

Test Report

No.: ED210401052C

Date: Apr. 09, 2021

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Applicant : Norden Logic Oy

Address : Henry Fordin Katu 5 K , 00150 Helsinki , Finland

Sample Name : NL024

Style/Item No. : NL024

Material : PCB

Supplier : Norden Logic

Received Date : Apr. 02, 2021

Test Period : Apr. 02, 2021 ~ Apr. 09, 2021

Test Requested : As requested by the client, to evaluate the compliance of the submitted sample with EU RoHS Directive 2011/65/EU Annex II and its amendment (EU) 2015/863 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Test Method : 1. Review was performed for the sample and the related Bill of Materials submitted by the Applicant.
2. a) Refer to the standard IEC 62321-3-1:2013: Screening by XRF Spectroscopy.
b) Wet chemical test
1) refer to IEC 62321-5:2013, determine the Cadmium, Lead content by ICP-OES.
2) refer to IEC 62321-4:2013+A1:2017, determine the Mercury content by ICP-OES.
3) refer to IEC 62321-7-1:2015 & IEC 62321-7-2:2017, determine the Hexavalent Chromium content by UV-VIS.
4) refer to IEC 62321-6:2015, determine the Polybrominated Biphenyls and Polybrominated Diphenyl Ethers by GC-MS.
5) refer to IEC 62321-8:2017, determine the Dibutyl phthalate(DBP), Benzylbutyl phthalate(BBP), Di-2-ethylhexyl phthalate(DEHP) and Diisobutyl phthalate(DIBP) by GC-MS.

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

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Conclusion:

Basing on the test results obtained from the homogenous materials, the submitted sample **COMPLIES** with the EU RoHS Directive 2011/65/EU Annex II and its amendment (EU) 2015/863.



Signed for and on behalf of
EMTEK(Dongguan) Co., Ltd.

Prepared by:

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Reviewed by:

Zhang Hongjing, Carrie
Supervisor

Approved by:

Li Wei, Lisa
Authorized signatory
Apr. 09, 2021

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Test Results:

1. Pb, Cd, Hg, Cr⁶⁺, PBBs, PBDEs Test Results:

No.	Sample description	Restricted substances	Analytical element	Results of EDXRF ⁽¹⁾	Results of Chemical Testing ⁽²⁾ (mg/kg)	Conclusion	Remark
1	Green PCB	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	X	ND		
		PBDEs			ND		
2	Black solid	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					
3	Pin-silver metal	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	NA			
		PBDEs					
4	SMD triode	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					
5	Black solid	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					

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No.	Sample description	Restricted substances	Analytical element	Results of EDXRF ⁽¹⁾	Results of Chemical Testing ⁽²⁾ (mg/kg)	Conclusion	Remark
6	Pin-silver metal	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	NA			
		PBDEs					
7	SMD capacitor	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					
8	SMD IC	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					
9	SMD resister	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					
10	SMD resister	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					

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No.	Sample description	Restricted substances	Analytical element	Results of EDXRF ⁽¹⁾	Results of Chemical Testing ⁽²⁾ (mg/kg)	Conclusion	Remark
11	SMD capacitor	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					
12	SMD IC	Pb	Pb	BL	NA	Pass	No comment
		Cd	Cd	BL			
		Hg	Hg	BL			
		Cr ⁶⁺	Cr	BL			
		PBBs	Br	BL			
		PBDEs					

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Test Results:

2. Phthalates (DBP, BBP, DEHP, DIBP) Test Results:

Test Item	Test Result (mg/kg)				Reporting Limit (mg/kg)	Requirement Limit (mg/kg)
	1/2/4	5/7/8	9/10	11/12		
Dibutyl phthalate(DBP)	ND	ND	ND	ND	30	1000
Benzylbutyl phthalate(BBP)	ND	ND	ND	ND	30	1000
Di-2-ethylhexyl phthalate(DEHP)	ND	ND	ND	ND	30	1000
Diisobutyl phthalate(DIBP)	ND	ND	ND	ND	30	1000
Conclusion	Pass	Pass	Pass	Pass	---	---

Note: mg/kg = parts per million = ppm

ND = Not Detected (less than reporting limit)

Test Materials List:

Item No.	Description
1	Green PCB
2	Black solid
4	SMD triode
5	Black solid
7	SMD capacitor
8	SMD IC
9	SMD resistor
10	SMD resistor
11	SMD capacitor
12	SMD IC

Note: As specified by the client, the samples were subjected to mixed testing.

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- Remark: (1) ① Results are obtained by XRF for primary screening, and further wet chemical testing by ICP-OES / AAS (for Cd, Pb, Hg), UV-VIS (for Cr(VI)) and GC/MS (for PBBs, PBDEs) is recommended to be performed, if an inconclusive result was found (as "X" in below table) (unit: mg/kg).
- ② OL = Over Limit, BL = Below Limit, X = Inconclusive, NA= Not Applicable.
- ③ XRF screening test for RoHS elements – The test result may be different from the actual content in the non-uniformity composition sample.

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

(2) ① mg/kg = ppm = 0.0001%, ND = Not Detected (Less than reporting limit value.).

② Unit, Reporting Limit (RL) and Requirement limit in wet chemical test.

Test items	Pb	Cd	Hg	Cr ⁶⁺ (Non-metal)	Cr ⁶⁺ (metal)	PBBs(single)	PBDEs(single)
Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
RL	2	2	2	2	---	5	5
Requirement Limit	1000	100	1000	1000	Negative	1000	1000

③ According to IEC 62321-7-1:2015 & IEC 62321-7-2:2017, result on Cr⁶⁺ for metal sample shall be shown as Positive/Negative.

- a) The Cr(VI) concentration is more than 0.13 µg/cm², the sample is positive for Cr(VI), the coating is considered to contain Cr(VI).
- b) The Cr(VI) concentration is less than 0.10 µg/cm², the sample is negative for Cr(VI), the coating is considered a non-Cr(VI) based coating.

Storage condition and production date of the tested sample are unavailable and thus results of Cr⁶⁺ represent status of the sample at the time of testing.

④ According to IEC 62321-3-1:2013, this column represents the results of wet chem test. And "NA" means no need to perform wet chem test, when the XRF screening results are acceptable.

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Sample Photo



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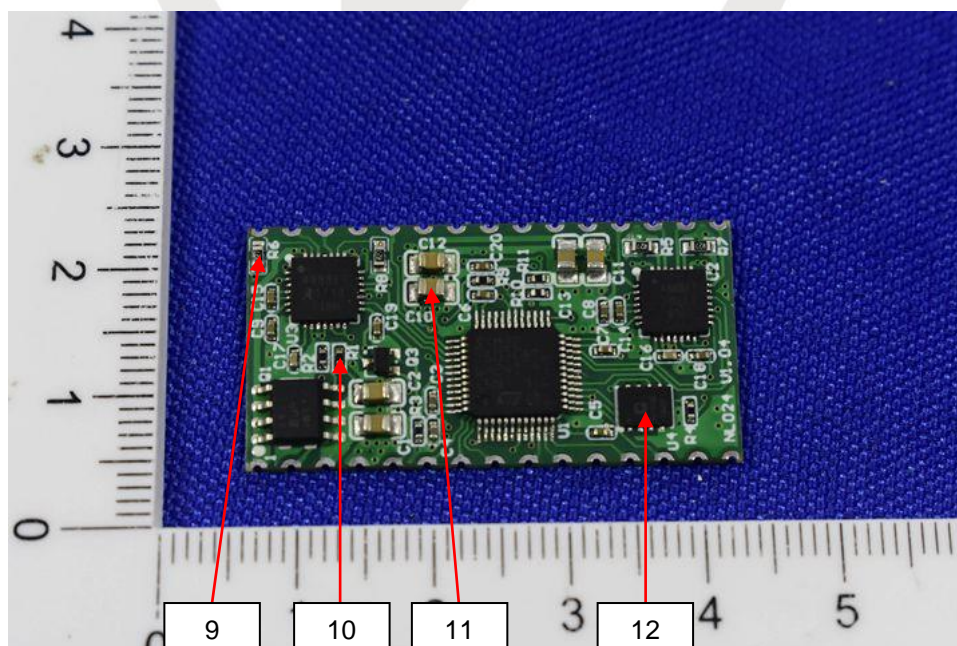
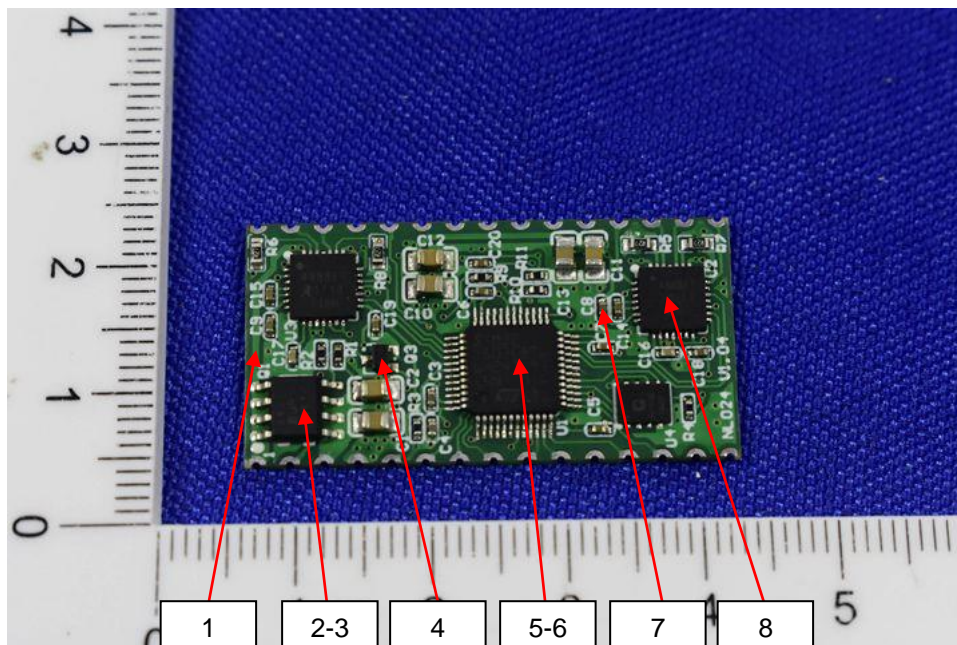
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*** End of Report ***

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- 1 Mercury in single capped (compact) fluorescent lamps not exceeding (per burner):
 - 1(a) For general lighting purposes < 30W: 5mg (expires on 31 December 2011; 3.5mg may be used per burner after 31 December 2011 until 31 December 2012; 2.5mg shall be used per burner after 31 December 2012)
 - 1(b) For general lighting purposes ≥ 30W and <50W: 5mg (expires on 31 December 2011; 3.5mg may be used per burner after 31 December 2011)
 - 1(c) For general lighting purposes ≥ 50W and <150W: 5mg
 - 1(d) For general lighting purposes ≥ 150W: 15mg
 - 1(e) For general lighting purposes with circular or square structural shape and tube diameter ≤17mm (no limitation of use until 31 December 2011; 7mg may be used per burner after 31 December 2011)
 - 1(f) For special purposes: 5mg
 - 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 < 9mm (e.g. T2): 5mg (expires on 31 December 2011; 4mg may be used per lamp after 31 December 2011)
 - 2(a)(2) Tri-band phosphor with normal lifetime and a tube diameter ≥ 9mm and ≤ 17mm (e.g. T5): 5mg (expires on 31 December 2011; 3mg may be used per lamp after 31 December 2011)
 - 2(a)(3) Tri-band phosphor with normal lifetime and a tube diameter > 17mm and ≤ 28mm (e.g. T8): 5mg (expires on 31 December 2011; 3.5mg may be used per lamp after 31 December 2011)
 - 2(a)(4) Tri-band phosphor with normal lifetime and a tube diameter > 28mm (e.g. T12): 5mg (expires on 31 December 2012; 3.5mg may be used per lamp after 31 December 2012)
 - 2(a)(5) Tri-band phosphor with long lifetime (≥ 25000h): 8mg (expires on 31 December 2011; 5mg may be used per lamp after 31 December 2011)
- 2(b) Mercury in other fluorescent lamps not exceeding (per lamp):
 - 2(b)(2) Non-linear halophosphate lamps (all diameters): 15mg (expires on 13 April 2016)
 - 2(b)(3) Non-linear tri-band phosphor lamps with tube diameter > 17mm (e.g. T9) (no limitation of use until 31 December 2011; 15mg may be used per lamp after 31 December 2011)
 - 2(b)(4) Lamps for other general lighting and special purposes (e.g. induction lamps) (no limitation of use until 31 December 2011; 15mg may be used per lamp after 31 December 2011)
- 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 (≤ 500mm) (No limitation of use until 31 December 2011; 3.5mg may be used per lamp after 31 December 2011)
 - 3(b) Medium length (> 500mm and ≤ 1500mm) (No limitation of use until 31 December 2011; 5mg may be used per lamp after 31 December 2011)
 - 3(c) Long length (> 1500mm) (No limitation of use until 31 December 2011; 13mg may be used per lamp after 31 December 2011)
- 4(a) Mercury in other low pressure discharge lamps (per lamp) (no limitation of use until 31 December 2011; 15mg may be used per lamp after 31 December 2011)
- 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 ≤ 155W (no limitation of use until 31 December 2011; 40mg may be used per burner after 31 December 2011)
 - 4(b)-II 155W < P ≤ 405W (no limitation of use until 31 December 2011; 40mg may be used per burner after 31 December 2011)
 - 4(b)-III P > 405W (no limitation of use until 31 December 2011; 40mg may be used per burner after 31 December 2011)
- 4(c) Mercury in other High Pressure Sodium (vapour) lamps for general lighting purposes not exceeding (per burner):
 - 4(c)-I P ≤ 155W (no limitation of use until 31 December 2011; 25mg may be used per burner after 31 December 2011)
 - 4(c)-II 155W < P ≤ 405W (no limitation of use until 31 December 2011; 30mg may be used per burner after 31 December 2011)
 - 4(c)-III P > 405W (no limitation of use until 31 December 2011; 40mg may be used per burner after 31 December 2011)
- 4(d) Mercury in High Pressure Mercury (vapour) lamps (HPMV) (expires on 13 April 2015)
- 4(e) Mercury in metal halide lamps (MH)
- 4(f) Mercury in other discharge lamps for special purposes not specifically mentioned in this Annex
- 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: (Expires on 31 December 2018)
 - (a) 20 mg per electrode pair + 0,3 mg per tube length in cm, but not more than 80 mg, for outdoor applications and indoor applications exposed to temperatures below 20 °C;
 - (b) 15 mg per electrode pair + 0,24 mg per tube length in cm, but not more than 80 mg, for all other indoor applications.

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- 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. piezoelectric devices, or in a glass or ceramic matrix compound
- 7(c)-II Lead in dielectric ceramic in capacitors for a rated voltage of 125V AC or 250V DC or higher
- 7(c)-III Lead in dielectric ceramic in capacitors for a rated voltage of less than 125V AC or 250V DC (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).
- 7(c)-IV Lead in PZT based dielectric ceramic materials for capacitors being part of integrated circuits or discrete semiconductors
- 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
Applies to categories 8, 9 and 11 and expires on:
— 21 July 2021 for categories 8 and 9 other than in vitro diagnostic medical devices and industrial monitoring and control instruments;
— 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
- 8(b)-I Cadmium and its compounds in electrical contacts used in:
Applies to categories 1 to 7 and 10 and expires on 21 July 2021.
— circuit breakers,
— thermal sensing controls,
— thermal motor protectors (excluding hermetic thermal motor protectors),
— AC switches rated at:— 6 A and more at 250 V AC and more, or
— 12 A and more at 125 V AC and more,
— DC switches rated at 20 A and more at 18 V DC and more, and
— switches for use at voltage supply frequency ≥ 200 Hz.
- 9 Hexavalent chromium as an anti-corrosion 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
- 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)
- 13(a) Lead in white glasses used for optical applications
- 13(b) Cadmium and lead in filter glasses and glasses used for reflectance standards
- 14 Lead in solders consisting of more than two elements for the connection between the pins and the package of microprocessors 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
- 17 Lead halide as radiant agent in High Intensity Discharge (HID) lamps used for professional reprography applications
- 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 ($\text{BaSi}_2\text{O}_5\text{:Pb}$)
- 21 Lead and cadmium in printing inks for the application of enamels on glasses, such as borosilicate and soda lime glass
- 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
- 29 Lead bound in crystal glass as defined in Annex 1 (Categories 1, 2, 3 and 4) of Council Directive 69/493/EEC
- 30 Cadmium alloys as electrical/mechanical solder joints to electrical conductors located directly on the voice coil in transducers used in high-powered loudspeakers with sound pressure levels of 100 dB (A) and more

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- 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
- 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 Cadmium in colour converting II-VI LEDs (< 10 µg Cd per mm² of light- emitting area) for use in solid state illumination or display systems (expires on 1 July 2014)
- 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 Bis(2-ethylhexyl) phthalate in rubber components in engine systems, designed for use in equipment that is not intended solely for consumer use and provided that no plasticised material comes into contact with human mucous membranes or into prolonged contact with human skin and concentration value of bis(2-ethylhexyl) phthalate does not exceed:
 - a) 30% by weight of the rubber for
 - (i) gasket coatings;
 - (ii) solid-rubber gaskets; or
 - (iii) rubber components included in assemblies of at least three components using electrical, mechanical or hydraulic energy to do work, and attached to the engine.
 - b) 10% by weight of the rubber for rubber-containing components not referred to in point (a).

For the purposes of this entry, "prolonged contact with human skin" means continuous contact of more than 10 minutes duration or intermittent contact over a period of 30 minutes, per day.
- 44 Lead in solder of sensors, actuators, and engine control units of combustion engines within the scope of Regulation (EU) 2016/1628 of the European Parliament and of the Council, installed in equipment used at fixed positions while in operation which is designed for professionals, but also used by non-professional users.

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声明 Statement

1. 本检测报告首页所列信息中除样品来源、接样日期、检测日期、检测结果和检测结论外，均由委托方提供，委托方对样品的代表性和资料的真实性负责，本实验室不承担任何相关责任。
The information as listed on the first page of this test report was all provided by the client except the sample from, date received, test period, test results and test conclusion. The client shall be responsible for the representativeness of sample and authenticity of materials, for which EMTEK shall bear no responsibilities.
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