

# Welcome to RoHS Guide



RoHS stands for Restriction of Hazardous Substances and impacts the entire electronics industry and many electrical products as well. The original RoHS, also known as Directive 2002/95/EC, originated in the European Union in 2002 and restricts the use of six hazardous materials found in electrical and electronic products. All applicable products in the EU market since July 1, 2006 must pass RoHS compliance.

Directive 2011/65/EU was published in 2011 by the EU, which is known as RoHS-Recast or RoHS 2. RoHS 2 includes a **CE-marking directive**, with RoHS compliance now being required for CE marking of products. RoHS 2 also added Categories 8 and 9, and has additional compliance recordkeeping requirements.

Directive 2015/863 is known as RoHS 3. RoHS 3 adds four additional restricted substances (phthalates) to the list of six.

# Is Your Organization RoHS Compliant for 2021?

Any business that sells applicable electrical or electronic products, equipment, sub-assemblies, cables, components, or spare parts directly to RoHS-directed countries, or sells to resellers, distributors or integrators that in turn sell products to these countries, is impacted if they utilize any of the restricted 10 substances.

With the rapid spread of digitization, the world's production of electrical and electronic devices is exploding. Besides mobile devices, think about the coming wave of IoT, smart home assistants, robots, drones, 3D printers, and home medical devices to all corners of the planet, they are all regulated under RoHS.

EU RoHS specifies maximum levels for the following 10 restricted substances. The first six applied to the original RoHS while the last four were added under [RoHS 3](#), which took effect July 22, 2019.

- **Cadmium (Cd):** < 100 ppm
- **Lead (Pb):** < 1000 ppm
- **Mercury (Hg):** < 1000 ppm
- **Hexavalent Chromium: (Cr VI)** < 1000 ppm
- **Polybrominated Biphenyls (PBB):** < 1000 ppm
- **Polybrominated Diphenyl Ethers (PBDE):** < 1000 ppm
- **Bis(2-Ethylhexyl) phthalate (DEHP):** < 1000 ppm
- **Benzyl butyl phthalate (BBP):** < 1000 ppm
- **Dibutyl phthalate (DBP):** < 1000 ppm
- **Di isobutyl phthalate (DIBP):** < 1000 ppm

Related to RoHS is WEEE, which stands for Waste from Electrical and Electronic Equipment. WEEE Directive 2002/96/EC mandates the treatment, recovery and recycling of electric and electronic equipment (90% ends up in landfills). All applicable products in the EU market must pass WEEE compliance and carry the "Wheelie Bin" sticker.

# RoHS 3 (EU 2015/863)

RoHS 3 (EU Directive 2015/863) adds Category 11 (catch-all) products and adds four new restricted substances - all phthalates. The four phthalates are mainly used as insulation plasticizers and are on the REACH list of SVHC (Substances of Very High Concern). The expanded list for RoHS 3 is thus as follows:

Cadmium	(0.01 %)
Lead	(0.1 %)
Mercury	(0.1 %)
Hexavalent chromium	(0.1 %)
Polybrominatedbiphenyls (PBB)	(0.1 %)
Polybrominated diphenyl ethers (PBDE)	(0.1 %)
<b>Bis(2-ethylhexyl)phthalate(DEHP)</b>	<b>(0.1 %)</b>
<b>Butylbenzylphthalate(BBP)</b>	<b>(0.1 %)</b>
<b>Dibutyl phthalate(DBP)</b>	<b>(0.1 %)</b>
<b>Disobutylphthalate (DIBP)</b>	<b>(0.1 %)</b>

**Extension exemption:** Of note is that medical devices have a two-year extension to meet RoHS 3 compliance:

*"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**."*

**Category 11** products include all other electronic and electrical equipment not covered under the other categories. Included are 2-wheeled vehicles, electronic nicotine delivery systems (ENDS) such as e-cigarettes, cannabis vaporizers and vape pens. Also included are electrical cables that are less than 250V working voltage.

# RoHS Annex III Lead Exemptions

Seven exemption groups have been approved for the use of lead in certain applications under EU RoHS Annex III for a few more years, summarized and detailed below:

## Lead Category Exemption Deadlines

**July 21, 2021:** All categories except for Category 8 in-vitro diagnostic medical devices, Category 9 industrial monitoring & control instruments, Category 11 products

**July 21, 2023:** Category 8 in-vitro diagnostic medical devices (IVDs)

**July 21, 2024:** Category 9 industrial monitoring & control instruments; Category 11 products

## Lead Exemption Table

Exemption	Application	Category	Deadline	
6a	Lead up to 0.35% by weight in alloyed steel (for machining) and galvanized steel	Categories 8, 9 (except for in-vitro diagnostic medical devices and industrial monitoring & control instruments)	21	Jul, 2021
		Category 8 in-vitro diagnostic medical devices	21	Jul, 2023
		Category 9 industrial monitoring & control; Category 11	21	Jul, 2024
6a-1	Lead up to 0.35% by weight in alloyed steel (for machining) and up to 0.2% lead by weight in batch hot-dip galvanized steel	Categories 1-7 and 10	21	Jul, 2021
6b	Lead up to 0.4% lead by weight in aluminium alloys	Categories 8, 9 (except for in-vitro diagnostic medical devices and industrial monitoring & control instruments)	21	Jul, 2021
		Category 8 in-vitro diagnostic medical devices	21	Jul, 2023

		Category 9 industrial monitoring & control instruments; Category 11	21	Jul, 2024
6b-I	Lead up to 0.4% lead by weight in recycled scrap aluminium alloys	Categories 1-7 and 10	21	Jul, 2021
6b-II	Lead up to 0.4% lead by weight in aluminium alloys for machining	Categories 1-7 and 10		
6c	Lead up to 0.4% lead by weight in copper alloys	Categories 1-7 and 10	21	Jul, 2021
		Categories 8, 9 (except for in-vitro diagnostic medical devices and industrial monitoring & control instruments)	21	Jul, 2021
		Category 8 in-vitro diagnostic medical devices	21	Jul, 2023
		Category 9 industrial monitoring & control instruments; Category 11	21	Jul, 2024
7a	Lead up to 85% by weight in high-temperature solder alloys	Categories 1-7 and 10 (except for Exemption 24 capacitor applications)	21	Jul, 2021
		Categories 8, 9 (except for in-vitro diagnostic medical devices and industrial monitoring & control instruments)	21	Jul, 2021
		Category 8 in-vitro diagnostic medical devices	21	Jul, 2023
		Category 9 industrial monitoring & control instruments; Category 11	21	Jul, 2024
7c-I	Lead in glass or ceramics (including matrix compounds) other than for capacitor dielectrics (such as piezo electronic devices)	Categories 1-7 and 10 (except for Exemption 24 potentiometer applications)	21	Jul, 2021
		Categories 8 and 9 (except for in-vitro diagnostic medical devices)	21	Jul, 2021

		and industrial monitoring & control instruments)		
		Category 8 in-vitro diagnostic medical devices	21	Jul, 2023
		Category 9 industrial monitoring & control instruments; Category 11	21	Jul, 2024
24	Lead in solders for machined through-hole discoidal and planar array ceramic multilayer capacitors	Categories 1-7 and 10	21	Jul, 2021
		Categories 8 and 9 (except for in-vitro diagnostic medical devices and industrial monitoring & control instruments)	21	Jul, 2021
		Category 8 in-vitro diagnostic medical devices	21	Jul, 2023
		Category 9 industrial monitoring & control instruments; Category 11	21	Jul, 2024
34	Lead in cermet-based trimmer potentiometer elements	Categories 1-7 and 10	21	Jul, 2021
		Categories 8 and 9 (except for in-vitro diagnostic medical devices and industrial monitoring & control instruments)	21	Jul, 2021
		Category 8 in-vitro diagnostic medical devices	21	Jul, 2023
		Category 9 industrial monitoring & control instruments; Category 11	21	Jul, 2024

## RoHS Testing Methods

The initial method used for RoHS compliance testing is by X-Ray Fluorescence Spectroscopy (XRF), as per ASTM F2617. XRF analysers come in stand-alone, bench-top and handheld formats. Portable, on-site XRF testing using a handheld XRF analyser is usually performed first and focuses on the parts of a product with the highest risk of containing restricted substances. Other RoHS testing methods used include Fourier Transform Infra-red Spectroscopy (FTIR) testing and sometimes Scanning Electron Microscope (SEM) testing.

XRF analysers can be bought or rented as the need arises. The following is a list of major XRF manufacturers:

 Bruker	AXS
 Innov-X	Systems
 Niton	
 Oxford	Instruments
 PANalytical	
 Rigaku	Americas
 RMD	Instruments
 Shimadzu	
 SII	Nanotechnology
 Skyray	XRF
 Spectro Analytical	

With the advent of RoHS 3 and the four added phthalates, additional testing is required to ascertain levels of these compounds, which are extracted with a solvent. The extraction solvent is then analysed for the presence of phthalates using gas chromatography coupled with mass spectrometry (GC/MS) or coupled with flame ionization detection (GC/FID).

# RoHS Steps to Certification

The following steps are involved for RoHS certification.

**1. Testing:** Either on-site or XRF testing and/or lab phthalate solvent extraction testing is done to determine values of the ten restricted RoHS substances.

**2. Process Audit:** Inspect all applicable manufacturing processes used towards RoHS compliance on-site.

**3. Documentation Review:** Review the Bill of Materials, Technical File, assembly drawings, materials declarations, test reports, and conformance/compliance certificates from all suppliers.

The **Technical File** must contain the following:

- ✓ General product description and design structure information
- ✓ Risk assessment of materials, parts and subassemblies
- ✓ Conformity information on materials, parts, and subassemblies
- ✓ Manufacturing documentation and records
- ✓ Harmonized standards, specifications, and conformity procedures

**4. Certification Statement:** After a successful audit, a RoHS Certificate of Compliance (also known as a Certificate of Conformity or Declaration of Conformity) is issued.



# China RoHS

The Chinese Ministry of Industry and Information Technology (MIIT) published China RoHS 2 (called the Administrative Measures for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products on Jan 21, 2016, with it coming into effect on July 1, 2016. China RoHS 2 restricts the same six substances as EU RoHS 2.

The original China RoHS only impacted electronic information products (EIP); with China RoHS 2, electrical and electronic products (EEE) are impacted, similar to EU RoHS. This applies to equipment with working voltages less than or equal to 1000VAC and 1500VDC.

On June 29, 2017, the MIIT published a (Chinese language) draft catalog of products in 12 product categories subject to compliance, as listed below. Products and parts that contain restricted substances exceeding limits can still be sold in China but need to be marked as such. Unlike EU RoHS, there currently are **no** exemptions.

## **China RoHS 2 Product Categories**

**Communication equipment, fixed or mobile**

**Professional broadcast and TV equipment**

**Computer and office equipment**

**Household appliances**

**Electronic instruments for monitoring and control applications**

**Industrial electrical and electronic equipment, including monitoring and control equipment**

**Power tools**

**Medical electronics and devices**

**Lighting products, including electric light sources (lamps) and luminaires**

**Sports and entertainment products**

Unlike EU RoHS, products for large commercial applications (Large Scale Industrial Tools (LSIT) and Large Scale Fixed Installations (LSFI)) are **NOT** exempted.

Unlike EU RoHS, which imposes substance concentrations for a product or component, China RoHS 2 restricts substance concentrations for to each homogenous material in the product. These concentration limits are published in the GB/T 26572-2011 (Requirements for concentration limits for certain restricted substances in electronic and electrical products).

China RoHS 2 also stipulates that an **Environmental Protection Use Period** be listed for each product that contains restricted substances above the prescribed limit during which products "will not leak or mutate suddenly under normal operating conditions and will not result in serious environmental pollution or cause serious bodily injury to the user or damage to their assets during the normal use by the user". This Use Period starts on the date of manufacture.

#### **China RoHS 2 Marking:**


The symbol on the left is affixed to products that pass RoHS 2 compliance for all materials, while the symbol on the right is affixed to products containing substances above RoHS limits, and displaying the Environment Use Period (in this example 10 years).



Along with the non-compliance mark, a Hazardous Substance table must also be supplied with the product that lists each part that is out of compliance:

Hazardous Substance Table

部件名称 Part Name	有毒有害物质 Hazardous Substance					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	铬 6+ (Cr <sup>6+</sup> )	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属部件 Metal Parts	X	o	o	o	o	o
电源 Power Supplies	X	o	X	o	o	o
主板 Motherboard	X	o	o	o	o	o
散热器部件 Heatsink Assemblies	o	o	o	o	o	o
闪存卡 Compact Flash Card	X	o	o	o	o	o
硬盘 Hard Drives	X	o	o	o	o	o
风扇装置 Fan Assembly	X	o	o	o	o	o
<p>o: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006标准规定的限量要求以下 Expresses that this hazardous substance is below the specified limits as described in SJ/T 11363-2006.</p> <p>x: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006标准规定的限量要求 (企业可在此处, 根据实际情况对上表中打“x”的技术原因进行进一步说明) Expresses that this hazardous substance is above the specified limits as described in SJ/T 11363-2006.</p>						

<p>除非另外特别的标注,此标志为针对所涉及产品的环保使用期标志. 某些零部件会有一个不同的环保使用期(例如,电池单元模块)贴在其产品上.</p> <p>此环保使用期限只适用于产品是在产品手册中所规定的条件下工作.</p> <p>The Environmentally Friendly Use Period (EFUP) for all enclosed products and their parts are per the symbol shown here, unless otherwise marked. Certain parts may have a different EFUP (for example, battery modules) and so are marked to reflect such. The Environmentally Friendly Use Period is valid only when the product is operated under the conditions defined in the product manual.</p>	
--	---

Compliance enforcement protocols and penalties for non-compliance may be included might become part of the China Compulsory Certificate system, with testing by a 3rd-party lab required.

# RoHS Initiatives Worldwide

Your business probably will not escape RoHS compliance just because your products don't sell in the EU market. The following countries have implemented their own version of RoHS as well:

## U.S. California RoHS (SB20/SB50) Compliance

California RoHS took effect on January 1, 2007. California Senate Bills SB 20 and SB 50 contain both RoHS and WEEE-like provisions. California RoHS is narrower in scope than EU RoHS in that it restricts only lead, mercury, cadmium and hexavalent chromium and not the other six substances covered under EU RoHS 3. In addition, it **only** applies to "covered electronic devices" that are defined as **standalone** LCD, plasma, and CRT video displays with a screen greater than four inches diagonally. Displays integrated into other equipment do not apply.

Other U.S. states that have enacted RoHS-like and e-waste regulations include Colorado, Illinois, Indiana, Minnesota, New Mexico, New York, Rhode Island, and Wisconsin.

## China RoHS Compliance

China RoHS, known as the **Administrative Measure on the Control of Pollution Caused by Electronic Information Products** (ACPEIP), took effect on 1 March 2007.

China RoHS has product marking requirements for the six EU RoHS restricted substances for all applicable products as to whether it is compliant or non-compliant. Disclosure can be at the component or at the sub-assembly level, but it has to be in a prescribed format in Chinese as detailed in "Marking for the control of Pollution Caused by Electronic Information Products". Specifically, a sticker with the Environment Friendly Use Period (EFUP) is applied, which lists the period of time in years before any of the RoHS substances are likely to cause possible harm to health or the environment. China RoHS also used to be referred to as RPCEP (Regulation for Pollution Control of Electronic Products).

The Ministry of Industry and Information Technology (MIIT) maintains the database of products that are subject to RoHS restrictions. For more information, see [China RoHS vs EU RoHS](#).

## Japan RoHS (J-MOSS) Compliance

Japan RoHS law combines the Japanese Recycling Law (Law for Promotion of Effective Utilization of Resources in Japan) with the JIS C 0950 standard (marking for presence of the specific chemical substances for electrical and electronic equipment) and is referred to as J-MOSS. Japan RoHS restricts the same six substances in the same concentration limits as EU RoHS 2, but for only seven product categories.

For more information, see [Japan RoHS vs EU RoHS](#).

## Taiwan RoHS Compliance

Taiwan RoHS (CNS 15633) became law on December 1, 2016 by the BSMI (Bureau of Standards, Metrology & Inspection, M.O.E.A., R.O.C.). Taiwan RoHS mirrors the original EU RoHS for the six restricted substances, with differing effective dates.

However, unlike EU RoHS, which prohibits products that contain hazardous substances from being placed on the market, Taiwan allows products even if their restricted substances content is beyond the thresholds. In this case, the applicant must create a **Table of Presence Condition of Restricted Substances** and add the table to the body, packaging, stickers, and instruction manuals of these products.

## Korea RoHS Compliance

On Jan 1, 2008, the Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles went into effect as Korea RoHS. It restricts the six substances with the same limits as EU RoHS2 for electrical and electronic equipment. Vehicles under 3.5 tons are also impacted under the first 4 substances (cadmium, mercury, lead, and chromium (Cr6+)). The definition of vehicles is adopted from Article 2(1) of the Automobile Management Act. No mark or certification is required.

Korea's equivalent of the EU RoHS, WEEE, and ELV directives adopts an Eastern approach by including "design for the environment" in its requirements. Implementation is geared toward improvement in product design and recycling technology as they become technically and economically feasible.

## Norway RoHS Compliance (PoHS)

As of December 20, 2011, Norway restricted lead (at 0.01% vs. 0.1% for EU RoHS), PCP, PFOA and MCCP, of which lead is the only common substance with EU RoHS. Also known as PoHS, which stands for the "Prohibition on Certain Hazardous Substances in Consumer Products", it is more of a general consumer product legislation rather than for EEE equipment.

## India RoHS Compliance

India RoHS, which took effect in May 2014, restricts the same six substances at the same thresholds as EU RoHS, but with a differing scope of products. For more information, see [India RoHS vs EU RoHS](#).

## Ukraine RoHS Compliance

Ukraine RoHS, also known as **Technical Regulation Decree No. 139**, was approved by the Cabinet of Ministers of Ukraine on March 10, 2017. This decree supersedes the original Decree No. 1057 from 2008. Ukraine RoHS follows EU RoHS 3 (2015/863) in the restriction of 10 substances (6+4) in 11 EEE product categories and with the same exemptions.

## Singapore RoHS Compliance (SG-RoHS)

Starting June 1, 2017, the Singapore Ministry of the Environment and Water Resources (MEWR) adopted a regulation that prohibits the use of the six RoHS substances used in the following products: mobile phones, laptops, flat-panel TVs, refrigerators, air conditioners, and washing machines. For more information, see [Singapore RoHS vs EU RoHS](#).

## UAE RoHS Compliance

UAE Cabinet Decision No. 10/2017 specifies that starting on January 1, 2018, ROHS will be enforced in Abu Dhabi, Ajman, Dubai, Fujairah, Ras al-Khaimah, Sharjah, and Umm al-Quwain. UAE RoHS regulations will require companies to provide a national UAE RoHS Declaration of Compliance (DoC), associated documentation, and obtain a certificate to put products on the UAE market. Unlike EU RoHS, this information would only be required by regulatory agencies if there was a suspected compliance issue.

## Turkey RoHS Compliance

Turkey announced the implementation of their Restriction of Hazardous Substances (RoHS) legislation effective **June 2019**. The legislation was created by the Turkish Ministry of Environment and Forestry and includes manufacturers and sellers of electronic goods and includes products which are supplied by others under their own brand names.

Manufacturers must keep documentation showing that products they introduce to the market meet the criteria for legislation for 5 years starting from the date the product is released to the market. Manufacturers must also submit a Conformity Declaration Form to the Turkish government every year.

## Eurasian/Russian RoHS Compliance

The Eurasian Economic Union (EEU) member states of Armenia, Belarus, Kazakhstan, Kyrgyzstan and Russia passed RoHS legislation on March 1, 2018, and has aligned its regulation with the EU RoHS. This is known as CU TR 037/2016 or EAC RoHS. EEU member states will have until **March 1, 2020** to comply.

## Brazil RoHS Compliance (COMING)

A working group presented a draft proposal that aligns closely with EU RoHS before the National Environment Council (Conama) in summer, 2018.