EUROPEAN COMMISSION
DIRECTORATE-GENERAL JRC
JOINT RESEARCH CENTRE
Institute for the Energy
Renewable Energy Unit

Ispra, 16 March 2011

CODE of CONDUCT

on

Energy Efficiency and Quality

of

AC Uninterruptible Power Systems

(UPS)

Final version with new target values for 2011 - 2014

Version 2.0
2011-03-16

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1. Introduction

The Uninterruptible Power Systems (UPS) are widespread in the European Industry and service centres. Expectations are that UPS will increase in European Community in the near future. The energy supply with UPS generates energy losses that are higher than the supply of the consumer direct from the low voltage network. With the general principles and actions resulting from the implementation of this Code of Conduct the additional electricity energy losses caused by UPS will be limited.

The energy losses caused by UPS are not to be neglected by EU energy and environmental policies. It is important that the electrical efficiency of UPS is maximised.

To help all parties to address the issue of energy efficiency whilst avoiding competitive pressures to raise energy consumption of equipment all manufacturers of UPS are invited to sign this Code of Conduct. Taking into account that the energy efficiency of UPS is influenced by the quality realised, the mode of operation as well as the components used.

This Code of Conduct sets out the basic principles to be followed by all parties involved in Uninterruptible Power Systems, operating in the European Community in respect of energy efficient equipment.

2. Equipment covered

This Code of Conduct covers Uninterruptible Power Systems (UPS according to EN 62040-3 Ed. 1.0 b: 1999) delivering 1-phase and 3-phase uninterruptible power above 0.3kVA at 230/400 V. The UPS are designed in different configurations and operations. Typical circuit arrangements are “UPS double conversion” with or without bypass, “UPS line interactive operation” with or without bypass and “UPS stand-by operation”.

In the rest of this Code of Conduct these different configurations and operations of equipment will be simply referred to as "UPS".

This Code of Conduct does not cover:
- UPS designed or complying with specific customer requirements impacting efficiency such as DC/battery voltage, additional isolation, special cooling …;
- UPS based on rotating machines;

3. Aim

The aim of this Code of Conduct is to minimise energy consumption (kWh) in Europe by maximising the energy efficiency of UPS.

4. Commitment

Signatories of this Code of Conduct are UPS manufacturers who agree to make all reasonable efforts to:

4.1 Abide by the General Principles contained in Annex A.

4.2 Achieve the minimum energy efficiency targets set out in Annex B for new UPS models placed on the market after 1.1.2011.

4.3 Encourage engineers and operators to adopt energy efficient practices in connection with the use of UPS. In particular by providing information to engineers and operators.

4.4 Co-operate with the European Commission in monitoring the effectiveness of this Code of Conduct, through the procedure described in Section 5 of this Code of Conduct.

4.5 The signatories will develop marketing tools to promote the Code of Conduct and improve the average efficiency level of UPSs sold on the European market.

5. Monitoring

Manufacturers signatories agree to provide to the European Commission on a yearly basis, starting with the year 2011 covering the figures of 2010, information concerning the energy efficiency of the equipment covered by the present Code of Conduct they sell in the European Union (EU) and EFTA-Countries.

The reported results will be discussed starting with year 2011 at least once a year in a confidential and anonymous way by the signatories in order to:

a) Evaluate the level of compliance and the effectiveness of this Code of Conduct in achieving its aims.

b) Evaluate current and future developments that influence energy efficiency, i.e. at the power electronics

c) Contribute to set targets for future time periods.

Reporting: The presentation of the results provided to the Commission will be in the form of the attached Excel Spreadsheet *Code of Conduct UPS DATA sheet (Annex C).*

Annex A – General Principles

UPS are designed to provide high quality power with the highest reliability. Provided the functional requirements are the same, the customer would choose the more efficient solution.

Taking into account the above, signatories of this Code of Conduct should endeavour and make all reasonable efforts to ensure:

A.1 UPS are designed so as to minimise energy consumption respectively to operate with maximum energy efficiency.

A.2 Operational and control systems are specified on the presumption that hardware has power management built in, i.e. depending on the functionality required of the UPS, the hardware will automatically operate with the highest possible energy efficiency according to the normal mode (as defined in tables of Annex B).

A.3 UPS, originally declared by the manufacturer with classification “VFI”, shall have the possibility to operate continuously on higher efficiency modes (bypass mode or other advanced modes). The selection of the operation mode can be automatic, fixed or load dependent. These UPS products could be also declared as “VI” and/or “VFD” by the manufacturer if in compliance with the tables of Annex B for these modes of operation. For further details about higher efficiency modes, clients should refer to the manufacturers’ specifications. The operator of a UPS has to decide whether this function is used or not. UPS manufacturers shall provide information about UPS behaviour and efficiency also in higher efficiency modes.

Annex B – Power levels: targets and time schedule

The equipment covered by this Code of Conduct shall meet the following minimum efficiency targets and time schedule. The minimum efficiency targets have to be reached with guaranteed and measured values of the equipment covered.

The calculation of the efficiency referred to in this Code of Conduct is based on the basic configurations of three phase UPS according to EN 62040-3 Ed. 1.0 b: 1999.

1. For UPS double conversion in the basic configuration with the classification "VFI – S…" (See EN 62040-3 Ed. 1.0 b: 1999 for the definition of the classification)

Table I.1 – Efficiency for UPS rated from 0,3kVA ≥ 200kVA with classification "VFI – S…"
From 1.1.2011 to 31.12.2014

Voltage V	**Load** %	**UPS rating** (kVA)				
		≥0,3 to <0,8	**≥0,8 to <1,5**	**≥1,5 to <3,5**	**≥3,5 to <5,0**	**≥5,0 to <10,0**
230/400	25	73,0 %	73,0 %	78,0 %	82,0 %	82,5 %
	50	74,0 %	80,0 %	83,0 %	84,0 %	85,0 %
	75	78,0 %	82,0 %	83,0 %	86,0 %	87,0 %
	100	80,0 %	82,0 %	84,0 %	86,0 %	87,0 %

Mode	**from 1-1-2011 to 31-12-2012**			
	UPS range: • *10 – < 20 kVA*	*UPS range:* • *20 – < 40 kVA*	*UPS range:* • *40 – < 200 kVA*	*UPS range:* • *200 kVA*
Normal mode **Minimum** efficiency measured according to EN 62040-3 Annex AA				
25 % of nominal power	85,5%	85,5 %	87,8 %	89,8 %
50 % of nominal power	89,8 %	90,3 %	91,3 %	92,3 %
75 % of nominal power	91,3 %	91,8 %	92,5 %	93,3%
100 % of nominal power	91,5 %	92 %	92,5%	93,3 %
Mode	**from 1-1-2013 to 31-12-2014**			
	UPS range: • *10 – < 20 kVA*	*UPS range:* • *20 – < 40 kVA*	*UPS range:* • *40 – < 200 kVA*	*UPS range:* • *200 kVA*
Normal mode **Minimum** efficiency measured according to EN 62040-3 Annex AA				
25 % of nominal power	86,5%	87,5 %	89,0 %	90,0 %
50 % of nominal power	91,0 %	91,5 %	92,0 %	92,5 %
75 % of nominal power	92,0 %	92,5 %	93,0 %	93,5%
100 % of nominal power	92,0 %	92,5%	93,0%	93,5 %

2. For all VI and VFI UPS, except "VFI – S…" (See EN 62040-3 Ed. 1.0 b: 1999 for the definition of the classification)

Table I.2 – Efficiency for UPS rated from 0,3kVA ≥ 200kVA with classification VI and VFI, except "VFI – S…"
From 1.1.2011 to 31.12.2014

Voltage V	**Load** %	**UPS rating** (kVA)				
		≥0,3 to <0,8	**≥0,8 to <1,5**	**≥1,5 to <3,5**	**≥3,5 to <5,0**	**≥5,0 to <10,0**
230/400	25	80,0 %	85,0 %	85,0 %	85,0 %	85,5 %
	50	87,0 %	88,0 %	89,0 %	91,0 %	91,5 %
	75	87,5 %	88,5 %	89,9 %	92,0 %	92,5 %
	100	88,0 %	89,0 %	90,0 %	92,0 %	92,5 %

Mode	**from 1-1-2011 to 31-12-2012**			
	UPS range: • *10 – < 20 kVA*	*UPS range:* • *20 – < 40 kVA*	*UPS range:* • *40 – < 200 kVA*	*UPS range:* • *200 kVA*
Normal mode **Minimum** efficiency measured according to EN 62040-3 Annex AA				
25 % of nominal power	90 %	91 %	91.5 %	93 %
50 % of nominal power	93 %	93.5 %	94 %	95.5 %
75 % of nominal power	93.5 %	94 %	94.5 %	96 %
100 % of nominal power	93.5 %	94%	94.5 %	96 %
Mode	**from 1-1-2013 to 31-12-2014**			
	UPS range: • *10 – < 20 kVA*	*UPS range:* • *20 – < 40 kVA*	*UPS range:* • *40 – < 200 kVA*	*UPS range:* • *200 kVA*
Normal mode **Minimum** efficiency measured according to EN 62040-3 Annex AA				
25 % of nominal power	90 %	91 %	91.5 %	93 %
50 % of nominal power	93 %	93.5 %	94 %	95.5 %
75 % of nominal power	93.5 %	94 %	94.5 %	96 %
100 % of nominal power	93.5 %	94%	94.5 %	96 %

3. For all VFD UPS (see EN 62040-3 Ed. 1.0 b: 1999 for the definition of the classification)

Table I.3 – Efficiency for UPS rated from 0,3kVA ≥ 200kVA with classification VFD From 1.1.2011 to 31.12.2014

Voltage V	**Load** %	**UPS rating** (kVA)				
		≥0,3 to <0,8	**≥0,8 to <1,5**	**≥1,5 to <3,5**	**≥3,5 to <5,0**	**≥5,0 to <10,0**
230/400	25	86,0 %	87,0 %	87,8 %	89,0 %	90,0 %
	50	87,0 %	88,0 %	88,8 %	92,0 %	93,0 %
	75	88,0 %	89,0 %	89,8 %	93,0 %	94,0 %
	100	89,0 %	90,0 %	90,8 %	93,0 %	94,0 %

Mode	**from 1-1-2011**		**to 31-12-2012**	
	UPS range: • *10 – < 20 kVA*	*UPS range:* • *20 – < 40 kVA*	*UPS range:* • *40 – < 200 kVA*	*UPS range:* • *200 kVA*
Normal mode **Minimum** efficiency measured according to EN 62040-3 Annex AA				
25 % of nominal power	94 %	94.5 %	95 %	95.5 %
50 % of nominal power	96 %	96.5 %	97 %	97.5 %
75 % of nominal power	96.5 %	97 %	97.5 %	98 %
100 % of nominal power	96,5 %	97 %	97.5 %	98 %
Mode	**from 1-1-2013**		**to 31-12-2014**	
	UPS range: • *10 – < 20 kVA*	*UPS range:* • *20 – < 40 kVA*	*UPS range:* • *40 – < 200 kVA*	*UPS range:* • *200 kVA*
Normal mode **Minimum** efficiency measured according to EN 62040-3 Annex AA				
25 % of nominal power	94 %	94.5 %	95 %	95.5 %
50 % of nominal power	96 %	96.5 %	97 %	97.5 %
75 % of nominal power	96.5 %	97 %	97.5 %	98 %
100 % of nominal power	96,5 %	97 %	97.5 %	98 %

4. Additional devices

For additional components that may be added on to the equipment in the basic configuration, the following additional **maximum losses** per device are allowed.

Additional or embedded transformer connected at the inlet or outlet in the normal power path (no stand-by connection on the bypass line) [Note 1]

Maximum losses per transformer

UPS efficiency allowances for input or output isolation transformer

UPS Load	**UPS rating** (kVA)									
	• 0,3 to < 10		**• 10 to < 40**		**• 40 to <200**		**• 200 to < 500**		**• 500**	
(% of rated) [5]	duty	stand-by	duty	stand-by	duty	stand-by	duty	stand-by	duty	stand-by
25	6.0%	5.5%	6.0%	5.5%	4.0%	3.5%	2.8%	2.3%	1.9%	1.4%
50	3.9%	2.7%	3.9%	2.7%	2.9%	1.7%	2.2%	1.1%	1.5%	0.7%
75	3.5%	1.8%	3.5%	1.8%	2.9%	1.2%	2.4%	0.8%	1.7%	0.5%
100	3.6%	1.4%	3.6%	1.4%	3.2%	0.9%	2.7%	0.6%	2.0%	0.4%

For use of allowance table refers to EN 62040-3 ed2 annex I

Additional or embedded Harmonic correcting device connected at the inlet or outlet in the normal power path (no stand-by connection on the bypass line)

Maximum losses per filter

UPS efficiency allowances for input harmonic current filtering

UPS Load	**UPS rating** (kVA)									
	• 0,3 to < 10		**• 10 to < 20**		**• 20 to < 40**		**• 40 to < 200**		**• 200**	
(% of rated)[5]	duty	stand-by	duty	stand-by	duty	stand-by	duty	stand-by	duty	stand-by
25	2,5%	2,3%	2,5%	2,3%	2,3%	2,1%	2,1%	1,7%	1,9%	1,5%
50	1,6%	1,1%	1,6%	1,1%	1,5%	1,0%	1,5%	0,9%	1,4%	0,8%
75	1,4%	0,8%	1,4%	0,8%	1,3%	0,7%	1,3%	0,6%	1,2%	0,5%
100	1,4%	0,6%	1,4%	0,6%	1,3%	0,5%	1,3%	0,4%	1,2%	0,4%

For use of allowance table refers to EN 62040-3 ed2 annex I

[1] As an example: this additional transformer shall allow to change the neutral grounding and/or provide isolation.

Annex C – Code of Conduct UPS DATA sheet

Reporting rules:

Manufacturers' signatories of this Code of Conduct provide to the European Commission every year, starting with the year 2007, information concerning the UPS model they put on the market (selling units). The Information supplied to the EU follows the following rules:

- The information has to be given for all UPS-Types that are sold even if they are brought to the market before 2008 and even if they do not fulfil the CoC.
- The values of the energy efficiency declared in the UPS DATA sheet will be according to the tables of the target values.
- The UPS DATA sheet will be extended with sales portions in percent of each UPS-Type.
- Signing companies intends to supply the figures of 2010 at the beginning of the 2011. These are the so called "starting figures".

This individual information provided to the EU will be kept confidential. The summarized figures, built out of all individual figures will not be kept confidential.

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UPS DATA Sheet (per sold UPS-Type):

The following declaration has to be filled in per UPS-Type, sold in the corresponding year

<table>
<tr><td colspan="6">Manufacturer: ……..…….. Reporting Year: ……..</td></tr>
<tr><td colspan="6">UPS-Declaration / Type :
¨ UPS double conversion with the classification “VFI – S…"
¨ For VFI UPS, except “VFI – S…”
¨ For all VI UPS
¨ For all VFD UPS
¨ Additional transformer (Yes / no)
¨ Additional device to reach harmonic currents</td></tr>
<tr><td rowspan="3">Placed on the market:
¨ before 1.1.11
¨ after 1.1.11 and before 1.1.13
¨ after 1.1.13 and before 1.1.15</td><td colspan="5">Model: …….. Nominal Power: ……. kVA</td></tr>
<tr><td colspan="5">Sales-Percentage of corresponding range ……..</td></tr>
<tr><td>UPS range:
≥0,3 to <0,8kVA
¨</td><td>UPS range:
≥0,8 to <1,5kVA
¨</td><td>UPS range:
≥1,5 to <3,5kVA
¨</td><td>UPS range:
≥3,5 to <5,0kVA
¨</td><td>UPS range:
≥5,0 to <10,0kVA
¨</td></tr>
<tr><td>UPS range:
• 10 – < 20 kVA
¨</td><td>UPS range:
• 20 – < 40 kVA
¨</td><td colspan="2">UPS range:
• 40 – < 200 kVA
¨</td><td>UPS range:
• 200 kVA
¨</td></tr>
<tr><td>Load
according to EN 62040-3 Annex AA</td><td>declared values</td><td colspan="4">Fulfils CoC of UPS</td></tr>
<tr><td>25 % of nominal power</td><td>……</td><td colspan="2">Yes ¨</td><td colspan="2">No ¨</td></tr>
<tr><td>50 % of nominal power</td><td>……</td><td colspan="2">Yes ¨</td><td colspan="2">No ¨</td></tr>
<tr><td>75 % of nominal power</td><td>……</td><td colspan="2">Yes ¨</td><td colspan="2">No ¨</td></tr>
<tr><td>100 % of nominal power</td><td>……</td><td colspan="2">Yes ¨</td><td colspan="2">No ¨</td></tr>
</table>

Code of Conduct
on Energy Efficiency and Quality of AC Uninterruptible Power Systems

SIGNING FORM

The company/

……..

declares its willingness to sign the Code of Conduct on Energy Efficiency and Quality of AC Uninterruptible Power Systems (Version 2010-13-09) and to commit itself to abide to the principles described in point 4 "Commitment" for the equipment it produces, buys or specifies

The company, through regular upgrade reports, will keep the European Commission informed on the implementation of the Code of Conduct on Energy Efficiency and Quality of AC Uninterruptible Power Systems.

The company participation is valid for the period: 1.1.2011 – 31.12.2014

for the company

Director or person authorised to sign:
Name: **…… . . . . . .**
Managerial Function: **…….. . . . . .**
Address **……..**
Tel. / Fax. **……/ ……..**

Signature **……**

Please send the signed form to:
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