

Sustainable Public Procurement-fiche: basic

1) Subject matter

Environmental friendly printers, copiers, fax machines & scanners.

“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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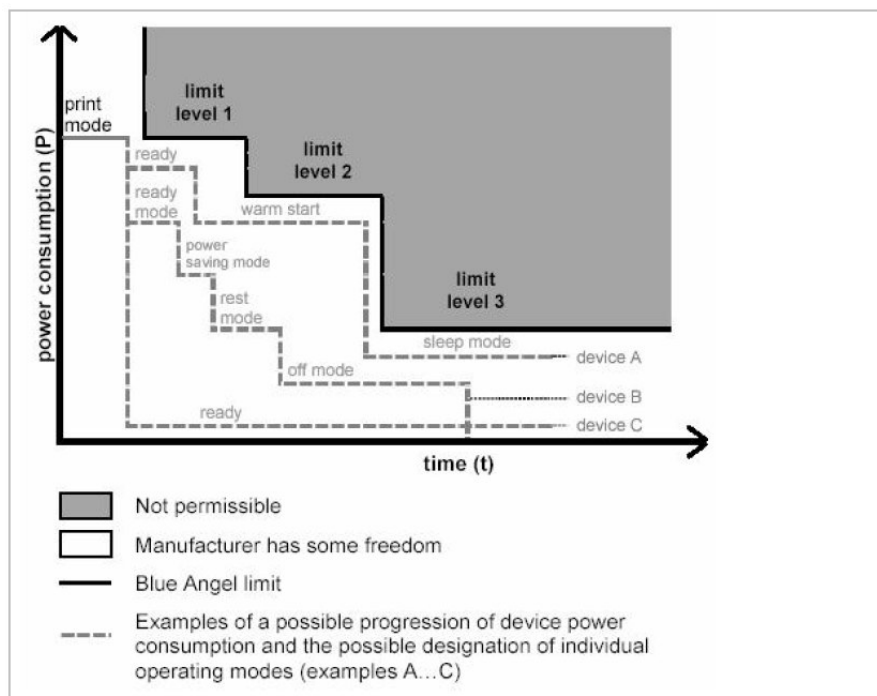
4) Technical specifications

Energy consumption

The product must follow the A scheme (Blaue Engel) OR B scheme (Energy Star)



Scheme A) Power consumption curve and return time limit [EU toolkit: core]



The power consumption curve of the device for the time elapsing after the end of any primary function – not only copying or printing – and does not perform any other primary function., i.e. in the sleep modes, may not exceed this specified limit curve. This limit curve is determined:

- by a product specific maximum power consumption defined in Annex A: Power limit Curve limits.
- factory default activation times to be set in a way that the device does not exceed the limit curve. The user can change the activation time of individual sleep modes with a fixed upper limit value not exceeding 240 minutes. The limits are given in Annex A: Power limit Curve limits.

The return time, the time it takes to return from a low-power consumption mode to “Ready” mode, is limited.

	Limit level 2	Limit level 3
Electrophotographic devices	$0.4 \times \text{SSW} + 10$ (maximum 35 sec.)	$0.5 \times \text{SSW} + 30$ (maximum 60 sec.)
Ink jet devices	5 sec.	5 sec.

Scheme B) Typical Electricity Consumption (TEC) and Operational Mode (OM) [EU toolkit: core]

The product should not exceed the TEC limits or OM limits. TEC, The typical electricity consumption is defined as the consumption of a machine during normal use over one week measured in kilowatt-hours (kWh). The measuring procedure is defined within the Energy Star program. (<http://www.energystar.gov>). The operational mode focuses on product energy consumption in various low-power modes from active (highest consumption) over sleep mode till standby mode (lowest consumption). The OM approach defines power consumption in sleep mode, the mode after the primary function has ended, maximum time limits for the sleep mode before the machine enters the standby mode and maximum power consumption limits for the standby mode.

Standard format^{*} machines need to be evaluated with the TEC method, small[†] and large[‡] format machines need to be evaluated using the OM method. Following exceptions on this rule must follow the OM method:

- standard format fax machines
- standard format inkjet multifunctional devices
- standard format impact printers
- standard format inkjet printers
- standard format scanners

The TEC values for each type of product are given in Annex B: Typical Electricity Consumption. OM products must meet the default-delay time settings, provided in Annex C: Operational Mode limits, upon product shipment. In addition, all OM products must be shipped with a maximum machine delay time not in excess of four hours, which is only adjustable by the manufacturer. This maximum machine delay time cannot be influenced by the user.

* Large format machine include those designed for A2 media and larger, including those designed to accommodate continuous-form media at a width of 406 millimetres (mm) or wider. Large-format products may also be capable of printing on standard-size or small-format media.

† Small size machines include those designed for media sizes smaller than those defined as Standard (e.g., A6, 4" x 6", microfilm), including those designed to accommodate continuous-form media at widths smaller than 210 mm.

‡ Standard format machines include those designed for standard-sized media (e.g., Letter, Legal, Ledger, A3, A4, and B4), including those designed to accommodate continuous-form media at widths between 210 mm and 406 mm. Standard-size products may also be capable of printing on small-format media.



More information on how to determine and apply the correct method (OM or TEC) can be found on (<http://www.energystar.gov>).

Others

Appliances [with a printing function] with a maximum operating speed of more than 45 sheets per minute for A4 size paper must be equipped with automatic doublesided copying (a duplex-unit). All other devices with a lower maximum operating speed must at least offer a manual option (copiers) or an extra software-based option (printers, multifunction devices) for double-sided printing on A4 size paper. [EU toolkit: core]

Evidence:

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



Blaue Engel



Nordic Swan



Energy Star

In case that the tendering company can present one of these labels, any further proof is not necessary. Any other suitable evidence from a recognized body can also be used.

5) Awarding the contract:

	Criterion	Weight
1	Price <i>Calculation (e.g.):</i> Lowest offered price/ stated price x 0,70	e.g. 70%
2	Environmental criteria (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

Power consumption

Product specific external power supplies must meet the requirements of EU Commission Guideline on External Power Supplies with regard to the efficiency level. Their power consumption in sleep mode (see the above-named European Commission Guideline) will not exceed the following limit value: (Nordic Swan, Blaue Engel)

$$\text{Limit value in watts} = \text{Power output in watts} \times 0.004 + 0.4 \text{ watts}$$

Product design

- The device must have a switch mounted in an easily accessible position in a usual setup position which can at least switch the device to Plug-in Off mode. Easy accessibility must also be ensured if the device is upgraded – for example, with accessories. Standard IEEE 1621 21 should be complied with when designing switches and buttons. It is highly recommended to follow this standard already now. (Blaue Engel)
- Batteries and accumulators which are not designed for exchange by the user must be replaceable at the end of their useful life without needing to exchange the entire printed circuit board or similar parts holding such batteries or accumulators. (Blaue Engel)

6) Performance clauses:

- The applicant undertakes to accept the free return of the original userexchangeable batteries/accumulators. A third party may be subcontracted for this task. (Blaue Engel)
- The devices must be capable of processing recycled paper made of 100% post consumer paper that meets the requirements of EN 12281:2002. The applicant is free to recommend certain types of recycled paper. The user information must include the following note: „This device is suited for processing recycled paper.“ A reference to EN 12281:2002 may be included. (Blaue Engel)
- The bidder must guarantee the availability of spare parts for at least 3 years from the time that production ceases. (EU Toolkit, Blaue Engel, Nordic Swann) [EU toolkit: core]
- Spent photoconductor drums must be taken back by the applicant (free of charge at a return facility) and either be recovered for reuse or subjected to material recycling. The user information should include details regarding take-back and return facility. (Blaue Engel)



- Products with combined toner cartridge may be accepted if the cartridge is not designed to prevent reuse. Products must accept remanufactured toner cartridges. (Nordic Swann)

References

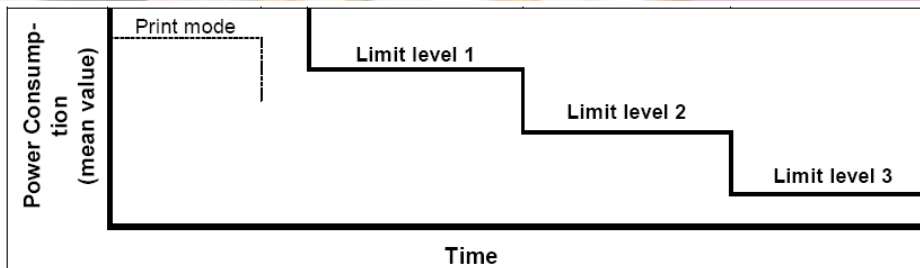
[Information of the public authority that used these clauses in a procurement case]



Annex A Power limit curve

Electrophotographic colour devices are divided into group A containing devices whose output speed in colour print mode (SF) is far lower than in monochrome print mode (SSW), e.g. $SF < 0.9 \times SSW$. And a group B with devices whose output speed in colour print mode (SF) is almost or exactly the same as in monochrome print mode (SSW). The following formula applies: $SF \geq 0.9 \times SSW$.





Limits P_i are functions of output speed S_{sw} according to the formula

$$P_i = m \times S_{sw} + b.$$

Factors m and b are first replaced by the basic values given in line 1. If the device possesses functional units and/or printing technologies or functionalities in its delivery status that are listed in lines 2 to 7 the values given there for m and b are added.

Limit value	P _i Values in Watts					
	Limit level 1		Limit level 2		Limit level 3	
	$P_1 = \Sigma m \times S_{sw} + \Sigma b$		$P_2 = \Sigma m \times S_{sw} + \Sigma b$		$P_3 = \Sigma m \times S_{sw} + \Sigma b$	
	m	b	m	b	m	b
1. Devices with print unit (i.e. all devices)	0.3	2	0.3	2	0.3	2
Bonus for individual functional units						
2. † Scan unit	—	5	—	5	—	—
3. † Telephone modem and/or † LAN interface	—	15	—	15	—	10
Bonus for individual functions						
4. † Multifunctionality of electrophotographic devices	2.2	5	2.2	5	—	—
Bonus for individual printing technologies						
5. Electrophotography, monochrome printing only	2.5	20	1.5	—	0.1	—



Limit value	P _i Values in Watts					
	Limit level 1		Limit level 2		Limit level 3	
	P ₁ = Σm × S _{sw} + Σb		P ₂ = Σm × S _{sw} + Σb		P ₃ = Σm × S _{sw} + Σb	
	m	b	m	b	m	b
6. Electrophotography, monochrome and colour printing, † group A	2.5	70	2.5	—	0.1	—
7. Electrophotography, Monochrome and colour printing, † Group B	3.0	100	3.0	50	0.1	10
Example:						
For a multifunction device, electrophotographic, colour printing, Group B and the functions printing, copying as well as sending an receiving of faxes (via telephone modem) the limits P _i are calculated as follows:						
1. Devices with print unit	0.3	2	0.3	2	0.3	2
2. Scan unit	—	5	—	5	—	—
3. Telephone modem and/or LAN interface	—	15	—	15	—	10
4. Multifunctionality	2.2	5	2.2	5	—	—
7. Electrophotography, monochrome as well as colour printing, Group B	3.0	100	3.0	50	0.1	10
Total:	5.5	127	5.5	77	0.4	22
Limit values:	P ₁ = 5.5 × S _{sw} + 127		P ₂ = 5.5 × S _{sw} + 78		P ₃ = 0.4 × S _{sw} + 22	

Following table defines the maximum factory defaults time limits:



all devices with an output speed S_{SW} of	t_{1A}	t_{2A}	t_{3A}
> 0 ... 5 pages/minute	3	5	10
> 5 ... 10 pages/minute	5	10	15
> 10 ... 20 pages/minute	5	10	20
> 20 ... 30 pages/minute	5	10	30
> 30 ... 40 pages/minute	5	10	45
> 40 pages/minute	10	15	60



Annex B: TEC limit values

Used annotations:

- MFD: A commercially-available imaging product, which is a physically-integrated device or a combination of functionally-integrated components, that performs two or more of the core functions of copying, printing, scanning, or faxing.
- Direct Thermal (DT) – A marking technology that transfers an image by burning dots onto coated media as it passes over a heated print head. DT products do not use ribbons.
- Dye Sublimation (DS) – A marking technology where images are formed by depositing (subliming) dye onto the print media based upon the amount of energy delivered by the heating elements.
- Electrophotography (EP) – A marking technology characterized by illumination of a photoconductor in a pattern representing the desired hard copy image via a light source, development of the image with particles of toner using the latent image on the photoconductor to define the presence or absence of toner at a given location, transfer of the toner to the final hard copy medium, and fusing to cause the desired hard copy to become durable. Types of EP include Laser, LED, and LCD. Colour EP is distinguished from monochrome EP in that toners of at least three different colours are available in a given product at one time. Two types of colour EP technology are defined below:
 - Parallel Colour EP – A marking technology that uses multiple light sources and multiple photoconductors to increase the maximum colour printing speed.
 - Serial Colour EP – A marking technology that uses a single photoconductor in a serial fashion and one or multiple light sources to achieve the multi-colour hard copy output.
- Impact – A marking technology characterized by the formation of the desired hard copy image by transferring colourant from a “ribbon” to the media via an impact process. Two types of impact technology are Dot Formed Impact and Fully-formed Impact.
- Ink Jet (IJ) – A marking technology where images are formed by depositing colourant in small drops directly to the print media in a matrix manner. Colour IJ is distinguished from monochrome IJ in that more than one colourant is available in a product at any one time. Typical types of IJ include Piezo-electric (PE) IJ, IJ Sublimation, and Thermal IJ.
- Solid Ink (SI) – A marking technology where the ink is solid at room temperature and liquid when heated to the jetting temperature. Transfer to the media can be direct, but is most often made to an intermediate drum or belt and then offset printed to the media.



- Stencil – A marking technology that transfers images onto the print media from a stencil that is fitted around an inked drum.
- Thermal Transfer (TT) – A marking technology where the desired hard copy image is formed by depositing small drops of solid colourant (usually coloured waxes) in a melted/fluid state directly to the print media in a matrix manner. TT is distinguished from IJ in that the ink is solid at room temperature and is made fluid by heat.



TEC Table 1

Product(s): Copiers, Digital Duplicators, Fax Machines, Printers		
Size Format(s): Standard-size		
Marking Technologies: DT, Mono DS, Mono EP, Mono Stencil, Mono TT		
	Tier I	Tier II
Product Speed (ipm)	Maximum TEC (kWh/week)	Maximum TEC (kWh/week)
≤ 12	1.5 kWh	TBD
$12 < ipm \leq 50$	$(0.20 \text{ kWh/ipm})x - 1 \text{ kWh}$	TBD
$> 50 \text{ ipm}$	$(0.80 \text{ kWh/ipm})x - 31 \text{ kWh}$	TBD

TEC Table 2

Product(s): Copiers, Digital Duplicators, Fax Machines, Printers		
Size Format(s): Standard-size		
Marking Technologies: Color DS, Color Stencil, Color TT, Color EP, SI		
	Tier I	Tier II
Product Speed (ipm)	Maximum TEC (kWh/week)	Maximum TEC (kWh/week)
≤ 50	$(0.20 \text{ kWh/ipm})x + 2 \text{ kWh}$	TBD
> 50	$(0.80 \text{ kWh/ipm})x - 28 \text{ kWh}$	TBD

TEC Table 3

Product(s): MFDs		
Size Format(s): Standard-size		
Marking Technologies: DT, Mono DS, Mono EP, Mono TT		
	Tier I	Tier II
Product Speed (ipm)	Maximum TEC (kWh/week)	Maximum TEC (kWh/week)
≤ 20	$(0.20 \text{ kWh/ipm})x + 2 \text{ kWh}$	TBD
$20 < ipm \leq 69$	$(0.44 \text{ kWh/ipm})x - 2.8 \text{ kWh}$	TBD
> 69	$(0.80 \text{ kWh/ipm})x - 28 \text{ kWh}$	TBD

TEC Table 4

Product(s): MFDs		
Size Format(s): Standard-size		
Marking Technologies: Color DS, Color TT, Color EP, SI		
	Tier I	Tier II
Product Speed (ipm)	Maximum TEC (kWh/week)	Maximum TEC (kWh/week)
≤ 32	$(0.20 \text{ kWh/ipm})x + 5 \text{ kWh}$	TBD
$32 < ipm \leq 61$	$(0.44 \text{ kWh/ipm})x - 2.8 \text{ kWh}$	TBD
> 61	$(0.80 \text{ kWh/ipm})x - 25 \text{ kWh}$	TBD



Annex C: Operational Mode limits

Large format machine include those designed for A2 media and larger, including those designed to accommodate continuous-form media at a width of 406 millimetres (mm) or wider. Large-format products may also be capable of printing on standard-size or small-format media.

Small size machines include those designed for media sizes smaller than those defined as Standard (e.g., A6, 4" x 6", microfilm), including those designed to accommodate continuous-form media at widths smaller than 210 mm.

Standard format machines include those designed for standard-sized media (e.g., Letter, Legal, Ledger, A3, A4, and B4), including those designed to accommodate continuous-form media at widths between 210 mm and

Power limits sleep mode

OM Table 1

Product(s): Copiers, MFDs	
Size Format(s): Large Format	
Marking Technologies: Color DS, Color TT, DT, Mono DS, Mono EP, Mono TT, Color EP, SI	
	Sleep (W)
Marking Engine	58

OM Table 2

Product(s): Fax Machines, MFDs, Printers	
Size Format(s): Standard-size	
Marking Technologies: Color IJ, Mono IJ	
	Sleep (W)
Marking Engine	3

OM Table 3

Product(s): MFDs, Printers	
Size Format(s): Large Format	
Marking Technologies: Color IJ, Mono IJ	
	Sleep (W)
Marking Engine	13

OM Table 4

Product(s): Mailing Machines	
Size Format(s): N/A	
Marking Technologies: DT, Mono EP, Mono IJ, Mono TT	
	Sleep (W)
Marking Engine	3



OM Table 5

Product(s): Printers	
Size Format(s): Small Format	
Marking Technologies: Color DS, DT, Color IJ, Color Impact, Color TT, Mono DS, Mono EP, Mono IJ, Mono Impact, Mono TT, Color EP, SI	
	Sleep (W)
Marking Engine	3

OM Table 6

Product(s): Printers	
Size Format(s): Standard-size	
Marking Technologies: Color Impact, Mono Impact	
	Sleep (W)
Marking Engine	6

OM Table 7

Product(s): Scanners	
Size Format(s): Large Format, Small Format, Standard-size	
Marking Technologies: N/A	
	Sleep (W)
Scanning Engine	5

OM Table 8

Product(s): Printers	
Size Format(s): Large Format	
Marking Technologies: Color DS, Color Impact, Color TT, DT, Mono DS, Mono EP, Mono Impact, Mono TT, Color EP, SI	
	Sleep (W)
Marking Engine	54

The values above should be increased if the machine has additional functions besides printing, following table defines the amounts that must be added to the power consumption values in sleep mode:

Type	Details	Functional Adder Allowances (W)	
		Primary	Secondary
Interfaces	A. Wired < 20 MHz	0.3	0.2
	A physical data- or network-connection port present on the imaging product that is capable of a transfer rate < 20 MHz. Includes USB 1.x, IEEE488, IEEE 1284/Parallel/Centronics and RS232.		
	B. Wired ≥ 20 MHz and < 500 MHz	0.5	0.2
	A physical data- or network-connection port present on the imaging product that is capable of a transfer rate ≥ 20 MHz and < 500 MHz. Includes USB 2.x, IEEE 1394/FireWire/i.LINK, and 100Mb Ethernet.		
	C. Wired ≥ 500 MHz	1.5	0.5
	A physical data- or network-connection port present on the imaging product that is capable of a transfer rate ≥ 500 MHz. Includes 1G Ethernet.		
	D. Wireless	3.0	0.7
	A data- or network-connection interface present on the imaging product that is designed to transfer data via radio-frequency wireless means. Includes Bluetooth and 802.11.		
	E. Wired card/camera/storage	0.5	0.1
A physical data- or network-connection port present on the imaging product that is designed to allow the connection of an external device, such as flash memory-card/smart-card readers and camera interfaces (including PictBridge).			
G. Infrared	0.2	0.2	



Type	Details	Functional Adder Allowances (W)	
		Primary	Secondary
Other	A data- or network-connection interface present on the imaging product that is designed to transfer data via infrared technology. Includes IrDA.	-	0.2
	Storage	-	0.2
	Internal storage drives present on the imaging product. Includes internal drives only (e.g., disk drives, DVD drives, Zip drives), and applies to each separate drive. This adder does not cover interfaces to external drives (e.g., SCSI) or internal memory.	-	2.0
	Scanners with CCFL lamps	-	0.5
	The presence of a scanner that uses Cold Cathode Fluorescent Lamp (CCFL) technology. This adder is applied only once, regardless of the lamp size or the number of lamps/bulbs employed.	-	0.5
	Scanners with non-CCFL lamps	-	0.5
	The presence of a scanner that uses a lamp technology other than CCFL. This adder is applied only once, regardless of the lamp size or the number of lamps/bulbs employed. This adder addresses scanners using Light-Emitting Diode (LED), Halogen, Hot-Cathode Fluorescent Tube (HCFT), Xenon, or Tubular Fluorescent (TL) technologies.	-	-0.5
	PC-based system (cannot print/copy/scan without use of significant PC resources)	-	-0.5
	This adder applies to imaging products that rely on an external computer for significant resources, such as memory and data processing, to perform basic functions commonly performed by imaging products independently, such as page rendering. This adder does not apply to products that simply use a computer as a source or destination for image data.	-	0.8
	Cordless handset	-	0.8
	The capability of the imaging product to communicate with a cordless handset. This adder is applied only once, regardless of the number of cordless handsets the product is designed to handle. This adder does not address the power requirements of the cordless handset itself.	-	1.0 W per 1 GB
	Memory	-	1.0 W per 1 GB
	The internal capacity available in the imaging product for storing data. This adder applies to all volumes of internal memory and should be scaled accordingly. For example, a unit with 2.5 GB of memory would receive an allowance of 2.5 W while a unit with 0.5 GB would receive an allowance of 0.5 W.	-	For PSOR > 10 W, 0.05 x (PSOR - 10 W)
	Power-supply (PS) size, based on PS output rating (OR) [Note: this adder does not apply to scanners]	-	For PSOR > 10 W, 0.05 x (PSOR - 10 W)

PSOR: Power supply output rating

For the adder allowances shown in the table above, distinctions are made for “Primary” and “Secondary” types of adders. These designations refer to the state in which the interface is required to remain while the imaging product is in Sleep. Connections that remain active during the OM test procedure while the imaging product is in Sleep are defined as Primary, while connections that can be inactive while the imaging product is in Sleep are defined as Secondary.



Time limits sleep mode

Table A: Maximum Default Delay Times to Sleep for Small-format and Standard-size OM Products, Excluding Mailing Machines, in Minutes

Product Speed (ipm)	Fax Machines	MFDs	Printers	Scanners
0 - 10	5	15	5	15
11 - 20	5	30	15	15
21 - 30	5	60	30	15
31 - 50	5	60	60	15
51 +	5	60	60	15

Table B: Maximum Default Delay Times to Sleep for Large-format OM Products, Excluding Mailing Machines, in Minutes

Product Speed (ipm)	Copiers	MFDs	Printers	Scanners
0 - 10	30	30	30	15
11 - 20	30	30	30	15
21 - 30	30	30	30	15
31 - 50	30	60	60	15
51 +	60	60	60	15

Table C: Maximum Default Delay Times to Sleep for Mailing Machines in Minutes

Product Speed (mppm)	Mailing Machines
0 - 50	20
51 - 100	30
101 - 150	40
151 +	60



Power limits Standby Mode

Table D: Maximum Standby Power Levels for OM Products in Watts

Product Type & Size Format	Standby (W)
All Small Format and Standard-size OM Products without Fax Capability	1
All Small Format and Standard-size OM Products with Fax Capability	2
All Large Format OM Products and Mailing Machines	N/A



Annex D: R-PHRASES

R1:	Explosive when dry.
R2:	Risk of explosion by shock, friction, fire or other sources of ignition.
R3:	Extreme risk of explosion by shock, friction, fire or other sources of ignition.
R4:	Forms very sensitive explosive metallic compounds.
R5:	Heating may cause an explosion.
R6:	Explosive with or without contact with air.
R7:	May cause fire.
R8:	Contact with combustible material may cause fire.
R9:	Explosive when mixed with combustible material.
R10:	Flammable
R11:	Highly flammable
R12:	Extremely flammable
R13 (obsolete):	<i>Extremely flammable liquid gas (This R-phrase is no longer designated by the version of the GefStoffV published on 26.10.93.)</i>
R14:	Reacts violently with water.
R15:	Contact with water liberates extremely flammable gases.
Merck R15.1	<i>Contact with acid liberates extremely flammable gases.</i>
R16:	Explosive when mixed with oxidizing substances.
R17:	Spontaneously flammable in air.
R18:	In use, may form flammable/explosive vapour-air mixture.
R19:	May form explosive peroxides.
R20:	Harmful by inhalation.
R21:	Harmful in contact with skin.
R22:	Harmful if swallowed.
R23:	Toxic by inhalation.
Riedel-de Haen R23K:	<i>Also toxic by inhalation.</i>
R24:	Toxic in contact with skin.
Riedel-de Haen R24K:	<i>Also toxic in contact with skin.</i>
R25:	Toxic if swallowed.
Riedel-de Haen R25K:	<i>Also toxic if swallowed.</i>
R26:	Very toxic by inhalation.
Riedel-de Haen R26K:	<i>Also very toxic by inhalation.</i>
R27:	Very toxic in contact with skin
Riedel-de Haen R27A:	<i>Very toxic in contact with eyes.</i>
Riedel-de Haen R27K:	<i>Also very toxic in contact with skin.</i>
Riedel-de Haen R27AK:	<i>Also very toxic in contact with eyes.</i>
R28:	Very toxic if swallowed.
Riedel-de Haen R28K:	<i>Also very toxic if swallowed.</i>
R29:	Contact with water liberates toxic gas.
R30:	Can become highly flammable in use.
R31:	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.
<i>R47(obsolete):</i>	<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.

