

Report No. 48.400.22.0507.01-00/01

Dated 2022-05-07

Technical Report

Applicant: Tongwei Solar (Hefei) Co.,Ltd

Address: No.888, Changning Road,High-tech District,Hefei City,Auhui Province, 230088, P.R.China

Attn. to: Andy Huang

Manufacture: Same as the above.

Test object: The tested object(s) was(were) submitted and described by client as:
Product Name: Single Glass Solar Module & Double Glass Solar Module
Product Model: TH650PMB6-69SDC, TH545PMB6-58SC, TH430PMB7-46SCF



Additional list models' information, please refer to Appendix I.

Test specification: 2011/65/EU (RoHS) Directive and its Annex II amending directive 2015/863/EU.

Test with reference to EN 62321-1:2013, EN 62321-2:2014, EN 62321-3-1:2014, EN 62321-4:2014/A1:2017, EN 62321-5:2014, EN 62321-6:2015, EN 62321-7-1:2015; EN 62321-7-2:2017 and EN 62321-8:2017.

Test result: Refer to the data listed in following pages.

Conclusion: With regards to the data of tested components, the requirements of RoHS Directive 2011/65/EU and 2015/863/EU. **PASS**

Remarks:

1. The result relates only to the items tested.
2. Samples were tested as received.
3. The tested components were as the request by applicant.

Disclaimer Measurement Uncertainty:

Unless otherwise agreed upon, Pass or Fail verdicts are given base on the measured values without any considerations of measurement uncertainties. Please note, every test method has a measurement uncertainty which has been evaluated by the laboratory according to ISO/IEC 17025 requirements. By taking measurement uncertainties into account it might happen that measured values can neither be assessed as Pass nor as Fail.

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1. Order

1.1 Date of Purchase Order
2022-04-24

1.2 Customer's Reference
Nil

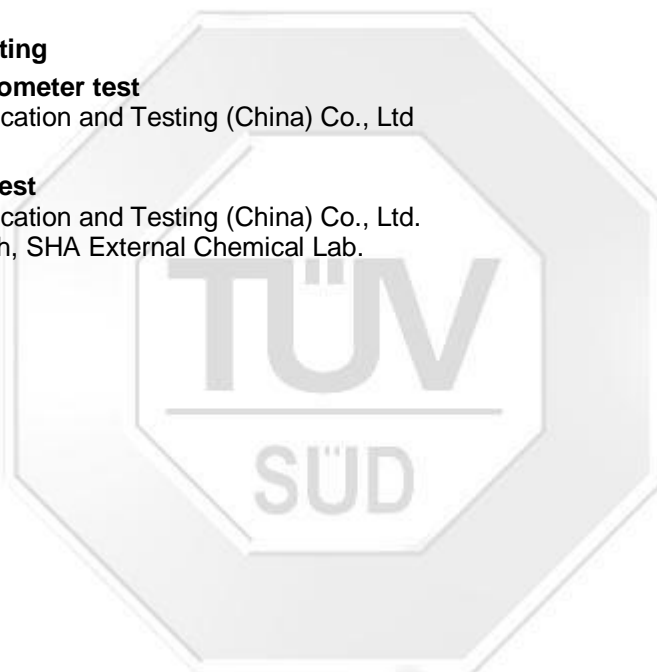
1.3 Receipt Date of Test Sample
2022-04-24

1.4 Date of Testing
2022-04-24 ~ 2022-05-06

1.5 Document submitted
Nil

1.6 Location of Testing
ED-XRF Spectrometer test
TÜV SÜD Certification and Testing (China) Co., Ltd

Wet Chemical test
TÜV SÜD Certification and Testing (China) Co., Ltd.
Shanghai Branch, SHA External Chemical Lab.



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2. Description of the tested specimen

Sample No.	Description	Photograph/Location
01	Encapsulation Material: White EVA(Backsheet Side)	
02	Encapsulation Material: Transparent EVA(Glass Side)	
03	Encapsulation Material: Transparent EVA(Front Glass Side)	
04	Encapsulation Material: Transparent EPE(Rear Glass Side)	
05	Rear Cover: White Backsheet	

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2. Description of the tested specimen

Sample No.	Description	Photograph/Location
06	Rear Cover: Black Backsheet (Air Side White,PV Side Black)	
07	Potting Adhesive	
08	Insulation Tape	
09	Adhesive (Junction Box) & Adhesive (Frame)	
10	PV Cable: XLPE Jacket & XLPE Insulation	

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2. Description of the tested specimen

Sample No.	Description	Photograph/Location
11	PV Connector: Body	
12	Junction Box: Body	
13	Junction Box: Lid	
14	Bypass Diode	
15	PV Connector: Sealing Gasket	

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2. Description of the tested specimen

Sample No.	Description	Photograph/Location
16	PV Connector: O Sealing Ring	
17	White wire tier	
18	White plastic clip	
19	Electronic Conductive adhesive	
20	Soldering Material	

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2. Description of the tested specimen

Sample No.	Description	Photograph/Location
21	PV Cable: Conductor	
22	Junction Box: Carry Current Parts(Copper)	
23	Junction Box: Preset Plated Tin	
24	PV Connector: Carry Current Part(Copper,Tin-plated)	
25	String connector : Copper belt with tin plated	

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2. Description of the tested specimen

Sample No.	Description	Photograph/Location
26	Silver Aluminum Frame Part	
27	Black Aluminum Frame Part	
28	Front Cover : AR Coating Tempered Glass	
29	Rear Cover: Semi Tempered Glass with White Gred	
30	PERC Bifacial Solar Cell	

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3. Test Results

3.1 ED-XRF Spectrometer test for total Cadmium, Chromium, Mercury, Lead and Bromine according to EN 62321-3-1:2014

XRF screening limits in mg/kg for regulated elements in various matrices

ELEMENT	POLYMER		
	BL	INCONCLUSIVE	OL
Cd	$X < (70-3\sigma)$	$(70-3\sigma) < X < (130+3\sigma)$	$X > (130+3\sigma)$
Pb	$X < (700-3\sigma)$	$(700-3\sigma) < X < (1300+3\sigma)$	$X > (1300+3\sigma)$
Hg	$X < (700-3\sigma)$	$(700-3\sigma) < X < (1300+3\sigma)$	$X > (1300+3\sigma)$
Br	$X < (300-3\sigma)$	$X > (300-3\sigma)$	--
Cr	$X < (700-3\sigma)$	$X > (700-3\sigma)$	--

ELEMENT	METAL		
	BL	INCONCLUSIVE	OL
Cd	$X < (70-3\sigma)$	$(70-3\sigma) < X < (130+3\sigma)$	$X > (130+3\sigma)$
Pb	$X < (700-3\sigma)$	$(700-3\sigma) < X < (1300+3\sigma)$	$X > (1300+3\sigma)$
Hg	$X < (700-3\sigma)$	$(700-3\sigma) < X < (1300+3\sigma)$	$X > (1300+3\sigma)$
Cr	$X < (700-3\sigma)$	$X > (700-3\sigma)$	--

ELEMENT	COMPLEX MATERIAL		
	BL	INCONCLUSIVE	OL
Cd	$X < (50-3\sigma)$	$(50-3\sigma) < X < (150+3\sigma)$	$X > (150+3\sigma)$
Pb	$X < (500-3\sigma)$	$(500-3\sigma) < X < (1500+3\sigma)$	$X > (1500+3\sigma)$
Hg	$X < (500-3\sigma)$	$(500-3\sigma) < X < (1500+3\sigma)$	$X > (1500+3\sigma)$
Br	$X < (250-3\sigma)$	$X > (250-3\sigma)$	--
Cr	$X < (500-3\sigma)$	$X > (500-3\sigma)$	--

Explanation for RoHS limit

Regarding Chromium and Bromine, the XRF test score shows the total Chromium and the total Bromine, but the RoHS limit of 1000 mg/kg, according to the directive 2011/65/EU, is only for Hexavalent Chromium and Brominated Flame Retardants. Therefore, if the XRF test result for the total Chromium and the total Bromine is inconclusive, further analytical tests are necessary to find out the exact amount of Hexavalent Chromium and Brominated Flame Retardants.

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Test Sample	Total Cadmium [mg/kg]	Total Lead [mg/kg]	Total Mercury [mg/kg]	Total Chromium [mg/kg]	Total Bromine [mg/kg]
RoHS Limit	100	1000	1000	1000	1000
01	BL	BL	BL	BL	BL
02	BL	BL	BL	BL	BL
03	BL	BL	BL	BL	BL
04	BL	BL	BL	BL	BL
05	BL	BL	BL	BL	BL
06	BL	BL	BL	BL	BL
07	BL	BL	BL	BL	BL
08	BL	BL	BL	BL	BL
09	BL	BL	BL	BL	BL
10	BL	BL	BL	BL	BL
11	BL	BL	BL	BL	INC ^(b)
12	BL	BL	BL	BL	INC ^(b)
13	BL	BL	BL	BL	INC ^(b)
14	BL	BL	BL	BL	INC ^(b)
15	BL	BL	BL	BL	BL
16	BL	BL	BL	BL	BL
17	BL	BL	BL	BL	BL
18	BL	BL	BL	BL	BL
19	BL	BL	BL	BL	BL
20	BL	BL	BL	BL	
21	BL	BL	BL	BL	--
22	BL	BL	BL	BL	--
23	BL	BL	BL	BL	--
24	BL	INC ^(a)	BL	BL	--
25	BL	BL	BL	BL	--
26	BL	BL	BL	BL	--
27	BL	BL	BL	BL	--

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Test Sample	Total Cadmium [mg/kg]	Total Lead [mg/kg]	Total Mercury [mg/kg]	Total Chromium [mg/kg]	Total Bromine [mg/kg]
RoHS Limit	100	1000	1000	1000	1000
28	BL	BL	BL	BL	--
29	BL	BL	BL	BL	--
30	BL	BL	BL	BL	--

Remark:

1. "mg/kg" denotes "milligram per kilogram".
2. "BL" means test result is "Below the Limit".
3. "INC" means test result is "Inconclusive".
4. "OL" means test result is "Over the Limit".
5. "--" means the substance for this sample are not tested.
6. "(a)" denotes further wet chemical confirmation test was conducted, results are listed in 3.2.1.
7. "(b)" denotes further wet chemical confirmation test was conducted, results are listed in 3.2.2.
8. With regards to the stoichiometry of Br in PBBs and PBDEs, the lower limit for Br is set at 300 mg/kg.



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3. Test Results

3.2 Wet chemical test

Main instruments used for wet chemical test

Testing Target	Instrument	Method
Lead & Cadmium	ICP-OES	EN 62321-5:2014,
Mercury	ICP-OES	EN 62321-4:2014/A1:2017
Hexavalent Chromium	UV-Vis	EN 62321-7-1:2015 EN 62321-7-2:2017
PBBs & PBDEs	GC/MS	EN 62321-6:2015
DEHP, DBP, BBP & DIBP	GC/MS	EN 62321-8:2017

3.2.1 Metallic material wet chemical test result (Cd, Pb, Hg, Cr6+)

Test Sample	Cadmium [mg/kg]	Lead [mg/kg]	Mercury [mg/kg]	Chromium (VI) [mg/kg]
RoHS Limit	100	1000	1000	§
24	--	178	--	--

Remark:

1. "--" means the substance for this sample are not tested.
2. "mg/kg" denotes "milligram per kilogram."
3. Detected limit of Cd, Pb and Hg: 10mg/kg.
4. "§" The Cr(VI) content in surface layer have been confirmed with reference to EN 62321-7-1:2015

Result	Chromium (VI) concentration	Qualitative result
Negative	$<0.1 \mu\text{g}/\text{cm}^2$	The sample is negative for Cr(VI). The Cr(VI) concentration is below the limit of quantification. The coating is considered a non-Cr(VI) based coating.
Inconclusive	$\geq 0.1 \mu\text{g}/\text{cm}^2$ and $\leq 0.13 \mu\text{g}/\text{cm}^2$	The result is considered to be inconclusive. Unavoidable coating variations may influence the determination. Recommendation: if additional samples are available, perform a total of 3 trials to increase sampling surface area. Use the averaged result of the 3 trials for the final determination.
Positive	$>0.13 \mu\text{g}/\text{cm}^2$	The sample is positive for Cr(VI). Concentration is above the limit of quantification and the statistical margin of error. The sample coating is considered to contain Cr(VI).

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3.2.2 Non-metallic material wet chemical test result (Cd, Pb, Hg, Cr6+, PBBs, PBDEs)

Test Sample	Cadmium [mg/kg]	Lead [mg/kg]	Mercury [mg/kg]	Chromium (VI) [mg/kg]	PBBs (Sum) [mg/kg]	PBDEs (Sum) [mg/kg]
RoHS Limit	100	1000	1000	1000	1000	1000
11	--	--	--	--	<50	<50
12	--	--	--	--	<50	<50
13	--	--	--	--	<50	<50
14	--	--	--	--	<50	<50

Remark:

1. Detected limit of Cd, Pb, Hg, Cr :10mg/kg; PBBs and PBDEs :5mg/kg.
2. "mg/kg" denotes "milligram per kilogram".
3. "--" means the substance for this sample are not tested.
4. "<" means less than (<MDL).
5. PBBs denotes the sum of Monobromobiphenyl to Decabromobiphenyl.
6. PBDEs denotes the sum of Monobromodiphenyl ether to Decabromodiphenyl ether.

3.2.3 Non-metallic material wet chemical test result (DEHP, DBP, BBP, DIBP)

Test Sample	DEHP [mg/kg]	BBP [mg/kg]	DBP [mg/kg]	DIBP [mg/kg]
RoHS Limit	1000	1000	1000	1000
01	<200	<200	<200	<200
02	<200	<200	<200	<200
03	<200	<200	<200	<200
04	<200	<200	<200	<200
05	<200	<200	<200	<200
06	<200	<200	<200	<200
07	<200	<200	<200	<200
08	<200	<200	<200	<200
09	<200	<200	<200	<200
10	<200	<200	<200	<200
11	<200	<200	<200	<200
12	<200	<200	<200	<200
13	<200	<200	<200	<200
14	<200	<200	<200	<200
15	<200	<200	<200	<200

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Test Sample	DEHP [mg/kg]	BBP [mg/kg]	DBP [mg/kg]	DIBP [mg/kg]
RoHS Limit	1000	1000	1000	1000
16	<200	<200	<200	<200
17	<200	<200	<200	<200
18	<200	<200	<200	<200
19	<200	<200	<200	<200

Remark:

1. Detected limit of DEHP, DBP, BBP and DIBP: 200mg/kg.
2. "mg/kg" denotes "milligram per kilogram".
3. "<" means less than (<MDL).
4. DEHP is the abbreviation for Bis(2-ethylhexyl) phthalate, BBP is the abbreviation for Butyl benzyl phthalate, DBP is the abbreviation for Dibutyl phthalate, DIBP is the abbreviation for Diisobutyl phthalate.



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Prepared by:

Mr. Yongfeng DU

Checked by:

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APPENDIX I: Additional Listed Models Reference

THXXXPMB6-58SC (XXX=535 to 555,in increment of 5)
THXXXPMB7-46SC (XXX=425 to 445,in increment of 5)
THXXXPMB7-46SCF (XXX=425 to 440,in increment of 5)
THXXXPMB7-46SCS (XXX=425 to 445,in increment of 5)
THXXXPMB6-69SDC (XXX=635 to 670,in increment of 5)

Remarks:

The above listed may covered models were only based on client's guarantee letter (self-declaration). TÜV SÜD takes no responsibility for any mistakes and the problems of product consistency caused by inaccurate and/or invalid information submitted by the client.



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APPENDIX II: Official Exemption Items

Below items are quoted based on Directives of 2011/65/EU and its valid Amending Directives.

Exemption		Scope and dates of applicability
1	Mercury in single capped (compact) fluorescent lamps not exceeding (per burner)	
1(a)	For general lighting purpose < 30 W:5mg	Expires on 31 December 2011; 3,5mg maybe 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 ≥ 30 W and < 50 W:5mg	Expires on 31 December 2011; 3,5mg maybe used per burner after 31 December 2011 until 31 December 2012; 2.5mg shall be used per burner after 31 December 2012
1(c)	For general lighting purposes ≥ 50 W and < 150 W:5mg	
1(d)	For general lighting purpose ≥ 30 W and ≥ 150 W:15mg	
1(e)	For general lighting purpose with circular or square structural shape and tube diameter ≤ 17 mm	No limitation of use until 31 December 2011; 7 mg may be used per burner after 31 December 2011
1(f)	For special purposes:5mg	
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): 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 ≥ 9 mm and ≤ 17 mm (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 >17 mm and ≤ 28 mm (e.g. T8): 5mg	Expires on 31 December 2011; 3,5 mg 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 2011; 3,5 mg may be used per lamp after 31 December 2011
2(a)(5)	Tri-band phosphor with long lifetime($\geq 25\ 000$ h):8mg	Expires on 13 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)(1)	Linear halophosphate lamps with tube >28 mm(e.g.T10 and T12): 10mg	Expires on 13 April 2012
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; 15 mg 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; 15 mg 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)	

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Exemption		Scope and dates of applicability
3(a)	Short length($\leq 500\text{mm}$)	No limitation of use until 31 December 2011; 3,5 mg may be used per lamp after 31 December 2011
3(b)	Medium length ($> 500\text{mm}$ and $\leq 1\,500\text{mm}$)	No limitation of use until 31 December 2011; 5 mg may be used per lamp after 31 December 2011
3(c)	Long length ($> 1\,500\text{mm}$)	No limitation of use until 31 December 2011; 13 mg 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; 15 mg 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 $R_a > 60$;	
4(b)-I	$P \leq 155\text{ W}$	No limitation of use until 31 December 2011; 30mg may be used per burner after 31 December 2011
4(b)-II	$155\text{ W} < P \leq 405\text{ W}$	No limitation of use until 31 December 2011; 40mg may be used per burner after 31 December 2011
4(b)-III	$P > 405\text{ W}$	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	$P \leq 155\text{ W}$	No limitation of use until 31 December 2011; 30mg may be used per burner after 31 December 2011
4(c)-II	$155\text{ W} < P \leq 405\text{ W}$	No limitation of use until 31 December 2011; 40mg may be used per burner after 31 December 2011
4(c)-III	$P > 405\text{ W}$	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: (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 $20\text{ }^{\circ}\text{C}$; (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.	Expires on 1 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	

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Exemption		Scope and dates of applicability
6(a)	Lead as an alloying element in steel for machining purposes containing up to 0,35 % lead by weight and in galvanized steel containing up to 0,35 % lead by weight	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
6(a)-I	Lead as an alloying element in steel for machining purposes containing up to 0,35 % lead by weight	Expires on 21 July 2024 for all categories
6(a)-II	Lead as an alloying element in batch hot dip galvanised steel components containing up to 0,2 % lead by weight	Expires on 21 July 2026 for all categories
6(a)-I	Lead as an alloying element in steel for machining purposes containing up to 0,35 % lead by weight and in batch hot dip galvanised steel components containing up to 0,2 % lead by weight	Expires on 21 July 2021 for categories 1-7 and 10.
6(b)	Lead as an alloying element in aluminium containing up to 0,4 % lead by weight	Expires 12 months after the decision for all categories
6(b)-I	Lead as an alloying element in aluminium containing up to 0,4 % lead by weight, provided it stems from lead-bearing aluminium scrap recycling	Expires on 21 July 2026 for all categories
6(b)-II	Lead as an alloying element in aluminium for machining purposes with a lead content up to 0,4 % by weight	Expires 18 months after the decision for all categories
6(b)-IV	Lead as an alloying element in aluminium for machining purposes with a lead content up to 0,4 % by weight in gas valves applied in category 1 EEE (large household appliances)	Expires on 31 December 2024
6(c)	Copper alloy containing up to 4 % lead by weight	Expires on 21 July 2026 for all categories
7(a)	Lead in high melting temperature type solders (i.e., lead-based alloys containing 85 % by weight or more lead) (excludes those in the scope of exemption 24)	For all categories except applications covered by point 24 of this Annex, expires on 21 July 2024.
	Lead in high melting temperature type solders (i.e., lead-based alloys containing 85 % by weight or more lead) when used for the following applications (excludes those in the scope of exemption 24): I) for internal interconnections for attaching die, or other components along with a die in semiconductor assembly with steady state or transient/impulse currents of 0.1 A or greater or blocking voltages beyond 10 V, or die edge sizes larger than 0.3 mm x 0.3 mm II) for integral (meaning internal and external) connections of die attach in electrical and electronic components, if the thermal conductivity of the cured/sintered die-attach material is >35W/(m*K) AND the electrical conductivity of the cured/sintered die-attach material shall be >4.7MS/m AND solidus melting temperature has to be above 260°C III) In first level solder joints (internal or integral connections - meaning internal and external) for manufacturing components so that subsequent mounting of electronic components onto subassemblies (i.e., modules or sub-circuit boards or substrates or point to point soldering) with a secondary solder does not reflow the first level solder. This item excludes die attach applications and hermetic sealings IV) In second level solder joints for the attachment of components to printed circuit board or lead frames: 1. in solder balls for the attachment of ceramic ball-grid-array (BGA) 2. in high temperature plastic overmouldings (> 220 °C) V) as a hermetic sealing material between: 1. a ceramic package or plug and a metal case, 2. component terminations and an internal sub-part	Applies to all categories except applications covered by point 24 of this Annex, expires on 21 July 2026

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Exemption		Scope and dates of applicability
	VI) for establishing electrical connections between lamp components in incandescent reflector lamps for infrared heating or high intensity discharge lamps or oven lamps VII) for audio transducers where the peak operating temperature exceeds 200°C	
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	Expires on 21 July 2024 for all categories
7(c)-II	Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or 250 V DC or higher	Does not apply to applications covered by point 7(c)-I and 7(c)-IV of this Annex. Expires on 21 July 2026 for all categories Note: As in the RoHS legal text, commas are used as a decimal separator for exemption formulations appearing in this table, in contrast to the decimal point used throughout the rest of t
7(c)-III	Lead in dielectric ceramic in capacitors for a rated voltage of less than 125 V AC or 250 V 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'	Expires on: —21 July 2021 for categories 1-7 and 10; —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.'
7(c)-V	Electrical and electronic components containing lead in a glass or glass matrix compound that fulfils the following functions: 1) protection and electrical insulation in glass beads of high voltage diodes and glass layers for wafer on the basis of a lead-zincborate or a lead-silica-borate glass body,* 2) for hermetic sealings between ceramic, metal and/or glass parts 3) for bonding purposes in a process parameter window for < 500°C combined with a viscosity of 1013, 3 dPas (so called "glasstransition temperature") 4) used as resistance materials such as ink, with a resistivity range from 1 Ohms/square to 1 Mega Ohms/square, excluding trimmer potentiometers** 5) used in chemically modified glass surfaces for Microchannel Plates (MCPs), Channel Electron Multipliers (CEMs) and Resistive Glass Products (RGPs).	Expires on 21 July 2026 for all categories
7(c)-VI	Electrical and electronic components containing lead in a ceramic that fulfils the following functions (excluding items covered under item 7(c)-II, 7(c)-III and 7(c)-IV of this annex): 1) piezoelectric lead zirconium titanate (PZT) ceramics 2) providing ceramics with a positive temperature coefficient (PTC)	Expires on 21 July 2026 for all categories
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.

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Exemption		Scope and dates of applicability
8(b)-I	Cadmium and its compounds in electrical contacts used in: — 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.	Applies to categories 1 to 7 and 10 and expires on 21 July 2021.'
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	
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
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	
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	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.
15(a)	Lead in solders to complete a viable electrical connection between the semiconductor die and carrier within integrated circuit flip chip packages where at least one of the following criteria applies: —a semiconductor technology node of 90 nm or larger; —a single die of 300 mm ² or larger in any semiconductor technology node; —stacked die packages with die of 300 mm ² or larger, or silicon interposers of 300 mm ² or larger.	Applies to categories 1 to 7 and 10 and expires on 21 July 2021.'
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)	Expires on 1 January 2011
18(b)		Categories 1-7 and 10, Expires on 21 July 2021

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Exemption		Scope and dates of applicability
	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 ₂ O ₅ :Pb)	Categories 8 and 9 other than in vitro diagnostic medical devices and industrial monitoring and control instruments, Expires on 21 July 2021 Category 8 in vitro diagnostic medical devices, Expires on 21 July 2023 Category 9 industrial monitoring and control instruments, and for category 11, Expires on 21 July 2024
18(b)-I	Lead as activator in the fluorescent powder (1 % lead by weight or less) of discharge lamps containing phosphors such as BSP (BaSi ₂ O ₅ :Pb) when used in medical phototherapy equipment	Categories 5 and 8, excluding applications covered by entry 34 of Annex IV, Expires on 21 July 2021
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
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	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.
21(a)	Cadmium when used in colour printed glass to provide filtering functions, used as a component in lighting applications installed in displays and control panels of EEE	Applies to categories 1 to 7 and 10 except applications covered by entry 21(b) or entry 39 and expires on 21 July 2021.
21(b)	Cadmium in printing inks for the application of enamels on glasses, such as borosilicate and soda lime glasses	Applies to categories 1 to 7 and 10 except applications covered by entry 21(a) or 39 and expires on 21 July 2021.
21(c)	Lead in printing inks for the application of enamels on other than borosilicate glasses	Applies to categories 1 to 7 and 10 and expires on 21 July 2021.
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	Expires on: — 21 July 2021 for categories 1-7 and 10, — 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.
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)	Expires on: —21 July 2021 for categories 1-7 and 10; —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;

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Exemption		Scope and dates of applicability
		—21 July 2024 for category 9 industrial monitoring and control instruments, and for category 11.
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	
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	Expires on: —21 July 2021 for categories 1-7 and 10, —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.'
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	Applies to all categories; expires on: — 21 July 2021 for categories 1-7 and 10, — 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.'
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	Expires on: —21 July 2021 for categories 1-7 and 10; —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.'
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 [two years after the publication of the Delegated Directive in the Official Journal]
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.	Expires on 1 December 2018

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Exemption		Scope and dates of applicability
42	Lead in bearings and bushes of diesel or gaseous fuel powered internal combustion engines applied in non-road professional use equipment: - with engine total displacement ≥ 15 litres; or - with engine total displacement < 15 litres and the engine is designed to operate in applications where the time between signal to start and full load is required to be less than 10 seconds; or regular maintenance is typically performed in a harsh and dirty outdoor environment, such as mining, construction, and agriculture applications.	Applies to category 11, excluding applications covered by entry 6(c) of this Annex. Expires on 21 July 2024.'
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 the 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.	Applies to category 11 and expires on 21 July 2024.
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 (*1), installed in equipment used at fixed positions while in operation which is designed for professionals, but also used by non-professional users	Applies to category 11 and expires on 21 July 2024.
45	Lead diazide, lead styphnate, lead dipicramate, orange lead (lead tetroxide), lead dioxide in electric and electronic initiators of explosives for civil (professional) use and barium chromate in long time pyrotechnic delay charges of electric initiators of explosives for civil (professional) use	Applies to category 11 and expires on 20 April 2026

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