Information about ROHS III

In Germany, the Directives regarding RoHS (Restrictions of Hazardous Substances) were translated into national law by the Ordinance on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (ElektroStoffV). Apart from of a few legal exceptions, RoHS Directives apply to **all** categories of electrical and electronic devices and specify restrictions as to certain hazardous substances.

On **22 July 2019**, these rules and regulations will finally enter into force for all categories.

The RoHS Directive **2011/65/EU ("RoHS II")** currently restricts the use of six hazardous materials in electrical and electronic devices:

- Lead (0.1 %)
- Mercury (0.1 %)
- Cadmium (0.01 %)
- Hexavalent chromium (0.1 %)
- Polybromated biphenyl (PBB) (0.1 %)
- Polybromated diphenyl ethers (PBDE) (0.1 %)

The Delegated Directive **2015/863/EU (RoHS III)** added another four substances, the so-called phthalates. Phthalates are "plasticizers" (additives that render materials more flexible, elastic, pliable or workable):

- Bis(2-ethylhexyl) phthalate (0.1 %)
  DEHP Most widely used phthalate that so far accounts for more than 50 % of the total production of phthalate (low production costs and excellent characteristics regarding flexibility)
- Benzyl butyl phthalate (0.1 %)
  BBP One of the most expensive phthalates – if technically possible, alternative phthalate are used
- Dibutyl phthalate (0.1 %)
  DBP Particularly good characteristics regarding flexibility at low temperatures in soft PVC
- Diisobutyl phthalate (0.1 %)
  DIBP Special plasticizer that is most frequently used in combination with other plasticizers (too inconsistent to be used individually in PVC applications)

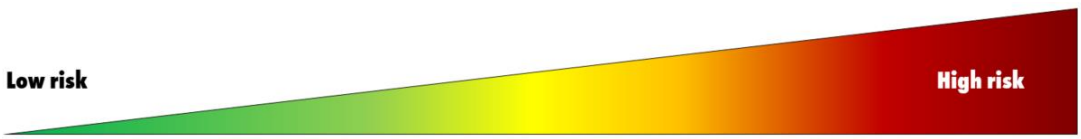
Not contained in:

- ▸ Metal, glass, ceramics
- ▸ Metal coatings, leads
- ▸ Wood, paper, leather, textiles

Contained in:

- ▸ Plastic, resin, foams, paints and varnishes
  (the more flexible, the more probable it is that the substance is contained)
- ▸ Cables, wires, electronic components, electronics

Graphically, the risk that certain materials contain plasticizers can be displayed as follows:



- **Unplasticized PVC, other unplasticized plastics**
- **Rigid adhesives**
- **Solid epoxy resin**
- **Solid paints and coatings**

e.g. printed circuit boards

- **Sealants** based on polysulfide, polyurethane foam or acrylic
- **Flexible adhesives** based on polyvinyl acetate (PVA) and polyacrylics
- **Flexible paints** based on polyurethane or polyacrylics (e.g. water-resistant paints)
- **Ink and varnishes** based on acrylic, nitrocellulose or vinyl resin

e.g. electronic components

- **Flexible PVC** and other vinyl resins (e.g. cable sheathings)
- **Rubber** including acrylonitrile-butadiene (NBR, Buna-n), styrene-butadiene (SBR, Buna-S) and polychloroprene rubber (neoprene)
- **Cellulose ester plastic**
- **Plastic bags and adhesive tape**
- **Flexible plastics and rubber hoses**

e.g. cables, hoses, dampers

RoHS connecting elements

Connecting elements as such in principle are **not** subject to the area of application of the RoHS Directive. The situation may be different if they are **ingredients** of devices that fall under the above-mentioned areas of application. When analyzing the ingredients and material-related restrictions, the assessment refers to the individual components of the device so that every single component must comply with the requirements of the RoHS Directive.

- Connecting elements with yellow or black chromated zinc or zinc alloy coatings contain a small share of chromium (VI) and can therefore only be used to a limited extent.
- Connecting elements with blue or transparent passivated zinc or zinc alloy coatings are **not affected** by this restriction and can be used without restriction.

In cases in which connecting elements with yellow or black chromated coatings are to be replaced by connecting elements with blue or transparent passivated coatings, one must take into consideration that the anti-corrosion characteristics of chromated coatings cannot be compared with the anti-corrosion characteristics of passivated surfaces.

Adolf Würth GmbH & Co. KG offers application-specific anti-corrosion protective coatings compliant with both RoHS and REACH. The following table offers an overview of standard coatings. The question which coating constitutes the most appropriate solution from both a technical and economic perspective in individual cases must be decided based on the product proper and the intended use.

System	Abbreviated chemical name optional	RoHS compliant	Compliant with REACH	Corrosion resistance (base metal corrosion) ISO 9227 NSS (h) Reference values for 5µm layer thicknesses
Electro zinc-plated, yellow	A2C, A3C, A2L, A3L	**no**	**no**	72
Electro zinc-plated, black	A2R, A3R, A2S, A3S	**no**	**no**	72
Electro zinc-plated blue	A2K, A3K	yes	yes	36
Electro zinc-nickel plated black	ZNBHL, ZNBH	yes	yes	480
Electro zinc-nickel plated silver	ZNSHL, ZNSH	yes	yes	480
Zinc flake silver	ZFSHL, ZFSH	yes	yes	480

Based on the following Delegated Directives there are exceptions to the restrictions of use of certain substances. In connecting elements made of metallic materials, the above-mentioned substances can only be contained as alloying component in the raw material within the approved threshold values.
In part, the steel materials used for connecting elements are subject to exceptions 6a or 6a I (Delegated Directive (EU) 2018/739 of the Commission from 1 March 2018).
In part, the aluminum materials used for connecting elements are subject to exceptions 6b, 6b I or 6b. II (Delegated Directive (EU) 2018/740 of the Commission from 1 March 2018).
In part, the copper alloys used for connecting elements are subject to exception 6c. (Delegated Directive (EU) 2018/741 of the Commission from 1 March 2018).