Lenovo Engineering Specification 41A7731

Baseline Environmental Requirements for Lenovo Products, Materials and Parts

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Revision History

Date	EC Level	Change Summary
2008-11-19	M07196M	Modified document Title. Table 1 Changed references to PCD to SMD (Supplier Material Declaration) Asbestos - description changed to be consistent with IPC-1752 Brominated Flame Retardants - add “Intentionally Added” and remove all other comments. Mercury/Mercury Compounds - change the description to “Not present except in lambs”; consistent with Table 3. Hexavalent Chromium/Hexavalent Chromium - changed the description to be consistent with description in 41A7733; consistent with Table 3. Polyvinyl chloride (PVC) – removed threshold limit; changed description to reflect no usage in external plastic covers; consistent with Table 3. Polycyclic Aromatic Hydrocarbons (PAH) – moved requirements from Table 3 Red Phosphorous (Red-P) flame retardants – changed description Table 2 “Low Halogen” Substance Requirements – changed description Table 3 Antimony/Antimony Compounds – added phase-out target Beryllium/Beryllium Compounds – added phase-out target Brominated / Chlorinated Flame Retardants (other than PBBs or PBDEs) – changed description to be consistent with Table 3. Change the *Copyright Lenovo Corp. 2006* to *Copyright Lenovo Corp. 2008* EC release dates added under the EC numbers. 2.4.2.4 Additional Requirements for Taiwan – revised to reflect recent updates Figure 4. Four-in-One recycling symbol for Taiwan – updated symbol 2.4.2 Product Design and Labeling Requirements for Batteries - "EU" notation added to EU Battery Directive Mark per EPBA recomendation.
2009-02-10	**M07339F**	Added REACH requirements and information. Updated reference documents. Updated BFR/PVC phaseout plans (beginning 2011); criteria and requirements. Updated rechargeable battery labelling requirements for Japan. Added Product Energy requirements for monitors, external power adapters, PC’s (China, Korea, EU, Switzerland, Australia, New Zealand).
2012-09-26	**Version 6.0**	Updated China WEEE and National Standards reference documents Updated Restricted Substances listings Added Additional Requirements for Children’s Products Updated REACH/SVHC information Updated Battery restrictions for non-removable and button cell batteries Update Battery labeling requirements Update WEEE marking label (remove EU Only) Update China WEEE information and requirements Updated China Product Energy requirements Updated EuP/ErP product energy efficiency requirements Updated External Power Supply (EPS) for Australia, New Zealand, US/DOE, Canada, China. Added California Battery Charger requirements Added Annex DD SVHC Candidate List (June 2012)
2012-10-10	**Version 6.1**	Added Annex FF. Hydrofluorocarbons (HFCs) Correctd Desktop/AIO, Notebook Frame Buffer Width criteria in Table 12.

2013-09-26	**Version 6.2**	Table 1 Updates: Short Chain Chlorinated Paraffins reference to PoPs convention added. Perfluorooctane sulfonates(PFOS) reference to PoPs convention added. Lead carbonates and Lead sulphates reference to REACH annex XVII added. Monomethyl — tetrachlorodiphenyl methane reference to REACH annex XVII added. Monomethyl-dichloro-diphenyl methane reference to REACH annex XVII added. Monomethyl-dibromo-diphenyl methane reference to REACH annex XVII added. 2-(2-butoxyethoxy)ethanol(CAS No.：112-34-5) prohibited no more than 3% by weight by REACH annex XVII added. Dibutyltin (DBT) reference to REACH annex XVII added. Dioctyltin (DOT reference to REACH annex XVII added. TBT and TPT reference to REACH annex XVII added. CAS number for Dimethyl fumarate corrected. Polychlorinated biphenyls(PCBs) Annex reference corrected. JIG 101 Level A definition/references updated to edition 4.1 , EU Regulation (EC) No 1907/2006 and Annex XVII replaces Directive 76/769/EEC, Marketing and Use of Dangerous Substances. Updated Table 1 references. Corrected Annex references to Polybrominated biphenyls, Polychlorinated biphenyls. Updated requirements for Halogenated diphenyl methanes (refer to Annex D). RoHS definition/references updated to 2011/65/EU. WEEE definition/references updated to 2012/19/EU. Updated and included other jurisdictions with RoHS requirements. Updated RoHS exemption list per Directive 2011/65/EU. Updated REACH SVHC listing per 20 June 2013 Candidate List. Added Annex EE. List of substances subject to REACH Authorisation (current as of the date of this specification. Hydrofluorocarbons (HFCs) listing moved to Annex FF. Added requirements for Austrailia and New Zealand MEPS. Updated EPEAT logo images, specifications, and guidelines.
2014-06-22	**Version 6.3**	Added definition of EEE (Section 1.2) Table 1 Updates: Acids generated from chromium trioxide and their oligomers, Ammonium dichromate, Biocidal product, chromium trioxide, Hexavalent chromium restriction for leather, Potassium chromate, Potassium dichromate, Sodium chromate, Sodium dichromate, Trichloroethylene Table 3 Updates: Regulatory or other references changed to Examples of Industry Uses / Comments 1, 2, 3-Trichlorobenzene, 1, 2, 4-Trichlorobenzene, 2,3-Dibromo-1-propanol, 2,4-Dinitrotoluene, 2-Butanone oxime, 2-Ethylhexyl-2,3,4,5-tetrabromobenzoate (TBB), 4, 4'-Diaminodiphenylmethane (MDA), Arsenic pentaoxide, Arsenic trioxide, Beryllium (CAS 7440-41-7), Beryllium oxide (CAS 1304-56-9), Bis(2-ethylhexyl)tetrabromophthalate (TBPH or BEHTBP), Bisphenol A, Cobalt dichloride, Cobalt metal, Cobalt sulfate, Dibromoneopentyl-glycol, Dibromoneopentyl-glycol, Diethyl phthalate, Diisononyl phthalate (DINP), Di-n-hexyl phthalate (DNHP), Di-n-octyl phthalate (DNOP), Di-n-pentyl phthalate (DNPP), Dioctyltin (DOT) compounds, Formaldehyde, Hydrazine, Indium phosphide, Indium phosphide, Long chain chlorinated paraffins (LCCP),

		Nanomaterials, n-Butyl glycidyl ether, n-Hexane, Nickel sulfamate, Nickel sulphate, Nonylphenols, P-Dichlorobenzene, Perchlorates (Annex MM), Perfluoroalkyl sulfonates (PFASs), Perfluorooctanoic acid (PFOA) and its salts, Polycyclic aromatic hydrocarbons (PAHs), Refractory ceramic fibres, Tetrabromobisphenol A, Tetrabutyltin (TTBT) (CAS 1461-25-2), Toluene (CAS 108-88-3), Tributyltin (TBT) and tributyltin compounds, Triphenyltin (TPT) and triphenyltin compounds, Tris (1,3-dichloro-2-propyl) phosphate (TDCPP), Tris (2, 3-dibromopropyl) phosphate, Tris (2-chloro-1-methylethyl) phosphate (TCPP), Tris (2-chloroethyl) phosphate (TCEP), Vinyl chloride Removed the weight plastic weight exemption for Brominated / Chlorinated Flame Retardants (other than PBBs or PBDEs). Table 5 Updates: Sum of PAHs changed to 18. Ammonium pentadecafluorooctanoate (APFO), Benzyl butyl phthalate (BBP), 1,2-Benzenedicarboxylic acid, dipentylester, branched and linear, 1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear, Bis (2-ethyl(hexyl)phthalate) (DEHP), Cadmium, Cadmium chloride, Cadmium oxide, Cadmium sulphide, Diboron trioxide, Diisopentylphthalate, Di-n-hexyl phthalate (DNHP), 1,2-dimethoxyethane;ethylene glycol dimethyl ether (EGDME), Dipentyl phthalate (DPP), Fatty acids, C16-18, lead salts, Hexabromocyclododecane (HBCDD), Lead monoxide (lead oxide) trioxide, Lead oxide sulphate, Lead titanium trioxide, Orange lead (lead tetroxide), Pentadecafluorooctanoic acid (PFOA), [Phthalate (2-)]dioxotrilead Pyrochlore, antimony lead yellow, Sodium perborate; perboric acid, sodium salt, Sodium peroxometaborate, Tetralead trioxide sulphate Updated Annex C Halogenated aromatic substances Updated Annex BB Tributyl Tin, Triphenyl Tin Updated Annex CC Polycyclic Aromatic Hydrocarbons Updated Annex DD SVHC Candidate List Updated Annex EE List of substances subject to REACH Authorisation Added Annex GG Nonylphenols Added Annex HH Perchlorates Added Section 2.4.2.6: Requirements for Alkaline Batteries Sold in Latin America Updated Section 2.11.1.4 Energy requirements for Flat Panel TVs in China and Section 2.11.4.4 Energy requirement for External Power Supplies in China Updated Section 2.11.4.6 Requirements for California to include the BC mark labeling requirements. Added Section 2.11.6 Requirements for Mexico: Computers, Small Scale Servers, Servers, Storage Products, and peripheral
2014-09-05	**Version 6.4**	Table 1 Update: Red Phosphorous (Red-P) flame retardants restricted from use in all electrical/electronic parts, assemblies, etc.
2015-03-05	**Version 6.5**	Table 1 Update: 600ppm allowance for PBBs, PBDEs, excluding DecaBDE in PCC recyclate and plastic resins. Table 4 Update: Added New SVHC substances. Cadmium fluoride, Cadmium sulphate, 2-benzotriazol-2-yl-4,6-di-tert-butylphenol (UV-320), 2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol (UV-328), 2-ethylhexyl 10-ethyl-

		4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (DOTE), reaction mass of 2-ethylhexyl-10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4- stannatetradecanoate and 2-ethylhexyl 10-ethyl-4-[[2-[(2-ethylhexyl)oxy]-2- oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (reaction mass of DOTE and MOTE) General: format, punctuation, grammatical updates/corrections.
2015-07-02	**Version 6.6**	Added 4 phthalates per new Directive (EU) 2015/863 to amend Annex II to EU RoHS 2 (Directive 2011/65/EU). Updated REACH SVHC listing per 15 June 2015 Candidate List: UV-320, UV328, Cadmium fluoride, Cadmium sulphate, DOTE, Reaction mass of DOTE and MOTE, 1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters; 1,2-benzenedicarboxylic acid, mixed decyl and hexyl and octyl diesters with > 0.3% of dihexyl phthalate Table 1 Updates: Azocolourants entry updated, Nonylphenol ethoxylates, Perfluorooctanoic acid PFOAs (REACH restrictions) Table 4 Updates: Toluene diisocyanates, Perfluoro carboxylic acid and related compounds (reporting requirements) Table 7 Updates: New law –Canada Products Containing Mercury Regulations SOR/2014-254 (all battery types) Section 2.6 New law –Canada Products Containing Mercury Regulations SOR/2014-254 (product and packaging label requirements) Table 10 updates: Product and packaging labeling requirements for Canada, US Web page notification requirements for notebook, laptop computers 2.11.4 EPS energy efficiency requirements and standards updated (DOE Energy Conservation Program: Energy Conservation Standards for External Power Supplies) Added: Annex II. Perfluorooctyl acid (PFOA) and salts Added: Annex JJ. Perfluorinated compounds Added: Annex KK. Toluene Diisocyanates Added: Annex LL. Nonylphenol Ethoxylates Updated: Annex DD. SVHC Candidate List Updated: Annex EE. REACH Authorisation List of substances
2016-03-25	**Version 6.7**	Update to Article definition Table 1 Updates: Changed restriction for 22 Authorised SVHCs from term "Deliverable" to "Article" Updated GS Mark standard and requirements for Polycyclic Aromatic Hydrocarbons (PAH) Table 4: Updates: The term "Deliverable" has been replaced with "Article" and a note added referring to the September 10, 2015 ruling from the EU Court of Justice. Added -Nanomaterial (new law -Belgium Royal Decree) Additional requirement "Prohibited in Substances and Preparations" added for Cadmium, Hexachloroethane, Nonylphenol ethoxylates, Tris-(aziridinyl)–phosphineoxide, Tris (2,3 dibromopropyl) Updated REACH SVHC listing per 17 December 2015 Candidate List.: 2-(2H-benzotriazol-2-yl)-4-(tert-butyl)-6-(sec-butyl)phenol (UV-350) Dicyclohexyl phthalate 2,4-di-tert-butyl-6-(5-chloro benzotriazol -2-yl) phenol (UV-327) Hexamethylene diacrylate Perfluorononan-1-oic acid (2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononanoic acid and its sodium and ammonium salts 1,3-propanesultone Table 7 Updates: Zinc silver oxide, zinc air and zinc manganese dioxide button batteries prohibited (Japan Act on Preventing Environmental Pollution of Mercury)

		Added – Battery requirements for Brazil Added SystemX energy efficiency requirements; i.e., Switches, Routers Updated: Annex DD. SVHC Candidate List Updated: Annex EE. REACH Authorisation List of substances
2016-10-28	**Version 6.8**	Updated: 2.11.1 System Requirements for China Updated: Restrictions on Polychlorinated naphthalenes Updated: Exemption added for Red-P flame retardants (Plastic mechanical parts) Updated: Reference for Japan's Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. Added: Note 9, Low Halogen Substance Requirements. Added: Low halogen power cord option and label requirements. Updated: Annex Q. Polybrominated diphenyl ethers (PBDEs) Added: Annex MM: Creosote, Coal Tar, Anthracene Etc. Added: Annex NN: Dibutyltin (DBT) Compounds Updated: Dicyclohexyl phthalate threshold and description Updated: Table4. Substances of Very High Concern (SVHC) Updated: Annex DD. SVHC Candidate List Updated: Threshold concentration for HBCDD Updated: Lenovo Guide to Full Material Disclosures (Version 2), new link Updated: Table 4, changed Deliverable to Article
2017-03-30	**Version 6.9**	Updated/corrected reporting threshold for HBCCD in Table 3. Updated/corrected Annex I titles regarding Polychlorinated naphthalene restrictions. Table 4 Update: Added New SVHC substances. • 4,4'-isopropylidenediphenol (bisphenol A; BPA) • Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts • p-(1,1-dimethylpropyl)phenol • 4-heptylphenol, branched and linear [substances with a linear and/or branched alkyl chain with a carbon number of 7 covalently bound predominantly in position 4 to phenol, covering also UVCB- and well-defined substances which include any of the individual isomers or a combination thereof] Updated: Annex DD. SVHC Candidate List
2017-04-10	**Version 7.0**	Updated: Product Energy Efficiency Requirements for Mexico (Sec. 2.11.6.1)
2017-10-02	**Version 7.1**	Table 1 Update: Added Bisphenol A (BPA) , Tris (1,3-dichloro-2-propyl) phosphate, Tris (2-chloroethyl) phosphate, REACH restriction for Decabromo diphenyl ether; Added Taiwan Green Mark material concentration requirements for RoHS substances and Shortchain Chlorinated Paraffins; Added China Environmental Product Labeling material threshold requirements for Medium Chain Chlorinated Paraffins. Table 3 Update: Added Dysprosium and compounds, Neodymium and compounds Praseodymium and compounds,Terbium and compounds, Tris (1,3-dichloro-2-propyl) phosphate (reporting only for cables, adaptors and other connecting devices, storage media such as compact discs, for interactive software, not for mice cables.) Section 2.2.1 Added Lenovo target to eliminate all SVHC's in a concentration of more than 0.1% w/w in the article by December 31th, 2020. Table 4 Update: Added New SVHC substance - Perfluorohexane-1-sulfonic acid and its salts (PFHxS Annex DD: Added new SVHC substance - Perfluorohexane-1-sulfonic acid and its salts (PFHxS); Added Lenovo target to eliminate all SVHC's in a concentration of more than 0.1% w/w in the article by December 31th, 2020.
2018-27-04	**Version 7.2**	Update: Added Sec 2.11.6.2 Mexico EPS efficiency and labeling requirements

		Update: Added Sec 2.11.9 Server and Data Storage Product (EU Requirements) Update: Annex DD: Added new seven (7) SVHC substances.
2018-28-08	**Version 7.3**	Update: Annex DD: Added new ten (10) SVHC substances. Update: Revised CEC and US DOE BCS requirements. Update: Added Sec 2.11.10 CEC Computer and Monitor efficiency requirements
2019-14-01	**Version 7.4**	Update: Added reference to RoHS 3 effective date for 4 phthaltes (DEHP, DPB, BBP, DIBP). Update: Removed Table 4 Substances of Very High Concern (SVHC) and directed users to link to current listing maintained by EU. Update: Annex DD: Added three (3) new SVHC Candidate substances.
2019-01-05	**Version 7.5**	Update: Table 1: Added Benzene, n-Hexane, Trichloroethylene, Tetrachloroethylene, Methylene Chloride Update: Table 7: Update battery regulation references for alkaline and zinc carbon batteries
2019-09-09	**Version 7.6**	Update: Various url's and hyperlinks to new Lenovo sustainability web pages Update: Table 1 PFOA restrictions, effective dates and link to Annex XVII info. Update: Added Sec 2.1.2.1 China RoHS Conformity Assessment System Update: Sec 2.2.1 - deleted Lenovo target to eliminate all SVHCs in a concentration of more than 0.1% in the article by December 31, 2020. Update: Annex DD: Added four (4) new SVHC Candidate substances. • 2-methoxyethyl acetate, • Tris(4-nonylphenyl, branched and linear) phosphite (TNPP) with ≥ 0.1% w/w of 4-nonylphenol, branched and linear (4-NP), • 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propionic acid, its salts and its acyl halides (covering any of their individual isomers and combinations thereof), • 4-tertbutylphenol. Update: Organohalogen flame retardants added to Table 3 and Annex OO. Update: Added references to Washington and Colorado regulations to Sec 2.11.10.2 Update: Updated Sec 2.11.4.6 BCS definitions and requirements for Canada. Update: Added EPEAT optional criteria requirements for Cadmium (4.1.2.1), Beryllium (4.1.4.1) and Brominated/Chlorinated flame retardants (4.1.5.2). Refer to IEEE STD 1680.1-2018.
2020-05-11	**Version 7.7**	Update: Sec 1.5.2 Added IEC 62474 - Material Declaration for Products of and for the Electrotechnical Industry to list of reference documents. Update: Sec 2.11.11 Added requirements for electronic displays for EU Regulation 2019/2021 and EU Regulation 2019/2013. Update: Sec 2.11.4.4 Added EU regulation 2019/1782 for EPSs and requirements. Update: Annex DD: Added new four (4) SVHC substances. Update: Methylene Chloride (Dichloromethane) (CAS 75-09-2) restrictions updated. Update: GS Mark standard and requirements for Polycyclic Aromatic Hydrocarbons (PAH). Update: Removed EPEAT Lead criteria for Visual Display Units (4.1.4.1; IEEE Std 1680-2006) Update: Table 3, Added IEC 62474 Declarables List Update: Sec 4.0 References, added IEC 62474 Declarable substance groups and declarable substances. Update: Sec 2.3.3 Table 6 Plastic Marking nomenclature updated. Update:Sec 2.3.4 Plastic Marking nomenclature updated.
2020-06-25	**Version 7.8**	Update: Annex DD: Added new two (2) SVHC substances. Update: Add Sec 2.13 China VOC Standard Requirements
2021-04-09	**Version 7.9**	Update: Table 1 TSCA PBT bans (DecaBDE, HCBD, PIP (3:1), 2,4,6-TTBP

		Update: Annex DD: Added new two (2) SVHC substances. Update: Table 7 China Battery Heavy Metals Requirements Update: Table 1 Mercury, PFOA legal reference(s) Update: Sec 2.2.1 added ECHA SCIP requirements Update: Sec 2.11.10.1 CEC Amended Title 20 Computer Regulations Update: Sec 2.11.10.2 CEC Amended Title 20 Monitor Regulations
2022-03-09	**Version 8.0**	Update: Annex DD: Added new four (4) SVHC substances. Update: Added EU Restriction of C9-C14 PFCAs to Table 1 Update: Remove EU Restriction of C9-C14 PFCAs from Reportable Substances list. Update: Table 1 PFOA/PFOS restriction info and details Update: Hyperlinks to OECD per and poly-fluorinated chemicals information Update: Add reference to EN IEC 63000:2018 for RoHS testing/verification Update: China phosphorous flame retardant (TCEP/TCPP/TDCP) restriction added to Table 1
2022-08-26	**Version 8.1**	Update: Annex DD: Added one (1) new SVHC substance. Update: Sec 2.2 Added minimum FMD chemical info requirements (95%) Update: Table 1 Added Perfluorohexane sulfonic acid (PFHxS) restrictions (Switzerland) Update: Table 1 Restrictions for Mineral Oil Saturated Hydrocarbons (MOSH), Mineral Oil Aromatic Hydrocarbons (MOAH) in printing inks (France)
2023-02-22	**Version 8.2**	Update: Annex DD: Added one (9) new SVHC substances. Update: Table 3 Reportable Substances: Added Organophosphate Flame Retardants Update: Added Annex QQ Organophosphate Compounds
2024-02-22	**Version 8.3**	Update: Table 1 PFAS and MOAH/MOSH thresholds, PFOA note Update: Table 1 Added two (2) new restricted substances: 2-benzotriazol-2-yl-4,6-di-tertpentylphenol (UV-328) 1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.16,9.02,13.05,10] octadeca-7,15-diene("Dechlorane Plus"TM)[covering any of its individual anti- and syn-isomers or any combination thereof] Update: Table 1 PFHxS and Formaldehyde restrictions/prohibitions and thresholds Update: Table 1 Update BPA restrictions (external plastics; ≤ 300ppm) Update: Table 1 Update DecaBDE prohibitions/exemptions (TSCA Section 6(h)) Update: Table 1 Update PIP(3:1) and PCTP exemptions (TSCA Section 6(h)) Update: Table 7 Updated battery materials restrictions (new EU Battery regulation) Update: Number of SVHC (240), REACH Authorisation (122) substances Update: Added Sec. 2.2.2 REACH Restricted Substances Reporting Requirements Update: Annex DD: Added seven (7) new SVHC substances. Update: Annex JJ: Perfluorinated compound CAS numbers Update: Added two (2) SVHCs per France Decree No. 2020-105 Update: Web links update; 41A7731, battery recyclingoss
2024-09-27	**Version 8.4**	Update: Table 1 Added PFAS restriction and reporting requirements Update: Table 1 Added (PFHxA), its salts and PFHxA-related substances restrictions Update: Table 1 Bisphenol A (BPA) restrictions and thresholds for thermal paper Update: Table Added Formaldehyde regulatory reference Update: Table 1 Update lower HBCDD threshold limits Update: Table1 Update OECD Comprehensive Database of Per- and polyfluoroalkyl substances links Update: Added new regulatory reference for Hydrofluorocarbons, Perfluorinated compounds, Perfluorocarbons (PFC), Sulphur hexafluoride (EU) 2024/573 Update: Table 3 Update lower HBCDD threshold limitsUpdate: Section 2.2.2. Restricted Substances in Articles (Annex XVII) – Reporting Requirements

		Update: Number of SVHC substances (241) Update: Number of REACH restricted substances (74) Update: Section 2.11.1.1 System Requirements for China – Monitors Update: Remove 2.11.1.4 System Requirements for China - Flat Panel TVs Update: Annex Z. Radioactive Substances
2025-03-28	**Version 8.5**	Update: Updated battery definition per EU Directive 2023/1542 Update: Table 1 *N*-methyl-2-pyrrolidone; 1-methyl-2-pyrrolidone (NMP) (CAS 872-50-4) Update: Table 1 Update reference regulation list for HBCDD Update: Table 1 Update reference regulation list for DIBP, DBP, BBP, DEHPph Update: Table 1 Add EPEAT requirements for Beryllium, Ortho-phthalates, PFAS, PVC (including polyvinylidene) Update: Table 3 Update Phthalates report threshold and Annex X listing Update: Annex DD Added six (6) new SVHC substances Update: Battery label, documentation, testing requirements per EU Directive 2023/1542 Update: Table 7 Update lead (Pb) content thresholds by battery type Update: Annex X Phthalate listing
2025-09-11	**Version 8.6**	Update: Table 1 *N*-methyl-2-pyrrolidone; 1-methyl-2-pyrrolidone (NMP) (CAS 872-50-4) restriction concentration threshold Update: Table 1 MCCPs (chain lengths at least C14 but not exceeding C17) Singapore restriction Update: Annex DD Added three (3) new SVHC substances Update: GB/T 26572-2011 into GB 26572-2025 Update: Section 2.13 GB 30981-2020 into GB 30981.2-2025
2026-02-05	**Version 8.7**	Update: Minimum Allowable Values of Energy Efficiency and Energy Efficiency Grades for Microcomputers, Standard GB 28380-2025 Update: 1.2 EPEAT definition (latest version) Update: Table 1 added MCCPs, LC-PFCA, Chlorpyifos restrictions (SC POPs) Update: Table 1 EPEAT references, Update: Sec. 2.2 EPEAT references Update: 2.4 Additional Requirements for Batteries: India Update: Annex DD Added three (3) new SVHC substances Update: Annex EE. REACH Authorisation List of substances
2026-07-23	**Version 8.8**	Update: Table 1 added MCCPs, LC-PFCA, Chlorpyifos restrictions (SC POPs)

Contents

	Page
Revision History	2
1.0 Scope	16
1.1 Objectives	16
1.2 Definitions	16
1.3 Application	19
1.4 Document Administration	20
1.5 List of Documents Referenced in This Specification	20
2.0 Requirements	21
2.1 Restricted Substances	21
2.2 Supplier Full Material Declarations	43
2.3 Marking of Hardware Plastic Parts	54
2.4 Additional Requirements for Batteries	56
2.5 Requirement for Decorative Metal Finishing	68
2.6 Requirements for Parts and Products Containing Mercury	68
2.7 Requirements for Chemicals	71
2.8 Product Chemical Emissions	72
2.9 WEEE Marking	73
2.10 EPEAT Marking	75
2.11 Product Energy Requirements	77
2.12 Environmental Notification – Customer Publications	157
2.13 China VOC Standard Requirements	157
3.0 Notification Procedures	162
4.0 References	162

Tables

	Page
Table 1. Restricted Substances	22
Table 2. “Low Halogen” Substance Requirements	41
Table 3. Reportable Substances	45
Table 4. Substances of Very High Concern (SVHC) - deleted	
Table 5. Commonly Used Resins	56
Table 6. Examples of Completed Plastic Part Markings	57
Table 7. Restrictions on Content of Batteries	57
Table 8. Texts for Battery Marking for the U.S. Battery	63
Table 9. Battery Label Requirements for Japan	66
Table 10. Mercury Added Product Labeling Information for the United States	68
Table 11. Minimum Efficiency Standards for Monitors	79
Table 12. Product Category	82
Table 13. Energy grades for microcomputers (with a central processing unit featuring a transistor density greater than 30 Mtr/mm2)	82
Table 14. Energy grades for microcomputers (with a central processing unit featuring a transistor density less than or equal to 30 Mtr/mm2 or not manufactured by the EUV lithography equipment)	83
Table 15. Percentage of time spent in each mode of a microcomputer	83
Table 16. Additional function power factors of the microcomputer (Table 12 applies)	84
Table 17. Additional function power factors of the microcomputer (Table 13 applies)	86

Table 18. Additional function power factors of the microcomputer (Table 13 applies) 88

Table 19. Energy efficiency grades of servers (for those equipped with a CPU manufactured using the less than 14nm process) 89

Table 20. Minimum allowable values of energy efficiency for servers when using the efficiency rating tool specified in ISO/IEC 21836:2020 89

Table 21. Low Power Performance Requirements 92

Table 22. Direct Operation External Power Supply Efficiency Standards (Beginning February 10, 2016) 95

Table 23. EPS Efficiency Requirement for Canada 98

Table 24. Minimum Energy Performance Standards for Adapters 100

Table 25. Minimum Energy Performance Standards for Chargers 100

Table 26: Minimum Average Energy Efficiency Requirements for EPS 104

Table 27. Minimum Average Energy Efficiency Requirements of No-Load model for EPS 104

Table W-1. Standards for Large Battery Charger Systems 107

Table W-2. Standards for Small Battery Charger Systems 108

Figures

		Page
Figure 1.	Collection mark and heavy metal content marking for the European Union	61
Figure 2.	Three chasing arrows symbol as cited by the U.S. EPA for the U.S. Battery Act	63
Figure 3.	RBRC Seals for Rechargeable Lithium Ion Batteries	64
Figure 4	Four-in-One recycling symbol for Taiwan	65
Figure 4.1	Four-in-One recycling symbol and words for Taiwan	65
Figure 5.	Chasing Arrows recycling symbol and Battery type for Japan	67
Figure 6.	The marking and dimensional relationship of the solid bar symbol for indication of products manufactured or put on the EU market after August 13, 2005.	74
Figure 7.	EPEAT Marking	76
Figure 8a.	Example of China Energy Label for LCD/OLED Display	80
Figure 8b.	Example of China Energy Label for LED Display	80
Figure 8b.	Example of China Energy Label	87
Figure 9.	Example of CEL when using BenchSEE	90
Figure 10.	Example of CEL when using the server efficiency rating tool specified in ISO/IEC 21836:2020	91
Figure 11.	Example of a Warning Logo for e-Standby Power Program Target Products.	92
Figure 12.	Example of CE conformity marking.	94
Figure 13.	Korea Energy Label for Adapters and Chargers.	101

Detailed Chemical Lists with CAS Numbers

	Page
Annex A. Asbestos	168
Annex B. Azo colorants	168
Annex C. Halogenated aromatic substances	168
Annex D. Halogenated diphenyl methanes	169
Annex E. Nickel	169
Annex F. Ozone Depleting Substances	169
Annex G. Perfluorocarbons (PFC)	177
Annex H. Polychlorinated biphenyls (PCBs)	177
Annex I. Polychlorinated naphthalenes	177
Annex J. Short chain Chlorinated Paraffins	177
Annex K. Tributyl tin oxide (TBTO)	178
Annex L. Cadmium/Cadmium Compounds	178
Annex M. Chromium VI Compounds	178
Annex N. Lead/Lead Compounds	178
Annex O. Mercury/Mercury Compounds	179
Annex P. Polybrominated biphenyls (PBB) including all congeners and isomers	179
Annex Q. Polybrominated diphenyl ethers (PBDEs) including all congeners and isomers	179
Annex R. Antimony/Antimony Compounds	179
Annex S. Arsenic/Arsenic Compounds	179
Annex T. Beryllium/Beryllium Compounds	180
Annex U. Bismuth/Bismuth Compounds and alloys	180
Annex V. Brominated Flame Retardants (Other than PBB /PBDE)	180
Annex W. Magnesium/Magnesium Alloys	181
Annex X. Phthalates	181
Annex Y. Polyvinyl Chloride	182
Annex Z. Radioactive Substances	182
Annex AA. Selenium/Selenium Compounds	182
Annex BB. Tributyl Tin, Triphenyl Tin	182
Annex CC. Polycyclic Aromatic Hydrocarbons	183
Annex DD. SVHC Candidate List	184
Annex EE. REACH Authorisation List	193
Annex FF. Hydrofluorocarbons (HFCs)	199
Annex GG. Nonylphenols	200
Annex HH. Perchlorates	200
Annex II. Perfluorooctyl acid (PFOA) and salts	200

Annex JJ. Perfluorinated compounds **201**
Annex KK. Toluene Diisocyanate **201**
Annex LL. Nonylphenol Ethoxylates **201**
Annex MM. Creosote, Coal Tar, Anthracene, Etc. **202**
Annex NN Dibutylin Compounds (DBT) **202**
Annex OO Organohalogen Flame Retardants **202**
Annex PP. IEC 62474 Declarables List **203**
AnnexQQ. OrganophosphateCompounds **207**

Scope
1.0 Scope
1.1 Objectives
This Lenovo Engineering Specification establishes baseline environmental requirements for all *Materials, Parts and Products that comprise a Lenovo hardware Product for which this specification is referenced in a Statement of Work, print, contract or other procurement documents. This specification implements Lenovo's environmental policy objectives and contains some, but not all, environmental legal requirements for Materials, Parts and Products.

Compliance with the requirements in this specification alone may not satisfy the Supplier's responsibilities to Lenovo since this specification does not encompass all environmental legal requirements in various countries around the world for Materials, Parts and Products. This specification also contains some restrictions on Materials and on certain chemicals used in manufacturing. It also requires suppliers to disclose information about the content of certain substances in their products. This specification also includes requirements for batteries, marking of plastic parts, and other product labeling requirements.

It is important to note that in addition to this specification, Lenovo also maintains environmental and/or related requirements in other specifications, contracts or procurement documents

1.2 Definitions
Article - an object which during production is given a special shape, surface, or design which determines its function to a greater degree than does its chemical composition. In reference to EU REACH Substances of Very High Concern (SVHC), when a product is made up of more than one constituent Article, the SVHC concentration above 0.1% weight by weight applies to each constituent Article making up the product.

Battery: means any device delivering electrical energy generated by direct conversion of chemical energy, having internal or external storage, and consisting of one or more non-rechargeable or rechargeable battery cells, modules or of packs of them, and includes a battery that has been subject to preparation for re-use, preparation for repurposing, repurposing, or remanufacturing. [Source: EU REGULATION (EU) 2023/1542 concerning batteries and waste batteries]

Consumer Product: any article, or component part thereof, produced or distributed (i) for sale to a consumer for use in or around a permanent or temporary household or residence, a school, in recreation, or otherwise, or (ii) for the personal use, consumption or enjoyment of a consumer in or around a permanent or temporary household or residence, a school, in recreation, or otherwise. For exclusions please see the US Consumer Product Safety Act.
[Source: 15 U.S.C. United States Code Title 15 – Commerce and Trade Chapter 47 – Consumer Product Safety]

Deliverable(s): any tangible item(s) delivered by or for a Supplier to Lenovo in accordance with a

purchase contract or other agreement with Lenovo. Deliverables include, but are not limited to, components, materials, parts, and products.

Electrical and Electronic Equipment (EEE): means equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1000 volts for alternating current and 1500 volts for direct current. This definition is from EU Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE).

Electronic Display: means a display screen and associated electronics that, as its primary function, displays visual information from wired or wireless sources. [Source: EU Regulation 2019/2021 of 1 October 2019 laying down ecodesign requirements for electronic displays pursuant to Directive 2009/125/EC of the European Parliament and of the Council]

EPEAT: Electronic Products Environmental Assessment Tool (EPEAT). EPEAT is a procurement tool designed to help purchasers evaluate, compare and select desktop computers, laptops and monitors based upon their environmental attributes as specified in the EPEAT 2.0 ecolabel requirements. Refer to: www.epeat.net

Intentionally Added or Intentional Addition shall mean that a substance is deliberately utilized in the production of a Material or Part.

Materials are chemical substances and preparations that are supplied for the production of Parts and Products (for example structural plastics, metals, coatings, paints, adhesives) and chemical substances or preparations that are shipped with Products, such as toner, cleaners, lubricants, oils, and refrigerants.

Not Detected - Below the detection limit of established test standards or appropriate industry wide test methods. In general, these test standards/ methods should achieve trace level detection or at the lowest detection capabilities of the specific sample matrix.

Homogenous Material is a unit that cannot be mechanically disjointed into different materials. The term “Homogenous” means having uniform composition throughout. Examples of homogenous materials are individual types of plastics, ceramics, glass, metals, alloys, resins, and coatings. Mechanically disjointed means that the materials can, in principle, be separated by mechanical actions such as unscrewing, cutting, crushing, grinding, and abrasive processes.

Parts include fabricated Materials, components, devices and assemblies.

Placing on the market: means making a product available for the first time on the Community market with a view to its distribution or use within the Community, whether for reward or free of charge and irrespective of the selling technique. [Source: EU Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting

of ecodesign requirements for energy-related products]

Preparation: a mixture or solution composed of two or more substances, for example paint, lubricant or ink. This definition is found in the EU Council Directive relating to restrictions on the marketing and use of certain dangerous substances and preparations and EU Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Products are stand alone, final assemblies that Lenovo markets under its own brand including complete machines supplied by an original equipment manufacturer (OEM) to Lenovo for sale under a Lenovo brand.

Putting into service: means the first use of a product for its intended purpose by an end-user in the Community. [Source: EU Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products]

RoHS - an acronym for the European Union Directive 2011/65/EU on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment and subsequent amendments to this Directive.

RoHS substances: substances restricted by European Union Directive 2011/65/EU, "Restriction on the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment" Refer to Lenovo RoHS Engineering Specification 41A7733.

REACH: an acronym for the European Commission Regulation Number 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of CHemicals.

Substance: a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition. This definition is found in the EU Council Directive relating to restrictions on the marketing and use of certain dangerous substances and preparations and EU Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Substance includes such examples as ethanol and metals. Note: metals are included here not in the form of a part or product such as a heat sink or sheet metal cover but as a metal such as aluminum or aluminum alloy. Substance goes beyond a pure chemical compound defined by a single molecular structure. The definition of the substance includes different constituents such as impurities. Also note the word "substance" is used throughout this specification, only the "Substance" with a capital letter refers to this specific definition.

Substance(s) of Very High Concern (SVHC)
1. Substances meeting the criteria for classification in accordance with EU Directive

67/548/EEC:

- Carcinogenic category 1 or 2
- Mutagenic category 1 or 2
- Toxic for reproduction category 1 or 2;

2. Substances which are persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) in accordance with the criteria set out in Annex XIII of the EU REACH Regulation;
3. Substances- such as those having endocrine disrupting properties or those having PBT properties or vPvB properties which do not fulfill the criteria of 2 above - for which there is scientific evidence of probable serious effects to human health or the environment which give rise to an equivalent level of concern to those of other substances listed in 1 or 2 and which are identified on a case-by-case basis in accordance with the procedure set out in Article 59 of REACH. This definition is from the EU REACH Regulation, Article 57.

WEEE - an acronym for the European Union Directive 2012/19/EU of the European Parliament and of the Council on Waste Electrical and Electronic Equipment.

Threshold Level: concentration level or limit (equal to or) above which the presence of a substance or material in a product or subpart must be declared. Threshold levels are provided in ppm (and mass %). The general conversion used is 1000 ppm = 0.1% by weight.

1.3 Application

This specification applies to all Materials, Parts, and Products supplied for Lenovo brand hardware Products that reference this specification. All suppliers must comply with **Sections 2.1 through 2.2 and 3.0** of this specification and their corresponding tables. In addition suppliers of Parts or Products containing molded thermoplastics must comply with **Section 2.3**. Suppliers of Parts and Products containing batteries must comply with **Section 2.4**. Suppliers of Parts and Products having decorative metal finishes must comply with section 2.5. Suppliers of Parts and Products containing mercury must comply with **Section 2.6**. Suppliers of chemicals must comply with **Section 2.7.** Suppliers of Products and operating chemicals (e.g., toner) must comply with **Section 2.8**. Products defined by the European Union as electrical and electronic equipment (EEE) for the Directive on Waste Electrical and Electronic Equipment (2012/19/EU) must comply with **Section 2.9.** Suppliers are responsible for compliance with this specification in their own operations, in their subcontracted operations, and in the Materials they procure for the manufacture of components, Parts, assemblies, and Products for Lenovo hardware.

Compliance with the requirements in this specification alone may not satisfy the supplier's responsibilities to Lenovo since this specification does not necessarily encompass all applicable environmental requirements for Materials, Parts and Products.

In the event of conflict between this specification and any Lenovo part drawing requirement, suppliers shall immediately notify their Lenovo procurement representative. **Any deviation from the requirements of this specification must have prior written approval by Lenovo's procurement representative.**

1.4 Document Administration

This document is maintained and controlled by Lenovo Global Environmental Affairs.
Technical questions regarding the requirements in this specification may be referred through Lenovo procurement to:

Alvin Carter
Environmentally Conscious Product Team Lead
Phone: 919-294-0420
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1.5 List of Documents Referenced in This specification

1.5.1 External Documents

- **Joint Industry Guide (JIG)101 A**
- **European Union Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)**
- **European Union Directive 2011/65/EU on the restriction of the use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS)**
- **EU Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).**
- **EU Commission Regulation No 1275/2008**
- Labeling requirements for restricted use of hazardous substances in electrical and electronic products**SJ/T11364-2024**
- **National Standard of the People's Republic of China GB 20943-2007**
- **National Standard of the People's Republic of China GBT 18455-2010**
- **National Standard of the People's Republic of China GB 24850-2010**
- **National Standard of the People's Republic of China GB 25956-2010**
- **National Standard of the People's Republic of China GB 26572-2025**
- **National Standard of the People's Republic of China GB 28380-2025**
- **Regulations on Recovery Processing of Waste Electrical and Electronic Products (China WEEE)**
- **Regulations on Fund Collecting of Waste Electrical and Electronic Products (China WEEE Fund)Korean e-Standby Program Application Regulation**
- **IEC 62474 - Material Declaration for Products of and for the Electrotechnical Industry**

1.5.2 Lenovo Documents

Lenovo Information for Suppliers can be found at:
https://www.lenovo.com/us/en/sustainability-resources

Product Content Restrictions and Packaging Requirements

- Environmental Product Content Restrictions

- Baseline Environmental Requirements for Materials, Parts and Products, 41A7731
- RoHS Engineering Specification, 41A7733
- Lenovo Supplier Material Self-Declaration
- Lenovo Guide to Full Material Disclosure

. Packaging Requirements
- Wooden Packaging - Material Selection, Treatment, and Marking Requirements, 41A0609
- Expanded Packaging Materials - Prohibited Expansion Agents, 41A0610
- Packaging Materials, Environmental Requirements, 41A0612
- Recyclable Packaging Materials - Selection and Identification, 41A0613

Lenovo requires Suppliers to provide Declarations confirming that materials, parts and products meet the requirements of Lenovo's Restricted Materials Specifications. At Lenovo's request, the supplier may be asked to provide additional technical documentation or test results supporting the declaration.

- Lenovo Supplier Material Self-Declaration
- Lenovo Guide to Full Material Disclosure

2.0 Requirements

2.1 Restricted Substances

2.1.1 Lenovo Restrictions

Table 1, “Restricted Substances,” lists restrictions for categories of substances which are restricted for use in Materials, Parts, and Products for Lenovo hardware. The scope of restrictions varies by substance category. Relatively few categories have general bans; most restrictions pertain to limited applications for the substance categories. Details of the restrictions for each category are provided in **Table 1** along with some applicable regulatory references. These references are not intended to be a complete list, but rather examples of the regulations driving these restrictions. Restrictions on chemicals used in manufacturing of Lenovo hardware Products may also be included as specified in the table or notes. Expanded listings of relevant substances in each of the categories are available in the Annexes for this specification referenced in **Table 1**.

Table 1. Restricted Substances		
Chemical Substance Category	**Details of Restriction**	**Regulatory/ Industry References**
Acids generated from chromium trioxide and their oligomers. Group containing: Chromic acid (CAS 7738-94-5); dichromic acid (CAS 13530-68-2); oligomers of chromic acid and dichromic acid (CAS not yet assigned)	Prohibited at or above 0.1% weight by weight of the Article..	1
Acrylamide (CAS 79-06-1)	Shall not be used as a substance or constituent of mixtures in a concentration equal to or greater than 0.1% by weight for grouting applications.	1
Ammonium dichromate (CAS 7789-09-5)	Prohibited at or above 0.1% weight by weight of the Article.	1
Arsenic and compounds (Annex S)	Prohibited in wood products and paints.	1, 2
Asbestos (Annex A)	Prohibited Must not be used. Report any content.	1, 2, 3 JIG 101 Ed. 4.1
Azo colorants (Annex B)	Azodyes which may release one or more aromatic amines (listed in 1B, 1J, 2 Annex B (1)) are prohibited above 30 ppm in textile and leather articles which may come into direct and prolonged contact with human skin. Azodyes (listed in Annex B (2)) are prohibited in concentrations above 0.1% by weight in colorants for textile and leather articles (e.g., fabrics for headphones and wrist straps).	1, 2 JIG 101 Ed. 4.1
Benzene (CAS 71-43-2)	Prohibited in Manufacturing and in clothing or related accessories, and textiles which under normal or reasonably foreseeable conditions of use come into contact with human skin - concentration limit of 5 mg/kg. Disposable textiles, not for clothing, are exempt.	1
Benzenamine, N-phenyl-, reaction products with styrene and 2,4,4-trimethylpentene (CAS 68921-45-9)	Prohibited	15
Benzidine, CAS No 92-87-5, and its salts	Prohibited	1, 2, 12, 15,38
Beryllium and compounds (CAS 7440-41-7)	Shall not contain beryllium > 1000 ppm (w/w) in homogeneous materials.	EPEAT-COC-2025: 6.1.8 Optional – Reduction of beryllium content
Benzo[a]pyrene (CAS No 50-32-8)	Prohibited in wood based materials in excess of 0.5 milligrams per kilogram of dry matter.	2
Biocidal product as defined in EU Regulation 528/2012 concerning the making	Prohibited on or in Deliverables, for example, prohibited for use as a treatment on Deliverables where the biocidal product is expected to remain on the Lenovo Deliverable. This restriction	41

available on the market and use of biocidal products	shall not apply to treated articles where the sole treatment undertaken was the fumigation or disinfection of premises or containers used for storage or transport and where no residues are expected to remain from such treatment on the Lenovo Deliverable.	
Bisphenol A (BPA) (CAS 80-05-7)	Prohibited in Frequently Handled Cables and frequently handled parts and products, e.g., mice, mouse pads, and keyboards. This prohibition applies to dermal exposure levels at or above 3 micrograms/day. Thermal paper (≤0.02% by weight) External plastics (≤ 300ppm)	1, 14
2-(2-butoxyethoxy)ethanol (DEGBE) (CAS 112-34-5)	Prohibited at or above 3% weight by weight of the Deliverable.	1
Brominated Flame Retardants: •Polybrominated biphenyl (PBBs) •Polybrominated diphenyl ether (PBDEs) including Decabromobiphenyl Ether (DecaBDE)	Prohibited RoHS Substances: no exemptions Any content must be reported 600ppm max in post consumer plastic feedstock and post consumer content plastic resin only (excluding DecaBDE). Subject to approval. Taiwan Green Mark Products：10 ppm in homogenous material for >25g plastic component	1, 14, 55 JIG 101 Ed. 4.1 45
Cadmium/Cadmium Compounds (Annex L)	100 ppm or Intentionally Added in homogenous material RoHS Substance: allowance made for RoHS exemptions Shall not be intentionally added to any package or packaging component. For incidental presence, the sum of the combined concentrations of lead, cadmium, mercury, and hexavalent chromium present in any packaging component shall not exceed 100 ppm (w/w). For restrictions in battery applications see Table 7 Prohibited in Substances and Preparations Taiwan Green Mark Products：10 ppm in homogenous material for >25g plastic component	Annex L 1, 2, 12, 28 EPEAT-COC-2025: 6.5.1 Required – Elimination of substances of concern in packaging California Health and Safety Code sections 25214.9-25214.10.2 37 45
Chlorpyrifos* CAS No. 2921-88-2	Prohibited	62
Chromium trioxide (CAS 1333-82-0)	Prohibited at or above 0.1% weight by weight of the Article.	1
Creosote, coal tar, tar oils and anthracene substances (see Annex MM for list)	Prohibited for the treatment of wood.	1, 2
Decabromo diphenyl ether (DecaBDE) (CAS number 1163-19-5)	Prohibited at or above 0.1% by weight (intentionally added) (except where more restrictive regulatory thresholds are prescribed or exemptions are granted).	1, 19, 22, 23, 43, 44, 51, 55 1, 22, 44

	Prohibited in Substances, Preparations and Products (other than computer plastic housings which have a more restrictive level, see above) at levels at and above 0.1% by weight. Prohibited in an Article, or any part thereof, in a concentration equal to or greater than 0.1% by weight. (This specific prohibition does not apply to electrical and electronic equipment within scope of EU Directive 2011/65/EU RoHS.) Lenovo prohibits the Intentional Addition of Deca BDE in any Homogeneous Material.	1 Lenovo Requirement
4,4'-Diaminodiphenylmethane (MDA) (CAS 101-77-9)	Prohibited at or above 0.1% weight by weight of the Article.	1
Diarsenic pentaoxide (CAS 1303-28-2)	Prohibited at or above 0.1% weight by weight of the Article.	1
Diarsenic trioxide (CAS 1327-53-3)	Prohibited at or above 0.1% weight by weight of the Article.	1
Dibutyltin (DBT) compounds (Annex NN)	Prohibited in Mixtures and Articles where the concentration in the Mixture or Article, or part thereof, is greater than the equivalent of 0.1% by weight of tin.	26
Dimethylfumarate (CAS 624-49-7)	Prohibited in Products, Parts, and Deliverable greater than 0.1 mg/kg of the weight of the Product, Part or Deliverable. Prohibited in pouches (e.g., desiccants) and in chemicals, Substances, and Preparations.	1, 31
2,4-Dinitrotoluene (CAS 121-14-2)	Prohibited at or above 0.1% weight by weight of the Article.	1
Dioctyltin (DOT) compounds (e.g., dioctyl tin oxide CAS 870-08-6 and dioctyltin dilaurate (CAS 3648-18-8)	Prohibited in concentrations greater than the equivalent of 0.1% by weight of tin in: 1. Textile articles intended to come into contact with skin, and 2. Two-component room temperature vulcanization molding kits (RTV-2 molding kits).	26
Formaldehyde, formaldehyde releasers CAS No 50-00-0 * Shall not be placed on the market in articles, after 6 August 2026, * Shall not be placed on the market in articles, after 6 August 2026,	1. Materials capable of releasing formaldehyde into the air, under reasonably foreseeable conditions of use at concentrations reaching or exceeding 0.1ppm are prohibited. 2. The use of formaldehyde in textiles intended for skin contact is prohibited (e.g. Wrist straps and headphones) above 120 mg/kg formaldehyde. 3. The use of formaldehyde in wood applications may not be used if the formaldehyde emission caused by the wooden materials exceeds 0.062 ml/m3 (ppm) in the air of a test chamber. 4. Formaldehyde emission standards in Composite Wood must not exceed the following limits (see Section 2.12 for more details): Hardwood Plywood Veneer Core - 0.05ppm Hardwood Plywood Composite Core - 0.05ppm Particleboard - 0.09ppm Medium Density Fiberboard - 0.11 ppm Thin Medium Density Fiberboard - 0.13 ppm 5. The use of formaldehyde in articles other than furniture and woodbased articles may not be used if the formaldehyde emission caused by these materials exceeds 0.080 mg/m3 (ppm) in the air of a test chamber. 6. Annex XVII to Regulation (EC) No 1907/2006	25 11, 32 1*, 20, 21 24, 25 1*, 53 74
Halogenated aromatic substances (Annex C)	Prohibited from use in capacitors and transformers above 500 ppm for monohalogenated or 50 ppm for polyhalogenated aromatic	1, 2

	substances in materials of the component.	
Halogenated diphenyl methanes (Annex D)	Prohibited	1, 12
Halogenated Flame Retardants	Prohibited in the enclosure and stand of Electronic Displays	52
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified (alpha HBCDD, beta HBCDD, gamma HBCDD) (CAS 25637-99-4, 3194-55-6, 134237-50-6, 134237-51-7, 134237-52-8)	Prohibited except as Unintentional Trace Contamination in Articles, Substance, and Preparations, not exceeding 75 mg/kg (0.0075% by weight) of the Article.	1, 2, 15, 37, 49, 53, 62, 70, 81
Hexachlorobenzene (CAS 118-74-1)	Prohibited except if incidentally present.	15,37
Hexachlorobutadiene (HBCD) (CAS 87-68-3)	Prohibited	10, 15, 55
Hexachloroethane (Annex F)	Prohibited in manufacturing or processing of nonferrous metals. Prohibited in Substances and Preparations	1, 2, 15 37
Hexavalent Chromium/Hexavalent Chromium Compounds (Annex M)	Intentionally Added in homogenous material RoHS Substance: allowance made for RoHS exemptions Intentional Addition is prohibited by Lenovo in paints and plastic resins. Prohibited in leather articles or articles containing leather parts coming into contact with skin in concentrations equal to or greater than 3 mg/kg (0.0003% by weight) of the total dry weight of the leather. Taiwan Green Mark Products：10 ppm in homogenous material for >25g plastic component	1,53 45
Hydrofluorocarbons (Annex FF)	Prohibited in non-refillable containers, foams, and non-confined, direct evaporation systems containing refrigerants.	30, 75
Lead chromate (CAS 7758-97-6) (Please note hexavalent chromium and lead are prohibited for use in Deliverables.	Prohibited at or above 0.1% weight by weight of the Article.	1
Lead chromate molybdate sulphate red (Color Index Pigment Red 104) (CAS 12656-85-8)) (Please note hexavalent chromium and lead are prohibited for use in Deliverables.	Prohibited at or above 0.1% weight by weight of the Article.	1
Lead/Lead Compounds (Annex N)	1000 ppm or Intentionally Added in homogenous Material RoHS Substance: allowance made for RoHS exemptions Paints and varnishes shall not have lead or lead compounds with a lead content of 0.01% or more by mass. The prohibition is also for Articles treated with such paints and varnishes. External PVC cables, wire coatings: 300 ppm For restrictions in battery applications see **Table 7**	Annex N 1, 12 2 14 California Health and Safety Code sections 25214.9-25214.10.2

	GENERAL LEAD: 100ppm LEAD PAINT 90ppm Taiwan Green Mark Products: For >25g plastic component: 2ppm in homogenous material; 20ppm in post-consumer plastic material or add glass fiber plastic material for those safety component which have high temperature requirements	Public Law 110–314 (Consumer Product Safety Improvement Act of 2008) 45
Lead sulfochromate yellow (Color Index Pigment Yellow 34) (CAS 1344-37-2, see Annex II for deleted CAS numbers.) (Please note hexavalent chromium and lead are prohibited for use in Deliverables.	Prohibited at or above 0.1% weight by weight of the Article.	1
Long-chain perfluorocarboxylic acids, their salts and related compounds “Long-chain perfluorocarboxylic acids, their salts and related compounds” means the following: (i) Long-chain perfluorocarboxylic acids or their salts, for the purposes of the Convention, are a homologous series of substances with the molecular formula of CnF2n+1COOH (where $8 \leq n \leq 20$); (ii) Compounds related to long-chain perfluorocarboxylic acids, for the purposes of the Convention, are any substance that is a precursor and may transform to long-chain perfluorocarboxylic acids, where the perfluorinated alkyl moiety has the formula CnF2n+1 (where $8 \leq n \leq 20$) and is directly bonded to any chemical moiety other than a fluorine, chlorine or bromine atom. The following compounds are not included as longchain perfluorocarboxylic acids, their salts and related compounds: perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds as listed in Annex A to the Convention.	Prohibited	62, 82
Medium-chain chlorinated paraffins (MCCPs) Substances or mixtures are considered as “Medium-chain chlorinated paraffins	Prohibited	62, 82

(MCCPs)" when they meet the definition in (i), (ii), or both (i) and (ii): (i) Substances or mixtures that contain linear chloroalkanes with carbon chain lengths in the range C14–17 and chlorination levels at or exceeding 45 per cent chlorine by weight; (ii) Substances or mixtures that contain linear C14–17 chloroalkanes of the following molecular formulae: C14H(30−y)Cly where y ≥ 5; C15H(32−y)Cly where y ≥ 5; C16H(34−y)Cly where y ≥ 6; C17H(36−y)Cly where y ≥ 6.		
Mercury/Mercury Compounds (Annex O)	Must not be present; except in lamps. RoHS Substance: allowance made for RoHS exemptions In exempt applications, labeling requirements and maximum content limits apply (see **Section 2.6**); when present in an approved application, Lenovo must be supplied with a data sheet on mercury content. For mercury restrictions in batteries, see **Table 7** Taiwan Green Mark Products：10 ppm in homogenous material for >25g plastic component	Annex O 1, 2, 8, 9, 12, 13, 17, 18, 39, 56, 57, 58, 59, 60, 61, 62 JIG 101 Ed. 4.1 45
Methylene Chloride (Dichloromethane) (CAS 75-09-2)	Prohibited in Manufacturing and in Substances, Mixtures, Preparations, Field Use Materials, and Chemical Product Supplies. Prohibited in paint strippers (including also varnish removers and lacquer removers.), in concentrations equal to or greater than 0.1% by weight	1, 2, 28
Middle Chain Chlorinated Paraffins	China Environmental Labeling Products: 1000ppm for >25g plastic component	46
2-(2-methoxyethoxy)ethanol (DEGME) (CAS 111-77-3)	Prohibited in paints, paint strippers, cleaning agents, and self-shining emulsions in concentrations equal to or greater than 0.1% by weight.	1
Mineral Oil Aromatic Hydrocarbons (MOAH) 1 to 7 aromatic cycles 1 to 7 aromatic cycles 3 to 7 aromatic cycles	Prohibited in substances present in inks used in packaging and printing documents Prohibited if the concentration in the ink is > 1 % (10,000ppm) (January 1, 2023) Prohibited if the concentration in the ink is > 0.1 % (1000ppm) (January 1, 2025) Prohibited if the concentration in the ink is > 0.0001 % (1ppm) (January 1, 2025)	67
Mineral Oil Saturated Hydrocarbons (MOSH) 16 to 35 aromatic cycles	Prohibited in substances present in inks used in packaging and printing documents No Prohibition (January 1, 2023)	67

16 to 35 aromatic cycles	Prohibited if the concentration in the ink is > 0.1 % (1000ppm) (January 1, 2025)	
Monomethyl- dibromodiphenyl methane bromobenzylbromo-toluene, mixture of isomers (Trade name DBBT) (CAS 99688-47-8)	Prohibited in Substances, Mixtures, and Articles.	26
Monomethyl-dichloro- diphenyl methane (Trade names Ugilec 121 and Ugilec 21) (CAS 81161-70-8)	Prohibited in Substances, Mixtures, and Articles.	26
Monomethyltetrachlorodiphenyl Methane (Trade name Ugilec 141) (CAS 76253-60-6)	Prohibited in Substances, Mixtures, and Articles.	26
N-methyl-2-pyrrolidone; 1-methyl-2-pyrrolidone (NMP) (CAS 872-50-4)	1. Prohibited in Substances. Prohibited in Mixtures in a concentration equal to or greater than 0.3% by weight. 2. Prohibited for use as a solvent or reactant in the process of coating wires.	1, 53 79
Nanomaterials. Substance produced in nanoparticular state: a substance containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range of 1 nanometer (nm) to 100 nm, with the exception of natural, nonchemically modified substances and the substances of which the fraction between one nanometer and one hundred nanometers is a by-product of human activity. Fullerenes, graphene flakes and single and multi-walled carbon nanotubes with one or more external dimensions below 1 nm shall be deemed to be substances produced in nanoparticular state. Other common nanomaterials include silver nanoparticles, iron nanoparticles, titanium dioxide, aluminum oxide, cerium oxide, zinc oxide, silicon dioxide and dendrimers with external dimensions listed above.	Prohibited in Articles and complex objects (an object consisting of a set of Articles) where a fraction of at least one of the substances produced in nanoparticular state exceeding 0.1 % of the mass originally contained in the Article or complex object is released.	40
Nickel (Annex E)	Nickel finishes are prohibited on Product surfaces that are designed to be in prolonged contact with skin	1
Nitrogen trifluoride (CAS 7783-54-2)	Prohibited in Preparations and Articles.	2
Nonylphenol ethoxylates (Annex LL)	Prohibited in textile articles in concentrations equal to or greater than 0.01% by weight of the textile article or of each part of the textile article. Prohibited in Substances, Mixtures, and Preparations.	1 37
Ortho-phthalates (Annex X)	Shall not be intentionally added to any package or packaging component. Sum of the combined concentrations of Ortho-Phthalates listed on EU RoHS and EU REACH Annex XIV (Authorization List) shall not exceed 500 ppm (w/w).	EPEAT-COC-2025 (6.5.1 - Elimination of substances of concern in packaging.

Ozone-Depleting Substances (CFCs, HCFCs, HBFCs, carbon tetrachloride, etc.) (Annex F)	Prohibited for Products to contain or be manufactured with these substances	2, 5, 6, 7, 12 JIG 101 Ed. 4.1
Pentachlorophenol (CAS No 87-86-5) and its salts and esters	Prohibited in the treatment of wood. Prohibited in wood based materials in excess of 3 milligrams per kilogram of dry matter. Prohibited in textiles and leather articles Prohibited in chemicals Prohibited	1, 2, 10 47, 49 48
Pentachlorothiophenol (PCTP) (CAS No 133-49-3)	Prohibited (except where exemptions are permitted)	55
Perfluorinated compounds (Annex JJ has a complete list of regulated substances)	Prohibited	30, 75
Perfluorocarbons (PFC) (Annex G)	Must not be contained in Products; not prohibited from use in production of Products in which the gas is not present in the final Product	4, 27, 30, 75
'Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds "Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds" means the following: (i) perfluorohexane sulfonic acid, including any of its branched isomers; (ii) its salts; (iii) PFHxS-related compounds which, for the purposes of the Convention, are any substance that contains the chemical moiety C6F13S- as one of its structural elements and that degrades to PFHxS. Download list info: http://www.pops.int/TheConvention/POPsReviewCommittee/Meetings/POPRC15/Overview/tabid/8052/ctl/Download/mid/22060/Default.aspx?id=29&ObjID=27302	Prohibited in Substances, Mixtures, constituents of Preparations and Articles, except as Unintentional Trace Contamination, not exceeding 25 ppb (0.025 mg/kg or 0.0000025 % by weight) or not exceeding 0.0001% (100 ppb) total content of PFHxS- related substances	62, 68
Perfluorooctane sulfonate (PFOS), its salts, precursors, and related substances. Perfluorooctane sulfonate (PFOS) refers to a molecule with the following molecular formula: C8F17SO2X [X=OH, metal salt, halide (F/Cl/Br/I), amide and other derivatives including polymers]. For a list of CAS numbers see category codes 201, 202, 203, 203.01, 203.02, 203.03, 203.04, 203.05, 204, 204.01, 204.02, 204.03, and 205 in the OECD Comprehensive Database of Per- and polyfluoroalkyl substances: http://www.oecd.org/chemicalsafety/risk-management/globaldatabase-	Prohibited in Substances, in Mixtures or as a constituent of Preparations in a concentration higher than 10mg/kg (0.001% by weight). Prohibited in deliverables, products, parts and articles, except as Unintentional Trace Contaminations, not exceeding 0.1% by weight. Prohibited in textiles, except as Unintentional Trace Contaminations, not exceeding 1 ug/m2. Refer to the EU Directive and the Canada Regulations referenced for more details on these requirements and exemptions.	1, 2, 10, 15, 33, 36

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Perfluorooctanoic acid (PFOA), its salts, precursors, and related substances. Perfluorooctanoic acid (PFOA) refers to a fully fluorinated, eight-carbon chain carboxylic acid (CnF2n+1COOH, n = 7; 7 carbons in the perfluoroalkyl chain) and its derivative. For a list of CAS numbers see category codes 102, 103, 103.01, 103.02, and 104, in the OECD Comprehensive Database of Per- and polyfluoroalkyl substances: https://comptox.epa.gov/dashboard/chemical-lists/PFASOECD Note: This grouping also includes Long Chain (C8-C20) Perfluorocarboxylic acids (LCPFCAs), its salts, precursors, and related substances.	Prohibited in substances, mixtures or articles, not exceeding 25 ppb (0.025 mg/kg) for PFOA or any of its salts. Prohibited in substances, mixtures or articles, not exceeding 1 mg/kg for any individual PFOA-related compound or a combination of PFOA-related compounds/ See EU Regulation 1907/2006 Annex XVII # 68 for more details of the restrictions, effective dates, limited exemptions and descriptions of PFOA substances.	1, 36, 53, 54, 60, 61, 62
Perfluorocarboxylic acids (PFCAs) containing 9 to 14 carbon atoms in the chain (C9-C14 PFCAs) PFNA - Perfluorononan-1-oic acid (C9-PFCA, CAS 375-95-1) PFDA - Nonadecafluorodecanoic acid (C10-PFCA, CAS 335-76-2) PFUnDA - Henicosafluoroundecanoic acid (C11-PFCA, CAS 2058-94-8) PFDoDA - Tricosafluorododecanoic acid (C12-PFCA, CAS 307-55-1) PFTrDA - Pentacosafluorotridecanoic acid (C13-PFCA, CAS 72629-94-8) PFTDA - Heptacosafluorotetradecanoic acid (C14-PFCA, CAS 376-06-7 For a list of potential CAS Numbers A see OECD Comprehensive Database of Per- and polyfluoroalkyl substances https://comptox.epa.gov/dashboard/chemical-lists/PFASOECD	25 ppb for the sum of C9-C14 PFCAs and their salts. 260 ppb for the sum of C9-C14 PFCA-related substances. Note: This requirement includes below substances, • Linear and branched perfluorocarboxylic acids of the formula CnF2n+1-C(=O)OH where n=8, 9, 10, 11, 12, or 13 (C9-C14 PFCAs), including their salts, and any combinations thereof;• Any C9-C14 PFCA-related substance having a perfluoro group with the formula CnF2n+1- directly attached to another carbon atom, where n = 8, 9, 10,11, 12, or 13, including their salts and any combinations thereof; • Any C9-C14 PFCA-related substance having a perfluoro group with the formula CnF2n+1- that it is not directly attached to another carbon atom, where n = 9, 10, 11, 12, 13 or 14 as one of the structural elements, including their salts and any combinations thereof. See Commission Regulation (EU) 2021/1297 of 4 August 2021 for more details of the restrictions, effective dates, limited exemptions and descriptions of PFCA substances.	65
Per- and Polyfluoroalkyl Substances (PFAS); i.e., fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom (without any H/Cl/Br/I atom attached to it), i.e. with a few noted exceptions, any chemical with at least a perfluorinated methyl group (–CF3) or a perfluorinated methylene group (–CF2–) is a PFAS. For a list of possible CAS numbers	Any concentration must be reported Textiles (Vermont): in a product or product component at or above 100 parts per million, as measured in total organic fluorine. Textiles (California): in a product or product component at or above the following thresholds, as measured in total organic fluorine: • Commencing January 1, 2025, 100 parts per million. • Commencing January 1, 2027, 50 parts per million.	36, 71, 73, 76 77 78

refer OECD Comprehensive Database of Per and polyfluoroalkyl substances: https://comptox.epa.gov/dashboard/chemical-lists/PFASOECD	Shall not be intentionally added to any package or packaging component. The concentrations of total fluorine present in any packaging component due to PFAS shall not exceed 100 ppm by weight with the exception of any packaging component that contains ≥ 25% post-consumer recycled (PCR) content which shall not exceed 1000 ppm by weight.	EPEAT-COC-2025: 6.5.2 Optional – Restriction of PFAS in packaging
Phenol, 2- (2H - benzotriazol -2-yl) - 4,6-bis (1,1-dimethylethyl)- (CAS No 3846-71-7)	Prohibited in decorative laminate, adhesives, paints, printing inks, inked ribbon, and molded plastic products.	10
Phthalates: Benzyl butyl phthalate (BBP) (CAS 85-68-7), Bis (2-ethylhexyl) phthalate (DEHP) (CAS 117-81-7), Dibutyl phthalate (DBP) (CAS 84-74-2), Diisobutyl phthalate (DIBP) (CAS 84-69-5)	Prohibited at or above 0.1% by weight (or 1000ppm) in homogeneous materials. (Please note these substances are prohibited elsewhere in this specification. The more restrictive level applies, which will generally be this entry.) 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. For all other equipment the restriction is in effect.	50, 51, 80
Phosphorous flame retardant Tris (2-chloroethyl) phosphate (TCEP) (CAS 115-96-8) Phosphoric acid tris (2-chloro-1-methylethyl) ester (TCPP) (CAS 13674-84-5) Tris(2,3-dichloropropyl) phosphate (TDCP) (CAS 78-43-3)	China government procurement of green data center and relating equipments: Prohibited in >25g plastic components	66
PIP (3:1) - phenol, isopropylated phosphate (3:1), also known as tris(4-isopropylphenyl) phosphate (CAS 68937–41–7)	Prohibited at or above 0.1% by weight (intentionally added) (except where more restrictive regulatory thresholds are prescribed or exemptions are granted).	55
Polybrominated Biphenyls (PBBs) (Annex P)	Prohibited	1, 2, 12, 10, 15 33, 37 JIG 101 Ed. 4.1
Polychlorinated naphthalenes, $C_{10}H_{8-n}Cl_n$ where “n” is greater than or equal to1 (Annex I)	Prohibited Any PCNs (1 or more chlorine atoms) must not be used.	10 JIG 101 Ed. 4.1 Lenovo Requirement
Polychlorinated biphenyls (PCBs) (Annex H)	Prohibited. (Please note PCBs are prohibited by other regulations; see halogenated aromatic substances in Table 1 and Annex O.)	1, 10, 12, 33, 34
Polychlorinated terphenyls (PCTs)	Prohibited	1, 12, 15
Polycyclic Aromatic Hydrocarbons		Annex CC.

(PAH) Benzo[a]pyrene Benzo[e]pyrene Benzo[a]anthracene Benzo[b]fluoranthene Benzo[j]fluoranthene Benzo[k]fluoranthene Chrysene Dibenzo[a,h]anthracene Benzo[g,h,i]perylene Indeno[1,2,3-c,d]pyrene	Category 1 (<0.2mg/kg) Materials intended to be placed in the mouth, or materials in toys (Directive 2009/48/EC) or articles for children up to 3 years of age with intended long-term skin contact (> 30 seconds) Category 2 Materials that are not in Category 1, with intended or foreseeable long-term skin contact (> 30 seconds) or short-term repetitive contact with the skin. 2a. Use by children under 14: (<0.2mg/kg) 2b. Other consumer products: (<0.5mg/kg) Category 3 Materials not covered by Category 1 or 2, with intended or foreseeable short-term skin contact (≤ 30 seconds). 3a. Use by children under 14: (<0.5mg/kg) 3b. Other consumer products: (<1mg/kg)	German AfPS GS 2019:01 PAK for GS certification
Phenanthrene, Pyrene, Anthracene, Fluorathene	Category 1 (<1mg/kg sum) Materials intended to be placed in the mouth, or materials in toys (Directive 2009/48/EC) or articles for children up to 3 years of age with intended long-term skin contact (> 30 seconds) Category 2 Materials that are not in Category 1, with intended or foreseeable long-term skin contact (> 30 seconds) or short-term repetitive contact with the skin. 2a. Use by children under 14: (<5mg/kg sum) 2b. Other consumer products: (<10mg/kg sum) Category 3 Materials not covered by Category 1 or 2, with intended or foreseeable short-term skin contact (≤ 30 seconds). 3a. Use by children under 14: (<20mg/kg sum) 3b. Other consumer products: (<50mg/kg su)	
Naphthalene	Category 1 (<1mg/kg) Materials intended to be placed in the mouth, or materials in toys (Directive 2009/48/EC) or articles for children up to 3 years of age with intended long-term skin contact (> 30 seconds) Category 2 Materials that are not in Category 1, with intended or foreseeable long-term skin contact (> 30 seconds) or short-term repetitive contact with the skin. 2a. Use by children under 14: (<2mg/kg) 2b. Other consumer products: (<2mg/kg) Category 3 Materials not covered by Category 1 or 2, with intended or foreseeable short-term skin contact (≤ 30 seconds). 3a. Use by children under 14: (<10mg/kg) 3b. Other consumer products: (<10mg/kg)	

Sum of 15 PAHs***	Category 1 (<1mg/kg) Materials intended to be placed in the mouth, or materials in toys (Directive 2009/48/EC) or articles for children up to 3 years of age with intended long-term skin contact (> 30 seconds) Category 2 Materials that are not in Category 1, with intended or foreseeable long-term skin contact (> 30 seconds) or short-term repetitive contact with the skin. 2a. Use by children under 14: (<5mg/kg) 2b. Other consumer products: (<10mg/kg) Category 3 Materials not covered by Category 1 or 2, with intended or foreseeable short-term skin contact (≤ 30 seconds). 3a. Use by children under 14: (<20mg/kg) 3b. Other consumer products: (<50mg/kg)	
Potassium chromate (CAS 7789-00-6)	Prohibited at or above 0.1% weight by weight of the Article.	1
Potassium dichromate (CAS 7778-50-9)	Prohibited at or above 0.1% weight by weight of the Article.	1
Polyvinyl chloride (PVC) (Annex Y) (including Polyvinyldene)	External covers for Lenovo products must not contain Polyvinyl Chloride (PVC). Sheathing for wires and cables, connectors, and electronic components are exempt from this requirement. Shall not be intentionally added to any package or packaging component. Sum of the combined concentration of polyvinylchloride present in any packaging component shall not exceed 100 ppm chlorine by weight.	Lenovo Commitment EPEAT-COC-2025 (6.5.1 - Elimination of substances of concern in packaging.
Radioactive Substances (Annex Z)	Intentionally addition is prohibited	JIG 101 Ed. 4.1
Red Phosphorous (Red-P) flame retardants in: Printed circuit boards, printed circuit assemblies, electrical and electronic components, packaging materials such as encapsulates, die attach materials, underfill epoxies and substrates Exemption: Does not apply to mechanical case parts; i.e., covers	Intentionally addition is prohibited	Lenovo Requirement
Sodium chromate (CAS 7775-11-3)	Prohibited at or above 0.1% weight by weight of the Article.	1
Sodium dichromate (CAS 7789-12-0 and 10588-01-9)	Prohibited at or above 0.1% weight by weight of the Article.	1
Shortchain Chlorinated Paraffins (Annex J)	Prohibited at or above 0.1% weight by weight of the Article. If present below 0.1% by weight of the product, it must be only incidentally present. Taiwan Green Mark Products：10 ppm in homogenous material for >25g plastic component	1, 2, 12, 36 JIG 101 Ed. 4.1 15 45

Substances subject to REACH Authorisation found in Annex XIV of REACH regulation and amendments (Annex EE) in this specification lists current authorized substances as of date of this specification)	Prohibited at or above 0.1% weight by weight of the Article.	1
Sulphur hexafluoride (CAS 2551-62-4)	Prohibited in Preparations and Articles. Prohibited in foams and nonrefillable containers.	2, 27, 30, 75
Tetrachlorobenzenes (CAS numbers included in Annex C)	Prohibited	15
Tetrachloroethylene (perchloroethylene) (CAS 127-18-4)	Prohibited in Manufacturing and in Substances, Mixtures, Preparations, Field Use Materials, and Chemical Product Supplies, including but not limited to adhesives, paints, and cleaning agents	10, 28
Trichloroethylene (CAS 79-01-6)	Prohibited in Manufacturing and in Substances, Mixtures, Preparations, Field Use Materials, and Chemical Product Supplies, including but not limited to adhesives, paints, and cleaning agents.	10, 28
Toluene (CAS 108-88-3)	Prohibited as a Substance or constituent of Preparations in concentrations equal to or greater than 0.1% by mass in adhesives and spray paints.	1
Tributal Tin (TBT) and Triphenyl Tin (TPT)	Prohibited in Articles, or part thereof, where the concentration in the article is greater than the equivalent of 0.1% by weight of tin.	1, 15 JIG 101 Ed. 4.1
Tributyl Tin Oxide (TBTO) (Annex K)	Intentional Addition is prohibited in chemical products	10 JIG 101 Ed. 4.1
Tris (1,3-dichloro-2-propyl) phosphate (CAS 13674-87-8)	Prohibited above 0.1% by mass in any product component. Exempt from this requirement are cables (except cables for mice), adaptors and other similar connecting devices and storage media, such as compact discs, for interactive software, such as computer games. This substance is prohibited in cables for mice. If a replacement flame retardant for this substance is used, it cannot be a substance classified as a “known to be a human carcinogen” or “reasonably anticipated to be a human carcinogen” as listed by the US National Toxicology Program in the US Department of Health and Human Services; classified as “carcinogenic to humans” or “likely to be carcinogenic to humans” by the US Environmental Protection Agency; or identified by the US Environmental Protection Agency or the US National Institutes of Health as causing birth defects, hormone disruption, neurotoxicity, or harm to reproduction or development.	14, 42
Tris (2,3 dibromopropyl) phosphate CAS No 126-72-7 and Tris-(aziridinyl) - phosphineoxide CAS No 545-55-1	Prohibited from use in textile articles intended to come into contact with skin, e.g. Wrist straps and headphones. Prohibited in Substances and Preparations	1, 12, 35 37
Tris(2-chloroethyl) phosphate (CAS 115-96-8)	Prohibited at or above 0.1% by mass in any product component. This restriction does not apply to desktop and laptop computers, audio and video equipment, calculators, wireless telephones, game consoles, handheld devices incorporating a screen that are used to access interactive software and their associated peripherals, and cables, adaptors and other similar connecting devices (except cables for mice). This substance is prohibited in cables for mice. (Note: If a replacement flame retardant for this substance is used, it cannot be a substance classified as a “known to be a human carcinogen” or “reasonably anticipated to be a human carcinogen” as listed by the US National Toxicology Program in the US Department of Health and Human Services; classified as “carcinogenic to humans” or “likely to be carcinogenic to humans” by the US Environmental Protection Agency; or identified by the US Environmental Protection Agency or the US	14, 42

	National Institutes of Health as causing birth defects, hormone disruption, neurotoxicity, or harm to reproduction or development.)	
Undecafluorohexanoic acid (PFHxA), its salts and PFHxA-related substances: (a) having a linear or branched perfluoropentyl group with the formula C5F11- directly attached to another carbon atom as one of the structural elements; or (b) having a linear or branched perfluorohexyl group with the formula C6F13-. The following substances are excluded from this designation: (a) C6F14; (b) C6F13-C(=O)OH, C6F13-C(=O)O-X or C6F13-CF2-X (where X´ = any group, including salts); (c) any substance having a perfluoroalkyl group C6F13- directly attached to an oxygen atom at one of the non-terminal carbon atoms.	1. Shall not, from 10 October 2026 be placed on the market, or used, in a concentration equal to or greater than 25 ppb for the sum of PFHxA and its salts, or 1 000 ppb for the sum of PFHxA-related substances, measured in homogeneous material, in the following: a) textiles, leather, furs and hides in clothing and related accessories for the general public; b) footwear for the general public; c) paper and cardboard used as food contact materials within the scope of Regulation (EC) No 1935/2004; d) mixtures for the general public; e) cosmetic products as defined in Article 2(1), point (a), of Regulation (EC) No 1223/2009. 2. Shall not, from 10 October 2027 be placed on the market, or used, in a concentration equal to or greater than 25 ppb for the sum of PFHxA and its salts, or 1 000 ppb for the sum of PFHxA-related substances, measured in homogeneous material, in textiles, leather, furs and hides, other than in clothing and related accessories referred to in paragraph 1, for the general public. 3. Paragraphs 1 and 2 shall not apply to the following: a) personal protective equipment intended to protect users against risks within the scope of risk category III, points (a), (c) to (f), (h), and (l) of Annex I to Regulation (EU) 2016/425; b) devices within the scope of Regulation (EU) 2017/745; c) devices within the scope of Regulation (EU) 2017/746; d) textiles used as construction textiles. 4. Shall not, from 10 April 2026 be placed on the market, or used, in a concentration equal to or greater than 25 ppb for the sum of PFHxA and its salts, or 1 000 ppb for the sum of PFHxA-related substances, in: a) firefighting foams and firefighting foam concentrates for training and for testing, except functional testing of the firefighting systems provided that all releases are contained; b) firefighting foams and firefighting foam concentrates for public fire services, except where those services intervene at industrial fires at establishments covered by Directive 2012/18/EU of the European Parliament and of the Council (*1) and they use the foams and the equipment for that purpose only. 5. Shall not, from 10 October 2029 be placed on the market, or used, in firefighting foams and firefighting foam concentrates for civil aviation (including in civilian airports) in a concentration equal to or greater than 25 ppb for the sum of PFHxA and its salts, or 1 000 ppb for the sum of PFHxA-related substances. 6. Paragraphs 1, 2, 4 and 5 shall not apply to substances having a perfluoroalkyl group C6F13- directly attached to a sulphur atom that are prohibited in Annex I to Regulation (EU) 2019/1021 of the European Parliament and of the Council (*2).	72

	7. By way of derogation from paragraph 1, that paragraph shall not apply to articles and mixtures which were placed on the market before 10 October 2026. 8. By way of derogation from paragraph 2, that paragraph shall not apply to articles which were placed on the market before 10 October 2027. 9. For the purposes of this entry, PFHxA-related substances are substances that, based on their molecular structure, are considered to have the potential to degrade or be transformed to PFHxA.	
2,4,6-Tri-tert-butylphenol (CAS 732-26-3)	Prohibited in lubricating oils.	55
2-benzotriazol-2-yl-4,6-di-tertpentylphenol (UV-328) (CAS 25973-55-1)	Prohibited	62, 69
1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo [12.2.1.16,9.02,13.05,10] octadeca-7,15-diene (“Dechlorane Plus”TM) [covering any of its individual anti- and syn-isomers or any combination thereof] (CAS 13560-89-9)	Prohibited	62, 69

Regulatory references for Table 1

1) EU Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) will replace the above Directive.
2) Switzerland Ordinance on Risk Reduction related to the Use of certain particularly dangerous Substances, Preparations and Articles (Ordinance on Risk Reduction related to Chemical Products (ORRChem) of 18 May 2005.
3) United States Toxic Substances Control Act; Occupational Safety and Health Act (29 CFR 1910.1001-1051).
4) Statutory Order no. 552 of 2 July 2002 Regulating Certain Industrial Greenhouse Gasses (Denmark).
5) EU Regulation (EC) No. 2037/2000.
6) Section 611 of the 1990 amendments of the Clean Air Act (United States); 40 CFR Part 82.
7) Law Concerning the Protection of the Ozone Layer through the Control of Specified Substances and Other Measures (Law No. 53 of May 20, 1988) (Japan).
8) No. 553 Decree of 9 September 1998, comprising regulations regarding products containing mercury (Decree on Product Containing Mercury, 1998 Environmentally Hazardous Substances Act) Netherlands.
9) The Mercury-containing Products (Certain) Ordinance (SFS 1991:1290) Sweden.
10) Japan’s Act on the Evaluation of chemical substances and Regulation of Their Manufacture, etc. (Act No. 117 of October 16,1973).
11) The Netherlands 178 Besluit van 22 maart 2001, houdende vaststelling van het Warenwetbesluit formaldehyde in textiel.
12) Norway Product Control Regulation Chapter 2. Restricted Substances and Preparations.
13) Connecticut Public Law 02-90, The Mercury Education and Reduction Act.
14) California Safe Drinking Water and Toxic Enforcement Act of 1986.
15) Canada Environmental Protection Act, 1999. Prohibition of Certain Toxic Substances Regulations, 2005. Updated 2008-05-29.
16) State of Washington Title 70 RCW An act relating to phasing out the use of polybrominated diphenyl ethers.
17) Louisiana Mercury Risk Reduction Act of 2006.
18) Rhode Island Mercury Education and Reduction Act.
19) Maine Public Law Chapter 296 Section 1. 38 MRSA 1609.
20) Austria - BGB I 1990/194: Formaldehydeverordnung, 2, 12/2/1990.
21) Germany: LMBG B 82.02-1 Untersuchungen von Bedarfsgegenständen; Bestimmung der Formaldehydabgabe aus textile Bedarfsgegenständen; Ausgabe: 1985-06.
22) Norway Regulation amending regulation of 1 June 2004 No 922 relating to restrictions on the use of chemicals dangerous to health and environment and other products.
23) Minnesota 325E.387 Ban on deca-BDE in computer enclosures.

24) California Regulation 93120 Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite WoodProducts.
25) USA 29 CFR 1910.1048 Toxic and Hazardous Substances - Formaldehyde.
26) EU Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Annex XVII.
27) Austria Ordinance on bans and restrictions of partly fluorinated and fully fluorinated hydrocarbons and of sulfur hexafluoride 447/2002, with amendments 246/2005, 86/2006 and 139/2007.
28) Sweden. The Chemical Products Ordinance 1998:944 to 2009:14.
29) Public Law 110–314 (Consumer Product Safety Improvement Act of 2008): http://www.cpsc.gov/cpsia.Pdf
30) EU Regulation (EC) No 517/2014 on fluorinated greenhouse gases.
31) EU Commission Decision 2009/251/EC Products containing the biocide dimethylfumarate.
32) Lithuanian Hygiene Norm HN 96:2000.
33) EU Commission Regulation 757/2010 of 24 August 2010 amending Regulation No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III.
34) EU Regulation No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC.
35) Canada Hazardous Products Act.
36) Stockholm Convention on Persistent Organic Pollutants (UNEP/POPS/POPRC.2/INF/6).
37) EU Regulation No 649/2012 of 4 July 2012 concerning the export and import of hazardous chemicals.
38) USA 40 CFR Part 721.1660 Benzidine-based chemical substances.
39) Environment Canada Canadian Environmental Protection Act, 1999 “Products Containing Mercury Regulations” (SOR/2014-1244)
40) Belgium Royal Decree concerning the placing on the market of substances produced in nanoparticular state.
41) EU Regulation No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products.
42) Washington DC Carcinogenic Flame Retardant Prohibition Amendment Act of 2016.
43) Oregon SB 596 Relating to decabrominated diphenyl ether amending ORS 453.005, 453.025 and 453.085.
44) Maryland Act concerning Environment – Decabrominated Diphenyl Ether – Prohibitions.
45) Taiwan Green Mark Standard for Desktop No. 66, M-09
46) HJ2536-2014 Technical Requirement for Environmental Labeling Products Computers and Display
47) EU Commission Regulation 757/2010 of 24 August 2010 amending Regulation No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III.
48) EU Regulation 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants (recast).
49) India Regulation of Persistent Organic Pollutants Rules, 2018.
50) EU Commission Delegated Directive 2015/863 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances (RoHS).
51) United Arab Emirates: Restrictions on the Use of Hazardous Materials in Electronic and Electrical Devices Control Scheme, Regulation No. 10, 2017.
52) EU Regulation 2019/2021 of 1 October 2019 laying down ecodesign requirements for electronic displays pursuant to Directive 2009/125/EC of the European Parliament and of the Council.
53) Turkey Regulation Concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).
54) IEC 62474 Declarables Substances List
55) Regulation of Persistent, Bioaccumulative, and Toxic Chemicals Under TSCA Section 6(h).
56) Japan Act on Preventing Environmental Pollution of Mercury
57) Canada Consumer Product Safety Act57) Columbia Decree 2133-2016 Control measures for the importation and commercialization of mercury and the products that contain it.
58) EU Regulation 2017/852 of the European Parliament and of the Council of 17 May 2017 on mercury, repealing Regulation (EC) No 1102/3008.
59) Argentina Resolution 75 2019 Products with added mercury.
60) USA Toxic Substances Control Act 40 CFR Part 721.10068 Elemental mercury.
61) Massachusetts 310 CMR 75.00 Collection, Recycling, Labeling and sales ban of mercury added products.
62) Stockholm Convention on Persistent Organic Pollutants
63) Japan National Implementation Plan of Japan under the Stockholm Convention on Persistent Organic Pollutants
64) Japan Export Trade Control Ordinance and Import Trade Control Ordinance
65) European Commission Regulation (EU) 2021/1297
66) China green data center government procurement requirements standards
67) French Ministry of Ecological Transition Order, pursuant to article 112 of the AGEC law on mineral oils

68) Swiss Federal Council Ordinance on the reduction of risks when handling certain particularly dangerous substances, preparations and objects (Chemical Risk Reduction Ordinance, ChemRRV)
69) Switzerland-Reduction of Risks Linked to Use of Dangerous Substances, Preparations and Articles, Ordinance, May 2005 - Amendment - (on adaptation to various EU Regulations) Ordinance, February 2022
70) Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants (recast) (Text with EEA relevance.)
71) Canada Gazette, Part I, Volume 158, Number 30: SUPPLEMENT: Canadian Environmental Protection Act, 1999 - Notice with respect to certain per- and polyfluoroalkyl substances (PFAS)
72) Commission Regulation (EU) 2024/2462 of 19 September 2024 amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council as regards undecafluorohexanoic acid (PFHxA), its salts and PFHxA-related substances
73) US EPA Toxic Substances Control Act (TSCA) 40 CFR Part 705 (section 8(a)(7)): Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Data Reporting and Recordkeeping
74) Commission Regulation (EU) 2023/1464 of 14 July 2023 amending Annex XVII to Regulation (EC) No 1907/2006 of the European Parliament and of the Council as regards formaldehyde and formaldehyde releasers
75) Regulation (EU) 2024/573 of the European Parliament and of the Council of 7 February 2024 on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014
76) California SB-903 Environmental health: product safety: perfluoroalkyl and polyfluoroalkyl substances.
77) Vermont Senate Bill 25 (Act 131)
78) California Safer Clothes & Textiles Act, AB 1817
79) EU Commission Regulation 2018/588 of 18 April 2018 amending Annex XVII to Regulation (EC) No 1907/2006 of the EuropeanParliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards 1-methyl-2-pyrrolidone

80) China: GB 26572-2025 Requirements for restricted use of hazardous substances in electrical and electronic products
81) EU: Persistent Organic Pollutants (POPs), Regulation (EU) 2019/1021 - Amendment - (on exemptions and UTC limit value of HBCDD in Annex I) Regulation (EU) 2024/2555
82) Singapore Environmental Protection and Management Act 1999 (Amendment of Second Schedule) Order 2025

2.1.2 EU RoHS

The DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 bans the use of the following in new electrical and electronic products put on the market after July 1, 2006:

- **Lead (Pb),**
- **Mercury (Hg),**
- **Cadmium (Cd),**
- **Hexavalent chromium (Cr_{+6}),**
- **Polybrominated biphenyl (PBB) flame retardants and**
- **Polybrominated diphenyl ether (PBDE) flame retardants.**
- **Bis (2-ethylhexyl) phthalate (DEHP)[1]**
- **Butyl benzyl phthalate (BBP) [1]**
- **Dibutyl phthalate (DBP) [1]**
- **Diisobutyl phthalate (DIBP)[1]**

[1] On 4 June 2015, the EU commission published a new Directive (EU) 2015/863 to amend Annex II to EU RoHS 2 (Directive 2011/65/EU) to add the following 4 phthalates onto the list of restricted substances. Restriction become effective July 22, 2019.

Lenovo **Engineering Specification** **41A7733** provides the detailed requirements.

Lenovo follows the guidelines as set forth in European Standard EN IEC 63000:2018 "Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances" to specify evidence requirements for suppliers, materials, components,

Certain substances affected by the European Commission's Directive 2011/65/EU on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) are already restricted by other regulations at concentration levels that are more stringent than those associated with RoHS compliance. **Table 1** presents the requirements for these substances as defined by certain existing legislation and/or Lenovo internal standards.

2.1.2.1 Other Jurisdictions

There are other jurisdictions, other than the EU Member States, with RoHS types of requirements. The list below is not complete and is provided for information only. In some jurisdictions the product scope and requirements are different from the scope and requirements of the EU Directive. Deliverables to Lenovo which cite this specification must meet the requirements of this specification irrespective of the jurisdiction where the Deliverable is transferred to Lenovo.

- Multiple US States
- New York City
- People's Republic of China
- European Economic Area (EEA) States
- European Free Trade Association (EFTA) States
- EU Candidate Countries - Albania, Montenegro, Macedonia, Serbia, and Turkey
- EU potential Candidate Countries – Bosnia and Herzegovina, KosovoBrazil
- EAEU
- UAE
- Korea
- Ukraine
- Vietnam
- India
- Japan
- Thailand

2.1.2.1 China RoHS Conformity Assessment System

According to Arrangements for the Implementation of the RoHS Conformity Assessment System for Electrical and Electronic Products (hereinafter referred to as "Arrangements"), which are hereby announced. All products that are included in the Management Catalogue of Electrical and Electronic Products (EEP) that Should Meet the RoHS Standards and are shipped out of factory or imported after November 1, 2019 shall meet the requirements of the Arrangements.

Modes of Conformity Assessment

- The unified voluntary RoHS certification scheme introduced by the State for EEPs (hereinafter referred to as “State-introduced voluntary certification”)

- The supplier’s declaration of RoHS conformity for EEPs (hereinafter referred to as “SDoC”)

The supplier of an EEP included in the Management Catalogue shall choose the State-introduced voluntary certification mode or SDoC mode to complete the RoHS conformity assessment. Product conformity information should be submitted to China RoHS public service platform within 30 days after the product is put on the market. And Enterprise self-declaration and technical support documents are conformity information for SDoC mode.

Labels of Conformity Assessment
The below Design I will be used as the conformity assessment label for the products undergoing the State-introduced voluntary certification, and The identification of the certification authority in the box should be confirmed with the corresponding certification authority. While Design II will be used as the conformity assessment label for the products going through the SDoC procedure.

Vector drawings of basic patterns of green product identification can be downloaded on the information platform. Green product labels can be scaled up or down, and should be clearly identifiable after labeling.

Unless otherwise required by relevant systems or certification bodies, enterprises can independently choose any manufacturing process (such as printing, molding, etc.) to use or display the green product logo on the product body, nameplate, packaging, attached documents (such as instruction manual, qualification certificate, etc.), operating system, electronic sales platform, etc.

The color of green product logo should be white background plate, green pattern.



Design II



Design I

For China RoHS and China RoHS Conformity Assessment related requirement,please refer to http://www.cesi.cn/rohs/page/fgptbz.jsp?catalog=/001/001-008/001-008-006/001-008-006-001

2.1.3 Additional Requirements for “Low Halogen” Products

Lenovo's plans require the elimination of brominated and chlorinated flame retardants (BRFs, CFR) and polyvinyl chloride (PVC) in new products starting in 2010. These plans are dependent upon the identification and availability of safe, environmentally proven alternative materials that do not compromise product safety, reliability or performance. The alternative materials identified must also be:

- Equal to or better than existing materials in quality, reliability, performance
- Cost competitive
- Available in high volume
- Continue to meet applicable regulatory requirements, international fire safety standards and agency certification requirements.

Lenovo "Low Halogen" materials, parts and products must meet all of the following requirements:

Table 2. "Low Halogen" Substance Requirements

Substance	Threshold Level	Reference
All Printed Circuit Board (PCB) and substrate laminates materials must meet Bromine (Br) and Chlorine (Cl) requirements for low halogen as defined in IEC 61249-2-21. Printed Circuit Board (PCB) and substrate laminates do not include the solder mask. Solder mask is considered a separate homogenous plastic material. Bromine (Br) Chlorine (Cl)	. Maximum concentration of 900 ppm (0.09%) by weight Maximum concentration of 900 ppm (0.09%) by weight Note: Combined total concentration of bromine and chlorine must not exceed 0.15 % (1500ppm) by weight	• IEC 61249-2-21 • JEDEC - JEP709
All other materials and components, with the exception of Printed Circuit Board (PCB) and substrate laminates, must meet the following requirements: Bromine (Br) and Bromine (Br) in Brominated Flame Retardants (BFRs) Chlorine (Cl) and Chlorine (Cl) in Chlorinated Flame Retardants (CFRs) or Polyvinyl Chloride (PVC)	Less than 1000 ppm (0.1%) by weight in homogenous materials Less than1000 ppm (0.1%) by weight in homogenous materials	• IEC 61249-2-21 • JEDEC - JEP709 • JIG 101 Ed. 4.1 • EPEAT-COC-2025: 6.1.5 Required – Reduction of bromine and chlorine content of plastic parts ≥ 25g EPEAT-COC-2025: 6.1.6 Optional – Further reduction of bromine and chlorine content of plastic parts ≥ 5g

Note:

1.Halogens fluorine (F), iodine (I), and astatine (At) are not restricted
2.Any materials and components other than PCB laminates and prepreg materials fall under item 2 “All other.” in Table 2 above.
3.A listing of BFR compounds may be found in the Joint Industry Guide (JIG) 101-A Annex (www.eia.org)
4.Low Halogen materials, parts and products require a unique part number to differentiate them from "non-low-halogen" versions
5.Suppliers must submit a Part Change Notice (PCN) identifying alternate materials
6.Supplier must complete and provide a Lenovo Supplier Material Declaration showing Br and Cl < 900 ppm by weight in any Printed Circuit Board laminates; Br in BFRs < 1000 ppm, Cl in CFRs < 1000 ppm, Cl in PVC < 1000 ppm in homogenous material for other components and materials.
7.Supplier shall provide Lenovo a **Test Report** from a qualified, independent laboratory upon request
8.Reactive TBBPA for printed circuit boards is exempt, until acceptable alternative materials are identified
9.Substitute flame retardant and PVC materials shall meet "low halogen" requirements and shall not contain red phosphorous or antimony compounds as a rule. Red phosphorous in plastic parts such as case parts is exempted.

Exemptions:
Reactive TBBPA for printed circuit boards until acceptable alternative materials are identified.
Server and Third-party option products.
Parts for standard, "non-low-halogen" products are exempt .

Low halogen power cord is available as an option upon customer’s requirements. The term of “Low Halogen” must appear on the label of low halogen power cord as shown in the example below.



2.1.4 Additional Requirements for “Children’s” Products

Any product that will be marketed to K-12 schools or other education customers, or which otherwise might be used by children, must meet children's product requirements for the geographies in which

it will be sold. These include, but are not limited to, the following substance restrictions which are in addition to the other restrictions and limits outlined in this specification.

Children's Product Requirements:

- Ensure CPSIA testing conducted by approved third party lab and include test report in PCRB.
  - Testing/analysis must include leads and phthalates.
  - Power cords and AC adapters sourced from all suppliers must also be tested.
- Paint must be under CPSIA limits (see Table 1)
- Cables and other accessible parts must have less than 90 ppm lead
- Must not contain Bisphenol A (BPA) (see Table 3) nor p-nonylphenol
- No mercury lighting or other use of mercury

2.2 Supplier Full Material Disclosure Declarations

Suppliers must declare the presence of certain of substances in its Lenovo hardware Products to meet regulatory reporting requirements and customer requirements for Product content disclosures.. Lenovo's Supplier Material Declaration process and template is available on-line at www.lenovo.com – About Lenovo – Global Procurement – Product Content Restrictions.

Lenovo's Requirements for Suppliers:

All materials, parts and products incorporated into Lenovo products or bundled with Lenovo products as part of a delivered solution are required to meet the requirements of applicable laws and regulations, Lenovo's Specification 41A7731 Baseline Environmental Requirements for Materials, Parts and Products and Lenovo RoHS Specification 41A7733.

Suppliers are required to provide Full Material Disclosure (FMD) data via the Green Data Exchange (GDX), refer to Lenovo Guide to Full Material Disclosures (Version 2). The referenced FMD should represent a minimum of 95% of the chemical information pertaining to the subject materials, parts or products incorporated into Lenovo products.

At Lenovo's request, the supplier must be able to provide technical documentation in the form of internal design controls, supplier declarations, or analytical test data.

Additional requirements for EPEAT products:

For desktop, notebook, workstation, server and computer monitor products designated to be registered under the Electronic Products Environmental Assessment Tool (EPEAT) the required FMD data should represent a minimum of 95% of the weight of the subject materials, parts or components incorporated into these products. Supplier Verification information, as shown in the Lenovo Supplier Declaration, is also required.

EPEAT is a procurement tool designed to help large volume purchasers evaluate, compare and select desktop computers, laptops and monitors based upon their environmental attributes as specified in the EPEAT 2.0 ecolabel requirements. The registration criteria and list of registered products are provided at www.epeat.net.

Substances in **Table 3** are included in industry standardized product content declarations for electronic products, or other regulatory or Lenovo requirements. Lenovo requires that these substances be quantified and reported by suppliers if they are present in a supplier's product at concentrations greater than the specified thresholds per **Table 3** in any individual Part in the item supplied to Lenovo. For example, if the item supplied to Lenovo is a power supply, then the substances in **Table 3** should be reported to Lenovo if they occur above the specified thresholds in any of the individual Parts (e.g., fan, circuit board, fasteners, connectors) of the power supply.

If the supplier determines that substances in **Table 3** are present in any Parts of the Product above their respective specified thresholds, **then the absolute weight in grams of the substance present in the Part supplied to Lenovo shall be reported to Lenovo**. Absolute weights, rather than weight percentages or ppm, shall be reported to allow aggregation of the data with that from other Parts that comprise the final Lenovo Product.

Table 3. Reportable Substances

Reportable Substance	Threshold for reporting in non-restricted applications*	Examples of Industry Uses / Comments
Antimony/Antimony Compounds (Annex R)	1000 ppm (0.1%)	• Solder alloy • CRT glass
Antimony trioxide (CAS 1309-64-4)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant, e.g., in plastic housings and chip encapsulant. Often used in combination with brominated flame retardants. • Opacifying agent for glass, ceramics and enamels • Pigments • Catalyst for polyethylene terephthalate and vulcanization of rubber
Arsenic/Arsenic Compounds (Annex S)	1000 ppm (0.1%)	• Dopant in semiconductor manufacture • Gallium arsenide is

		used as semiconductor substrate
Arsenic pentoxide (CAS 1303-28-2)	1000 ppm (0.1%) in a homogeneous material	• Solution in the manufacturing of metal adhesives, wood preservatives, and in printing and dyeing.
Beryllium metal (CAS 7440-41-7)	1000 ppm (0.1%) in a homogeneous Material EPEAT Products: 1000 ppm (0.1%) in a homogeneous Material	• Heat transport and heat sinking applications, gears, and cogs • EPEAT-COC-2025: 6.1.8 Optional – Reduction of beryllium content
Beryllium/Beryllium Compounds (Annex T)	200 ppm (0.02%)	• Substrate for integrated circuits • Lightweight housings
Beryllium copper alloys	1000 ppm (0.1%) in a homogeneous material	• Connectors • Electrical contacts and springs
Beryllium oxide (CAS 1304-56-9)	1000 ppm (0.1%)	• Insulator • Structural ceramic
Bis(2-ethylhexyl)tetrabromophthalate (TBPH or BEHTBP) (CAS 26040-51-7)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant in polyurethane foam • Plasticizer for PVC • Adhesives
Bismuth/Bismuth Compounds (also alloys) (Annex U)	1000 ppm (0.1%)	• Solder alloy
Bisphenol A (CAS 80-05-7)	1000 ppm (0.1%) in a homogeneous Material	• Used in synthesis of epoxy and plastic resins, e.g., polycarbonate, polyesters • Antioxidant in some plasticizers • Polymerization inhibitor in PVC • Precursor for the flame retardant tetrabromobisphenol A • Carbonless paper
Brominated Flame Retardants: •Polybrominated biphenyl (PBBs) •Polybrominated diphenyl ether (PBDEs) including Decabromobiphenyl Ether (DecaBDE)	Prohibited RoHS Substances: no exemptions Any content must be reported	• Flame retardant
Brominated / Chlorinated Flame Retardants (other than PBBs or PBDEs). Note: suppliers must report use of brominated flame retardants and provide CAS number or ISO 1043-4 code (Annex V)	1000 ppm (0.1%) by weight in homogenous material	• Flame retardant

	See Table 2 in 2.1.3 Additional Requirements for "Low Halogen" Products. Plastic materials in a product exceeding 25g and/or 0.5 g shall not contain greater than 1000 ppm chlorine or greater than 1000 ppm bromine at the homogeneous level,	• Exception: Servers and reactive TBBPA for printed circuit boards are exempt from the Low Halogen requirements. • • EPEAT-COC-2025: 6.1.5 Required – Reduction of bromine and chlorine content of plastic parts ≥ 25g • EPEAT-COC-2025: 6.1.6 Optional – Further reduction of bromine and chlorine content of plastic parts ≥ 5g •
2-Butanone oxime (CAS 96-29-7)	1000 ppm (0.1%) in a homogeneous material	• Paints, varnishes, stains and coatings • Wood preservatives • Adhesives, silicone sealants and printing inks • Corrosion inhibitors • Urethane polymers
n-Butyl glycidyl ether (CAS 2426-08-6)	1000 ppm (0.1%) in a homogeneous material	• Epoxy resin formulations for coatings, adhesives, binders, sealants, fillers and resins
Cadmium	For restrictions in battery applications see **Table 7**	• All applications; e.g. plating and surface coating applications.
Cobalt dichloride (CAS 7646-79-9)	1000 ppm (0.1%) in a homogeneous material	• Cobalt plating and cobalt based pigments and drier compounds (desiccants). Pneumatic panels for indicating water contamination.
Cobalt metal (CAS 7440-48-4)	1000 ppm (0.1%) in a homogeneous material	• Electroplating
Cobalt sulfate (CAS 10124-43-3; 13455-64-0 monohydrate; 10026-24-1 heptahydrate)	1000 ppm (0.1%) in a homogeneous material	• Preparation of pigments for glass and porcelain • Used in storage batteries • Electroplating baths • Use in sympathetic ink
4, 4'-Diaminodiphenylmethane (MDA) (CAS 101-77-9)	1000 ppm (0.1%) in a homogeneous	• Epoxy hardening agent

	material	• Production of high performance polymers • Curative for neoprene • Hardener in adhesives • Preparation of isocyanates and polyisocyanates
Decabromodiphenyl ethane (DBDPE) (CAS 84852-53-9); synonyms e.g., Benzene, 1,1'-(1,2-ethanediyl)bis [2,3,4,5,6pentabromo-; Please note this substance is not to be included in the Brominated Flame-Retardant entry in this table, but rather as its own separate entry here.	Any level of DBDPE must be reported	• Adhesives and sealants • Plastic and rubber materials • Polymers used for electronic and electrical applications
2,3-Dibromo-1-propanol (CAS 96-13-9)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant
Dibromoneopentyl-glycol (CAS 3296-90-0)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant in unsaturated polyester resins, in molded products, and in rigid polyurethane foam.
P-Dichlorobenzene (CAS 106-46-7)	1000 ppm (0.1%) in a homogeneous material	• Precursor to the high performance polymer poly (p-phenylene sulfide) • Disinfectant
Dicyclohexyl phthalate (CAS 84-61-7)	At or above 0.1% weight by weight of the Article.	• Plasticizer in plastisol, PVC, rubber and plastics.
Diethyl phthalate (CAS 84-66-2)	1000 ppm (0.1%) in a homogeneous material	• Plasticizer
Diisodecyl phthalate (DIDP) (CAS 26761-40-0 and 68515-49-1)	1000 ppm (0.1%) in a homogeneous material	• Plasticizer (e.g., for PVC) • Paints, sealing compounds, and textile inks
Diisononyl phthalate (DINP)	1000 ppm (0.1%) in a homogeneous material	• Plasticizer (e.g., for PVC)
Di-n-hexyl phthalate (DNHP) (CAS 84-75-3)	1000 ppm (0.1%) in a homogeneous material	• Plasticizer
2,4-Dinitrotoluene (CAS 121-14-2)	1000 ppm (0.1%) in a homogeneous material	• Production of flexible polyurethane foam • Plasticizer
Di-*n*-octyl phthalate (DNOP) (CAS 117-84-0)	1000 ppm (0.1%) in a homogeneous material	• Constituent of phthalate mixtures
Di-*n*-pentyl phthalate (DNPP) (CAS131-18-0)	1000 ppm (0.1%) in a homogeneous material	• Plasticizer
Dioctyltin (DOT) compounds (e.g., dioctyl tin oxide CAS 870-08-6 and dioctyltin dilaurate CAS 3648-18-8)	1000 ppm (0.1%) in a homogeneous material	• Textiles • Vulcanization molding kits
Dysprosium (CAS 7429-91-6) and	1000 ppm (0.1%)	• Magnets, lasers, and

compounds	in a homogeneous material	hard disk drives
2-Ethylhexyl-2,3,4,5-tetrabromobenzoate (TBB) (CAS 183658-27-7	1000 ppm (0.1%) in a homogeneous material	• Flame retardant in polyurethane foam
Formaldehyde (CAS 50-00-0)	1000 ppm (0.1%) in a homogeneous material	• Wood • Textiles
Hexabromocyclododecane (HBCDD), (e.g., CAS 25637-99-4, 3194-55-6, 134237-50-6, 134237-51-7, 134237-52-8.)	75 ppm (0.0075%) in a homogeneous material	• Flame retardant in extruded and expanded polystyrene and flexible polyurethane foam
n-Hexane (CAS 110-54-3)	1000 ppm (0.1%) in a homogeneous material	• Used as solvents in cleaning agents in the printing and textile industry. • Used in glues for the leather industry. • Used in quick-drying glues and rubber cement.
		- (IEEE STD 1680.1-2018)
Hydrazine (CAS 302-01-2)	1000 ppm (0.1%) in a homogeneous material	• Nickel plating • Polymerization of urethane • Corrosion inhibitor
Hydrofluorocarbons (HFCs) having up to 6 carbons	Any Intentional Addition and any presence as a gas.	• Refrigerant
IEC 62474 Declarables List http://std.iec.ch/iec62474/iec62474.nsf/Index?open&q=225923	EPEAT Products: per prescribed concentrations in Homogenous Material	• EPEAT-COC-2025: 6.2.1 Required – Record of declarable substances
Indium phosphide (CAS 22398-80-7)	1000 ppm (0.1%) in a homogeneous material	• Semiconductor
Lead	300 ppm or Intentionally Added in homogenous Material Paint: Intentionally Added For restrictions in battery applications see **Table 7**	External PVC cables, wire coatings
Long chain chlorinated paraffins (LCCP; generally C 18-28) (also referred to as Long-chain chlorinated alkanes) (e.g., CAS 85535-86-0)	1000 ppm (0.1%) in a homogeneous material	• Metal working applications • Plasticizer

		• Leather • Paints and coatings • Sealants • Rubber applications
Magnesium/Magnesium Alloys (Annex W)	1000 ppm (0.1%)	• Surface coating • Computer casings
Mercury **	Must not be present; except in lamps. RoHS Substance: allowance made for RoHS exemptions In exempt applications, labeling requirements and maximum content limits apply (see **Section 2.6**); when present in an approved application, Lenovo must be supplied with a data sheet on mercury content. For mercury restrictions in batteries, see **Table 7**	Annex O 2, 8, 9, 13,14, 39 JIG 101 Ed. 4.1
Neodymium (CAS 7440-00-8) and compounds	1000 ppm (0.1%) in a homogeneous material	• Hard disk drives, lasers, violet color in glass and ceramics, ceramic capacitors, magnets and any application
Nickel sulfamate (CAS 13770-89-3)	1000 ppm (0.1%) in a homogeneous material	• Nickel plating
Nickel sulphate CAS 7786-81-4 (anhydrous), 10101-97-0 (hexahydrate), 10101-98-1 (heptahydrate)	1000 ppm (0.1%) in a homogeneous material	• Nickel plating
N,N'-mixed phenyl and tolyl derivatives of 1,4-benzenediamine (CAS 68953-84-4)	1000 ppm (0.1% by mass) in Deliverables	• Additive in rubber.
Nonylphenols (Annex GG)	1000 ppm (0.1%) in a homogeneous material	• Lubrication oil additive • Emulsifier • Wetting and dispersing agent • Antistatic agent • Demulsifier and solubiliser
Organophosphate Compounds (Annex QQ)	Any intentional	• Flame retardant

	addition of these aryl organophosphate compounds	
Pentachlorothiophenol (PCTP) (CAS 133– 49–3)	1000 ppm (0.1% by mass) in Deliverables	• Used in the manufacture of rubber compounds.
Perchlorates (Annex HH)	6ppb in a material	• Coin cell batteries • Acoustic foam
Perfluoroalkyl sulfonates (PFASs) (for a list of PFAS CAS numbers see OECD info at: http://www.oecd.org/chemicalsafety/risk-management/globaldatabase-of-per-andpolyfluoroalkyl-substances.xlsx	≥ 25 ppb (as a constituent) ≥ 250 ppb (in a mixture) ≥ 50ppm (in an article) In Deliverables	• Semiconductor applications • Flame retardant in resins
Praseodymium (CAS 7440-10-0) and compounds	1000 ppm (0.1%) in a homogeneous material	• Hard disk drives, lasers, violet color in glass and ceramics, ceramic capacitors, magnets and any application
Phthalates (Annex X) Please note several phthalates have separate entries on this Table and should not be included for reporting in this general phthalate category. Several phthalates are restricted, see Table 1.	Any Level - intentionally added or known to be present	• Plasticizer in plastics (e.g., PVC) • PVC electrical cables • Solder paste • Sealants, varnishes, paper coating, inks, resins and adhesives.
PIP (3:1) - phenol, isopropylated phosphate (3:1), also known as tris(4-isopropylphenyl) phosphate (CAS 68937–41–7)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant, plasticizer, and an anticompressibility and anti-wear additive. • Used in lubricants and hydraulic fluids.
Plant based materials	Includes wood and paper based materials excluding paper used in publications and packaging and corn/soy based plastics and rubbers. Import of plant based materials into US requires special declaration. Notify Lenovo if and wood or paper materials are used (except in publications and packaging).	US Lacey Act
Polycyclic aromatic hydrocarbons (PAHs) (e.g., phenanthrene CAS 85-01-8) (Annex LL) Please note this substance grouping has prohibited	1000 ppm (0.1%) in a homogeneous	Dyes, plastics, coal tars, and creosote.

applications listed in Table 1. This entry is for reporting of all other non-restricted applications or levels below the restricted amount	material	
Polyvinyl chloride (PVC) (Annex Y)	1000 ppm by weight in homogenous material See Table 2 in 2.1.3 Additional Requirements for "Low Halogen" Products.	• Plastic • Insulator • Windows on cell phones • Housings for IT equipment • Electrical cables • Flexible CD jackets
Radioactive Substances (Annex Z)	Any Intentional Addition	• Promethium 147 as an over-voltage device • Measuring devices • Gauges • Detectors • Optical properties (e.g., thorium)
Refractory Ceramic Fibres; Special Purpose Fibres, [Man-made vitreous (silicate) fibres with random orientation with alkaline oxide and alkali earth oxide (Na2O+K2O+CaO+MgO+ BaO)	Content less or equal to 18 % by weight	• Insulation material in high temperature applications
Selenium/Selenium Compounds (Annex AA)	1000 ppm (0.1%)	• diodes and light detectors (lead selenide) • Historically used as photoelectric coating
Terbium (CAS 7440-27-9) and compounds	1000 ppm (0.1%) in a homogeneous material	• Hard disk drives, lasers, green phosphors, and magnets
Tetrabromobisphenol A (CAS 79-94-7)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant • Epoxy resins in printed circuit boards
Tetrabutyltin (TTBT) (CAS 1461-25-2)	1000 ppm (0.1%) in a homogeneous material	• Stabilizer for PVC
Toluene (CAS 108-88-3)	1000 ppm (Please note that in Table 1 toluene is prohibited as a Substance or constituent of Preparations in concentrations equal to or greater than 0.1% by mass in adhesives and spray paints.)	• Adhesive • Paints/varnishes • Coatings • Silicon sealants
Toluene Diisocyanates (see Annex KK for all inclusive list of CAS numbers)	1000 ppm (0.1%) in a homogeneous material	Chemical intermediate in the production of polyurethane
Tributyltin (TBT) and tributyltin compounds (Annex BB)	Any Intentional Addition in chemical products	• Antibacterial and antifungal agents, antifoulant • Paint, pigment, and

		stabilizer
1, 2, 3-Trichlorobenzene (CAS 87-61-6)	1000 ppm (0.1%) in a homogeneous material	• Solvent • Dye carrier • Heat transfer medium
1, 2, 4-Trichlorobenzene (CAS 120-82-1)	1000 ppm (0.1%) in a homogeneous material	• Solvent • Dielectric fluid • Dye carrier • Synthetic transformer oil Lubricant • Heat transfer medium • Wood preservatives
Triphenyltin (TPT) and triphenyltin compounds (Annex BB)	Any Intentional Addition in chemical products	• Antiseptic and antifungal agent • Paint, pigment, and stabilizer
Tris (2-chloroethyl) phosphate (TCEP) (CAS 115-96-8)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant, plasticizer, and viscosity regulator in polyurethane, polyester resins, polyacrylates, polyvinyl chloride, cellulose derivatives, and thermoplastic resins. Also in adhesives, paints, varnishes, and epoxy.
Tris (2-chloro-1-methylethyl) phosphate (TCPP) (CAS 13674-84-5)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant, e.g., for polyurethane
Tris (2, 3-dibromopropyl) phosphate (CAS 126-72-7)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant, e.g., synthetic textiles and plastics • Phenolic resins • Paints, paper coatings, and rubber
Tris (1,3-dichloro-2-propyl) phosphate (TDCPP) (CAS 13674-87-8)	1000 ppm (0.1%) in a homogeneous material	• Flame retardant, e.g., in textiles and polyurethane foam.
2,4,6-tris(tert-butyl)phenol (2,4,6-TTBP) (CAS 732–26–3)	1000 ppm (0.1%) in a homogeneous material	• Antioxidant that can be used as a fuel additive or lubricant additive
Vinyl chloride (CAS 75-01-4)	1000 ppm (0.1%) in a homogeneous material	• Chemical intermediate used in production of polyvinyl chloride

* Restricted applications are defined in **Table 1**.

** Mercury is only permitted in lamps. The threshold for mercury reporting reflects regulations cited in **Table 1** which are currently more stringent than RoHS maximum concentration limits.

2.2.1. Substances of Very High Concern (SVHC) in Articles - Reporting Requirements

Lenovo requires suppliers to identify if any Substances of Very High Concern (SVHC) present in an Article (Deliverable) at or above the 0.1% weight by weight (w/w) concentration and report the

name and CAS number of the SVHC candidate and the quantity on the Supplier Material Declaration (IPC-1752A form) for the Deliverable. See **Annex DD** for a list of SVHC which must be reported on the Supplier Material Declaration. The table in this annex has a list of SVHC Candidate substances which may potentially be present in Information Technology (IT) equipment.

The current candidate list of REACH SVHC as published by the European Chemicals Agency is located at:

https://echa.europa.eu/candidate-list-table

Annex DD in this specification has the list of 253 Candidate Substances as of the date of this document. Please check the web site for updates since this list is subject to change.

Annex EE is the list of 120 unique substances/entries subject to REACH Authorisation (current as of the date of this specification) and which are prohibited at or above 0.1% weight by weight of a Deliverable.

https://echa.europa.eu/recommendations-for-inclusion-in-the-authorisation-list

If an SVHC is present in a Article at or above the reporting concentrations, the Supplier must provide a customer communication to Lenovo meeting the requirements of Article 33 of the EU REACH Regulation.

EU REACH Regulation Number 1907/2006 can be found at:
https://eur-lex.europa.eu/eli/reg/2006/1907/oj/eng

The EU provides guidance documents for REACH, specifically guidance documents for Substances in Articles as well as the candidate list for SVHC at https://echa.europa.eu/guidance-documents/guidance-on-reach

Additional information about REACH can be found at the European Chemicals Agency web site at https://echa.europa.eu/regulations/reach/understanding-reach

Additionally, from 5 January 2021, Suppliers supplying articles containing SVHCs in a concentration of 0.1% w/w or above will be required to notify their information via the new SCIP database as prescribed by ECHA under the Waste Framework Directive (WFD). SCIP stands for **S**ubstances of **C**oncern **I**n articles, as such or in complex objects (**P**roducts).

The SVHC Candidate List is updated twice a year by the European Chemicals Agency (ECHA). All suppliers are requested to update SVHC declaration information and associated SCIP data in GDX per the latest SVHC Candidate List.

The new database, which will be made available to waste operators and consumers, ensures that

information on products containing SVHCs is available throughout the product's whole lifecycle, including the waste stage. See the info here for more details: https://echa.europa.eu/scip-database

See the info here for details regarding submission of the SCIP Notification information in GDX: http://apps.qpointtech.com/redmine/projects/gdxhelp/wiki/SCIP_Notification_in_GDX

2.2.2. Restricted Substances in Articles (Annex XVII) - Reporting Requirements

Lenovo requires all materials/parts/products meet EU REACH Restriction Substances (Annex XVII) requirement. If there is any substances, even if the substance concentration less than the prescribed restriction conditions under Annex XVII , suppliers shall report the name and CAS number of the restricted substance and the quantity on Full Material Disclosure (FMD) via the Green Data Exchange (GDX), refer to Lenovo Guide to Full Material Disclosures (Version 3), for the Deliverable/Sub-Deliverable.

The latest substances list of REACH Restricted Substances as published by the EU is located at: https://echa.europa.eu/substances-restricted-under-reach.

This list is subject to change by the European Chemicals Agency (ECHA); contains 77 unique substances/entries on the date this specification was published.

EU REACH Regulation Number 1907/2006 can be found at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02006R1907-20140410

The EU provides guidance documents for REACH at:
https://echa.europa.eu/guidance-documents/guidance-on-reach

2.3 Marking of Hardware Plastic Parts

Hardware plastic Parts molded and/or fabricated from thermoplastic materials and weighing 25 grams or more must be marked in accordance with the International Organization for Standardization's international standard ISO 11469:2016 "Plastics- Generic identification and marking of plastics products." The marking convention of ISO 11469 is outlined in the following sections. Marking is optional for Parts weighing less than 25 grams, however, all Parts having adequate surface area for coding should be marked. **Marking requirements do not apply to cable and cable assemblies or experimental tooling.** The marking of protective packaging materials is not in the scope of this specification.

2.3.1 Coding Method

The marking shall be made by injection molding, stamping, or other means of permanently affixing the information in a readily visible area on non-decorative or nonfunctional surfaces.
Marking in a readily visible area means that the marking can be seen on the disassembled plastic Parts. Use of labels with adhesives for coding Parts is not allowed.

Notes:

1. When two or more resins may be used for production of a Part, identification of the actual resin used for fabrication is required.

2. If the Parts must be plated or painted on the internal surface, it may not be possible to have a readily visible injection molded-in marking. In such cases, it may be necessary to code the Parts with a stamp or other means of permanently affixing the information. If the Parts must be painted with a decorative paint, it must be indicated on the internal surface with an appropriate means (for example, stamp) that the Part has been painted.

2.3.2 Symbol to Signify Recyclability

To indicate that the plastic Material used for the fabrication of the Part is recyclable, the two symbols ">" and " <" (normally used to indicate *greater than* and *less than*) will be used. These symbols are shown in **Section 2.3.3**. Marking with these symbols indicates that the Part Material is recyclable. **Note:** The size of the symbol is optional as long as it is clearly legible.

2.3.3 Resin Generic Identification

Resin identification will be marked on Parts using the symbol for polymer type in between the symbols > and < as shown in the example of polycarbonate/ABS blend below.

> PC+ABS <

The symbols for the plastic Materials shall be selected from Part 1 of international standard ISO 1043, *Plastics-Symbols and abbreviated terms*. Symbols of plastics not appearing in ISO 1043-1 shall be selected from ASTM D 4000, *Classification System for Specifying Plastic Materials*; and ASTM D 1600, *Terminology Relating to Abbreviations, Acronyms and Codes for Terms Relating to Plastics*. See **Table 5** "Commonly Used Resins" for typical examples.

Table 5. Commonly Used Resins

Generic Family Name	Polymer Symbol
Polyamide	PA
Polycarbonate	PC
Poly(phenylene ether)	PPE
Polymethylmethacrylate	PMMA
Polystyrene	PS
Polyvinyl chloride	PVC
Acrylonitrile/Butadiene/Styrene	ABS
Polycarbonate + Acrylonitrile/Butadiene/Styrene	PC +ABS
Polycarbonate with 10% glass fiber	PC - GF10

When two or more resins may be used for production of a Part, identification of the actual resin used for fabrication can be displayed by arrows. See **Table 6** for examples.

Table 6. Examples of Completed Plastic Part Markings	
Example	**Marking**
Single material used in production of Part	> ABS-FR(17) <
Two or more generically different materials allowed for production of Part	Arrow points to actual material used in production. > ABS-FR(17) < > PC + ABS-FR(40) <

2.3.4 Additives Generic Identification

Additives identification shall be marked on Parts using the generic symbols from the series of international standards ISO 1043-2, 1043-3 and 1043-4. For example, a blend of polycarbonate/ABS with halogen-free organic phosphate flame retardant compounds is marked with the following code:

> PC+ABS-FR(40) <

2.4 Additional Requirements for Batteries

2.4.1 Battery Content Restrictions

Table 6 "Restrictions on Content of Batteries" lists restrictions on content of batteries sold by Lenovo. Also, all batteries contained in Parts or Products covered by this specification shall meet the requirements of **Table 7.**

Table 7. Restrictions on Content of Batteries	
Battery Type	**Restrictions**
All Battery Types, including accumulators (Some battery types have more restrictive substance levels; see following entries on this table.)	• No intentionally-introduced mercury • ≤ 0.0005% mercury (expressed as mercury metal) by weight. [1, 5, 11, 13, 15, 17] • 0.002% cadmium (expressed as cadmium metal) by weight [1, 17] • 0.01% lead (expressed as lead metal) by weight [1] • 0.0004% lead • Only battery types which are exempted from all hazardous materials transport regulations (surface and air), i.e., not classified as a hazardous material (for purposes of transport) or dangerous good, can be used.
Nonremovable batteries or accumulators, unless the battery is nonremovable due to user safety or other principal purpose.	• ☒ 0.0005% cadmium by weight [4] ☒ 0.1% lead by weight [4] • ☒ 0.0005% mercury by weight [4]
Alkaline batteries	• ☒ 0.01% lead by weight [1, 15] • ☒ 0.001% cadmium by weight [15] • ☒ 0.0001% mercury by weight [15]
Alkaline zinc manganese dioxide	• ☒ 0.001% cadmium by weight [3, 5] • ☒ 0.004% lead by weight [5, 8, 16] • ☒ 0.0001% mercury by weight [5, 16]
Alkaline manganese button cell battery with mercury added	Prohibited [7]

Button Cell Batteries	• ☒ 0.002% cadmium by weight [1] • ☒ 0.0005% mercury by weight [1] • ☒ 0.01% lead by weight [1]
Lead Acid (Pb), Sealed	Must be classified as non-spillable and meet the requirements of US Code of Federal Regulation, 49 CFR 173.159a and IATA Special Provision A67.
Mercuric oxide button cell battery	Prohibited [7]
Nickel Cadmium (Ni-Cd)	Restricted to applications where no technically feasible alternative exists. Use requires written approval of a Lenovo procurement representative unless battery(ies) have been specified by an Lenovo print or specification.*
Nickel Metal Hydride (Ni-MH)	≤ 0.025% cadmium by weight
Silver oxide mercury added button cell batteries, including silver oxide button cell batteries designated SR357, SR364, R371, SR377 and SR395	Prohibited [6]
Zinc-air button cell battery with mercury added	Prohibited [6, 7] ☒ 0.005% mg/g mercury [10] ☒ 0.040% mg/g cadmium [9] ☒ 0.500% mg/g lead [9]
Zinc Carbon Batteries	☒ 0.01% lead by weight [1, 16] ☒ 0.001% cadmium by weight [4, 15] • ☒ 0.0001% mercury by weight [2]
Zinc silver oxide, zinc air and zinc manganese dioxide button batteries	Prohibited [11] ☒ 0.005% mg/g mercury [9] ☒ 0.040% mg/g cadmium [9] ☒ 0.01% mg/g lead [1, 9]
Non-alkaline zinc manganese dioxide	☒ 0.001% cadmium by weight [3, 5, 8] ☒ 0.01% lead by weight [1. 5, 16, 9] • ☒ 0.0005% mercury by weight [5, 16, 9]

Note - the regulations cited below are only a sample of the regulations pertaining to batteries. They are provided for example purposes only.

1) EU Directive 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries.
2) New York Battery Reduction and Elimination. New York State Consolidated Laws. Environmental Conservation
3) Austrian Battery Ordinances 514/1990, as amended by BGB1 No. 3/1991(4 January, 1991) and BGB1.II Nol. 495/1999 (28 December 1999) of the Ordinance of Federal Ministry for Environment, Youth and Family.
4) Switzerland Ordinance on Risk Reduction related to the Use of certain particularly dangerous Substances, Preparations and Articles.
5) Brazil Resolution Number 401 of November 4, 2008 Batteries.
6) Maine Act Concerning Mercury-added Button Cell Batteries.
7) 2011 Wisconsin Act 201 relating to zinc air button cell batteries
8) GB 24427-2009 Limitation of mercury, cadmium and lead contents for alkaline and non-alkaline zinc manganese dioxide batteries. National Standards of the People's Republic of China
9) GB 24428-2009 Limitation of mercury contents for zinc silver oxide, zinc air and zinc manganese dioxide button batteries. National Standards of the People's Republic of China
10) Canada Products Containing Mercury Regulations SOR/2014-254
11) Japan Act on Preventing Environmental Pollution of Mercury
12) Ecuador Technical Regulations RTE INEN 105 (1R) Cells and Batteries, Primary and Secondary
13) Columbia Decree 2133-2016 Control measures for the importation and commercialization of mercury and the products that contain it
14) EU Regulation 2017/852 of 17 May 2017 on mercury

15) Columbia Resolution Number 0172 Technical Regulation No 0172 of January 23, 2012.
16) Argentina National Legislature Act 26.184 on the manufacturing, assembly and importing of batteries.
17) India's Battery Waste Management Rules, 2022 (and 2025 amendments)

2.4.2 Product Design and Labeling Requirements for Batteries

All batteries contained in Parts and Products covered by this specification shall be designed for easy identification and removal. Batteries must be classified as nonhazardous (for purposes of transport) by all modes of transport as required and data (safety data sheets for all batteries, plus UN38.3 test reports for lithium batteries) used to classify batteries as nonhazardous in transport must be supplied to Lenovo upon request. See Lenovo battery compliance information here: Lenovo Battery MSDS Compliance Information | Lenovo US

Suppliers of Deliverables with lead acid batteries must provide Lenovo with a Material Safety Data Sheet (MSDS) which is current, e.g., less than 3 years old, and conforms to US Occupational Safety and Health Administration requirements in 29 Code of Federal Register 1910. A copy of this MSDS must accompany lead acid batteries which ship to a Lenovo customer, including end use customers, Business Partners, and OEM customers. The MSDS must also be available upon request in Spanish.

All Non-Spillable Wet Batteries purchased for use in Lenovo or non-Lenovo equipment must be non-regulated for shipment per IATA Special Provision A67; 49 CFR 173.159 (d); and all other application transportation regulations. The battery and external package must be marked “NONSPILLABLE” or “NONSPILLABLE BATTERY” according to 49 CFR 173.159 (d) (2). All Lithium Batteries purchased for use in Lenovo or non-Lenovo equipment must be non-regulated for shipment per IATA Special Provision A45; 49 CFR 173.185 (b) or (c); and all other applicable transportation regulations. Bulk shipments of Lithium cells or batteries must be in quantities of 12 or less and have a gross package weight of 5 kg or less for all field use shipments. This requirement does not apply to Lithium battery or cell shipments used to support manufacturing operations as long as all transportation regulations are met.

IMPORTANT: The U.S. Department of Transportation (USDOT) prohibits the shipment of primary (non-rechargeable) lithium batteries and cells on passenger aircraft for both foreign and domestic passenger-carrying aircraft entering, leaving, or operating in the United States according to 49 CFR 172.102 Special Provision A100. In addition, the package must also be marked "PRIMARY LITHIUM BATTERIES - FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT" when transported by highway, rail, vessel and cargo aircraft in the U.S. Per 49 CFR 173.185 (b)(5) or (c)(4). Secondary (rechargeable) lithium batteries and cells are only permitted on passenger aircraft for both foreign and domestic passenger-carrying aircraft entering, leaving, or operating in the United States with a gross package weight not exceeding 5 kg according to 49 CFR 172.102 Special Provision A100.

Documentation from the manufacturer/supplier of the battery must be provided to Lenovo clearly stating that the part number being purchased by Lenovo meets all the requirements which make the battery non-hazardous for shipment by IATA, 49 CFR, and any other applicable regulation such as

ADR, IMDG, TDG, etc. Data (industry test reports) used to classify batteries as non-hazardous in transport must be supplied upon request.

All rechargeable primary batteries must be labeled with a reference to Lenovo's website for further information on recycling. For example, the label may read: "Please see https://www.lenovo.com/us/en/compliance/recycling/ for more information about recycling options in your area." Variations on this label require Lenovo GEA approval.

Batteries shall have appropriate labels affixed, including but not limited to

1. Battery type and chemistry (IEC standard name is acceptable for button cells, e.g., CR2032, BR1225, see IEC 60086-2),
2. Manufacturer name,
3. Registered trade name or registered trade mark,
4. Postal address indicating a single contact point,
5. Web address and email address if available,
6. Batch or serial number, or product number or another element allowing their identification,
7. Capacity rating on all batteries with the exception of coin cell
    a. All batteries must, at a minimum, have the capacity displayed in Ah on a label with a minimum size of 1 mm x 5 mm,
    b. Lithium ion batteries also require the specific marking format of Wh, and

4. Other markings, hazard warnings, and information as required by applicable laws and regulations.

Battery labels or markings must be printed visibly, legibly and indelibly. The battery marking shall be located on or adjacent to each battery unless otherwise noted in this Section. Deliverables containing batteries that are not readily identifiable must be clearly labeled on the exterior to indicate the presence of a battery inside. In battery packs, individual cells may be labeled (in cases where multiple manufacturers or chemistries cannot clearly be identified using a single label for the pack) or one label may be used for the pack.

If a label design is specified by Lenovo in a Part print, drawing or assembly specification, the specified label on the print or assembly specification must be affixed. In the absence of a battery label specified by Lenovo in a Part print, the supplier shall refer to country requirements. For reference, the following **Sections 2.4.2.1 - 2.4.2.5** summarize battery marking requirements for selected geographies.

2.4.2.1 Marking Requirements for the EU, Brazil, Turkey, India and other jurisdictions
Instructions must be provided in the Product or Part hardware publications, showing how batteries can be removed safely and informing the customer of the type of battery in the Deliverable.

In the European Union, a mark indicating separate collection must be printed on all batteries or accumulators. See **Figure 1**. The mark must (1) consist of a crossed-out wheeled bin container; (2) cover 3% of battery or accumulator's largest side area, and be of a maximum size of 5 cm x 5 cm; (3) for cylindrical cells, cover 3% of half the surface area of battery or accumulator, and

maximum size of 5 cm x 5 cm; and (4) where the mark would be smaller than 0.5 cm x 0.5 cm, a separate mark measuring at least 1 cm x 1 cm must be printed on the package.

In addition, batteries and accumulators containing heavy metals must be marked with specific symbols for heavy metal content: Hg for mercury content greater than 0.0005% mercury; Cd for cadmium content greater than 0.002% cadmium; Pb for lead content greater than 0.004% lead. These symbols must be printed beneath the separate collection mark and must be at least 1/4 of the size of the separate collection mark.

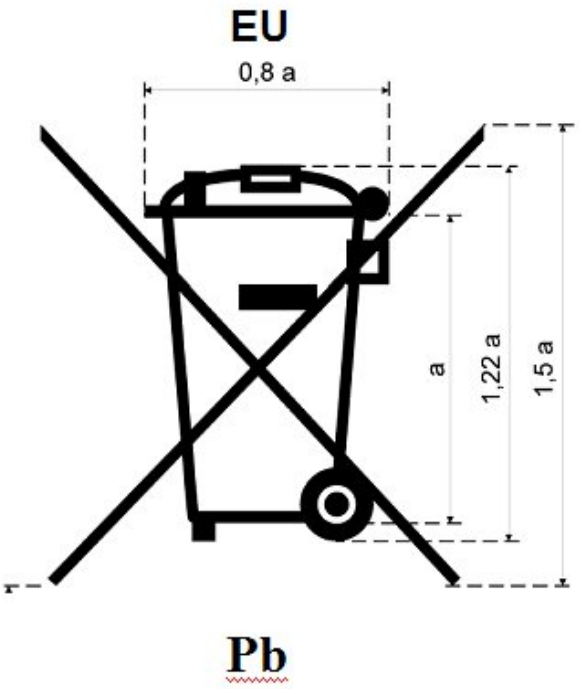
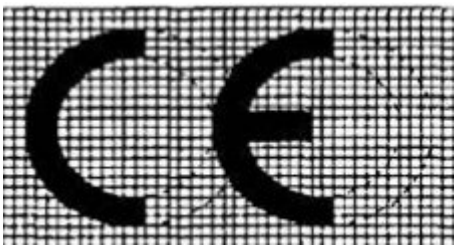


Figure 1. Collection mark and heavy metal content marking for a battery containing lead.

The CE marking shall be affixed visibly, legibly, and indelibly to the battery. Where that is not possible or not warranted due to the nature of the battery, it shall be affixed to the packaging and to the documents accompanying the battery. Articles 19-20 EU 2023/1542. The CE marking shall be subject to the general principles set out in Article 30 of Regulation (EC) No 765/2008.



A Declaration of Conformity shall be provided in accordance with EU 2023/1542 Article 18 and Annexes VIII & IX.

Technical documentation shall be provided as part of the Declaration of Conformity per EU Regulation 2023/1542 Article 38 & Annex VIII.

Test reports shall be provided showing compliance with substance restrictions per EU Regulation 2023/1542 Article 6 and Annex I.

Batteries shall be tested as required in Turkey Announcement 2009/15 by a Turkey accredited laboratory. The analysis shall show compliance of the battery to the substance restrictions in the Turkey Regulation for Used Batteries and Accumulators, Number 25569 for mercury and cadmium. The analysis shall be completed and dated within six months of submittal to Lenovo.

Starting 18 August 2025, EU regulation 2023/1542 concerning batteries and waste batteries, articles 48,49,50 & 52 list Due Diligence requirements.

- Ensure third-party verification of battery due diligence policies
- Keep documentation for 10 years after the last battery manufactured under the relevant battery due diligence policy has been placed on the market
- Adopt and communicate to suppliers and the public a company battery due diligence policy
- Identify and assess the risk of adverse impacts in the supply chain and design and implement a strategy to respond to the identified risks
- Make available to Lenovo all relevant information gained and maintained pursuant to its battery due diligence policy, with due regard for business confidentiality and other competitive concerns
- On an annual basis review and make publicly available, including on the internet, a report on the due diligence policy.

The capacity rating must be labeled on all portable batteries. Portable battery is defined by the EU Directive 2006/66/EC on batteries and accumulators to mean any battery, button cell, battery pack or accumulator that is sealed, can be hand carried, and is neither an industrial battery or accumulator nor an automotive battery or accumulator. Capacity rating (e.g., Watt-hour, Wh) for button or coin cell batteries may be located on the packaging if space is not available on the battery.

Under India's Battery Waste Management Rules, 2022 (and 2025 amendments), producers must obtain an Extended Producer Responsibility (EPR) registration number from the Central pollution Control Board (CPCB) and mark it on batteries, packaging, or via QR codes.

Key Aspects of Indian Battery Regulations & EPR

- Registration Number: Producers must obtain a unique EPR registration number via the CPCB portal.
- Marking Requirements: By March 31, 2025, batteries must feature the EPR registration number.
- Labeling Flexibility (2025 Amendment): The EPR number can be printed directly on the

battery, equipment containing the battery, packaging, or included via a barcode/QR code on the brochure.

- Small Battery Exemption: If the battery is too small (e.g., <0.5 cm x 0.5 cm), the mark must be on the packaging.
- Chemical Symbols: Markings for Lead (Pb) or Cadmium (Cd) are not required if concentration levels are ≤0.004% and ≤0.002%, respectively.

2.4.2.2 Labeling Requirements for the United States

2.4.2.2.1 Requirements for Rechargeable Ni-Cd and Small Sealed Lead Acid Batteries

In the United States, the Mercury-Containing and Rechargeable Battery Management Act (Public Law 104-142) establishes national, uniform labeling requirements for rechargeable Ni-Cd, small sealed lead acid batteries, and products containing these regulated batteries as a primary energy supply. Products that include an internal uninterrupted power supply (UPS) device are exempt. Regulated batteries must display three chasing arrows or a comparable recycling symbol and the text indicated in **Table 8** for the respective regulated items. No size or color requirements for the recycling symbol are specified in the regulation. EPA publication EPA530-K-97-009, "Implementation of the Mercury-Containing and Rechargeable Battery Management Act" depicts the three chasing arrows symbol shown in **Figure 2**.



Figure 2. Three chasing arrows symbol as cited by the U.S. EPA for the U.S. Battery Act

The required labeling must appear on the packaging of the Products containing regulated batteries that are not easily removable, and on the packaging of regulated batteries that are sold separately from such Products, if the labeling on the Product or battery is not visible through the packaging.

Table 8. Texts for Battery Marking for the U.S. Battery Act

Regulated Item	Text
Nickel-cadmium batteries*	Nickel-cadmium or Ni-Cd with the phrase BATTERY MUST BE RECYCLED OR DISPOSED OF PROPERLY
Lead acid batteries	Pb or the words "LEAD," "RETURN," and "RECYCLE", and if the batteries are sealed, the phrase "BATTERY MUST BE RECYCLED."
Products containing regulated lead-acid batteries that are not easily removable	"CONTAINS SEALED LEAD BATTERY. BATTERY MUST BE RECYCLED."
Product containing Ni-Cd batteries that are not easily removable	"CONTAINS NICKEL-CADMIUM BATTERY. BATTERY MUST BE RECYCLED OR DISPOSED

	OF PROPERLY."

* Unless specifically called out on an Lenovo print or specification, nickel cadmium batteries may not be used in Parts and Products covered by this specification.

2.4.2.2.2 Requirements for Rechargeable Lithium Ion Batteries Sold in US and Canada

Lenovo is a licensee of the Rechargeable Battery Recycling Corporation (RBRC) for rechargeable lithium ion batteries sold in the US and Canada. As part of this program, all Lenovo rechargeable lithium ion batteries offered for sale in the US and Canada must bear the Rechargeable Battery Recycling Corporation (RBRC) seal (**Figure 3**). This requirement applies to rechargeable lithium ion batteries that will be included in products as well as batteries that will be sold as stand alone parts or replacements.

The seal must be placed on the battery itself. It should also be placed on battery packaging, in user manuals, and in informational materials wherever possible. The seal must be at least 13mm in diameter and must have white space around the seal at least equal to the width of the outer ring of the seal. The seal must contain the RBRC toll free number (1-800-822-8837), the word "RECYCLE," and the battery chemistry as illustrated in **Figure 3** below.



Figure 3. RBRC seals for rechargeable lithium ion batteries (color or black and white).

Lenovo requires the additional text "**US & Canada Only**" to appear below the seal when Products are sold outside the US or Canada. The size of the lettering "**US & Canada Only**" shall have a minimum text height of 2mm. Helvetica font, 8 or 10 points is recommended. Text is to be centered under the seal but must not touch the seal.

2.4.2.2.3 Requirements for Batteries Containing Perchlorate

Many manganese dioxide lithium coin cell batteries used in Lenovo applications such as desktop and laptop computers contain perchlorate. The use of any material, part, or product containing perchlorate triggers specific labeling and notification requirements in the US. California's Perchlorate Contamination Prevention Act requires that all perchlorate containing materials and products containing perchlorate be labeled with or accompanied by the following statement:

Perchlorate Material - special handling may apply, See
www.dtsc.ca.gov/hazardouswaste/perchlorate

The statement must appear on either (1) a label conspicuously applied to the exterior of all outer shipping packages and on consumer packages or (2) the statement may be included on a document

included with the shipment such as an owners manual or package insert. The above statement must be used verbatim and must accompany every Lenovo part or product containing perchlorate that will be shipped in the US.

2.4.2.3 Requirements for Batteries Sold in China

The Regulation on Mercury Content Limitation for Batteries requires all domestically manufactured and imported alkaline batteries sold in China to be marked to indicate mercury content using Chinese characters equivalent to “low mercury” (if the mercury content is less than 0.025% of the weight of the battery) or “mercury free” (if the mercury content is less than 0.0001% of the weight of the battery).

2.4.2.4 Additional Requirements for Taiwan

All batteries sold in Taiwan are required to have the “Four-in-One” recycling symbol. See **Figure 4**. The “Four-in-One” recycling symbol must be printed in any solid color (monotone), must be square in shape with each side not smaller than 0.5 cm in packaging and 1.5 cm in user manuals and product literature. The recycle symbol should be placed on the battery.



Figure 4. Four-in-One recycling symbol for Taiwan

Electronic products with embedded dry cells must be affixed with Four-in-One Recycling Symbol on the product packaging, product labels or instruction books. Nearby the Four-in-One Recycling Symbol, the Chinese characters for “Please Recycle Batteries” must be indicated. See Figure 4.1.



Figure 4.1 Four-in-One recycling symbol and words for Taiwan

2.4.2.5 Requirements for Rechargeable Batteries Sold in Japan

Rechargeable sealed lead acid, nickel cadmium, nickel metal hydride, and lithium ion batteries sold inside Japan shall be labeled according to the Ordinance No. 95 of Ministry of Economy, Trade, and

Industry under the Law for the Promotion of the Effective Utilization of Resources (Law No. 48, 1993 as amended, 2001). These requirements are summarized in the Tables and Forms below. Sealed lead acid batteries with greater than 234,000 coulombs charge and small coin type rechargeable batteries that are contained inside Products are exempted from the special Japanese labeling requirements of this section. Recommended background color of label is silver (PANTONE877C) or gray (PANTONE421C) for sealed lead acid, yellowish green (PANTONE389C) for sealed nickel-cadmium, orange (PANTONE1375C) for sealed nickel-hydrogen, and blue (PANTONE312C) for sealed lithium storage battery.

In case of Li-ion battery, it is recommended the following two digits be added.
Indication of Li-ion battery : Li-ion XY Near the three arrow mark, indicating "X: the maximum amount of metal contained in the positive electrode" and "Y: the metals which disturb the recycling of main metals" with two numbers.

1st Number(X): Max. amount of metal contained in the positive electrode
- 0: Cobalt
- 1: Manganese
- 2: Nickel

2nd Number(Y): metals which disturb recycling main metals
- 0: None
- 1: In case the total "Tin(Sn)" content in the cell(s) is more than 1.0 wt% per battery pack weight
- 2: In case the total "Phosphorous(P)" content in the cell(s) is more than 0.5 wt% per battery pack weight

See **Figure 5** for detail specifications for symbol and battery type.

Table 9. Battery Label Requirements for Japan	
Class of the Specified Labeled Product	
Storage batteries not covered by using plastic or other materials and storage batteries covered by using plastic or other materials with height of less than 10mm	**Battery type**
Sealed lead storage batteries covered by using plastic or other materials with height of 10mm or more	**Symbol with Battery type**
Sealed nickel-cadmium storage batteries covered by using plastic or other materials with height of 10mm or more	
Sealed nickel-hydrogen storage batteries covered by using plastic or other materials with height of 10mm or more	
Sealed lithium storage batteries covered by using plastic or other materials with height of 10mm or more	



Figure 5. Chasing Arrows recycling symbol and Battery type for Japan

2.4.2.6 Requirements for Alkaline Batteries Sold in Argentina, Colombia, Paraguay

Alkaline batteries are banned in Argentina, Colombia and Paraguay and should not be distributed there directly (factory) or indirectly (distribution center). For use of Alkaline batteries in other Latin America countries please check with Lenovo LA Global Environmental Affairs.

2.4.2.7 Requirements for Brazil

Lead acid, nickel cadmium, mercury oxide, alkaline manganese, and zinc manganese batteries or accumulators shall be labeled in accordance to the requirements for the European Union, see previous section for the EU. In addition, these batteries must be clearly and indelibly labeled in Brazilian Portuguese with the following information:

- Identification of the importer and manufacturer,
- Warning about risks to human health and the environment, and
- Requirement to return the battery, after use, to the reseller, manufacturer, or importer.

If there is insufficient space on the batteries to put the above information then this information must be on the packaging and in the product manual shipped with products.

The manufacturer of these batteries must:

- Register in the Brazil Federal Technical Register of Activities that are Potentially Contaminating or that Use Environmental Resources.
- Test the batteries in accordance to Chapter 1, Section 3 of Brazil Resolution Number 401 of November 4, 2008 (and Article 3 of Brazil Normative Instruction (NI) No. 8) at an in-country (Brazil) INMETRO accredited laboratory. The testing results must be submitted annually to Lenovo, the Brazil National Institute of Metrology and Standards (INMETRO), and the Brazil Institute of the Environment and Renewable Natural Resources (IBAMS). Please note this testing requirement applies only to lead acid, zinc manganese and alkaline manganese batteries and accumulators only. (This testing also applies to nickel cadmium and mercury oxide batteries which are not allowed in Lenovo products.)
- Submit a battery management plan to the required Brazil environmental agency (IBAMA).
- Include in the packaging, in Brazilian Portuguese, information about the symbols, warnings on the risks to human health and the environment, and the necessity to return the battery after use to the reseller, manufacturer or importer.

2.5 Requirement for Decorative Metal Finishing

Powder coating is the preferred material for decorative metal finishing of Lenovo hardware products. This includes the finishing of decorative metal parts and OEM products. Exceptions to this requirement are applications where production volumes don't justify using the powder coating process; a unique color, texture, or "feel" (e.g., soft-touch) is specified; or conductive (e.g., electrostatic discharge (ESD), electromagnetic compatibility (EMC)) functional coatings are required. Powder coatings are not applicable, at this time, for the finishing of plastic parts). Contact your Lenovo procurement representative to identify the Lenovo approved powder coating supplier and qualified color matched materials for decorative metal finishing of Lenovo hardware products.

2.6 Requirements for Parts and Products Containing Mercury

While most mercury-containing components are prohibited from Lenovo hardware Products (see Table 1), mercury is allowed in energy efficient lamps. The use of a mercury-containing component must be reported to your Lenovo procurement representative to ensure that the applicable legal requirements are met for Products containing mercury. All Parts or Products containing mercury must be labeled in English and French per the requirements of Table 10 for certain U.S. State and Canadian laws. Appropriate text as defined in Table 10 must be added to user and service manuals (or instructions for projector replacement lamps) for mercury-added Products indicating which Product components contain mercury, directing the Product owner to dispose of the Product per local regulations, proving safe handling procedures and measures to be taken in case of accidental breakage of the lamp; and a link to options available for recycling. Information must be in English and French in at least 10 point font or 3 mm in height or greater, and must be enclosed by a border. Product packaging for products with mercury added lamps that are easily removable by the consumer (such as projectors and projector replacement lamps) and packaging for all mercury containing replacement parts must also be labeled per the requirements of Table 10.

Please contact Lenovo Global Environmental Affairs for approval prior to releasing any products with mercury containing lamps other than notebook computers, all-in-one desktops, and displays as prior permit applications and notifications may need to be filed.

Table 10 provides a list of those Lenovo Product categories that are known to contain mercury and provides exact requirements for label wording, label font size, and user manual text. Labels and manual text for Product categories not listed in **Table 10** must be reviewed and approved by your Lenovo procurement representative.

Table 10. Mercury Added Product Labeling Information for the United States and Canada

Product Type	Mercury Location	Mercury Amount	Product Label Requirements	Package Label Requirements	User / Service Manual Requirements
Laptop / Notebook Computer*	Fluorescent lamp in Display module	0-5 mg per lamp; 1-3 lamps per product	. Label Wording- “This product contains a lamp(s) which contains mercury; dispose according to local,	. Statement Wording - "The fluorescent lamp in the liquid crystal display contains mercury; dispose according	. Statement Wording - "The fluorescent lamp in the liquid crystal display contains mercury; dispose according

		Eco Labels such as "EU Flower" and Nordic Swan" requires that each bulb has <3.0 mg of Hg.	state, or federal laws." . The symbol Hg must be readily visible on the product in a font size of at least 10 points with characters that are at lease 3 mm in height or withing a pictogram of at least 7 mm in height.  . Label Location - Bottom of product; must be clearly visible. . Label Construction – Per requirements of UL 969 Standard, "Marking and Labeling Systems " . Label font size must be 10 point and 3 mm in height or greater.	to local, state or federal laws." Contains mercury / Contient du mercure." •Statements must be 10 point font and 3mm in height or greater. •Statements must be in English and French and enclosed by a border.	to local, state or federal laws." . Contains mercury / Contient du mercure. La lampe fluorescente de l'écran à cristaux liquides contient du mercure; disposer selon les lois locales, étatiques ou fédérales." . Instructions on safe handling procedures and measures to be taken in case of accidental breakage of mercury lamp, including the address of a website where that information is available. . Recycling instructions and reference to www.lenovo.com/recycling . Statement must be 10 point font and 3 mm in height or greater.
Flat Panel LCD Display	Fluorescent lamp in Display module	0-5 mg per lamp; 2-12 lamps per products	. Label Wording- "This product contains a lamp(s) which contains mercury; dispose according to local, state, or federal laws." . The symbol Hg must be readily visible on the product in a font size of at least 10 points with characters that are	. Statement Wording - "The fluorescent lamp in the liquid crystal display contains mercury; dispose according to local, state or federal laws." Contains mercury / Contient du mercure." •Statements must be 10 point font and	. Statement Wording - "The fluorescent lamp in the liquid crystal display contains mercury; dispose according to local, state or federal laws." . Contains mercury / Contient du mercure. La lampe fluorescente de l'écran à cristaux liquides contient du

			at lease 3 mm in height or withing a pictogram of at least 7 mm in height.  . Label Location - Bottom of product; must be clearly visible. . Label Construction – Per requirements of UL 969 Standard, "Marking and Labeling Systems " . Label font size must be 10 point and 3 mm in height or greater.	3mm in height or greater. . •Statements must be in English and French and enclosed by a border.	mercure; disposer selon les lois locales, étatiques ou fédérales." . Instructions on safe handling procedures and measures to be taken in case of accidental breakage of mercury lamp, including the address of a website where that information is available. . Recycling instructions and reference to www.lenovo.com/recycling Statement must be 10 point font and 3 mm in height or greater.
Mercury containing replacement parts for notebooks and flat panel LCD monitors	Fluorescent lamp	0-5 mg per lamp	. None for replacement parts	. Replacement part package must be labeled with "This part contains a lamp which contains mercury; dispose according to local, state, or federal laws."	. None for replacement parts
Digital Projectors (LCD Data and Video), Video Projector Replacement lamp assembly, and Video Projector Replacement Lamp, or any other type of mercury containing device **Please notify Lenovo Global Environmental Affairs prior to use of any digital projector metal arc lamps. Prior approval must be granted by Global Environmental Affairs to release products using these lamps.**				Lenovo currently does not manufacture and sell Digital Projectors or their replacement parts or other mercury containing devices. Prior to releasing and/or selling any Lenovo logoed mercury containing product or part, please contact Lenovo Global Environmental Affairs to confirm proper legal notifications, labels, and other requirements have been met.	

. **US Sales Webpage Requirements:** The US sales webpage information for this product must include the statement "The fluorescent lamp in the liquid crystal display contains intentionally added mercury; dispose according to local, state or federal laws. Contains mercury / Contient du mercure."

For Canada, the following information is required in a readily visible location on the product and package:

a) The statement “Contains mercury / Contient du mercure”
b) Safe handling procedures and the measures to be taken in case of accidental breakage, the address of a website where that information is available, or contact information for a person who can provide that information;
c) The options available for the disposal and recycling of the product in accordance with the laws of the jurisdiction where the disposal or recycling is to take place, the address of a website where that information is available, or contact information for a person who can provide that information;
d) A statement that the product should be disposed of or recycled in accordance with the applicable laws; and
e) Symbol “Hg” in a font size of at least 10 points with characters that are at least 3 mm in height or within a pictogram of a least 7 mm in height.

The above information for Canada, must be in both English and French Canadian; in a font size of at least 10 points with characters that are at least 3mm in height, that are legible and indelible and that are impressed, embossed or in a color that contrasts with the label’s background or the color of the product; be enclosed by a border, and be easily distinguishable from other graphic material on the product or its package. See the Canada regulation for further details if the product or package is too small, or there is no package to accommodate the information. Annual reporting and a permit is required to import mercury containing products into Canada after November 7, 2015.

In some jurisdictions, at the point of sale of a Product containing mercury, notification must be given to the customer that the product contains mercury. Contact your Lenovo representative for more details or requirements.

2.7 Requirements for Chemicals

The following requirements apply to any

- Chemical used to maintain or service hardware Products. Examples include adhesives, cleaning solvents or solutions, lubricants, and paint
- Chemical contained in a Product or assembly which is not normally consumed but may require replacement of the chemical to maintain operation of Product or assembly. Examples include silicone grease for heat radiation sealing, refrigerants, lubricants, biocides, or corrosion inhibitors in a closed looped system.

The chemical’s individual container or individual protective packaging must be labeled with:

- The chemical name as it appears on the associated Material Safety Data Sheet(s)
- The name and address of the appropriate chemical manufacturer, supplier or other responsible party, (in some cases, Lenovo may designate the responsible party) and
- Appropriate hazard warnings as applicable.

The label must be provided in English at a minimum. The label may also be required to have text in other languages and format as required by law or regulation in countries outside the U.S.

The Supplier shall work with the Lenovo chemical representative through the Lenovo procurement representative to ensure proper labeling. In some cases, Lenovo may specify the label and its contents.

A Material Safety Data Sheet (MSDS) for the chemical must be supplied to the Lenovo procurement representative or other Lenovo designated representative. The MSDS must be provided in English at a minimum and comply with legal requirements for information content and format. The MSDS may be required in other languages and formats as required by law or regulation in countries outside the U.S. The supplier shall work with the appropriate Lenovo chemical representative through the Lenovo procurement representative to ensure proper format, information content, and translation requirements. In some cases, Lenovo may specify the language and format of an MSDS.

Chemical FUMs are materials stocked by Lenovo to support customers. Some examples include cleaners, adhesives, glues, paint, oils, alcohol, and chemicals in kits. Chemical FUMs must be packaged according to this specification including the following:

a. They must be packaged in field use units (usually a unit of one) so that Lenovo can reship them in the same package.

b. Under special circumstances, Lenovo Purchasing may permit the use of a single combination package that consolidates **multiple** inner containers inside a **single** outer container. Such configurations may be acceptable due to the small physical package size, shipping quantity or other factors as defined by Lenovo. In this instance, only government approved third-party test laboratories are permitted to authorize and certify the UN specification package. Authorization to use a combination package, which consists of multiple inner packages in a single outer package, must be provided by Lenovo Purchasing in writing.

c. A FUM containing liquids must use combination packagings, as single packaging is restricted by some airlines.

d. Packaging, labeling and marking must be compliant with all transportation regulations where materials will be shipped (ie IATA / 49 CFR / ADR....). All FUM packaging, labeling and marking must be compliant with IATA regulations as purchased from the supplier no matter where it is intended to be shipped.

e. The net quantity per package shall not exceed the standard maximum net quantity per package as allowed on “Passenger and Cargo Aircraft”, as defined by IATA regulations. The net quantity per package is not required to meet IATA Limited Quantity requirements.

2.8 Product Chemical Emissions

Chemical emissions analyses shall be performed on Products and supplies (e.g. toner), but are not necessary for Parts or subassemblies of Lenovo hardware Products. Products covered by this specification shall not emit chemicals during normal use conditions which exceed the threshold values or requirements listed in U.S. 29 CFR 1910 (tables Z 1-3) (see http://www.gpoaccess.gov/cfr/index.html) or the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) (see http://www.calepa.ca.gov/). Product chemical

emissions requirements are delineated in ECMA 328: Detection and Measurement of Chemical Emissions From Electronic Equipment (see http://www.ecma-international.org/).

2.9 WEEE Marking

2.9.1 Affected Products and Jurisdictions

Electrical and electronic equipment (EEE) that is put on the market in the European Union after August 13, 2005, and that is listed in the category of IT and telecommunications products in Annex II of the EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) is subject to the requirements for product markings in accordance with the Directive. In addition to the products specified in this Annex of the WEEE Directive, stand alone options that operate external to the products listed in Annex II (e.g., keyboards, monitors, mice, external drives) should also be marked. Components and internal parts of the stand-alone equipment listed in Annex II do not need to be marked.

Please note that external power supplies, adapters and electronic tools require a WEEE label. This requirement is also required for several other jurisdictions outside of the EU, e.g., Buenos Aires, Argentina, Bosnia-Herzegovina, India, Jordan, Macedonia, Nigeria, Peru (recommended for Peru, not required), Serbia, and Turkey (this list is not all inclusive).

2.9.2 WEEE Marking Elements

The marking of EEE in order to meet requirements in all jurisdictions, must have the following:

1) The crossed-out wheeled bin symbol, including the black bar, in accordance with Annex IX of the WEEE Directive per Article 14(4). (Please note, the symbol of the crossed-out wheeled bin, without the underlying black bar, is the same as required for the battery collection mark in the EU, see **Figure 1**).

2) A unique identification of the producer such as a brand name, trademark, company registration number or other suitable means recorded in EU member state's register of producers per Article 12(1) of the Directive and

3) The date of manufacture/put on the market.

4) Product identification number (compliance ID number) and/or serial number (India, Nigeria).

European Standard EN 50419:2005 identifies three options for the indication of the date of manufacture/put on the market:

A) Indicate the date of manufacture or date put on the market in un-coded text in accordance with EN 28601 (This European Standard is equivalent to ISO 8601) or other coded text, for which the code shall be made available for treatment facilities; or

B) Use the solid bar symbol as shown in **Figure 6** below in conjunction with the crossed out wheeled bin symbol. The height (h) of the solid bar shall be the greater of 0.3a or 1 mm. The bar must only be used in conjunction with the crossed out wheeled bin to indicate that the product is put on the market after August 13, 2005.

C) Use both options A) and B).

All three marking elements (the crossed-out wheeled bin, the producer identification, and the date of manufacture/put on the market or the solid bar under the crossed out wheeled bin) must be present on the Product; however, the specific placement of these markings is not prescribed other than for the relationship of the solid bar to the crossed-out wheeled bin if the bar symbol is used.

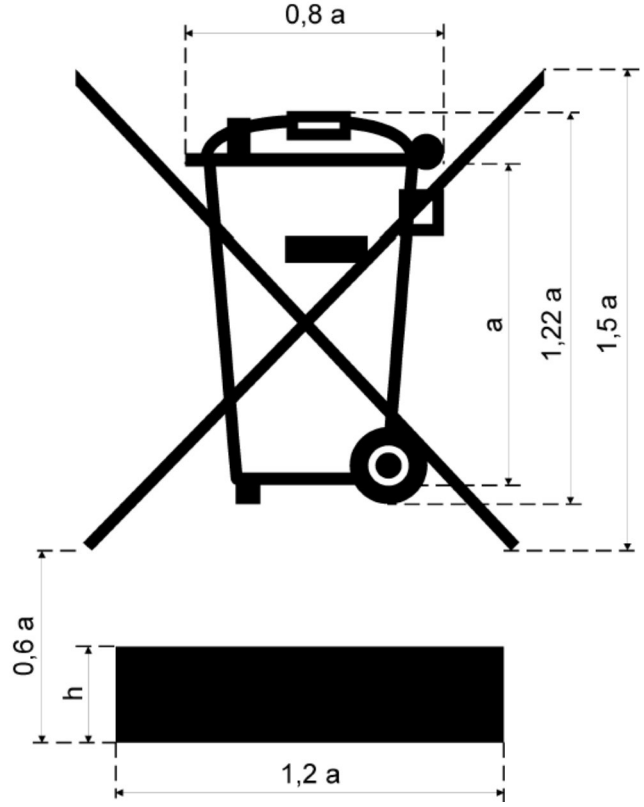


Figure 6. The marking and dimensional relationship of the solid bar symbol for indication of products manufactured or put on the EU market after August 13, 2005.

The markings must be visible, durable, legible, and indelible; that is, each marking element must be located on a permanent portion of the Product such as a frame member or chassis that cannot be removed or exchanged. Markings can be located behind a door or cover, but must be viewable without the use of a tool by a customer or operator.

European Standard 50419:2005 also prescribes that the marking must meet minimum marking

durability requirements. The marking must remain legible after rubbing by hand for 15 seconds with a piece of cloth soaked with water and again for 15 seconds with a piece of cloth soaked with aliphatic solvent hexane. If marking plates or labels are used, after this test they shall not show curling.

2.9.2.1 China WEEE

The Regulations for the Administration of the Recovery and Disposal of Waste Electric and Electronic Products (hereinafter the "Regulations") have been adopted at the Executive Meeting of the State on August 20th, 2008. The Regulations was effective as of January 1st, 2011. (No.551 Order of the State Council of the People's Republic of China).

The State implements a system of recovery by multiple channels and centralized disposal with respect to waste electric and electronic products. And the State will establish a fund for the disposal of waste electric and electronic products to be used as allowance for the recovery and disposal of electric and electronic products. The manufacturers of electric and electronic products, consignees of import electric and electronic products or their agents shall, as required, perform their obligations of contributing to the fund or waste electric and electronic products disposal.

Affected products

The recovery and disposal of and any activities in relation to the waste electric and electronic products listed in the Catalogue of Waste Electric and Electronic Products for Disposal shall be governed by the Regulations. Scope of products: Microcomputer, including:

1) Monitor for desktop microcomputer
2) Host-display integrated desktop microcomputer
3) Laptop microcomputer (including PDA)
4) Other devices for processing of information
5) Smart phone

Marking

Add the descriptive text for China WEEE in the SWG and UG of products to declare that Lenovo provide the service for the recycle. If any update in the regulations, follow the latest requirements.

2.10 Electronic Product Environmental Assessment Tool (EPEAT) Marking

Products which meet the requirements of the EPEAT program may exhibit the appropriate certification mark on the product, product manual, product promotional materials or packaging. Lenovo Global Environmental Affairs must be contacted to determine the level of EPEAT compliance (if at all) and ensure product is registered in EPEAT database prior to the use of any EPEAT certification mark. Only one form of the mark should be used in any one publication (either preferred mark or optional mark).

2.10.1 EPEAT Mark Specifications

- The green EPEAT logo is the primary identifier, and should be used when representing the EPEAT brand holistically.
- Three logo variations distinguish the tiers of the EPEAT rating system: EPEAT Bronze, EPEAT Silver and EPEAT Gold. It's critical that the correct logo variation be associated with each product, and that the tier identifications for all products are kept current.
- Downloadable files of all logos are available to licensees online and by contacting Lenovo Global Environmental Affairs..
- Artwork should never be altered or redrawn.

Logo Colors

- The logos should be reproduced in full color in all materials, electronic or printed, where full color is available.
- The CMYK (for print) and RGB (for screen) values provided must be used when the logos appear in color.
- If your printing method requires the use of singlecolor artwork, the logo must be printed using black ink only. Files for black-only EPEAT logos are available for download.

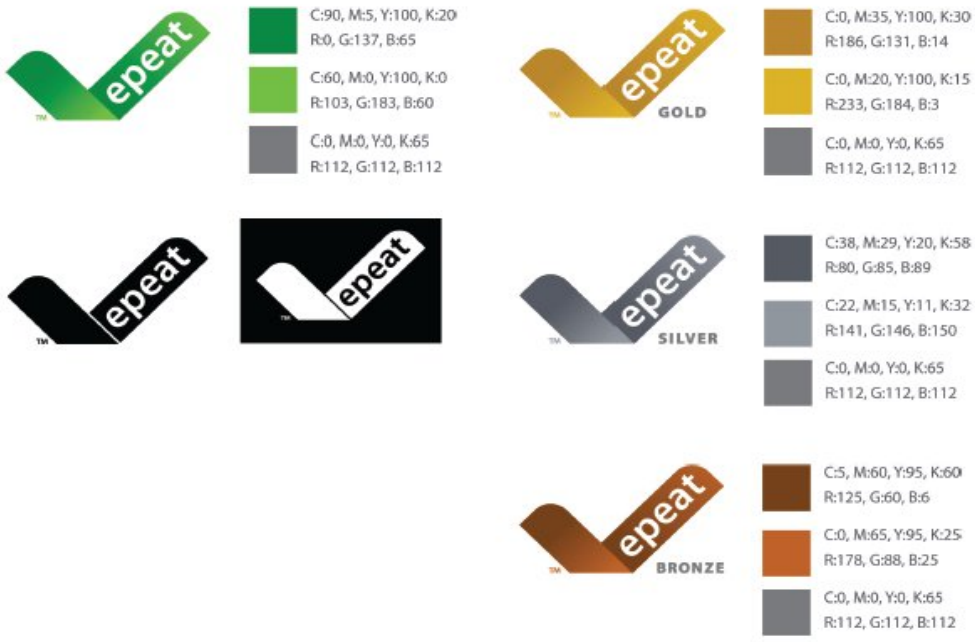


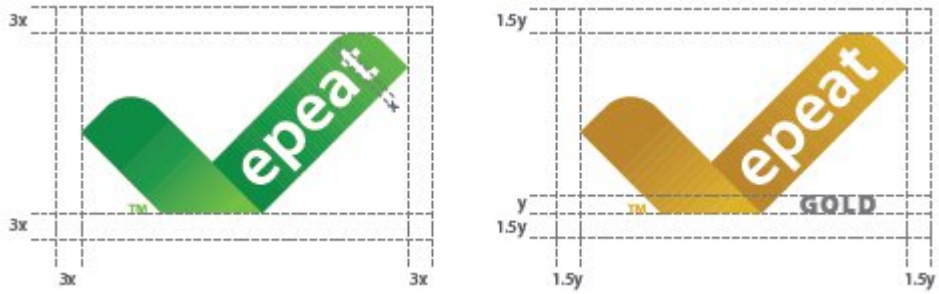
Figure 7. EPEAT markings.

Logo Guidelines

Clear Space

- Always maintain clear space around the EPEAT logo to protect it from distracting graphics or typography.
- For the green primary identifier, measure clear space by using the width of the ascender in "t" as a unit.

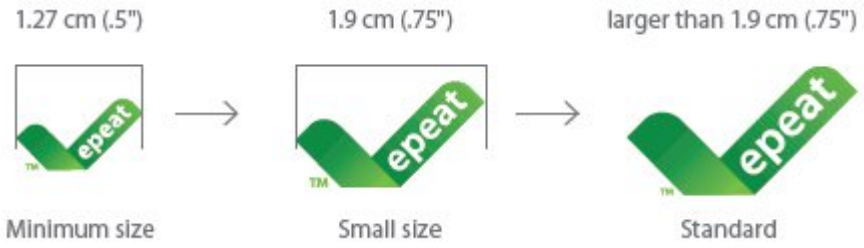
- For the Gold, Silver and Bronze logos, measure clear space using the height of the text label (the word GOLD, in the example to the right) as a unit.



Minimum Size

- Use the adjusted "small size" artwork when the logo is between 1.27 cm (.5") and 1.9 cm (.75") in width, measured from end to end of the check mark.

- For use on a physical label (for applying to a product or product packaging, for example) never reproduce the logo smaller than 1.27 cm (.5") in width. When using the logo on a website, we also recommend retaining a minimum width of 1.27 cm (.5").



2.11 Product Energy Requirements

The following sections summarize requirements for selected geographies.

2.11.1 System Requirements for China

2.11.1.1 Displays

Displays shall meet the energy efficiency requirements of Sections 5.2, 5.3 and 5.4 in the National Standard of the People's Republic of China GB 21520-2023. The requirement applies to flat-panel and curved general-purpose and commercial displays that are AC or DC powered, with a diagonal screen size of the screen is no less than 40 cm, display modes include liquid crystal display (LCD) and organic light-emitting diode (OLED).

This requirement applies to LED panel-controller integrated display terminals that are AC or DC powered, display mode is light-emitting diode (LED), with the pixel pitch exceeding 0.30mm but not exceeding 2.60mm and the maximum luminance not exceeding 3000cd/m2.

This requirement does not apply to

a) special-purpose monitors for images evaluation during the filming, production and broadcasting of TV programs;
b) dual-screen displays;
c) special-purpose displays used for industrial equipment, medical equipment, film projection, virtual reality (VR), augmented reality (AR), mixed reality (MR), extended reality (XR), LCD consoles (KVM/KMM), among others, and display products used solely as accessories;
d) displays that can only be powered by batteries.

Definitions

Energy efficiency of displays: Ratio of the luminous intensity of the display screen to the power of on mode under the conditions specified.

The minimum allowable values of energy efficiency for displays: The minimum energy efficiency that should be satisfied by displays, and the maximum active power for LCD and OLED displays in off mode and sleep mode, under the test conditions specified in this document.

Calculation

The power (P_i) of a display in a certain mode is calculated according to Formula (1):

$$Pi = \frac{E_t}{t} \quad \text{.....} \quad (1)$$

Where:
P_i - Power of a display in a certain mode, unit for W;
E_t - Energy power consumption measured, unit for W•h;
t - Measured time duration, unit for h;
i - Mode of the display, including on mode (on), sleep mode (sleep) and off mode (off).

The energy efficiency (E_{ff}) for displays is calculated according to Formula (2):

$$E_{ff} = \frac{S' L}{P_{on}} \quad \text{.....} \quad (2)$$

Where:
E_{ff} - Energy efficiency, unit for cd/W;
P_{on} - Power of a display in on mode, unit for W;
S - Effective light-emitting area, unit for m^2;
L - Luminance of the screen, unit for cd/m^2.

Requirements

Displays manufactured after June 1st, 2024, must meet Grade 3's requirements of the National Standard of the People's Republic of China GB 21520-2023. See Table 1 in the section 5.1 about Grade 3's requirements.

Table 11 Energy efficiency grades for displays

In cd/W

Display mode	Display type	Energy efficiency			
		Grade 1	Grade 2	Grade 3	
LCD	LCD display	3.0	2.2	1.5	
	Enhance-performance LCD display [a]	2.7	1.9	1.2 (Pixel number greater than or equal to 3.6 million or 8.0 million and less than 32 million)	0.50 (Pixel number greater than or equal to 32 million)
OLED	OLED display	1.5	1.2	0.80	
	Enhance-performance OLED display [b]	1.3	1.0	0.40	
LED	LED panel-controller integrated display terminal	3.0	2.2	1.5	
	Enhance-performance LED panel-controller integrated display terminal [c]	2.7	1.9	1.2 (Pixel pitch greater than 0.60 mm and no greater than 2.60 mm)	0.70 (Pixel pitch greater than 0.30 mm and no greater than 0.60 mm)

[a] LCD displays are classified as enhance-performance LCD displays when they meet at least three conditions of the a)-e).
a) When the contrast ratio is 60:1, the horizontal viewing angle is no less than 160° (for flat-panel displays), or no less than 130° (for curved displays);
b) The native resolution of displays with a diagonal screen size below 139.7 cm is no less than 3.6 million pixels, and the native resolution of displays with a diagonal screen size of 139.7 cm or more is no less than 8 million pixels;
c) The NTSC color gamut coverage *(CIE 1931)* of displays with a diagonal screen size below 139.7 cm is ≥ 80%, and the NTSC color gamut coverage *(CIE 1931)* of displays with a diagonal screen size of 139.7 cm or more is ≥ 85%;
d) The refresh rate is 100 Hz or more;
e) The peak luminance satisfies 600 cd/m^2 in HDR mode.

[b] OLED displays are classified as enhance-performance OLED displays when they meet at least three conditions of the a)-e) .
a) When the contrast ratio is 60:1, the horizontal viewing angle is no less than 160° (for flat-panel displays), or the horizontal viewing angle is no less than 130° (for curved displays);
b) The native resolution of displays with a diagonal screen size below 139.7 cm is no less than 3.6 million pixels, and the native resolution of displays with a diagonal screen size of 139.7 cm or more is no less than 8.0 million pixels;
c) The NTSC color gamut coverage *(CIE 1931)* of displays with a diagonal screen size below 139.7 cm is ≥ 80%, and the NTSC color gamut coverage *(CIE 1931)* of displays with a diagonal screen size of 139.7 cm or more is ≥ 85%;
d) The refresh rate is 100 Hz or more;
e) The peak luminance satisfies 400 cd/m^2 in HDR mode.

[c] LED panel-controller integrated display terminals are classified as enhance-performance LED panel-controller integrated display terminals when they meet at least three conditions of the a)-e) .
a) The horizontal viewing angle is no less than 170 °;
b) Contrast ratio ≥ 3000:1;
c) Pixel pitch ≤ 1.30 mm;
d) NTSC color gamut coverage *(CIE 1931)* ≥ 100%;
e) Refresh rate of passive matrix (addressed) driving products ≥ 3840 Hz, and that of active matrix（addressed）driving products ≥ 100Hz.

Label Requirements

Displays shall be tested, reported, registered, and labeled with China Energy Label in accordance with GB21520-2023 and the requirement of the Implementation Rules on China Energy Label for Display. See Figure 8 below for an example label.

Figure 8a. Example of China Energy Label for LCD/OLED Display



Figure 8b. Example of China Energy Label for LED Display



Note: The label pattern takes Grade 2 as an example and actual energy efficiency grade shall be depended on product energy efficiency information.

The label shall be colorful with blue and white background, with the dimension of 66 × 45mm
1) The label name: China Energy Label
2) The LCD/OLED Display label must include below contents:
   a. Name of Manufacturer (or Abbreviation);
   b. Product Model
   c. Energy Efficiency Grade
   d. Energy Efficiency (cd/w);
   e. Off mode power consumption (W)
   f. Sleep mode power consumption (W)
   g. Category of Product
   h. Reference No. of National Standard on Energy Efficiency
   i. QR code

The LED Display label must include below contents:
   a. Name of Manufacturer (or Abbreviation);
   b. Product Model
   c. Energy Efficiency Grade
   d. Energy Efficiency (cd/w);
   e. Category of Product
   f. Reference No. of National Standard on Energy Efficiency
   g. QR code

3) The label can be on the product, or on the minimum packaging, or displayed at least two seconds on the display when turning on.
4) The label shall be put on the product webpage in accordance with the product if it can be sold by internet.
5) The label shall be made by copper plate paper with weight of 80g or heavier.
6) The label shall be stuck with self-adhesive glue.
7) The label or the information in the label shall also be included in the product instructions if product has, otherwise are not.

Every display shipped out of the factory or imported shall be stuck with label. The label can be printed by manufacturer or importer. And the manufacturer or importer shall be responsible for the quality of the label. If used in product description, package and brochure, the label can be enlarged and reduced in proportion, and can be printed in monochrome color. However, the characters in label shall be legible and identifiable.

2.11.1.2 Desktops (Including AIO Desktops) and Laptops Computers

Desktop computers including AIOs and laptop computers shall meet the energy efficiency requirements of Section 4.2 in the National Standard of the People's Republic of China GB 28380-2025. The scope of this standard includes desktop computers for general purpose, all-in-one microcomputers ("AIO") with display function, and laptop computers.

This standard does not apply to:
a) Tablets, desktop/rack-mounted workstations, and microcomputers for industrial applications;
b) Microcomputers with two or more discrete graphics;
c) Microcomputers whose power supply's rated output power is greater than 500 W;
d) All-in-one and portable microcomputers having a display screen with a diagonal size of less than 294.6 mm (11.6 in).

Category

Table 12 Categorization of microcomputers

Microcomputer	Type	Configuration description
Desktop microcomputer	Type I	Integrated graphics or switchable graphics
	Type D	Discrete graphics
All-in-one	Type 1	P<8
	Type 2	P≥8
Portable microcomputer	Type 1	P<8
	Type 2	P≥8
Note: P = (CPU core count) × (CPU clock frequency (GHz)). The core count is the count of physical CPU cores, and the CPU clock frequency is the maximum TDP clock frequency instead of the automatic overclocking frequency.		

Energy grades for microcomputers

Table 13 Energy grades for microcomputers (with a central processing unit featuring a transistor density greater than 30 Mtr/mm^2)

Unit: kWh

Microcomputer type		Typical energy consumption		
		Level 1	Level 2	Level 3
Desktop microcomputer	Type I	18.0+$\sum E_{fa}$	32.0+$\sum E_{fa}$	76.0+$\sum E_{fa}$
	Type D	30.0+$\sum E_{fa}$	45.0+$\sum E_{fa}$	105.0+$\sum E_{fa}$
All-in-one	Type 1	13.0+$\sum E_{fa}$	28.0+$\sum E_{fa}$	60.0+$\sum E_{fa}$
	Type 2	16.0+$\sum E_{fa}$	37.0+$\sum E_{fa}$	72.0+$\sum E_{fa}$
Portable microcomputer	Type 1	8.0+$\sum E_{fa}$	14.0+$\sum E_{fa}$	21.0+$\sum E_{fa}$
	Type 2	12.0+$\sum E_{fa}$	18.0+$\sum E_{fa}$	31.0+$\sum E_{fa}$

Note: $\sum E_{fa}$ is the sum of additional function power factors of the microcomputer.

Table 14 Energy grades for microcomputers (with a central processing unit featuring a transistor density less than or equal to 30 Mtr/mm^2 or not manufactured by the EUV lithography equipment)

Unit: kWh

Microcomputer type		Typical energy consumption		
		Level 1	Level 2	Level 3
Desktop microcomputer	Type I	30.0+$\sum E_{fa}$	80.0+$\sum E_{fa}$	140.0+$\sum E_{fa}$
	Type D	32.0+$\sum E_{fa}$	115.0+$\sum E_{fa}$	150.0+$\sum E_{fa}$
All-in-one	Type 1/Type 2	21.0+$\sum E_{fa}$	85.0+$\sum E_{fa}$	130.0+$\sum E_{fa}$
Portable microcomputer	Type 1/Type 2	16.0+$\sum E_{fa}$	35.0+$\sum E_{fa}$	50.0+$\sum E_{fa}$
Note 1: $\sum E_{fa}$ is the sum of additional function power factors of the microcomputer. Note 2: For a processor using the chiplet technology, its process is determined according to the process used for the chiplet with the largest area proportion (excluding memory chiplets such as dynamic random access memory (DRAM) and flash memory (FLASH)).				

Calculation Method

The typical energy consumption of microcomputers is calculated according to Formula (1). For microcomputers using ALPM in place of the sleep mode or long idle, it is calculated according to Formula (2):

$$TEC=(8\ 760/1\ 000)\times(P_{off}\times T_{off}+P_{sleep}\times T_{sleep}+P_{long_idle}\times T_{long_idle}+P_{short_idle}\times T_{short_idle}) \quad \cdots\cdots(1)$$

$$TEC=(8\ 760/1\ 000)\times(P_{off}\times T_{off}+P_{ALPM}\times(T_{sleep}+T_{long_idle})+P_{short_idle}\times T_{short_idle}) \quad \cdots\cdots(2)$$

Table 15 Percentage of time spent in each mode of a microcomputer

Mode	Desktop microcomputer and all-in-one	Portable microcomputer
Off mode	15%	10%
Sleep mode	45%	60%
Long idle mode	10%	10%
Short idle mode	30%	20%

The sum of additional function power factors (ΣE_{fa}) of the microcomputer in Table 12 is obtained from Table 16. The sum of additional function power factors (ΣE_{fa}) of the microcomputer in Table 13 is obtained from Table 17.

Table 16 Additional function power factors of the microcomputer (Table 12 applies)

Unit: kWh

Function	Desktop microcomputer	All-in-one	Portable microcomputer	Description of additional functions
Power adapter (TECEPS)	Not applicable		EPS×0.05	Applicable once if the following conditions are met at the same time: 1） The system memory is greater than or equal to 32 GB, and any of the following functions is supported: (a) There is at least one integrated or discrete graphics processing unit (GPU), with a frame buffer bandwidth greater than or equal to 96 GB/s; or (b) The system memory bandwidth is greater than or equal to 134 GB/s, and the integrated graphics processing unit (GPU) is supported. The system memory bandwidth is the rate at which data is read or stored from the memory of the computer system, expressed in gigabytes per second (GB/s). 2) The rated output power of the power adapter (EPS) is greater than or equal to 140 W, in watts (W), and the value is taken during calculation
Memory (TECmemory)	0.17×GB		0.08×GB	GB is calculated according to the capacity of the memory installed in the system, in gigabytes (GB), and the value is taken during calculation
Discrete graphics (TECgraphics)	29.4×tanh (0.008×FBBW – 0.03) ＋11+ (0.011×FBBW)		14.7×tanh (0.008×FBBW–0.03) ＋ 5.5+ (0.0055×FBBW)	1) Applicable to the discrete graphics (dGfx) installed in the system, but not applies to the switchable graphics. 2) FBBW is the video memory bandwidth of the discrete graphics, in gigabytes per second (GB/s), and the value is taken during calculation FBBW= (DR×DW) /(8×1000) Where: DR - Equivalent frequency of video memory, in megahertz (MHz); DW - Bit width of the video memory, in bit.
Discrete graphics with multiplexer (MUX) (TECMUXGraphics)	12.2		5.2	1) Discrete graphics with multiplexer (MUX Graphics) refers to that the system has both an integrated graphics and a discrete graphics, and the discrete graphics can be disabled when the integrated graphics needs to work independently. The image display is allowed to be driven by an integrated graphics or a discrete graphics depending on different scenarios. 2) Applicable to systems where the display is driven by a MUX device on the motherboard
Switchable graphics (TECswitchable)	7.0		Not applicable	1) Switchable graphics refers to that the system has both an integrated graphics and a discrete graphics, and the discrete graphics can be

					disabled when the integrated graphics needs to work independently. The image display is driven by the integrated graphics. 2) Applicable to default automatic switching.
Multiple internal storage devices (TECstorage)	3.5" hard disk drive (HDD)	16.5		Not applicable	1) In addition to the hard disk drive carrying the operating system, an additional internal storage device, if configured, applies only once, and the larger value of the additional power factor is taken for calculation. 2) Hybrid disk drive (HDD/SSD) is a kind of hard disk that integrates magnetic hard disk and flash memory together, and combines the traditional hard disk and the solid state drive.
	2.5" hard disk drive (HDD)	2.1		2.6	
	Hybrid disk drive (Hybrid HDD/SSD)	0.8			
	Solid state disk (SSD, including M.2 interface)	0.4			
Display screen (TECint_display)	A< (190×645.16)	Not applicable	[(3.43×r)+(0.148×A/645.16)+1.30] ×(1+EP)	8.76×0.20×(1+EP) × (0.43×r+0.0263×A/645.16)	1) r is the intrinsic resolution of the screen, in megapixels (MP); A is the viewable screen area, in square millimeters (mm2). Its value is taken during calculation. The value of EP is taken according to the following rules: a) The value is 0 for non-enhanced display screen; b) The value is 0.3 for enhanced display screen; 2) The enhanced display screen shall meet the following conditions at the same time: a) No matter whether it is fitted with a screen protection glass, the horizontal viewing angle shall be no less than 85° when the contrast ratio is 60:1; b) The intrinsic resolution shall be no less than 2.3 megapixels (MP); c) The color gamut shall be sRGB defined in IEC 61966-2-1 at least. Color space offset is allowed, but 99% sRGB shall be supported at least. 3) The display adder may be applied for each display screen if there are multiple displays in the system, then sum up.
	(190×645.16) ≤A< (210×645.16)		[(3.43×r)+(0.018×A/645.16)+26.1] ×(1+EP)		
	(210×645.16) ≤A< (315×645.16)		[(3.43×r)+(0.078×A/645.16)+13.2] ×(1+EP)		
	A≥ (315×645.16)		[(3.43×r)+(0.156×A/645.16)-11.3]×(1+EP)		
Network interface (TECglan)	1Gb/s<glan<10Gb/s	4.0		Not applicable	1) If the system contains an Ethernet port with a network rate greater than 1Gb/s and less than 10Gb/s, 4.0 applies. 2) If the system contains an Ethernet port with a network rate of 10Gb/s or greater, 18.0 applies. 3) If the system contains both 1) and 2), 18.0 applies.
	glan≥10Gb/s	18.0			

Table 17 Additional function power factors of the microcomputer (Table 13 applies)

Unit: kWh

Function	Desktop	All-in-one	Portable microcomputer	Description of additional functions

		microcomputer			
Power adapter (TECEPS)		Not applicable		EPS×0.05	Applicable once if the following conditions are met at the same time: 1) The system memory is greater than or equal to 32 GB, and any of the following functions is supported: (a) There is at least one integrated or discrete graphics processing unit (GPU), with a frame buffer bandwidth greater than or equal to 96 GB/s; (b) The system memory bandwidth is greater than or equal to 134 GB/s, and the integrated graphics processing unit (GPU) is supported. The system memory bandwidth is the rate at which data is read or stored from the memory of the computer system, expressed in gigabytes per second (GB/s). 2) The rated output power of the power adapter (EPS) is greater than or equal to 140W, in watts (W), and the value is taken during calculation
Processor last-level cache (TECLLC)		0.05×MB			With regard to the processor last-level cache, the unit is megabytes (MB), and the value is taken during calculation
Memory (TECmemory)		1.7+(0.24×GB)		2.4+(0.294×GB)	GB is calculated according to the capacity of the memory installed in the system, in gigabytes (GB), and the value is taken during calculation
		2		1	For memory with a rate greater than 3200 MT/s, add one additional time
Discrete graphics (TECgraphics)		50.4 × tanh (0.0038 × FBBW – 0.137) + 40		14.7×tanh (0.008×FBBW–0.03) + 5.5+ (0.0055×FBBW)	1) Applicable to the discrete graphics (dGfx) installed in the system, but not applies to the switchable graphics. 2) FBBW is the video memory bandwidth of the discrete graphics, in gigabytes per second (GB/s), and the value is taken during calculation FBBW= (DR×DW) /(8×1000) Where: DR - Equivalent frequency of video memory, in megahertz (MHz); DW - Bit width of the video memory, in bit.
Switchable graphics (TECswitchable)		14.4		Not applicable	1) Switchable graphics refers to that the system has both an integrated graphics and a discrete graphics, and the discrete graphics can be disabled when the integrated graphics needs to work independently. The image display is driven by the integrated graphics. 2) Applicable to default automatic switching
Integrated graphics (TECiGFX)		15		2	Applicable to the integrated graphics (iGFX)
Multiple internal storage devices (TECstorage)	3.5" hard disk drive (HDD)	21		Not applicable	1) In addition to the hard disk drive carrying the operating system, an additional internal storage device, if configured, applies only once, and the value with the larger additional power factor is taken for calculation. 2) Hybrid disk drive (HDD/SSD) is a kind of hard disk that integrates magnetic hard disk and flash memory together, and combines the traditional hard disk and the solid state drive
	2.5" hard disk drive (HDD)	2.1		2.6	
	Hybrid disk drive (HDD/SSD)	0.8			
	Solid state disk (SSD, including M.2 interface)	0.4			
	CD driver	2		Not applicable	
Display screen (TEC	A< (190×645.16)	Not applicable	[(3.43×r)+(0.148×A/645.16)+1.30]×(1+EP)	8.76×0.30×(1+EP) × (0.43×r+0.0263×A/645.16)	1) r is the intrinsic resolution of the screen, in megapixels (MP); A is the viewable screen area, in square millimeters (mm2). Its value is taken during calculation. The value of EP is taken according to the following rules: a) The value is 0 for non-enhanced display screen; b) For the enhanced display with a screen diagonal size less than 685.8 mm, the value is taken as 0.3; c) For the enhanced display with a screen diagonal size greater than or equal to 685.8mm, the value is taken as 0.75. 2) The enhanced display screen shall meet the following conditions at the same time: a) No matter whether it is fitted with a screen protection glass, the horizontal viewing angle shall be no less than 85° when the contrast ratio is 60:1; b) The intrinsic resolution shall be no less than 2.3 megapixels (MP); c) The color gamut shall be sRGB defined in IEC 61966-2-1 at least. Color space offset is allowed, but
	(190×645.16) ≤A< (210×645.16)		[(3.43×r)+(0.018×A/645.16)+26.1]×(1+EP)		
	(210×645.16) ≤A< (315×645.16)		[(3.43×r)+(0.078×A/645.16)+13.2]×(1+EP)		
	A≥ (315×645.16)		[(3.43×r)+(0.156×A/645.16)-11.3]×(1+EP)		

					99% sRGB shall be supported at least. 3) The display adder may be applied for each display screen if there are multiple displays in the system, then sum up.
Network interface (TECglan)	1Gb/s<glan<10Gb/s	4.0		Not applicable	1) If the system contains an Ethernet port with a network rate greater than 1Gb/s and less than 10Gb/s, 4.0 applies. 2) If the system contains an Ethernet port with a network rate of 10Gb/s or greater, 18.0 applies. 3) If the system contains both 1) and 2), 18.0 applies.
	glan≥10Gb/s	18.0			

Label Requirement
Microcomputers manufactured after Feb 1st, 2026 shall be tested, reported, registered, and labeled with China Energy Label in accordance with GB28380-2025 and the requirement of the Implementation Rules on China Energy Label for Microcomputer.

Figure 8b. Example of China Energy Label

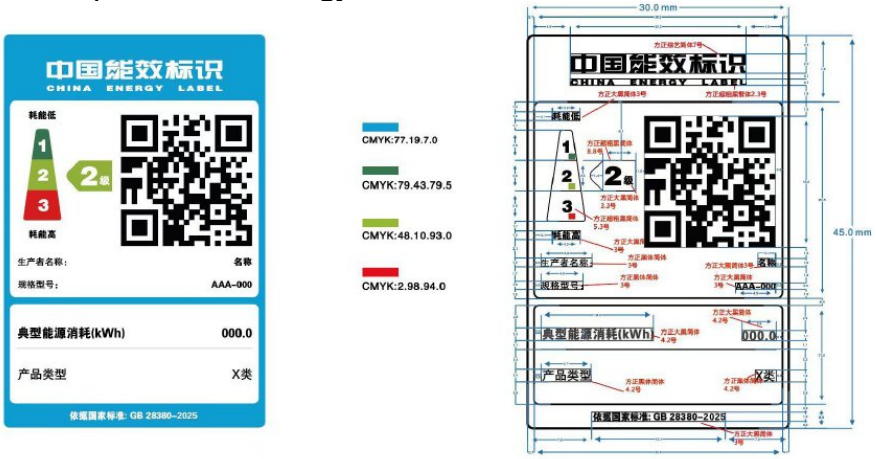


图 1 微型计算机能效标识样式示例

注：产品类型填写台式微型计算机-I 类、台式微型计算机-D 类、一体机-1 类、一体机-2 类、便携式微型计算机-1 类、便携式微型计算机-2 类。

Note: The label pattern takes Grade 2 as an example and actual energy efficiency grade shall be depended on product energy efficiency information. The label shall be colorful with blue and white background, with the dimension of 45 × 30mm
1) The label name: China Energy Label
2) The label must include below contents
   a. Name of Manufacturer (or Abbreviation);
   b. Product Model
   c. Energy Efficiency Grade
   d. TEC (kWh);
   e. Product Catogery

f. Reference No. of National Standard on Energy Efficiency
g. QR code

3) The label can be on the product or on the minimum packaging
4) The label shall be put on the product webpage in accordance with the product if it can be sold by internet.
5) The label shall be made by copper plate paper with weight of 80g or heavier.
6) The label shall be stuck with self-adhesive glue.
7) The label or the information in the label shall also be included in the product instructions if product has, otherwise are not.

Every microcomputer shipped out of the factory or imported shall be stuck with label. The label can be printed by manufacturer or importer. And the manufacturer or importer shall be responsible for the quality of the label. If used in product description, package and brochure, the label can be enlarged and reduced in proportion, and can be printed in monochrome color. However, th

2.11.1.3 Servers

1-socket and 2-socket general-use tower servers and rack servers shall meet the energy efficiency requirements of Section 4.1 in the National Standard of the People's Republic of China GB 43630-2023.

This standard is not applicable to such products as elastic servers, computer servers equipped with high-performance computing system and integrated auxiliary processing accelerator, full fault-tolerance servers, storage devices (including blade storage), and network equipment.

Energy Efficiency Grades

Servers manufactured after Dec.1st, 2025 must meet Grade 3's requirements of the National Standard of the People's Republic of China GB 43630-2023.

Table 18 Energy efficiency grades of servers (for those equipped with a central processing unit (CPU) manufactured using the 14 nm or 14+ nm process or a CPU manufactured by non-EUV lithography

Unit: performance standard score per watt-hour

Server type		Energy efficiency of servers		
		Grade 1	Grade 2	Grade 3
Tower	1-socket	≥25.0	≥15.0	≥5.0
	2-socket	≥30.0	≥20.0	≥7.5
Rack	1-socket	≥25.0	≥20.0	≥10.0
	2-socket	≥30.0	≥25.0	≥15.0

Table 19 Energy efficiency grades of servers (for those equipped with a CPU manufactured using the less than 14nm process)

Unit: performance standard score per watt-hour

Server type		Energy efficiency of servers		
		Grade 1	Grade 2	Grade 3
Tower	1-socket	≥40.0	≥25.0	≥7.5
	2-socket	≥60.0	≥30.0	≥15.0
Rack	1-socket	≥45.0	≥40.0	≥12.5
	2-socket	≥70.0	≥45.0	≥25.0

Only when it is impossible to use the Benchmark of Server Energy Efficiency tool (BenchSEE) to test the energy efficiency of a server, the server efficiency rating tool specified in ISO/IEC 21836:2020 may be used to obtain the server's energy efficiency score. The server's energy efficiency score shall comply with the values given in Table 3.

Table 20 Minimum allowable values of energy efficiency for servers when using the efficiency rating tool specified in ISO/IEC 21836:2020

Server type		Energy efficiency score
Tower	1-socket	≥12.9
	2-socket	≥13.1
Rack	1-socket	≥11.9
	2-socket	≥13.5

Label Requirement

Servers manufactured after Dec.1st, 2025 shall be tested, reported, registered, and labeled with China Energy Label in accordance with GB 43630-2023 and the requirement of the Implementation Rules on China Energy Label for Server.

Figure1. Example of CEL when using BenchSEE



CMYK:77.19.7.0

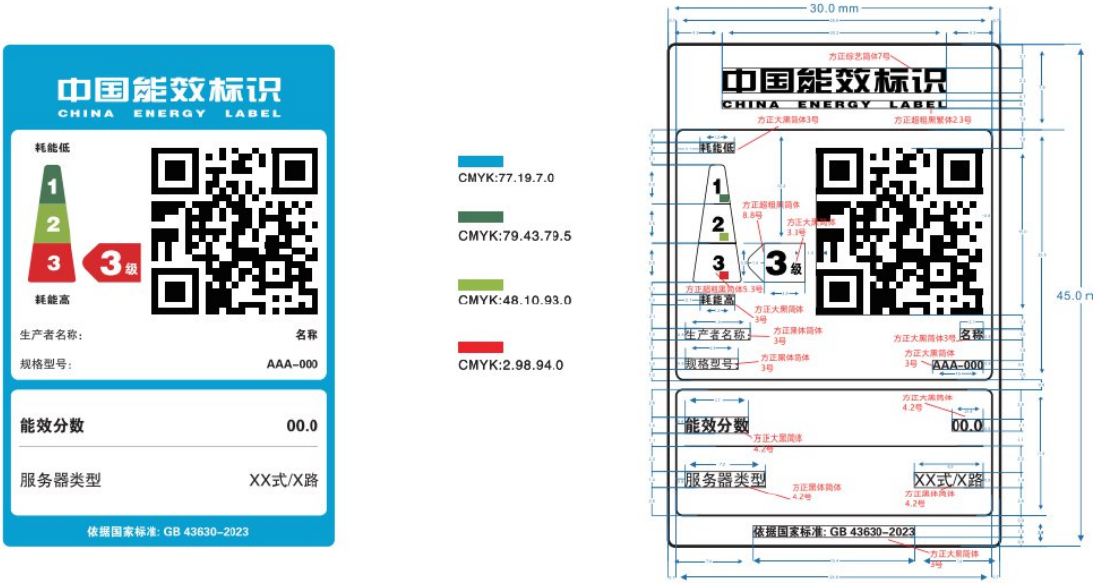
CMYK:79.43.79.5

CMYK:48.10.93.0

CMYK:2.98.94.0



Figure 2. Example of CEL when using the server efficiency rating tool specified in ISO/IEC 21836:2020



2.11.2 Requirements for Korea

Standby Product meeting standby power criteria : e-Standby Warning Label Products (Mandatory)

In 2008, certain products were designated as requiring mandatory energy efficiency labeling. Therefore, besides the best e-standby product labeling program (voluntary), manufacturers or importers of certain MKE and KEMCO designated electric appliances ("e-Standby Warning Label Products") must test covered products by a designated testing institution and report the testing result to KEMCO. If the standby power falls short of the e-standby power reduction criteria the manufacturer or importer is legally obliged to attach an e-Standby Warning Label.

MKE and KEMCO designated the following 7 products as e-Standby Warning Label Products: computers, monitors, printers, multifunction devices, televisions, set top boxes, and microwave ovens. However, this mandatory labeling system became effective only with respect to televisions as of August 28, 2008; it will further become effective with respect to the remaining six products as of July 1, 2009. In addition, beginning January 1, 2010, almost all target products of the e-Standby Program will become the target products of the e-Standby Warning Label system.

Definitions

Computer - Computers with nameplate output power of power supply less than equal to 1,000W. Covers mainly computers sold commercially or for household use in the market, including personal

computers, notebook computers, and including integrated computer systems. Computers for network servers, workstations and computers in standby mode awaiting instructions remotely are excluded

Monitor - Electrical appliance with rated power consumption of 1000W or less, consisting of a display screen (CRT, LCD, PDP, etc.) to display the output information from the computer via one or more input terminals such as VGA or DVI terminal, and its associated electronic equipment. This includes those with both computer monitor and TV functions, either with a focus on computer monitor as the primary function or with equal dual function. Integrated computer systems (where computer and monitor combined into a single unit), network monitor and monitors embedded with special functions including VoIP are excluded.

Requirements

Computers and Monitors must be labeled according to Annex VII of the Korean e-Standby Program Application Regulation, August 28, 2008 with a warning logo if the monitors do not meet the requirements in the following tables:

Table 21. Low Power Performance Requirements		
Category	**Watts in Sleep Mode**	**Watts in Off mode**
Monitor	<2.0W	<1.0W

Category	**Sleep mode**		Watts in off mode
	Default time	Watts in low power mode	
Personal Computers(Laptop)	≤30 min	≤1.7W	≤1.0W
Personal Computers(Desktop)	≤30 min	≤4.0W	≤2.0W
Integrated Computer System	≤30 min	≤4.0W	≤2.0W

Note: When applying the standards listed in table above to computers shipped to the market, additional allowable tolerance of +0.7W is given at sleep and off modes for computers with WOL (Wake on Lan) function.

The figure below has an example warning logo. The minimum diameter of the logo is 2.5cm. The logo is to be labeled on the front or top side of the product. The logo may be monochrome, the predominant color of the product's surface, or in the colors suggested by the Korean e-Standby Regulation.



Figure 12. Example of a Warning Logo for e-Standby Power Program Target Products**.**

The manufacturer of the monitor shall submit the appropriate reporting forms as required to the

Korea Energy Management Corporation (KEMCO).

2.11.3 Requirements for the EU, Switzerland, Norway, Turkey, Israel, and other jurisdictions

This section applies to Energy Using Products (EUP) including information technology equipment intended primarily for use in the domestic environment (see Annex I of EU Commission Regulation No 1275/2008.)

Definitions
Electrical and electronic household and office equipment - means any energy-using product which:

(a) is made commercially available as a single functional unit and is intended for the end-user;
(b) falls under the list of energy-using products of Annex I (in EU Regulation (EC) No 1275/2008);
(c) is dependent on energy input from the mains power source in order to work as intended; and
(d) is designed for use with a nominal voltage rating of 250 V or below.

This definition is from EU Commission Regulation (EC) No 1275/2008. Energy-using products in Annex I include information technology equipment intended primarily for use in the domestic environment which means products classified as Class B per EN55022 in EU Directive 89/336/EEC for Electromagnetic Compatibility (EMC). Examples of products which may be classified as Class B include monitors, workstations and laptops. EU Regulation 1275/2008 for ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment can be found at:
Http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:339:0045:0052:EN:PDF

Requirements
Electronic equipment, such as monitors, workstations and laptops which are EMC Class B Information Technology equipment as defined in EN 55022:2006+A1:2007 or EN 55022:2010 and newly releasing must meet the following requirements:

1. Power consumption in off-mode shall not exceed 0.50 W,
2. Power consumption in standby mode with a reactivation function shall not exceed 0.50 W,
3. Power consumption in standby mode providing only information or status display shall not exceed 1.00 W, and
4. When equipment is not providing the main function, or when other energy-using product(s) are not dependent on its functions, equipment shall, unless inappropriate for the intended use, offer a power management function that switches equipment after the shortest possible period of time into standby mode, or off mode, or another condition which does not exceed the applicable power consumption requirements for off mode and/or standby mode when the equipment is connected to the mains power supply.

Electronic equipment, such as monitors, workstations and laptops which are EMC Class B Information Technology equipment as defined in EN 55022:2006 or EN 55022:2010 and currently shipping as of September 1, 2009 must meet the following requirements:

1. Power consumption in off-mode shall not exceed 1.0 W,
2. Power consumption in standby mode with a reactivation function shall not exceed 1.0 W,
3. Power consumption in standby mode providing only information or status display shall not exceed 2.00 W, and

The product must be marked with the CE conformity marking. See the following Figure. The CE mark must have a height of at least 5 mm. The CE marking must be affixed to the EuP. Where this is not possible, it must be affixed to the packaging and to the accompanying documents.

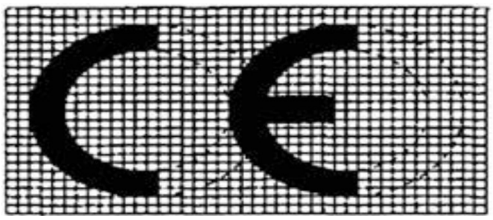


Figure 13. Example of CE Conformity Marking.

The following technical documents must be provided to Lenovo:
A. Declaration of Conformity (DoC) to EU Regulation 1275/2008 as required by EU Directive 2009/125/EC. The DoC must include:
i. Name and address of the manufacturer or of its authorized representative;
ii. A description of the model sufficient for unambiguous identification;
iii. Where appropriate, the references of the harmonized standards applied;
iv. Where appropriate, the other technical standards and specifications used;
v. Where appropriate, the reference to other EU Community legislation providing for the affixing of the CE mark that is applied;
vi. Identification and signature of the person empowered to bind the manufacturer or its authorized representative.
B. Statement indicating which energy efficiency tier (or both) the DoC applies to (see the first two paragraphs of this section for energy efficiency tier information), and
C. The technical documentation showing efficiency data must be provided. The technical documentation must meet the requirements of Annex IV of EU Commission Regulation No 1275/2008. For Israel, testing must be conducted at an approved Standards Institute of Israel (SII) testing facility in Israel and the results provided to Lenovo.

2.11.4 External Power Supplies, Adapters and Chargers

2.11.4.1 Requirements for USA/ Australia/ New Zealand

Definitions

External Power Supply (EPS) – A single voltage external AC to DC or AC to AC power supply is a device designed to convert line voltage AC input to a lower AC or DC voltage, converting to only 1 AC or DC output at a time, is sold with or intended to be used with a separate end-use product that constitutes the primary load, is contained in a separate physical enclosure from the end use product, is connected to the end-use product via removable or hard wired male/female electrical connection, cable, cord or other wiring, and has a nameplate output power less than or

equal to 250 watts. Please note, for Australia and New Zealand only, these countries have an additional phrase for the definition of an EPS. The EPS must have an input from a mains supply. The EPS must have an integral mains plug to be within scope of the Australia/NZ requirements.

Requirements

External power supplies manufactured after February 10, 2016 must meet the requirements of the Department of Energy - 10 CFR Part 430, RIN: 1904-AB57, Docket ID, ERE-2008-BT-STD-0005. The efficiency standards are listed below.

Table 22. Direct Operation External Power Supply Efficiency Standards (Beginning February 10, 2016)		
Single-voltage External AC-DC Power Supply, Basic Voltage		
Nameplate Output Power (Pout)	**Minimum Average Efficiency in Active Mode** ***(expressed as a decimal)***	**Maximum Power in No-Load Mode [W]**
Pout ≤ 1 W	≥ 0.5 × Pout + 0.16	≤ 0.100
1 W < Pout ≤ 49 W	≥ 0.071 × ln(Pout) - 0.0014 × Pout + 0.67	≤ 0.100
49 W < Pout ≤ 250 W	≥ 0.880	≤ 0.210
Pout > 250 W	≥ 0.875	≤ 0.500
Single-Voltage External AC-DC Power Supply, Low-Voltage		
Nameplate Output Power (Pout)	**Minimum Average Efficiency in Active Mode** ***(expressed as a decimal)***	**Maximum Power in No-Load Mode [W]**
Pout ≤ 1 W	≥ 0.517 × Pout + 0.087	≤ 0.100
1 W < Pout ≤ 49 W	≥ 0.0834 × ln(Pout) - 0.0014 × Pout + 0.609	≤ 0.100
49 W < Pout ≤ 250 W	≥ 0.870	≤ 0.210
Pout > 250 W	≥ 0.875	≤ 0.500
Single-voltage External AC-AC Power Supply, Basic Voltage		
Nameplate Output Power (Pout)	**Minimum Average Efficiency in Active Mode** ***(expressed as a decimal)***	**Maximum Power in No-Load Mode [W]**
Pout ≤ 1 W	≥ 0.5 × Pout + 0.16	≤ 0.100
1 W < Pout ≤ 49 W	≥ 0.071 × ln(Pout) - 0.0014 × Pout + 0.67	≤ 0.100
49 W < Pout ≤ 250 W	≥ 0.880	≤ 0.210
Pout > 250 W	≥ 0.875	≤ 0.500
Single-Voltage External AC-AC Power Supply, Low-Voltage		
Nameplate Output Power (Pout)	**Minimum Average Efficiency in Active Mode** ***(expressed as a decimal)***	**Maximum Power in No-Load Mode [W]**
Pout ≤ 1 W	≥ 0.517 × Pout + 0.087	≤ 0.100
1 W < Pout ≤ 49 W	≥ 0.0834 × ln(Pout) - 0.0014 × Pout + 0.609	≤ 0.100
49 W < Pout ≤ 250 W	≥ 0.870	≤ 0.210
Pout > 250 W	≥ 0.875	≤ 0.500
Multiple Voltage External Power Supply		

Nameplate Output Power (Pout)	Minimum Average Efficiency in Active Mode *(expressed as a decimal)*	Maximum Power in No-Load Mode [W]
Pout ≤ 1 W	≥ 0.497 × Pout + 0.067	≤ 0.300
1 W < Pout ≤ 49 W	≥ 0.075 × ln(Pout) + 0.561	≤ 0.300
Pout ≥ 49 W	≥ 0.860	≤ 0.300

The power supply and packaging must be labeled according to the International Efficiency Marking Protocol. In keeping with the above efficiency standards, the power supply must have a marking of IV or higher. The marking is determined by comparing the unit's active and no load test data with the performance requirements of the International Efficiency Marking Protocol scale. The marking shall be permanently shown on the nameplate of the power supply. The font should be a plain serif font such as Times Roman. The size must be legible and indelible in a color that contrasts with the nameplate background. The label must include the manufacturer's name, model number, and Date of Manufacture. Further information about the International Efficiency Marking Protocol can be found at: http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/International_Efficiency_Marking_Protocol.pdf

The manufacturer must register each model or family of models in Australia, New Zealand and other jurisdictions as required (e.g., Arizona, New York, and Oregon.) The state of Oregon requires the manufacturer of a single voltage AC to DC power supply to certify with a letter that the product is compliant and has been tested. The supplier must provide Lenovo with a copy the Energy Efficiency test results, used to verify the supply meets the IV mark criteria. See the following web site for more details for registration in Australia: http://www.energyrating.gov.au/regulations/

In addition to the above, a Class A EPS must meet the US Department of Energy rule for Certification, Compliance and Enforcement Requirements for Certain Consumer Products and Commercial and Industrial Equipment, 75 Federal Register Regulation 652.

A Class A EPS is defined as an EPS which meets the following criteria:

- Designed to convert line voltage AC input into lower voltage AC or DC output;
- Sold with or intended to be used with , a separate end-use product that constitutes the primary load;
- Contained in a separate physical enclosure from the end-use product;
- Connected to the end-use product via a removable or hard-wired male/female electrical connection, cable, cord, or other wiring;
- Nameplate output power 250 watts or less; and
- Able to convert to only one AC or DC output voltage at a time

Class A EPS does not include any device that –

- Requires Federal Food and Drug Administration listing and approval as a medical device in accordance with section 513 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360c); or

- Powers the charge of a detachable battery pack or charges the battery or a product that is fully or primarily motor operated.

Class A EPSs must meet the energy requirements in Table 25 above. Exceptions to this include EPSs which were:

- Manufactured during the period beginning on July 1, 2008, and ending on June 30, 2015; and
- Made available by the manufacturer as a service part or a spare part for an end-use product –
  - That constitutes the primary load; and
  - Was manufactured before July 1, 2008.

Class A EPSs which are in scope of this requirement as cited above must be certified by the manufacturer to the US Department of Energy with test results and a compliance statement. See US 10 CFR Part 429 Subpart B Certification, 429.10 through 429.71 for more information at http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr;sid=11d3a1f4f775aa25c0e125fe9dab140d;rgn=div5;view=text;node=10%3A3.0.1.4.17;idno=10;cc=ecfr

Test procedures for energy efficiency measurements as cited in US 10 CFR Part 430, must be followed for External Power Supplies and Battery Chargers. Please refer to the following web site for more details:
http://www1.eere.energy.gov/buildings/appliance_standards/residential/battery_external.html

2.11.4.2 Requirements for Canada

Definitions

External Power Supply (EPS) means a power supply device that

a) is designed to convert line voltage AC input to a lower voltage DC or AC output,
b) is able to convert to only one DC or AC output voltage at a time,
c) is designed to be used with a household or office end-use product that constitutes the primary load,
d) is encased in an enclosure separated from that end-use product and is connected to that product by an electrical connection, and
e) has a nominal output power of 250 W or less.

An EPS does not include a device

a) that powers the charger of a detachable battery pack of an end-use product,
b) that charges the battery of an end-use product that is fully or primarily motor operated,
c) that is an accessory to a medical device as defined in section 1 of Canada Medical Devices Regulations, or
d) that is a power sourcing equipment as defined in IEEE 802.3-2008 Standard for Information Technology – Telecommunications and Information Exchange Between Systems.

The scope is limited to EPSs designed for household and office end-use products.

Replacement External Power Supply means an external power supply that

a. is marked for replacement of a specified end-use product that was manufactured before July 1, 2010, and
b. is imported or shipped in quantities of less than fifty units.

Security External Power Supply is an EPS that is manufactured before July 1, 2017 and

a) is designed to convert line voltage ac input into lower voltage ac output,
b) has a nominal output power of 20 W or more, and
c) is designed for and marketed with equipment that operates continuously in on mode to perform any of the following principal functions:
    i. monitor, detect, record or provide notification of any intrusion on or access to real property or physical assets or notification of threats to personal safety resulting from that intrusion or access,
    ii. deter or control access to real property or physical assets or prevent the unauthorized removal of physical assets, or
    iii. monitor, detect, record or provide notification of any physical threats to real property, physical assets or personal safety, including fire, gas, smoke and flooding.

A Security EPS does not include an EPS for equipment that is designed and marketed with a built-in alarm or theft deterrent feature if the equipment's principal functions are not any of the functions mentioned above. There is an exemption for no-load power requirements for Security EPSs manufactured before July 1, 2017. See regulation for more details.

Requirements

External power supplies must meet the following requirements (not applicable to replacement EPS manufactured before July 1, 2013)

Table 23: EPS Efficiency Requirement for Canada		
External Power Supply Energy Efficiency Standard		
Nameplate output (nominal power Ln)	**Minimum average efficiency in active mode** (decimal equivalent of a percentage)	**Maximum power in no-load mode** (not applicable to security EPS)
<1 watt	0.5 *Ln (nameplate output)	0.5 watt
⩾ 1 watt and ⩽ 51 watts	0.09*Ln (nameplate output) + 0.5	0.5 watt
>51 watts	0.85	0.5 watt

Verification Requirements

The EPS must bear a verification mark indicating that the energy efficiency reporting requirements have been verified. The verification mark is the mark of a Standards Council of Canada (SCC) accredited certification body that administers an energy performance verification program for EPSs. The use of the Roman numeral IV is accepted as an alternative to the energy efficiency verification mark for EPSs if:

- the Roman numeral is clearly indicated on the product according to the ENERGY STAR® protocol, and

- the product performance is initially verified by an SCC accredited certification organization offering an EPS energy efficiency verification program.

Additional information about the ENERGY STAR® protocol can be found at http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/International_Efficiency_Marking_Protocol.pdf

A model number must be clearly marked on the product which can be traced to the certification body's energy performance verification. This certification must be provided to Lenovo. The manufacturer or the dealer of the External Power Supply must submit to Natural Resources Canada an energy efficiency report, which must include:

a) product name,
b) manufacturer name,
c) brand name,
d) model number,
e) nominal output, in volts, at highest and lowest output setting,
f) nominal output, in watts, at highest and lowest output setting, if applicable,
g) whether the output is AC or DC,
h) the average efficiency at highest and lowest output setting,
i) no load power in watts,
j) whether it is a replacement external power supply or a security EPS,
k) if a replacement EPS or a security EPS, the end-use equipment and the brand and model number of that equipment,
l) roman numeral mark, if applicable,
m) whether the product bears a verification mark
n) name of the certification body associated with verifying the Roman numeral mark or that authorized the verification mark that appears on the product.

A dealer who imports external power supplies into Canada must include on the customs release document:

a) product name (i.e., EPS)
b) model number
c) brand name
d) address of the dealer importing the product
e) purpose for which the product is being imported (e.g., for sale of lease in Canada without modification)

Replacement EPSs, which meet the definition above are exempt from MEPS until July 1, 2013, however, they must be registered prior to and reported at the time of import. Initial registration does not need to include an efficiency report, or any of the electrical parameters that would be required for production hardware. See the reporting requirements above for EPSs, the required elements for Replacement EPSs would include items (a) through (d) and (i) through (k).

2.11.4.3 Requirements for Korea

Definitions

Adapter – A single voltage external power supply (AC-DC or AC-AC) under 150 W (nameplate output power) without any charging function.

Charger – Single voltage external power supply (AC-DC) with charging function to charge a lithium ion battery and has an input of 20W.

Requirements

Adapters (external power supply without charging) shall meet the requirements found in the table below.

Table 24. Minimum Energy Performance Standards for Adapters	
Minimum Energy Performance Standards (MEPS)	
Output power on name plate (P_{no})	**Running Efficiency (On mode energy efficiency)**
$0<P_{no}<1W$	$>0.49 \times P_{no}$
$1W<P_{no}<49W$	$>[0.09 \times Ln(P_{no})] + 0.49$
$49W<P_{no}<150W$	>0.84

Output power on name plate (P_{no})	**Maximum Standby Power (Power consumption on No-Load Mode)**
$0<P_{no}<10W$	<0.5W
$10W<P_{no}<150W$	<0.75W

Chargers (external power supply with charging function to charge Li-Ion Battery) must meet the requirements found in the table below.

Table 25. Minimum Energy Performance Standards for Chargers	
Minimum Energy Performance Standards (MEPS)	
$0<P_{in}<10W$	<0.5W
$10W<P_{in}<20W$	<0.75W

Adapters and Chargers must be tested and labeled in accordance with the Korean Regulation on Energy Efficiency Labeling and Standards, July 31, 2008. The required label is in the Figure below. The label shall be on the front or top of the product. Please note that "ABC-12345" represents the model number of the external power supply. If the model number is already shown on the unit, then the line text with the model number can be eliminated on this label. The KC mark does not need to be right next to the Korean text but does need to be on the front or top of the unit.

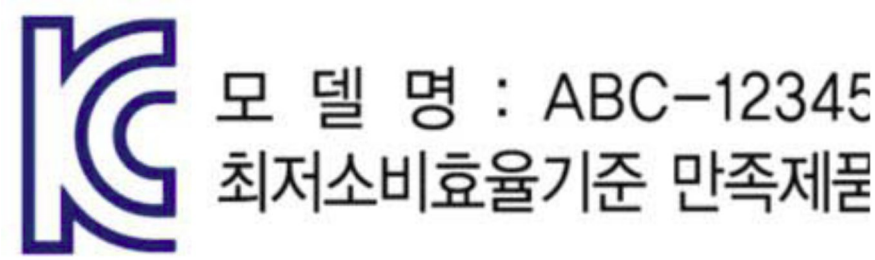


Figure 14. Korea Energy Label for Adapters and Chargers.

2.11.4.4 Requirements for the EU, Norway, Turkey and Switzerland (Lot 7)
European Union Commission Regulation EC No 278/2009 of 6 April 2009 implementing Directive 2005/32/EC with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies. This Regulation (EC) No 278/2009 is repealed on 1 April 2020. Commission Regulation (EU) 2019/1782 of 1 October 2019 laying down ecodesign requirements for external power supplies pursuant to Directive 2009/125/EC.

The section applies to external power supplies (EPSs) irrespective of the EMC classification of A or B. This section does not apply to uninterruptable power supplies (UPSs).

Definitions
This definition below no longer applies after April 1, 2020.
External power supply - device which meets all of the following criteria:
1. It is designed to convert alternating current (AC) power input from the mains power source into lower voltage direct current (DC) or AC output;
2. It is able to convert to only one DC or AC output voltage at a time;
3. It is intended to be used with a separate device that constitutes the primary load;
4. It is contained in a physical enclosure separate from the device that constitutes the primary load;
5. It is connected to the device that constitutes the primary load via a removable or hard-wired male/ female electrical connection, cable, cord or other wiring;
6. It has nameplate output power not exceeding 250 Watts;
7. It is intended for use with electrical and electronic household and office equipment as referred to in EU Regulation (EC) No 1275/ 2008 Article 2(1).

This definition below is effective April 1, 2020.
External power supply means a device which meets all of the following criteria:
a) it is designed to convert alternating current (AC) power input from the mains power source input into one or more lower voltage direct current (DC) or AC outputs;
b) it is used with one or more separate devices that constitute the primary load;
c) it is contained in a physical enclosure separate from the device or devices that constitute the primary load;
d) it is connected to the device or devices that constitute the primary load with removable or hard-wired male/female electrical connections, cables, cords or other wirings;

e) it has nameplate output power not exceeding 250 watts; and it is used with electrical and electronic household and office equipment included in Annex I; such as Information technology equipment, including copying and printing equipment, and set-top boxes, intended primarily for use in the domestic environment. See EU regulation for more definitions, details and product scope information.

Domestic environment means an environment where the use of broadcast radio and television receivers may be expected within a distance of 10 m of the equipment concerned.

Information technology equipment means any equipment which has a primary function of either entry, storage, display, retrieval, transmission, processing, switching, or control, of data or of telecommunication messages or a combination of these functions and may be equipped with one or more terminal ports typically operated for information transfer.

Mains means the electricity supply from the grid of 230 (± 10 %) volts of alternating current at 50 Hz.

Requirements
External power supplies must meet the following requirements (effective April 2010):
1. The no-load condition power consumption shall not exceed 0.50 W
2. The average active efficiency shall be not less than:
a. 0.500 * P_O, for P_O < 1.0 W;
b. 0.090 * Ln(P_O) + 0.500, for 1.0 W < P_O < 51.0 W;
c. 0.850 for P_O > 51.0 W.

1. The no-load condition power consumption shall not exceed the following limits (effective April 2011):

	AC-AC EPSs, except low voltage EPSs	**AC-DC EPSs except low voltage EPSs**	**Low voltage EPSs**
P_O < 51.0 W	0.50 W	0.30 W	0.30 W
P_O > 51.0 W	0.50 W	0.50 W	Not Applicable

2. The average active efficiency shall be not less than the following limits:

	AC-AC and AC-DC EPSs, except low voltage EPSs	**Low voltage EPSs**
P_O < 1.0 W	0.480 x P_O + 0.140	0.497 x P_O + 0.067
1.0 W < P_O < 51.0 W	0.0626 x Ln(P_O) + 0.622	0.075 x Ln(P_O) + 0.561
P_O > 51.0 W	0.870	0.860

External power supplies must meet the following requirements (effective April 1 2020):

Ecodesign requirements for external power supplies

1. Energy efficiency requirements:

(a) from 1 April 2020, the no-load condition power consumption shall not exceed the following values:

	AC-AC external power supplies, except low voltage and multiple voltage output external power supplies	AC-DC external power supplies, except low voltage and multiple voltage output external power supplies	Low voltage external power supplies	Multiple voltage output external power supplies
$P_O \leq 49{,}0$ W	0,21 W	0,10 W	0,10 W	0,30 W
$P_O > 49{,}0$ W	0,21 W	0,21 W	0,21 W	0,30 W

(b) from 1 April 2020, the average active efficiency shall be not less than the following values:

	AC-AC external power supplies, except low voltage and multiple voltage output external power supplies	AC-DC external power supplies, except low voltage and multiple voltage output external power supplies	Low voltage external power supplies	Multiple voltage output external power supplies
$P_O \leq 1{,}0$ W	$0{,}5 \times P_O/1W + 0{,}160$	$0{,}5 \times P_O/1W + 0{,}160$	$0{,}517 \times P_O/1W + 0{,}087$	$0{,}497 \times P_O/1W + 0{,}067$
1 W < $P_O \leq 49{,}0$ W	$0{,}071 \times \ln(P_O/1W) - 0{,}0014 \times P_O/1W + 0{,}67$	$0{,}071 \times \ln(P_O/1W) - 0{,}0014 \times P_O/1W + 0{,}67$	$0{,}0834 \times \ln(P_O/1W) - 0{,}0014 \times Po/1W + 0{,}609$	$0{,}075 \times \ln(P_O/1W) + 0{,}561$
$P_O > 49{,}0$ W	0,880	0,880	0,870	0,860

The product must be marked with the CE conformity marking. See Figure 13. The CE mark must have a height of at least 5 mm. The CE marking must be affixed to the EPS. Where this is not possible, it must be affixed to the packaging and to the accompanying documents.

The following technical documents must be provided to Lenovo:
1. Declaration of Conformity (DoC) to EU Regulation 1275/2008 as required by EU Directive 2005/32/EC. The DoC must include:
i. Name and address of the manufacturer or of its authorized representative;
ii. A description of the model sufficient for unambiguous identification;
iii. Where appropriate, the references of the harmonized standards applied;
iv. Where appropriate, the other technical standards and specifications used;
v. Where appropriate, the reference to other EU Community legislation providing for the affixing of the CE mark that is applied;

vi. Identification and signature of the person empowered to bind the manufacturer or its authorized representative.

2. The technical documentation showing efficiency data must be provided. The technical documentation must meet the requirements of Annexes I and II of EU Commission Regulation No 278/2009 and Switzerland Energy Regulation Appendix 2:11.

EPSs which are packaged as service or spare parts must clearly indicate the primary load product for which the EPS is intended to be used with.

2.11.4.5 Requirements for China

External Power Supplies shall meet the energy efficiency requirements of Sections 4.1 in the National Standard of the People's Republic of China GB 20943-2013. This standard is applicable to product with rated output power lower than or equal to 250W. This standard is NOT applicable to product used for industrial equipment, medical device and others with special functions.

Energy Efficiency Requirements

External Power Supplies manufactured after Sep. 1st, 2014 must meet table 28's and table 29's requirements of the National Standard of the People's Republic of China GB 20943-2013. See table 28 and table 29 in this section.

Table 26. Minimum Average Energy Efficiency Requirements for EPS

Rated Power	**Product Classification**	**Minimum Average Efficiency**
$0 < P_O \leq 1W$	Rated Voltage < 6V and Rated Current ⩾ 550mA	$0.497 \times P_O + 0.067$
	Others	$0.480 \times P_O + 0.140$
$1W < P_O \leq 49W$	Rated Voltage < 6V and Rated Current ⩾ 550mA	$0.0750 \times \ln(P_O) + 0.561$
	Others	$0.0626 \times \ln(P_O) + 0.622$
$49 < P_O \leq 250W$	Rated Voltage < 6V and Rated Current ⩾ 550mA	0.86
	Others	0.87

Table 25. Minimum Average Energy Efficiency Requirements of No-Load model for EPS

Rated Power	**No load power**	
$0 < P_O < 50W$	AC output	0.5
	DC output	0.3
$50W \leq P_O \leq 250W$	0.5	

2.11.4.6 Battery Chargers (including Battery Back-up Units and Uninterruptible Power

Supplies)

Requirements for California, Oregon, Canada and British Columbia

References

California Energy Commission (CEC) Appliance Efficiency Regulations.
California Regulatory Advisory Backup Battery Charger Systems October 31, 2018
Oregon Act relating to minimum energy efficiency standards
Oregon House Bill 3025 Enrolled Relating to energy efficiency standards for battery charger systems, amending Oregon Revised Statutes (ORS) 469.229
Canada Energy Efficiency Regulations 2016, Amendment SOR/2018-201
Canada Standards Association (CSA) C381.2-17 Energy performance of battery-charging systems and uninterruptible power supplies
Notice from NRCan for Energy Efficiency Regulations
British Columbia Energy Efficiency Act, Standards for Small Battery Charging Systems
British Columbia Regulatory Bulletin Energy Efficiency Standards Regulation Amendment March 2018

Battery Chargers: California

The California Appliance Efficiency Regulations (California Code of Regulations [CCR], Title 20, Sections 1601 to 1609) contain definitions, test methods, energy efficiency standards, certification requirements, and marking requirements for state-regulated battery charger systems and federally regulated battery chargers. The California Energy Commission has modified these regulations to align the state requirements with the U.S. Department of Energy's requirements for these products. (See Docket #18-AAER-02 [Appliance Efficiency Standards Rulemaking for Portable Electric Spas and Battery Chargers]; Docket #18-AAER-10 [Amendments to Title 20 Appliance Efficiency Regulations Rulemaking].)

This regulatory advisory applies to two types of products:

1. Federally regulated battery chargers are battery chargers manufactured on or after June 13, 2018, to which a federal efficiency standard applies. A federally regulated battery charger is defined as, "a device that charges batteries for consumer products, including battery chargers embedded in other consumer products." (10 C.F.R. § 430.2; see also 10 C.F.R. § 430.32(z) for efficiency standards.) Examples include cell phone battery chargers, electric toothbrush battery chargers (wet-inductive), and power tool battery chargers. Under federal law, the date of manufacture means either the date of manufacture if manufactured in the United States, or the date of import into the United States.(10 C.F.R. § 430.2, definition of "manufacture.")

2. State-regulated small battery charger systems are products meeting California's definition for a "small battery charger system" and that are not federally regulated battery chargers. Examples include forklift battery chargers, dry-inductive battery chargers, and battery chargers for nonconsumer products. Small battery charger systems are defined in Section 1602(w) of Title 20 of the CCR. This regulatory advisory is not applicable to state-regulated

battery charger systems that are battery backups or non-federally regulated uninterruptible power supplies.

Manufacturers may voluntarily certify federally regulated battery chargers to MAEDbS using the new appliance sub-type on or after June 13, 2018.

Beginning January 1, 2019, all federally regulated battery chargers must appear in MAEDbS to be lawful for sale or offer for sale in California. Products not included in the federal scope that meet the definition of a battery charger system will remain regulated as state-regulated battery charger systems and may be referred for enforcement if they are not certified to MAEDbS.

See California Energy Commission Appliance Efficiency Regulations for more details, including further definitions and effective dates. Web site is at http://www.energy.ca.gov/appliances/. Some effective dates are referenced later in this section.

Definitions
À la carte charger means a battery charger that is individually packaged without batteries. À la carte chargers include those with multi-voltage or multi-port capability.

Battery or battery pack means an assembly of one or more rechargeable cells intended to provide electrical energy to a product, and may be in one of the following forms: (a) detachable battery: a battery that is contained in a separate enclosure from the product and is intended to be removed or disconnected from the product for recharging; or (b) integral battery: a battery that is contained within the product and is not removed from the product for charging purposes.

Battery backup or uninterruptible power supply charger (UPS) means a small battery charger system that is voltage and frequency dependent (VFD) and designed to provide power to an end use product in the event of a power outage, and includes a UPS as defined in IEC 62040-3 ed.2.0. The output of the VFD upon which the UPS is dependent changes in AC input voltage and frequency and is not intended to provide additional corrective functions, such as those relating to the use of tapped transformers.

Battery charger system (BCS) means a battery charger coupled with its batteries or battery chargers coupled with their batteries, which together are referred to as battery charger systems. This term covers all rechargeable batteries or devices incorporating a rechargeable battery and the chargers used with them. Battery charger systems include, but are not limited to:
1) electronic devices with a battery that are normally charged from ac line voltage or dc input voltage through an internal or external power supply and a dedicated battery charger;
2) the battery and battery charger components of devices that are designed to run on battery power during part or all of their operations;
3) dedicated battery systems primarily designed for electrical or emergency backup; and
4) devices whose primary function is to charge batteries, along with the batteries they are designed to charge. These units include chargers for power tool batteries and chargers for automotive, AA, AAA, C, D, or 9 V rechargeable batteries, as well as chargers for batteries used in larger

industrial motive equipment and à la carte chargers. The charging circuitry of battery charger systems may or may not be located within the housing of the end-use device itself. In many cases, the battery may be charged with a dedicated external charger and power supply combination that is separate from the device that runs on power from the battery.

Except those:

1) used to charge a motor vehicle that is powered by an electric motor drawing current from rechargeable storage batteries, fuel cells, or other portable sources of electrical current, and which may include a nonelectrical source of power designed to charge batteries and components thereof. This exception does not apply to autoettes, electric personal assistive mobility devices, golf carts, or low speed vehicles, as those vehicles are defined in Division 1 of the California Vehicle Code;
2) that are classified as Class II or Class III devices for human use under the Federal Food, Drug, and Cosmetic Act and require U.S. Food and Drug Administration listing and approval as a medical device;
3) used to charge a battery or batteries in an illuminated exit sign, as defined in Section 1602(l);
4) with input that is three phase of line-to-line 300 volts root mean square or more and is designed for a stationary power application;
5) that are battery analyzers; or
6) that are voltage independent or voltage and frequency independent uninterruptible power supplies (UPS) as defined by International Electrotechnical Commission (IEC) 62040-3 ed.2.0.

Inductive charger system means a small battery charger system that transfers power to the charger through magnetic or electric induction.

Large battery charger system means a battery charger system (other than a battery charger system for golf carts) with a rated input power of more than 2 kW.

Small battery charger system means a battery charger system with a rated input power of 2 kW or less, and includes golf cart battery charger systems regardless of the output power.

USB charger system means a small battery charger system that uses a Universal Serial Bus (USB) connector as the only power source to charge the battery, and is packaged with an external power supply rated with a voltage output of 5 volts and a power output of 15 watts or less.

Definitions (Canada)

Backup battery charger means a device that (a) is incorporated into an end-use product, including a device that is incorporated into an uninterruptible power supply or that uses an external power supply, that is designed to operate continuously using mains power; and (b) recharges a battery that is used to maintain the continuity of electrical power to the end use product such that the product can continue its full or partial operation in the event of a failure of mains power.

Battery charger means a device that charges the battery of a wheelchair, golf cart, low speed vehicle or any other end-use product. It does not include any of the following:
(a) a device that charges the battery of a vehicle other than a wheelchair, golf cart or low speed vehicle;
(b) a device that charges the battery of a medical device;
(c) a wireless battery charger, other than a wireless battery charger that is inductive and designed for wet environments; or
(d) a backup battery charger.

Battery Charger is a device that charges batteries for consumer products, including battery chargers embedded in other consumer products. [Source: CSA C381.2-17 Energy Performance of battery-charging systems and uninterruptible power supplies]

Requirements
Large Battery Charger Systems manufactured on or after January 1, 2014 shall meet the performance values in:

1. Table W-1 of the CEC Appliance Energy Regulation.
2. ORS 469.233 Section 10, chapter 418, 19(a), updated 2015.

Table W-1
Standards for Large Battery Charger Systems

Performance Parameter		Standard
Charge Return Factor (CRF)	100 percent, 80 percent Depth of discharge	CRF ⩽ 1.10
	40 percent Depth of discharge	CRF ⩽ 1.15
Power Conversion Efficiency		Greater than or equal to: 89 percent
Power Factor		Greater than or equal to: 0.90
Maintenance Mode Power (Eb = battery capacity of tested battery)		Less than or equal to: 10 + 0.0012Eb W
No Battery Mode Power		Less than or equal to: 10 W

The following Small Battery Charger Systems shall meet the applicable performance values in Table W-2 of the California Energy Commission Appliance Efficiency Regulations:

- consumer products that are not USB charger systems with a battery capacity of 20 watt-hours or more, and are manufactured on or after February 1, 2013;

- consumer products that are USB charger systems with a battery capacity of 20 watt-hours or more and are manufactured on or after January 1, 2014; and
- those that are not consumer products and are manufactured on or after January 1, 2017.

Exceptions to these Small Battery Charger requirements are à la carte charger that are:

a) provided separately from and subsequent to the sale of a small battery charger system manufactured before the effective date of the applicable standard in Section 1605.3(w)(2);
b) necessary as a replacement for, or as a replacement component of, such small battery charger system;
c) is provided by a manufacturer directly to a consumer or to a service or repair facility; and is manufactured no more than five years after the effective date in Section 1605.3(w)(2) applicable to the particular small battery charger system for which the à la carte charger is intended as a replacement or replacement component. These chargers shall not be required to meet the applicable standard in Section 1605.3(w)(2) and Table W-2.14 of the California regulations.

Table W-2
Standards for Small Battery Charger Systems

Performance Parameter	Standard
Maximum 24 hour charge and maintenance energy (Wh) (Eb = capacity of all batteries in ports and N = number of charger ports)	For Eb of 2.5 Wh or less: 16 × N
	For Eb greater than 2.5 Wh and less than or equal to 100 Wh: 12 x N +1.6Eb
	For Eb greater than 100 Wh and less than or equal to 1000 Wh: 22 x N+1.5Eb
	For Eb greater than 1000 Wh: 36.4 x N +1.486Eb
Maintenance Mode Power and No Battery Mode Power (W) (Eb = capacity of all batteries in ports and N = number of charger ports)	The sum of maintenance mode power and no battery mode power must be less than or equal to: 1x N+0.0021xEb Watts

Inductive charger systems manufactured on or after February 1, 2013, shall meet either the applicable performance standards in Table W-2 or shall use less than 1 watt in maintenance mode, less than 1 watt in no battery mode, and an average of 1 watt or less over the duration of the charge and maintenance mode test.

Battery Backup and Uninterruptible Power Supplies manufactured on or after February 1, 2013, for consumer products and January 1, 2017, for products that are not consumer products shall consume no more than 0.8+0.0021 x Eb watts in maintenance mode where Eb is the battery capacity in watt-hours.

The appliances must be tested in accordance with Sections 1603 and 1604 of the California Energy Commission Appliance Efficiency Regulations at an approved test laboratory or an approved industry certification program.

Battery chargers in scope of these requirements must be certified in the California Energy Commission's Modernized Appliance Efficiency Database System (MAEDBS). In Docket #18-AAER-02, the Energy Commission adopted regulatory changes to modify the marking requirements for battery chargers to require that only state-regulated battery charger systems be marked with a "BC" inside of a circle. Federally regulated battery chargers become covered by the U.S. Department of Energy on June 13, 2018; however, the Energy Commission anticipates that the changes to the California regulations will not take effect until October 1, 2018, after they are approved by the Office of Administrative Law. Therefore, Energy Commission staff will not refer for enforcement federally regulated battery chargers manufactured on or after June 13, 2018, that are not marked with a (BC).

State-regulated battery charger systems must continue to comply with the requirement to mark the device with a "BC" inside of a circle, as required under Section 1607(d)(10) of Title 20 of the CCR.

For British Columbia (BC): Products manufactured on or after June 2, 2018, are exempt from the energy efficiency verification label requirement including verification by the designated tester that the product meets the efficiency standard. The label exemption allows products which are compliant with the US Department of Energy (DOE) standards to be imported into BC without additional third-party testing. The BC energy device categories (product classes) and corresponding efficiency standard (maximum Unit Energy Consumption) are aligned with the US DOE battery charger standard (10 CFR 430.32 (z)). The testing procedure for all product categories is CSA C381.2-17 which is aligned with the U.S. DOE test standard (US CFR Title 10, Part 430, Subpart B, Appendix Y).

For Canada (requirements apply to battery chargers manufactured on or after June 13, 2019):

A battery charger must have a unit energy consumption (UEC) that is less than or equal to that set out for the battery charger's product class in Table C.1 of CSA C381.2-17. Canada has adopted the definition for battery chargers as listed in CSA C381.2-17. See definition above.

Information, as listed in the Canada Energy Regulation must be submitted to the respective Canadian minister –

a) its product class;
b) its rated battery energy (E), expressed in watt-hours;
c) its unit energy consumption expressed in kilowatt-hours per year;

d) its power, expressed in watts, when it is in active mode, maintenance mode and standby mode, respectively; and
e) if an external power supply was used to test the battery charger, the power supply's model number and the name of its manufacturer

Labeling
The labeling and marking requirements apply to all products that are within the scope of the adopted regulation. The requirements are that the marking be legible and permanently affixed. There are no specific size, font, or color requirements as long as the marking is legible. An example of an acceptable mark is shown below:



Placement of the mark should go either on the product (i.e., nameplate) or the product packaging and the front page of the publication.

Effective dates of this regulation vary, please see regulation for details.
https://www.energy.ca.gov/appliances/documents/2018-06-07_Battery_Chargers_Advisory.pdf

Requirements for Battery Chargers for USA (US DOE)
References
US 10 CFR Part 430 Energy Conservation Standards for Battery Chargers
See regulations for additional definitions, requirements, effective dates, and updates.
https://www.regulations.gov/document?D=EERE-2008-BT-STD-0005-0256

Definitions
Battery charger means a device that charges batteries for consumer products, including battery chargers embedded in other consumer products.

Consumer product means any article (other than an automobile, as defined in Section 501(1) of the Motor Vehicle Information and Cost Savings Act):
(1) Of a type—
(i) Which in operation consumes, or is designed to consume, energy or, with respect to showerheads, faucets, water closets, and urinals, water; and
(ii) Which, to any significant extent, is distributed in commerce for personal use or consumption by individuals;
(2) Without regard to whether such article of such type is in fact distributed in commerce for personal use or consumption by an individual, except that such term includes fluorescent lamp

ballasts, general service fluorescent lamps, incandescent reflector lamps, showerheads, faucets, water closets, and urinals distributed in commerce for personal or commercial use or consumption.

Requirements

Battery chargers manufactured on or after June 13, 2018, must have a unit energy consumption (UEC) less than or equal to the prescribed ‘‘Maximum UEC’’ standard when using the equations for the appropriate product class and corresponding rated battery energy as shown in the following table:

DOE § 430.32(z)(1)[7]				
[PC]	Product Class (“PC”) Description	Rated Battery Energy (Ebatt**)	Special Characteristic or Battery Voltage	Maximum UEC (kWh/yr) (as a function of Ebatt**)
1	Low-Energy	≤ 5 Wh	Inductive Connection*	3.04
2	Low-Energy, Low-Voltage	< 100 Wh	< 4 V	.1440 * Ebatt + 2.95
3	Low-Energy, Medium-Voltage		4-10 V	For Ebatt < 10 Wh, 1.42 kWh/y Ebatt ≥ 10 Wh, .0255 * Ebatt + 1.16
4	Low-Energy, High-Voltage		> 10 V	.11 * Ebatt + 3.18
5	Medium-Energy, Low Voltage	100 – 3000 Wh	< 20 V	.0257 * Ebatt + .815
6	Medium-Energy, High- Voltage		≥ 20 V	.0778 * Ebatt + 2.4
7	High Energy	> 3000 Wh	-	.0502 * Ebatt + 4.53

Requirements for Uninterruptible Power Supplies for Colorado, Washington and USA

References

Colorado Revised Statutes Article 7.5 Water and Energy Efficiency Standards Washington An Act relating to appliance efficiency standards

US 10 CFR Part 430 Subpart B Appendix Y Uniform Test Method for Measuring the Energy Consumption of Battery Chargers

US 10 CFR Part 430 Energy Conservation Standards for Uninterruptible Power Supplies (prepublication final rule)

US CFR Part 430.32 Energy and water conservation standards and their compliance dates

Definitions

Uninterruptible Power Supply (UPS): a battery charger consisting of a combination of convertors, switches and energy storage devices (such as batteries), constituting a power system for maintaining continuity of load power in case of input power failure.

Voltage and frequency dependent UPS or VFD UPS: a UPS that produces an AC output where the output voltage and frequency are dependent on the input voltage and frequency. This UPS architecture does not provide corrective functions like those in voltage independent and voltage and frequency independent systems.

Voltage and frequency independent UPS or VFI UPS: a UPS where the device remains in normal mode producing an AC output voltage and frequency that is independent of input voltage and frequency variations and protects the load against adverse effects from such variations without depleting the stored energy source.

Voltage independent UPS or VI UPS: a UPS that produces an AC output within a specific tolerance band that is independent of under-voltage or over-voltage variations in the input voltage without depleting the stored energy source. The output frequency of a VI UPS is dependent on the input frequency, similar to a voltage and frequency dependent system.

Requirements
UPSs that utilize a National Electrical Manufacturer Association (NEMA) 1-15P or 5-15P input plug and have an AC output shall have an average load adjusted efficiency that meets or exceeds the values shown in the table below based on the rated output power (Prated) of the UPS, as measured in accordance with test procedures prescribed in Appendix Y to Subpart B of Part 430 of Title 10 of the Code of Federal Regulations "Uniform Test Method for Measuring the Energy Consumption of Battery Chargers" in effect as of January 11, 2017.

Battery charger product class	Rated output power	Minimum efficiency
10a (VFD UPSs)	0 W < Prated ≤ 300 W	–1.20E-06 * P2rated + 7.17E-04 * Prated + 0.862.
	300 W < Prated ≤ 700 W	–7.85E-08 * P2rated + 1.01E-04 * Prated + 0.946.
	Prated > 700 W	–7.23E-09 * P2rated + 7.52E-06 * Prated + 0.977.
10b (VI UPSs)	0 W < Prated ≤ 300 W	–1.20E-06 * P2rated + 7.19E-04 * Prated + 0.863.
	300 W < Prated ≤ 700 W	–7.67E-08 * P2rated + 1.05E-04 * Prated + 0.947.
	Prated > 700 W	–4.62E-09 * P2rated + 8.54E-06 * Prated + 0.979.
10c (VFI UPSs)	0 W < Prated ≤ 300 W	–3.13E-06 * P2rated + 1.96E-03 * Prated + 0.543.
	300 W < Prated ≤ 700 W	–2.60E-07 * P2rated + 3.65E-04 * Prated + 0.764.
	Prated > 700 W	–1.70E-08 * P2rated + 3.85E-05 * Prated + 0.876.

2.11.5 Requirements for Austrailia and New Zealand
2.11.5.1 Minimum Energy Performance Standards: Computer and Monitors
Minimum Energy Performance Standards (MEPS) for computers and Monitors will be implemented on October 1, 2013 in Australia and New Zealand.

Computers and Monitors must be registered on www.energyrating.gov.au before they are available for sale.

2.11.5.1.1 Computers

Requirements for computers

Computers must meet the requirements of the Standard AS/NZS 5813.2 and must be tested to the Standard AS/NZS 5813.1.

Standards can be purchased from www.standards.co.nz and www.saiglobal.com.

Non-compliant computer stock imported into, or manufactured in Australia and New Zealand before October 1, 2013 may continue to be sold. Second-hand sales are not covered by the Regulations.

The MEPS will cover all computers that are imported or manufactured in New Zealand for sale or hire, including:

- desktop computers
- notebooks
- small scale servers.

The following computers do not need to comply with MEPS:

- personal digital assistants (PDAs)
- palmtop computers and smartphones
- games consoles
- blade, slate or thin client computers
- workstations
- computers that are not connected to mains voltage or by external power supply.

Alternative requirements for small production runs

There will be "deemed-to-comply" provisions for computer models where less than 200 units are manufactured per year. The model must be registered on the energy rating website. However it will be exempt from typical energy consumption (TEC) requirements if it uses an internal power supply that meets the standard below, or an external power meeting the requirements of energy performance mark V.

AS/NZS 5814.1:2012 sets out Method of Measurement for internal power supplies.
AS/NZS 4665.1:2005 sets out the test method and energy performance mark for external power supplies.
There is no requirement to register the internal power supply, however it must qualify as an internal power supply that meets or exceeds:

85 per cent efficiency when tested at 20 per cent of rated power;
88 per cent efficiency when tested at 50 per cent of rated power;
85 per cent efficiency when tested at 100 per cent of rated power; and
power factor of 0.9 when tested at 100 per cent of rated power.

Labeling
There are no labeling requirements for computers.

How to register
All computers manufactured in or imported on or after October 1, 2013 must be registered.

More information on registering a computer is available at: www.energyrating.gov.au/programs/e3-program/energy-rating-labelling/submit/

A test report is not required to be submitted as part of the registration process. However, manufacturers or importers are required to provide a copy of the test report to the Regulator on request. For this reason it is recommended that an electronic copy of the test report be uploaded when making a registration application.

Instructions on the use of the on-line registration system are available at:
www.energyrating.gov.au/resources/program-publications/?viewPublicationID=2139

2.11.5.1.2 Monitors
References
Australia Greenhouse and Energy Minimum Standards Act 2012
Australia Greenhouse and Energy Minimum Standards (Computer Monitors) Determination 2013
Computer Monitors Information Sheet from the New Zealand Energy Efficiency and Conservation Authority September 2019
Additional information for this program can be found at http://www.energyrating.gov.au/ and https://www.eeca.govt.nz/standards-ratings-and-labels/equipment-energy-efficiency-programme/about-the-e3-programme/#meps

Standards can be purchased from www.standards.co.nz or www.saiglobal.com.

The standards are intended to cover all computer monitors that are imported or manufactured in Australia and New Zealand for sale or hire, that are up to 152 cm (measured diagonally across).

Requirements for Monitors
Computer monitors must meet the minimum energy performance standards (MEPS) and energy rating label requirements as found in AS/NZS 5815.1:2013 and AS/NZS 5815.2:2013. There are multiple displays which these standards do not apply to, for example, specialized electronic displays intended for use primarily in commercial and professional fields, not intended for sale to the general public. Also excluded are displays which are built-in or have integrated networking functionality, the circuitry for which cannot be physically separated or switched independently from the electronic display component. Rack mount monitors are excluded from these requirements.

Computer monitors are required to have the six star, or ten star label affixed to the product, as outlined in Section 26 of the Greenhouse and Energy Minimum Standards Act 2012 and section 7 of the Greenhouse and Energy Minimum Standards (Computer Monitors) determination 2013. The

label may also be placed on the packaging. The format of the labels is in Schedule 1 and Schedule 2 of the Greenhouse and Energy Minimum Standards (Computer Monitors) Determination 2013.

Labeling

Monitors up to 76 cm across must comply with MEPS (in on-mode) and labeling.

Larger monitors (between 76 cm and 152 cm across) only need to display an energy rating label and meet standby levels (1W when off, 2W on standby).

**** Electronic labelling (where the energy rating label appears as an image on the screen or in a video loop) is allowed but must be approved by the regulator.***

The following monitors will not need to comply with MEPS and labeling:

- Monitors larger than 152 cm across.
- Products with an integrated television tuner are classified as televisions and are already subject to MEPS and labelling.
- Electronic displays used exclusively for digital signage, advertising or digital picture frames.
- High performance or specialised electronic displays.
- Displays used in public settings.

How to register
All monitors manufactured in or imported on or after October 1, 2013 must be registered and be supplies with an energy rating label.

More information on registering a monitor is available at: www.energyrating.gov.au/programs/e3-program/energy-rating-labelling/submit/

A test report is not required to be submitted as part of the registration process. However, manufacturers or importers are required to provide a copy of the test report to the Regulator on request. For this reason it is recommended that an electronic copy of the test report be uploaded when making a registration application.

Instructions on the use of the on-line registration system are available at:
www.energyrating.gov.au/resources/program-publications/?viewPublicationID=2139

2.11.6 Requirements for Mexico
2.11.6.1 Computers, Small Scale Servers, Servers, Storage Products, and peripherals

Requirements

Equipment and Appliances must contain, in a clear and visible manner, basic information (in Spanish) regarding:

1. The energy consumption per unit of time in operation;
2. The energy consumption in standby mode, per unit of time, if applicable.
3. The type of energy or power used, which should indicate the measurement units, unless by its operational nature, the type of power or energy is evidently identifiable, in which case it will not be necessary to include this requirement on the labeling;
4. Quantity of the good, product or service offered by the equipment per unit of energy consumed when applicable.

The manufacturer must submit the forms found in the Mexico Catalog of the Equipment and Apparatus for which the manufacturers, importers, distributors and sellers should provide information about power consumption and forms for providing information to the Mexico National Commission for Efficient Energy Use (CONUEE). A copy of this form must be supplied to Lenovo.

Products which do not meet the definition of Specialized products must be labeled (in Spanish) with the above energy consumption and quantity of service provided per unit of energy consumed.

Definitions

Equipment and Appliances means products cited in the Mexico Catalog of Equipment and Appliances, for which Manufacturers, Importers, Distributors and Marketers, must include information regarding their energy consumption.

Specialized products means equipment, spare parts, accessories and additions, that are not sold to the general public, but to a specific client due to its level of technical specialization, and which are set up considering the requirements and specifications of the customer; in addition, the entities requiring this kind of equipment shall previously get from their supplier(s) the features of any such equipment, including energy consumption.

2.11.6.2 EPS efficiency and labeling requirements (NOM 029-ENER-2017)

Scope

Covers external power supplies that are sold in the Mexican market by converting AC voltage to a single fixed DC voltage (or allowing the user to manually select different output voltages) with a maximum output power of 250W as a separate product or component of the end product.

Requirements

Must comply with the energy efficiency values for the active power mode and not surpass the power values in no-load mode, as indicated in the table below:

Classification according to the level of output voltage	Nominal output voltage in DC	With an output power (P_o)	Efficiency Level	Minimum energy efficiency level in active mode, greater than or equal to:	The maximum power limit in no-load mode, less than or equal to:
USB output voltage	5.0 V ± 0.25 V	Less than or equal to 1.0 W	V	0.497 x P_o + 0.067	0.30
			VI	0.517 x P_o + 0.087	0.10
		Greater than 1.0 W and less than or equal to 49.0 W	V	0.075 x [L_n (P_o)] + 0.561	0.30
			VI	0.0834 x [L_n (P_o)] 0.0014 x P_o + 0.609	0.10
		Greater than 49.0 W and less than or equal to 250.0 W	V	0.86	0.50
			VI	0.87	0.21
Low output voltage	Less than 6.0 V	Less than or equal to1.0 W	V	0.497 x P_o + 0.067	0.30
			VI	0.517 x P_o + 0.087	0.10
		Greater than 1.0 W less than or equal to 49.0 W	V	0.075 x [L_n (P_o)] + 0.561	0.30
			VI	0.0834 x [L_n (P_o)] 0.0014 x Po + 0.609	0.10
		Greater than 49.0 W and less than or equal to 250.0 W	V	0.86	0.50
			VI	0.87	0.21
Generic output voltage	Greater than or equal to 6.0 V	Less than or equal to 1.0 W	V	0.480 x P_o + 0.140	0.30
			VI	0.5 x P_o + 0.16	0.10
		Greater than 1.0 W less than or equal to 49.0 W	V	0.0626 x [L_n (P_o)] + 0.622	0.30
			VI	0.071 x (L_n (P_o)) 0.0014 x Po + 0.67	0.10
		Greater than 49.0 W and less than or equal to 250.0 W	V	0.87	0.50
			VI	0.88	0.21

Marking

All external power supplies in scope of the Mexican Official Standard must be marked on the body of the product or with a legible and indelible data plate with the data listed below. It must be adhered or mechanically attached to the enclosure or housing on the main body of the external power supply in a visible place. The minimum information that the marking of the external power supply must have is:

- Name of the manufacturer or distributor, or a logo or registered trademark;
- Model or commercial identification designated by the manufacturer or distributor and used for commercial identification;
- Electrical data, nominal input voltage, and frequency.
- Marking of energy efficiency level V or VI, in roman numbers; (as appropriate);
- Nominal electrical data of the electrical output voltage, electrical power and/or the electric current output intensity.

The mark must be indelible and legible after manual rubbing of the mark for fifteen seconds with a rag soaked in water. The data plate must be made of a material that permanently guarantees the

legibility of the information, and that does not become degraded over time under normal environmental conditions.

External power supplies in scope of this Mexican Official Standard that are directly sold to the public, individually, that is, not as a piece or accessory of a product for end-use, must bear the information as listed below. This label is additional to the marking that must be done as listed above. The information can be imprinted or affixed, or placed on the product, or packaging or instructions or user manuals, or in the regulatory information included with the product. The energy efficiency information must contain the following, as a minimum, in a legible and indelible manner. (Please see Exemption entry in this Section for additional exempted EPS information.)

Label information:
ENERGY EFFICIENCY, in capital letters.
Complies with NOM-029-ENER-2017
Level of energy efficiency V or VI, in Roman numbers.

Below is an example of a label in accordance with this standard. The label must be written in Spanish.



Exemptions
This Mexican Official Standard NOM 029-ENER-2017 does not apply to external power supplies:

a) That are designed to deliver an output AC electrical voltage;
b) That are equipped with some type of battery or battery pack (including removable ones) that is physically connected to the power supply;
c) That are equipped with switch for choosing the battery type (or chemical) and an indicator light or meter that shows a battery's charge status (a product with a built-in selector switch for battery types and a meter that shows the status of the battery charge);
d) Designed for special uses that are part of the equipment and apparatus that are not sold directly to the public, and that are marketed towards business users or institutions that install or operate the equipment directly, or share responsibility with the supplier, in accordance with the technical features and specifications that have been presented and authorized by the Department that issues this standard.

2.11.7 Switches
2.11.7.1 Requirements for Japan
These requirements are from Japan Ordinance No. 39 of the Ministry of Economy, Trade and Industry (METI) amending the Japan Enforcement Regulation of the Law Concerning the Rational Use of Energy. English translation is not yet available from the Japan Ministry.

Definitions

Switch – Switching apparatus specified by a Cabinet Order set forth in Paragraph 1 of Article 78 of the Law shall be defined in Article 21 in Enforcement Ordinance of the Law Concerning the Rational Use of Energy as below:

(xxiii) Switching apparatus (referring to apparatus which transmit and receive telecommunication signals and are capable of selecting, in the transmission of telecommunication signals, such a path as is provided for in the preceding item (i) for each destination from among a plurality of paths through which the said apparatus may
transmit telecommunication signals and of transmitting telecommunication signals to each destination through the said path selected (limited to such apparatus used exclusively for telecommunications via the Internet, excluding those capable of wireless communications and other matters specified by an Ordinance of the METI)).

The exclusion from application for switching apparatus prescribed by an Ordinance of the METI as set forth in Article 21, item (xxiii) of the Enforcement Order shall be as follows:

(i) Those which do not transmit or exchange any Ethernet frames;
(ii) Those which transmit and exchange Internet Protocol packets;
(iii) Those with connection ports for transmitting and/or receiving telecommunications signals, half or more of which use a two-wire connection mode;
(iv) Those designed to be capable of being incorporated into items such as a housing or computer;
(v) Those intended to control a device that wirelessly relays telecommunication signals;
(vi) Those intended mainly for use as a power supply, as specified by the Minister of Economy, Trade and Industry.

Requirements

Switch suppliers must provide to Lenovo the following information with respect to the energy efficiency ratio of an applicable Switch in order to meet the Japanese Energy Savings law:

(a) Product names, including manufacturer's name,
(b) Category letter and the Standard Energy Efficiency Ration,
(c) Line speed for a port during measurement and the number of ports per line speed,
(d) Maximum effective transmission speed at a frame length of 1,518 bytes, (e) Maximum supply capability achieved by Power over Ethernet (limited to Switches with the Power over
Ethernet function), and
(f) Energy efficiency ratio.

The above information must be included in a prominent location in a product catalog where either the performance of the Switch is indicated or in a document used for the selection of a Switch.

Requirements for the EU and other CE Marking jurisdictions

References

EU Commission Regulation No 801/2013 of 22 August 2013 amending Regulation (EC) No 1275/2008 with regard to ecodesign requirements for standby, off mode electric power consumption of electrical and electronic household and office equipment
EU Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009

establishing a framework for the setting of ecodesign requirements for energy-related products
Jordan JSNO 2090/2013 Technical Regulation on eco-design requirements for energy related products
Jordan JSNO 2109/2013 Technical Regulation on eco-design requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment

2.11.8 Routers

Requirements for Japan

These requirements are from Japan Ordinance No. 39 of the METI amending the Japan Enforcement Regulation of the Law Concerning the Rational Use of Energy. English translation is not yet available from the Japan Ministry.

Definitions

Router – Router apparatus specified by a Cabinet Order set forth in Paragraph 1 of Article 78 of the Law shall be defined in Article 21 in Enforcement Ordinance of the Law Concerning the Rational Use of Energy as below:
(xxii) Routing apparatus (referring to apparatus which transmit and receive telecommunication signals and are capable of identifying, in the transmission of telecommunication signals, the path that is the most appropriate of the existing plurality of paths to the destination apparatus according to circumstances such as the conditions of the said paths, and of transmitting the said telecommunication signals through the said path identified as being the most appropriate (limited to such apparatus used exclusively for telecommunications transmission via the Internet, excluding those used for connecting a communication terminal to the Internet via a telephone line for the purpose of telephoning an Internet-access service provider to connect the said communication terminal to the Internet, and other matters specified by an Ordinance of the METI.))

Exclusions from application for the Routing apparatus prescribed by an Enforcement Regulation of the METI as set forth in Article 48, item (20) of the Enforcement regulations shall be as follows:
(i) Those which do not transmit or exchange Internet Protocol packets;
(ii) Those which transmit Internet Protocol packets at a speed, in terms of the maximum sum of signal bits of the said packets transmitted per unit time, in excess of 200 megabits per second (excluding those listed in item (vi));
(iii) Those equipped with a device intended for the use of Asynchronous Transfer Mode that cannot be easily removed;
(iv) Those with the capability to superimpose a high-frequency current of 10 kilohertz or higher upon a power line;
(v) Those with connection ports for transmitting and/or receiving telecommunication signals, at least three of which (excluding such connection ports which use Internet Protocol) are intended for transmitting and/or receiving audio signals;
(vi) Those which wirelessly transmit Internet Protocol packets at a speed, in terms of the maximum sum of signal bits of the said packets transmitted per unit time, in excess of 100 megabits per second;
(vii) Those with the capability to use an artificial satellite;
(viii) Those with the capability to multiplex and then transmit 53 subcarriers or more by an orthogonal frequency division multiplex system;
(ix) Those with the capability to set up a virtual closed network;

(x) Those designed to be capable of being incorporated into items such as a computer.

Requirements
Router suppliers must provide Lenovo the following information with respect to the energy efficiency ratio of an applicable Router to meet the Japanese Energy Savings law:

(a) Product names, including manufacturer's name,
(b) Category letter and the Standard Energy Efficiency Ratio,
(c) Availability of 2.4 GHz band wireless output power (for Routers falling under category C, limited to cases of 2.4 GHz band wireless transmission only or of simultaneous transmission of waves of the two frequency bands),
(d) Availability of 5 GHz band wireless output power (for Routers falling under Category C, limited to cases of 5GHz band wireless transmission only or of simultaneous transmission of waves of the two frequency bands), and
(e) Energy efficiency ratio.

The above information must be included in a prominent location in a product catalog where either the performance of the Router is indicated or in a document used for the selection of a Router.

2.11.9 Servers and Data Storage Product Requirements for the EU

Requirements for the EU
References
EU Regulation 2019/424 laying down ecodesign requirements for servers and data storage products.
EN 303 470:2019 Energy Efficiency measurement methodology and metrics for servers.
Generalized Test Protocol for Calculating the Energy Efficiency of Internal AC-DC and DC-DC Power Supplies (80Plus program – EPRI and Ecova).

This regulation does not apply to the following products:

a) Servers intended for embedded applications;
b) Servers classified as small scale servers in terms of Regulation (EU) No 617/2013;
c) Servers with more than four processor sockets;
d) Server appliances;
e) Large servers;
f) Fully fault tolerant servers;
g) Network servers;
h) Small data storage products;
i) Large data storage products.

Definitions
Server means a computing product that provides services and manages networked resources for client devices, such as desktop computers, notebook computers, desktop thin clients, internet protocol telephones, smartphones, tablets, tele-communication, automated systems or other servers, primarily accessed via network connections, and not through direct user input devices, such as a keyboard or a mouse and with the following characteristics:

a) it is designed to support server operating systems (OS) and/or hypervisors, and targeted to run user-installed enterprise applications;
b) it supports error-correcting code and/or buffered memory (including both buffered dual in-line memory modules and buffered on board configurations);
c) all processors have access to shared system memory and are independently visible to a single OS or hypervisor;

Server with more than four processor sockets means a server containing more than four interfaces designed for the installation of a processor. For multi-node servers, this term refers to a server having more than four processor sockets in each server node;

Embedded application means a software application that permanently resides in an industrial or consumer device, typically stored in a non-volatile memory such as read-only memory or flash memory;

Server appliance means a server that is not intended to execute user-supplied software, delivers services through one or more networks, is typically managed through a web or command line interface and is bundled with a pre-installed OS and application software that is used to perform a dedicated function or set of tightly coupled functions;

Resilient server means a server designed with extensive reliability, availability, serviceability and scalability features integrated in the micro architecture of the system, central processing unit (CPU) and chipset;

Large server means a resilient server which is shipped as a pre-integrated/pre-tested system housed in one or more full frame racks and that includes a high connectivity input/output subsystem with a minimum of 32 dedicated input/output slots;

Multi-node server means a server that is designed with two or more independent server nodes that share a single enclosure and one or more power supply units. In a multi-node server, power is distributed to all nodes through shared power supply units. Server nodes in a multi-node server are not designed to be hot-swappable;

Fully fault tolerant server means a server that is designed with complete hardware redundancy (to simultaneously and repetitively run a single workload for continuous availability in mission critical applications), in which every computing component is replicated between two nodes running identical and concurrent workloads (i.e., if one node fails or needs repair, the second node can run the workload alone to avoid downtime);

Network server means a network product which contains the same components as a server in addition to more than 11 network ports with a total line rate throughput of 12 Gb/s or more, the capability to dynamically reconfigure ports and speed and support for a virtualized network environment through a software defined network;

Data storage product means a fully-functional storage system that supplies data storage services to clients and devices attached directly or through a network. Components and subsystems that are an integral part of the data storage product architecture (e.g., to provide internal communications between controllers and disks) are considered to be part of the data storage product. In contrast, components that are normally associated with a storage environment at the data centre level (e.g. devices required for operation of an external storage area network) are not considered to be part of the data storage product. A data storage product may be composed of integrated storage controllers, data storage devices, embedded network elements, software, and other devices;

Hard Disk Drive (HDD) means a data storage device which reads and writes to one or more rotating magnetic disk platters;
Solid State Drive (SSD) means a data storage device that reads and writes to non-volatile solid state memory instead of rotating magnetic platters for data storage;
Data storage device means a device providing non-volatile data storage, with the exception of aggregating storage elements such as subsystems of redundant arrays of independent disks, robotic tape libraries, filers, and file servers and storage devices which are not directly accessible by end-user application programs, and are instead employed as a form of internal cache;
Online data storage product means a data storage product designed for online, random-access of data, accessible in a random or sequential pattern, with a maximum time to first data of less than 80 milliseconds;
Small data storage product means a data storage product containing a maximum of three data storage devices;
Large data storage product means a high end or mainframe data storage product that supports more than 400 data storage devices in its maximum configuration and with the following required attributes: no single point of failure, non-disruptive serviceability and integrated storage controller

2.11.9.1 Specific ecodesign requirements for servers and data storage products

PSU efficiency and power factor requirements
From 1 March 2020, for servers and online data storage products, with the exception of direct current servers and of direct current data storage products, the PSU efficiency at 10%, 20%, 50% and 100% of the rated load level and the power factor at 50% of the rated load level shall not be less than the values reported in the table below.

Minimum PSU efficiency and power factor requirements from 1 March 2020

	Minimum PSU efficiency				Minimum power factor
% of rated load	10 %	20 %	50 %	100 %	50 %
Multi output	—	88 %	92 %	88 %	0,90
Single output	—	90 %	94 %	91 %	0,95

From 1 January 2023, for servers and online data storage products, with the exception of direct current servers and of direct current data storage products, the PSU efficiency at 10%, 20%, 50% and 100% of the rated load level and the power factor at 50% of the rated load level shall not be less than the values reported in the table below.

Minimum PSU efficiency and power factor requirements from 1 January 2023

	Minimum PSU efficiency				Minimum power factor
% of rated load	10 %	20 %	50 %	100 %	50 %
Multi output	—	90 %	94 %	91 %	0,95
Single output	90 %	94 %	96 %	91 %	0,95

Material efficiency requirements

From 1 March 2020, manufacturers shall ensure that joining, fastening or sealing techniques do not prevent the disassembly for repair or reuse purposes of the following components, when present:

a) Data storage devices
b) Memory
c) Processor (CPUs)
d) Motherboard
e) Expansion card/graphic card
f) Power supply unit
g) chassis
h) batteries.

From 1 March 2020, a functionality for secure data deletion shall be made available for the deletion of data contained in all the data storage devices of the product.

From 1 March 2021, the latest available version of the firmware shall be made available from two years after the placing on the market of the first product of a certain product model for a minimum period of eight years after the placing on the market of the last product of a certain product model, free of charge or at a fair, transparent and nondiscriminatory cost. The latest available security update to the firmware shall be made available from the time a product model is placed on the market until at least eight years after the placing on the market of the last product of a certain product model, free of charge.

2.11.9.2 Specific ecodesign requirements for servers with one or two processor sockets

Idle State Power

From 1 March 2020, the idle state power (Pidle) of servers with the exception of resilient servers, HPC servers and servers with integrated APA, shall not exceed the value calculated using the following equation:

$P_{idle} = P_{base} + \Sigma P_{add_i}$

Where P_{base} is the basic idle state power allowance in the first Table below, and ΣP_{add_i} is the sum of

the idle state power allowances for applicable, additional components, as determined in the second Table below. For blade servers, P_{idle} is calculated as the total measured power divided by the number of installed blade servers in the tested blade chassis. For multi-node servers, the number of sockets are counted per node while P_{idle} is calculated as the total measured power divided by the number of installed nodes in the tested enclosure.

Base idle state power allowances

Product type	Base idle state power allowance, P_{base} (W)
1-socket servers (neither blade nor multi-node servers)	25
2-socket servers (neither blade nor multi-node servers)	38
Blade or multi-node servers	40

Additional Idle Power Allowances for Extra Components

System characteristics	Applies to	Additional idle power allowance
CPU Performance	All servers	1 socket: 10 × $Perf_{CPU}$ W 2 socket: 7 × $Perf_{CPU}$ W
Additional PSU	PSU installed explicitly for power redundancy	10 W per PSU
HDD or SSD	Per installed HDD or SSD	5,0 W per HDD or SSD
Additional memory	Installed memory greater than 4 GB	0,18 W per GB
Additional buffered DDR channel	Installed buffered DDR channels greater than 8 channels	4,0 W per buffered DDR channel

Additional I/O devices	Installed devices greater than two ports of ≥ 1 Gbit, on-board Ethernet	< 1 Gb/s: No Allowance
		= 1 Gb/s: 2,0 W/Active Port
		> 1 Gb/s and < 10 Gb/s: 4,0 W/Active Port
		≥ 10 Gb/s and < 25Gb/s: 15,0 W/Active Port
		≥ 25 Gb/s and < 50Gb/s: 20,0 W/Active Port
		≥ 50 Gb/s 26,0 W/Active Port

Active state efficiency

From 1 March 2020, the active state efficiency (Eff_{server}) of servers, with the exception of resilient servers, HPC servers and servers with integrated APA, shall not be lower than the values in table below.

Active state efficiency requirements

Product type	Minimum active state efficiency
1-socket servers	9,0
2-socket servers	9,5
Blade or multi-node servers	8,0

2.11.9.3 Information to be provided by manufacturers

2.11.9.3.1

From 1 March 2020, with the exception of custom made servers, made on a one-off basis, the following product information on servers shall be provided in the instruction manuals for installers and end-users (when present with the product), and on the free-access websites of manufacturers, their authorised representatives and importers from the time a product model is placed on the market until at least eight years after the placing on the market of the last product of a certain product model:

a) product type;
b) manufacturer's name, registered trade name and registered trade address at which they can be contacted;
c) product model number, and if applicable the low-end performance configuration and the high-end performance configuration model numbers;
d) year of manufacture;
e) PSU efficiency at 10% (if applicable), 20%, 50% and 100% of rated output power, with the exception of direct current servers, expressed in % and rounded to the first decimal place;

f) power factor at 50% of the rated load level, with the exception of direct current servers, rounded to three decimal places;
g) PSU rated power output (Watts), rounded to the nearest integer. If a product model is part of a server product family, all PSUs offered in a server product family shall be reported with the information specified in (5) and (6);
h) idle state power expressed in Watts and rounded to the first decimal place;
i) list of all components for additional idle power allowances, if any (additional PSU, HDDs or SSDs, additional memory, additional buffered DDR channels, additional I/O devices);
j) maximum power expressed in Watts and rounded to the first decimal place;
k) declared operating condition class;
l) idle state power (Watts) at the higher boundary temperature of the declared operating condition class;
m) the active state efficiency and the performance in active state of the server;
n) information on the secure data deletion functionality, including instructions on how to use thefunctionality, the techniques used and the supported secure data deletion standard(s), if any;
o) or blade servers, a list of recommended combinations with compatible chassis;
p) if a product model is part of a server product family, a list of all model configurations that are represented by the model shall be supplied.

If a product model is part of a server product family, the product information required for items e) to m) shall be reported for the low-end and high-end performance configurations of the server product family.

2.11.9.3.2

From 1 March 2020, with the exception of custom made data storage products, made on a one-off basis, the following product information on online data storage products shall be provided in the instruction manuals for installers and end-users (when present with the product), and on the free-access websites of manufacturers, their authorised representatives and importers from the time a product model is placed on the market until at least eight years after the placing on the market of the last product of a certain product model:

a) product type;
b) manufacturer’s name, registered trade name and registered trade address at which they can be contacted;
c) product model number,
d) year of manufacture;
e) PSU efficiency at 10% (if applicable), 20%, 50% and 100% of rated output power, with the exception of direct current online data storage products, expressed in % and rounded to the first decimal place;
f) power factor at 50% of the rated load level, with the exception of direct current online data storage products, rounded to three decimal places;
g) declared operating condition class; it shall also be indicated that 'This product has been tested in order to verify that it will function within the boundaries (such as temperature and humidity) of the declared operating condition class';
h) information on the data deletions tool(s), including instructions on how to use the

functionality, the techniques used and the supported secure data deletion standard(s), if any.

2.11.9.3.3
From 1 March 2020, the following product information on servers and online data storage products shall be made available from the time a product model is placed on the market until at least eight years after the placing on the market of the last product of a certain product model free of charge by manufacturers, their authorized representatives and importers to third parties dealing with maintenance, repair, reuse, recycling and upgrading of servers (including brokers, spare parts repairers, spare parts providers, recyclers and third party maintenance) upon registration by the interested third party on a website provided:

a) indicative weight range (less than 5 g, between 5 g and 25 g, above 25 g) at component level, of the following critical raw materials:
   i. Cobalt in the batteries;
   ii. Neodymium in the HDDs;
b) instructions on the disassembly operations referred to in point 1.2.1 of this Annex, including, for each necessary operation and component:
   i. the type of operation;
   ii. the type and number of fastening technique(s) to be unlocked;
   iii. the tool(s) required.

In the case of servers, if a product model is part of a server product family, the product information required for items a) and b) under point 3.3 shall be reported either for the product model or, alternatively, for the low-end and high-end configurations of the server product family.

2.11.9.4
From 1 March 2020, the following product information on servers and online data storage products shall be provided in the technical documentation for the purposes of conformity assessment pursuant to Article 4:

a) Information listed in points 2.11.9.1 and 2.11.9.3, in the case of servers
b) Information listed in points 2.11.9.2 and 2.11.9.3, in the case of data storage products

2.11.10 Requirements for California
2.11.10.1 Computers

References
California Appliance Efficiency (CEC) Regulations – Appliance Efficiency Rulemaking for Computers, Computer Monitors, and Signage Displays. Regulation and details are located at: http://www.energy.ca.gov/

CEC Amended Title 20 Computer and Monitor Regulations: see here.

Scope/Requirements
Effective Date for Implementation: January 1, 2019

Desktop computers, thin clients, mobile gaming systems, portable all-in-ones, and notebook computers manufactured on or after January 1, 2019 shall either:

(A) Comply with Table V-7

(B) Be shipped with power management settings that do both of the following:

1) Transition the computer into either the computer sleep mode or computer off mode measured in Section 1604(v)() within 30 minutes of user inactivity. If the transition is to a computer sleep mode, that sleep mode shall either:

   a. Be a computer sleep mode as described in ACPI as S3; or

   b. Consume power less than or equal to the values shown in Table V-6.

2) Transition connected displays into sleep mode within 15 minutes of user inactivity.

EXCEPTION: If the model is shipped at the purchaser's request with either a limited capability operating system or without an operating system, or if the model is not capable of having an operating system, the model is not required to comply with Section 1605.3(v)(5)(B).

EXCEPTION: Desktop computers and thin clients assembled before July 1, 2021, entirely from parts manufactured before September 1, 2018, are not required to comply with Section 1605.3(v)(5)(A).

Table V-6
Alternative Computer Sleep Mode Power Limits

Computer Type	Maximum Power Consumption (watts)
Workstations, Mobile Workstations, High Expandability Computers, Small Servers	10 + 0.03 * C where C is the system memory capacity in gigabytes minus 32 gigabytes. If C is less than zero, use zero for the value of C.
Desktop Computers, Thin Clients, Mobile Gaming Systems	5 + 0.03 * C where C is the system memory capacity in gigabytes minus 32 gigabytes. If C is less than zero, use zero for the value of C.
Notebook Computers, Portable All-In-Ones	2.5 + 0.03 * C where C is the system memory capacity in gigabytes minus 16 gigabytes. If C is less than zero, use zero for the value of C. If a discrete GPU is present in the system, the maximum power consumption limit shall be increased by an additional 2 watts

Table V-7
Energy Consumption Standards for Desktop Computers, Thin Clients, Notebook Computers, Mobile Gaming Systems, and Portable All-in-Ones

Computer Type	For models manufactured on or	For models manufactured on or after July 1, 2021, the measured

	after January, 1, 2019, and before July 1, 2021, the measured annual energy consumption shall be less than or equal to the values below.	annual energy consumption shall be less than or equal to the values below.
Desktop Computers, mobile gaming systems, and then clients with an ES of 250 or less	50 kWh/yr + applicable adders in Table V-8	50 kWh/yr + applicable adders in Table V-8
Desktop Computers, mobile gaming systems, and then clients with an ES more than 250 but no more than 425	80 kWh/yr + applicable adders in Table V-8	60 kWh/yr + applicable adders in Table V-8
Desktop Computers, mobile gaming systems, and then clients with an ES more than 425 but no more than 690	100 kWh/yr + applicable adders in Table V-8	75 kWh/yr + applicable adders in Table V-8
Notebook Computers and portable all-in -ones	30 kWh/yr + applicable adders in Table V-8	30 kWh/yr + applicable adders in Table V-8
Minimum power factor of a computer power supply that is not a federally-regulated external power supply	0.9 measured at full load	0.9 measured at full load

List of Potentially Applicable Adders

Function	Desktop Computer, Mobile Gaming System, and Thin Client Adder (kWh/yr)	Notebook Computers and Portable All-In-One Adder (kWh/yr)
System Memory	4 + 0.15 * C Where C is the capacity in GB.	4 + 0.15 * C Where C is the capacity in GB.
Energy-Efficient Ethernet	0.9 per computer	0.9 per computer
Storage device other than main storage device	3.5-inch Drive: 26 2.5-inch Drive: 4.5 Solid State Drive (SSD): 0.5 Solid State Hybrid Drive (SSHD): 1.0 Other: 26 per storage device	2.6 per storage device
Integrated Display Where: “d” is the diagonal measurement of the display in inches “r” is the megapixel resolution of the display “A” is the monitor screen area in square inches EP=0 for displays that are not enhanced performance displays	For d≤20: (8.76*0.35*(1+EP)* [(4.2*r) + 5.7])*0.8 For 20<d<23: (8.76*0.35*(1+EP)* [(4.2*r)+(0.02*A)+2.2])*0.8 For 23≤d<25: (8.76*0.35*(1+EP)* [(4.2*r)+(0.04*A)-2.4])*0.8 For 25≤d: (8.76*0.35*(1+EP)* [(4.2*r)+(0.07*A)-10.2])*0.8 r=6 for resolutions greater than 6 megapixels	(8.76*0.3*(1+EP)* [(0.43*r)+(0.0263*A)] r=6 for resolutions greater than 6 megapixels EP+0.4 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors).

	Before July 1, 2021: EP=0.3 for displays with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors); and EP=0.75 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors On or after July 1, 2021: EP=0.2 for displays with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors); and EP=0.6 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors	
For a multi-screen notebook, this adder is applied for each integrated display that is enabled when shipped and shall show the same test image during testing.	For 25<d: (8.76*0.35*(1+EP)*[(4.2*r)+(0.07*A)-10.2])*0.8 r=6 for resolutions greater than 6 megapixels Before July 1, 2021: EP=0.3 for displays with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors); and EP=0.75 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors). On or after July 1, 2021: EP=0.2 for displays with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors); and EP=0.6 for displays with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors).*	
First discrete GPU that is not packaged on the same substrate as the CPU (on or after January 1, 2019 and before July 1, 2021) Where “B” is frame buffer bandwidth measured in GB/s	58.6*tanh(0.0038*B-0.137)+26.8	29.3*tanh(0.0038*B-0.137)+13.4
First discrete GPU that is not packaged on the same substrate as the CPU (on or after July 1, 2021) Where “B” is frame buffer bandwidth measured in GB/s	29.4*tanh(0.008*B-0.03)+11+(0.011*B)	14.7*tanh(0.008*B-0.03)+5.5+(0.0055*B)
First discrete GPU that is packaged on the same substrate as the CPU (on or after July 1, 2021) Where “B” is frame buffer bandwidth measured in GB/s	29.4*tanh(0.008*B-0.03)+11+(0.011*B)	14.7*tanh(0.008*B-0.03)+5.5+(0.0055*B)
Additional Discrete GPU	11 per GPU	5.5 per GPU

Add-in Cards This adder does not apply if either of the following criteria is met: 1) An adder is claimed for a device connected through this add-in-card; or 2) An interface score from Table V-1 applies to a slot or interface provided by this add-in-card	10 per card	5 per card
Video Surveillance Card	25 per card	12.5 per card
Wired Ethernet with a transmit rate of greater than 1 Gb/s and less than 10 Gb/s that is not an Add-in card	4 per computer	0
Wired Ethernet or Fiber Card with a transmit rate of 10 Gb/s or greater	25 per card	12.5 per card
High bandwidth system memory, where "S" is system memory bandwidth measured in GBs. This adder does not apply to a computer that meets any of the following criteria: 1) Expandability score includes a credit for 4-channel memory. 2) System memory bandwidth Is less than 146 GB/s 3) Less than 4 GB of the system memory has a bandwidth of 146 GB/s or more and either: a) Has an integrated display with a resolution of 9 megapixels or less; or b) Does not have an integrated display. 4) Uses an adder for a first discrete GPU.	22.78*tanh[0.006*(S-70)+0.15]-12.33	9.11*tanh[0.006*(S-70)+0.15]-4.45

2.11.10.2 Small-scale servers, high expandability computers, mobile workstations, and workstations

Small-scale servers, high expandability computers, mobile workstations, and workstations manufactured on or after January 1, 2018, shall:

(A) Be powered by an internal power supply that meets or exceeds the standards in Table V-9, or an external power supply that meets the level VI of efficiency described in the *International Efficiency Marking Protocol for External Power Supplies Version 3.0* (Sept. 2013);

(B) Incorporate Energy-Efficient Ethernet functionality;

(C) Transition connected displays into sleep mode within 15 minutes of user inactivity; and

(D) Transition the computer into either the computer sleep mode or computer off mode measured

in Section 1604(v)(5) within 30 minutes of user inactivity. If the transition is to a computer sleep mode, that sleep mode shall either:

1. Be a computer sleep mode as described in ACPI as S3; or
2. Consume power less than or equal to the values shown in Table V-6.

EXCEPTION: to section 1605.3(v)(6)(6)(D): Small-scale servers and rack-mounted workstations are not required to comply with section 1605.3(v)(6)(D) of this Article.

Table V-9
Internal Power Supply Requirements

115V power supplies				
10% load	20% load	50% load	100% load	Power Factor Correction
--	87%	90%	87%	0.9 at 50% load
230V power supplies				
10% load	20% load	50% load	100% load	Power Factor Correction
--	88%	92%	88%	0.9 at 50% load

2.11.10.3 Monitors

Scope/Requirements for California, Washington, and Colorado

References
California Appliance Efficiency (CEC) Regulations – Appliance Efficiency Rulemaking for Computers, Computer Monitors, and Signage Displays. Regulation and details are located at: http://www.energy.ca.gov/
Washington Appliance Efficiency Standards Chapter 286, Laws of 2019
Colorado Revised Statutes Article 7.5 Water and Energy Efficiency Standards

CEC Amended Title 20 Computer and Monitor Regulations: see here.

Effective Date for Implementation (California): July 1, 2019

Requirements
Computer monitors manufactured on or after July 1, 2019, shall comply with the energy efficiency standards in CEC Appliance Efficiency Rulemaking for Computers, Computer Monitors, and Signage Displays in Section 1605.3 including Table V-4. Medical computer monitors are not required to comply with Section 1605.3(v)(4) or the test procedures in Section 1604(v)(4).

Manufacturers of Computer monitors, and Medical computer monitors must comply with the

certification requirements in Section 1606 (Filing by Manufacturers with the State of California) for each of the products sold or offered for sale in California as well as the marking requirements in Section 1607 (manufacturer's name, model number and date of manufacture).

Rack mounted displays are out of scope of this regulation.

- Computer monitors manufactured on or after July 1, 2019 shall comply with all of the following:

(A) The computer monitor on-mode power draw shall be less than or equal to the following equation with each of the applicable allowances applied at most once:

$E_{on} \leq (E_{on_max} + E_{EP} + E_{Game} + E_{FRRG} + E_{OLED} + E_{Curve})$

- E_{on} is the computer monitor on-mode power draw in enhanced performance display allowance in watts,
- E_{on_max} is the maximum on-mode power draw in watts as determined by Table V-4,
- E_{EP} is the enhanced performance display allowance in watts as determined in Table V-5,
- E_{Game} is the gaming monitor allowance in watts as determined in Table V-5,
- E_{FRRG} is the fast refresh rate gaming monitor allowance in watts as determined in Table V-5,
- E_{OLED} is the OLED monitor allowance in watts as determined in Table V-5, and
- E_{Curve} is the curved monitor allowance in watts as determined in Table V-5.

(B) Consume less than or equal to 1.2 watts in computer monitor sleep mode and computer monitor off mode power combined.
(C) Be shipped with a screen luminance less than or equal to 200 cd/m^2 ± 35 percent. A manufacturer may ship with additional features enabled, even if they were turned off in testing.
(D) Computer monitors with touch screen capability are allowed an additional 1 watt allowance per mode in modes where touch functionality is enabled
(E) EXCEPTIONS to Section 1605.3(v)(4): The following computer monitors are not required to comply with Section 1605.3(v)(4) but shall comply with the test procedures in Section 1604(v)(4), the certification requirements in Section 1606, and the marking requirements in Section 1607:

- 1. KVMs.
- 2. KMMs.
- 3. Very high performance monitors.

(F) EXCEPTION to Section 1605.3(v)(4): Medical computer monitors are not required to comply with Section 1605.3(v)(4) or the test procedures in Section 1604(v)(4) but shall comply with the certification requirements in Section 1606 and the marking requirements in Section 1607.

Table V-4
Power Consumption Standards for Computer Monitors

Resolution in megapixels (MP)	Diagonal Screen Size (d) in Inches	Maximum Computer Monitor On Mode Power Consumption in Watts
≤ 5.0 MP	17”≤d≤20”	[(6.0*r) + (0.025*A) + 3.7]
	20”<d<23”	[(4.2*r) + (0.02*A) + 2.2]
	23”≤d<25”	[(4.2*r) + (0.04*A) - 2.4]
	25”≤d<30”	[(4.2*r) + (0.07*A) - 10.2]
	30”≤d≤61”	[(6.0*r) + (0.1*A) – 14.5]
> 5.0 MP	17”≤d≤20”	[25+ (0.025*A) + 3.7]
	20”<d<23”	[25 + (0.02*A) + 2.2]
	23”≤d<25”	[25 + (0.04*A) - 2.4]
	25”≤d<30”	[25 + (0.07*A) - 10.2]
	30”≤d≤61”	[25 + (0.01*A) – 14.5]
Where: “A” is the monitor screen area in square inches “d” is the diagonal measurement of the display in inches “r” is the megapixel resolution of the display.		

Table V-5
List of Potentially Applicable Allowances

Allowance	Computer Monitor Type	Models manufactured on or after July 1, 2019, and before January 1, 2021	Models manufactured on or after January 1, 2021,
E_{EP}	Enhanced Performance Display with a color gamut support of 32.9% of CIELUV or greater (99% or more of defined sRGB colors)	.3 * Eon_max	.2 * Eon_max
	Enhanced Performance Display with a color gamut support of 38.4% of CIELUV or greater (99% or more of defined Adobe RGB colors)	.75 * Eon_max	.6 * Eon_max
E_{Game}	Gaming Monitors without incremental hardware-based assistance	.3 * Eon_max	.2 * Eon_max
	Gaming Monitors with incremental hardware-based assistance	.35 * Eon_max	.3 * Eon_max

E_{FRRG}	Fast refresh rate gaming monitor with MRR less than 480 Hertz	0	[0.0025*(MRR-300) + 0.25] * E_{on_max}
	Fast refresh rate gaming monitor with MRR of 480 Hertz or more	0	0.7 * $E_{on\ max}$
E_{OLED}	OLED monitor	.3 * Eon_max	.2 * Eon_max
E_{Curve}	Curved Monitor	.3 * Eon_max	.2 * Eon_max
Where "MRR" is the maximum refresh rate in Hertz			

The Computers and Displays regulations are in affect and can be referenced here (sections 1602, 1604, 1605.3, etc).

Requirements for the EU and other CE Marking jurisdictions
References
EU Commission Regulation No 801/2013 of 22 August 2013 amending Regulation (EC) No 1275/2008 with regard to ecodesign requirements for standby, off mode electric power consumption of electrical and electronic household and office equipment
EU Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products
Jordan JSNO 2090/2013 Technical Regulation on eco-design requirements for energy related products
Jordan JSNO 2109/2013 Technical Regulation on eco-design requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment

2.11.11 Requirements for the EU and other jurisdictions which transpose EU directives
2.11.11.1 Monitors

References
EU Commission Regulation No 801/2013 of 22 August 2013 amending Regulation (EC) No 1275/2008 with regard to ecodesign requirements for standby, off mode electric power consumption of electrical and electronic household and office equipment.
EU Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products.
EU Regulation 2019/2021 laying down ecodesign requirements for electronic displays pursuant to Directive 2009/125/EC of the European Parliament and of the Council, amending Commission Regulation (EC) No 1275/2008 and repealing Commission Regulation (EC) No 642/2009.
EU Regulation 2019/2013 of 11 March 2019 supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of electronic displays and

repealing Commission Delegated Regulation (EU) No 1062/2010.
EU Regulation 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU.
Israel Energy Sources (Maximum Electric Power in Standby Mode for Home and Office Appliances), 5771-2011 Regulations
Jordan JSNO 2109/2013 Technical Regulation on eco-design requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment.

Requirements
For EU Regulation 2019/2021 ecodesign requirements for Electronic Displays, see below. Refer to the regulation for more definitions and specific requirements including testing.

Definitions
Electronic Display means a display screen and associated electronics that, as its primary function, displays visual information from wired or wireless sources;
Monitor or computer monitor, or computer display means an Electronic Display intended for one person for close viewing such as in a desk-based environment;
Status display means a display used to show simple but changing information such as selected channel, time or power consumption. A simple light indicator is not considered a status display;
Control panel means an electronic display whose main function is to display images associated with product operational status; it may provide user interaction by touch or other means to control the product operation. It may be integrated into products or specifically designed and marketed to be used exclusively with the product;
Professional display means an electronic display designed and marketed for professional use for editing video and graphic images. Its specification shall include all of the following features:

a) a contrast ratio of at least 1000:1 measured at a perpendicular to the vertical plane of the screen and at least 60:1 measured at a horizontal viewing angle of at least 85° relative to that perpendicular and at least 83° from the perpendicular on a curved screen, with or without a screen cover glass;
b) a native resolution of at least 2,3 mega pixels;
c) colour Gamut support is 38,4 % of CIE LUV or greater (equivalent to greater than 99 % of Adobe RGB and over 100 % of sRGB colour space). Shifts in colour space are allowable as long as the resultant colour space is at least 38,4 % of CIE LUV. Colour and luminance uniformity shall be as required for grade 1 monitors;

Security display means an electronic display whose specification shall include all of the following features:

A - self-monitoring function capable of communicating at least one of the following information to a remote server:

- power status;
- internal temperature from anti-overload thermal sensing;
- video source;
- audio source and audio status (volume/mute);
- model and firmware version;

B - user-specified specialist form factor facilitating the installation of the display into professional

housings or consoles;

Integrated referring to a display which is part of another product as a functional component, means an electronic display that is not able to be operated independently from the product and that depends on it for providing its functions, including power;

Medical display means an electronic display covered by the scope of:

a) Council Directive 93/42/EEC (16) concerning medical devices; or
b) Regulation (EU) 2017/745 of the European Parliament and of the Council (17) on medical devices; or
c) Council Directive 90/385/EEC (18) on the approximation of the laws of the Member States relating to active implantable medical devices; or
d) Directive 98/79/EC of the European Parliament and of the Council (19) on in vitro diagnostic medical devices; or
e) Regulation (EU) 2017/746 of the European Parliament and of the Council (20) on in vitro diagnostic medical devices;

This regulation applies to electronic displays, including televisions, **monitors** and digital signage displays

This Regulation shall not apply to the following:

a) any Electronic Display with a screen area smaller than or equal to 100 square centimeters;
b) projectors;
c) all-in-one video conference systems;
d) medical displays;
e) virtual reality headsets;
f) displays integrated or to be integrated into products listed into Article 2, point 3(a) and point 4 of Directive 2012/19/EU (WEEE) (equipment which is necessary for the protection of the essential interests of the security of Member States, including arms, munitions and war material intended for specifically military purposes; equipment designed to be sent into space; large-scale stationary industrial tools; large-scale fixed installations, except any equipment which is not specifically designed and installed as part of those installations; means of transport for persons or goods, excluding electric two-wheel vehicles which are not type-approved; non-road mobile machinery made available exclusively for professional use; equipment specifically designed solely for the purposes of research and development that is only made available on a business-to-business basis; medical devices and in vitro diagnostic medical devices, where such devices are expected to be infective prior to end of life, and active implantable medical devices.)
g) displays that are components or subassemblies of products covered by implementing measures adopted under Directive 2009/125/EC (EU Directive 2009/125/EC establishing a framework for the setting of ecodesign requirements for energy-related products.)

Requirements

The requirements in points A (Energy Efficiency Requirements) and B (Allowances and Adjustments for the purpose of the EEI Calculation and functional requirements) of Annex II of this regulation shall not apply to the following displays:

a) broadcast displays;
b) professional displays;
c) security displays;
d) digital interactive whiteboards;
e) digital photo frames;
f) digital signage displays.

For the displays above, points C (Off mode, standby and networked standby mode requirements), D (Material Efficiency Requirements) and E (Information Availability Requirements) of Annex II of this regulation do apply.

The requirements in points A, B and C (Off mode, standby and networked standby mode requirements) of Annex II of this regulation shall not apply to the following displays:

a) status displays;
b) control panels.

For status displays and control panels, the requirements in points D (Material Efficiency Requirements) and E (Information Availability Requirements) of Annex II of the regulation do apply.

These requirements are effective from 1 March 2021, except for the requirements in this paragraph only which are in effect at this time. The Electronic Display must not be designed to be able to detect they are being tested (e.g. by recognizing the test conditions or test cycle) and to react specifically by automatically altering their performance during the test with the aim of reaching a more favorable level, for any of the parameters required. The energy consumption of the product and any of the other declared parameters shall not deteriorate after a software or firmware update when measured with the same test standard originally used. No performance change shall occur as result of rejecting the update. A software update shall never have the effect of changing the product's performance in a way that makes it non-compliant with the ecodesign requirements applicable. This paragraph is effective at this time.

The Electronic Display must meet all of the energy efficiency and ecodesign requirements as outlined in Annex II of the regulation. Control panels must meet the Material Efficiency requirements in Point D and Information availability requirements in Point E of Annex II of the regulation only.

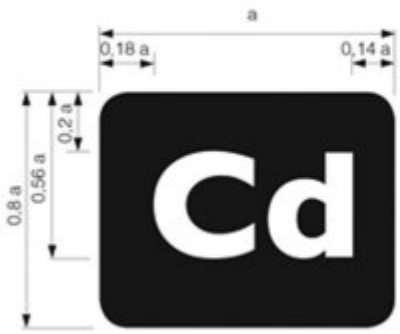
Manufacturers shall ensure that joining, fastening or sealing techniques do not prevent the removal, using commonly available tools, of the components indicated in point 1 of Annex VII of Directive 2012/19/EU (WEEE) or in Article 11 of Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators.

Manufacturers and importers shall make available, on a free-access website, the dismantling information needed to access the components referred to in point 1 of Annex VII of Directive 2012/19/EU (WEEE). This dismantling information shall include the sequence of dismantling steps, tools or technologies needed to access the targeted components. The end of life information shall be available until at least 15 years after the placing on the market of the last unit of a product model.

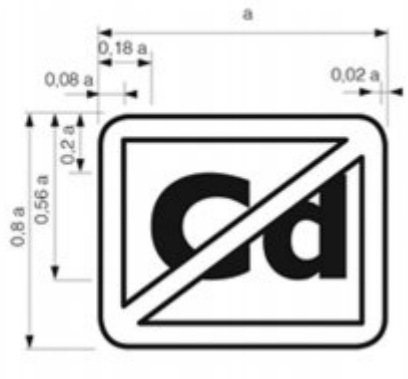
Plastic components > 50 grams shall be marked in accordance with Article II of the regulation. See Section 2.3.2 of this specification or the regulation for more detail.

Electronic Displays which have concentration values of Cadmium (Cd) by weight in homogeneous materials exceeding 0.01 % as defined in Directive 2011/65/EU (RoHS) on the restriction of the use of certain hazardous substances in electrical and electronic equipment, shall be labeled with the 'Cadmium inside' logo. The logo shall be clearly visible durable, legible and indelible. The logo shall be in the form of the following graphic:

Cadmium inside



Cadmium free



The dimension of 'a' shall be greater than 9 mm and the typeface to be used is 'Gill Sans'.

An additional 'Cadmium inside' logo shall be firmly attached internally on the display panel or molded in a position clearly visible to workers once the external back cover bearing the external logo is removed.

A 'Cadmium free' logo shall be used if concentration values of Cadmium (Cd) by weight in any homogeneous material part of the display do not exceed 0.01 % as defined in Directive 2011/65/EU (RoHS).

The use of halogenated flame retardants is not allowed in the enclosure and stand of Electronic Displays.

Access to repair and maintenance information

After a period of two years after the placing on the market of the first unit of a model or of an equivalent model, and until the end of the period mentioned under (a), the manufacturer shall provide access to the appliance repair and maintenance information to professional repairers. See the regulation for specific details such as registration, technical competence of the repairer, insurance coverage, and fees.

From 1 March 2021, the manufacturer shall make available the information below. The information shall be provided free of charge to third parties dealing with professional repair and reuse of Electronic Displays.

Availability of software and firmware updates.

a) The latest available version of the firmware shall be made available for a minimum period of eight years after the placing on the market of the last unit of a certain product model, free of charge or at a fair, transparent and nondiscriminatory cost. The latest available security update to the firmware shall be made available until at least eight years after the placing on the market of the last product of a certain product model, free of charge.
b) Information on the minimum guaranteed availability of software and firmware updates, availability of spare parts and product support shall be indicated in the product information sheet as from Annex V of Regulation (EU) 2019/2013.

The manufacturer of the electronic display must provide this information to IBM upon request including a Declaration of Conformity and Technical Documentation.

For EU Regulation 2019/2013 energy labeling of Electronic Displays see below. Refer to the regulation for more definitions and specific requirements.

Definitions
Electronic Display means a display screen and associated electronics that, as its primary function, displays visual information from wired or wireless sources;
Monitor or computer monitor, or computer display means an electronic display intended for one person for close viewing such as in a desk based environment;
Status display means a display used to show simple but changing information such as selected channel, time or power consumption. A simple light indicator is not considered a status display
Control panel means an electronic display whose main function is to display images associated with product operational status; it may provide user interaction by touch or other means to control the product operation. It may be integrated into products or specifically designed and marketed to be used exclusively with the product;
'security display' means an electronic display whose specification shall include all of the following features:

(a) self-monitoring function capable of communicating at least one of the following information to a remote server:
- power status;
- internal temperature from anti-overload thermal sensing;

- video source;
- audio source and audio status (volume/mute);
- model and firmware version;

(b) user-specified specialist form factor facilitating the installation of the display into professional housings or consoles;

Medical display means an electronic display covered by the scope of:

a) Council Directive 93/42/EEC (10) concerning medical devices; or
b) Regulation (EU) 2017/745 of the European Parliament and of the Council (11) on medical devices; or
c) Council Directive 90/385/EEC (12) on the approximation of the laws of the Member States relating to active implantable medical devices; or
d) Directive 98/79/EC of the European Parliament and of the Council (13) on in vitro diagnostic medical devices; or
e) Regulation (EU) 2017/746 of the European Parliament and of the Council (14) on in vitro diagnostic medical devices.

Requirements – see Regulation for more details and requirements

This regulation applies to electronic displays, including televisions, monitors and digital signage displays.

This Regulation shall not apply to the following:

a) any Electronic Display with a screen area smaller than or equal to 100 square centimeters;
b) projectors;
c) all-in-one video conference systems;
d) medical displays;
e) virtual reality headsets;
f) displays integrated or to be integrated into products listed in points 3(a) and 4 of Article 2 of Directive 2012/19/EU of the European Parliament and of the Council (8);
g) electronic displays that are components or subassemblies of products covered by implementing measures adopted under Directive 2009/125/EC;
h) broadcast displays;
i) security displays;
j) digital interactive whiteboards;
k) digital photo frames;
l) digital signage displays which meet any of the following characteristics:
    1) designed and constructed as a display module to be integrated as a partial image area of a larger display screen area and not intended for use as a standalone display device;
    2) distributed self-contained in an enclosure for permanent outdoor use;
    3) distributed self-contained in an enclosure with a screen area less than 30 dm2 or greater than 130 dm2;
    4) the display has a pixel density less than 230 pixels/cm2 or more than 3025 pixels/cm2;
    5) a peak white luminance in standard dynamic range (SDR) operating mode of greater than or equal to 1000 cd/m2;

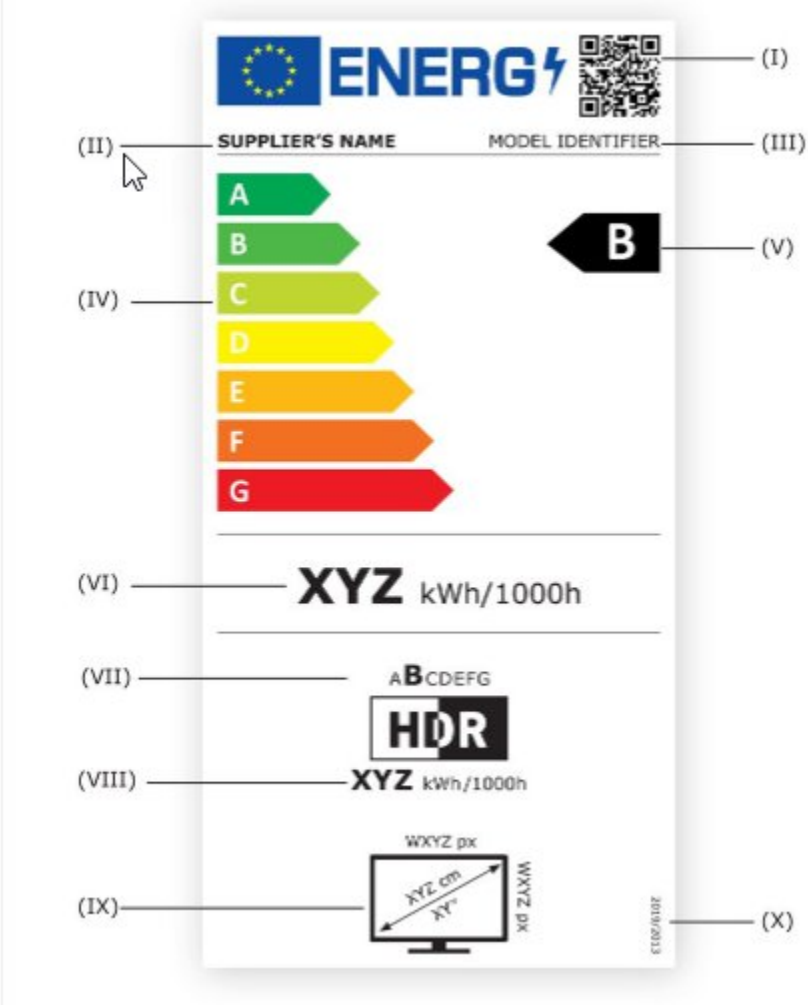
6) no video signal input interface and display drive allowing the correct display of a standardized dynamic video test sequence for power measurement purposes;
m) status displays;
n) control panels.

Supplier shall ensure that:
Electronic Displays are labeled in a printed form in the format and containing the information set out in Annex III of this regulation. This label shall also be printed on the packaging or adhered to the packaging.

The parameters of the product information sheet, found in Annex V of the regulation must be entered into the product database.

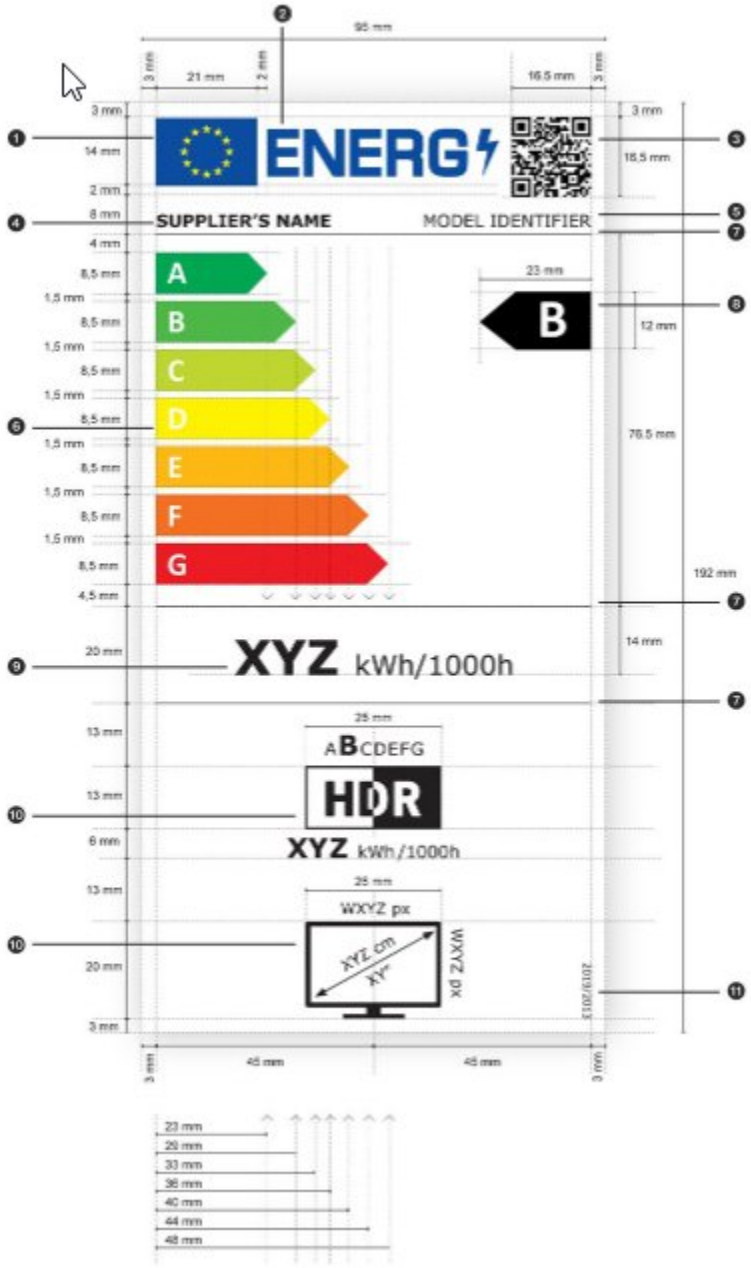
The content of the technical documentation, found in Annex VI of the regulation, must be entered into the product database.

The following information shall be included in the label for Electronic Displays:



I. QR code;
II. supplier's name or trademark;
III. supplier's model identifier;
IV. scale of energy efficiency classes from A to G;
V. the energy efficiency class determined in accordance with point B of Annex II when using PmeasuredSDR;
VI. on mode energy consumption in kWh per 1000 h, when playing SDR content, rounded to the nearest integer;
VII. the energy efficiency class determined in accordance with point B of Annex II when using PmeasuredHDR;
VIII. the on mode energy consumption in kWh per 1000 h, when playing HDR content, rounded to the nearest integer;
IX. visible screen diagonal in centimeters and inches and horizontal and vertical resolution in pixels;
X. the number of this Regulation, that is '2019/2013'.

The label design must follow the format below (see regulation for dimensions, coloration, typeface, etc.)



Whereby:

a) The label shall be at least 96 mm wide and 192 mm high. Where the label is printed in a larger format, its content shall nevertheless remain proportionate to the specifications above. For electronic displays with a size of the diagonal of the visible area less than 127 cm (50 inches), the label can be printed scaled down, but not less than 60 % of its normal size; its content shall nevertheless be proportionate to the specifications above and the QR code still readable by a commonly available QR reader, such as those integrated in a smartphone.

b) The background of the label shall be 100 % white.

c) The typefaces shall be Verdana and Calibri.

d) The dimensions and specifications of the elements constituting the label shall be as indicated in the label design.

e) Colours shall be CMYK — cyan, magenta, yellow and black, following this example: 0,70,100,0: 0 % cyan, 70 % magenta, 100 % yellow, 0 % black.

f) The label shall fulfil all the following requirements (numbers refer to the figure above):

❶ the colours of the EU logo shall be as follows:

— the background: 100,80,0,0;

— the stars: 0,0,100,0;

❷ the colour of the energy logo shall be: 100,80,0,0;

❸ the QR code shall be 100 % black;

❹ the supplier's name shall be 100 % black and in Verdana Bold 9 pt;

❺ the model identifier shall be 100 % black and in Verdana Regular 9 pt;

❻ the A to G scale shall be as follows:

— the letters of the energy efficiency scale shall be 100 % white and in Calibri Bold 19 pt; the letters shall be centred on an axis at 4,5 mm from the left side of the arrows;

— the colours of the A to G scale arrows shall be as follows:

— A-class: 100,0,100,0;

— B-class: 70,0,100,0;

— C-class: 30,0,100,0;

— D-class: 0,0,100,0;

— E-class: 0,30,100,0;

— F-class: 0,70,100,0;

— G-class: 0,100,100,0;

❼ the internal dividers shall have a weight of 0,5 pt and the colour shall be 100 % black;

❽ the letter of the energy efficiency class shall be 100 % white and in Calibri Bold 33 pt. The energy efficiency class arrow and the corresponding arrow in the A to G scale shall be positioned in such a way that their tips are aligned. The letter in the energy efficiency class arrow shall be positioned in the centre of the rectangular part of the arrow which shall be 100 % black;

❾ the energy consumption value in SDR shall be in Verdana Bold 28 pt; 'kWh/1 000h' shall be in Verdana Regular 16 pt. The text shall be centred and in 100 % black;

❿ the HDR and the screen pictograms shall be 100 % black and as shown as in the label design; the texts (numbers and units) shall be 100 % black, and as follows:

— above the HDR pictogram, the letters of energy efficiency classes (A to G) shall be centred, with the letter of the applicable energy efficiency class in Verdana Bold 16 pt and the other letters in Verdana Regular 10 pt; under the HDR pictogram, the energy consumption value in HDR shall be centred, in Verdana Bold 16 pt with 'kWh/1 000h' in Verdana Regular 10 pt;

— the texts of the screen pictogram shall be in Verdana Regular 9 pt and placed as in the label design;

⓫ the number of the regulation shall be 100 % black and in Verdana Regular 6 pt.

Product Information Sheet

The supplier shall enter into the product database the information as set out in the table below.

The product manual or other literature provided with the product shall clearly indicate the link to the model in the product database as a human-readable Uniform Resource Locator (URL) or as QR-code or provide the product registration number.

Information, order and format of the product information sheet

	Information	Value and precision	Unit	Notes
1.	Supplier's name or trade mark	TEXT		
2.	Supplier's model identifier	TEXT		
3.	Energy efficiency class for standard Dynamic Range (SDR)	[A/B/C/D/E/F/G]		If the product database automatically generates the definitive content of this cell, the supplier shall not enter this data.
4.	On mode power demand for Standard Dynamic Range (SDR)	X,X	W	Rounded to the first decimal place for power values below 100 W, and rounded to the first integer for power values from 100 W.
5.	Energy efficiency class (HDR)	[A/B/C/D/E/F/G] or n.a.		If the product database automatically generates the definitive content of this cell, the supplier shall not enter this data. Value set to 'n.a.' (not applicable) if HDR not implemented.
6.	On mode power demand in High Dynamic Range (HDR) mode	X,X	W	Rounded to the first decimal place for power values below 100 W, and rounded to the first integer for power values from 100 W (value set to 0 (zero) if 'not applicable').
7.	Off mode, power demand	X,X	W	
8.	Standby mode power demand	X,X	W	

	Information	Value and precision			Unit	Notes
9.	Networked standby mode power demand	X,X			W	
10.	Electronic display category	[television/monitor/ signage/other]				Select one.
11.	Size ratio	X	:	Y	integer	E.g. 16:9, 21:9, etc.
12.	Screen resolution (pixels)	X	x	Y	pixels	Horizontal and vertical pixels
13.	Screen diagonal	X,X			cm	In cm according to the International System of Units (SI), rounded to the nearest decimal place.
14.	Screen diagonal	X			inches	Optional, in inches rounded to the nearest integer place.
15.	Visible screen area	X,X			cm^2	Rounded to the one decimal place
16.	Panel technology used	TEXT				E.g. LCD/LED LCD/QLED LCD/ OLED/MicroLED/QDLED/SED/FED/ EPD, etc.
17.	Automatic Brightness Control (ABC) available	[YES/NO]				Must be activated as default (if YES).
18.	Voice recognition sensor available	[YES/NO]				
19.	Room presence sensor available	[YES/NO]				Must be activated as default (if YES).
20.	Image refresh frequency rate	X			Hz	
21.	Minimum guaranteed availability of software and firmware updates (until):	GG MM AAAA			date	As from Annex II E, point 1 of Commission Regulation (EU) 2019/2021 ([1]).
22.	Minimum guaranteed availability of spare parts (until):	GG MM AAAA			date	As from Annex II D, point 5 of Regulation (EU) 2019/2021.
23.	Minimum guaranteed product support (until):	GG MM AAAA			date	

	Information		Value and precision	Unit	Notes
24.	Power supply type:		Internal/External/ Standardised external		Select one.
i	External standardised power supply (included in the product box)	Standard name	TEXT		
		Input voltage	X	V	
		Output voltage	X	V	
ii	External standardised suitable power supply (if not included in the product box)	Standard name	TEXT		Mandatory only if EPS not included in the box, non-mandatory otherwise.
		Required output voltage	X,X	V	Mandatory only if EPS not included in the box, non-mandatory otherwise.
		Required delivered current	X,X	A	Mandatory only if EPS not included in the box, non-mandatory otherwise.
		Required current frequency	X	Hz	Mandatory only if EPS not included in the box, non-mandatory otherwise.

Technical Documentation

Shall include:

1) identification data (general description of the model):
    a. trademark and model identifier;
    b. supplier's name, address, registered trade name;
2) references to the harmonised standards applied, other measurement standards and specifications used in measuring the technical parameters and calculations performed;
3) specific precautions to be taken when the model is assembled, installed and tested;
4) a list of all equivalent models, including model identifiers;
5) measured technical parameters of the model and calculations performed with the measured parameters as listed in the table below;

Measured technical parameters

		Value and precision	Unit	Notes
	General			
1.	Ambient temperature	XX,XX	°C	
2.	Test voltage	X	V	
3.	Frequency	X,X	Hz	
4.	Total harmonic distortion (THD) of the electricity supply system	X	%	
	For On-mode			
5.	Peak white luminance of the brightest on mode configuration	X	cd/m²	
6.	Peak white luminance of the normal configuration	X	cd/m²	
7.	Peak white luminance ratio (calculated)	X,X	%	Value row 6 above divided by value row 5 above times 100
	For APD			
8.	Duration of the on mode condition, before the electronic display reaches automatically standby, or off mode, or another condition which does not exceed the applicable power consumption requirements for off mode and/or standby mode.	mm:ss		
	For televisions: the measured value of the time before the television automatically reaches standby, or off-mode, or another condition which does not exceed the applicable power consumption requirements for off-mode and/or standby-mode following the last user interaction;	mm:ss		

	For televisions equipped with room presence sensor: the measured value of the time before the television automatically reaches standby, or off-mode, or another condition which does not exceed the applicable power consumption requirements for off mode and/or standby mode when no presence is detected;	mm:ss		
	Other electronic displays than televisions and broadcast displays: The measured value of the time before the electronic display automatically reaches standby, or off-mode, or another condition which does not exceed the applicable power consumption requirements for off mode and/or standby mode when no input is detected;	mm:ss		
	For ABC			If available and activated by default (as from Annex V, Table 4)
9.	Average on mode power demand of the electronic display at an ambient light intensity, measured at the ABC sensor of the electronic display, of 100 lux and 12 lux.	X,X	W	
10.	Percentage of power reduction due to ABC action between the 100 lux and 12 lux ambient light conditions.	X,X	%	
11.	Display peak white luminance at each of the following ambient light intensities measured at the ABC sensor of the electronic display, 100 lux, 60 lux, 35 lux, 12 lux.	x	cd/m^2	
	Measured on mode power at 100 lux ambient light at the ABC sensor	X,X	W	
	Measured on mode power at 12 lux ambient light at the ABC sensor	X,X	W	
	The measured screen luminance at 60 lux ambient light at the ABC sensor	X	cd/m^2	

		Value and precision	Unit	Notes
	The measured screen luminance at 35 lux ambient at the ABC sensor	X	cd/m²	
	The measured screen luminance at 12 lux ambient light at the ABC sensor	X	cd/m²	

(6) Additional information requirements:
- (a) input terminal for the audio and video test signals used for testing;
- (b) information and documentation on the instrumentation, set-up and circuits used for electrical testing;
- (c) any other testing condition not described or determined in point (b);
- (d) for on mode:
  - ii) the characteristics of the dynamic broadcast-content video signal representing typical broadcast TV content; for the HDR dynamic broadcast content video signal the electronic display must be automatically switched to HDR mode by the HDR metadata of that signal;
  - iii) the sequence of steps for achieving a stable condition with respect to power demand level; and
  - iv) the picture settings used for the brightest peak white luminance measurement and the test pattern for the video signal used for the measurement.
    - (a) For standby and off mode:
  - v) the measurement method used;
  - vi) description of how the mode was selected or programmed including any enhanced reactivation functions; and
  - vii) sequence of events to reach the condition where the electronic display automatically changes mode.
- (e) For electronic displays with a designated computer signal interface:
  - i) confirmation that the electronic display prioritises the computer display power management protocols set out in point 6.2.3 of Annex II of Commission Regulation (EU) No 617/2013). Any deviation from the protocols should be reported;
- (f) For the networked electronic displays only:
  - i. number and type of network interfaces and, except for wireless network interfaces, their position in the electronic display;
  - ii. whether the electronic display qualifies as electronic display with HiNA functionality; if no information is provided the electronic display is considered not to be HiNA display or display with HiNA functionality; and
  - iii. information whether networked electronic display provides functionality allowing the power management function and/or the end-user to switch the electronic display being in a condition providing networked standby into standby mode, or off mode or another condition which does not exceed the applicable power demand requirements for off

mode and/or standby mode including enhanced reactivation function power allowance where applicable

(h) For each type of network port:

i. the default time (mm:ss) after which the power management function, switches the display into a condition providing networked standby; and

ii. the trigger to be used to reactivate the electronic display.

(7) where the information included in the technical documentation file for a particular electronic display model has been obtained:

a) from a model that has the same technical characteristics relevant for the technical information to be provided but is produced by a different manufacturer or

b) by calculation on the basis of design or by extrapolation from another model of the same or of a different supplier, or both;

the technical documentation shall include, as appropriate, the details of such calculation, the assessment undertaken by suppliers to verify the accuracy of the calculation and, where appropriate, the declaration of identity between the models of different suppliers; and

(8) the contact details of the person empowered to bind the supplier, if not included in the technical information uploaded into the database, shall be made available, on request, to market surveillance authorities or to the Commission for carrying out their tasks under this Regulation.

Information to be provided in visual advertisements, in technical promotional material in distance selling and in telemarketing, except distance selling on the internet

1. In visual advertisements, for the purposes of ensuring conformity with the requirements laid down in point 1(e) of Article 3 and point (d) of Article 4, the energy efficiency class and the range of efficiency classes available on the label shall be shown as set out in point 4 of this Annex.
2. In technical promotional material, for the purposes of ensuring conformity with the requirements laid down in point 1(f) of Article 3 and point (e) Article 4 the energy class and the range of efficiency classes available on the label shall be shown as set out in point 4 of this Annex.
3. Any paper-based distance selling must show the energy class and the range of efficiency classes available on the label as set out in point 4 of this Annex.
4. The energy efficiency class and the range of energy efficiency classes shall be shown, as indicated in figure below, with:
   a) an arrow, containing the letter of the energy efficiency class in 100 % white, Calibri Bold and in a font size at least equivalent to that of the price, when the price is shown;
   b) the colour of the arrow matching the colour of the energy efficiency class;
   c) the range of available energy efficiency classes in 100 % black; and,
   d) the size shall be such that the arrow is clearly visible and legible. The letter in the energy efficiency class arrow shall be positioned in the centre of the rectangular part

of the arrow, with a border of 0,5 pt in 100 % black placed around the arrow and the letter of the energy efficiency class.

By way of derogation, if the visual advertisement, technical promotional material or paper-based distance selling is printed in monochrome, the arrow can be in monochrome in that visual advertisement, technical promotional material or paper-based distance selling.

Coloured/monochrome left/right arrow, with range of energy efficiency classes indicated

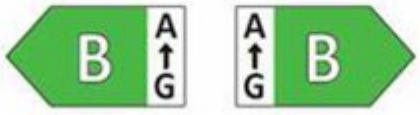


5. Telemarketing-based distance selling must specifically inform the customer of the energy efficiency class of the product and of the range of energy efficiency classes available on the label, and that the customer can access the label and the product information sheet through the product database website, or by requesting a printed copy.
6. For all the situations mentioned in points 1 to 3 and 5, it must be possible for the customer to obtain, on request, a printed copy of the label and the product information sheet.

Information to be provided in the case of distance selling through the internet

1. The appropriate label made available by suppliers in accordance with point 1(g) of Article 3 shall be shown on the display mechanism in proximity to the price of the product. The size shall be such that the label is clearly visible and legible and shall be proportionate to the size specified in point 2(a) of Annex III. The label may be displayed using a nested display, in which case the image used for accessing the label shall comply with the specifications laid down in point 3 of this Annex. If a nested display is applied, the label shall appear on the first mouse click, mouse rollover or tactile screen expansion on the image.
2. The image used for accessing the label in the case of nested display, as indicated in figure below, shall:
   a) be an arrow in the colour corresponding to the energy efficiency class of the product on the label;
   b) indicate the energy efficiency class of the product on the arrow in 100 % white, Calibri Bold and in a font size equivalent to that of the price;
   c) have the range of available energy efficiency classes in 100 % black; and,
   d) have one of the following two formats, and its size shall be such that the arrow is clearly visible and legible. The letter in the energy efficiency class arrow shall be positioned in the centre of the rectangular part of the arrow, with a visible border in 100 % black placed around the arrow and the letter of the energy efficiency class:

Coloured left/right arrow, with range of energy efficiency classes indicated



3. In the case of nested display, the sequence of display of the label shall be as follows:
   a) the image referred to in point 2 of this Annex shall be shown on the display mechanism in proximity to the price of the product;
   b) the image shall link to the label set out in Annex III;
   c) the label shall be displayed after a mouse click, mouse roll-over or tactile screen expansion on the image;
   d) the label shall be displayed by pop up, new tab, new page or inset screen display;
   e) for magnification of the label on tactile screens, the device conventions for tactile magnification shall apply;
   f) the label shall cease to be displayed by means of a close option or other standard closing mechanism; and
   g) the alternative text for the graphic, to be displayed on failure to display the label, shall be the energy efficiency class of the product in a font size equivalent to that of the price.
4. The appropriate product information sheet made available by suppliers in accordance with point 1(h) of Article 3 shall be shown on the display mechanism in proximity to the price of the product. The size shall be such that the product information sheet is clearly visible and legible. The product information sheet may be displayed using a nested display or by referring to the product database in which case the link used for accessing the product information sheet shall clearly and legibly indicate 'Product information sheet'. If a nested display is used, the product information sheet shall appear on the first mouse click, mouse roll-over or tactile screen expansion on the link.

2.11.12 Requirements for the EU and other jurisdictions which transpose EU directives

2.11.12.1 Monitors

EAEU: Approving Technical Regulations on Energy Efficiency Requirements for Energy-Consuming Devices, Decision No. 114, 2019 - Proposed Amendment - (on postponing some EE compliance deadlines) Draft Decision, September 2020

https://www-12.compliance2product.com/c2png/source?id=67229&request_from=InboxNewsAnalysis&newsAnalysisId=53073

2.12 Environmental Notifications - Customer Hardware Publications

Customer Hardware Publications for Lenovo Logo Deliverables must include specific Environmental Notices. Suppliers providing Lenovo with customer hardware publications must contact their Lenovo Procurement representative or the author of this specification for details.

2.13 China VOC (Volatile Organic Compound) Standard Requirements

All the coatings, inks, adhesive and cleaning agents used in Lenovo products, packaging and the production process must meet below China VOC Standards. Testing reports in accordance with the standard requirements are required and must be supplied to Lenovo as requested.

- GB 30981.2-2025, Limit of harmful substances of coatings — Part2:Industrial coatings
- GB 38507-2020, Limits of volatile organic compounds (VOCs) in printing ink
- GB 33372-2020, Limit of volatile organic compounds content in adhesive
- GB 38508-2020, Limit of volatile organic compounds content in cleaning agents

Limit of harmful substances of coatings — Part2:Industrial coatings (GB 30981.2-2025)

All coatings excepted special functional coatings, powder coatings and zinc-aluminum coatings used in Lenovo products, the production process must meet VOCs limitation as below:

Paint type	Main paint type		VOCs Limits（g/L）
Water-based coating	Primer		≦420
	Color paint		≦420
	Varnish		≦420
Solvent based coating	Primer		≦600
	Color paint		≦700
	Varnish		≦650
Solvent-free coating			≦100
Radiation cured coating	Water-based	Spraying	≦400
		Others	≦150
	Non-water-based	Spraying	≦550
		Others	≦200

All coatings used in Lenovo products, packaging and the production process must meet the other hazardous substances requirements as below:

Item	Limitation

Benzene content / % (Limited to solvent-based % coatings, non-water-based radiation-cured coatings, and solvent-based auxiliary materials)	≤0.3
Total content of benzene series substances /% (limited to water-based coatings, water-based radiation-cured coatings, and water-based auxiliary materials)	≤1
Toluene content /% (for solvent-based coatings only, Polypropylene substrate primer)	≤15
The total content of toluene and xylene (including ethylbenzene) /% (Solvent-based industrial coatings and non-aqueous radiation-cured coatings)	≤35
Total content of halogenated hydrocarbons/(limited to solvent-based coatings, non-aqueous radiation-cured coatings, and solvent-based auxiliary materials)	≤1
Total content of polycyclic aromatic hydrocarbons /(mg/kg) (Limited to solvent-based coatings, non-water-based radiation-cured coatings, and solvent-based auxiliary materials)	≤500
Methanol content /%	Zinc-aluminum coating≤3
	Inorganic coating≤1
	Nitrocellulose coatings≤1
Total content of ethylene glycol ethers and ether esters /%(limited to water-based coatings, solvent-based coatings, radiation-cured coatings, and auxiliary materials)	≤1
SVOC content (g/L)(limited to latex coatings and water-based wood coatings)	Color paint, ≤100
	Varnish, ≤150
Formaldehyde content (mg/kg) (limited to water-based wood coatings, water-based radiation-cured wood coatings, and water-based decorative board coatings)	≤100
Biocide content (mg/kg)(limited to antifouling paint)	Organotin, Should not be used
	DDT, Should not be used
	Sibutrini, Should not be used
The total content of free diisocyanates (TDI and HDI) %	Isocyanate curing agents for solvent-based coatings, ≤0.5
Total content of alkylphenol polyoxyethylene ether (APEO) (mg/kg) (Limited to water-based paint color pastes, water-based wood coatings, and water-based radiation-cured coatings)	≤1000
Total heavy metal content (mg/kg)(for color-limiting paints, powder coatings, alkyd varnishes, color pastes, putties)[Except for all varieties of toy coatings and wood coatings, as well as topcoats and clear coats of other consumer product coatings that come into close contact with the human body]	Pb, ≤1000
	Cd, ≤100
	Cr(VI), ≤1000
	Hg, ≤1000
Soluble element [chromium (Cr)] content (mg/kg)(limited color paint m, powder coatings, color pastes) [Except for all varieties of toy coatings and wood coatings, as well as topcoats and clear coats for other consumer products that come into close contact with the human body]	≤200

In addition to meeting the above requirements, the topcoats and clear coats of coatings used in other consumer products that come into close contact with the human body shall also comply with the requirements in the following table.

Item	Limitation
Total content of phthalates %(organic sol type)	≤0.1
Total content of photoinitiators %(limited to radiation-cured coatings)	≤0.1

Total heavy metal content (mg/kg)(for color-limiting paints, powder coatings, alkyd varnishes	Pb, ≤90
	Hg, ≤10
Soluble element content (mg/kg)(color-limiting paint, powder coating, alkyd varnish)	Pb, ≤90
	Cd, ≤75
	Cr, ≤60
	Hg, ≤60
	Sb, ≤60
	As, ≤25
	Ba, ≤1000
	Se, ≤500

Limits of volatile organic compounds (VOCs) in printing ink (GB 38507-2020)

All inks used in Lenovo products, packaging and the production process must meet the VOCs limitation as below:

Printing Ink Type			VOCs Limits (%)
Solvent-based ink	Gravure ink		≦75
	Flexographic ink		≦75
	Ink-jet ink		≦95
	Screen ink		≦75
Water-based ink	Gravure ink	Absorbent substrate	≦15
		Nonabsorbent substrate	≦30
	Flexographic ink	Absorbent substrate	≦5
		Nonabsorbent substrate	≦25
	Ink-jet ink		≦30
	Screen ink		≦30
Offset ink	Sheet-fed offset ink		≦3
	Cold-set web-fed ink		≦3
	Heat-set web-fed ink		≦10
Energy curing ink	Offset ink		≦2
	Flexographic ink		≦5
	Screen ink		≦5
	Ink-jet ink		≦10
	Gravure ink		≦10
Intaglio ink			≦20

Below solvents are prohibited to be added in printing inks which used in Lenovo products, packaging and the production process:

Substances Name	**CAS No**
Halogenated hydrocarbon	-
Ethyl benzene	100-41-4
Methyloxirane	75-56-9

styrene	100-42-5
benzene	71-43-2
Isopropyl nitrite	541-42-4
Butyl nitrite	544-16-1
2-ethoxyethanol	110-80-5
2-ethoxyethyl acetate	111-15-9
2-methoxyethanol	109-86-4
2-Methoxy acetate	110-49-6
2-nitropropane	79-46-9
1-Methyl-2-pyrrolidone (NMP)	872-50-4
1,2-bis(2-methoxyethoxy)ethane (TEGDME; triglyme)	112-49-2
1, 2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	110-71-4
1,2-diethoxyethane	629-14-1
toluene	108-88-3
xylene	1330-20-7

Limit of volatile organic compounds content in adhesive (GB 33372-2020)
Solvent-based adhesive used in Lenovo products, packaging and the production process must meet the VOCs limitation as below:

Application field	VOCs Limits (g/L) ≦				
	Neoprene	Styrene-butadiene-styrene block copolymer rubber	polyurethanes	Acrylates	Others
Case & bag	600	500	400	-	400
packaging	600	500	400	510	500
others	600	500	250	510	250

Water-based adhesive used in Lenovo products, packaging and the production process must meet the VOCs limitation as below:

Application field	VOCs Limits (g/L) ≦						
	Polyvinyl acetate	Polyvinyl alcohol	rubber	polyurethanes	Vinyl acetate - ethylene copolymer emulsions	Acrylates	Others
Case & bag	50	-	150	50	50	100	50
packaging	50	-	50	50	50	50	50
others	50	50	50	50	50	50	50

Bulk adhesive used in Lenovo products, packaging and the production process must meet the VOCs

limitation as below:

Application field	VOCs Limits (g/L) ≦								
	Organic silicon	MS	polyurethanes	Polysulfide	Acrylates	Epoxy resins	a-cyanoacrylate	Thermoplastic	others
Case & bag	-	50	50	-	-	-	20	50	50
packaging	100	50	50	-	-	-	-	50	50
others	100	50	50	50	200	50	20	50	50

Adhesive used in case and bags need to meet below limitations of GB 19340:

Substances	Limitation
Benzene（CAS 71-43-2）	Prohibited above 5g/kg in solvent based adhesive in case and bags
Sum of toluene (CAS 108-88-3) & xylene (CAS 1330-20-7)	Prohibited above 200g/kg in solvent based adhesive in case and bags.
Free toluene diisocyanate (CAS 471-62-5)	Prohibited above 10g/kg in solvent based adhesive in case and bags
n-Hexane (CAS 110-54-3)	Prohibited above 150g/kg in solvent based adhesive in case and bags
1,2-Dichloroethane (CAS 107-06-2)	Prohibited above 5g/kg in solvent based adhesive in case and bags
Sum of Halogenated hydrocarbon (including 1,2-Dichloroethane (CAS 107-06-2), Methylene Chloride (CAS 75-09-2), 1,1,1-trichloroethane (CAS 71-55-6), 1,1,2-trichloroethane (CAS 79-00-5))	Prohibited above 50g/kg in solvent based adhesive in case and bags

Limit of volatile organic compounds content in cleaning agents (GB 38508-2020)

All cleaning agents used in Lenovo products, packaging and the production process must meet the VOCs and other specific chemical limits as below:

VOCs and Other Specific Chemical Limits in Cleaning Agent

Contents	Limits		
	Water-based	Semi-water-based	Solvent-based
VOCs (g/L) ≤	50	300	900
Dichloromethane (CAS 75-09-2), Trichloromethane (CAS 67-66-3), Trichloroethylene (CAS 79-01-6), Tetrachloroethylene (CAS 127-18-4) in total / % ≤	0.5	2	20
Formaldehyde (CAS 50-00-0) (g/kg) ≤	0.5	0.5	-
Benzene (CAS 71-43-2), toluene (CAS 108-88-3), xylene (CAS 100-41-4) and ethylbenzene (BTEX) (CAS 1330-20-7) in total / % ≤	0.5	1	2

Low-VOCs Limits of Semi-Water-Based Cleaning Agents

Contents	Limits
VOCs (g/L) ≤	100

Dichloromethane (CAS 75-09-2), Trichloromethane (CAS 67-66-3), Trichloroethylene (CAS 79-01-6), tetrachloroethylene (CAS 127-18-4) in total / % ≤	0.5
Formaldehyde (CAS 50-00-0) (g/kg) ≤	0.5
Benzene (CAS 71-43-2), toluene (CAS 108-88-3), xylene (CAS 100-41-4) and ethylbenzene (BTEX) (CAS 1330-20-7) in total / % ≤	0.5

3.0 Notification Procedures

If the Material, Part, or Product being supplied to Lenovo does not meet one or more of the applicable requirements in this ES, the supplier must immediately notify the Lenovo procurement representative. This also applies if the supplier or a subcontractor(s) makes changes in their operations that will cause a Material, Part, or Product to no longer comply with this ES. If any Material, Part, or Product contains any substances in applications restricted by **Tables 1 or 2**, or contains any mercury, suppliers must immediately report such information to their Lenovo procurement representative.

4.0 References

Argentina National Legislature Act 26184. Published 21 December 2006. Prohibitions on the manufacturing, assembly and importing of batteries and primary batteries.

Australian Ozone Protection and Synthetic Greenhouse Gas Management Act of 1989 http://www.environment.gov.au/atmosphere/ozone/legislation/commonwealthleg.html
Austrian Battery Ordinances 514/1990, as amended by BGB1 No. 3/1991(4 January, 1991) and BGB1.II Nol. 495/1999 (28 December 1999) of the Ordinance of Federal Ministry for Environment, Youth and Family.

Austrian Ordinance by the Federal Minister for Agriculture, Forestry, Environment and Water Management on Bans and Restrictions for Partly Fluorinated and Fully Fluorinated Hydrocarbons and Sulphur Hexafluoride

California Code of Regulations, title 22, division 4.5: Chapter 33. Best Management Practices for Perchlorate Materials.
Http://www.dtsc.ca.gov/LawsRegsPolicies/Title22/index.cfm

California Safe Drinking Water and Toxic Enforcement Act of 1986:
Http://www.oehha.org/prop65/law/P65law72003.html

Canada Prohibition of Certain Toxic Substances Regulations, 2005. Canadian Environmental Protection Act, 1999.
Http://laws.justice.gc.ca/en/showtdm/cr/SOR-2005-41//?showtoc=&instrumentnumber=SOR-2005-41

Connecticut Public Law 02-90, The Mercury Education and Reduction Act
http://www.ct.gov/dep/cwp/view.asp?a=2708&q=324028&depNav_GID=1638

Denmark Statutory Order no. 552 of 2 July 2002 Regulating Certain Industrial Greenhouse Gasses
http://glwww.mst.dk/homepage/

EU Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast)
http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:174:0088:0110:EN:PDF

EU Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)
(recast) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:197:0038:0071:en:PDF

EU Commission Decision 2005/618/EC of 18 August 2005 amending Directive 2002/95/EC of the European Parliament and of the Council for the purpose of establishing the maximum concentration values for certain hazardous substances in electrical and electronic equipment.
Http://europa.eu.int/comm/environment/waste/weee_index.htm

EU Commission Decision 2005/717/EC of 13 October 2005 amending for the purposes of adapting to the technical progress the Annex to Directive 2002/95/EC of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
Http://europa.eu.int/comm/environment/waste/weee_index.htm

EU Commission Decision 2005/747/EC of 21 October 2005 amending for the purposes of adapting to technical progress the Annex to Directive 2002/95/EC of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
Http://europa.eu.int/comm/environment/waste/weee_index.htm

EU Commission Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Official Journal of the European Union 13.2.2003
Http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_037/l_03720030213en00190023.pdf

EU Commission Directive 2012/19/EU of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE)
Http://ec.europa.eu/environment/waste/weee/index_en.htm

EU Commission Directive 2006/122/ECOF of 12 December 2006 amending for the 30th time Council Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain

dangerous substances and preparations (perfluorooctane sulfonates) http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2006:372:SOM:en:HTML

EU Council Directive 76/769/EEC, on the approximation of the laws, regulations and administrative provisions of the Member States relating to the restrictions on the marketing and use of dangerous substances and preparations
http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1976/L/01976L0769-20030215-en.pdf

EU Commission Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators
Http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_266/l_26620060926en00010014.pdf

EU Commission Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Official Journal of the European Union 30.12.2006
Http://eur-lex.europa.eu/JOIndex.do?year=2006&serie=L&textfield2=396&Submit=Search

EU Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators
http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_266/l_26620060926en00010014.pdf

EU Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
Http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf

EU: Regulation (EC) No. 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer.
http://eur-lex.europa.eu/LexUriServ/site/en/consleg/2000/R/02000R2037-20041224-en.pdf

EU Commission Directive 2006/122/ECOF of 12 December 2006 amending for the 30th time Council Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations (perfluorooctane sulfonates) http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2006:372:SOM:en:HTML

Florida Statutes Title XXIX, Chapter 403.7192 Batteries; requirements for consumer, manufacturers, and sellers.
Http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=Ch0403/SEC7192.HTM&Title=->2007->Ch0403->Section%207192#0403.7192

Lenovo Packaging Specification 41A0613 - Recyclable Packaging Materials, Selection and Identification
http://www.lenovo.com/global_procurement/us/en/Guidelines/Restrictions_and_Packaging.html

Lenovo Information for Suppliers web site:
http://www.lenovo.com/global_procurement/us/en/information_suppliers.html

Japan Ordinance No. 95 of the Ministry of Economy, Trade, and Industry under the Law for the Promotion of the Effective Utilization of Resources (Law No. 48, 1993 as amended, 2001).
Japan Law Concerning the Protection of the Ozone Layer through the Control of Specified Substances and Other Measures (Law No. 53 of May 20, 1988)

Japan's Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (Act No. 117 of October 16,1973). This law is also called Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances or Chemical Substances Control Law. All substances covered in this law must be prohibited or restricted according to this law.
http://www.safe.nite.go.jp/jcheck/list6.action?category=211

Louisiana Mercury Risk Reduction Act of 2006
http://www.legis.state.la.us/billdata/streamdocument.asp?did=399136

Maine Public Law Chapter 296 Section 1. 38 MRSA 1609 An Act to Protect Pregnant Women and Children from Toxic Chemicals released into the home.
http://janus.state.me.us/legis/ros/lom/LOM123rd/PUBLIC296.asp

Maine Title 38, Chapter 24, Subchapter 4, 2165 Regulation of certain dry cell batteries
Http://janus.state.me.us/legis/statutes/38/title38sec2165.html

Maryland Title 6 of the Environment Code, Subtitle 11 Rechargeable Batteries, 6-1101 - 1114.
Http://www.dsd.state.md.us/comar/Annot_Code_Idx/EnvirIndex.htm

Minnesota Statutes 115A 9155 - Disposal of certain dry cell batteries. 115A 9157 - Rechargeable batteries and products.
Http://ros.leg.mn/revisor/pages/forms/getstatute.php

Netherlands, The, No. 553 Decree of 9 September 1998, comprising regulations regarding products containing mercury (Decree on Product Containing Mercury, 1998 Environmentally Hazardous Substances Act)
http://www2.vrom.nl/docs/internationaal/kwikbesluit_engels.pdf

Netherlands, The, 178 Besluit van 22 maart 2001, houdende vaststelling van het Warenwetbesluit formaldehyde in textiel.

New Jersey Dry Cell Battery Management Act; NJSA 12:1E-99.5 - 206
Http://lis.njleg.state.nj.us/cgi-bin/om_isapi.dll?clientID=27915686&depth=2&expandheadings=off&headingswithhits=on&infobase=statutes.nfo&softpage=TOC_Frame_Pg42

New York Battery Reduction and Elimination. New York State Consolidated Laws. Environmental Conservation
Http://caselaw.lp.findlaw.com/nycodes/c37/a125.html

Norway Product Control Regulation Chapter 2. Restricted Substances and Preparations
http://www.sft.no/seksjonsartikkel____30217.aspx

Organisation for Economic Co-operation and Development (OECD). 2018. Toward a new comprehensive global database of perand polyfluoroalkyl substances (PFASs).
http://www.oecd.org/chemicalsafety/risk-management/globaldatabase-of-per-andpolyfluoroalkyl-substances.xlsx

People's Republic of China GB 18455-2001 Packaging Recycling Mark
Http://www.aeanet.org/governmentaffairs/gajl_Packaging_GB18455_2001ENG.asp

People's Republic of China - Management Methods for restricted use of hazardous substances in electrical and electronic products
https://faolex.fao.org/docs/pdf/chn153715.pdf

People's Republic of China SJ/T 11364-2024 Labeling requirements for restricted use of hazardous substances in electrical and electronic products

China: GB 26572-2025 Requirements for restricted use of hazardous substances in electrical and electronic products
https://openstd.samr.gov.cn/bzgk/gb/newGbInfo?hcno=279928A31DAA3737BD0205BD3A0A4857

Rhode Island Mercury Education and Reduction Act
http://www.rilin.state.ri.us/Statutes/TITLE23/23-24.9/INDEX.HTM

Sweden Mercury-containing Products (Certain) Ordinance (SFS 1991:1290)

Switzerland Ordinance on Risk Reduction related to Chemical Products (ORRChem)
Http://www.bafu.admin.ch/chemikalien/01410/01411/index.html?lang=en

United States Section 611 of the 1990 amendments of the Clean Air Act http://www.epa.gov/air/caa/

United States Mercury-Containing and Rechargeable Battery Management Act (Public Law 104-142)
http://www.epa.gov/epaoswer/hazwaste/state/policy/pl104.pdf

United States Toxic Substances Control Act; Occupational Safety and Health Act (29 CFR 1910.1001-1051)
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9696

Vermont Statutes Title 10. Chapter 159. Subchapter 1. 6621b. Regulation of dry cell batteries and 6621c Lead Acid Batteries; collection for recycling.
Http://www.leg.state.vt.us/statutes/sections.cfm?Title=10&Chapter=159

Washington, Revised Code, Title 70, Public Health and Safety. An Act relating to phasing out the use of polybrominated diphenyl ethers.
Http://www.leg.wa.gov/pub/billinfo/2007-08/Pdf/Bills/Session%20Law%202007/1024-S.SL.pdf

Australia/New Zealand Minimum Energy Performance Requirements for External Power Supplies
http://www.energyrating.gov.au/regulations/legislation/legislation-for-e3-under-gems/
http://www.energyrating.gov.au/regulations

United States Federal US statue 42 U.S.C. 6291(36), US Department of Energy rule for Certification, Compliance and Enforcement Requirements for Certain Consumer Products and Commercial and Industrial Equipment, 75 Federal Register Regulation 652

United States CA Code of Regulations, Title 20 Section 1601-1608

United States Oregon Minimum Energy Efficiency Standards for State-regulated appliances and equipment Canada Energy Efficiency Act, Energy Efficiency Regulations

Korea - Korean Regulation on Energy Efficiency Labeling and Standards, July 31, 2008.

European Union Commission Regulation EC No 278/2009 of 6 April 2009 implementing Directive 2005/32/EC with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of external power supplies

International Electrotechnical Commission
IEC 62474 - Material Declaration for Products of and for the Electrotechnical Industry
Declarable substance groups and declarable substances
http://std.iec.ch/iec62474/iec62474.nsf/Index?open&q=225923

ANNEXES: Detailed Chemical Lists with CAS Numbers

Unless specifically indicated as complete for the chemicals affected, these annex listings are not exhaustive.

Annex A. Asbestos

Asbestos	1332-21-4
Actinolite	77536-66-4
Amosite (Grunerite)	12172-73-5
Anthophyllite	77536-67-5
Chrysotile	12001-29-5
Crocidolite	12001-28-4
Tremolite	77536-68-6

Annex B. Azo colorants

Note: The EC azo dyes ban applies to:
1.) Certain azo colorants that by reductive cleavage of azo groups may release one of the following 22 aromatic amines, and 2.) The Azodye compound listed in the second table of this annex.

1. List of regulated aromatic amines	
biphenyl-4-ylamine	92-67-1
benzidine	92-87-5
4-chloro-o-toluidine	95-69-2
2-naphthylamine	91-59-8
o-aminoazotoluene	97-56-3
5-nitro-o-toluidine	99-55-8
4-chloroaniline	106-47-8
4-methoxy-m-phenylenediamine	615-05-4
4,4'-methylenedianiline	101-77-9
3,3'-dichlorobenzidine	91-94-1
3,3'-dimethoxybenzidine	119-90-4
3,3'-dimethylbenzidine	119-93-7
4,4'-methylenedi-o-toluidine	838-88-0
6-methoxy-m-toluidine	120-71-8
4,4'-methylene-bis(2-chloroaniline)	101-14-4
4,4'-oxydianiline	101-80-4
4,4'-thiodianiline	139-65-1
o-toluidine	95-53-4
4-methyl-m-phenylenediamine	95-80-7
2,4,5-trimethylaniline	137-17-7
o-anisidine	90-04-0
4-amino azobenzene	60-09-3
2. List of regulated azodyes	
mixture of Disodium- (6- (4- anisidino) -3- sulfonato -2- (3,5- dinitro- 2-oxidophenylazo) -1-naphtholato) (1- (5-chloro -2-oxidophenylazo) -2-naphtholato) chromate (1-); (molecular formula C39H23ClCrN7O12S.2Na); Trisodium bis (6- (4-anisidino) -3- sulfonato -2- (3,5- dinitro-2-oxidophenylazo) -1- naphtholato) chromate(1-) (molecular formula C46H30CrN10O20S2.3Na)	118685-33-9 Not available

Annex C. Halogenated aromatic substances

Polychlorinated biphenyls (PCB)(Note: PCBs are prohibited by other regulations, see PCBs in Table 1 and Annex H)	See Annex H
Halogenated diarylalkanes -	

Monomethyl tetrachloro diphenyl methane ade name: Ugilec 141	76253-60-6
Monomethyl dichloro diphenyl methane Trade name: Ugilec 121, Ugilec 21	81161-70-8
Monomethyl dibromo dipenyl methane Trade name: DBBT	99688-47-8
Halogenated benzenes -	
Chlorobenzene (Monochlorobenzene, MCB)	108-90-7
Dichlorobenzene, 1,2- (ortho-DCB)	95-50-1
Dichlorobenzene, 1,4- (para-DCB)	106-46-7
Pentachlorobenzene	608-93-5
Tetrachlorobenzene, 1, 2, 4, 5-	95-94-3
Tetrachlorobenzene, 1, 2, 3, 5-	634-90-2
Tetrachlorobenzene, 1, 2, 3, 4-	634-66-2
Trichlorobenzene, 1, 2,4 -	120-82-1
Trichlorobenzene, 1, 2, 3-	87-61-6
Hexachlorobenzene	118-74-1

Annex D. Halogenated diphenyl methanes

Monomethyl tetrachloro diphenyl methane ade name: Ugilec 141	76253-60-6
Monomethyl dichloro diphenyl methane Trade name: Ugilec 121, Ugilec 21	81161-70-8
Monomethyl dibromo dipenyl methane Trade name: DBBT	99688-47-8

Annex E. Nickel

Nickel	7440-02-0
Nickelacetate	373-02-4
Nickelcarbonate	3333-67-3
Nickelcarbonyl	13463-39-3
Nickelhydroxide	12054-48-7, 11113-74-9
Nickelocene	1271-28-9
Nickeloxide	1313-99-1
Nickelsulfide	12035-72-2
Other nickel compounds	-

Annex F. Ozone Depleting Substances

Chlorofluorocarbons (CFCs):	
Trichlorofluoromethane (CFC-11) and its isomers	75-69-4 DR[2] 62185-70-0 DR[2] 79620-41-0 DR[2] 83589-40-6 DR[2] 91315-61-6
Dichlorodifluoromethane (CFC-12) and its isomers	75-71-8 DR[2] 185009-39-6 DR[2] 62185-71-1
Trichlorotrifluoroethane (CFC-113) and its isomers	76-13-1 DR[2] 39349-94-5 DR[2] 56996-61-3

	DR[2] 57762-34-2
Dichlorotetrafluoroethane (CFC-114) and its isomers	76-14-2
Monochloropentafluoroethane (CFC-115) and its isomers	76-15-3 DR[2] 12770-91-1
Chlorotrifluoromethane (CFC-13) and its isomers	75-72-9 185009-43-2
Pentachlorofluoroethane (CFC-111) and its isomers	354-56-3 29756-45-4
Tetrachlorodifluoroethane (CFC-112) and its isomers	76-12-0 76-11-9
Heptachlorofluoropropane (CFC-211) and its isomers	422-78-6 135401-87-5
Hexachlorodifluoropropane (CFC-212) and its isomers	3182-26-1
Pentachlorotrifluoropropane (CFC-213) and its isomers	2354-06-5 134237-31-3
Tetrachlorotetrafluoropropane (CFC-214) and its isomers	29255-31-0 2268-46-4
Trichloropentafluoropropane (CFC-215) and its isomers	1599-41-3 4259-43-2 76-17-5
Dichlorohexafluoropropane (CFC-216) and its isomers	661-97-2
Chloroheptafluoropropane (CFC-217) and its isomers	422-86-6 76-18-6
Halons:	
Bromochlorodifluoromethane (Halon-1211) and its isomers	353-59-3 11104-73-7
Bromotrifluoromethane (Halon-1301) and its isomers	75-63-8 62395-25-9
Dibromotetrafluoroethane (Halon-2402) and its isomers	124-73-2 DR[2] 76199-55-8
Carbon tetrachloride	56-23-5
1,1,1-trichloroethane (methyl chloroform) and its isomers except 1,1,2-trichloroethane	71-55-6 DR[2] 74552-83-3
Bromomethane (methyl bromide)	74-83-9
Chlorobromomethane	74-97-5
Hydrobromofluorocarbons (HBFCs) and their isomers:	
Bromodifluoromethane and its isomers	1511-62-2
HBFC-22B1 (FM-100) 1511-62-2	
CHFBr2	1868-53-7
CH2FBr	NA
C2HFBr4	NA
C2HF2Br3	NA
C2HF3Br2	354-04-1 DR[2] 66542-88-9
C2HF4Br	NA
C2H2FBr3	NA
C2H2F2Br2	75-82-1
C2H2F3Br	421-06-7
C2H3FBr2	358-97-4
C2H3F2Br	NA
C2H4FBr	762-49-2
C3HFBr6	NA
C3HF2Br5	NA
C3HF3Br4	NA
C3HF4Br3	NA
C3HF5Br2	NA

C3HF6Br	NA
C3H2FBr5	NA
C3H2F2Br4	NA
C3H2F3Br3	NA
C3H2F4Br2	NA
C3H2F5Br	NA
C3H3FBr4	NA
C3H3F2Br3	NA
C3H3F3Br2	NA
C3H3F4Br	NA
C3H4FBr3	NA
C3H4F2Br2	NA
C3H4F3Br	NA
C3H5FBr2	NA
C3H5F2Br	NA
C3H6FBr	NA
Hydrochlorofluorocarbons (HCFCs) and their isomers:	
Dichlorofluoromethane (HCFC-21)	75-43-4 DR[2] 39289-28-6
Chlorodifluoromethane (HCFC-22)	75-45-6 DR[2] 73666-77-0 DR[2] 134191-96-1
Chlorofluoromethane (HCFC-31)	593-70-4
Tetrachlorofluoroethane (HCFC-121) 1,1,1,2-tetrachloro-2-fluoroethane 1,1,2,2-tetrachloro-1-fluoroethane	130879-71-9 DR[2] 134237-32-4[3] 354-11-0 354-14-3
Trichlorodifluoroethane (HCFC-122) Trichloro-1,1-difluoroethane 1,2,2-trichloro-1,1-difluoroethane 1,2,2-trichloro-1,2-difluoroethane 1,1,1-trichloro-2,2-difluoroethane 1,1,2-trichloro-2,2-difluoroethane	41834-16-6 55949-46-7 354-21-2 DR[2] 134237-33-5[3] DR[2] 62549-18-2 354-15-4 354-12-1 NA
Dichlorotrifluoroethane (HCFC-123) Dichloro-1,1,2-trifluoroethane 2,2-dichloro-1,1,1-trifluoroethane 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a) 1,1-dichloro-1,2,2-trifluoroethane 2,2-dichloro-1,1,2-trifluoroethane	34077-87-7 90454-18-5 306-83-2 354-23-4 812-04-4 NA
Chlorotetrafluoroethane (HCFC-124) 2-chloro-1,1,1,2-tetrafluoroethane 1-chloro-1,1,2,2-tetrafluoroethane (HCFC-124a)	63938-10-3 2837-89-0 354-25-6
Trichlorofluoroethane (HCFC-131) 1,1,2-trichloro-2-fluoroethane 1,1,2-trichloro-1 (or 2)-fluoroethane 1,1,2-trichloro-1-fluoroethane (HCFC-131a) 1,1,1-trichloro-2-fluoroethane (HCFC-131b)	27154-33-2 134237-34-6[3] 359-28-4 90134-98-8 811-95-0 2366-36-1
Dichlorodifluoroethane (HCFC-132) Dichloro-1,1-difluoroethane 1,1-dichlorodifluoroethane (meso) 1,2-dichloro-1,2-difluoroethane (R,R)-(+-).1,2-dichloro-1,2-difluoroethane 1,2-dichloro-1,1-difluoroethane (HCFC-132b) 1,1-dichloro-1,2-difluoroethane	25915-78-0 55494-45-6 31153-51-2 33579-37-2 33489-30-4 1649-08-7 1842-05-3

1,1-dichloro-2,2-difluoroethane	471-43-2
1,2-dichloro-1,2-difluoroethane	431-06-1
Chlorotrifluoroethane (HCFC-133)	1330-45-6
	DR[2] 38097-47-1
1-chloro-1,2,2-trifluoroethane	431-07-2
1-chloro-1,1,2-trifluoroethane	421-04-5
2chloro-1,1,1-trifluoroethane (HCFC-133a)	75-88-7
Dichlorofluoroethane (HCFC-141)	25167-88-8
1,1-dichloro-1-fluoroethane (HCFC-141b)	1717-00-6
1,2-dichloro-1-fluoroethane	430-57-9
1,1-dichloro-2-fluoroethane	430-53-5
Chlorodifluoroethane (HCFC-142)	25497-29-4
	DR[2] 58561-84-5
	DR[2] 27175-71-9
Chloro-1,1-difluoroethane	55949-44-5
2-chloro-1,1-difluoroethane	338-65-8
1-chloro-1,1-difluoroethane (HCFC-142b)	75-68-3
	DR[2] 65762-25-6
1-chloro-1,2-difluoroethane (HCFC-142a)	338-64-7
Hexachlorofluoropropane (HCFC-221)	29470-94-8
	134237-35-7[3]
1,1,1,2,3,3-hexachloro-3-fluoropropane	431-79-8
1,1,1,2,3,3-hexachloro-2-fluoropropane	422-40-2
1,1,1,2,2,3-hexachloro-1-fluoropropane	422-26-4
1,1,2,2,3,3-hexachloro-1-fluoropropane	422-28-6
1,1,1,3,3,3-hexachloro-2-fluoropropane	NA
Pentachlorodifluoropropane (HCFC-222)	116867-32-4
	134237-36-8[3]
1,1,2,3,3-pentachloro-1,3-difluoropropane	421-82-3
1,1,1,2,3-pentachloro-3,3-difluoropropane	431-80-1
1,1,1,3,3-pentachloro-2,2-difluoropropane	422-49-1
1,2,2,3,3-pentachloro-1,1-difluoropropane	422-30-0
1,1,1,2,2-pentachloro-3,3-difluoropropane	422-27-5
1,1,1,2,3-pentachloro-2,3-difluoropropane	NA
1,1,1,3,3-pentachloro-2,3-difluoropropane	NA
(1,1,3,3,3-pentachloro-1,2-difluoropropane)	
1,1,2,2,3-pentachloro-1,3-difluoropropane	NA
1,1,2,3,3-pentachloro-1,2-difluoropropane	NA
Tetrachlorotrifluoropropane (HCFC-223)	29470-95-9
	134237-37-9[3]
1,1,1,3-tetrachloro-2,3,3-trifluoropropane	54002-59-4
1,1,2,3-tetrachloro-1,3,3-trifluoropropane	431-83-4
1,1,1,2-tetrachloro-3,3,3-trifluoropropane	431-81-2
1,1,3,3-tetrachloro-1,2,2-trifluoropropane	422-52-6
1,1,1,3-tetrachloro-2,2,3-trifluoropropane	422-50-4
1,2,3,3-tetrachloro-1,1,2-trifluoropropane	422-41-3
2,2,3,3-tetrachloro-1,1,1-trifluoropropane	422-35-5
1,1,2,2-tetrachloro-1,3,3-trifluoropropane	422-29-7
1,1,1,2-tetrachloro-2,3,3-trifluoropropane	NA
1,1,3,3-tetrachloro-1,2,3-trifluoropropane	NA
1,2,2,3-tetrachloro-1,1,3-trifluoropropane	NA
1,1,2,3-tetrachloro-1,2,3-trifluoropropane	NA
Trichlorotetrafluoropropane (HCFC-224)	127564-91-4
	134237-38-0[3]
1,1,3-trichloro-1,2,3,3-tetrafluoropropane	53063-53-9
1,1,1-trichloro-2,3,3,3-tetrafluoropropane	53063-52-8
1,1,2-trichloro-1,3,3,3-tetrafluoropropane	431-84-5
1,3,3-trichloro-1,1,2,2-tetrafluoropropane	422-54-8

1,1,3-trichloro-1,2,2,3-tetrafluoropropane	422-53-7
1,1,1-trichloro-2,2,3,3-tetrafluoropropane	422-51-5
2,3,3-trichloro-1,1,1,2-tetrafluoropropane	422-47-9
1,2,3-trichloro-1,1,2,3-tetrafluoropropane	422-42-4
1,2,2-trichloro-1,1,3,3-tetrafluoropropane	422-32-2
2,2,3-trichloro-1,1,1,3-tetrafluoropropane	NA
1,1,2-trichloro-1,2,3,3-tetrafluoropropane	NA
Dichloropentafluoropropane (HCFC-225)	127564-92-5
1,3-dichloro-1,1,2,3,3-pentafluoropropane	136013-79-1
3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca)	422-56-0
1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	507-55-1
2,2-dichloro-1,1,1,3,3-pentafluoropropane (HCFC-225aa)	128903-21-9
1,1-dichloro-1,2,3,3,3-pentafluoropropane	111512-56-2
(R,S)2,3-dichloro-1,1,1,2,3-pentafluoropropane	111512-55-1
(R,R)2,3-dichloro-1,1,1,2,3-pentafluoropropane	111512-51-7
1,1-dichloro-1,2,2,3,3-pentafluoropropane	13474-88-9
1,2-dichloro-1,1,3,3,3-pentafluoropropane (HCFC-225da)	431-86-7
2,3-dichloro-1,1,1,2,3-pentafluoropropane (HCFC-225ba)	422-48-0
1,2-dichloro-1,1,2,3,3-pentafluoropropane	422-44-6
Chlorohexafluoropropane (HCFC-226)	28987-04-4
	134308-72-8[3]
2-chloro-1,1,1,2,3,3-hexafluoropropane (HCFC-226ba)	51346-64-6
2-chloro-1,1,1,3,3,3-hexafluoropropane (HCFC-226da)	431-87-8
3-chloro-1,1,1,2,2,3-hexafluoropropane (HCFC-226ca)	422-57-1
1-chloro-1,1,2,2,3,3-hexafluoropropane (HCFC-226cb)	422-55-9
1-chloro-1,1,2,3,3,3-hexafluoropropane (HCFC-226ea)	359-58-0
Pentachlorofluoropropane (HCFC-231)	NA
	134190-48-0[3]
1,1,1,2,3-pentachloro-2-fluoropropane	421-94-3
1,1,2,3,3-pentachloro-2-fluoropropane	NA
1,1,1,3,3-pentachloro-3-fluoropropane	NA
1,1,2,2,3-pentachloro-1-fluoropropane	NA
1,1,1,2,2-pentachloro-3-fluoropropane	NA
1,1,1,2,3-pentachloro-3-fluoropropane	NA
1,1,1,3,3-pentachloro-2-fluoropropane	NA
1,1,2,2,3-pentachloro-3-fluoropropane	NA
1,1,2,3,3-pentachloro-1-fluoropropane	NA
Tetrachlorodifluoropropane (HCFC-232)	127564-82-3
1,2,3,3,-tetrachloro-1,1-difluoropropane	67879-59-8
1,1,3,3,-tetrachloro-2,2-difluoropropane	1112-14-7
1,1,1,3,-tetrachloro-2,2-difluoropropane	677-54-3
1,1,1,3,-tetrachloro-3,3-difluoropropane	460-89-9
1,1,1,3,-tetrachloro-2,3-difluoropropane	NA
1,1,1,2,-tetrachloro-2,3-difluoropropane	NA
1,1,1,2,-tetrachloro-3,3-difluoropropane	NA
1,1,2,3,-tetrachloro-1,2-difluoropropane	NA
1,1,2,3,-tetrachloro-1,3-difluoropropane	NA
1,2,3,3,-tetrachloro-1,2-difluoropropane	NA
(1,1,2,3,-tetrachloro-2,3-difluoropropane)	
1,2,2,3,-tetrachloro-1,1-difluoropropane	NA
1,2,2,3,-tetrachloro-1,3-difluoropropane	NA
1,1,3,3,-tetrachloro-1,3-difluoropropane	NA
1,1,2,2,-tetrachloro-3,3-difluoropropane	NA
(2,2,3,3,-tetrachloro-1,1-difluoropropane)	
1,1,2,2,-tetrachloro-1,3-difluoropropane	NA
Trichlorotrifluoropropane (HCFC-233)	61623-04-9
	134237-40-4[3]
1,1,3-trichloro-2,2,3-trifluoropropane	131221-36-8

1,1,1-trichloro-2,2,3-trifluoropropane	131211-71-7
1,1,3-trichloro-1,2,3-trifluoropropane	54377-32-1
1,1,1-trichloro-2,3,3-trifluoropropane	54306-56-8
1,1,2-trichloro-2,3,3-trifluoropropane	13058-99-6
1,1,1-trichloro-3,3,3-trifluoropropane	7125-84-0
2,2,3-trichloro-1,1,1-trifluoropropane	7125-83-9
2,3,3-trichloro-1,1,1-trifluoropropane	431-51-6
1,1,3-trichloro-1,2,2-trifluoropropane	421-99-8
1,2,3-trichloro-1,1,2-trifluoropropane	421-95-4
1,1,3-trichloro-1,3,3-trifluoropropane	333-26-6
1,1,2-trichloro-1,2,3-trifluoropropane	NA
1,2,3-trichloro-1,2,3-trifluoropropane	NA
1,1,2-trichloro-1,3,3-trifluoropropane	NA
1,3,3-trichloro-1,1,2-trifluoropropane	NA
2,2,3-trichloro-1,1,3-trifluoropropane	NA
1,2,3-trichloro-1,1,3-trifluoropropane	NA
1,2,2-trichloro-1,1,3-trifluoropropane	NA
Dichlorotetrafluoropropane (HCFC-234)	127564-83-4
1,3-dichloro-1,1,3,3-tetrafluoropropane (HCFC-234fa)	76140-39-1
1,3-dichloro-1,2,2,3-tetrafluoropropane	70341-81-0
1,1-dichloro-1,2,2,3-tetrafluoropropane	70192-63-1
1,1-dichloro-1,3,3,3-tetrafluoropropane	64712-27-2
(R,R) 1,3-dichloro-1,1,2,3-tetrafluoropropane	53149-65-8
3,3-dichloro-1,1,1,2-tetrafluoropropane	53063-54-0
2,2-dichloro-1,1,3,3-tetrafluoropropane	17705-30-5
1,1-dichloro-2,2,3,3-tetrafluoropropane	4071-01-6
1,2-dichloro-1,2,3,3-tetrafluoropropane	425-94-5
1,3-dichloro-1,1,2,2-tetrafluoropropane (HCFC-234cc)	422-00-5
2,3-dichloro-1,1,1,3-tetrafluoropropane (HCFC-234da)	NA
1,1-dichloro-1,2,3,3-tetrafluoropropane	NA
1,2-dichloro-1,1,3,3-tetrafluoropropane	NA
2,3-dichloro-1,1,1,2-tetrafluoropropane	NA
2,2-dichloro-1,1,1,3-tetrafluoropropane	NA
1,2-dichloro-1,1,2,3-tetrafluoropropane	NA
1,3-dichloro-1,1,2,3-tetrafluoropropane	NA
Chloropentafluoropropane (HCFC-235)	108662-83-5 134237-83-5[3]
3-chloro-1,1,1,2,3-pentafluoropropane	134237-41-5
2-chloro-1,1,1,3,3-pentafluoropropane (HCFC-235da)	134251-06-2
1-chloro-1,2,2,3,3-pentafluoropropane (HCFC-235ca)	28103-66-4
1-chloro-1,1,2,2,3-pentafluoropropane (HCFC-235cc)	679-99-2
1-chloro-1,1,3,3,3-pentafluoropropane (HCFC-235fa)	677-55-4
3-chloro-1,1,1,2,2-pentafluoropropane (HCFC-235cb)	460-92-4
2-chloro-1,1,1,2,3-pentafluoropropane	422-02-6
1-chloro-1,1,2,3,3-pentafluoropropane	NA
2-chloro-1,1,2,3,3-pentafluoropropane	NA
Tetrachlorofluoropropane (HCFC-241)	NA 134190-49-1[3]
1,1,1,2-tetrachloro-3-fluoropropane	84816-05-7
1,1,1,3-tetrachloro-3-fluoropropane	23153-22-2
1,1,2,3-tetrachloro-3-fluoropropane	21981-25-9
1,1,2,2-tetrachloro-1-fluoropropane	7126-06-9
1,1,2,3-tetrachloro-2-fluoropropane	3175-26-6
1,1,1,2-tetrachloro-2-fluoropropane	3175-25-5
1,1,2,3-tetrachloro-1-fluoropropane	666-27-3
1,1,1,3-tetrachloro-2-fluoropropane	NA
1,1,2,2-tetrachloro-3-fluoropropane	NA
1,2,2,3-tetrachloro-1-fluoropropane	NA

1,1,3,3-tetrachloro-1-fluoropropane	NA
1,1,3,3-tetrachloro-2-fluoropropane	NA
Trichlorodifluoropropane (HCFC-242)	127564-90-3
	134237-42-6[3]
1,3,3-trichloro-1,1-difluoropropane	460-63-9
1,2,3-trichloro-1,2-difluoropropane	7164-14-9
1,1,3-trichloro-2,2-difluoropropane	1112-13-6
1,2,3-trichloro-1,1-difluoropropane	431-24-3
1,1,1-trichloro-2,2-difluoropropane	1112-05-6
1,2,2-trichloro-1,1-difluoropropane	7126-05-8
1,1,2-trichloro-1,2-difluoropropane	7126-04-7
1,1,1-trichloro-2,3-difluoropropane	NA
1,1,2-trichloro-1,3-difluoropropane	NA
1,1,3-trichloro-1,2-difluoropropane	NA
1,1,2-trichloro-2,3-difluoropropane	NA
1,2,2-trichloro-1,3-difluoropropane	NA
2,2,3-trichloro-1,1-difluoropropane	NA
1,1,1-trichloro-3,3-difluoropropane	NA
1,1,3-trichloro-1,3-difluoropropane	NA
1,1,2-trichloro-3,3-difluoropropane	NA
1,1,3-trichloro-2,3-difluoropropane	NA
1,2,3-trichloro-1,3-difluoropropane	NA
Dichlorotrifluoropropane (HCFC-243)	116890-51-8
	134237-43-7[3]
2,2-dichloro-1,1,1-trifluoropropane	7126-01-4
1,1-dichloro-1,2,2-trifluoropropane	7125-99-7
1,2-dichloro-1,1,2-trifluoropropane	7126-00-3
2,3-dichloro-1,1,1-trifluoropropane (HCFC-243da)	338-75-0
1,3-dichloro-1,2,2-trifluoropropane	67406-68-2
1,1-dichloro-2,2,3-trifluoropropane	70192-70-0
3,3-dichloro-1,1,1-trifluoropropane	460-69-5
1,3-dichloro-1,1,2-trifluoropropane	NA
1,2-dichloro-1,1,3-trifluoropropane	NA
1,1-dichloro-1,2,3-trifluoropropane	NA
2,3-dichloro-1,1,2-trifluoropropane	NA
2,2-dichloro-1,1,3-trifluoropropane	NA
1,2-dichloro-1,2,3-trifluoropropane	NA
1,3-dichloro-1,1,3-trifluoropropane	NA
1,1-dichloro-1,3,3-trifluoropropane	NA
3,3-dichloro-1,1,2-trifluoropropane	NA
2,3-dichloro-1,1,3-trifluoropropane	NA
1,3-dichloro-1,2,3-trifluoropropane	NA
Chlorotetrafluoropropane (HCFC-244)	NA
	134190-50-4[3]
2-chloro-1,1,1,3-tetrafluoropropane (HCFC-244db)	117970-90-8
3-chloro-1,1,2,2-tetrafluoropropane	679-85-6
1-chloro-1,2,2,3-tetrafluoropropane	67406-66-0
1-chloro-1,1,3,3-tetrafluoropropane (HCFC-244fb)	2730-64-5
2-chloro-1,1,3,3-tetrafluoropropane (HCFC-244da)	19041-02-2
2-chloro-1,1,1,2-tetrafluoropropane (HCFC-244ba)	421-73-8
1-chloro-1,1,2,2-tetrafluoropropane	421-75-0
1-chloro-1,1,2,3-tetrafluoropropane	NA
3-chloro-1,1,1,2-tetrafluoropropane	NA
2-chloro-1,1,2,3-tetrafluoropropane	NA
3-chloro-1,1,1,3-tetrafluoropropane	NA
3-chloro-1,1,2,3-tetrafluoropropane	NA
Trichlorofluoropropane (HCFC-251)	NA
	134190-51-5[3]

(R,S)-(.+-.) 1,2,3-trichloro-1-fluoropropane	84847-80-3
(R,R)-(.+-.)	84847-79-0
[R(R,S)]	76985-34-7
[R(R,R)]	76985-33-6
(R,S)	67832-50-2
(R,R)	67832-44-4
1,2,3-trichloro-2-fluoropropane	7126-16-1
1,2,2-trichloro-3-fluoropropane	70192-89-1
1,1,3-trichloro-1-fluoropropane	818-99-5
1,1,3-trichloro-2-fluoropropane	76937-36-5
1,1,2-trichloro-1-fluoropropane	421-41-0
1,1,2-trichloro-2-fluoropropane	3175-24-4
1,1,1-trichloro-2-fluoropropane	NA
1,1,1-trichloro-3-fluoropropane	NA
1,1,2-trichloro-3-fluoropropane	NA
1,1,3-trichloro-3-fluoropropane	NA
1,2,2-trichloro-1-fluoropropane	NA
1,2,3-trichloro-1-fluoropropane	NA
Dichlorodifluoropropane (HCFC-252)	NA
	134190-52-6[3]
1,1-dichloro-2,2-difluoropropane	1112-01-2
1,1-dichloro-3,3-difluoropropane	131404-17-6
1,1-dichloro-1,3-difluoropropane	121612-64-4
1,2-dichloro-1,1-difluoropropane	7126-15-0
1,2-dichloro-2,3-difluoropropane	70192-74-4
2,3-dichloro-1,1-difluoropropane	82578-00-5
1,3-dichloro-1,1-difluoropropane	819-00-1
1,3-dichloro-1,2-difluoropropane	111483-26-2
1,3-dichloro-2,2-difluoropropane	1112-36-3
1,1-dichloro-1,2-difluoropropane	NA
1,1-dichloro-2,3-difluoropropane	NA
1,2-dichloro-1,2-difluoropropane	NA
1,2-dichloro-1,3-difluoropropane	NA
1,3-dichloro-1,3-difluoropropane	NA
2,2-dichloro-1,1-difluoropropane	NA
2,2-dichloro-1,3-difluoropropane	NA
Chlorotrifluoropropane (HCFC-253)	26588-23-8
	134237-44-8[3]
2-chloro-1,1,1-trifluoropropane	421-47-6
3-chloro-1,1,1-trifluoropropane	460-35-5
1-chloro-1,1,2-trifluoropropane	134251-05-1
2-chloro-1,1,2-trifluoropropane	69202-10-4
3-chloro-1,1,2-trifluoropropane	121612-65-5
1-chloro-1,1,3-trifluoropropane	83124-56-5
1-chloro-1,2,2-trifluoropropane	70192-76-6
1-chloro-2,2,3-trifluoropropane	56758-54-4
2-chloro-1,1,3-trifluoropropane	NA
3-chloro-1,1,3-trifluoropropane	NA
(1-chloro-1,3,3-trifluoropropane)	
1-chloro-1,2,3-trifluoropropane	NA
2-chloro-1,2,3-trifluoropropane	NA
Dichlorofluoropropane (HCFC-261)	127404-11-9
	134237-45-9[3]
1,1-dichloro-1-fluoropropane	7779-56-6
1,1-dichloro-2-fluoropropane	53074-31-0
1,1-dichloro-3-fluoropropane	53074-30-9
1,2-dichloro-1-fluoropropane	7799-55-5
1,2-dichloro-2-fluoropropane	420-97-3

1,2-dichloro-3-fluoropropane	453-01-0
1,3-dichloro-1-fluoropropane	83124-60-1
1,3-dichloro-2-fluoropropane	816-38-6
2,2-dichloro-1-fluoropropane	NA
Chlorodifluoropropane (HCFC-262)	NA 134190-53-7[3]
1-chloro-1,1-difluoropropane	421-02-3
2-chloro-1,1-difluoropropane	430-93-3 DR[2] 5268567-3
3-chloro-1,1-difluoropropane	83124-57-6
1-chloro-1,2-difluoropropane	430-96-6
1-chloro-2,3-difluoropropane	37161-81-2
2-chloro-1,3-difluoropropane	102738-79-4
1-chloro-2,2-difluoropropane	420-99-5
2-chloro-1,2-difluoropropane	NA
1-chloro-1,3-difluoropropane	NA
Chlorofluoropropane (HCFC-271)	NA 134190-54-8[3]
1-chloro-1-fluoropropane	430-55-7
1-chloro-2-fluoropropane	430-46-6
1-chloro-3-fluoropropane	462-38-4
2-chloro-1-fluoropropane	20372-78-5
2-chloro-2-fluoropropane	420-44-0
Notes: [1] Manufacturing processes do not include facilities equipment or systems such as chillers and fire suppression systems. [2] DR denotes a deleted registry number that was replaced with another registry number. [3] Chemical to which Chemical Abstract Service (CAS) assigned registry number based on premise that it was a trade name, although chemical may be the same as another one already listed.	

Annex G. Perfluorocarbons (PFC)

Carbon tetrafluoride	75-73-0
Perfluoroethane	76-16-4

Annex H. Polychlorinated biphenyls (PCBs)

Polychlorinated Biphenyls	1336-36-3
Aroclor	12767-79-2
Chlorodiphenyl (Aroclor 1260)	11096-82-5
Kanechlor 500	27323-18-8
Aroclor 1254	11097-69-1
Terphenyls	26140-60-3

Annex I. Polychlorinated naphthalenes

Polychlorinated Naphthalenes	70776-03-3

Annex J. Shortchain Chlorinated Paraffins

Only short-chain chlorinated paraffins with carbon length of 10-13 atoms are covered.

Chlorinated paraffins (C10-13)	85535-84-8
Other Short Chain Chlorinated Paraffins	-

Annex K. Tributyl tin oxide (TBTO)

Bis(tri-n-butyltin) oxide	56-35-9

Annex L. Cadmium/Cadmium Compounds

Cadmium	7440-43-9
Cadmium oxide	1306-19-0
Cadmium sulfide	1306-23-6
Cadmium chloride	10108-64-2
Cadmium sulfate	10124-36-4
Other cadmium compounds	-

Annex M. Chromium VI Compounds

Chromium (VI) oxide	1333-82-0
Barium chromate	10294-40-3
Calcium chromate	13765-19-0
Chromic acetate	1066-30-4
Chromium trioxide	1333-82-0
Lead (II) chromate	7758-97-6
Sodium chromate	7775-11-3
Sodium dichromate	10588-01-9
Strontium chromate	7789-06-2
Potassium dichromate	7778-50-9
Potassium chromate	7789-00-6
Zinc chromate	13530-65-9

Annex N. Lead/Lead Compounds

Lead	7439-92-1
Lead (II) sulfate	7446-14-2
Lead (II) carbonate	598-63-0
Lead hydrocarbonate	1319-46-6
Lead acetate	301-04-2
Lead (II) acetate, trihydrate	6080-56-4
Lead phosphate	7446-27-7
Lead selenide	12069-00-0
Lead (IV) oxide	1309-60-0
Lead (II,IV) oxide	1314-41-6
Lead (II) sulfide	1314-87-0
Lead (II) oxide	1317-36-8
Lead (II) carbonate basic	1319-46-6
Lead hydroxidcarbonate	1344-36-1
Lead (II) phosphate	7446-27-2
Lead (II) chromate	7758-97-6
Lead (II) titanate	12060-00-3
Lead sulfate, sulphuric acid, lead salt	15739-80-7
Lead sulphate, tribasic	12202-17-4
Lead stearate	1072-35-1
Other lead compounds	-

Annex O. Mercury /Mercury Compounds

Mercury	7439-97-6
Mercuric chloride	33631-63-9
Mercury (II) chloride	7487-94-7
Mercuric sulfate	7783-35-9
Mercuric nitrate	10045-94-0
Mercuric (II) oxide	21908-53-2
Mercuric sulfide	1344-48-5
Other mercury compounds	-

Annex P. Polybrominated biphenyls (PBBs) including all congeners and isomers

2-Bromobiphenyl	2052-07-05
3-Bromobiphenyl	211-57-7
4-Bromobiphenyl	92-66-0
Decabromobiphenyl	13654-09-06
Dibromobiphenyl	92-86-4
Heptabromobiphenyl	35194-78-6
Hexabromobiphenyl	59080-40-9, 36355-01-8, 67774-32-7
Nonabromobiphenyl	27753-52-2
Octabromobiphenyl	61288-13-9
Pentabromobiphenyl	56307-79-0
Polybrominated Biphenyl	59536-65-1
Tetrabromobiphenyl	40088-45-7
Tribromobiphenyl	59080-34-1
Firemaster FF-1	67774-32-7

Annex Q. Polybrominated diphenyl ethers (PBDEs) including all congeners and isomers

Bromodiphenyl Ether	101-55-3
Decabromodiphenyl Ether	1163-19-5
Dibromodiphenyl Ether	2050-47-7
Heptabromodiphenyl Ether	68928-80-3
Hexabromodiphenyl Ether	36483-60-0
Nonabromodiphenyl Ether	63936-56-1
Octabromodiphenyl Ether	32536-52-0
Pentabromodiphenyl Ether	32534-81-9
Tetrabromodiphenyl Ether	40088-47-9
Tribromodiphenyl Ether	49690-94-0

Annex R. Antimony/Antimony Compounds

Antimony (metallic)	7440-36-0
Antimony trioxide	1309-64-4
Antimony pentoxide	1314-60-9
Antimony trichloride	10025-91-9
Sodium antimonate	15432-85-6
Other antimony compounds	-

Annex S. Arsenic/Arsenic Compounds

Arsenic	7440-38-2
Gallium arsenide	1303-00-0
Calcium arsenate	7778-44-1

Calcium arsenite	27152-57-4
Arsenic pentoxide	1303-28-2
Arsenic trioxide	1327-53-3
Potassium arsenite	10124-50-2
Potassium arsenate	7784-41-0
Lead arsenate	3687-31-8
Other arsenic compounds	-

Annex T. Beryllium/Beryllium Compounds

Beryllium	7440-41-7
Beryllium-aluminum alloy	12770-50-2
Beryllium chloride	7787-47-5
Beryllium fluoride	7787-49-7
Beryllium hydroxide	13327-32-7
Beryllium oxide	1304-56-9
Beryllium phosphate	13598-15-7
Beryllium sulfate	13510-49-1
Beryllium sulfate tetrahydrate	7787-56-6
Beryl ore	1302-52-9
Other beryllium compounds	-

Annex U. Bismuth/Bismuth Compounds and Alloys

Bismuth	7440-69-9
Bismuth trioxide	1304-76-3
Bismuth nitrate	10361-44-1
Other bismuth compounds	-

Annex V. Brominated Flame Retardants (other than PBB or PBDE)

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 carbonate oligomer, 2,4,6-tribromo-phenol terminated	71342-77-3
TBBA carbonate oligomer, phenoxy end capped	94334-64-2
TBBA carbonate oligomer	28906-13-0
TBBA-TBBA-diglycidyl-ether oligomer	70682-74-5
TBBA-epichlorhydrin oligomer	40039-93-8
TBBA, unspecified	30496-13-0
Brominated epoxy resin end-capped with tribromophenol	139638-58-7
Brominated epoxy resin end-capped with tribromophenol TBBA-(2,3-dibromo-propyl-ether)	135229-48-0 21850-44-2
TBBA bis-(2-hydroxy-ethyl-ether)	4162-45-2
TBBA-bis-(allyl-ether) TBBA-dimethyl-ether	25327-89-3 37853-61-5
Tetrabromo-bisphenol S	39635-79-5
TBBS-bis-(2,3-dibromo-propyl-ether) 2,4-Dibromo-phenol 2,4,6-tribromo-phenol	42757-55-1 615-58-7 118-79-6
Pentabromo-pheno 2,4,6-Tribromo-phenyl-allyl-ether	l 608-71-9 3278-89-5

Tribromo-phenyl-allyl-ether, unspecified	26762-91-4
Bis(2-ethylhexyl)tetrabromo-phthalate 2-Hydroxy-propyl-2-(2-hydroxy-ethoxy)-ethyl-TBP TBPA, glycol-and propylene-oxide esters	26040-51-7 20566-35-2 75790-69-1
N,N'-Ethylene –bis-(tetrabromo-phthalimide) Ethylene-bis(5,6-dibromo-norbornane-2,3-dicarboximide)	32588-76-4 52907-07-0
2,3-Dibromo-2-butene-1,4-diol	3234-02-4
Dibromo-neopentyl-glycol Dibromo-propanol Tribromo-neopentyl-alcohol	3296-90-0 96-13-9 36483-57-5
Poly tribromo-styrene Tribromo-styrene Dibromo-styrene grafted PP	57137-10-7 61368-34-1 171091-06-8
Poly-dibromo-styrene Bromo-/Chloro-paraffins Bromo-/Chloro-alpha-olefin	31780-26-4 68955-41-9 82600-56-4
Vinylbromide Tris-(2,3-dibromo-propyl)-isocyanurate Tris(2,4-Dibromo-phenyl) phosphate	593-60-2 52434-90-9 49690-63-3
Tris(tribromo-neopentyl) phosphate	19186-97-1
Chlorinated and brominated phosphate ether	125997-20-8
Pentabromo-toluene	87-83-2
Pentabromo-benzyl bromide	38521-51-6
1,3-Butadiene homopolymer,brominated	68441-46-3
Pentabromo-benzyl-acrylate, monomer	59447-55-1
Pentabromo-benzyl-acrylate, polymer	59447-57-3
Decabromo-diphenyl-ethane Tribromo-bisphenyl-maleinimide Brominated trimethylphenyl-lindane	84852-53-9 59789-51-4 59789-51-4
Other Brominated Flame Retardants	-
Hexabromo-cyclo-dodecane (HBCD), unspecified Tetrabromo-cyclo-octane 1,2-Dibromo-4-(1,2 dibromo-methyl)-cyclo-hexane	3194-55-6 31454-48-5 3322-93-8
TBPA Na salt Tetrabromo phthalic anhydride	25357-79-3 632-79-1

Annex W. Magnesium/Magnesium Alloys

Magnesium	7439-95-4
Other magnesium alloys	-

Annex X. Phthalates

Benzyl 3-isobutyryloxy-1-isopropyl-2,2-dimethylpropyl phthalate	16883-83-3
Benzyl octyl phthalate	68515-40-2
Benzylbutyl phthalate (BBP)	85-68-7
Bis (2-ethylhexyl) phthalate (DEHP)	117-81-7
Bis(2-ethylhexyl) tetrabromophthalate (TBPH or BEHTBP)	26040-51-7
Bis(2-methoxyethyl) phthalate (DBP)	117-82-8
Butyl cyclohexyl phthalate (BCP)	84-64-0
Butyl decyl phthalate (BDP)	89-19-0
Di (2-methoxyethyl) phthalate	117-82-8
Di-(2-ethylhexyl phthalate) (DEHP)	117-81-7
Diallyl phthalate (DAP)	131-17-9

Dibutylphthalate (DBP)	84-74-2
Dicyclohexyl phthalate (DCHP)	84-61-7
Diethyl phthalate (DEP)	84-66-2
Di-isobutyl phthalate (DIBP)	84-69-5
Diisodecyl phthalate (DIDP)	26761-40-0 68515-49-1
Diisoheptyl phthalate (DiHpP)	41451-28-9
Diisohexyl phthalate (DiHxP)	146-50-9
Diisononyl phthalate (DINP)	28553-12-0 68515-48-0
Diisooctyl phthalate (DIOP)	27554-26-3
Diisotridecyl phthalate (DIUP)	68515-47-9
Diisoundecyl phthalate (DIUP)	85507-79-5
Dimethyl phthalate (DMP)	131-11-3
Di-n-hexyl phthalate (DNHP)	84-75-3
Di-n-octyl phthalate (DNOP	117-84-0
Di-n-pentyl phthalate (DnPP)	131-18-0
Di-n-propyl phthalate (DPP)	131-16-8
Ditridecyl phthalate (DTDP)	119-06-2
Diundecyl phthalate (DUP)	3648-20-2
N-Octyl n-decyl phthalate (ODP)	119-07-3

Annex Y. Polyvinyl Chloride

Polyvinyl chloride (PVC)	9002-86-2

Annex Z. Radioactive Substances

Americium – 241	14596-10-2; 7440-35-9
Cesium	7440-46-2
Cesium – 137	10045-97-3
Plutonium	7440-07-5
Radon	10043-92-2
Strontium	7440-24-6
Strontium-90	10098-97-2
Thorium – 232	7440-29-1
Uranium – 238	7440-61-1
Other radioactive substances -	

Annex AA. Selenium/Selenium Compounds

Selenium	7782-49-2
Hydrogen selenide	7783-07-5
Sodium selenide	1313-85-5
Selenium dioxide	7446-08-4
Sodium selenate	10112-94-4
Dimethyl selenide	593-79-3
Selenium oxide	12640-89-0
Other selenium compounds	-

Annex BB. Tributyl Tin, Triphenyl Tin

Tributyltin	688-73-3
Tributyltin oxide	56-35-9

Tributyltin benzoate	4342-36-3
Tributyl tin bromide	1461-23-0
Tributyltin linoleate	24124-25-2
Tributyltin methacrylate	2155-70-6
Triphenyl tin	668-34-8
Triphenyltin N,N'-dimethyldithiocarbamate	1803-12-9
Triphenyltin fluoride	379-52-2
Triphenyltin acetate	900-95-8
Triphenyltin chloride	639-58-7
Triphenyltin hydroxide	76-87-9
Triphenyltin fatty acid salts (C=9-11)	47672-31-1
Triphenyltin chloroacetate	7094-94-2
Tributyltin methacrylate	2155-70-6
Bis(tributyltin) fumarate	6454-35-9
Tributyltin fluoride	1983-10-4
Bis(tributyltin) 2,3-dibromosuccinate	31732-71-5
Tributyltin acetate	56-36-0
Tributyltin laurate	3090-36-6
Bis(tributyltin) phthalate	4782-29-0
Copolymer of alkyl acrylate, methyl methacrylate and tributyltin	
methacrylate(alkyl, C=8)	67772-01-4
Tributyltin sulfamate	6517-25-5
Bis(tributyltin) maleate	14275-57-1
Tributyltin chloride	1461-22-9,7342-38-3
Mixture of tributyltin cyclopentanecarboxylate and its analogs (Tributyltin	
naphthenate)	-
Tributyltin cyclopentane carbonate=mixture	5409-17-2
Triphenyltin fatty acid ((9-11) salt)	18380-71-7,18380-72-8,47672-31-1,94850-90-5
Mixture of tributyltin 1,2,3,4,4a,4b,5,6,10,10a-decahydro -7-isopropyl- 1,4a- dimethyl-1-phenanthrenecarboxylate and its analogs (Tributyltin rosin salt)	26239-64-5
Tributyltin naphthenate	85409-17-2
Other Tributyl Tins & Triphenyl Tins	-

Annex CC. Polycyclic Aromatic Hydrocarbons

Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Benzo(e)pyren	192-97-2
Benzo(g,h,i)perylene	191-24-2
Benzo(j)fluoranthene	205-82-3
Benzo(k)fluoranthene	207-08-9
Chrysene	218-01-9
Dibenzo(a,h)anthracene	53-70-3
Fluoranthene	206-44-0
Fluorene	86-73-7

Indeno(1,2,3-c,d)pyrene	193-39-5
Naphthalene	91-20-3
Phenanthrene	81-5-8
Pyrene	129-00-0

Annex DD. SVHC Candidate List (current as of the date of this specification, current list maintained by ECHA at https://echa.europa.eu/candidate-list-table)
***includes two (2) additional substances per France Decree No. 2020-105**

Substance name	CAS No.
6,6'-di-tert-butyl-2,2'-methylenedi-p-cresol	119-47-1
tris(2-methoxyethoxy)vinylsilane	1067-53-4
(±)-1,7,7-trimethyl-3-[(4-methylphenyl)methylene]bicyclo[2.2.1]heptan-2-one covering any of the individual isomers and/or combinations thereof (4-MBC) (3E)-1,7,7-trimethyl-3-(4-methylbenzylidene)bicyclo[2.2.1]heptan-2-one (1R,3E,4S)-1,7,7-trimethyl-3-(4- methylbenzylidene)bicyclo[2.2.1]heptan-2-one (1S,3Z,4R)-1,7,7-trimethyl-3-(4-methylbenzylidene)bicyclo[2.2.1]heptan-2-one (±)-1,7,7-trimethyl-3-[(4-methylphenyl)methylene]bicyclo[2.2.1]heptan-2-one (1R,4S)-1,7,7-trimethyl-3-(4-methylbenzylidene)bicyclo[2.2.1]heptan-2-one (1S,3E,4R)-1,7,7-trimethyl-3-(4- methylbenzylidene)bicyclo[2.2.1]heptan-2-one (1R,3Z,4S)-1,7,7-trimethyl-3-(4- methylbenzylidene)bicyclo[2.2.1]heptan-2-one	- 1782069-81-1 95342-41-9 852541-25-4 36861-47-9 741687-98-9 852541-30-1 852541-21-0
S-(tricyclo(5.2.1.02,6)deca-3-en-8(or 9)-yl O-(isopropyl or isobutyl or 2-ethylhexyl) O-(isopropyl or isobutyl or 2-ethylhexyl) phosphorodithioate	255881-94-8
Dibutylbis(pentane-2,4-dionato-O,O')tin	22673-19-4
butyl 4-hydroxybenzoate	94-26-8
2-methylimidazole	693-98-1
1-vinylimidazole	1072-63-5
Perfluorobutane sulfonic acid (PFBS) and its salts N,N,N,-triethylethanaminium 1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonate Magnesium perfluorobutane sulfonate; PFBS 1-Butanesulfonic acid, 1,1,2,2,3,3,4,4,4-nonafluoro-, lithium salt (1:1) Morpholinium perfluorobutane sulfonate; PFBS Ammonium 1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulphonate Sulfonium, dimethylphenyl-, salt with 1,1,2,2,3,3,4,4,4-nonafluoro-1-butanesulfonic acid(1:1) Sulfonium, triphenyl-, salt with 1,1,2,2,3,3,4,4,4-nonafluoro-1-butanesulfonic acid(1:1) Potassium 1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulphonate tetrabutyl-phosphonium nonafluoro-butane-1-sulfonate	- 25628-08-4 507453-86-3 131651-65-5 503155-89-3 68259-10-9 220133-51-7 144317-44-2 29420-49-3 220689-12-3
Diisohexyl phthalate	71850-09-4
2-methyl-1-(4-methylthiophenyl)-2-morpholinopropan-1-one	71868-10-5
2-benzyl-2-dimethylamino-4'-morpholinobutyrophenone	119313-12-1
Tris(4-nonylphenyl, branched and linear) phosphite (TNPP) with ≥ 0.1% w/w of 4-nonylphenol, branched and linear (4-NP) tris(4-nonylphenyl, branched) phosphite Phenol, 4-nonyl-, phosphite (3:1) Tris(nonylphenyl) phosphite	- - 3050-88-2 26523-78-4
4-tert-butylphenol	98-54-4
2-methoxyethyl acetate	110-49-6

2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propionic acid, its salts and its acyl halides 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propionic acid Ammonium 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propanoate Potassium 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propionate 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy)propionyl fluoride	- 13252-13-6 62037-80-3 67118-55-2 2062-98-8
Pyrene	129-00-0
Phenanthrene	85-01-8
Fluoranthene	206-44-0
Benzo[k]fluoranthene	207-08-9
2,2-bis(4'-hydroxyphenyl)-4-methylpentane	6807-17-6
1,7,7-trimethyl-3-(phenylmethylene)bicyclo[2.2.1]heptan-2-one	15087-24-8
Terphenyl, hydrogenated	61788-32-7
Octamethylcyclotetrasiloxane	556-67-2
Lead	7439-92-1
Ethylenediamine	107-15-3
Dodecamethylcyclohexasiloxane	540-97-6
Disodium octaborate	12008-41-2
Dicyclohexyl phthalate	84-61-7
Decamethylcyclopentasiloxane	541-02-6
Benzo[ghi]perylene	191-24-2
Benzene-1,2,4-tricarboxylic acid 1,2 anhydride	552-30-7
Reaction products of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and 4-heptylphenol, branched and linear (RP-HP) Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs. Formaldehyde, reaction products with branched and linear heptylphenol, carbon disulfide and hydrazine	- - 93925-00-9
Chrysene	218-01-9
Cadmium nitrate	10325-94-7
Cadmium hydroxide	21041-95-2
Cadmium carbonate	513-78-0
Benz[a]anthracene	56-55-3
1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.16,9.02,13.05,10]octadeca-7,15-diene ("Dechlorane Plus"™) 1,6,7,8,9,14,15,16,17,17,18,18-dodecachloropentacyclo[12.2.1.16,9.02,13.05,10]octadeca-7,15-diene rel-(1R,4S,4aS,6aS,7S,10R,10aR,12aR)-1,2,3,4,7,8,9,10,13,13,14,14-dodecachloro-1,4,4a,5,6,6a,7,10,10a,11,12,12a-dodecahydro-1,4:7,10-dimethanodibenzo[a,e]cyclooctene rel-(1R,4S,4aS,6aR,7R,10S,10aS,12aR)-1,2,3,4,7,8,9,10,13,13,14,14-dodecachloro-1,4,4a,5,6,6a,7,10,10a,11,12,12a-dodecahydro-1,4:7,10-dimethanodibenzo[a,e]cyclooctene	- 13560-89-9 - -
Perfluorohexane-1-sulphonic acid and its salts Perfluorohexane-1-sulphonic acid Ammonium perfluorohexane-1-sulphonate Tridecafluorohexanesulphonic acid, compound with 2,2'-iminodiethanol (1:1) Potassium perfluorohexane-1-sulphonate	- 355-46-4 68259-08-5 70225-16-0 3871-99-6
p-(1,1-dimethylpropyl)phenol	80-46-6
Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts Decanoic acid, nonadecafluoro-, sodium salt Nonadecafluorodecanoic acid	- 3830-45-3 335-76-2

Ammonium nonadecafluorodecanoate	3108-42-7
4-heptylphenol, branched and linear Phenol, heptyl derivs. 4-heptylphenol	- 72624-02-3 1987-50-4
4,4'-isopropylidenediphenol	80-05-7
Benzo[def]chrysene (Benzo[a]pyrene)	50-32-8
Perfluorononan-1-oic-acid and its sodium and ammonium salts Ammonium salts of perfluorononan-1-oic-acid Perfluorononan-1-oic-acid Sodium salts of perfluorononan-1-oic-acid	- 4149-60-4 375-95-1 21049-39-8
Nitrobenzene	98-95-3
2-(2H-benzotriazol-2-yl)-4-(tert-butyl)-6-(sec-butyl)phenol (UV-350)	36437-37-3
2,4-di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol (UV-327)	3864-99-1
1,3-propanesultone	1120-71-4
5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [1], 5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [2] 1,3-Dioxane, 2-(2,4-dimethyl-3-cyclohexene-1-yl)-5-methyl-5-(1-methylpropyl)- 2-(2,4-Dimethylcyclohex-3-ene-1-yl)-5-methyl-(1-methylpropyl)-1,3-dioxane Reaction mass of 5-[(2R)-butan-2-yl]-2-[(1R,2R)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2R)-butan-2-yl]-2-[(1R,2S)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2R)-butan-2-yl]-2-[(1S,2R)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2R)-butan-2-yl]-2-[(1S,2S)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2S)-butan-2-yl]-2-[(1S,2R)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2S)-butan-2-yl]-2-[(1S,2S)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane 5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane 5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane	- 117933-89-8 117933-89-8 - - -
1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters or mixed decyl and hexyl and octyl diesters 1,2-Benzenedicarboxylic acid, mixed decyl and hexyl and octyl diesters 1,2-Benzenedicarboxylic acid, di-C6-10-alkyl esters	- 68648-93-1 68515-51-5
Reaction mass of 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate and 2-ethylhexyl 10-ethyl-4-[[2-[(2-ethylhexyl)oxy]-2-oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (reaction mass of DOTE and MOTE)	-
Cadmium sulphate	1 0 1 2 4 - 3 6 - 4 , 31119-53-6
Cadmium fluoride	7790-79-6
2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (DOTE)	15571-58-1
2-benzotriazol-2-yl-4,6-di-tert-butylphenol (UV-320)	3846-71-7
2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol (UV-328)	25973-55-1
Sodium peroxometaborate	7632-04-4
Sodium perborate, perboric acid, sodium salt Sodium perborate Perboric acid, sodium salt	- 15120-21-5 11138-47-9
Cadmium chloride	10108-64-2
1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear	68515-50-4
Trixylyl phosphate	25155-23-1
Lead di(acetate)	301-04-2
Imidazolidine-2-thione (2-imidazoline-2-thiol)	96-45-7

Disodium4-amino-3-[[4'-[(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo]-5-hydroxy-6-(phenylazo)naphthalene-2,7-disulphonate (C.I. Direct Black 38)	1937-37-7
Disodium 3,3'-[[1,1'-biphenyl]-4,4'-diylbis(azo)]bis(4-aminonaphthalene-1-sulphonate) (C.I. Direct Red 28)	573-58-0
Dihexyl phthalate	84-75-3
Cadmium sulphide	1306-23-6
Pentadecafluorooctanoic acid (PFOA)	335-67-1
Dipentyl phthalate (DPP)	131-18-0
Cadmium oxide	1306-19-0
Cadmium	7440-43-9
Ammonium pentadecafluorooctanoate (APFO)	3825-26-1
4-Nonylphenol, branched and linear, ethoxylated 26-(4-nonylphenoxy)-3,6,9,12,15,18,21,24-Octaoxahexacosan-1-ol 2-[2-(4-nonylphenoxy)ethoxy]ethanol Nonylphenol, branched, ethoxylated 4-Nonylphenol, ethoxylated Nonylphenol, ethoxylated Nonylphenol, ethoxylated (6,5-EO) (9016-45-9) Nonylphenol, ethoxylated (15-EO) (9016-45-9) Nonylphenol, ethoxylated (10-EO) (9016-45-9) Nonylphenol, ethoxylated (8-EO) (9016-45-9) 2-[2-[2-[2-(4-nonylphenoxy)ethoxy]ethoxy]ethoxy]ethanol 20-(4-nonylphenoxy)-3,6,9,12,15,18-hexaoxaicosan-1-ol Nonylphenol, branched, ethoxylated (CAS# 68412-54-4) Nonylphenol, ethoxylated (EO = 4) Nonylphenol, ethoxylated (polymer) 2-{2-[4-(3,6-dimethylheptan-3-yl)phenoxy]ethoxy}ethanol 2-[4-(3,6-dimethylheptan-3-yl)phenoxy]ethanol Nonylphenolpolyglycolether Nonylphenol, ethoxylated (EO = 10) Isononylphenol, ethoxylated 4-Nonylphenol, branched, ethoxylated 26-(nonylphenoxy)-3,6,9,12,15,18,21,24-octaoxahexacosan-1-ol Poly(oxy-1,2-ethanediyl), a-(nonylphenyl)-w-hydroxy- (CAS 9016-45-9)	- 14409-72-4 20427-84-3 68412-54-4 26027-38-3 9016-45-9 - - - - 7311-27-5 27942-27-4 - - - 1119449-38-5 1119449-37-4 - - 37205-87-1 127087-87-0 26571-11-9 9016-45-9
Trilead dioxide phosphonate	12141-20-7
Trilead bis(carbonate) dihydroxide	1319-46-6
Tricosafluorododecanoic acid	307-55-1
Tetralead trioxide sulphate	12202-17-4
Tetraethyllead	78-00-2
Sulfurous acid, lead salt, dibasic	62229-08-7
Silicic acid, lead salt	11120-22-2
Silicic acid (H2Si2O5), barium salt (1:1), lead-doped	68784-75-8
Pyrochlore, antimony lead yellow	8012-00-8
Pentalead tetraoxide sulphate	12065-90-6
Pentacosafluorotridecanoic acid	72629-94-8
Orange lead (lead tetroxide)	1314-41-6
o-toluidine	95-53-4
o-aminoazotoluene	97-56-3

n-pentyl-isopentylphthalate	776297-69-9
N-methylacetamide	79-16-3
N,N-dimethylformamide	68-12-2
Methyloxirane (Propylene oxide)	75-56-9
Methoxyacetic acid	625-45-6
Lead titanium zirconium oxide	12626-81-2
Lead titanium trioxide	12060-00-3
Lead oxide sulfate	12036-76-9
Lead monoxide (lead oxide)	1317-36-8
Lead dinitrate	10099-74-8
Lead cyanamidate	20837-86-9
Lead bis(tetrafluoroborate)	13814-96-5
Hexahydromethylphthalic anhydride Hexahydromethylphthalic anhydride Hexahydro-4-methylphthalic anhydride Hexahydro-3-methylphthalic anhydride Hexahydro-1-methylphthalic anhydride	- 25550-51-0 19438-60-9 57110-29-9 48122-14-1
Heptacosafluorotetradecanoic acid	376-06-7
Henicosafluoroundecanoic acid	2058-94-8
Furan	110-00-9
Fatty acids, C16-18, lead salts	91031-62-8
Dioxobis(stearato)trilead	12578-12-0
Dinoseb (6-sec-butyl-2,4-dinitrophenol)	88-85-7
Dimethyl sulphate	77-78-1
Diisopentyl phthalate	605-50-5
Diethyl sulphate	64-67-5
Dibutyltin dichloride (DBTC)	683-18-1
Diazene-1,2-dicarboxamide (C,C'-azodi(formamide)) (ADCA)	123-77-3
Cyclohexane-1,2-dicarboxylic anhydride cis-cyclohexane-1,2-dicarboxylic anhydride Cyclohexane-1,2-dicarboxylic anhydride trans-cyclohexane-1,2-dicarboxylic anhydride	- 13149-00-3 85-42-7 14166-21-3
Bis(pentabromophenyl) ether (decabromodiphenyl ether) (DecaBDE)	1163-19-5
Biphenyl-4-ylamine	92-67-1
Acetic acid, lead salt, basic	51404-69-4
[Phthalato(2-)]dioxotrilead	69011-06-9
6-methoxy-m-toluidine (p-cresidine)	120-71-8

4-Nonylphenol, branched and linear Phenol, 4-nonyl-, branched 4-(1-Ethyl-1,4-Dimethylpentyl)Phenol p-(1-methyloctyl)phenol p-isononylphenol p-nonylphenol 4-(1-Ethyl-1,3-Dimethylpentyl)Phenol p-(1,1-dimethylheptyl)phenol 4-(1-ethyl-1-methylhexyl)phenol Nonylphenol 4-(1,1,5-Trimethylhexyl)phenol 4-(3-ethylheptan-2-yl)phenol Isononylphenol Phenol, nonyl-, branched	- 84852-15-3 142731-63-3 17404-66-9 26543-97-5 104-40-5 186825-36-5 30784-30-6 52427-13-1 25154-52-3 521947-27-3 186825-39-8 11066-49-2 90481-04-2
4-methyl-m-phenylenediamine (toluene-2,4-diamine)	95-80-7
4-aminoazobenzene	60-09-3
4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated 20-[4-(1,1,3,3-tetramethylbutyl)phenoxy]-3,6,9,12,15,18-hexaoxaicosan-1-ol 2-[[]4-(2,4,4-trimethylpentan-2-yl)phenoxy]ethan-1-ol 2-{2-[4-(2,4,4-trimethylpentan-2-yl)phenoxy]ethoxy}ethanol 2-[[]4-(2,4,4-trimethylpentan-2-yl)phenoxy]ethanol	- 2497-59-8 2315-67-5 2315-61-9 9002-93-1
4,4'-oxydianiline and its salts 4,4'-oxydianiline	- 101-80-4
4,4'-methylenedi-o-toluidine	838-88-0
3-ethyl-2-methyl-2-(3-methylbutyl)-1,3-oxazolidine	143860-04-2
1-bromopropane (n-propyl bromide)	106-94-5
1,2-diethoxyethane	629-14-1
1,2-Benzenedicarboxylic acid, dipentyl ester, branched and linear	84777-06-0
α,α-Bis[4-(dimethylamino)phenyl]-4 (phenylamino)naphthalene-1-methanol (C.I. Solvent Blue 4)	6786-83-0
N,N,N',N'-tetramethyl-4,4'-methylenedianiline (Michler's base)	101-61-1
Lead(II) bis(methanesulfonate)	17570-76-2
Formamide	75-12-7
Diboron trioxide	1303-86-2
[4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]methylene]cyclohexa-2,5-dien-1-ylidene] dimethylammonium chloride (C.I. Basic Blue 26)	2580-56-5
[4-[4,4'-bis(dimethylamino) benzhydrylidene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride (C.I. Basic Violet 3)	548-62-9
4,4'-bis(dimethylamino)benzophenone (Michler's ketone)	90-94-8
4,4'-bis(dimethylamino)-4"-(methylamino)trityl alcohol	561-41-1
1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione (β-TGIC)	59653-74-6
1,3,5-Tris(oxiran-2-ylmethyl)-1,3,5-triazinane-2,4,6-trione (TGIC)	2451-62-9
1,2-bis(2-methoxyethoxy)ethane (TEGDME; triglyme)	112-49-2
1, 2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	110-71-4
Zirconia Aluminosilicate Refractory Ceramic Fibres Aluminosilicate refractory ceramic fibres	- 142844-00-6
Trilead diarsenate	3687-31-8
Potassium hydroxyoctaoxodizincatedichromate	11103-86-9

Phenolphthalein	77-09-8
Pentazinc chromate octahydroxide	49663-84-5
N,N-dimethylacetamide	127-19-5
Lead styphnate	15245-44-0
Lead dipicrate	6477-64-1
Lead diazide, Lead azide	13424-46-9
Formaldehyde, oligomeric reaction products with aniline	25214-70-4
Dichromium tris(chromate)	24613-89-6
Calcium arsenate	7778-44-1
Bis(2-methoxyethyl) phthalate	117-82-8
Bis(2-methoxyethyl) ether	111-96-6
Arsenic acid	7778-39-4
Aluminosilicate Refractory Ceramic Fibres	-
4-(1,1,3,3-tetramethylbutyl)phenol	140-66-9
2-Methoxyaniline, o-Anisidine	90-04-0
2,2'-dichloro-4,4'-methylenedianiline	101-14-4
1,2-dichloroethane	107-06-2
Strontium chromate	7789-06-2
Hydrazine	302-01-2, 7803-57-8
2-ethoxyethyl acetate	111-15-9
1-Methyl-2-pyrrolidone (NMP)	872-50-4
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters	68515-42-4
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich	71888-89-6
1,2,3-trichloropropane	96-18-4
Cobalt(II) sulphate	10124-43-3
Cobalt(II) dinitrate	10141-05-6
Cobalt(II) diacetate	71-48-7
Cobalt(II) carbonate	513-79-1
Chromium trioxide	1333-82-0
Acids generated from chromium trioxide and their oligomers Oligomers of chromic acid and dichromic acid Chromic acid Dichromic acid	- - 7738-94-5 13530-68-2
2-methoxyethanol	109-86-4
2-ethoxyethanol	110-80-5
Trichloroethylene	79-01-6
Tetraboron disodium heptaoxide, hydrate	12267-73-1
Sodium chromate	7775-11-3
Potassium dichromate	7778-50-9
Potassium chromate	7789-00-6

Disodium tetraborate, anhydrous	12179-04-3, 1303-96-4, 1330-43-4
Boric acid Boric acid, crude natural Boric acid	- 11113-50-1 10043-35-3
Medium-chain chlorinated paraffins (MCCP) UVCB substances consisting of more than or equal to 80% linear chloroalkanes with carbon chain lengths within the range from C14 to C17 Alkanes, C14-17, chloro Tetradecane, chloro derivs. Alkanes, C14-16, chloro di-, tri- and tetrachlorotetradecane	 85535-85-9 198840-65-2 1372804-76-6 -
Ammonium dichromate	7789-09-5
Acrylamide	79-06-1
Tris(2-chloroethyl) phosphate	115-96-8
Pitch, coal tar, high-temp.	65996-93-2
Lead sulfochromate yellow (C.I. Pigment Yellow 34)	1344-37-2
Lead chromate molybdate sulphate red (C.I. Pigment Red 104)	12656-85-8
Lead chromate	7758-97-6
Diisobutyl phthalate	84-69-5
Anthracene oil, anthracene-low	90640-82-7
Anthracene oil, anthracene paste, distn. lights	91995-17-4
Anthracene oil, anthracene paste, anthracene fraction	91995-15-2
Anthracene oil, anthracene paste	90640-81-6
Anthracene oil	90640-80-5
2,4-dinitrotoluene	121-14-2
Triethyl arsenate	15606-95-8
Sodium dichromate	10588-01-9, 7789-12-0
Lead hydrogen arsenate	7784-40-9
Hexabromocyclododecane (HBCDD) Hexabromocyclododecane gamma-hexabromocyclododecane 1,2,5,6,9,10-hexabromocyclododecane alpha-hexabromocyclododecane beta-hexabromocyclododecane	- 25637-99-4 134237-52-8 3194-55-6 134237-50-6 134237-51-7
Dibutyl phthalate (DBP)	84-74-2
Diarsenic trioxide	1327-53-3
Diarsenic pentaoxide	1303-28-2
Cobalt dichloride	7646-79-9
Bis(tributyltin) oxide (TBTO)	56-35-9
Bis (2-ethylhexyl)phthalate (DEHP)	117-81-7
Benzyl butyl phthalate (BBP)	85-68-7
Anthracene	120-12-7

Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	85535-84-8
5-tert-butyl-2,4,6-trinitro-m-xylene (Musk xylene)	81-15-2
4,4'- Diaminodiphenylmethane (MDA)	101-77-9
Bis(2-(2-methoxyethoxy)ethyl)ether	143-24-8
Dioctyltin dilaurate, stannane, dioctyl-, bis(coco acyloxy) derivs., and any other stannane, dioctyl-, bis(fatty acyloxy) derivs. wherein C12 is the predominant carbon number of the fatty acyloxy moiety Stannane, dioctyl-, bis(coco acyloxy) derivs. dioctyltin dilaurate; stannane, dioctyl-, bis(coco acyloxy) derivs. Dioctyltin dilaurate	 91648-39-4 3648-18-8
N-(hydroxymethyl) acrylamide	924-42-5
1,1'-[ethane-1,2-diylbisoxy]bis[2,4,6-tribromobenzene]	37853-59-1
2,2',6,6'-tetrabromo-4,4'-isopropylidenediphenol	79-94-7
4,4'-sulphonyldiphenol	80-09-1
Barium diboron tetraoxide	13701-59-2
Bis(2-ethylhexyl) tetrabromophthalate covering any of the individual isomers and/or combinations thereof	
Isobutyl 4-hydroxybenzoate	4247-02-3
Melamine	108-78-1
Perfluoroheptanoic acid and its salts potassium perfluoroheptanoa Sodium perfluoroheptanoate Perfluoroheptanoic acid Ammonium perfluoroheptanoate	 21049-36-5 20109-59-5 375-85-9 6130-43-4
reaction mass of 2,2,3,3,5,5,6,6-octafluoro-4-(1,1,1,2,3,3,3-heptafluoropropan-2-yl)morpholine and 2,2,3,3,5,5,6,6-octafluoro-4-(heptafluoropropyl)morpholine	
Oligomerisation and alkylation reaction products of 2-phenylpropene and phenol Phenol, methylstyrenated EC No.: 270-966-8	68512-30-1
Bumetrizole (UV-326)	3896-11-5
2-(dimethylamino)-2-[(4-methylphenyl)methyl]-1-[4-(morpholin-4-yl)phenyl]butan-1-one	119344-86-4
2-(2H-benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol (UV-329)	3147-75-9
2,4,6-tri-tert-butylphenol	732-26-3
diphenyl(2,4,6-trimethylbenzoyl)phosphine oxide	75980-60-8
bis(4-chlorophenyl) sulphone	80-07-9
Diisooctyl phthalate (DIOP)*	27554-26-3
1,3-benzenediol (resorcinol)*	108-46-3
Bis(α,α-dimethylbenzyl) peroxide	80-43-3
Triphenyl phosphate	115-86-6
reaction mass of: triphenylthiophosphate and tertiary butylated phenyl derivatives	192268-65-8
Perfluami ne	338-83-0
Octamethyltrisiloxane	107-51-7
O,O,O-triphenyl phosphorothioate	597-82-0
6-[(C10-C13)-alkyl-(branched, unsaturated)-2,5dioxopyrrolidin-1-yl]hexanoic acid	2156592-54-8

1,1,1,3,5,5,5-heptamethyl-3-[(trimethylsilyl)oxy]trisiloxane	17928-28-8
Decamethyltetrasiloxane	141-62-8
Reactive Brown 51	
1,1'-(ethane-1,2-diyl)bis[pentabromobenzene] (DBDPE)	84852-53-9
n-hexane	110-54-3
4,4′-[2,2,2-trifluoro-1-(trifluoromethyl)ethylidene]diphenol (bisphenol AF) and its salts	

Annex EE. List of substances subject to REACH Authorisation (current as of the date of this specification, current list maintained in the latest REACH regulation and its amendments: https://echa.europa.eu/recommendations-for-inclusion-in-the-authorisation-list)
PROHIBITED AT OR ABOVE 0.1% WEIGHT BY WEIGHT OF THE ARTICLE

Substance name	CAS No.
bis(2-ethylhexyl) tetrabromophthalate covering any of the individual isomers and/or combinations thereof Bis(2-ethylhexyl) tetrabromophthalate	- 26040-51-7
Barium diboron tetraoxide	13701-59-2
Diphenyl(2,4,6-trimethylbenzoyl)phosphine oxide	75980-60-8
S-(tricyclo(5.2.1.0'2,6)deca-3-en-8(or 9)-yl O-(isopropyl or isobutyl or 2-ethylhexyl) O-(isopropyl or isobutyl or 2-ethylhexyl) phosphorodithioate	255881-94-8
Melamine	108-78-1
2-methyl-1-(4-methylthiophenyl)-2-morpholinopropan-1-one	71868-10-5
2-benzyl-2-dimethylamino-4'-morpholinobutyrophenone	119313-12-1
2-(4-tert-butylbenzyl)propionaldehyde and its individual stereoisomers (2R)-3-(4-tert-butylphenyl)-2-methylpropanal 2-(4-tert-butylbenzyl)propionaldehyde (2S)-3-(4-tert-butylphenyl)-2-methylpropanal	- 75166-31-3 80-54-6 75166-30-2
Ethylenediamine	107-15-3
Glutaral	111-30-8
Lead	7439-92-1
Orthoboric acid, sodium salt (group) Boric acid, sodium salt Orthoboric acid, sodium salt boric acid (H3BO3), sodium salt, hydrate boric acid (H3BO3), sodium salt (1:1) Boric acid (H3BO3), disodium salt Trisodium orthoborate	- 1333-73-9 13840-56-7 25747-83-5 14890-53-0 22454-04-2 14312-40-4
Diisohexyl phthalate	71850-09-4
Dodecamethylcyclohexasiloxane	540-97-6
Decamethylcyclopentasiloxane	541-02-6
Octamethylcyclotetrasiloxane	556-67-2
Disodium octaborate	12008-41-2
Benzene-1,2,4-tricarboxylic acid 1,2-anhydride	552-30-7

Dicyclohexyl phthalate	84-61-7
Terphenyl, hydrogenated	61788-32-7
1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.16,9.02,13.05,10]octadeca-7,15-diene ("Dechlorane Plus"™) (1S,2S,5R,6R,9S,10S,13R,14R)-1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.1^{6,9}.0^{2,13}.0^{5,10}]octadeca-7,15-diene 1,6,7,8,9,14,15,16,17,17,18,18-dodecachloropentacyclo[12.2.1.16,9.02,13.05,10]octadeca-7,15-diene (1S,2S,5S,6S,9R,10R,13R,14R)-1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.1^{6,9}.0^{2,13}.0^{5,10}]octadeca-7,15-diene rel-(1R,4S,4aS,6aR,7R,10S,10aS,12aR)-1,2,3,4,7,8,9,10,13,13,14,14-dodecachloro-1,4,4a,5,6,6a,7,10,10a,11,12,12a-dodecahydro-1,4:7,10-dimethanodibenzo[a,e]cyclooctene rel-(1R,4S,4aS,6aS,7S,10R,10aR,12aR)-1,2,3,4,7,8,9,10,13,13,14,14-dodecachloro-1,4,4a,5,6,6a,7,10,10a,11,12,12a-dodecahydro-1,4:7,10-dimethanodibenzo[a,e]cyclooctene	- 135821-03-3 13560-89-9 135821-74-8 - -
4,4'-bis(dimethylamino)-4"-(methylamino)trityl alcohol	561-41-1
4,4'-isopropylidenediphenol	80-05-7
Reaction products of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and 4-heptylphenol, branched and linear (RP-HP)	-
Reaction product of 1,3,4-thiadiazolidine-2,5-dithione, formaldehyde and phenol, heptyl derivs.	1471311-26-8
Formaldehyde, reaction products with branched and linear heptylphenol, carbon disulfide and hydrazine	93925-00-9
Reaction mass of 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate and 2-ethylhexyl 10-ethyl-4-[[2-[(2-ethylhexyl)oxy]-2-oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (reaction mass of DOTE and MOTE)	-
2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate	15571-58-1
[phthalato(2-)]dioxotrilead	69011-06-9
Dioxobis(stearato)trilead	12578-12-0
Fatty acids, C16-18, lead salts	91031-62-8
Lead oxide sulfate	12036-76-9
Sulfurous acid, lead salt, dibasic	62229-08-7
Tetraethyllead	78-00-2
Trilead bis(carbonate) dihydroxide	1319-46-6
Trilead dioxide phosphonate	12141-20-7
Cyclohexane-1,2-dicarboxylic anhydride trans-cyclohexane-1,2-dicarboxylic anhydride Cyclohexane-1,2-dicarboxylic anhydride cis-cyclohexane-1,2-dicarboxylic anhydride	- 14166-21-3 85-42-7 13149-00-3
Hexahydromethylphthalic anhydride Hexahydro-1-methylphthalic anhydride Hexahydro-3-methylphthalic anhydride Hexahydromethylphthalic anhydride Hexahydro-4-methylphthalic anhydride	- 48122-14-1 57110-29-9 25550-51-0 19438-60-9
2-methoxyethanol	109-86-4

2-ethoxyethanol	110-80-5
2-(2H-benzotriazol-2-yl)-4-(tert-butyl)-6-(sec-butyl)phenol	36437-37-3
2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol	25973-55-1
2,4-di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol	3864-99-1
2-benzotriazol-2-yl-4,6-di-tert-butylphenol	3846-71-7
5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [1], 5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane [2] Reaction mass of 5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane and 5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane 1,3-Dioxane, 2-[(1S,2S)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, trans- Reaction mass of 5-[(2R)-butan-2-yl]-2-[(1R,2R)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2R)-butan-2-yl]-2-[(1R,6R)-4,6-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2S)-butan-2-yl]-2-[(1R,2R)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2S)-butan-2-yl]-2-[(1S,2R)-2,4-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane and 5-[(2S)-butan-2-yl]-2-[(1S,6R)-4,6-dimethylcyclohex-3-en-1-yl]-5-methyl-1,3-dioxane 5-sec-butyl-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane 5-sec-butyl-2-(4,6-dimethylcyclohex-3-en-1-yl)-5-methyl-1,3-dioxane 1,3-Dioxane, 2-(2,4-dimethyl-3-cyclohexen-1-yl)-5-methyl-5-(1-methylpropyl)- 1,3-Dioxane, 2-[(1R,2R)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, cis- 1,3-Dioxane, 2-[(1R,2R)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, cis-rel- 1,3-Dioxane, 2-[(1R,2R)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, trans- 1,3-Dioxane, 2-[(1R,2R)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, trans-rel- 1,3-Dioxane, 2-[(1R,2S)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, cis- 1,3-Dioxane, 2-[(1R,2S)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, trans- 1,3-Dioxane, 2-[(1S,2R)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, cis- 1,3-Dioxane, 2-[(1S,2R)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, trans- 1,3-Dioxane, 2-[(1S,2S)-2,4-dimethyl-3-cyclohexen-1-yl]-5-methyl-5-(1-methylpropyl)-, cis- 1,3-Dioxane, 2-(2,4-dimethyl-3-cyclohexen-1-yl)-5-methyl-5-(1-methylpropyl)-	- - 676367-06-9 - - - 186309-28-4 676367-05-8 343934-04-3 676367-09-2 343934-05-4 676367-04-7 676367-08-1 676367-03-6 676367-07-0 676367-02-5 117933-89-8
1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters or mixed decyl and hexyl and octyl diesters 1,2-Benzenedicarboxylic acid, mixed decyl and hexyl and octyl diesters 1,2-Benzenedicarboxylic acid, di-C6-10-alkyl esters	- 68648-93-1 68515-51-5
1-methyl-2-pyrrolidone	872-50-4
Tetralead trioxide sulphate	12202-17-4
Pentalead tetraoxide sulphate	12065-90-6
Orange lead	1314-41-6
Lead monoxide	1317-36-8

Hexahydromethylphthalic anhydride Hexahydro-1-methylphthalic anhydride Hexahydro-3-methylphthalic anhydride Hexahydromethylphthalic anhydride Hexahydro-4-methylphthalic anhydride	- 48122-14-1 57110-29-9 25550-51-0 19438-60-9
Cyclohexane-1,2-dicarboxylic anhydride trans-cyclohexane-1,2-dicarboxylic anhydride Cyclohexane-1,2-dicarboxylic anhydride cis-cyclohexane-1,2-dicarboxylic anhydride	- 14166-21-3 85-42-7 13149-00-3
1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear	68515-50-4
Dihexyl phthalate	84-75-3
Trixylyl phosphate	25155-23-1
Sodium perborate, perboric acid, sodium salt Perboric acid, sodium salt, tetrahydrate () Perboric acid (HBO(O2)), sodium salt, tetrahydrate Sodium perborate monohydrate Sodium perborate Borate(2-), tetrahydroxybis[μ-(peroxy-κO1:κO2)]di-, sodium (1:2) Borate(2-), tetrahydroxybis[μ-(peroxy-κO1:κO2)]di-, sodium, hydrate (1:2:6) Perboric acid, sodium salt Perboric acid (H3BO2(O2)), monosodium salt, trihydrate	- - 10486-00-7 10332-33-9 15120-21-5 90568-23-3 125022-34-6 11138-47-9 13517-20-9
Sodium peroxometaborate	7632-04-4
Acetic acid, lead salt, basic	51404-69-4
Lead monoxide	1317-36-8
Orange lead	1314-41-6
Pentalead tetraoxide sulphate	12065-90-6
Pyrochlore, antimony lead yellow	8012-00-8
Silicic acid, lead salt	11120-22-2
Tetralead trioxide sulphate	12202-17-4
Disodium tetraborate, anhydrous	1330-43-4
Tetraboron disodium heptaoxide, hydrate	12267-73-1
Diboron trioxide	1303-86-2
Boric acid Boric acid Boric acid	- 11113-50-1 10043-35-3

4-Nonylphenol, branched and linear, ethoxylated	-
Nonylphenol, ethoxylated (6,5-EO)	-
Nonylphenol, branched, ethoxylated	68412-54-4
Poly(oxy-1,2-ethanediyl), α-(nonylphenyl)-ω-hydroxy-, branched	-
Poly (oxy-1,2-ethanediyl), alpha -(nonylphenyl)-omega-hydroxy-, branched	-
4-Nonylphenol, ethoxylated	26027-38-3
Nonylphenol, ethoxylated (15-EO)	-
20-(4-nonylphenoxy)-3,6,9,12,15,18-hexaoxaicosan-1-ol	27942-27-4
Nonylphenol, ethoxylated	9016-45-9
26-(4-Nonylphenoxy)-3,6,9,12,15,18,21,24- octaoxahexacosan -1-ol	14409-72-4
2-[2-(4-nonylphenoxy)ethoxy]ethanol	20427-84-3
2-[2-[2-[2-(4-nonylphenoxy)ethoxy]ethoxy]ethoxy]ethanol	7311-27-5
Nonylphenol, ethoxylated (8-EO)	-
Nonylphenol, ethoxylated (10-EO)	-
Poly(oxy-1,2-ethanediyl), a-(nonylphenyl)-w-hydroxy- (CAS 9016-45-9)	-
14-(nonylphenoxy)-3,6,9,12-tetraoxatetradecan-1-ol	26264-02-8
26-(nonylphenoxy)-3,6,9,12,15,18,21,24-octaoxahexacosan-1-ol	26571-11-9
2-[2-(nonylphenoxy)ethoxy]ethanol	27176-93-8
20-(nonylphenoxy)-3,6,9,12,15,18-hexaoxaicosan-1-ol	27177-03-3
23-(nonylphenoxy)-3,6,9,12,15,18,21-heptaoxatricosan-1-ol	27177-05-5
29-(nonylphenoxy)-3,6,9,12,15,18,21,24,27-nonaoxanonacosanol	27177-08-8
2-(nonylphenoxy)ethanol	27986-36-3
26-(nonylphenoxy)-3,6,9,12,15,18,21,24-octaoxahexacosan-1-ol	42173-90-0
44-(nonylphenoxy)-3,6,9,12,15,18,21,24,27,30,33,36,39,42-tetradecaoxatetratetracontanol	57321-10-5
20-(isononylphenoxy)-3,6,9,12,15,18-hexaoxaicosan-1-ol	65455-69-8
4-Nonylphenol, branched, ethoxylated (CAS: 127087-87-0)	-
Nonylphenolpolyglycolether	-
2-[4-(3,6-dimethylheptan-3-yl)phenoxy]ethanol	1119449-37-4
Isononylphenol, ethoxylated	37205-87-1
17-(4-nonylphenoxy)-3,6,9,12,15-pentaoxaheptadecan-1-ol	34166-38-6
4-Nonylphenol, branched, ethoxylated	127087-87-0
2-(isononylphenoxy)ethanol	85005-55-6
3,6,9,12-Tetraoxatetradecan-1-ol, 14-(4-nonylphenoxy)-, branched	91648-64-5
3,6,9,12,15,18,21,24,27-Nonaoxanonacosan-1-ol, 29-(isononylphenoxy)-	65455-72-3
3,6,9,12,15-Pentaoxaheptadecan-1-ol, 17-(nonylphenoxy)-	27177-01-1
3,6,9,12-Tetraoxatetradecan-1-ol, 14-(4-nonylphenoxy)-	20636-48-0
4-t-Nonylphenol-diethoxylate	156609-10-8
2-(4-nonylphenoxy)ethanol	104-35-8
Nonylphenol, ethoxylated (10-EO) (9016-45-9)	-
2-{2-[4-(3,6-dimethylheptan-3-yl)phenoxy]ethoxy}ethanol	1119449-38-5
Nonylphenol, ethoxylated (polymer)	-
Nonylphenol, ethoxylated (EO = 4)	-
1-bromopropane	106-94-5
Anthracene oil	90640-80-5
Pitch, coal tar, high-temp.	65996-93-2
n-pentyl-isopentyl phthalate	776297-69-9
Dipentyl phthalate	131-18-0
Diisopentyl phthalate	605-50-5
Bis(2-methoxyethyl) phthalate	117-82-8
1,2-Benzenedicarboxylic acid, dipentyl ester, branched and linear	84777-06-0
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters	68515-42-4
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich	71888-89-6

Aluminosilicate Refractory Ceramic Fibres Refractories, fibers, aluminosilicate	- 142844-00-6
Zirconia Aluminosilicate Refractory Ceramic Fibres Refractories, fibers, aluminosilicate	- 142844-00-6
N,N-dimethylformamide	68-12-2
C,C'-azodi(formamide)	123-77-3
4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated 20-[4-(1,1,3,3-tetramethylbutyl)phenoxy]-3,6,9,12,15,18-hexaoxaicosan-1-ol Poly(oxy-1,2-ethanediyl), α-[(1,1,3,3-tetramethylbutyl)phenyl]-ω-hydroxy- 2-[4-(1,1,3,3-tetramethylbutyl)phenoxy]ethanol 2-{2-[4-(2,4,4-trimethylpentan-2-yl)phenoxy]ethoxy}ethanol Polyethylene glycol p-(1,1,3,3-tetramethylbutyl)phenyl ether	- 2497-59-8 9036-19-5 2315-67-5 2315-61-9 9002-93-1
Bis(pentabromophenyl) ether	1163-19-5
Formaldehyde, oligomeric reaction products with aniline	25214-70-4
N,N-dimethylacetamide	127-19-5
Bis(2-methoxyethyl) ether	111-96-6
1,2-dichloroethane	107-06-2
4,4'-methylenebis[2-chloroaniline]	101-14-4
Arsenic acid	7778-39-4
Pentazinc chromate octahydroxide	49663-84-5
Potassium hydroxyoctaoxodizincatedichromate(1-)	11103-86-9
Strontium chromate	7789-06-2
Dichromium tris(chromate)	24613-89-6
Trichloroethylene	79-01-6
Sodium dichromate	10588-01-9
Sodium chromate	7775-11-3
Potassium dichromate	7778-50-9
Potassium chromate	7789-00-6
Ammonium dichromate	7789-09-5
Acids generated from chromium trioxide and their oligomers Chromic acid Oligomers of chromic acid and dichromic acid Dichromic acid	- 7738-94-5 - 13530-68-2
Chromium trioxide	1333-82-0
Cobalt sulphate	10124-43-3
Cobalt dinitrate	10141-05-6
Cobalt di(acetate)	71-48-7
Cobalt dichloride	7646-79-9
Cobalt carbonate	513-79-1
2,4-dinitrotoluene	121-14-2
Diarsenic pentaoxide	1303-28-2
Diarsenic trioxide	1327-53-3

Diisobutyl phthalate	84-69-5
Lead chromate	7758-97-6
Lead chromate molybdate sulfate red	12656-85-8
Lead sulfochromate yellow	1344-37-2
Tris(2-chloroethyl) phosphate	115-96-8
Alkanes, C10-13, chloro	85535-84-8
Dibutyl phthalate	84-74-2
Benzyl butyl phthalate	85-68-7
Bis(2-ethylhexyl) phthalate	117-81-7
Hexabromocyclododecane (HBCDD) 1,2,5,6,9,10-hexabromocyclodecane gamma-hexabromocyclododecane Hexabromocyclododecane alpha-hexabromocyclododecane beta-hexabromocyclododecane	- 3194-55-6 134237-52-8 25637-99-4 134237-50-6 134237-51-7
4,4'-methylenedianiline	101-77-9
5-tert-butyl-2,4,6-trinitro-m-xylene	81-15-2

Annex FF. Hydrofluorocarbons (HFCs)

Trifluoromethane (HFC-23)	75-46-7
Difluoromethane (HFC-32)	75-10-5
Fluoromethane (HFC-41)	593-53-3
1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC-43-10)	138495-42-8
2H, 3H-Decafluoropentane (HFC-43-10mee)	138495-42-8
Pentafluoroethane (HFC–125)	354-33-6
1,1,2,2-tetrafluoroethane (HFC-134)	359-35-3
1,1,1,2-tetrafluoroethane (HFC-134a)	811-97-2
1,1,2-trifluoroethane (HFC-143)	430-66-0
1,1,1-trifluoroethane (HFC-143a)	420-46-2
1,2-Difluoroethane (HFC-152)	624-72-6
1,1-Difluoroethane (HFC-152a)	75-37-6
Monofluoroethane (Ethyl fluoride) (HFC-161)	353-36-6
1,1,1,2,3,3,3-heptafluoropropane (HFC-227ca)	431-89-0
1,1,1,2,2,3,3-heptafluoropropane (HFC-227ca)	2252-84-8
1,1,2,2,3,3-hexafluoropropane (HFC-236ca)	27070-61-7
1,1,1,2,2,3-hexafluoropropane (HFC-236cb)	677-56-5
1,1,1,2,3,3-hexafluoropropane (HFC-236ea)	431-63-0
1,1,1,3,3,3-hexafluoropropane (HFC-236fa)	690-39-1
1,1,2,2,3-pentafluoropropane (HFC-245ce)	679-86-7

1,1,1,3,3-pentafluoropropane (HFC-245fa)	460-73-1
1,1,1,3,3-pentafluorobutane (HFC-365mfc)	406-58-6
Heptafluorocyclopentane (HFC-c-447ef)	15290-77-4

Annex GG. Nonylphenols

Nonylphenol	25154-52-3
p-nonyl-phenol	104-40-5
4-nonyl-phenol, branched=	84852-15-3
Nonylphenol, branched	90481-04-2
Isononylphenol	11066-49-2
p-Isononylphenol	26543-97-5
p-(Nonan-2-yl))phenol	17404-66-9
p-(2-Methyloctan-2-yl) phenol	30784-30-6
4-(3-Methyloctan-3-yl) phenol	52427-13-1
o-Nonylphenol	136-83-4
o-Isononylphenol	27938-31-4
Phenol, 2-nonyl-, branched	91672-41-2
m-Nonylphenol	139-84-4
Neononylphenol	1196678-78-0
4-(3,5-Dimethylheptan-3-yl) phenol	186825-36-5
4-(3,6-Dimethylheptan-3-yl)phenol	142731-63-3
2-(Nonan-2-yl) phenol	17404-45-4
Phenol, 2-tert-nonyl-	89585-68-2
Phenol, sec-nonyl-	97372-03-7
Phenol, 4-tert-nonyl-	58865-77-3
Phenol, o-sec-nonyl-	27214-48-8
Phenol, p-sec-nonyl-	27072-91-9

Annex HH. Perchlorates

Ammonium perchlorate	7790-98-9
Lithium perchlorate	7791-03-9
Potassium perchlorate	7778-74-7
Sodium perchlorate	7601-89-0
Barium perchlorate	13465-95-7
Lead perchlorate	13637-76-8
Magnesium perchlorate	10034-81-8
Nickel perchlorate	13637-71-3

Annex II. Perfluorooctyl acid (PFOA) and salts (for a more comprehensive list of PFOA CAS numbers see OECD

http://www.oecd.org/chemicalsafety/risk-management/globaldatabase-of-per-andpolyfluoroalkyl-substances.xlsx

Pentadecafluorooctanoic acid	335-67-1
2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-penta¬deca¬fluoro-octanoic acid, sodium salt	335-95-5
2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-penta¬deca¬fluoro-octanoic acid, potassium salt	2395-00-8
2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-penta¬deca¬fluoro-octanoic acid, silver salt	335-93-3
Acid Fluoride of PFOA	335-66-0
Methyl ester of PFOA	376-27-2

Ethyl ester of PFOA	3108-24-5
2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-penta¬deca¬fluoro-octanoic acid, ammonium salt	3825-26-1
Octanoic acid, 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluoro-, chromium(3+)	68141-02-6
Ethanaminium, N,N,N-triethyl-, salt with pentadecafluorooctanoic acid (1:1)	98241-25-9

Annex JJ. Perfluorinated compounds

Perfluoropolymethylisopropyl-ether (PFPMIE)	69991-67-9
Trifluoromethyl sulphur pentafluoride	373-80-8
Nitrogen trifluoride	7783-54-2
Perfluorocyclopropane	Not available

Annex KK. Toluene Diisocyanate (this list is all inclusive)

Toluene diisocyanate trimer	9019–85–6
Poly(toluene diisocyanate)	9017–01–0
Toluene diisocyanate dimer	26747–90–0
Toluene diisocyanate ‘‘cyclic’’ trimer	26603–40–7
2,6-Toluene diisocyanate Note - reportable except for use in coatings, adhesives, elastomers, binders, and sealants at less than or equal to 0.1% in a Consumer Product (defined as a chemical substance that is directly, or as part of a mixture, sold or made available to consumers for their use in or around a permanent or temporary household or residence, in or around a school, or in recreation. [Source: US Code of Federal Regulations Title 40 Part 721.3 Subpart A])	91–08–7
2,4-Toluene diisocyanate Note - reportable except for use in coatings, adhesives, elastomers, binders, and sealants at less than or equal to 0.1% in a Consumer Product (defined as a chemical substance that is directly, or as part of a mixture, sold or made available to consumers for their use in or around a permanent or temporary household or residence, in or around a school, or in recreation. [Source: US Code of Federal Regulations Title 40 Part 721.3 Subpart A])	584–84–9
Toluene diisocyanate unspecified isomer Note - reportable except for use in coatings, adhesives, elastomers, binders, and sealants at less than or equal to 0.1% in a Consumer Product (defined as a chemical substance that is directly, or as part of a mixture, sold or made available to consumers for their use in or around a permanent or temporary household or residence, in or around a school, or in recreation. [Source: US Code of Federal Regulations Title 40 Part 721.3 Subpart A])	26471–62–5

Annex LL. Nonylphenol Ethoxylates

Ethanol, 2-[2-(4-nonylphenoxy)ethoxy]-	20427-84-3
Poly(oxy-1,2-ethanediyl), α-(4-nonylphenyl)- ω-hydroxy-	26027-38-3
3,6,9,12,15,18,21-Heptaoxatricosan-1-ol, 23- (nonylphenoxy)-	27177-05-5
3,6,9,12,15,18,21,24,27-Nonaoxanonacosan-1- ol, 29-(nonylphenoxy)-	27177-08-8
Ethanol, 2-(nonylphenoxy)-	27986-36-3
Ethanol, 2-[2-[2-[2-(4- nonylphenoxy)ethoxy] ethoxy]ethoxy]-	7311-27-5
Poly(oxy-1,2-ethanediyl), α(nonylphenyl)- ω-hydroxy-	9016-45-9
Ethanol, 2-[2-(nonylphenoxy)ethoxy]-	27176-93-8
Poly(oxy-1,2-ethanediyl), α-(2- nonylphenyl)-ω-hydroxy-	51938-25-1

Poly(oxy-1,2-ethanediyl), α-(isononylphenyl)- ω-hydroxy-	37205-87-1
3,6,9,12,15,18,21,24-Octaoxahexacosan-1-ol, 26-(nonylphenoxy)-	26571-11-9

Annex MM. Creosote, Coal Tar, Anthracene Etc.

Cresote; wash oil	8001-58-9
Creosote Oil; wash oil	61789-28-4
Distillates (coal tar); naphthalene oils; naphthalene oil	84650-04-4
Creosote oil; acenaphthene fraction; wash oil	90640-84-9
Distillates (coal tar); upper; heavy anthracene oil	65996-91-0
Anthracene oil	90640-80-5
Tar acids; coal; crude; crude phenols	65996-85-2
Cresote; wood	8021-39-4
Low temperature tar oil; alkaline; extract residues (coal); low temperature	122384-78-5
coal tar alkaline	
Coal tar	8007-45-2

Annex NN. Dibutyltin Compounds (DBT)

Dibutyltin oxide	818-08-6
Dibutyltin chloride	683-18-1
Dibutyltin diacetate	1067-33-0
Dibutyltin dilaurate	77-58-7
Dibutyltin hydrogen borate	75113-37-0
Dibutyltin maleate	78-04-6
Other dibutyltin compounds	-

Annex OO. Organohalogen Flame Retardants

1,2-bis(2,4,6,-tribromphenoxy)ethane – BTBPE	37853-59-1
2,2',4,4',5,5'-hexabromobiphenyl (Firemaster® BP-6) BB 153	59080-40-9
2,2-bis (bromomethyl) 1,3-propanedioil DBNPG	3296-90-0
2,3,4,5-tetrabromobenzoic acid TBBA	Not available
2-ethylhexyl 2,3,4,5-tetrabromobenzoate TBB	183658-27-7
Bis (2-ethylhexyl) 3,4,5,6-tetrabromophthalate TBPH	26040-51-7
Decabromodiphenyl ethane DBDPE	84852-53-9
Decabromodiphenyl ether decaBDE	1163-19-5
Di(2-ethylhexyl) phthalate DEHP	117-81-7
Hexabromocyclododecane HBCD	25637-99-4, 3194-55-6, 134237-50-6, 134237-51-7, 134237-52-8
Octabromodiphenyl ether octaBDE	32536-52-0
Pentabromodiphenyl ether pentaBDE	32534-81-9
Polybrominated diphenyl ether PBDE	See Annex Q for listing
Tetrabromobisphenol A TBBPA	79-94-7
Tetrabromobisphenol A-bis (2,3-dibromopropylether) TBBPA-BDBPE	Not available
Tetrabromoethylcyclohexane TBECH	Not available
Tributyl phosphate TBP	126-73-8

Tricrecyl phosphate TCP	Not available
Triphenyl phosphate TPhP	115-86-6
Tris (1-chloro-2-propyl) phosphate TCPP	13674-84-5
Tris (1,3-dichloro-2-propyl)phosphate ("chlorinated tris") TDCPP	13674-87-8
Tris (2-butoxyethyl) phosphate TBEP	Not available
Tris (2-chloroethyl) phosphate TCEP	115-96-8
Tris (2-ethylhexyl)phosphate TEHP	Not available
Tris (2,3-dibromopropyl) phosphate TDBPP	126-72-7

Annex PP. IEC 62474 Declarables List (see latest list and information here: http://std.iec.ch/iec62474/iec62474.nsf/Index?open&q=225923

Diarsenic pentoxide	1303-28-2
Diarsenic trioxide	1327-53-3
Asbestos	See Reference Substance worksheet for more details
Azocolourants and Azodyes which form certain aromatic amines	See Reference Substance worksheet for more details
Beryllium Oxide	1304-56-9
Boric acid	10043-35-3; 11113-50-1
Brominated flame retardants (other than PBBs, PBDEs, or HBCDD)	See Reference Substance worksheet for more details
Brominated flame retardants (other than PBBs, PBDEs, or HBCDD)	See Reference Substance worksheet for more details
Cadmium/Cadmium compounds	See Reference Substance worksheet for more details
Cadmium/Cadmium compounds	See Reference Substance worksheet for more details
Chromium (VI) Compounds	See Reference Substance worksheet for more details
Cobalt dichloride	7646-79-9
Dibutyltin (DBT) compounds	See Reference Substance worksheet for more details
Dioctyltin (DOT) compounds	See Reference Substance worksheet for more details
Dimethylfumarate (DMF)	624-49-7
Disodium tetraborate, anhydrous	See Reference Substance worksheet for more details
Fluorinated Greenhouse Gases (PFC, SF6, HFC)	See Reference Substance worksheet for more details
Formaldehyde	50-00-0
Hexabromocyclododecane (HBCDD)	See Reference Substance worksheet for more details
Lead/Lead Compounds	See Reference Substance worksheet for more details
Lead/Lead Compounds	See Reference Substance worksheet for more details
Lead/Lead Compounds	See Reference Substance worksheet for more details
Lead/Lead Compounds	See Reference Substance worksheet for more details
Lead/Lead Compounds	See Reference Substance worksheet for more details
Lead chromate	7758-97-6
Lead chromate molybdate sulphate red (C.I. Pigment Red 104)	12656-85-8
Lead sulfochromate yellow (C.I. Pigment Yellow 34)	1344-37-2
Mercury/Mercury Compounds	See Reference Substance worksheet for more details

Mercury/Mercury Compounds	See Reference Substance worksheet for more details
Mercury/Mercury Compounds	See Reference Substance worksheet for more details
Nickel/Nickel Compounds	See Reference Substance worksheet for more details
Ozone Depleting Substances (CFC, Halon, HBFC, HCFC & others)	See Reference Substance worksheet for more details
Perchlorates	See Reference Substance worksheet for more details
2-benzotriazol-2-yl-4,6-di-tert-butylphenol (UV-320)	3846-71-7
Phthalates, Selected Group 1 (DEHP, DBP, BBP, DIBP)	See Reference Substance worksheet for more details
Phthalates, Selected Group 2 (DIDP, DINP, DNOP)	See Reference Substance worksheet for more details
Bis (2-ethylhexyl)phthalate (DEHP)	117-81-7
Dibutyl phthalate (DBP)	84-74-2
Benzyl butyl phthalate (BBP)	85-68-7
Diisobutyl phthalate	84-69-5
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich	71888-89-6
1,2-Benzenedicarboxylic acid, di-C7-11-branched and linear alkyl esters	68515-42-4
Polybrominated biphenyls (PBB)	See Reference Substance worksheet for more details
Polybrominated diphenyl ethers (PBDE)	See Reference Substance worksheet for more details
Polychlorinated Biphenyls (PCBs) and specific substitutes	See Reference Substance worksheet for more details
Polychlorinated Terphenyls (PCTs)	See Reference Substance worksheet for more details
Polychlorinated naphthalenes	See Reference Substance worksheet for more details
Radioactive substances	See Reference Substance worksheet for more details
Aluminosilicate Refractory Ceramic Fibres	
Zirconia Aluminosilicate Refractory Ceramic Fibres	
Alkanes, C10-13, chloro (Short Chain Chlorinated Paraffins)	See Reference Substance worksheet for more details
Strontium chromate	7789-06-2
Bis(tributyltin) oxide (TBTO)	56-35-9
Tri-substituted organostannic compounds	See Reference Substance worksheet for more details
Tris(2-chloroethyl) phosphate	115-96-8
4-(1,1,3,3-tetramethylbutyl)phenol	140-66-9
Bis(2-methoxyethyl) ether	111-96-6
Bis(2-methoxyethyl) phthalate	117-82-8
Pentazinc chromate octahydroxide	49663-84-5
Potassium hydroxyoctaoxodizincatedichromate	11103-86-9
Chlorinated Flame Retardants (CFR)	See Reference Substance worksheet for more details
Chlorinated Flame Retardants (CFR)	See Reference Substance worksheet for more details
Bis(pentabromophenyl) ether (decabromodiphenyl ether) (DecaBDE)	1163-19-5
Sulfurous acid, lead salt, dibasic	62229-08-7
1,2-bis(2-methoxyethoxy)ethane (TEGDME; triglyme)	112-49-2

Trilead dioxide phosphonate	12141-20-7
1,2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	110-71-4
4-aminoazobenzene	60-09-3
Tetralead trioxide sulphate	12202-17-4
Orange lead (lead tetroxide)	1314-41-6
Pyrochlore, antimony lead yellow	8012-00-8
Pentalead tetraoxide sulphate	12065-90-6
1,2-diethoxyethane	629-14-1
Diboron trioxide	1303-86-2
Dibutyltin dichloride (DBTC)	683-18-1
Lead cyanamidate	20837-86-9
N,N-dimethylformamide	68-12-2
Silicic acid (H2Si2O5), barium salt (1:1), lead-doped	68784-75-8
1,2-Benzenedicarboxylic acid, dipentyl ester, branched and linear	84777-06-0
Diisopentyl phthalate	605-50-5
N-pentyl-isopentylphthalate	776297-69-9
Lead titanium trioxide	12060-00-3
Lead titanium zirconium oxide	12626-81-2
Lead oxide sulfate	12036-76-9
[Phthalato(2-)]dioxotrilead	69011-06-9
Dioxobis(stearato)trilead	12578-12-0
Fatty acids, C16-18, lead salts	91031-62-8
Lead dinitrate	10099-74-8
Di-isodecyl phthalate (DIDP)	68515-49-1; 26761-40-0
Di-n-hexyl phthalate (DnHP)	84-75-3
Hexahydromethylphthalic anhydride	See Reference Substance worksheet for more details
Cadmium	7440-43-9
Cadmium oxide	1306-19-0
Dipentyl phthalate (DPP)	131-18-0
Pentadecafluorooctanoic acid (PFOA)	335-67-1
Ammonium pentadecafluorooctanoate (APFO)	3825-26-1
4-Nonylphenol, branched and linear, ethoxylated	See Reference Substance worksheet for more details
Cadmium sulphide	1306-23-6
Trixylyl phosphate	25155-23-1
Disodium 3,3'-[[1,1'-biphenyl]-4,4'-diylbis(azo)]bis(4-aminonaphthalene-1-sulphonate) (C.I. Direct Red 28)	573-58-0
Perfluorooctanoic acid (PFOA) and individual salts and esters of PFOA	See Reference Substance worksheet for more details
Perfluorooctanoic acid (PFOA) and individual salts and esters of PFOA	See Reference Substance worksheet for more details

Imidazolidine-2-thione (2-imidazoline-2-thiol)	96-45-7
1,2-Benzenedicarboxylic acid, dihexyl ester, branched and linear	68515-50-4
Diisononyl phthalate (DINP)	28553-12-0; 68515-48-0
Benzo[a]pyrene (BaP)	50-32-8
Benzo[e]pyrene (BeP)	192-97-2
Benzo[a]anthracene (BaA)	56-55-3
Chrysen (CHR)	218-01-9
Benzo[b]fluoranthene (BbFA)	205-99-2
Benzo[j]fluoranthene (BjFA)	205-82-3
Benzo[k]fluoranthene (BkFA)	207-08-9
Dibenzo[a,h]anthracene (DBAhA)	53-70-3
Benzo[a]pyrene (BaP)	50-32-8
Benzo[e]pyrene (BeP)	192-97-2
Benzo[a]anthracene (BaA)	56-55-3
Chrysen (CHR)	218-01-9
Benzo[b]fluoranthene (BbFA)	205-99-2
Benzo[j]fluoranthene (BjFA)	205-82-3
Benzo[k]fluoranthene (BkFA)	207-08-9
Dibenzo[a,h]anthracene (DBAhA)	53-70-3
Perfluorooctane sulfonates (PFOS)	See Reference Substance worksheet for more details
Perfluorooctane sulfonates (PFOS)	See Reference Substance worksheet for more details
Disodium 4-amino-3-[[4'-[(2,4-diaminophenyl)azo][1,1'-biphenyl]-4-yl]azo]-5-hydroxy-6-(phenylazo)naphthalene-2,7-disulphonate (C.I. Direct Black 38)	1937-37-7
2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (DOTE)	15571-58-1
Reaction mass of 2-ethylhexyl 10-ethyl-4,4-dioctyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate and 2-ethylhexyl 10-ethyl-4-[[2-[(2-ethylhexyl)oxy]-2-oxoethyl]thio]-4-octyl-7-oxo-8-oxa-3,5-dithia-4-stannatetradecanoate (reaction mass of DOTE and MOTE)	
2-(2H-benzotriazol-2-yl)-4,6-ditertpentylphenol (UV-328)	25973-55-1
1,2-benzenedicarboxylic acid, di-C6-10-alkyl esters or mixed decyl and hexyl and octyl diesters	68515-51-5; 68648-93-1
1,3-propanesultone	1120-71-4
2,4-di-tert-butyl-6-(5-chlorobenzotriazol-2-yl)phenol (UV-327)	3864-99-1
2-(2H-benzotriazol-2-yl)-4-(tert-butyl)-6-(sec-butyl)phenol (UV-350)	36437-37-3
Perfluorononan-1-oic-acid and its sodium and ammonium salts	See Reference Substance worksheet for more details
Benzo[def]chrysene (Benzo[a]pyrene)	50-32-8
4,4'-isopropylidenediphenol	80-05-7

Nonadecafluorodecanoic acid (PFDA) and its sodium and ammonium salts	See Reference Substance worksheet for more details
Perfluorohexane-1-sulphonic acid and its salts	See Reference Substance worksheet for more details
Chrysene	218-01-9
Benz[a]anthracene	56-55-3
Cadmium hydroxide	21041-95-2
1,6,7,8,9,14,15,16,17,17,18,18-Dodecachloropentacyclo[12.2.1.16,9.02,13.05,10]octadeca-7,15-diene ("Dechlorane Plus"™)	See Reference Substance worksheet for more details
Benzo[ghi]perylene	191-24-2
Octamethylcyclotetrasiloxane	556-67-2
Decamethylcyclopentasiloxane	541-02-6
Dodecamethylcyclohexasiloxane	540-97-6
Disodium octaborate	12008-41-2
Terphenyl, hydrogenated	61788-32-7
Lead	7439-92-1
Dicyclohexyl phthalate	84-61-7
2,2-bis(4'-hydroxyphenyl)-4-methylpentane	6807-17-6
Benzo[k]fluoranthene	207-08-9
Fluoranthene	206-44-0
Phenanthrene	85-01-8
Pyrene	129-00-0
Perfluorooctanoic acid and its salts	See Reference Substance worksheet for more details
PFOA-related substances	See Reference Substance worksheet for more details
Tris(4-nonylphenyl, branched and linear) phosphite (TNPP) with ≥ 0.1% w/w of 4-nonylphenol, branched and linear (4-NP)	See Reference Substance worksheet for more details
Tetraboron disodium heptaoxide, hydrate	12267-73-1
Diisohexyl phthalate	71850-09-4
Perfluorobutane sulfonic acid (PFBS) and its salts	See Reference Substance worksheet for more details

Annex QQ. Organophosphate Compounds

Triphenyl phosphate (TPHP)	115-86-6
Tert-Butylphenyl diphenyl phosphate	56803-37-3
Isodecyl diphenyl phosphate	29761-21-5
bis(2-tert-butylphenyl) phenyl phosphate	65652-41-7
Triethyl phosphate	78-40-0