

## ***Sustainable Public Procurement-fiche-advanced-2010***

### ***1) Subject matter***

Environmental friendly portable computers.

“For <.....> (name of the public authority), the care for the environment and social aspects is important. It is stated in her <strategic policies>, <mission>, <vision>, <procurement policy>, ...”

### ***2) Exclusion criteria***

Non compliance with environmental and social legislation, which has been the subject of a final judgment or a decision having equivalent effect, may be considered an offence concerning the professional conduct of the economic operator concerned or grave misconduct, permitting to exclude the party concerned from competing for the contract

Ref:

Art. 53 and 54 of Directive 2004/17/EC and Art. 45 of Directive 2004/18/EC

### ***3) Technical capacity (not exclusive)***

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### ***4) Technical specifications***

#### ***Energy consumption \****

- All products must meet the latest ENERGY STAR standards for energy performance . The annual energy consumption based on a weighted sum of off, sleep and idle modes should be below the limits provided in Annex A [EU Toolkit core, Energy Star].
- External Power Supplies used for notebooks/laptops must be ENERGY STAR qualified or meet the active mode efficiency levels provided in the ENERGY STAR Program Requirements for Single Voltage Ac-Ac and Ac-Dc External Power Supplies v.2.0. The ENERGY STAR specification and qualified product

\* A new Energy Star version 5.0 will come into effect on July 1, 2009. See <http://www.energystar.gov> for more details.



list can be found at <http://www.energystar.gov/powersupplies>. [EU Toolkit Core, Energy Star]]

- Products must be shipped with the display's Sleep mode set to activate within 15 minutes of user inactivity. All products, except for desktop-derived servers which are exempt from this requirement, must be shipped with a Sleep mode which is set to activate within 30 minutes of user inactivity. Products may have more than one low power mode but these proposed criteria address Sleep mode as defined in this specification in Annex A. [EU Toolkit core, Energy Star]
- Computers with Ethernet capability need to have the ability to enable and disable WOL for Sleep mode. They must either be shipped with Wake On LAN (WOL) enabled from the Sleep mode when operating on ac power (i.e. notebooks may automatically disable WOL when disconnected from the mains); or provide control to enable WOL that is sufficiently-accessible from both the client operating system user interface and over the network if computer is shipped to enterprise without WOL enabled. [EU Toolkit core, Energy Star]
- Computers have to reduce the speed of any active 1 Gb/s Ethernet network links when transitioning to Sleep or Off. [EU Toolkit core, Energy Star]
- All machines shipped to enterprise customers are capable of both remote and scheduled wake events from Sleep mode. Manufacturers will ensure, where the manufacturer has control (i.e., configured through hardware settings rather than software settings), that these settings can be managed centrally, as the client wishes, with tools provided by the manufacturer. [EU Toolkit core, Energy Star]

### ***Upgradability***

Portable computers must be designed so that the memory is easily accessible and can be changed. (EU Ecolabel, Nordic Swan, Blaue Engel, toolkit) [EU toolkit: core]

### ***Materials***

The background lighting of LCD monitors shall not contain more than 3.5 mg of mercury on average per lamp. [EU Toolkit Comprehensive]

### ***Noise***

The 'Declared A-weighted Sound Power Level' (re 1 pW) of PCs or notebooks, according to paragraph 3.2.5 of ISO 9296, measured in accordance with ISO 7779, shall not exceed:

- 3.5 B(A) in the idle operating mode (equivalent to 35 dB(A)).
- 4.0 B(A) when accessing a hard-disk drive (equivalent to 40 dB(A)).

[EU Toolkit Comprehensive]



**Evidence:**

The compliance with all the criteria mentioned above can be proved with one of the following labels:

NONE

Following labels only partly comply with the technical specifications.



EU Ecolabel



Blaue engel



Nordic Swan



Energy Star



TCO

Any other suitable evidence from a recognized body can also be used.

**5) Awarding the contract:**

	<b>Criterion</b>	<b>Weight</b>
1	<b>Price</b> <i>Calculation (e.g.):</i> Lowest offered price/ stated price x 0,70	e.g. 70%
2	<b>Environmental criteria</b> (The public authority formulates the points it wants to assign to the below mentioned criteria ) <i>Calculation (e.g.):</i> Total scored points / maximum number of points x 0,20	e.g. 20%
3	...	e.g. 5 %
4	...	e.g. ....



## ***Environmental criteria***

### ***Upgradability***

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- The hard disk and, if available, the CD drive and/or DVD drive, can be changed. (EU Ecolabel, Nordic Swan, Blaue Engel, EU toolkit)
- Portable computers have at least two additional interfaces for external drives/peripherals (apart from the obligatory connection options for mouse, keyboard, monitor and printer). (Nordic Swan, Blaue Engel)

### ***Product design***

- The device must have an On-and-Off switch. Activation of this switch must set the device into Off mode. Switches and buttons are to be designed by use of symbols according to the IEEE 1621 standard. Off mode: The power consumption level in the lowest power mode which cannot be switched off (influenced) by the user. (EU Ecolabel, Nordic Swan, Blaue Engel)
- One qualified person will be able to dismantle it. (EU Ecolabel, Nordic Swan, Blaue Engel)
- Connections are easy to find, accessible with commonly available tools, and as standardised as possible (EU Ecolabel, Nordic Swan, Blaue Engel, toolkit) [EU toolkit: comprehensive]
- The substances, preparations and components listed in Annex II of WEEE Directive (2002/96/EC) must be removable. [Nordic Swan] If labels are required they shall be easily separable or inherent. Not valid for safety labels according to CENELEC safety standard EN 60850 §1.7.2. [Nordic Swan] Large-size casing parts must be so designed as to ensure that the plastics used can be recycled on the basis of existing recycling technologies for the manufacture of high-quality long-life products. Such casing parts can not have a metallic coating. (Blaue Engel)
- It must be possible to disconnect the device from the mains for an extended period of time (at least 4 weeks) without the functionality of the device suffering damage (loss of the timer information will not be considered as damage). (Blaue Engel)

### ***Machine materials and components***

- Plastic parts heavier than 25g have a permanent marking identifying the material, in conformity with ISO 11469: 2000. Excluded from this criterion are extruded



plastic materials and the light-guide of flat panel displays. (EU Ecolabel, Nordic Swan, Blaue Engel, toolkit, TCO) [EU toolkit: comprehensive]

- Plastic parts are of one polymer or compatible polymers, except for the cover, which consists of no more than two types of polymer, which are separable. (EU Ecolabel, Nordic Swan, Blaue Engel, toolkit) [EU toolkit: comprehensive]
- Plastic parts (>25 g) may contain metallic inlays provided that these can easily be separated without the use of special tools. (EU Ecolabel, Nordic Swan, Blaue Engel, TCO)
- Large plastic parts (>25 g) must not be painted or metallized. Metallic coatings are permissible in laptops if they are technically necessary. However, galvanic coatings will not be allowed. (Nordic Swan, Blaue Engel)
- Halogenated polymers will not be permissible. (Blaue Engel, Nordic Swan).  
Exempted from this rule are:
  - o Fluoroplastics as, for example, PTFEs.
  - o Plastic parts weighing less than 25 grams. This exemption does, however, not apply to keyboards.
- Organic halogenated compounds as flame retardants are not permissible and may not be added to the plastic parts. (Blaue Engel, Nordic Swan) Exempted from this rule are:
  - o Fluoroorganic additives (as, for example, anti-dripping agents) used to improve the physical properties of plastics, provided that they do not exceed 0.5 weight percent.
  - o Plastic parts weighing less than 25 grams. However, they may not contain PBBs (polybrominated biphenyls), PBDEs (polybrominated diphenyl ethers) or chlorinated paraffins. This exemption does, however, not apply to keyboards.
- Plastic parts heavier than 25g do not contain flame retardant substances or preparations that are assigned any of the following risk phrases as defined in Council Directive 67/548/EEC: (Toolkit, EU Ecolabel, Nordic Swan, Blaue Engel, TCO) [EU toolkit: comprehensive]
  - o R 40 ((limited evidence of a carcinogenic effect)
  - o R45 (may cause cancer).
  - o R46 (may cause heritable genetic damage).
  - o R 48 (danger of serious damage to health by prolonged exposure)
  - o R49 (may cause cancer by inhalation)
  - o R60 (may impair fertility).
  - o R61 (may cause harm to the unborn child).
  - o R62 (possible risk of impaired fertility)
  - o R63 (possible risk of harm to unborn child)R68 (possible risk of irreversible effects)
  - o R50/53 (very toxic to aquatic organisms / may cause long-term adverse effects in the aquatic environment)



Exempted are process-related technologically unavoidable impurities, printed wiring board laminates, electronic components and all kinds of cable insulation.

- - Flame retardants used in plastic parts with a mass greater than 25 grams will be indicated and identified by their CAS Number. (Blaue Engel)
  - 90% by weight of plastic and metal materials in the housing and the chassis are technically suitable for recycling. Material recovery does not include the recovery of thermal energy through incineration. (EU Ecolabel, Nordic Swan)
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  - Plastic parts and printed circuits can not contain any PBB (polybrominated biphenyls), PBDE (polybrominated diphenyl ethers), decaBDE or chlorinated paraffins (maximum permitted concentration for impurities is 0.1 wt% in homogenous material). (EU Ecolabel, Nordic Swan, Blaue Engel, TCO)
  - Batteries will not contain more than 0,0001 % of mercury, 0,001 % of cadmium or 0,01 % of lead by weight of the battery. (EU Ecolabel)
  - Materials may not contain cadmium, lead, mercury or hexavalent chromium. The exemptions are the same as in Directive 2002/95/EC (RoHS). The maximum permitted concentrations for impurities are:
    - Cadmium 0.01 wt% in homogenous material
    - Lead 0.1 wt% in homogenous material
    - Mercury 0.1 wt% in homogenous material
- Lamps in flat displays are exempted from this requirement. (Nordic Swan)
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## 6) Performance clauses:

- The applicant undertakes to accept the free return of the original user exchangeable batteries/accumulators. A third party may be subcontracted for this task. (Blaue Engel)
- For notebooks the availability of compatible batteries and power supplies as well as of the keyboard and its parts will be guaranteed for at least 3 years from the time that production ceases. (EU Ecolabel, Nordic Swan, Blaue Engel) [EU toolkit core]
- The manufacturer must furnish a commercial guarantee stating that the system unit, display or the portable computer will function for at least three years. The guarantee must apply from the day on which the computer is delivered to the customer. The applicant undertakes to ensure the supply of spare parts for product repair for at least 5 years following the termination of production and to inform the customer of this. (Blaue Engel, Nordic Swan)
- Batteries and accumulators which are not designed for exchange by the user must be replaceable without needing to exchange the entire printed circuit board or similar parts holding such batteries and accumulators. (Blaue Engel)



- The applicant undertakes action to take back own manufactured products after use in order to channel them with preference to reuse or to material. Non-recyclable device parts should be disposed of in an environmentally sound manner. Waste equipment from private households may always be given to municipal collection facilities free of charge. Waste equipment from the business sector can be returned free of charge to the applicant or to a return facility to be named by applicant. The return facilities named by applicant must be located in the country where the product is offered. (Blaue Engel)
- Plastics used for product packaging may not contain halogen-containing polymers. (Blaue Engel, TCO).
- All packaging components can be easily separable by hand into individual materials to facilitate recycling. Where used, cardboard packaging must consist of at least 80 % recycled material. (EU Ecolabel, TCO)
- The packaging material shall not contain lead (Pb), cadmium (Cd), mercury (Hg) or hexavalent chromium (Cr6). (TCO)
- The following information shall come with the product (EU Ecolabel, Energy Star, Blaue Engel, Nordic Swan):
  - o Benefits of the use of power management features and of unplugging the power supply
  - o Availability of spare parts.
  - o The parts of the personal computer are designed to be recycled or reused.
  - o Appropriate use of WLAN (WIFI) cards to minimize security risks.
- The printed product documentation supplied along with the devices (User Manual, Product Documents) is printed on chlorine-free bleached paper, preferably made of recycled paper. (Blaue Engel)

### **6bis) Specific performance clause**

#### **Clause on Ethical trade:**

The tenderer ensures that its company and its suppliers respect at least the following international instruments:

- ILO Conventions 29 and 105 (Forced & Bonded Labour)
- ILO Convention 87 and 98 (Freedom of Association and Right to Collective Bargaining)
- ILO Conventions 100 and 111 (Equal remuneration for male and female workers for work of equal value; Discrimination)
- ILO Convention 138 and 182 (Minimum Age and Recommendation and Worst Forms of Child Labour)



*Compliance guarantee:*

The tenderer states in his offer that the compliance with the specific performance clauses will be guaranteed. He mentions the evidence that can be presented to warrant the compliance. A SA 8000 certificate or the Belgian Social label can be such a proof.

In case the tenderer can't guarantee the compliance with the above mentioned conventions, he will describe the procedure to warrant the compliance in the short term. The social requirements are relevant for its own company and his subcontractors. The efforts will be stated in an action plan.

In case the contract is valid for several years, the company will report every year on the implementation of the action plan and the improvements made. The report is open to the public.

In case the procuring authority receives signals from society that during the execution of the contract the above mentioned requirements are not fulfilled or (announced to be) corrected, the procuring authority can demand the company to account, can demand external advice, can demand an external audit or can handle as in case of breach of contract.

***References***

[Information of the public authority that used these clauses in a procurement case]





## Annex A – Energy requirements

The following tables indicate the required TEC levels. Table 1 below lists TEC requirements, while Table 2 gives weightings for each operational mode by product type. TEC will be determined using the formula below:

$$E_{TEC} = (8760/1000) * (P_{off} * T_{off} + P_{sleep} * T_{sleep} + P_{idle} * T_{idle})$$

where all  $P_x$  are power values in watts, all  $T_x$  are Time values in % of year, and the TEC  $E_{TEC}$  is in units of kWh and represents annual energy consumption based on mode weightings in Table 2.

Table 1:  $E_{TEC}$  Requirement – Desktops and Notebooks

	Desktops and Integrated Computers (kWh)	Notebook Computers (kWh)
TEC (kWh)	Category A: ≤ 148.0 Category B: ≤ 175.0 Category C: ≤ 209.0 Category D: ≤ 234.0	Category A: ≤ 40.0 Category B: ≤ 53.0 Category C: ≤ 88.5
<b>Capability Adjustments</b>		
Memory	1 kWh (per GB over base)  <i>Base Memory:</i> Categories A, B and C: 2 GB Category D: 4 GB	0.4 kWh (per GB over 4)
Premium Graphics (for Discrete GPUs with specified Frame Buffer Widths)	Cat. A, B: 35 kWh (FB Width ≤ 128-bit) 50 kWh (FB Width > 128-bit) Cat. C, D: 50 kWh (FB Width > 128-bit)	Cat. B: 3 kWh (FB Width > 64-bit)
Additional Internal Storage	25 kWh	3 kWh

Table 2: Operational Mode Weighting – Desktops and Notebooks

	Desktop		Notebook	
	Conventional	Proxying*	Conventional	Proxying*
T <sub>off</sub>	55%	40%	60%	45%
T <sub>sleep</sub>	5%	30%	10%	30%
T <sub>idle</sub>	40%	30%	30%	25%

*Note: Proxying refers to a computer that maintains Full Network Connectivity as defined in Section 1 of this specification. For a system to qualify under the proxying weightings above, it must meet a non-proprietary proxying standard that has been approved by the EPA and the European Union as meeting the goals of ENERGY STAR. Such approval must be in place prior to submittal of product data for qualification. See Section 3.C, Qualifying Computers with Power Management Capabilities, for further information and testing requirements.*

### Categories

Category A: All notebook computers that do not meet the definition of Category B or C below will be considered under Category A for ENERGY STAR qualification.

Category B: To qualify under Category B desktops must have a discrete GPU

Category C: To qualify under Category C, notebooks must have:



- Greater than or equal to 2 Physical Cores;
- Greater than or equal to 2 gigabytes (GB) of System Memory; and
- A Discrete GPU with a Frame Buffer Width greater than 128-bit.

### Modes:

Off Mode: The power consumption level in the lowest power mode which cannot be switched off (influenced) by the user and that may persist for an indefinite time when the appliance is connected to the main electricity supply and used in accordance with the manufacturer's instructions. For systems where ACPI standards are applicable, Off Mode correlates to ACPI System Level S5 state.

Sleep Mode: A low power state that the computer is capable of entering automatically after a period of inactivity or by manual selection. A computer with sleep capability can quickly "wake" in response to network connections or user interface devices with a latency of  $\leq 5$  seconds from initiation of wake event to system becoming fully usable including rendering of display. For systems where ACPI standards are applicable, Sleep mode most commonly correlates to ACPI System Level S3 (suspend to RAM) state.

Idle State: The state in which the operating system and other software have completed loading, a user profile has been created, the machine is not asleep, and activity is limited to those basic applications that the system starts by default.

## Annex R-PHRASES:

**(R-phrases are mentioned on product labels and in product safety datasheets. It can be a useful tool for verification-procedures.)**

<u>R1:</u>	Explosive when dry.
<u>R2:</u>	Risk of explosion by shock, friction, fire or other sources of ignition.
<u>R3:</u>	Extreme risk of explosion by shock, friction, fire or other sources of ignition.
<u>R4:</u>	Forms very sensitive explosive metallic compounds.
<u>R5:</u>	Heating may cause an explosion.
<u>R6:</u>	Explosive with or without contact with air.
<u>R7:</u>	May cause fire.
<u>R8:</u>	Contact with combustible material may cause fire.
<u>R9:</u>	Explosive when mixed with combustible material.
<u>R10:</u>	Flammable
<u>R11:</u>	Highly flammable
<u>R12:</u>	Extremely flammable
<u>R13 (obsolete):</u>	<i>Extremely flammable liquid gas (This R-phrase is no longer designated by the version of the GefStoffV published on 26.10.93.)</i>
<u>R14:</u>	Reacts violently with water.



<u>R15:</u>	Contact with water liberates extremely flammable gases.
<i>Merck R15.1</i>	<i>Contact with acid liberates extremely flammable gases.</i>
<u>R16:</u>	Explosive when mixed with oxidizing substances.
<u>R17:</u>	Spontaneously flammable in air.
<u>R18:</u>	In use, may form flammable/explosive vapour-air mixture.
<u>R19:</u>	May form explosive peroxides.
<u>R20:</u>	Harmful by inhalation.
<u>R21:</u>	Harmful in contact with skin.
<u>R22:</u>	Harmful if swallowed.
<u>R23:</u>	Toxic by inhalation.
<i>Riedel-de Haen R23K:</i>	<i>Also toxic by inhalation.</i>
<u>R24:</u>	Toxic in contact with skin.
<i>Riedel-de Haen R24K:</i>	<i>Also toxic in contact with skin.</i>
<u>R25:</u>	Toxic if swallowed.
<i>Riedel-de Haen R25K:</i>	<i>Also toxic if swallowed.</i>
<u>R26:</u>	Very toxic by inhalation.
<i>Riedel-de Haen R26K:</i>	<i>Also very toxic by inhalation.</i>
<u>R27:</u>	Very toxic in contact with skin
<i>Riedel-de Haen R27A:</i>	<i>Very toxic in contact with eyes.</i>
<i>Riedel-de Haen R27K:</i>	<i>Also very toxic in contact with skin.</i>
<i>Riedel-de Haen R27AK:</i>	<i>Also very toxic in contact with eyes.</i>
<u>R28:</u>	Very toxic if swallowed.
<i>Riedel-de Haen R28K:</i>	<i>Also very toxic if swallowed.</i>
<u>R29:</u>	Contact with water liberates toxic gas.
<u>R30:</u>	Can become highly flammable in use.
<u>R31:</u>	Contact with acids liberates toxic gas.
<i>Merck R31.1</i>	<i>Contact with alkalis liberates toxic gas.</i>
<u>R32:</u>	Contact with acids liberates very toxic gas.
<u>R33:</u>	Danger of cumulative effects.
<u>R34:</u>	Causes burns.
<u>R35:</u>	Causes severe burns.
<u>R36:</u>	Irritating to eyes.
<i>Riedel-de Haen R36A:</i>	<i>Lacrimating</i>
<u>R37:</u>	Irritating to respiratory system.
<u>R38:</u>	Irritating to skin.
<u>R39:</u>	Danger of very serious irreversible effects.
<u>R40:</u>	Possible risk of cancer. <i>CAUTION: Until 2001 this R-phrase was used for possible mutagenic or teratogenic risks as well. These risks are now labelled with R68!</i>
<u>R41:</u>	Risk of serious damage to eyes.
<u>R42:</u>	May cause sensitization by inhalation.
<u>R43:</u>	May cause sensitization by skin contact.
<u>R44:</u>	Risk of explosion if heated under confinement.
<u>R45:</u>	May cause cancer.



<u>R46:</u>	May cause heritable genetic damage.
<u>R47</u> (obsolet):	<i>May cause deformities. (This R-phrase is no longer designated by the version of the GefStoffV published on 26.10.93.)</i>
<u>R48:</u>	Danger of serious damage to health by prolonged exposure.
<u>R49:</u>	May cause cancer by inhalation.
<u>R50:</u>	Very toxic to aquatic organisms.
<u>R51:</u>	Toxic to aquatic organisms.
<u>R52:</u>	Harmful to aquatic organisms.
<u>R53:</u>	May cause long-term adverse effects in the aquatic environment.
<u>R54:</u>	Toxic to flora.
<u>R55:</u>	Toxic to fauna.
<u>R56:</u>	Toxic to soil organisms.
<u>R57:</u>	Toxic to bees.
<u>R58:</u>	May cause long-term adverse effects in the environment.
<u>R59:</u>	Dangerous for the ozone layer.
<u>R60:</u>	May impair fertility.
<u>R61:</u>	May cause harm to the unborn child.
<u>R62:</u>	Possible risk of impaired fertility.
<u>R63:</u>	Possible risk of harm to the unborn child.
<u>R64:</u>	May cause harm to breastfed babies.
<u>R65:</u>	Harmful: may cause lung damage if swallowed.
<u>R66:</u>	Repeated exposure may cause skin dryness or cracking.
<u>R67:</u>	Vapours may cause drowsiness and dizziness.
<u>R68:</u>	Possible risks of irreversible effects.

## COMBINATIONS OF R-PHRASES:

R14/15:	Reacts violently with water, liberating extremely flammable gases.
R15/29:	Contact with water liberates toxic, extremely flammable gas.
R20/21:	Harmful by inhalation and in contact with skin.
R21/22:	Harmful in contact with skin and if swallowed.
R20/22:	Harmful by inhalation and if swallowed.
R20/21/22:	Harmful by inhalation, in contact with skin and if swallowed.
R21/22:	Harmful in contact with skin and if swallowed.
R23/24:	Toxic by inhalation and in contact with skin.
R24/25:	Toxic in contact with skin and if swallowed.
R23/25:	Toxic by inhalation and if swallowed.
R23/24/25:	Toxic by inhalation, in contact with skin and if swallowed.
R24/25:	Toxic in contact with skin and if swallowed.
R26/27:	Very toxic by inhalation and in contact with skin.
R27/28:	Very toxic in contact with skin and if swallowed.
R26/28:	Very toxic by inhalation and if swallowed.
R26/27/28:	Very toxic by inhalation, in contact with skin and if swallowed.
R36/37:	Irritating to eyes and respiratory system.
R37/38:	Irritating to respiratory system and skin.
R36/38:	Irritating to eyes and skin.
R36/37/38:	Irritating to eyes, respiratory system and skin.
R39/23:	Toxic: danger of very serious irreversible effects through inhalation.
R39/24:	Toxic: danger of very serious irreversible effects in contact with skin.
R39/25:	Toxic: danger of very serious irreversible effects if swallowed.
R39/23/24:	Toxic: danger of very serious irreversible effects through inhalation and in contact with skin.



- R39/23/25: Toxic: danger of very serious irreversible effects through inhalation and if swallowed.
- R39/24/25: Toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
- R39/23/24/25: Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
- R39/26: Very toxic: danger of very serious irreversible effects through inhalation.
- R39/27: Very toxic: danger of very serious irreversible effects in contact with skin.
- R39/28: Very toxic: danger of very serious irreversible effects if swallowed.
- R39/26/27: Very toxic: danger of very serious irreversible effects through inhalation and in contact with skin.
- R39/26/28: Very toxic: danger of very serious irreversible effects through inhalation and if swallowed.
- R39/27/28: Very toxic: danger of very serious irreversible effects in contact with skin and if swallowed.
- R39/26/27/28: Very toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
- R42/43: May cause sensitization by inhalation and skin contact.
- R48/20: Harmful: danger of serious damage to health by prolonged exposure through inhalation.
- R48/21: Harmful: danger of serious damage to health by prolonged exposure in contact with skin.
- R48/22: Harmful: danger of serious damage to health by prolonged exposure if swallowed.
- R48/20/21: Harmful: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
- R48/20/22: Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
- R48/21/22: Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
- R48/20/21/22: Harmful: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
- R48/23: Toxic: danger of serious damage to health by prolonged exposure through inhalation.
- R48/24: Toxic: danger of serious damage to health by prolonged exposure in contact with skin.
- R48/25: Toxic: danger of serious damage to health by prolonged exposure if swallowed.
- R48/23/24: Toxic: danger of serious damage to health by prolonged exposure through inhalation and in contact with skin.
- R48/23/25: Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
- R48/24/25: Toxic: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
- R48/23/24/25: Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
- R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- R51/53: Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- R52/53: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- R68/20: Harmful: possible risk of irreversible effects through inhalation.
- R68/21: Harmful: possible risk of irreversible effects in contact with skin.
- R68/22: Harmful: possible risk of irreversible effects if swallowed.
- R68/20/21: Harmful: possible risk of irreversible effects through inhalation and in contact with skin.
- R68/20/22: Harmful: possible risk of irreversible effects through inhalation and if swallowed.
- R68/21/22: Harmful: possible risk of irreversible effects in contact with skin and if swallowed.
- R68/20/21/22: Harmful: possible risk of irreversible effects through inhalation, in contact with skin and if swallowed.

