



# Test Report

Report No : TST20230340063-3RR

Date: Mar.23, 2023

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**Applicant:** Mamibot Manufacturing USA Inc.  
**Address:** One Commerce Center, 1201 Orange St, Wilmington, DE 19899 USA  
**Manufacturer:** Mamibot Manufacturing (Shanghai) Co.,Ltd.  
**Address:** North 21th, No.1 Building, LN1040 Caoyang Rd, Shanghai, P.R.C.

The following sample(s) was /were submitted and identified on behalf of the clients as :

**Sample Name:** Robot Window Cleaner  
**Trademark:** Mamibot  
**Main Model:** W110-P  
**Series Models:** W110-PA, W110-PR, W110-PE, W110-PM, W110-PU  
**Sample Received Date:** Mar.20, 2023  
**Testing Period:** Mar.20, 2023 To Mar.23, 2023  
**Test Requested:**  
1. As specified by client ,to screen Lead(Pb),Cadmium(Cd),Mercury(Hg), Chromium(Cr)and Bromine(Br)in the submitted sample(s)by XRF.  
2. As specified by client ,when screening results exceed the XRF screening limit in IEC62321:2013 Edition 1.0,further use of wet chemical methods are required to test Lead(Pb),Cadmium(Cd),Mercury(Hg),Hexavalent Chromium(Cr(VI)),Polybrominated Biphenyls(PBBs),Polybrominated diphenyl ethers (PBDEs) and Phthalates such as Bis(2-ethylhexyl) phthalate (DEHP) , Butyl benzyl phthalate (BBP), Dibutylphthalate (DBP) , and Diisobutyl phthalate (DIBP) in the submitted sample(s).  
**Test Method:** Please refer to next page(s).  
**Test Result:** Please refer to next page(s).  
**Test Conclusion:** The test results comply with the limits of RoHS 2.0 Directive (EU) 2015/863 and (EU)2017/2102 amending Annex II to Directive 2011/65/EU.

Signed for and on behalf of:

Andy

Andy Zheng  
Technical Director



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## 1. Pb, Cd, Cr(VI), Hg, PBBs&PBDEs

Test Method:

A. Disassembly, disjointment and mechanical sample preparation

— Ref. to IEC 62321-2:2021, Disassembly, disjointment and mechanical sample preparation.

B. With reference to IEC 62321-1:2013, tests were performed for the samples indicated by the photos in this report.

(1) Screening – Lead, mercury, cadmium, total chromium and total bromine

— Ref. to IEC 62321-3-1:2013, Screening for Lead, mercury, cadmium, total chromium and total bromine by X-ray fluorescence spectrometry.

(2) Wet chemical test method

Test Item(s)	Test Method	Test Equipment	Unit	MDL	Limit
Pb	IEC62321-5:2013	ICP-AES	mg/kg	2	1000
Cd	IEC62321-5:2013	ICP-AES	mg/kg	2	100
Hg	IEC 62321-4:2013/AMD1:2017	ICP-AES	mg/kg	2	1000
Cr(VI) (Metal)	IEC62321-7-1:2015	UV-Vis	μ g/cm2	0.1	0.13
Cr(VI) (Nonmetal)	IEC62321-7-2:2017	UV-Vis	mg/kg	8	1000
PBBs	IEC62321-6:2015	GC-MS	mg/kg	5	1000
PBDEs	IEC62321-6:2015	GC-MS	mg/kg	5	1000

PBBs		PBDEs	
Monobromobiphenyl	Hexabromobiphenyl	Monobromodiphenyl ether	Hexabromodiphenyl ether
Dibromobiphenyl	Heptabromobiphenyl	Dibromodiphenyl ether	Heptabromodiphenyl ether
Tribromobiphenyl	Octabromobiphenyl	Tribromodiphenyl ether	Octabromodiphenyl ether
Tetrabromobiphenyl	Nonabromobiphenyl	Tetrabromodiphenyl ether	Nonabromodiphenyl ether
Pentabromobiphenyl	Decabromobiphenyl	Pentabromodiphenyl ether	Decabromodiphenyl ether

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## Test result(s):

No.	Sample Description	Results of XRF					Chemical confirmation results (mg/kg)	Conclusion
		Pb	Cd	Hg	Cr	Br		
1	Black plastic case	BL	BL	BL	BL	BL	---	Pass
2	Grey plastic parts	BL	BL	BL	BL	BL	---	Pass
3	Motor	BL	BL	BL	BL	---	---	Pass
4	Silver metal buckle	BL	BL	BL	BL	---	---	Pass
5	Black terminal	BL	BL	BL	BL	BL	---	Pass
6	Plug	BL	BL	BL	BL	---	---	Pass
7	Transparent rubber straw	BL	BL	BL	BL	BL	---	Pass
8	Transparent plastic	BL	BL	BL	BL	BL	---	Pass
9	Battery	BL	BL	BL	BL	---	---	Pass
10	Red leather	BL	BL	BL	BL	BL	---	Pass
11	Yellow yarn leather	BL	BL	BL	BL	BL	---	Pass
12	Black leather	BL	BL	BL	BL	BL	---	Pass
13	Engine	BL	BL	BL	BL	---	---	Pass
14	Grey rope	BL	BL	BL	BL	BL	---	Pass
15	Grey cloth	BL	BL	BL	BL	BL	---	Pass
16	Spring	BL	BL	BL	BL	---	---	Pass
17	PCB	BL	BL	BL	BL	BL	---	Pass
18	Solder	BL	BL	BL	BL	---	---	Pass

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No.	Sample Description	Results of XRF					Chemical confirmation results (mg/kg)	Conclusion
		Pb	Cd	Hg	Cr	Br		
19	Capacitance	BL	BL	BL	BL	BL	---	Pass
20	Resistance	BL	BL	BL	BL	BL	---	Pass
21	Relay	BL	BL	BL	BL	BL	---	Pass
22	Transformer	BL	BL	BL	BL	---	---	Pass
23	Inductance	BL	BL	BL	BL	---	---	Pass
24	Coil	BL	BL	BL	BL	---	---	Pass
25	Black plastic remote control case	BL	BL	BL	BL	BL	---	Pass
26	Black rubber key	BL	BL	BL	BL	BL	---	Pass
27	Long silver metal screws	BL	BL	BL	BL	---	---	Pass
28	Short silver metal screws	BL	BL	BL	BL	---	---	Pass
29	Silver screw	BL	BL	BL	BL	---	---	Pass

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## Remark:

- 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(VI).
- The XRF screening test for RoHS elements-The reading may be different to the actual content in the sample be of non-uniformity composition.
- Results are obtained by EDXRF for primary screening, and further chemical testing by ICP-AES (for Pb, Cd, Hg), UV-VIS for Cr(VI) and GC/MS (for PBBs/PBDEs) is recommended to be performed if the concentration exceeds the below warning value according to IEC 62321-3-1:2013.

Attached table 1, XRF screening limits in mg/kg for regulated elements in various matrices:

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

## XRF detection limits in mg/kg for regulated elements in various material

Element	Polymer Material	Metallic Material	Composite Material
Pb	10	50	50
Cd	10	50	50
Hg	10	50	50
Cr	10	50	50
Br	10	50	50

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**Note:**

- BL = Under the XRF screening limit
- OL = Future chemical test will be conducted while result is above the screening limit
- X = inconclusive, the region where need further chemical testing by ICP-OES (for Pb, Cd, Hg), UV-VIS (for Cr(VI)) and GC/MSD (for PBBs, PBDEs).
- 3 $\sigma$ =The reproducibility of analytical instruments
- LOD=Detection limit
- “---” = Not Applicable
- mg/kg=0.0001%
- N.D.=Not Detected(<MDL)
- MDL = Method Detection Limit
- Negative = Absence of Cr(VI), the detected Cr(VI) concentration in the boiling water extraction solution is less than 0.02 mg/kg with 50cm<sup>2</sup> sample surface area used.
- \*=According to 2011/65/EU Annex, point \*Lead as an alloying element is steel containing up to 0.35% lead by weight, aluminum containing up to 0.4% lead by weight and as a copper alloy, containing up to 4% lead by weight can be exempted.

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## 2. Phthalates—DBP, BBP, DEHP & DIBP

Test Item(s)	Test Method	Test Equipment	Unit	MDL	Limit
Dibutyl Phthalate(DBP)	IEC62321-8:2017	GC-MS	mg/kg	30	1000
Benzylbutyl Phthalate (BBP)	IEC62321-8:2017	GC-MS	mg/kg	30	1000
Di-(2-ethylhexyl)Phthalate (DEHP)	IEC62321-8:2017	GC-MS	mg/kg	30	1000
Diisobutyl phthalate(DIBP)	IEC62321-8:2017	GC-MS	mg/kg	30	1000

### Test result(s):

Part No.	Test Item (mg/kg)				Conclusion
	DBP	BBP	DEHP	DIBP	
1+2	N.D.	N.D.	N.D.	N.D.	Pass
5	N.D.	N.D.	N.D.	N.D.	Pass
7	N.D.	N.D.	N.D.	N.D.	Pass
8	N.D.	N.D.	N.D.	N.D.	Pass
10+11+12	N.D.	N.D.	N.D.	N.D.	Pass
14+15	N.D.	N.D.	N.D.	N.D.	Pass
17+19+20	N.D.	N.D.	N.D.	N.D.	Pass
21	N.D.	N.D.	N.D.	N.D.	Pass
25+26	N.D.	N.D.	N.D.	N.D.	Pass

**Note:** - mg/kg=0.0001%  
-N.D.=Not Detected(<MDL)

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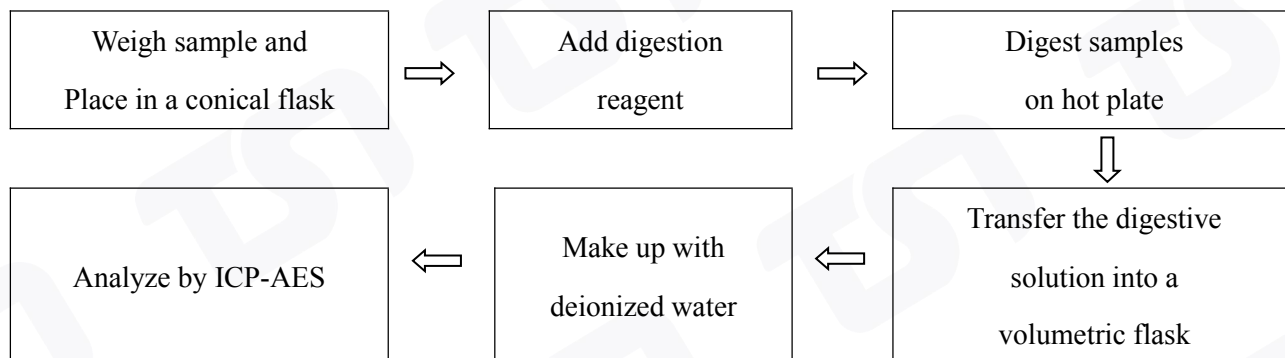
Report No : TST20230340063-3RR

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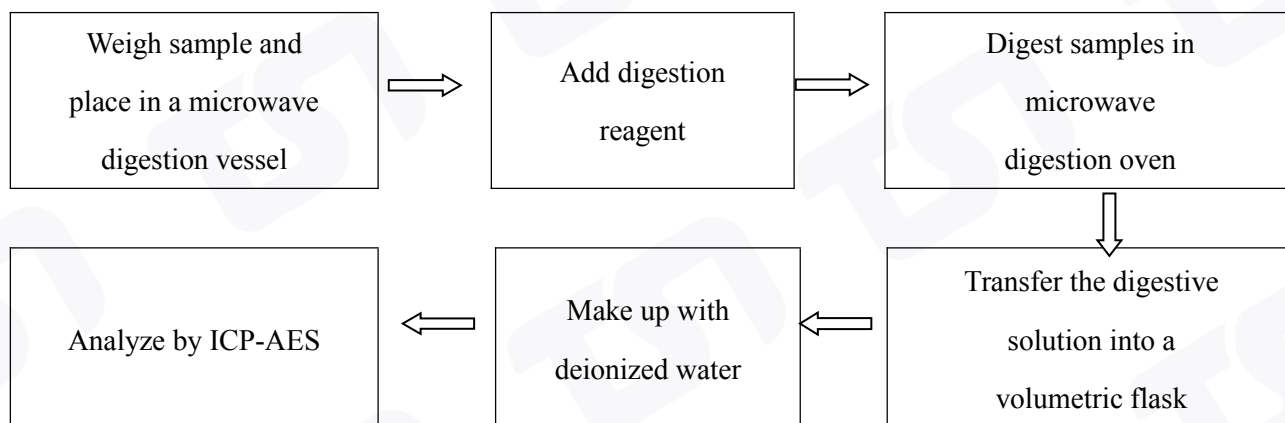
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## Chemical Test Process:

### 1. Test for Cd/Pb Content



### 2. Test for Hg Content



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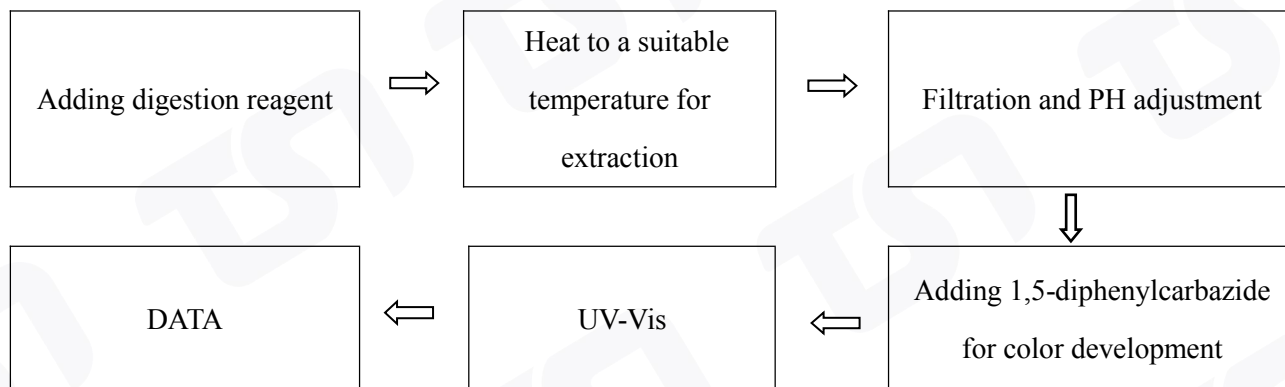
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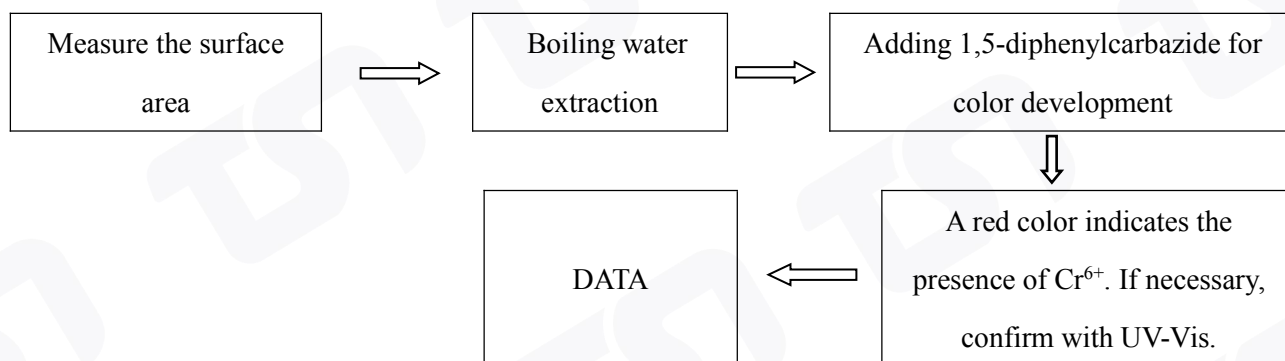
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## 3. Test for Chromium (VI) Content

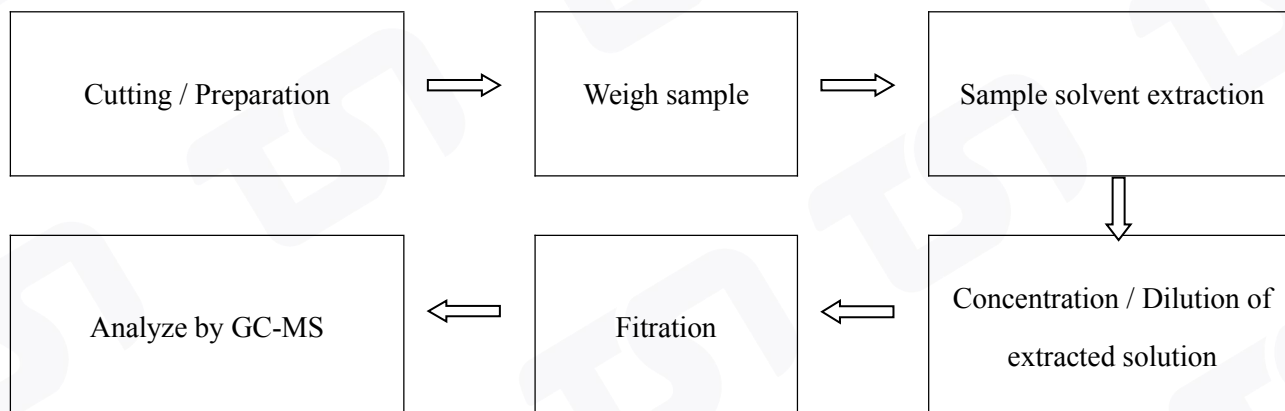
Nonmetal material



Metal material



## 4. Test for DBP, BBP, DEHP, DIBP, PBB, PBDE Content



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The figure consists of four photographs documenting the disassembly of a computer mouse. The top-left photo shows the mouse, its power adapter, various cables, and two black rings. The top-right photo shows the mouse with a ruler for scale. The bottom-left photo shows the disassembled mouse components, including the housing, buttons, rollers, and rings. The bottom-right photo shows the internal components, including the switches, springs, cord, feet, and other small parts, with a ruler for scale.

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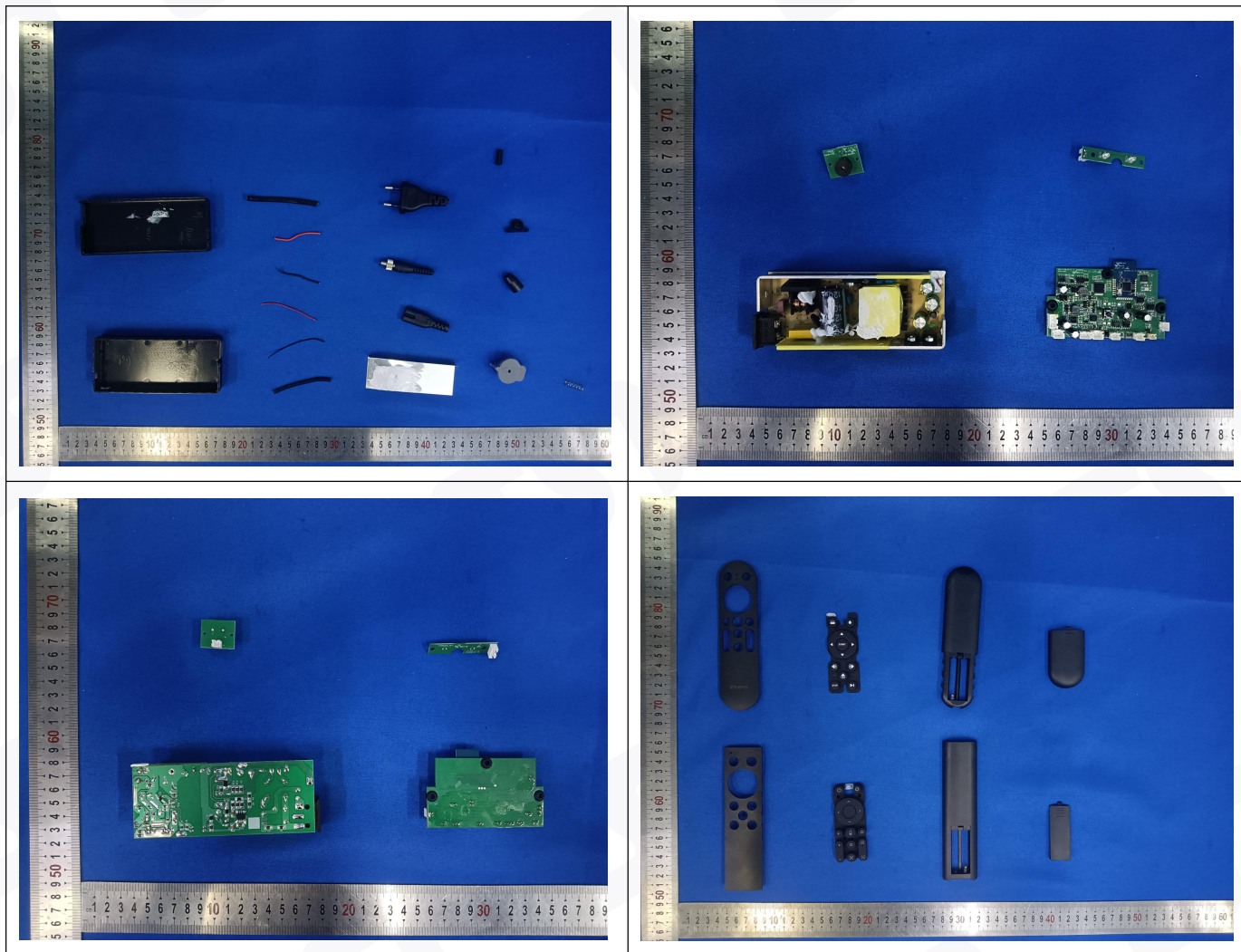


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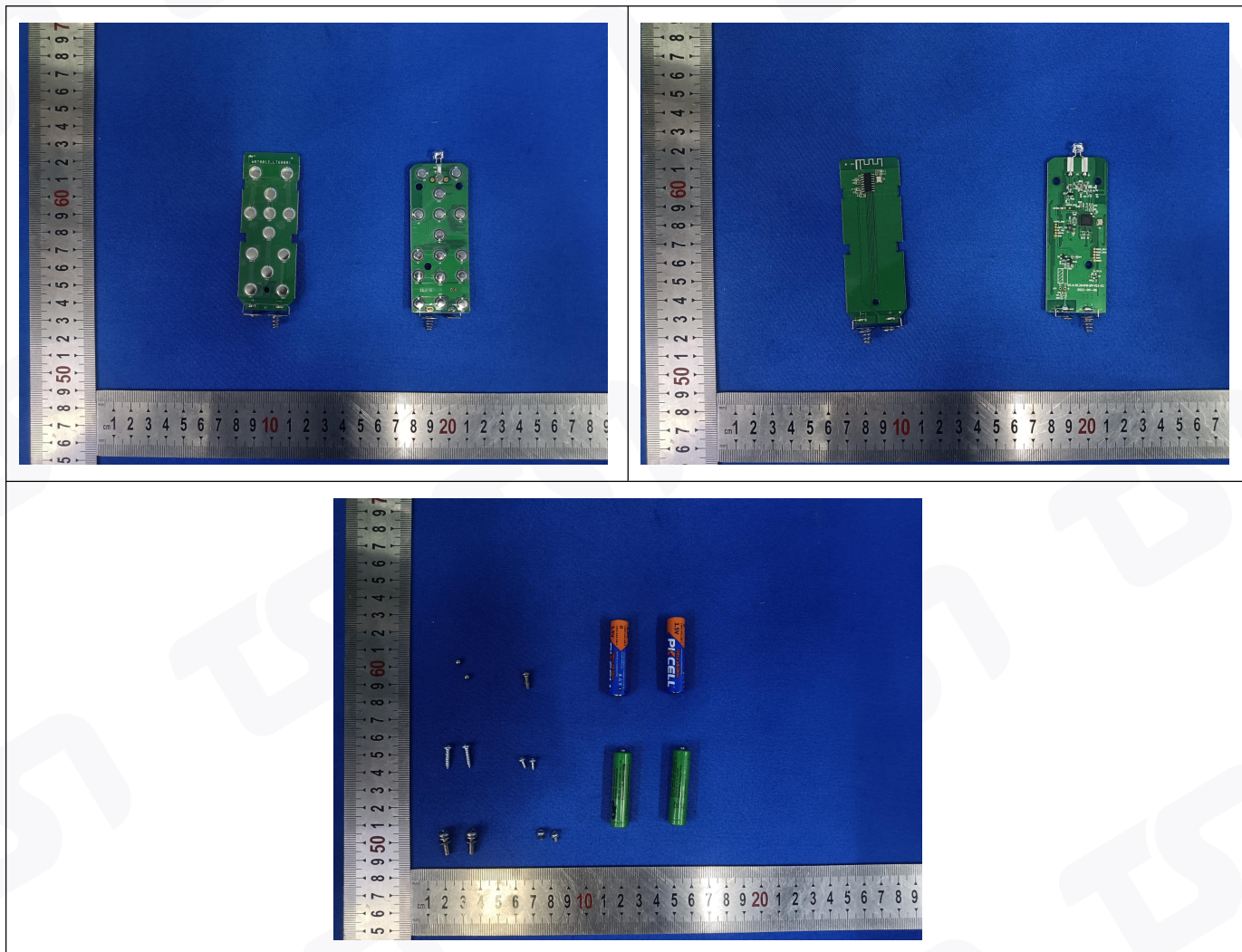


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