



Hazardous substances in EEE: COCIR comments on application in medical devices

March 28, 2008

Note that this table partly includes contributions submitted separately from eg ERA, Eurometaux, or EICTA. The table is a first attempt to collect data in a short time and more time would be needed to further explore the availability of adequate alternatives.

ID	Substance name	CAS-Nr.	Hazard	Main use in EEE	Stakeholder Input		
					Specification of use: component(s) in which substance is contained	Quantity	General comments
1	Antimony trioxide	1309-64-4	Carc Cat. 3 R40	Synergist brominated flame retardants;	Ceramics hobs in Household appliances (Sb_2O_3 -free alternatives exist), equipment housings, mouldings, connectors and many other electrical components Commonly used in connectors; very		Chemically bound in silicate-matrix antimony trioxide does not appear anymore as such. To comply with obligatory fire regulations, Sb_2O_3 must be used with most types of brominated flame retardants and in PVC. There are no substitutes that are as effective. Only brominated flame retardants are suitable for some types of plastic ¹

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					common fire retardant for plastics that was used to replace the more dangerous PBB's and PBDE's currently listed. There are alternatives that exist for most resins, but in some cases the price, and effectivity would need to be examined <i>(to be checked by Eurometaux)</i>		Current Risk assessment ongoing. Latest results indicate risk for EEE <i>(to be checked by Eurometaux)</i>
2	Antimony compounds	-	Xn; R20/22 N; R51-53	Flame retardant; melting agent in CRT glass; solder material (antimony-tin) Melting agent in CRT glass	Also used as a yellow pigment for ceramics and plastics Antimony compounds used in medical devices. Alternatives are not proven. <i>(to be checked by Eurometaux)</i>		Need to consult with pigment manufacturers. Need to determine if there is a risk from these pigments or any potential substitutes.
3	Arsenic/arsenic compounds	7440-38-2	T; R23/25 N; R50-53	III-V group semiconductor substrate (GaAs) Flame retardant	Ceramics hobs in Household appliances (as-free alternatives exist) Many GaAs components used in circuit boards. – some apps need parts to eliminate ground bounce as well as		Chemically bound in silicate-matrix Arsenic based semiconductors are used because of their unique combinations of characteristics. There are no alternatives for most applications.

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					semiconductor devices and lasers. Also in photodiodes and thermal imaging – Category 9 applications		
4	Beryllium metal	7440-41-7	Carc. Cat. 2; R49 T+; R26 T; R25-48/23 Xi; R36/37/38 R43	In alloys; copper-beryllium alloy; Connectors: contact springs, improves elasticity of copper alloy; Finger clips PCs: maintains electrical conductivity in metal housing; Monitors Relays: improves properties of copper contact springs Switches: high strength, high conductivity Laser printers: Rotating mirror, lightweight rigidity for precision instrumentation	Used in ceramic components in electronics 3 %in copper alloys. Precision co-axial connectors to meet high reliability (xks connects) standard IEEE Std 287-2007 to 110 Ghz. A useful property of copper beryllium is its corrosion resistance. Copper-beryllium housings are specifically used in under-water applications to protect the electronics from the corrosive effects of seawater. Due to its nuclear and mechanical properties, beryllium metal is also used in fusion reactors. See the ICRU Report	<100Kg /y	Copper-beryllium is the spring material that has the longest life and is the most reliable. It is also more expensive than steel or phosphor bronze (inferior substitutes) and so is used generally only if there is no alternative. Medical detectors requiring screening often operate near theoretical limits so they are in a class that is quite different from most normal applications of EMC shielding. We can not be sure that there is an alternative that will suit the most critical applications Published and approved safety studies are existing for the CAS 7440-41-7, and this product should be removed from this list The US- OSHA protective measures can be found under : http://www.osha.gov/SLTC/beryllium/index.html

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					<p>49: 'Stopping Powers and Ranges for Protons and Alpha Particles, Intern. Commission on Radiation Units', 1993.</p> <p>Beryllium has advantages over carbon in beam energy due to less scattering thus producing smaller beam emittance for necessary control in specific area such as for ophthalmologic cancer treatments using particles beams and dose rates required by the Good clinical practices, ...</p> <p>No replacement product available for these specific applications</p> <p>BeCu is also key for high-reliability connector contacts, sockets, and often used in switches, relays, EMI/RFI or EMC shields and gaskets.</p> <p>Because Be metal is</p>		

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					transparent to X-rays, it is used as X-Ray window material in X-Ray tubes (about 30 kg/year) No alternatives are available Also used in X-ray detectors		
5	Beryllium oxide BeO	1304-56-9	Carc. Cat. 2; R49 T+; R26 T; R25-48/23 Xi; R36/37/38 R43	In ceramics, as cooling device; Thermally conductive electrical insulator	BeO is used within specialised very high power microwave components for its excellent thermal conductivity. We can not be sure that alternatives exist for all applications. Beryllium oxide is separated at end of life for reuse or specialist disposal. Use in phosphor for X-ray detector Beryllium Oxide is a critical component of certain laser heads used in diagnostic		Properties of Beryllium metal and beryllium oxide are required for high standard precision connectors. Beryllium Oxide has the highest thermal conductivity of any electrically insulating material. Its thermal conductivity is similar to that of copper and so is used as an insulator on high power semiconductors to conduct heat away from the device. The next best material is aluminium nitride which has a thermal conductivity only one half that of BeO. BeO is expensive and so is used only if there are no alternatives. Parts containing BeO should be marked with a warning that it is present. These substances are very valuable and thorough recycling economically interesting.

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					equipment because of its unique properties as a thermal conductor and electrical insulator.		
6	Tetrabromo bisphenol A and related compounds (see Table II)	79-94-7	Dangerous to the environment N; R50/53	Flame retardant	<p>TBBPA is used as a flame retardant in a wide range of applications such as circuit boards (since we do not use PBB's or PBDE's any more).</p> <p>Reactive FR in PCB laminates so only traces present.</p> <p>Also present as FR together with Sb2O3 in plastic packaging of electronic components like ICs and resistors</p> <p>Additive FR in ABS. Some possible alternatives are more hazardous, others are inadequately tested</p>		<p>TBBPA is reactively bound in resins matrix.</p> <p>The monomer is only present in final product as residue in traces (amount <0.5%)</p> <p>Risk assessment has been carried out :</p> <p>No risk identified for human health in any of the applications. No risk to the environment when TBBPA is used as a reactive component in the production of printed circuits boards. For one use of TBBPA as an additive flame retardant in EEE plastics casings, a low environmental risk was identified in one production plant in Europe. No risk was identified for the production plants or in end use articles like EEE products.</p> <p>RoHS Directive considered as possible measure to reduce risks, but not withheld by EU Authorities. The IPPC directive was agreed as the most appropriate regulatory tool to address the risk identified.</p>
7	Bisphenol A (4,4'-Isopropylidene)	80-05-7	Repr. Cat. 3; R62	Polycarbonate plastic in electronic devices, medical	BPA is a chemical intermediate produced and used globally to make polymers such as		Neither polycarbonate nor epoxy resins can be made without BPA. There are no alternative materials

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	ndiphenol)		Xi; R37-41 R43	equipment; in PVC as hardener, catalyst, binding agents, stabiliser; epoxy resin production	<p>polycarbonate plastics and epoxy resins. The final polymers contain only technically unavoidable trace levels of BPA.</p> <p>Examples for uses in E&E sector:</p> <ul style="list-style-type: none"> - PC is used because of its unique technical properties as such or in various <p>Epoxy resins are used for e.g.</p> <ul style="list-style-type: none"> - Pottings/encapsulation electronic parts (transformers, inductors) - Printed circuit boards - Patient tables <p>Very minor use of BPA is as a component in antioxidant formulations for soft PVC which may be used e.g. in cables</p> <p>The use of BPA as catalyst is not a known application</p>		<p>available that offer the same combination and balance of desired and required properties of polycarbonate or epoxy resins in one product.</p> <p>Governments and scientific bodies worldwide have conducted numerous risk assessments for BPA, confirming that BPA-based products can safely be used:</p> <ul style="list-style-type: none"> - The EU commission conducted two risk assessments for BPA under the existing chemicals regulation (initially in 2003, updated in 2007 conclusions at TC NES December 2007); these do not identify any reasons for concern related to consumer use of BPA-based products. This includes IT-applications - BPA is positively listed for use to manufacture polymers with food contact , the European Food Safety Authority EFSA reconfirmed this in its 2007 reassessment of BPA and even increased the TDI (Tolerable Daily Intake) by a factor of 5 due to the strength of the available scientific data. - These conclusions are confirmed by governmental bodies world wide like the US FDA (2005/2007) and the Japanese METI (2005)

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							<p>BPA is not eligible as a SVHC according to the latest scientific information because BPA is</p> <ul style="list-style-type: none"> - Not carcinogenic, mutagenic or toxic for reproduction category 1 or 2 - Not persistent, bioaccumulative or toxic - Not very persistent or very bioaccumulative - Not an endocrine disrupter according to the Weybridge definition <p>Xn has to be added to the classification</p> <p>Use aspect: BPA has a very low vapour pressure resulting in a very low likelihood for evaporation during use of BPA based E/E devises.</p> <p>Used to make epoxy resin but very little should be present in equipment., eg, plasticized in epoxy used for patient tables</p> <p>End of life aspects: BPA-based products such as polycarbonate or epoxy resins can safely be reused, recycled or energetically recovered.</p>

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8	Diethylhexyl phthalate (DEHP)	117-81-7	Repr. Cat. 2; R60-61	Plasticizer in PVC cables	<p>Used in hoses and tubes in anesthesia equipment.</p> <p>New EU directive lists phthalates as a banned substance, especially if it leaches out based on test. Can justify why it is ok to use.</p> <p>Alternatives would have to be fully evaluated and tested for medical devices prior to their use.</p> <p>Used as main plasticizer for PVC cables</p>		<p>Risk assessment clearly demonstrates that DEHP does not pose a risk in EEE applications</p> <p>Alternatives for plasticizers in cables are available but all are not fully tested so the risks are not known</p> <p>There are non-phthalate plasticizers available. All are not fully tested so risks are not known</p>
9	Butylbenzyl phthalate (BBP)	85-68-7	Repr. Cat.2; R61 Repr. Cat.3; R62 N; R50-53	Plasticizer in PVC cables	<p>Almost no BBP is used in EEE applications</p> <p>Flexible plastic coated cables may have this. see 8</p>		<p>Risk assessment clearly demonstrates that BBP does not pose a risk in EEE applications</p> <p>Alternatives for plasticizers in cables are available but all are not fully tested so the risks are not known</p>
10	Dibutylphthalate (DBP)	84-74-2	Repr. Cat. 2; R61 Repr. Cat. 3; R62	Plasticizer in PVC cables	<p>Almost no DBP is used in EEE applications</p> <p>Flexible plastic coated cables may have this. see 8</p>		<p>Risk assessment clearly demonstrates that DBP does not pose a risk in EEE applications</p> <p>Alternatives for plasticizers in cables are available but all are not fully tested so the risks are not known</p>

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			N; R50				
11	Diocetylphthalate (DOP)	117-84-0	Dangerous to the Environment	Plasticizer in PVC cables	Almost no DNOP is used in EEE applications that we are aware of because very little is produced and it is never used by itself anyway		DOP should actually be DNOP for DIN-Octylphthalate (CAS number is correct - name is wrong) Alternatives for plasticizers in cables are available but all are not fully tested so the risks are not known
12	Dimethylformamide (DMF)	68-12-2	Repr. Cat. 2; R61 Xn; R20/21 Xi; R36	Electrolyte capacitors	Unknown		Uncommon or rare solvent for electrolytic capacitors. Most electrolytic capacitors use glycols.
13	Formaldehyde	50-00-0	Carc. Cat. 3; R40 T; R23/24/25 C; R34 R43	Preservatives, monomer (e.g. phenol resin and melamine resin)	Used globally to make polymers in production of plastics Also used/found in Wood Appliances, release at high temperature possible		The final polymers contain only trace levels of formaldehyde. German Indoor-Air-limits restricting emissions already exists (<i>to be checked</i>) Use of "E1" (<= 0.1 ppm in equilibrium) material would not endanger consumers Eye irritation observed > 0.1% (<i>to be checked</i>) Recent research has cast doubt on whether this is a carcinogen.
14	Gallium arsenide	1303-00-0	Human carcinogen*	Power amplifiers, semiconductors	GaAs semiconductor uses less power, is less susceptible to heat and is much faster than silicon. It is therefore		Substitution where possible already done with silicon-doped materials. No further substitution possible. GaAs is more expensive and hence avoided.

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					only used for very high frequency ICs and other devices. See item 3		GaAs is however difficult to make and so much more expensive than silicon. As a result it is always used <u>only</u> if there is no alternative
15	Hexabromo cyclododecane (HBCDD) and further brominated flame retardants (see table II)	3194-55-6	not (yet) classified in the Annex I of Directive 67/548/EEC; proposal: R33, R64, N R50-53; PBT	Flame retardant	Possibly no use in MD's		Largely used in construction industry Under risk reduction – need to wait outcome before making decision R64 and R33 agreed not applicable Uncommon in electrical equipment so better to control risk via REACH which would include all products put on EU market. On-going EU risk assessment.
16	Liquid crystals e.g. MBBA (4-methoxybenzylidene-4-butylaniline) ; 5CB (4-pentyl-4-cyanobiphenyl)			Electroactive layer in liquid crystal displays of cellular phones, notebooks, PC monitors	LCD displays widely used in medical products.		New developments in Liquid Crystals not taken into account Most liquid crystal materials used in electrical equipment are believed to be non-hazardous.
17	Medium-chained chlorinated paraffins (MCCP)	85535-85-9		secondary plasticisers in PVC (cable) flame retardant plasticisers in rubbers	Flexible plastic coated cables may use this.		EU risk assessment completed and recommendations in the draft Risk Reduction Strategy should be followed. MCCP allowed for continued use in

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	(Alkanes, C14-17, chloro)						PVC and rubber under BAT conditions. Risk Reduction Strategies will be finalised soon (April 2008); suggestion to wait for conclusions of 15 th Risk Reduction Strategies Meeting.
18	Nickel ²	7440-02-0	Carc. Cat. 3; R40 R43	<p>Stainless steel, plating; Decorative metal finishes, barrier layers</p> <p>Important antioxidant properties needed for steel in harsh chemical environments.</p>	<p>Nickel plating & stainless steel widely used in medical products. (tables, handles, tools, etc.) e.g., to screen medical detectors from magnetic fields.</p> <p>Or in X-ray tubes (pure Ni for wires).</p> <p>Nickel coating in PWB finishes (ENIG)</p> <p>No skin contact is expected for these applications</p> <p>Stainless steel containing nickel (6-10%) used routinely in pumps (e.g. within IVD analyzers) where components are routinely exposed to a harsh chemical environment (various</p>		<p>No alternatives available.</p> <p>The only risk identified for nickel metal (prolonged skin contact) is already controlled by item 27 of Annex XVII of REACH.</p> <p>Applicable EU standard: Nickel finishes that release greater than 0.5 µg/cm²/week must not be used on the external surface of any product designed to be frequently handled or carried by the user (or intended to be in direct and prolonged skin contact). Measurement to be performed using EN 1811:1998.</p> <p><i>(Eurometaux will provide further input)</i></p> <p>Various plating processes resulting in no skin contact applications. It is not clear that there is a practical alternative.</p>

those applications where nickel is likely to result in direct and prolonged skin exposure

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					IVD reagents and flushing solutions).		
19	Nonylphenol Nonylphenol polyglycol ethers (Nonylphenol ethoxylates)	25154-52-3 9016-45-9	Repr.Cat. 3; R62 Repr.Cat. 3; R63 Xn; R22 C; R34 N; R50-53	Surfactants, antioxidant plastics	Both substances are not used in EEE as already restricted in EU by 76/769/EEC (item 46 of Annex XVII of REACH) Nonylphenol is not a surfactant. It is an intermediate and is not used as such as an antioxidant in plastics Nonylphenol ethoxylates are surfactants and can be used in formulations to clean printed circuit boards. However, with the introduction of 76/769/EEC those uses have been phased out since January 2005.		Nonylphenol ethoxylates are classified and labeled as N, R51/53 and R22, R41 (depending on degree of ethoxylation)
20	Perfluorooctane sulfonates ³	1763-23-1	-		Surfactant only. Does not remain on product.		Will be banned by 76/769/EEC and REACH except where no alternatives are available so no need for RoHS to duplicate.

tion does not apply to the following applications or processes: 1) photoresists or antireflective coatings for photolithography processes; 2) photographic coatings applied to films, papers, printing plates; 3) mist suppressants for nondecorative hard chromium (VI) plating; 4) wetting agents for use in controlled electroplating systems

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21	PVC	9002-86-2	<p>Dependent on the additives (stabilizers and plasticizer) used;</p> <p>Dioxin formation during incineration;</p> <p>Source of organic bound chlorine</p>	Sleeve material (of capacitors), cables, tubing films labels and gaskets, insulator, chemical resistance, transparency, sheath material	<p>PVC is used extensively in our products. Excellent chemical resistance.</p> <p>Mainly used for cables;</p> <p>One application is known for covering strips;</p> <p>All strain reliefs and cables use flexible PVC;</p> <p>Possibly some wire coatings also use PVC</p> <p>Extensive research needed to validate any possible alternative.</p>		<p>PVC is a material and should be taken out of a substance list.</p> <p>PVC itself is not hazardous</p> <p>The combination of properties are very difficult to duplicate with alternative plastics for some applications</p>
22	PCBs Polychlorinated Biphenyls	1336-36-3 and various others	<p>R33 N; R50-53</p> <p>Dioxin/furan formation during incineration</p>	Flame retardant in PVC plastic cable; capacitors	Already banned		<p>Use restricted by 76/769/EEC but surprisingly this has not been included in Annex XVII of REACH.</p> <p>Not used in electrical equipment</p>
23	PCT Polychlorinated Terphenyls	61788-33-8 and various others		Electrical insulation medium, Plasticizers, fire retardants, coatings for electrical wire and cable, dielectric	Already banned		<p>Use already restricted by 76/769/EEC and by REACH (item 1 of Annex XVII)</p> <p>Already restricted by 76/769/EEC and will also be restricted by REACH (item 1 of Annex XVII).</p> <p>Class 1 substance under Japanese</p>

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				sealants			regulation
24	Polychlorinated Naphthalenes	70776-03-3		lubricant, paint, stabilizer (electric characteristic, flame-resistant, water-resistant) insulator, flame retardant	Already banned		Currently the major sources of PCN's in the environment is incineration, formation similar to e.g. dioxins. Candidate POP under UNECE LRTAP http://www.unece.org/env/popsxg/2000-2003/pcn.pdf
25	Selenium	7782-49-2	T; R23/25 R33 R53 Toxic/Danger of cumulative effects / Environment**	Rectifiers and detector instruments, photoreceptor, semiconductor material, light receiving element, photocell	Uses include alloy additive, in glass, light detection semiconductors such as infrared detectors (category 9). Rarely used in rectifiers. Selenium rectifiers used principally as spare parts, not used in new equipment.		Selenium is an essential mineral in the human diet and so trace quantities in the environment are normal and beneficial. Has many uses where replacement is difficult or impossible.
26	Short-chained chlorinated paraffins (SCCP) (Alkanes, C10-13, chloro)	85535-84-8	Carc. Cat. 3; R40 N; R50-53	plasticisers in PVC (cable) flame retardant plasticisers	Already banned		Already restricted by 76/769/EEC and by REACH (item 42 of Annex XVII) for metal working and fat liquoring of leather
27	Synthetic vitreous fibres -glass fibres - mineral wool	142844-00-6	RCF: Carc. Cat. 2;	Thermal insulation materials in domestic electrical appliances	Glass fiber is used extensively as a reinforcement in plastic. There are limited alternatives, but they do not have the physical		Geometric Dimension should be highlighted: Mineral fibers of length < 5 micro meter and diameter of fiber < 3 micro meter when (length of fiber)/(diameter

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	- refractory ceramic fibre (RCFs)				properties that glass does, or cost would be prohibitive (eg. Carbon fibre) Glass fibers used in epoxy materials for patient tables		of fiber) > 3 Fibers regulated by WHO (details needed)
28	Tributyl Tin (TBT) compounds Triphenyl Tin (TPT) compounds	various	T; R25-48/23/25 Xn; R21 Xi; R36/38 N; R50-53; T; R23/24/25 N; R50-53	Stabilizer, antioxidant, antibacterial and antifungal agents, antifoulant, antiseptic, antifungal agent, paint, pigment, antistaining	Already banned		Already restricted by 76/769/EEC and REACH (item 20 of Annex XVII) Additional restrictions on TBT and TPT under 76/769/EEC (point 20 of Annex I to Directive 76/769/EEC) close to final adoption
29	Tributyl Tin Oxide (TBTO)	56-35-9	No classification according to 67/548	antiseptic, antifungal agent, paint, pigment, antistaining, refrigerant, foaming agent, extinguishant,	Already banned		Already restricted by 76/769/EEC and REACH (item 20 of Annex XVII)
30	dinickel trioxide	1314-06-3	Carc. Cat. 1; R49 R43 R53	May be used as an electrolyte	Unknown		Annex XVII of REACH.
31	diarsenic trioxide;	1327-53-3	Carc. Cat. 1;	May be used in certain glass-	Unknown		

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	arsenic trioxide		R45 T+; R28 C; 34 N; R50-53	materials, less than 5000ppm			
32	4,4'-methylenedi-o-toluidine	838-88-0	Carc. Cat. 2; R45 Xn; R22 R43 N; R50-53	Potential use as a dye	Unknown		This compound is not a dye but may be used to make azo dyes. It should not be present in products except as impurity.
33	Petrolatum; Petrolatum	8009-03-8	Carc. Cat. 2; R45	Used in solder fluxes/pastes	Unknown		Petrolatum (petroleum jelly) has no known uses in EEE. Potential for residues left from human skin contact in production or use. Most petroleum jelly today is consumed as an ingredient in skin lotions and cosmetics. Petroleum jelly is used to moisten plasticine, as part of a mix of hydrocarbons including greater (paraffin wax) and lesser (mineral oil) molecular weights. Petroleum jelly is commonly used as a personal lubricant. (Not recommended due to its dissolving effect on condoms.
34	nickel dihydroxide	12054-48-7	Carc. Cat. 3; R40 Xn; R20/22 R43 N; R50-	May be present in certain plastics, metallic- or ceramic materials	Unknown		Used to make nickel pigments but not present in product. Nickel compounds are already restricted by item 27 of Annex XVII of REACH.

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			53				
35	tributyl phosphate	126-73-8	Carc.Cat. 3; R40 Xn; R22 Xi; R38	May be present in certain plastics, metallic- or ceramic materials	<i>Unknown, Inks and adhesives?</i>		May be used in inks and adhesives but uncommon or very rare in electrical equipment.
36	divanadium pentaoxide; vanadium pentoxide	1314-62-1	Muta. Cat. 3; R68 Repr. Cat. 3; R63 T; R48/23 Xn; R20/22 Xi; R37 N; R51-53	May be present in certain plastics, metallic- or ceramic materials	V2O5 is not used in plastics, metals or ceramics but it is used to make other materials that are used as additives to these materials. <i>(to be checked by Eurometaux)</i>		Only use of V ₂ O ₅ in electrical equipment is as a heat detector such as in microbolometers (category 9). <i>(to be checked by Eurometaux)</i>
37	nickel sulphate	7786-81-4	Carc. Cat. 3; R40 Xn; R22 R42/43 N; R50-53	May be present in certain plastics, metallic- or ceramic materials	Used to make other nickel compounds, not used in electrical equipment <i>(to be checked by Eurometaux)</i>		Intermediate for colorants production. Type of colorants used in EEE unclear Intermediate for polyurethane
38	cobalt oxide	1307-96-6	Xn; R22 R43 N; R50-53	May be present in certain plastics, metallic- or ceramic materials	Used to make pigments <i>(to be checked by Eurometaux)</i>		Mineral derivate No known uses in EEE
39	cobalt	7440-48-4	R42/43 R53	May be present in certain plastics, metallic- or ceramic	Used in certain ceramic materials in medical devices. There is no		Metal used in special alloys and in electroplated coatings such as NiFeCo which is a substitute for chromium plating that avoids the use of

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				materials	<p>known substitute.</p> <p>Kovar contains 18 % Cobalt and is used in X-ray tubes as typical glass- or ceramic joint metal, for cathode heads and some other parts.</p> <p>In very low amounts as activator in plastic formation. (patient tables)</p> <p>Used as binder in tungsten carbides.</p> <p><i>Detailed Info. to be provided by Eurometaux</i></p>		carcinogenic hexavalent chromium.

40	2-ethylhexyl acrylate	103-11-7	Xi; R37/38 R43	2-Ethylhexyl acrylate is used as a monomer in the chemical industry for the production of polymers and copolymers, which are mainly processed further to aqueous polymer dispersions. The polymers and polymer dispersions are used in adhesives and as binders for paints. Other applications include coatings raw materials and uses in the plastics and textiles industries.	No known uses in MD's.	Not aware of any uses in electrical equipment Monomer allowed to be used in plastic material for food contact	This monomer is not classified as carcinogenic nor as PBT Not aware of any uses in electrical equipment. Used as chemical intermediate so better to control by REACH.
41	Naphthenic acids, copper salts; copper naphthenate	1338-02-9	R10 Xn; R22 N; R50-53	May be present in certain plastics, metallic- or ceramic materials		Unknown	Used as a wood preservative
42	phenyl bis(2,4,6-trimethylbenzoyl)-phosphine oxide	162881-26-7	R43 R53	May be present in certain plastics, metallic- or ceramic materials		May be used as a UV Photoinitiator Has been used in photocells and infrared detectors but these have largely phased out.	Used in X-ray detectors (Categories 8 & 9). The possible substitutes contain mercury, cadmium or lead but are not drop-in replacements
43	Thallium	7440-28-0	T+; R26/28 R33 R53	May be present in certain plastics, metallic- or ceramic materials		Used in certain ceramic materials in medical devices. There is no known substitute.	

						<i>Detailed Info. to be provided by Eurometaux</i>	
44	bromobenzyl bromotoluene, mixture of isomers	99688-47-8	Xn; R48/22 R43 N; R50-53	May be present in certain plastics, metallic- or ceramic materials		Unknown	This substance is banned under EU directive 91/339/EC
45	2,2'-(ethylenedioxy) diethyl diacrylate; triethylene glycol diacrylate	1680-21-3	Xi; R36/38 R43	May be used in carton materials		Unknown triethylene glycol diacrylate is a monomer (cfr. 40)	This monomer is not classified as carcinogenic nor as a PBT Used as chemical intermediate and therefore it is better to evaluate it under REACH.
46	Rosin; colophony [1]	8050-09-7 [1] 8052-10-6 [2] 73138-82-6 [3]	R43	Used in solder fluxes/pastes	Operators are not exposed more than 20 hrs. per week.	Use for soldering flux for printed circuits. Will remain in very limited parts (ppm-level)	Cfr. 33 "Petrolatum"

Table II: Brominated flame retardants (other than PBBs or PBDEs) (JIG, 2007)

Brominated Flame Retardants (other than PBBs or PBDEs)	CAS Numbers
Brominated flame retardant which comes under notation of ISO 1043-4 code number FR(14) [Aliphatic/alicyclic brominated compounds]	-
Brominated flame retardant which comes under notation of ISO 1043-4 code number FR(15) [Aliphatic/alicyclic brominated compounds in combination with antimony compounds]	-
Brominated flame retardant which comes under notation of ISO 1043-4 code number FR(16) [Aromatic brominated compounds excluding brominated diphenyl ether and biphenyls]	-
Brominated flame retardant which comes under notation of ISO 1043-4 code number FR(17) [Aromatic brominated compounds excluding brominated diphenyl ether and biphenyls] in combination with antimony compounds]	-
Brominated flame retardant which comes under notation of ISO 1043-4 code number FR(22) [Aliphatic/alicyclic chlorinated and brominated compounds]	-
Brominated flame retardant which comes under notation of ISO 1043-4 code number FR(42) [Brominated organic phosphorus compounds]	-
Poly(2,6-dibromo-phenylene oxide)	69882-11-7
Tetra-decabromo-diphenoxy-benzene	58965-66-5
1,2-Bis(2,4,6-tribromo-phenoxy) ethane	37853-59-1
3,5,3',5'-Tetrabromo-bisphenol A (TBBA)	79-94-7
TBBA, unspecified	30496-13-0
TBBA-epichlorhydrin oligomer	40039-93-8
TBBA-TBBA-diglycidyl-ether oligomer	70682-74-5
TBBA carbonate oligomer	28906-13-0
TBBA carbonate oligomer, phenoxy end capped	94334-64-2
TBBA carbonate oligomer, 2,4,6-tribromo-phenol terminated	71342-77-3
TBBA-bisphenol A-phosgene polymer	32844-27-2
Brominated epoxy resin end-capped with tribromophenol	139638-58-7
Brominated epoxy resin end-capped with tribromophenol	135229-48-0
TBBA-(2,3-dibromo-propyl-ether)	21850-44-2
TBBA bis-(2-hydroxy-ethyl-ether)	4162-45-2
TBBA-bis-(allyl-ether)	25327-89-3
TBBA-dimethyl-ether	37853-61-5
Tetrabromo-bisphenol S	39635-79-5
TBBS-bis-(2,3-dibromo-propyl-ether)	42757-55-1
2,4-Dibromo-phenol	615-58-7
2,4,6-tribromo-phenol	118-79-6
Pentabromo-phenol	608-71-9
2,4,6-Tribromo-phenyl-allyl-ether	3278-89-5
Tribromo-phenyl-allyl-ether, unspecified	26762-91-4
Bis(methyl)tetrabromo-phtalate	55481-60-2
Bis(2-ethylhexyl)tetrabromo-phtalate	26040-51-7
2-Hydroxy-propyl-2-(2-hydroxy-ethoxy)-ethyl-TBP	20566-35-2
TBPA, glycol-and propylene-oxide esters	75790-69-1
N,N'-Ethylene -bis-(tetrabromo-phthalimide)	32588-76-4
Ethylene-bis(5,6-dibromo-norbornane-2,3-dicarboximide)	52907-07-0
2,3-Dibromo-2-butene-1,4-diol	3234-02-4
Dibromo-neopentyl-glycol	3296-90-0
Dibromo-propanol	96-13-9
Tribromo-neopentyl-alcohol	36483-57-5
Poly tribromo-styrene	57137-10-7
Tribromo-styrene	61368-34-1

Table III: Hazardous substances in EEE already regulated by existing legislation

Substance name	CAS-Nr.	Main use in EEE	Hazard	Key Legal and Regulatory Information
Asbestos	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5	Brake lining pad, insulator, filler, abrasive, insulator, filler, pigment, paint, talc, adiabatic material	Carc. Cat. 1; R45 T; R48/23	76/769/EEC, Marketing and Use of Dangerous Substances and amendments: (83/478/EEC; 85/610/EEC; 87/217/EEC; 91/659/EEC; 99/77/EEC)
Specific Azocolourants and azodyes (which form certain aromatic amines)	Various	Pigment, dyes, colorants		76/769/EEC, Marketing and Use of Dangerous Substances and amendments: (2002/61/EC; 2003/03/EEC).
Ozone Depleting Substances and Hydrochlorofluorocarbons	Various	Refrigerant, foaming agent, insulation extinguishant		Regulation (EC) No. 2037/2000 on substances that deplete the ozone layer