

REACH Chemical Analysis

Sterling-LWB SIP Module

Version 2.0

REVISION HISTORY

Version	Date	Notes	Contributors	Approver
1.0	2016-08-15	Initial Release	Chris H	N/A
2.0	2018-05-31	Updated to 181 chemicals	Sue F	N/A

CONTENTS

1	General Information	4
1.1	Summary.....	4
1.2	Dates of Test	4
1.3	Test Laboratory	4
1.4	Description of Sample.....	4
1.5	Definitions.....	4
1.6	Measurement Flow Chart	5
2	Chemical Analysis Report.....	5
3	Remarks	15
4	Notes.....	15

1 GENERAL INFORMATION

1.1 Summary

The test results below show that the Sterling-LWB SIP does not contain any of the 181 chemicals that are classified by REACH as Substances of Very High Concern (SVHC).

1.2 Dates of Test

04/05/17 to 04/12/17 and 01/16/18 to 01/31/18.

1.3 Test Laboratory

The chemical testing was completed by SGS, an independent accredited laboratory.

1.4 Description of Sample

This testing was performed on Laird part number 450-0159, Sterling-LWB SIP Module.

1.5 Definitions

MDL = Method Detection Limit. mg/kg = ppm.

N.D. = Not Detected. (The result is below the MDL.) Negative = Undetectable.

GC-MS = Gas Chromatograph-Mass Spectrometer.

GC-MS/MS = Gas Chromatograph-tandem mass spectrometer. GC-FID = Gas Chromatograph-flame ionization detector.

LC-MS/MS = Liquid Chromatograph-tandem mass spectrometer.

OM = Optical Microscope.

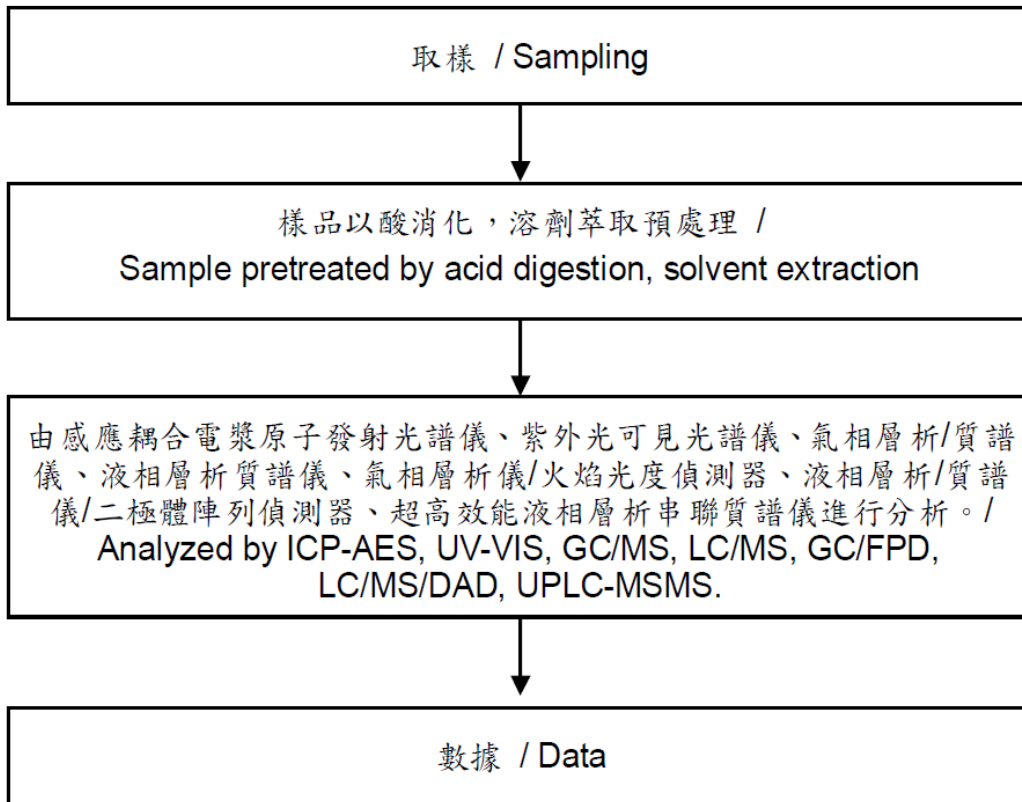
XRF = X-ray Fluorescence Spectrometer.

FTIR = Fourier-Transform Infrared Spectrometer.

ICP-OES = Inductively Coupled Plasma-Optical Emission Spectrometer.

UV-VIS = Ultraviolet-Visible Spectrophotometer.

1.6 Measurement Flow Chart



2 CHEMICAL ANALYSIS REPORT

Test Item(s)	CAS No.	Concentration (%)
1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.1.16,9.02,13.05,10]octadeca-7,15-diene ("Dechlorane Plus"™)	-	n.d.
Benz[a]anthracene	56-55-3, 1718-53-2	n.d.
Cadmium carbonate***	513-78-0	n.d.
Cadmium hydroxide	21041-95-2***	n.d.
Cadmium nitrate	10022-68-1, 10325-94-7	n.d.
Chrysene	218-01-9, 1719-03-5	n.d.

Test Item(s)	CAS No.	Concentration (%)
Reaction products of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and 4-heptylphenol, branched and linear (RP-HP)	-	n.d.
Perfluorohexane-1-sulphonic acid and its salts	355-46-4	n.d.
4,4'-isopropylidenediphenol	80-05-7	n.d.
4-heptylphenol, branched and linear	-	n.d.
Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts	-	n.d.
Nonadecafluorodecanoic acid	335-76-2	n.d.
Decanoic acid, nonadecafluoro-, sodium salt	3830-45-3	n.d.
Ammonium nonadecafluorodecanoate	3108-42-7	n.d.
p-(1,1-dimethylpropyl)phenol	80-46-6	n.d.
Benzo[def]chrysene (Benzo[a]pyrene)	50-32-8	n.d.
1,3-propanesultone	1120-71-4	n.d.
2,4-di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol (UV-327)	3864-99-1	n.d.
2-(2H-benzotriazol-2-yl)-4-(tert-butyl)-6-(sec-butyl)phenol (UV-350)	36437-37-3	n.d.
Nitrobenzene	98-95-3	n.d.
Perfluorononan-1-oic-acid and its sodium and ammonium salts	-	n.d.
Ammonium salts of perfluorononan-1-oic-acid	-, 4149-60-4	n.d.
Perfluorononan-1-oic-acid	375-95-1	n.d.
Sodium salts of perfluorononan-1-oic-acid	-, 21049-39-8	n.d.
1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters or mixed decyl and hexyl and octyl diesters	-	n.d.
1,2-Benzenedicarboxylic acid, mixed decyl and hexyl and octyl diesters	68648-93-1	n.d.
1,2-Benzenedicarboxylic acid, di-C6-10-alkyl esters	68515-51-5	n.d.
5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [1], 5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [2]	-	n.d.

Test Item(s)	CAS No.	Concentration (%)
5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane	-	n.d.
5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane	-	n.d.
2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol (UV-328)	25973-55-1	n.d.
2-benzotriazol-2-yl-4,6-di-tert-butylphenol (UV-320)***	3846-71-7	n.d.
2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (DOTE)***	15571-58-1	n.d.
Cadmium fluoride***	7790-79-6	n.d.
Cadmium sulphate***	10124-36-4, 31119-53-6	n.d.
Reaction mass of 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate and 2-ethylhexyl 10-ethyl-4-[[2-[(2-ethylhexyl)oxy]-2-oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (reaction mass of DOTE and MOTE)***	-	n.n.
1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear	68515-50-4	n.d.
Cadmium chloride***	10108-64-2	n.d.
Sodium perborate, perboric acid, sodium salt***	-	n.d.
Sodium perborate	15120-21-5	n.d.
Perboric acid, sodium salt	11138-47-9	n.d.
Sodium peroxometaborate	7632-04-4	n.d.
Cadmium sulphide***	1306-23-6	n.d.
Dihexyl phthalate	84-75-3	n.d.
Disodium 3,3'-[[1,1'-biphenyl]-4,4'-diylbis(azo)]bis(4-aminonaphthalene-1-sulphonate) (C.I. Direct Red 28)	573-58-0	n.d.
Disodium 4-amino-3-[[4'-[(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo]-5-hydroxy-6-(phenylazo)naphthalene-2,7-disulphonate (C.I. Direct Black 38)	1937-37-7	n.d.
Imidazolidine-2-thione (2-imidazoline-2-thiol)	96-45-7	n.d.
Lead di(acetate)***	301-04-2	n.d.
Trixylyl phosphate	25155-23-1	n.d.
4-Nonylphenol, branched and linear, ethoxylated	-	n.d.
Ammonium pentadecafluorooctanoate (APFO)***	3825-26-1	n.d.

Test Item(s)	CAS No.	Concentration (%)
Cadmium	7440-43-9	n.d.
Cadmium oxide***	1306-19-0	n.d.
Dipentyl phthalate (DPP)	131-18-0	n.d.
Pentadecafluorooctanoic acid (PFOA)	335-67-1	n.d.
1,2-Benzenedicarboxylic acid, dipentyl ester, branched and linear	84777-06-0	n.d.
1,2-diethoxyethane	629-14-1	n.d.
1-bromopropane (n-propyl bromide)	106-94-5	n.d.
3-ethyl-2-methyl-2-(3-methylbutyl)-1,3-oxazolidine	143860-04-2	n.d.
4,4'-methylenedi-o-toluidine	838-88-0	n.d.
4,4'-oxydianiline and its salts	-	n.d.
4,4'-oxydianiline	101-80-4	n.d.
4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated	-	n.d.
4-aminoazobenzene	60-09-3	n.d.
4-methyl-m-phenylenediamine (toluene-2,4-diamine)	95-80-7	n.d.
4-Nonylphenol, branched and linear	-	n.d.
6-methoxy-m-toluidine (p-cresidine)	120-71-8	n.d.
[Phthalato(2-)]dioxotrilead	69011-06-9	n.d.
Acetic acid, lead salt, basic	51404-69-4	n.d.
Biphenyl-4-ylamine	92-67-1	n.d.
Bis(pentabromophenyl) ether (decabromodiphenyl ether) (DecaBDE)	1163-19-5	n.d.
Cyclohexane-1,2-dicarboxylic anhydride	-	n.d.

Test Item(s)	CAS No.	Concentration (%)
Cyclohexane-1,2-dicarboxylic anhydride	85-42-7	n.d.
trans-cyclohexane-1,2-dicarboxylic anhydride	14166-21-3	n.d.
cis-cyclohexane-1,2-dicarboxylic anhydride	13149-00-3	n.d.
Diazene-1,2-dicarboxamide (C,C'-azodi(formamide)) (ADCA)	123-77-3	n.d.
Dibutyltin dichloride (DBTC)***	683-18-1	n.d.
Diethyl sulphate	64-67-5	n.d.
Diisopentyl phthalate	605-50-5	n.d.
Dimethyl sulphate	77-78-1	n.d.
Dinoseb (6-sec-butyl-2,4-dinitrophenol)	88-85-7	n.d.
Dioxobis(stearato)trilead	12578-12-0	n.d.
Fatty acids, C16-18, lead salts	91031-62-8	n.d.
Furan	110-00-9	n.d.
Henicosafleuroundecanoic acid	2058-94-8	n.d.
Heptacosafleurotetradecanoic acid	376-06-7	n.d.
Hexahydromethylphthalic anhydride	-	n.d.
Hexahydromethylphthalic anhydride	25550-51-0	n.d.
Hexahydro-4-methylphthalic anhydride	19438-60-9	n.d.
Hexahydro-3-methylphthalic anhydride	57110-29-9	n.d.
Hexahydro-1-methylphthalic anhydride	48122-14-1	n.d.
Lead bis(tetrafluoroborate)***	13814-96-5	n.d.
Lead cyanamidate***	20837-86-9	n.d.
Lead dinitrate***	10099-74-8	n.d.

Test Item(s)	CAS No.	Concentration (%)
Lead monoxide (lead oxide)***	1317-36-8	n.d.
Lead oxide sulfate***	12036-76-9	n.d.
Lead titanium trioxide***	12060-00-3	n.d.
Lead titanium zirconium oxide***	12626-81-2	n.d.
Methoxyacetic acid	625-45-6	n.d.
Methyloxirane (Propylene oxide)	75-56-9	n.d.
N,N-dimethylformamide	68-12-2	n.d.
N-methylacetamide	79-16-3	n.d.
N-pentyl-isopentylphthalate	776297-69-9	n.d.
o-aminoazotoluene	97-56-3	n.d.
o-toluidine	95-53-4	n.d.
Orange lead (lead tetroxide)***	1314-41-6	n.d.
Pentacosafuorotridecanoic acid	72629-94-8	n.d.
Pentalead tetraoxide sulphate***	12065-90-6	n.d.
Pyrochlore, antimony lead yellow	8012-00-8	n.d.
Silicic acid (H ₂ Si ₂ O ₅), barium salt (1:1), lead-doped	68784-75-8	n.d.
Silicic acid, lead salt***	11120-22-2	n.d.
Sulfurous acid, lead salt, dibasic***	62229-08-7	n.d.
Tetraethyllead***	78-00-2	n.d.
Tetralead trioxide sulphate***	12202-17-4	n.d.
Tricosafuorododecanoic acid	307-55-1	n.d.
Trilead bis(carbonate) dihydroxide	1319-46-6	n.d.
Trilead dioxide phosphonate***	12141-20-7	n.d.

Test Item(s)	CAS No.	Concentration (%)
1,2-bis(2-methoxyethoxy)ethane (TEGDME, triglyme)	112-49-2	n.d.
1,2-dimethoxyethane, ethylene glycol dimethyl ether (EGDME)	110-71-4	n.d.
1,3,5-Tris(oxiran-2-ylmethyl)-1,3,5-triazinane-2,4,6-trione (TGIC)	2451-62-9	n.d.
1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione (β-TGIC)	59653-74-6	n.d.
4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol	561-41-1	n.d.
4,4'-bis(dimethylamino)benzophenone (Michler's ketone)	90-94-8	n.d.
[4-[4,4'-bis(dimethylamino) benzhydrylidene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride (C.I. Basic Violet 3)	548-62-9	n.d.
[4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]methylene]cyclohexa-2,5-dien-1-ylidene] dimethylammonium chloride (C.I. Basic Blue 26)	2580-56-5	n.d.
Diboron trioxide***	1303-86-2	n.d.
Formamide	75-12-7	n.d.
Lead(II) bis(methanesulfonate)***	17570-76-2	n.d.
N,N,N',N'-tetramethyl-4,4'-methylenedianiline (Michler's base)	101-61-1	n.d.
α,α-Bis[4-(dimethylamino)phenyl]-4 (phenylamino)naphthalene-1-methanol (C.I. Solvent Blue 4)	6786-83-0	n.d.
1,2-dichloroethane***	107-06-2	n.d.
2,2'-dichloro-4,4'-methylenedianiline	101-14-4	n.d.
2-Methoxyaniline, o-Anisidine	90-04-0	n.d.
4-(1,1,3,3-tetramethylbutyl)phenol	140-66-9	n.d.
Aluminosilicate Refractory Ceramic Fibres	-	n.d.
Arsenic acid	7778-39-4	n.d.
Bis(2-methoxyethyl) ether	111-96-6	n.d.
Bis(2-methoxyethyl) phthalate	117-82-8	n.d.
Calcium arsenate***	7778-44-1	n.d.

Test Item(s)	CAS No.	Concentration (%)
Dichromium tris(chromate)***	24613-89-6	n.d.
Formaldehyde, oligomeric reaction products with aniline	25214-70-4	n.d.
Lead diazide, Lead azide***	13424-46-9	n.d.
Lead dipicrate***	6477-64-1	n.d.
Lead styphnate***	15245-44-0	n.d.
N,N-dimethylacetamide	127-19-5	n.d.
Pentazinc chromate octahydroxide***	49663-84-5	n.d.
Phenolphthalein	77-09-8	n.d.
Potassium hydroxyoctaoxodizincatedichromate***	11103-86-9	n.d.
Trilead diarsenate	3687-31-8	n.d.
Zirconia Aluminosilicate Refractory Ceramic Fibres	-	n.d.
1,2,3-trichloropropane	96-18-4	n.d.
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich	71888-89-6	n.d.
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters	68515-42-4	n.d.
1-Methyl-2-pyrrolidone (NMP)	872-50-4	n.d.
2-ethoxyethyl acetate	111-15-9	n.d.
Hydrazine	302-01-2, 7803-57-8	n.d.
Strontium chromate***	7789-06-2	n.d.
2-ethoxyethanol	110-80-5	n.d.
2-methoxyethanol	109-86-4	n.d.
Acids generated from chromium trioxide and their oligomers	-	n.d.
Dichromic acid***	7738-94-5	n.d.

Test Item(s)	CAS No.	Concentration (%)
Oligomers of chromic acid and dichromic acid	-	n.d.
Chromic acid***	13530-68-2	n.d.
Chromium trioxide***	1333-82-0	n.d.
Cobalt(II) carbonate***	513-79-1	N/A*
Cobalt(II) diacetate***	71-48-7	N/A*
Cobalt(II) dinitrate***	10141-05-6	N/A*
Cobalt(II) sulphate***	10124-43-3	N/A*
Ammonium dichromate***	7789-09-5	n.d.
Boric acid***	-	n.d.
Boric acid, crude natural***	11113-50-1	n.d.
Boric acid***	10043-35-3	n.d.
Disodium tetraborate, anhydrous***	12179-04-3, 1303-96-4, 1330-43-4	n.d.
Potassium chromate***	7789-00-6	n.d.
Potassium dichromate***	7778-50-9	n.d.
Sodium chromate***	7775-11-3	n.d.
Tetraboron disodium heptaoxide, hydrate	12267-73-1	n.d.
Trichloroethylene	79-01-6	n.d.
Acrylamide	79-06-1	n.d.
2,4-dinitrotoluene	121-14-2	n.d.
Anthracene oil**	90640-80-5	n.d.
Anthracene oil, anthracene paste	90640-81-6	n.d.
Anthracene oil, anthracene paste, anthracene fraction**	91995-15-2	n.d.
Anthracene oil, anthracene paste, distn. Lights**	91995-17-4	n.d.

Test Item(s)	CAS No.	Concentration (%)
Anthracene oil, anthracene-low**	90640-82-7	n.d.
Diisobutyl phthalate	84-69-5	n.d.
Lead chromate***	7758-97-6	n.d.
Lead chromate molybdate sulphate red (C.I. Pigment Red 104)	12656-85-8	n.d.
Lead sulfochromate yellow (C.I. Pigment Yellow 34)***	1344-37-2	n.d.
Pitch, coal tar, high-temp.**	65996-93-2	n.d.
Tris(2-chloroethyl) phosphate	115-96-8	n.d.
4,4'- Diaminodiphenylmethane (MDA)	101-77-9	n.d.
5-tert-butyl-2,4,6-trinitro-m-xylene (Musk xylene)	81-15-2	n.d.
Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	85535-84-8	n.d.
Anthracene	120-12-7	n.d.
Benzyl butyl phthalate (BBP)	85-68-7	n.d.
Bis (2-ethylhexyl)phthalate (DEHP)	117-81-7	n.d.
Bis(tributyltin) oxide (TBTO)***	56-35-9	n.d.
Cobalt dichloride	7646-79-9	n.d.
Diarsenic pentaoxide	1303-28-2	n.d.
Diarsenic trioxide	1327-53-3	n.d.
Dibutyl phthalate (DBP)	84-74-2	n.d.
Hexabromocyclododecane (HBCDD)	-	n.d.
Hexabromocyclododecane	25637-99-4	n.d.
1,2,5,6,9,10-hexabromocyclododecane	3194-55-6	n.d.
alpha-hexabromocyclododecane	134237-50-6	n.d.

Test Item(s)	CAS No.	Concentration (%)
beta-hexabromocyclododecane	134237-51-7	n.d.
gamma-hexabromocyclododecane	134237-52-8	n.d.
Lead hydrogen arsenate	7784-40-9	n.d.
Sodium dichromate	10588-01-9, 7789-12-0	n.d.
Triethyl arsenate	15606-95-8	n.d.

3 REMARKS

- Candidate list of SVHC (2018/01/15): <http://echa.eu.web/guest/candidate-list-table>
- In accordance with Regulation (EC) No 1907/2006, any product or importer of articles shall notify ECHA in accordance with paragraph 2 of Article 7, if a substance meets the criteria in Article 57 and is identified in accordance with Article 59(1) of the Regulation, if (a) the substance is present in those articles in quantities totaling over one tonne per producer or importer per year; and (b) the substance is present in those articles above a concentration of 0.1% weight by weight (w/w).
- Article 33 of Regulation (EC) No 1907/2006 requires supplier of an article containing a substance meeting the criteria in Article 57 and identified in accordance with Article 59(1) in concentration above 0.1% weight by weight (w/w) shall provide the recipient of the article with sufficient information, available to the supplier, to allow safe use of the article including, as a minimum, the name of that substance.
- If a SVHC is found over the reporting limit, client is suggested to identify the component which contains the SVHC and the exact concentration of the SVHC by requesting further quantitative analysis from the laboratory.

4 NOTES

- Mg/kg = ppm:0.1wt%
- RL = Reporting Limit
- N.d = not detected = below Reporting Limit
- "-" = Not Regulated
- (*1): Oligomers of chromic acid and dichromic acid: since the oligomers are made of the unknown amount of chromic acid or dichromic acid that results in no fixed molecular weight, therefore the monomer of chromic acid or dichromic acid is relevant and considered.
- (*2): Tetraboron disodium heptaoxide, hydrate: Only anhydrous form of disodium tetraborate is relevant and considered according to ECHA explanation (Ref no. INC 000000032519).
- (*): (conc. Of Sodium dichromate dihydrate = conc of sodium dichromate x 1.1374)
- (**): The concentrations of above mentioned mixtures are evaluated per the gained composition rate between the selected marks and the mixtures.
- (***) The substance was calculated by the test results of Monoctyl Tin, Dioctyl Tin, Tributyl Tin, Dibutyl TIN, PFOA or element (Exx. Arsenic, Lead, Cr(VI), Boron, Cobalt, Barium, Cadmium respectively).

The Test Result is given as:

Substance Name	RL (%)	Concentration (%)
Tributyl Tin (TBT)	0.05	n.d.
Arsenic (As) (✖ 2)	0.005	n.d.
Lead (Pb)	0.005	n.d.
Hexavalent Chromium Cr(VI)	0.005	n.d.
Boron (B) (✖ 2)	0.005	n.d.
Cobalt (Co)	0.005	0.0623
Dibutyl Tin (DBT)	0.05	n.d.
Barium (Ba)	0.005	0.150
Diocetyl Tin (DOT)	0.0230	n.d.
Monooctyl Tin (MOT)	0.0138	n.d.

10. Parameter Conversion Table: http://Twap.sgs.com/sgsrsts/chn/download-REACH_tw.asp
11. Classification: Please refer to http://twap.sgs.com/sgsrsts/chn/download-REACH_tw.asp
12. (✖ 1): (regarding the compound containing arsenic and lead, lead and arsenic are tested and respectively used for the calculation of the independent concentration of the compound containing arsenic and lead. The minimum value of the two independently calculated concentrations is used as the final concentration for the report).
13. (✖ 2): The extracted soluble Boron / Arsenic are detected by ICP-AES.
14. (✖ 3): TGIC is a mixture and also contains β -TGIC. According to the ECHA's technical dossier, the ratio of β -TGIC to TGIC is around 1 to 10. Therefore β -TGIC is issued based on the above mentions ratio.
15. (✖ 4): Only if both qualitative results of lead and silicon are positive, the test result of the compound will be calculated based on the concentration of Barium.
16. (✖ 5): (Regarding the compound containing Cr(VI) and lead, lead and Cr(VI) are tested and respectively used for the calculation of the independent concentration of the compound containing Cr(VI) and lead. The minimum value of the two independently calculated concentrations is used as the final concentration for the report.
17. (✖ 7): RP-HP can't be identified directly and test result can't be calculated based on specific element(s) or compound. RP-HP is identified as SVHC because of 4-HPb1. Therefore, HPb1 is analyzed instead of RP_HP.
18. N/A* = Not Applicable to direct analysis. The item can't directly be identified. Therefore, the specific element(s) of SVHC was analyzed according to the recommendations from ECHA. The submitted sample was found to contain detectable amount of specific element(s) of SVHC. Upon further test verification or information provided

from the client, the source of detectable specific element(s) can't be identified from SVHC. Therefore, the test result is expressed as N/A*.