

Test Report No. : ATL-RoHS-200612-1

Client : LEADER ENERGY
#710 Mecajeon, 117, Hwanggeum-ro,
Yangchon-eup, Gimpo-si, Gyeonggi-do, KOREA

Test Item(s)/Model No.(s) : heat pipe & heat pipe working liquid

Test specification : Restriction of the Use of Hazardous Substances Directive(RoHS) 2011/65/EU
with amendment 2015/863

Verification Period : Jun. 12. 2020 ~ Jun. 19. 2020

Issued date : Jun. 19. 2020

Test Result : Please refer to next page(s)

Verification Conclusion :

Based on the review of previous report and verification results of the submitted samples, the results of Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE), Phthalates (DEHP, DBP, BBP, DIBP) comply with the limits set by RoHS Directive 2011/65/EU with amendment 2015/863.

Checked by :



Mi Soon Yeo / Person in charge

Reviewed by :



Yong Sung Park / Technical Manager

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Details on Results

Part Description Number	Restricted Substances	Results of EDXRF	Results of Related or Additional Wet Chemical Tests (mg/kg)	Report No. of Related or Additional Wet Chemical Test	Conclusion on RoHS	Remark
1	Cd	BL		200612-1	Comply	
	Pb	BL			Comply	
	Hg	BL			Comply	
	Cr ⁶⁺	BL			Comply	
	PBBs	BL			Comply	
	PBDEs				Comply	
	DEHP	-	N.D		Comply	
	DBP	-	N.D		Comply	
	BBP	-	N.D		Comply	
	DIBP	-	N.D		Comply	
2	Cd	BL		200612-2	Comply	heat pipe working liquid
	Pb	BL			Comply	
	Hg	BL			Comply	
	Cr ⁶⁺	BL			Comply	
	PBBs	BL			Comply	
	PBDEs				Comply	
	DEHP	-	N.D		Comply	
	DBP	-	N.D		Comply	
	BBP	-	N.D		Comply	
	DIBP	-	N.D		Comply	

Remark

A. Screening Test by XRF Spectroscopy.

Test method : 1.Cadmium, Lead, Mercury, Total Chromium, Total Bromine
With reference to IEC 62321-3-1 (ed1.0)b : 2013

XRF Screening limits for different matrices :

Element	Polymers	Metals	Composite material
Cd	X ≤50 (BL) 50 < X ≤ (OL)	X ≤50 (BL) 50 < X ≤ (OL)	X ≤50 (BL) 50 < X ≤ (OL)
Pb	X ≤500 (BL) 500 < X ≤ (OL)	X ≤500 (BL) 500 < X ≤ (OL)	X ≤500 (BL) 500 < X ≤ (OL)
Hg	X ≤500 (BL) 500 < X ≤ (OL)	X ≤500 (BL) 500 < X ≤ (OL)	X ≤500 (BL) 500 < X ≤ (OL)
Br	X ≤300 (BL) 300 < X ≤ (OL)	-	X ≤250 (BL) 250 < X ≤ (OL)
Cr	X ≤500 (BL) 500 < X ≤ (OL)	X ≤500 (BL) 500 < X ≤ (OL)	X ≤500 (BL) 500 < X ≤ (OL)

When the screening result of Cd, Pb and Hg were detected above the screening limits,
Thus the further wet chemistry tests were suggested.
And the Total Chromium content in sample was found to be exceeded the limit (OL).

Negative = Absence of Cr⁶⁺ coating, Positive = Presence of Cr⁶⁺ coating.
BL = Below Limit, OL = Over Limit

B. Confirmation Test by Wet Chemistry.

Test method : 1.Cadmium, Lead - Ref. to IEC 62321-5 : 2013, ICP-OES
2.Mercury - Ref. to IEC 62321-4 : 2013, ICP-OES
3.Chromium VI - Ref. to IEC 62321-7-1 : 2015(metal), UV/VIS
and IEC 62321-7-2 : 2017, UV/VIS(polymer)
4.PBBs, PBDEs - Ref. to IEC 62321-6 : 2015, GC/MS
5.Pthalates(DEHP, DBP, BBP, DIBP) - Ref. to IEC 62321-8 : 2017, GC/MS

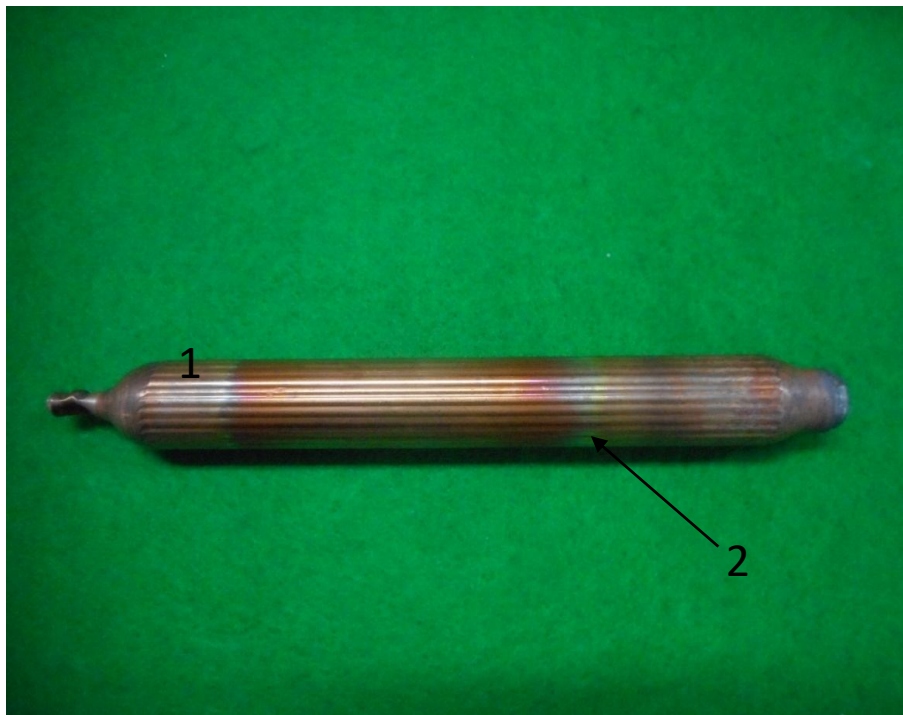
Element	unit (mg/kg)					
	Cd	Pb	Hg	Cr ⁶⁺	PBBs & PBDEs	Phthalates
MDL	0.5	5	2	1	5	50

Abbreviation : Pb denotes Lead
Cd denotes Cadmium
Hg denotes Mercury
Cr (⁶⁺) denotes Chromium (VI)
PBBs denotes Total Polybrominated Biphenyls
PBDEs denotes Total Polybrominated Diphenyl Ethers
N.D denotes Not detected
N.A denotes Not Applicable
MDL donotes Method Detection Limit

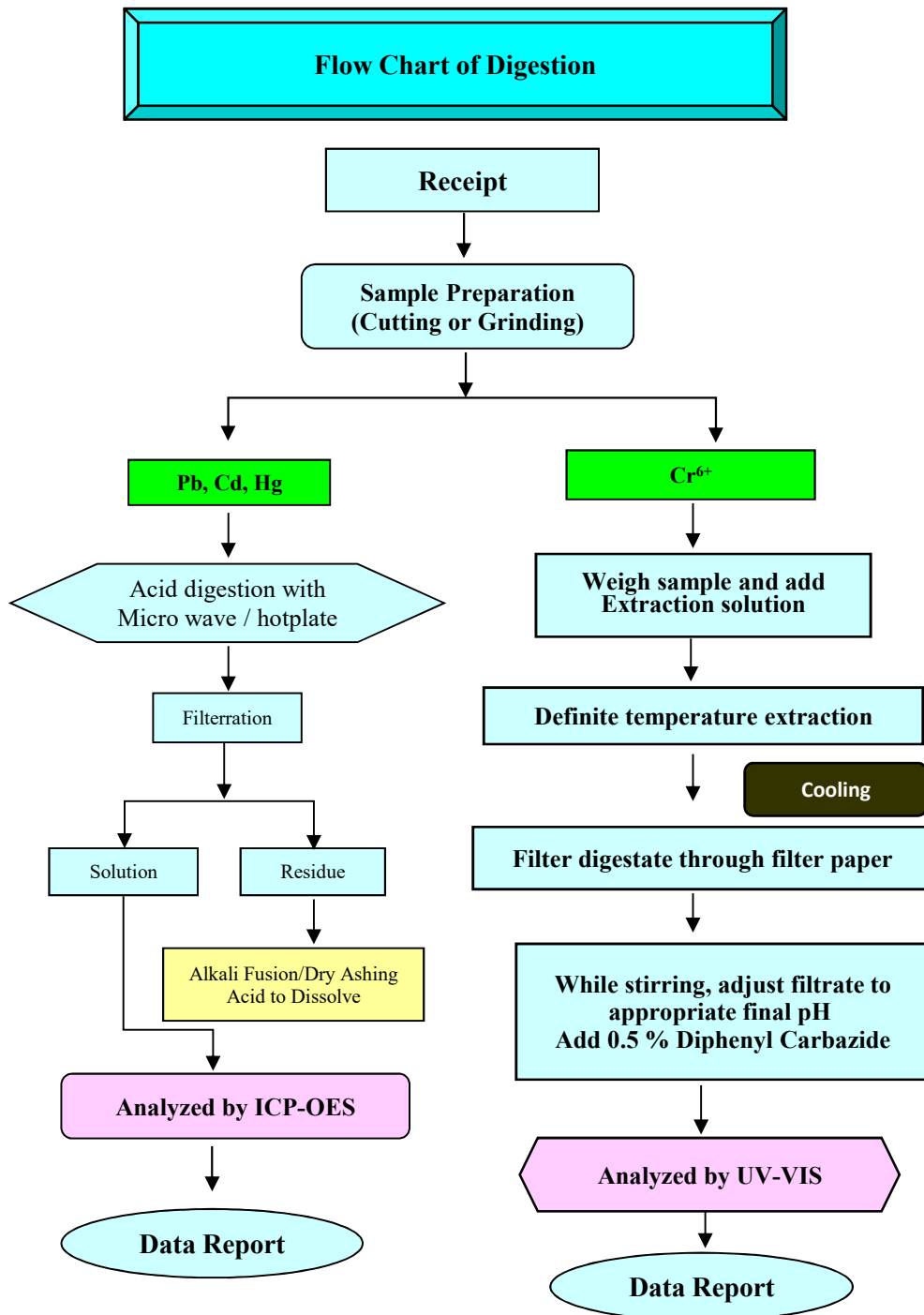
Picture of sample as Received :



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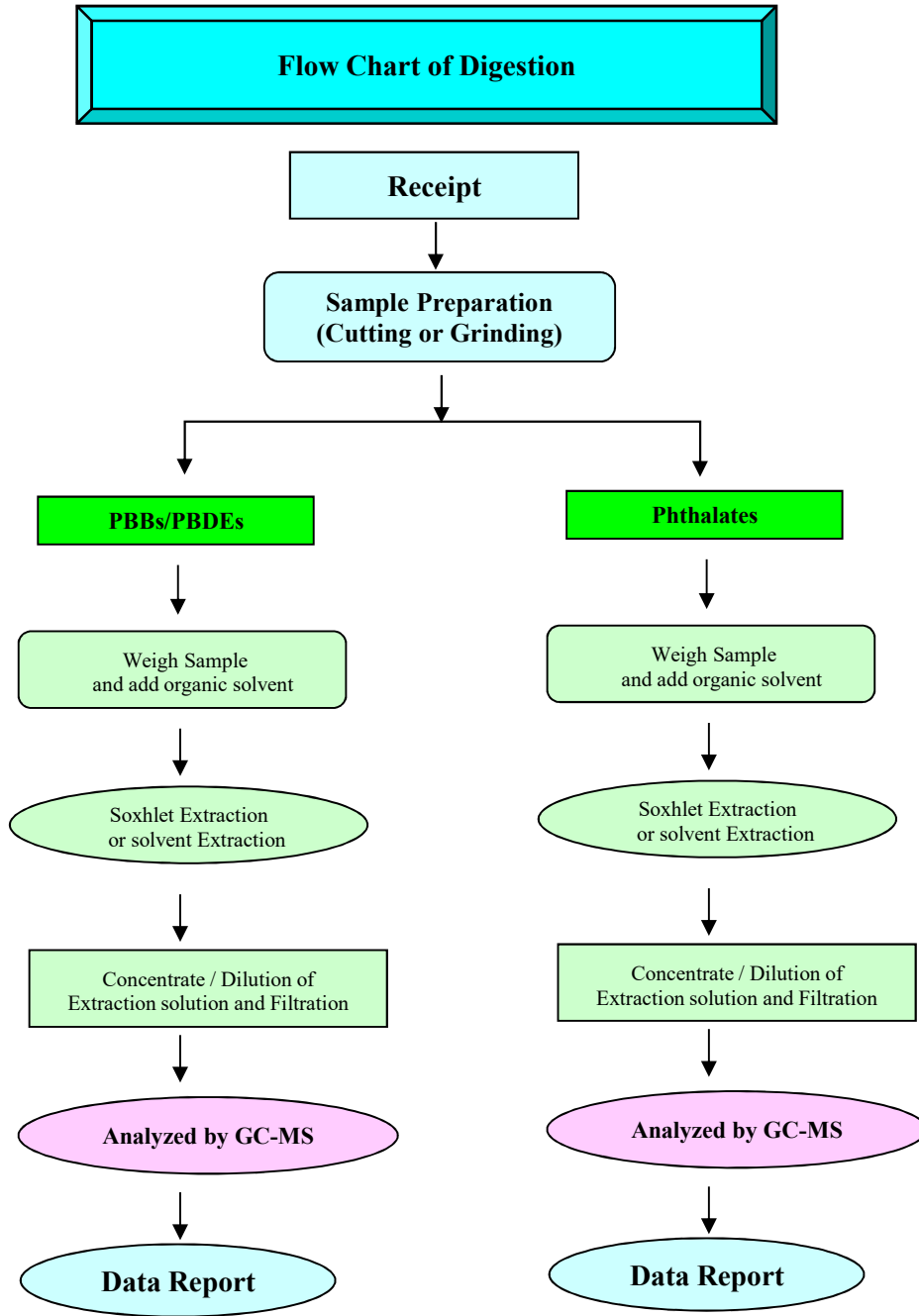


Wet Chemistry test Flow-Chart



► Remarks : The samples were dissolved totally by pre-conditioning method according to above flow chart

Wet Chemistry test Flow-Chart



► Remarks : The samples were dissolved totally by pre-conditioning method according to above flow chart

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***** End of Report *****