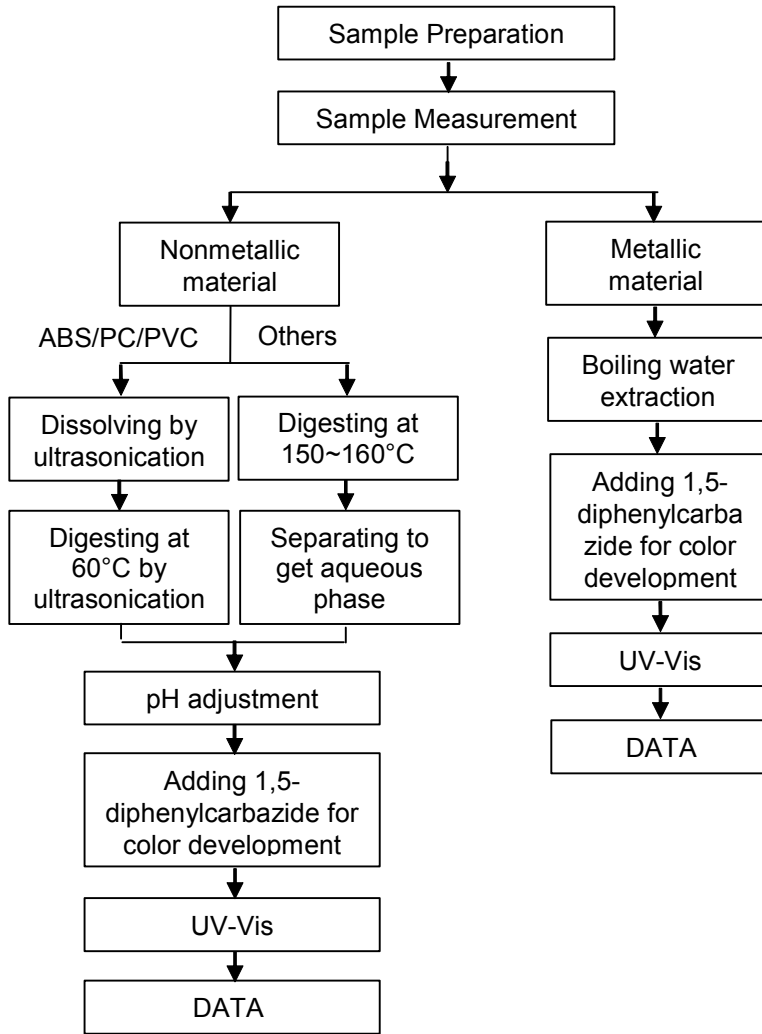
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Hexavalent Chromium (Cr(VI)) Testing Flow Chart



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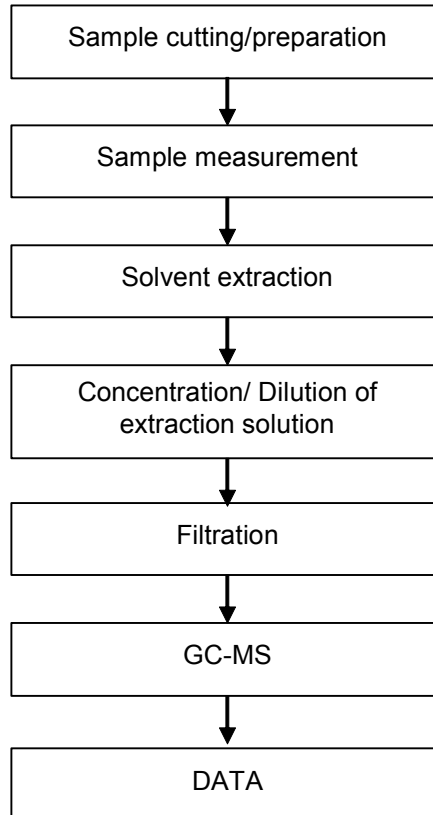
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Flame Retardants Testing Flow Chart

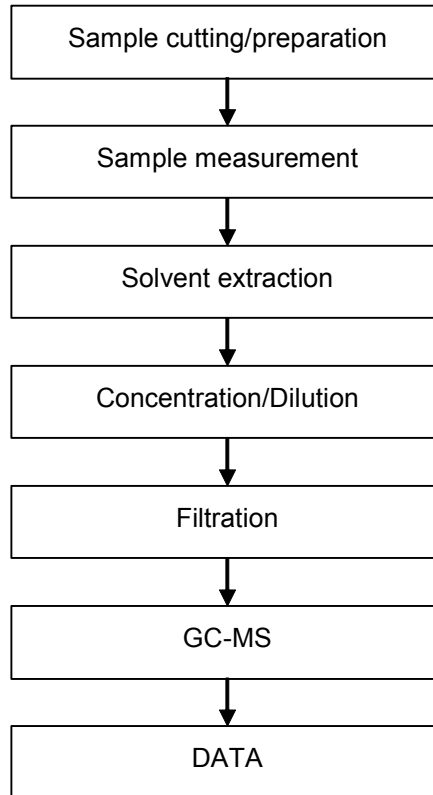


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Phthalates Testing Flow Chart

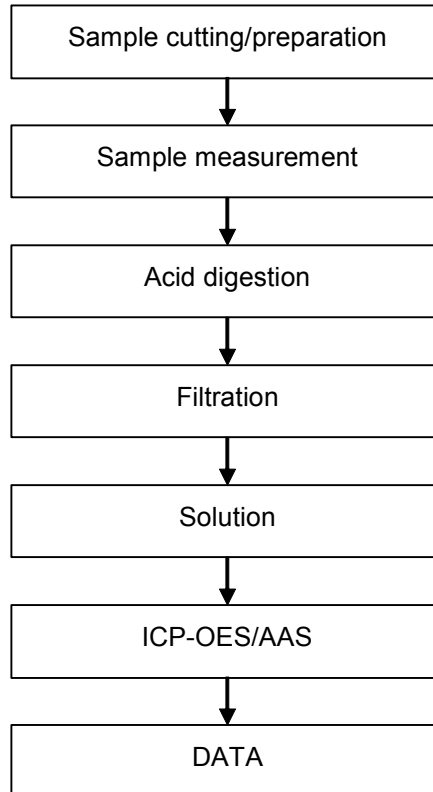


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Elements Testing Flow Chart

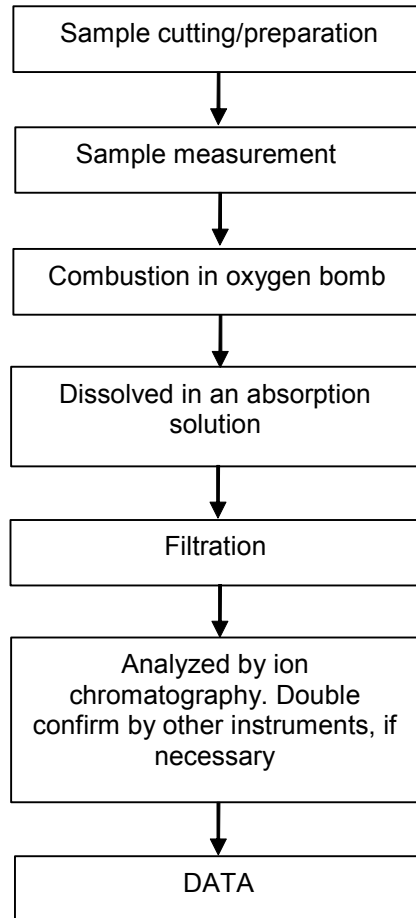


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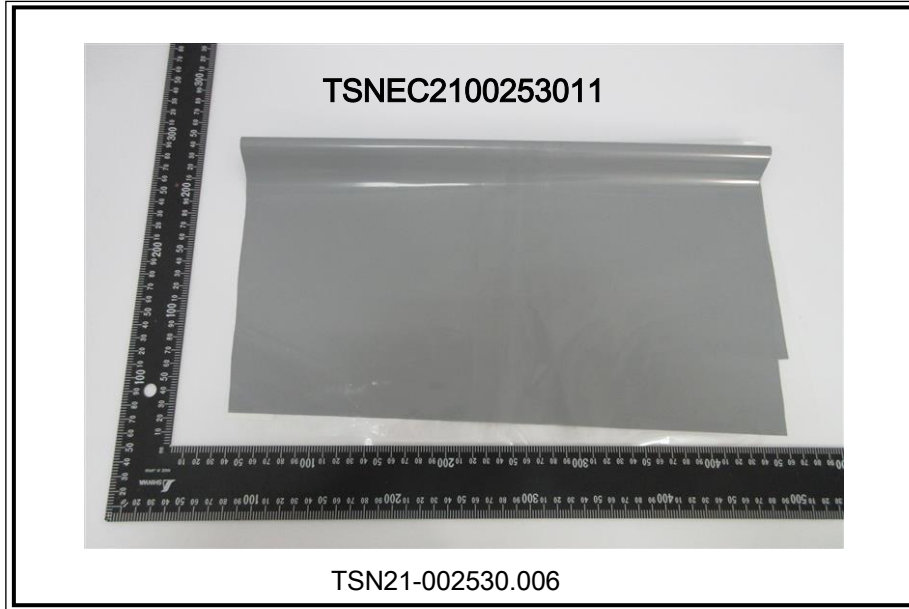
Halogen Testing Flow Chart



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