TEST REPORT

No. **8621.SH.2106.0178** Date: **07.09, 2021** Page: **1 / 19**

Applicant	:	ZHEJIANG FANGYUAN SIFU MECHANICAL AND ELECTRICAL CO., LTD.
Address	:	2479 HAIFENG ROAD, DEVELOPMENT ZONE, TAIZHOU CITY, ZHEJIANG PROVINCE, CHINA

Below information submitted by the applicant:

Product Name	:	Electric Motor
Model	:	/
Model may cover	:	/
Reference info.	:	/
Manufacturer info.	:	/
Supplier info.	:	/
Buyer info.	:	/
Country of Destination	:	/
Country of Origin	:	China

Sample Received	:	06.21, 2021
Test Period	:	06.21, 2021 - 07.05, 2021
Test Requirement	:	Refer to next pages
Test Method	:	Refer to next pages
Test Result	:	Refer to next pages
Test Conclusion	:	Refer to next pages

Signed for and on behalf of
Jordan Wang, General Manager
BU Chemical Compliance
TUV THURINGEN (SHANGHAI) CO., LTD.
Location: Shanghai

TEST RESULTS

As requested by the client, test items as below:

	Test Items	Verdict
1.	RoHS 2.0 directive 2011/65/EU and its commission delegated directive No.2015/863 - Lead and its compounds - Cadmium and its compounds - Mercury and its compounds - Hexavalent Chromium and its compounds - PBBs and PBDEs - Phthalates (DBP, BBP, DEHP, DIBP)	PASS

LIMIATATION

LIMIATION SETTED BY Commission Delegated Directive (EU) No.2015/863 amending ANNEX II to directive 2011/65/EU of the European Parliament and the Council as regards the list of restricted substances.

Restricted substance	Units	Permissible Limitation
Lead, Pb	%	0.1, max
Mercury, Hg	%	0.1, max
Cadmium, Cd	%	0.01, max
Hexavalent Chromium, CrVI	%	0.1, max
Polybrominated biphenyls, PBBs	%	0.1, sum, max
Polybrominated diphenyl ethers, PBDEs	%	0.1, sum, max
Bis(2-ethylhexyl) phthalate, DEHP	%	0.1, max
Butyl benzyl phthalate, BBP	%	0.1, max
Dibutyl phthalate, DBP	%	0.1, max
Diisobutyl phthalate, DIBP	%	0.1, max

* those provisions shall be applied from 22 July 2019; 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; The restriction of DEHP, BBP, DBP and DIBP shall not apply to cables or spare parts for the repair, the reuse, the updating of functionalities or upgrading of capacity of EEE placed on the market before 22 July 2019, and of medical devices, including in vitro medical devices, and monitoring and control instruments, including industrial monitoring and control instruments, placed on the market before 22 July 2021; The restriction of DEHP, BBP and DBP shall not apply to toys which are already subject to the restriction of DEHP, BBP and DBP through entry 51 of Annex XVII to Regulation (EC) No 1907/2006.

******** To be continued ********

SAMPLE DESCRIPTION

Sample Description : Electric motor

TEST RESULT(S)

1. Lead (Pb)/ Cadmium (Cd)/ Mercury(Hg)/ Hexavalent Chromium(Cr6+)/ PBBs/PBDEs/ Phthalates

Test Method: With reference to:

IEC 62321-1:2013 Determination of certain substances in electrotechnical products - Part 1: Introduction and overview

IEC 62321-2:2013 Determination of certain substances in electrotechnical products - Part 2: Disassembly, disjunction and mechanical sample preparation

IEC 62321-3-1:2013 Determination of certain substances in electrotechnical products - Part 3-1: Screening - Lead, mercury, cadmium, total chromium and total bromine using X-ray fluorescence spectrometry

IEC 62321-3-2:2013 Determination of certain substances in electrotechnical products - 3-2: Screening - Total bromine in polymers and electronics by Combustion - Ion Chromatography

IEC 62321-4:2013+AMD1:2017 CSV Determination of certain substances in electrotechnical products - Part 4: Mercury in polymers, metals and electronics by CV-AAS, CV-AFS, ICP-OES and ICP-MS

IEC 62321-5:2013 Determination of certain substances in electrotechnical products - Part 5: Cadmium, lead and chromium in polymers and electronics and cadmium and lead in metals by AAS, AFS, ICP-OES and ICP-MS

IEC 62321-6:2015 Determination of certain substances in electrotechnical products - Part 6: Polybrominated biphenyls and polybrominated diphenyl ethers in polymers by gas chromatograhy -mass spectometry (GC-MS)

IEC 62321-7-1:2015 Determination of certain substances in electrotechnical products - Part 7-1: Hexavalent chromium - Presence of hexavalent chromium (Cr(VI)) in colorless and colored corrosion-protected coatings on metals by the colorimetric method

IEC 62321-7-2:2017 Determination of certain substances in electrotechnical products - Part 7-2: Hexavalent chromium - Determination of hexavalent chromium (Cr(VI)) in polymers and electronics by the colorimetric method

IEC 62321-8:2017 Determination of certain substances in electrotechnical products - Part 8: Phthalates in polymers by gas chromatography-mass spectrometry (GC-MS), gas chromatography-mass spectrometry using a pyrolyzer/thermal desorption accessory (Py-TD-GC-MS)

Part No.	Part Description	Restricted Substances	Result of EDXRF (1)	Result of Chemical Testing (2) (mg/kg)	Conclusion On RoHS	Data Submitted / Resubmitted Date
NT2106210 08-01	Fiberglass sleeve	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	n.d.	comply	
		DIBP	---	n.d.	comply	
NT2106210 08-02	Red insulating protective layer	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	213	comply	
		DIBP	---	n.d.	comply	

Part No.	Part Description	Restricted Substances	Result of EDXRF (1)	Result of Chemical Testing (2) (mg/kg)	Conclusion On RoHS	Data Submitted / Resubmitted Date
NT2106210 08-03	Black insulating protective layer	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	225	comply	
		DIBP	---	n.d.	comply	
NT2106210 08-04	Blue insulating protective layer	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	193	comply	
		DIBP	---	n.d.	comply	
NT2106210 08-05	White insulating protective layer	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	204	comply	
		DIBP	---	n.d.	comply	
NT2106210 08-06	silvery metal	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	BL	---	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	
NT2106210 08-07	Black plastic	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	n.d.	comply	
		DIBP	---	n.d.	comply	

Part No.	Part Description	Restricted Substances	Result of EDXRF (1)	Result of Chemical Testing (2) (mg/kg)	Conclusion On RoHS	Data Submitted / Resubmitted Date
NT2106210 08-08	Black plastic	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	n.d.	comply	
		DIBP	---	n.d.	comply	
NT2106210 08-09	Black plastic	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	n.d.	comply	
		DIBP	---	n.d.	comply	
NT2106210 08-10	Blue insulating protective layer	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	195	comply	
		DIBP	---	n.d.	comply	
NT2106210 08-11	Silver screws	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	BL	---	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	
NT2106210 08-12	White plastic	Pb	BL	---	comply	Jun.23, 2021 Jun.24, 2021
		Cd	BL	---	comply	
		Hg	BL	---	comply	
		Cr/Cr(VI)	BL	---	comply	
		PBBs	BL	---	comply	
		PBDEs	BL	---	comply	
		DBP	---	n.d.	comply	
		BBP	---	n.d.	comply	
		DEHP	---	n.d.	comply	
		DIBP	---	n.d.	comply	

Part No.	Part Description	Restricted Substances	Result of EDXRF (1)	Result of Chemical Testing (2) (mg/kg)	Conclusion On RoHS	Data Submitted / Resubmitted Date
NT2106210 08-13	Silver screws	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	BL	---	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	
NT2106210 08-14	screw	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	IN	Negative	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	
NT2106210 08-15	Silver metal sheet	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	BL	---	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	
NT2106210 08-16	Silver nut	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	BL	---	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	
NT2106210 08-17	Silver metal sheet	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	BL	---	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	

Part No.	Part Description	Restricted Substances	Result of EDXRF (1)	Result of Chemical Testing (2) (mg/kg)	Conclusion On RoHS	Data Submitted / Resubmitted Date
NT2106210 08-18	Black rubber gasket	Pb Cd Hg Cr/Cr(VI) PBBs PBDEs DBP BBP DEHP DIBP	BL BL BL BL BL BL --- --- --- ---	--- --- --- --- --- --- n.d. n.d. n.d. n.d.	comply comply comply comply comply comply comply comply comply comply	Jun.23, 2021 Jun.24, 2021
NT2106210 08-19	Gray metal cover	Pb Cd Hg Cr/Cr(VI) PBBs PBDEs DBP BBP DEHP DIBP	IN BL BL IN --- --- --- --- --- ---	1334* --- --- Negative --- --- --- --- --- ---	Comply Comply Comply Comply N.A. N.A. N.A. N.A. N.A. N.A.	Jun.23, 2021
NT2106210 08-20	Silver metal shaft	Pb Cd Hg Cr/Cr(VI) PBBs PBDEs DBP BBP DEHP DIBP	BL BL BL IN --- --- --- --- --- ---	--- --- --- Negative --- --- --- --- --- ---	Comply Comply Comply Comply N.A. N.A. N.A. N.A. N.A. N.A.	Jun.23, 2021
NT2106210 08-21	Motor metal shell	Pb Cd Hg Cr/Cr(VI) PBBs PBDEs DBP BBP DEHP DIBP	BL BL BL IN --- --- --- --- --- ---	--- --- --- Negative --- --- --- --- --- ---	Comply Comply Comply Comply N.A. N.A. N.A. N.A. N.A. N.A.	Jun.23, 2021
NT2106210 08-23	Yellow tape	Pb Cd Hg Cr/Cr(VI) PBBs PBDEs DBP BBP DEHP DIBP	BL BL BL BL BL BL --- --- --- ---	--- --- --- --- --- --- n.d. n.d. n.d. n.d.	comply comply comply comply comply comply comply comply comply comply	Jun.23, 2021 Jun.24, 2021

Part No.	Part Description	Restricted Substances	Result of EDXRF (1)	Result of Chemical Testing (2) (mg/kg)	Conclusion On RoHS	Data Submitted / Resubmitted Date
NT210621008-23	Copper wire	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	BL	---	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	
NT210621008-24	Metal nameplate	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	IN	Negative	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	
NT210621008-25	rivet	Pb	BL	---	Comply	Jun.23, 2021
		Cd	BL	---	Comply	
		Hg	BL	---	Comply	
		Cr/Cr(VI)	BL	---	Comply	
		PBBs	---	---	N.A.	
		PBDEs	---	---	N.A.	
		DBP	---	---	N.A.	
		BBP	---	---	N.A.	
		DEHP	---	---	N.A.	
		DIBP	---	---	N.A.	

******** To be continued ********

Remark:

(1) (a) It is the result on total Br while test item on restricted substances is PBBs/PBDEs. It is the result on total Cr while test item on restricted substances is Cr^{6+}.

(b)Results are obtained by EDXRF for primary screening, and further chemical testing by ICP-OES (for Cd, Pb, Hg), UV-Vis (for Cr^{6+}) and GC/MS (for PBBs, PBDEs) is recommended to be performed, if the concentration exceeds the below warning value according to IEC62321-3-1:2013 (unit: mg/kg)

Element	Polymer	Metal	Composite Materials
Cd	BL≤(70-3σ)<X<(130+3σ) ≤OL	BL≤(70-3σ)<X<(130+3σ) ≤OL	LOD<X<(150+3σ) ≤OL
Pb	BL≤(700-3σ)<X<(1300+3σ) ≤OL	BL≤(700-3σ)<X<(1300+3σ) ≤OL	BL≤(500-3σ)<X<(1500+3σ) ≤OL
Hg	BL≤(700-3σ)<X<(1300+3σ) ≤OL	BL≤(700-3σ)<X<(1300+3σ) ≤OL	BL≤(500-3σ)<X<(1500+3σ) ≤OL
Br	BL≤(300-3σ)<X	--	BL≤(250-3σ)<X
Cr	BL≤(700-3σ)<X	BL≤(700-3σ)<X	BL≤(500-3σ)<X

(c) BL = Below Limit, OL = Over Limit, IN = Inconclusive, LOD = Limit of Detection,
-- = Not Regulated, NA = Not Applicable.

(d) The XRF screening test for RoHS elements – The reading may be different to the actual content in the sample be of non-uniformity composition.

(2) (a) mg/kg = ppm = 0.001%, N.D.= Not Detected (<MDL), --- = Not Conducted.

(b) Unit and Method Detection Limit (MDL) in wet chemical test

Test Items	Pb	Cd	Hg
Units	mg/kg	mg/kg	mg/kg
MDL	2	2	2

The MDL for single compound of PBBs & PBDEs is 5 mg/kg and MDL of Cr^{6+} for polymer & composite sample is 2 mg/kg, MDL for Phthalates (DIBP, DBP, BBP, DEHP) is 50mg/kg.

(c) According to IEC 62321-7-1:2017, result on Cr^{6+} for metal sample is shown as Positive/Negative.
Positive = Presence of Cr^{6+} coating, Negative = Absence of Cr^{6+} coating.

(3) ①Copper alloy containing up to 4 % lead by weight (RoHS Exemption 6(c))
②Cadmium and its compounds in electrical contacts (RoHS Exemption (8b))
③Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound (RoHS Exemption 7(c)-I).

******** To be continued ********

(3) RoHS Exemptions

Exemptions	
RoHS Directive 2011/65/EU ANNEX III	
Exemption Items	**Expires Date**
1, Mercury in single capped (compact) fluorescent lamps not exceeding (per burner):	
1(a), For general lighting purposes < 30 W:2.5 mg	
1(b), For general lighting purposes≥ 30 W and < 50W:3.5mg	
1(c), For general lighting purposes ≥ 50 W and < 150 W: 5 mg	
1(d), For general lighting purposes ≥ 150 W: 15 mg	
1(e), For general lighting purposes with circular or square structural shape and tube diameter ≤ 17 mm: 7 mg	
1(f), For special purposes: 5 mg	
1(g), For general lighting purposes < 30 W with a lifetime equal or above 20 000 h: 3,5 mg	Expires on 31 December 2017
2(a), Mercury in double-capped linear fluorescent lamps for general lighting purposes not exceeding (per lamp):	
2(a)(1), Tri-band phosphor with normal lifetime and a tube diameter < 9 mm (e.g. T2): 4 mg	
2(a)(2), Tri-band phosphor with normal lifetime and a tube diameter ≥ 9 mm and ≤ 17 mm (e.g. T5): 3 mg	
2(a)(3), Tri-band phosphor with normal lifetime and a tube diameter > 17 mm and ≤ 28 mm (e.g. T8):3.5mg	
2(a)(4), Tri-band phosphor with normal lifetime and a tube diameter > 28 mm (e.g. T12): 3.5 mg	
2(a)(5), Tri-band phosphor with long lifetime (≥ 25 000 h): 5 mg	
2(b), Mercury in other fluorescent lamps not exceeding (per lamp):	
2(b)(2), Non-linear halophosphate lamps (all diameters): 15 mg	Expires on 13 April 2016
2(b)(3), Non-linear tri-band phosphor lamps with tube diameter > 17 mm (e.g. T9):15mg	
2(b)(4), Lamps for other general lighting and special purposes (e.g. induction lamps):15mg	
3, Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for special purposes not exceeding (per lamp):	
3(a), Short length (≤500 mm):3.5mg	
3(b), Medium length (> 500 mm and ≤ 1 500 mm):5mg	
3(c), Long length (> 1 500 mm):13mg	
4(a), Mercury in other low pressure discharge lamps (per lamp):15mg	
4(b), Mercury in High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner) in lamps with improved colour rendering index Ra > 60:	
4(b) -I, P ≤155 W:30mg	
4(b) -II, 155 W < P ≤ 405 W:40mg	
4(b) -III, P > 405 W:40mg	
4(c), Mercury in other High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner):	
4(c)-I, P ≤ 155 W:25mg	
4(c)-II, 155 W < P ≤ 405 W:30mg	
4(c)-III, P > 405 W:40mg	
4(e), Mercury in metal halide lamps (MH)	
4(f), Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex	

Exemptions	
RoHS Directive 2011/65/EU ANNEX III	
Exemption Items	**Expires Date**
4(g), Mercury in hand crafted luminous discharge tubes used for signs, decorative or architectural and specialist lighting and light-artwork, where the mercury content shall be limited as follows: (a) 20 mg per electrode pair+0,3mg per tube length in cm, but not more than 80 mg, for outdoor applications and indoor applications exposed to temperatures below 20 ℃; (b) 15 mg per electrode pair+0,24mg per tube length in cm, but not more than 80 mg, for all other indoor applications	Expires on 31 December 2018'
5(a), Lead in glass of cathode ray tubes	
5(b), Lead in glass of fluorescent tubes not exceeding 0,2 % by weight	
6(a), Lead as an alloying element in steel for machining purposes and in galvanized steel containing up to 0,35 % lead by weight	
6(b), Lead as an alloying element in aluminium containing up to 0,4 % lead by weight	
6(c), Copper alloy containing up to 4 % lead by weight	
7(a), Lead in high melting temperature type solders (i.e. lead- based alloys containing 85 % by weight or more lead)	
7(b), Lead in solders for servers, storage and storage array systems, network infrastructure equipment for switching, signalling, transmission, and network management for telecommunications	
7(c)-I, Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound	
7(c)-II, Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or 250 V DC or higher	
7(c)-III, Lead in dielectric ceramic in capacitors for a rated voltage of less than 125 V AC or 250 V DC	
7(c)-Ⅳ, Lead in PZT based dielectric ceramic materials for capacitors being part of integrated circuits or discrete semiconductors	Expires on 21 July 2016
8(a), Cadmium and its compounds in one shot pellet type thermal cut-offs	Expires on 1 January 2012 and after that date may be used in spare parts for EEE placed on the market before 1 January 2012
8(b), Cadmium and its compounds in electrical contacts	
9, Hexavalent chromium as an anticorrosion agent of the carbon steel cooling system in absorption refrigerators up to 0,75 % by weight in the cooling solution	
9(b), Lead in bearing shells and bushes for refrigerant-containing compressors for heating, ventilation, air conditioning and refrigeration (HVACR) applications	Applies to categories 8, 9 and 11; expires on: - 21 July 2023 for category 8 in vitro diagnostic medical devices, - 21 July 2024 for category 9 industrial monitoring and control instruments and for category 11, - 21 July 2021 for other subcategories of categories 8 and 9.
9(b)-(I), Lead in bearing shells and bushes for refrigerant- containing hermetic scroll compressors with a stated electrical power input equal or below 9 kW for heating, ventilation, air conditioning and refrigeration (HVACR) applications	Applies to category 1; expires on 21 July 2019.
11(a), Lead used in C-press compliant pin connector systems	May be used in spare parts for EEE placed on the market before 24 September 2010

Exemptions	
RoHS Directive 2011/65/EU ANNEX III	
Exemption Items	**Expires Date**
11(b), Lead used in other than C-press compliant pin connector systems	Expires on 1 January 2013 and after that date may be used in spare parts for EEE placed on the market before 1 January 2013
12, Lead as a coating material for the thermal conduction module C-ring	May be used in spare parts for EEE placed on the market before 24 September 2010
13(a), Lead in white glasses used for optical applications	Applies to all categories; expires on: - 21 July 2023 for category 8 in vitro diagnostic medical devices; - 21 July 2024 for category 9 industrial monitoring and control instruments and for category 11; - 21 July 2021 for all other categories and subcategories
13(b), Cadmium and lead in filter glasses and glasses used for reflectance standards	Applies to categories 8, 9 and 11; expires on: - 21 July 2023 for category 8 in vitro diagnostic medical devices; - 21 July 2024 for category 9 industrial monitoring and control instruments and for category 11; - 21 July 2021 for other subcategories of categories 8 and 9
13(b)-(I), Lead in ion coloured optical filter glass types	Applies to categories 1 to 7 and 10; expires on 21 July 2021 for categories 1 to 7 and 10
13(b)-(II), Cadmium in striking optical filter glass types; excluding applications falling under point 39 of this Annex	Applies to categories 1 to 7 and 10; expires on 21 July 2021 for categories 1 to 7 and 10
13(b)-(III), Cadmium and lead in glazes used for reflectance standards	Applies to categories 1 to 7 and 10; expires on 21 July 2021 for categories 1 to 7 and 10
14, Lead in solders consisting of more than two elements for the connection between the pins and the package of micropro-cessors with a lead content of more than 80 % and less than 85 % by weight	Expires on 1 January 2011 and after that date may be used in spare parts for EEE placed on the market before 1 January 2011
15, Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages	
16, Lead in linear incandescent lamps with silicate coated tubes	Expires on 1 September 2013
17, Lead halide as radiant agent in high intensity discharge (HID) lamps used for professional reprography applications	
18(a), Lead as activator in the fluorescent powder (1 % lead by weight or less) of discharge lamps when used as speciality lamps for diazoprinting reprography, lithography, insect traps, photochemical and curing processes containing phosphors such as SMS ((Sr,Ba) 2 MgSi 2 O 7 :Pb)	Expired on 1 January 2011
18(b), Lead as activator in the fluorescent powder (1 % lead by weight or less) of discharge lamps when used as sun tanning lamps containing phosphors such as BSP ($BaSi_2O_5$:Pb)	
19, Lead with PbBiSn-Hg and PbInSn-Hg in specific compositions as main amalgam and with PbSn-Hg as auxiliary amalgam in very compact energy saving lamps (ESL)	Expires on 1 June 2011

Exemptions	
RoHS Directive 2011/65/EU ANNEX III	
Exemption Items	**Expires Date**
20, Lead oxide in glass used for bonding front and rear substrates of flat fluorescent lamps used for Liquid Crystal Displays (LCDs)	Expires on 1 June 2011
21, Lead and cadmium in printing inks for the application of enamels on glasses, such as borosilicate and soda lime glasses	
23, Lead in finishes of fine pitch components other than connectors with a pitch of 0,65 mm and less	May be used in spare parts for EEE placed on the market before 24 September 2010
24, Lead in solders for the soldering to machined through hole discoidal and planar array ceramic multilayer capacitors	
25, Lead oxide in surface conduction electron emitter displays (SED) used in structural elements, notably in the seal frit and frit ring	
26, Lead oxide in the glass envelope of black light blue lamps	Expires on 1 June 2011
27, Lead alloys as solder for transducers used in high-powered (designated to operate for several hours at acoustic power levels of 125 dB SPL and above) loudspeakers	Expired on 24 September 2010
29, Lead bound in crystal glass as defined in Annex I (Categories 1, 2, 3 and 4) of Council Directive 69/493/EEC (1)	
30, Cadmium alloys as electrical/mechanical solder joints to elec-trical conductors located directly on the voice coil in transducers used in high-powered loudspeakers with sound pressure levels of 100 dB (A) and more	
31, Lead in soldering materials in mercury free flat fluorescent lamps (which e.g. are used for liquid crystal displays, design or industrial lighting)	
32, Lead oxide in seal frit used for making window assemblies for Argon and Krypton laser tubes	
33, Lead in solders for the soldering of thin copper wires of 100 µm diameter and less in power transformers	
34, Lead in cermet-based trimmer potentiometer elements	
36, Mercury used as a cathode sputtering inhibitor in DC plasma displays with a content up to 30 mg per display	Expired on 1 July 2010
37, Lead in the plating layer of high voltage diodes on the basis of a zinc borate glass body	
38, Cadmium and cadmium oxide in thick film pastes used on aluminium bonded beryllium oxide	
39(a), Cadmium selenide in downshifting cadmium-based semiconductor nanocrystal quantum dots for use in display lighting applications (< 0,2 µg Cd per mm 2 of display screen area)	Expires for all categories on 31 October 2019
40, Cadmium in photoresistors for analogue optocouplers applied in professional audio equipment	Expires on 31 December 2013
41. Lead in solders and termination finishes of electrical and electronic components and finishes of printed circuit boards used in ignition modules and other electrical and electronic engine control systems, which for technical reasons must be mounted directly on or in the crankcase or cylinder of hand-held combustion engines (classes SH:1, SH:2, SH:3 of Directive 97/68/EC of the European Parliament and of the Council) (2)	Expires on 31 December 2018
43, Cadmium anodes in Hersch cells for oxygen sensors used in industrial monitoring and control instruments, where sensitivity below 10 ppm is required.	Expires on 15 July 2023

******** To be continued ********

(4) RoHS Exemptions

Exemptions	
RoHS Directive 2011/65/EU ANNEX IV	
Product Range	**Exemption Items**
Equipment utilising or detecting ionising radiation	1. Lead, cadmium and mercury in detectors for ionising radiation.
	2. Lead bearings in X-ray tubes.
	3. Lead in electromagnetic radiation amplification devices: micro-channel plate and capillary plate.
	4. Lead in glass frit of X-ray tubes and image intensifiers and lead in glass frit binder for assembly of gas lasers and for vacuum tubes that convert electromagnetic radiation into electrons.
	5. Lead in shielding for ionising radiation.
	6. Lead in X-ray test objects.
	7. Lead stearate X-ray diffraction crystals.
	8. Radioactive cadmium isotope source for portable X-ray fluorescence spectrometers.
Sensors, detectors and electrodes	1a. Lead and cadmium in ion selective electrodes including glass of pH electrodes.
	1b. Lead anodes in electrochemical oxygen sensors.
	1c. Lead, cadmium and mercury in infra-red light detectors.
	1d. Mercury in reference electrodes: low chloride mercury chloride, mercury sulphate and mercury oxide.
	Others
	9. Cadmium in helium-cadmium lasers.
	10. Lead and cadmium in atomic absorption spectroscopy lamps.
	11. Lead in alloys as a superconductor and thermal conductor in MRI.
	12. Lead and cadmium in metallic bonds creating superconducting magnetic circuits in MRI, SQUID, NMR (Nuclear Magnetic Resonance) or FTMS (Fourier Transform Mass Spectrometer) detectors. Expires on 30 June 2021.
	13. Lead in counterweights.
	14. Lead in single crystal piezoelectric materials for ultrasonic transducers.
	15. Lead in solders for bonding to ultrasonic transducers.
	16. Mercury in very high accuracy capacitance and loss measurement bridges and in high frequency RF switches and relays in monitoring and control instruments not exceeding 20 mg of mercury per switch or relay.
	17. Lead in solders in portable emergency defibrillators.
	18. Lead in solders of high performance infrared imaging modules to detect in the range 8-14 µm.
	19. Lead in Liquid crystal on silicon (LCoS) displays.
	20. Cadmium in X-ray measurement filters. ▼M4
	21. Cadmium in phosphor coatings in image intensifiers for X-ray images until 31 December 2019 and in spare parts for X-ray systems placed on the EU market before 1 January 2020.
	22. Lead acetate marker for use in stereotactic head frames for use with CT and MRI and in positioning systems for gamma beam and particle therapy equipment. Expires on 30 June 2021.
	23. Lead as an alloying element for bearings and wear surfaces in medical equipment exposed to ionising radiation. Expires on 30 June 2021.
	24. Lead enabling vacuum tight connections between aluminium and steel in X-ray image intensifiers. Expires on 31 December 2019.

Exemptions	
RoHS Directive 2011/65/EU ANNEX IV	
Product Range	**Exemption Items**
	25. Lead in the surface coatings of pin connector systems requiring nonmagnetic connectors which are used durably at a temperature below – 20 °C under normal operating and storage conditions. Expires on 30 June 2021.
	26. Lead in the following applications that are used durably at a temperature below – 20 °C under normal operating and storage conditions:
	(a) solders on printed circuit boards;
	(b) termination coatings of electrical and electronic components and coatings of printed circuit boards;
	(c) solders for connecting wires and cables;
	(d) solders connecting transducers and sensors.
	Lead in solders of electrical connections to temperature measurement sensors in devices which are designed to be used periodically at temperatures below – 150 °C. These exemptions expire on 30 June 2021.
	27. Lead in — solders, — termination coatings of electrical and electronic components and printed circuit boards, — connections of electrical wires, shields and enclosed connectors, which are used in (a) magnetic fields within the sphere of 1 m radius around the isocentre of the magnet in medical magnetic resonance imaging equipment, including patient monitors designed to be used within this sphere, or (b) magnetic fields within 1 m distance from the external surfaces of cyclotron magnets, magnets for beam transport and beam direction control applied for particle therapy. Expires on 30 June 2020.
	28. Lead in solders for mounting cadmium telluride and cadmium zinc telluride digital array detectors to printed circuit boards. Expires on 31 December 2017.
	29. Lead in alloys, as a superconductor or thermal conductor, used in cryo-cooler cold heads and/or in cryo-cooled cold probes and/or in cryo-cooled equipotential bonding systems, in medical devices (category 8) and/or in industrial monitoring and control instruments. Expires on 30 June 2021.
	30. Hexavalent chromium in alkali dispensers used to create photocathodes in X-ray image intensifiers until 31 December 2019 and in spare parts for X-ray systems placed on the EU market before 1 January 2020.
	31a. Lead, cadmium, hexavalent chromium, and polybrominated diphenyl ethers (PBDE) in spare parts recovered from and used for the repair or refurbishment of medical devices, including in vitro diagnostic medical devices, or electron microscopes and their accessories, provided that the reuse takes place in auditable closed-loop business-to-business return systems and that each reuse of parts is notified to the customer. Expires on: (a) 21 July 2021 for the use in medical devices other than in vitro diagnostic medical devices; (b) 21 July 2023 for the use in in vitro diagnostic medical devices; (c) 21 July 2024 for the use in electron microscopes and their accessories.
	32. Lead in solders on printed circuit boards of detectors and data acquisition units for Positron Emission Tomographs which are integrated into Magnetic Resonance Imaging equipment. Expires on 31 December 2019.
	33. Lead in solders on populated printed circuit boards used in Directive 93/42/EEC class IIa and IIb mobile medical devices other than portable emergency defibrillators. Expires on 30 June 2016 for class IIa and on 31 December 2020 for class IIb.
	34. Lead as an activator in the fluorescent powder of discharge lamps when used for extracorporeal photopheresis lamps containing BSP (BaSi 2 O 5 :Pb) phosphors. Expires on 22 July 2021.

Exemptions	
RoHS Directive 2011/65/EU ANNEX IV	
Product Range	**Exemption Items**
	35. Mercury in cold cathode fluorescent lamps for back-lighting liquid crystal displays, not exceeding 5 mg per lamp, used in industrial monitoring and control instruments placed on the market before 22 July 2017
	35. Mercury in cold cathode fluorescent lamps for back-lighting liquid crystal displays, not exceeding 5 mg per lamp, used in industrial monitoring and control instruments placed on the market before 22 July 2017 Expires on 21 July 2024.
	36. Lead used in other than C-press compliant pin connector systems for industrial monitoring and control instruments.
	Expires on 31 December 2020. May be used after that date in spare parts for industrial monitoring and control instruments placed on the market before 1 January 2021.
	37. Lead in platinized platinum electrodes used for conductivity measurements where at least one of the following conditions applies: (a) wide-range measurements with a conductivity range covering more than 1 order of magnitude (e.g. range between 0,1 mS/m and 5 mS/m) in laboratory applications for unknown concentrations; (b) measurements of solutions where an accuracy of +/– 1 % of the sample range and where high corrosion resistance of the electrode are required for any of the following: (i) solutions with an acidity < pH 1; (ii) solutions with an alkalinity > pH 13; (iii) corrosive solutions containing halogen gas; (c) measurements of conductivities above 100 mS/m that must be performed with portable instruments. Expires on 31 December 2018.
	38. Lead in solder in one interface of large area stacked die elements with more than 500 interconnects per interface which are used in X-ray detectors of computed tomography and X-ray systems. Expires on 31 December 2019. May be used after that date in spare parts for CT and X-ray systems placed on the market before 1 January 2020.
	39. Lead in micro-channel plates (MCPs) used in equipment where at least one of the following properties is present: (a) a compact size of the detector for electrons or ions, where the space for the detector is limited to a maximum of 3 mm/MCP (detector thickness + space for installation of the MCP), a maximum of 6 mm in total, and an alternative design yielding more space for the detector is scientifically and technically impracticable; (b) a two-dimensional spatial resolution for detecting electrons or ions, where at least one of the following applies: (i) a response time shorter than 25 ns; (ii) a sample detection area larger than 149 mm 2 ; (iii) a multiplication factor larger than 1,3 × 10 3 . (c) a response time shorter than 5 ns for detecting electrons or ions; (d) a sample detection area larger than 314 mm 2 for detecting electrons or ions; (e) a multiplication factor larger than 4,0 × 10 7 . The exemption expires on the following dates: (a) 21 July 2021 for medical devices and monitoring and control instruments; (b) 21 July 2023 for in-vitro diagnostic medical devices; (c) 21 July 2024 for industrial monitoring and control instruments.
	40. Lead in dielectric ceramic in capacitors for a rated voltage of less than 125 V AC or 250 V DC for industrial monitoring and control instruments. Expires on 31 December 2020. May be used after that date in spare parts for industrial monitoring and control instruments placed on the market before 1 January 2021.

Exemptions	
RoHS Directive 2011/65/EU ANNEX IV	
Product Range	**Exemption Items**
	41. Lead as a thermal stabiliser in polyvinyl chloride (PVC) used as base material in amperometric, potentiometric and conductometric electrochemical sensors which are used in in-vitro diagnostic medical devices for the analysis of blood and other body fluids and body gases. Expires on 31 December 2018.
	42. Mercury in electric rotating connectors used in intravascular ultrasound imaging systems capable of high operating frequency (> 50 MHz) modes of operation. Expires on 30 June 2019.
	43. Cadmium anodes in Hersch cells for oxygen sensors used in industrial monitoring and control instruments, where sensitivity below 10 ppm is required. Expires on 15 July 2023.

******** To be continued ********

SAMPLE PHOTO(S)

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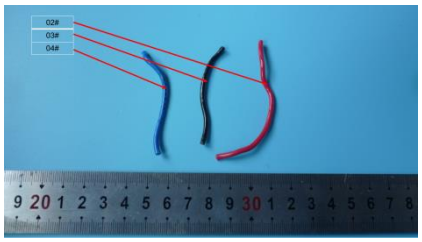

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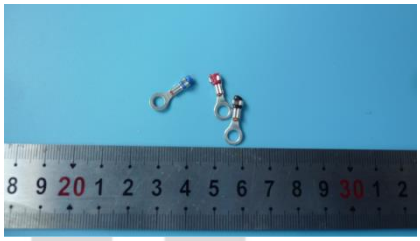

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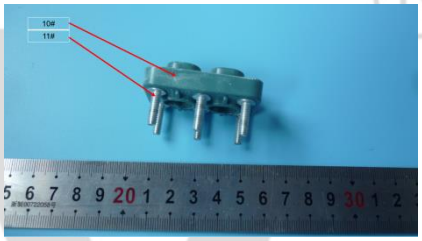

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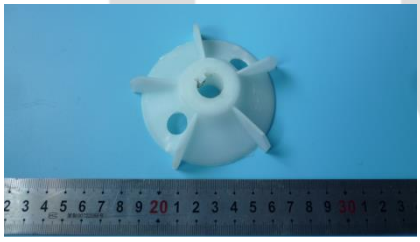

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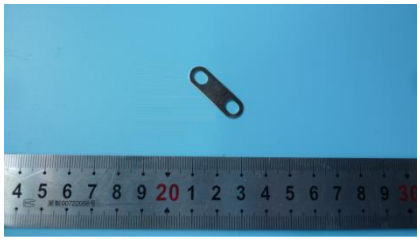

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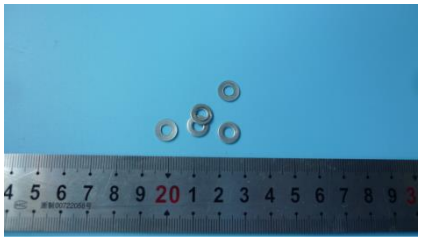

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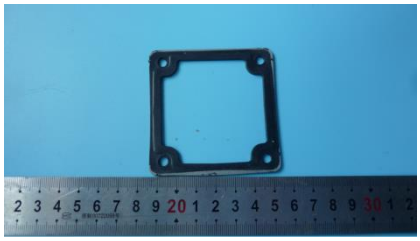

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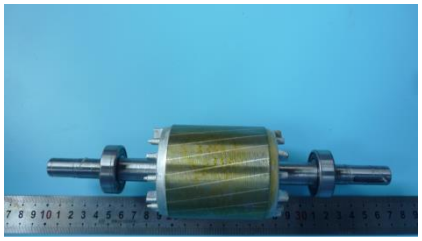

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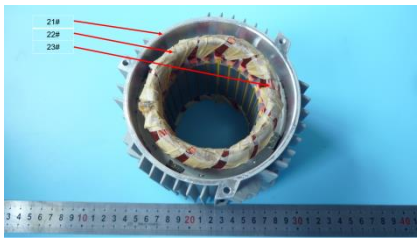

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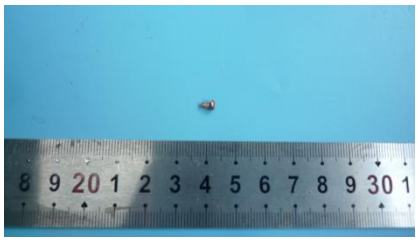

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