



What should you know about RoHS 3

As specified in the European Directive 2015/863 dated 22nd of July 2019, electronic equipment manufacturers will have to comply with the third revision of the Restriction of Hazardous Substances (RoHS), referenced as RoHS 3. All categories of electrical and electronic equipment are affected except medical devices and monitoring and control instruments, for which restrictions will apply from the later date of 22 July 2021 to take into account their longer innovation cycles. The “Revision 3” adds four additional restricted substances, listed under phthalate, to the original list of six (see table 1).

In 2010 some phthalates were on the REACH candidate list or listed in REACH Annex XIV as subject to the authorization process. They were also included in the European Commission’s proposal for the recast of the EU Directive on the restriction of hazardous substances

(RoHS) in electrical and electronic equipment as priority substances to be assessed for potential restriction, which eight years later is now happening.

Since the original listing in REACH, and in the candidate list of Substances of Very High Concern for authorization (SVHC), the risk and toxicity of the four substances: Bis (2-ethylhexyl) phthalate (DEHP) ; Benzyl butyl phthalate (BBP) ; Dibutyl phthalate (DBP) and Diisobutyl phthalate (DIBP) have been researched by international laboratories. The results of more than 10 years tests and investigation exhibit a very high hypothesis that the effects of exposure to phthalates may affect human reproduction, development and risk of cancer. These results have motivated the European Commission to move the four phthalates from “Observation” to “Restriction and Interdiction”.

RoHS 1 DIRECTIVE 2002/95	RoHS 2 DIRECTIVE 2011/65	RoHS 3 DIRECTIVE 2015/863
Published January 27, 2003, restricting the use of certain hazardous substances in electrical and electronic equipment.	Published June 8, 2011, restricting the use of certain hazardous substances in all electrical and electronic equipment.	Published March 31, 2015, amending Annex II to Directive 2011/65 / EU of the European Parliament and of the Council as regards the list of substances subject to restrictions.
Device categories covered by this policy		
<ol style="list-style-type: none"> 1. Home appliances 2. Small household appliances 3. IT and telecommunications equipment 4. Consumer electronics 5. Lighting fixture 6. Electrical and electronic tools (except stationary large industrial tools) 7. Toys and sports and leisure equipment 8. Medical devices (with the exception of all implanted and infected products) 9. Monitoring and control instruments 10. Automatic output devices 	<ol style="list-style-type: none"> 1. Home appliances 2. Small household appliances 3. IT and telecommunications equipment 4. Consumer electronics 5. Lighting fixture 6. Electrical and electronic tools (except stationary large industrial tools) 7. Toys and sports and leisure equipment 8. Medical devices (with the exception of all implanted and infected products) 9. Monitoring and control instruments 10. Automatic output devices 11. Other electrical and electronic equipment 	<ol style="list-style-type: none"> 1. Home appliances 2. Small household appliances 3. IT and telecommunications equipment 4. Consumer electronics 5. Lighting fixture 6. Electrical and electronic tools (except stationary large industrial tools) 7. Toys and sports and leisure equipment 8. Medical devices (with the exception of all implanted and infected products) 9. Monitoring and control instruments 10. Automatic output devices 11. Other electrical and electronic equipment
Substances which are subject to restrictions and maximum concentrations in homogeneous materials by weight.		
<ul style="list-style-type: none"> Lead (0.1%) Mercury (0.1%) Cadmium (0.01%) Hexavalent chromium (0.1%) Polybrominated biphenyls (PBB) (0.1%) Polybrominated diphenyl ethers (PBDE) (0.1%) 	<ul style="list-style-type: none"> Lead (0.1%) Mercury (0.1%) Cadmium (0.01%) Hexavalent chromium (0.1%) Polybrominated biphenyls (PBB) (0.1%) Polybrominated diphenyl ethers (PBDE) (0.1%) 	<ul style="list-style-type: none"> Lead (0.1%) Mercury (0.1%) Cadmium (0.01%) Hexavalent chromium (0.1%) Polybrominated biphenyls (PBB) (0.1%) Polybrominated diphenyl ethers (PBDE) (0.1%) Di (2-ethylhexyl) phthalate (DEHP) (0.1%) Butylbenzyl phthalate (BBP) (0.1%) Dibutyl phthalate (DBP) (0.1%) Diisobutyl phthalate (DIBP) (0.1%)
<p><i>Updates from previous edition marked in red.</i></p>		

Table 1– From RoHS 1 to RoHS 3

Phthalates are a group of chemical substances used to soften and increase the flexibility of plastic and vinyl. They are commonly used in all industries from food packaging to cables, in insulation tapes and in some resins, in short they are almost everywhere (see table 2).

This is yet another new challenge for the electronics industry which after reducing the amount of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers, is now further tasked with reducing the amount of the four listed Phthalates to below 1000 ppm in homogeneous material by weight.

Ready to comply

As was the case for the previous six restricted substance in RoHS 1st edition and RoHS 2nd edition, due to the high usage of phthalates in electronics equipment - including in power supplies - designers must work in close cooperation with their suppliers to substitute such materials with “phthalate free” elements and components.

Due to some industries (e.g. medical) being more sensitive to the risk of phthalates affecting people (patients), as long ago as 2010 they were informing and educating their suppliers about the forthcoming regulations, thus anticipating the demand for parts with less than 1000 ppm of the identified substances listed in REACH and SVHC.

Today, a number of companies are offering RoHS 3 compliant substitutes but there is a huge legacy lagging in the supply chain which will require some pretty intense work to ensure that all products delivered after 22nd July are compliant, which for newly made products might not be a major problem but it could be for products held in stock all over the world.

How do I know if my products comply?

Since the European Directive 2015/863 was released the 31st March 2015, designers have worked with their suppliers to guarantee that all new products pre-comply with the forthcoming regulation, but in some case it has been difficult to replace certain parts (e.g. insulation

Phthalate	Function(s)	Product(s)
BBP Benzyl butyl phthalate	Used as a plasticizer for PVC, polyurethane, polysulfide and acrylic-based polymers.	Vinyl flooring, sealants, adhesives, car care products, automotive trim, food conveyor belts, food wrapping material, and artificial leather.
DBP Dibutyl phthalate	Used as a plasticizer for PVC, poly vinyl alcohol (PVA) and rubber. Also used as solvent and fixative in paint and cosmetics.	Latex adhesives, sealants, car care products, cosmetics, some inks and dyes, insecticides, food wrapping materials, home furnishing, paint, clothing, industrial and pharmaceutical coating.
DEHP Bis (2-ethylhexyl) phthalate	Primarily used as a plasticizer for PVC.	Dolls, shoes, raincoats, clothing, medical devices (plastic tubing and intravenous storage bags), furniture, automobile upholstery, and floor tiles.
DIBP Diisobutyl phthalate	Primarily used as a plasticizer for PVC.	Shower curtains, raincoats, food wraps, bowls, car interiors, vinyl fabrics, floor tiles, and other products.

Table 2 – The four banned phthalates are widely used across the whole industry

tape for high voltage transformers), thus delaying the compliance of some products. In three years' time suppliers will have implemented different processes and substances to replace banned phthalates, but there are few questions remaining on special components or parts.

However, if in new products the level of banned phthalates is reduced to below 1000 ppm, the doubt remains for items laying in stock. To be on the safe side a number of companies have taken the decision to run samples through an X-Ray Fluorescence (XRF) analyzer, and if this is not deemed enough to use Fourier Transform Infra-red Spectroscopy (FTIR) testing methods and sometimes Scanning Electron Microscopes (SEM).

The cost for such analysis could be substantial however, in the context of present day market conditions and the effects of component shortages, scraping products without knowing if the level of the four phthalates below or over the 1000 ppm threshold might cost even more money.

What about repair and maintenance?

As specified in the Directive, 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 electrical and electronics equipment 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.

So what's coming next?!

"REACH aims to improve the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances." That means that research on toxicology and its impact on health and the environment will continue in order to identify risks.

As well, the European Chemical Agency has worked on a "Roadmap for SVHC identification and implementation of REACH Risk Management measures from now to 2020" which gives an EU-wide commitment to ensure that all relevant, currently known substances of very high concern (SVHC) are included in the candidate list by 2020. The objective of the SVHC Roadmap is to screen to identify new substances of concern, and to analyze the risk management options (RMO) appropriate to the particular substance of concern.

In today's business environment, electronics engineers must permanently monitor the evolution of REACH and SVCH. With the growing concerns about health and the environment we can expect more substances to be added to the RoHS list, which in some cases may prove to be extremely challenging.

As in many other situations, knowing your industry, being innovative and investing in new technologies is probably the only way to go.

About Powerbox

Founded in 1974, with headquarters in Sweden and operations in 15 countries across four continents, Powerbox serves customers all around the globe. The company focuses on four major markets - industrial, medical, transportation/railway and defense - for which it designs and markets premium quality power conversion systems for demanding applications. Powerbox's mission is to use its expertise to increase customers' competitiveness by meeting all of their power needs. Every aspect of the company's business is focused on that goal, from the design of advanced components that go into products, through to high levels of customer service. Powerbox is recognized for technical innovations that reduce energy consumption and its ability to manage full product lifecycles while minimizing environmental impact. Powerbox a Cosel Group Company.

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Patrick Le Fèvre
Powerbox Chief Marketing
& Communication Officer

About the author

Chief Marketing and Communications Officer for Powerbox, Patrick Le Fèvre is an experienced, senior marketer and degree-qualified engineer with a 25-year track record of success in power electronics. He has pioneered the marketing of new technologies such as digital power and technical initiatives to reduce energy consumption. Le Fèvre has written and presented numerous white papers and articles at the world's leading international power electronics conferences. These have been published over 210 times in media throughout the world. He is also involved in several environmental forums, sharing his expertise and knowledge of clean energy.

For more information

Visit www.prbx.com
Please contact Patrick Le Fèvre, CMCO
+46 (0)158 703 00