CODE of CONDUCT on Energy Efficiency of AC Uninterruptible Power Systems (UPS)

Version 2.0

2021

Joint
Research
Centre

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Contents

1 Introduction

Uninterruptible Power Systems (UPS) are widely used in European industry and data centres. Expectations are that UPS installations will increase in the EU in the near future. The electrical protection provided by a UPS inherently adds losses to the energy supplied to the consumer. With the general principles and actions resulting from the implementation of this Code of Conduct the additional electrical 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 maximized.

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. It is critical to take into account that the energy efficiency of UPS is influenced by the energy expected quality, 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 EU in respect of energy efficient equipment.

2 Scope

This Code of Conduct applies to AC Uninterruptible Power Systems (UPS according to EN 62040-3 Ed. 3.0 b: 2021) delivering 1-phase and 3-phase uninterruptible power above 0.05 kW 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” and “UPS stand-by operation”.

In the rest of this Code of Conduct these different configurations and operations of the 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, etc.
- UPS based on rotating machines.
- UPS with DC output.

3 Objective

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

4 Commitments

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

1.1 Abide by the General Principles contained in Annex A.

1.2 Introduce on the EU market after 1 January 2021, for each Power and Performance Classification that the manufacturer chooses to offer, defined by Power range (≥0.05 to ≤0.3kW, >0.3 to ≤3.5kW, >3.5 to ≤10kW, >10 to ≤200kW, >200kW) and Performance Classifications (VFD, VI, VFI), new UPS models reaching or exceeding the energy efficiency requirements set out in Table 1 of Annex B. Efficiency requirements set out in Table 1 of Annex B will hereafter be called "CoC for UPS standard requirements".

1.3 If not already available, introduce also on the EU market after 1 January 2021, for each Power and Performance Classification that the manufacturer chooses to offer, at least one UPS model for each Power and Performance Classification with higher energy efficiency requirements as indicated in Table 2 of Annex B, hereafter called "CoC for UPS elite requirements". Whenever the manufacturers have in their portfolio a UPS compliant with Table 1 of Annex B and a UPS compliant with Table 2 of Annex B in the same Power Rating and Classification, they commit to make their best efforts to promote preferentially the higher efficiency model in all segments of the market.

NB : As a reminder, in order to comply with the European Code of Conduct for Data Centres, data centres must be equipped with UPS complying with "CoC for UPS elite requirements".

1.4 Develop marketing tools to promote the Code of Conduct for UPS and drive the market towards UPS complying with "CoC for UPS elite requirements".

1.5 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.

1.6 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.

5 Reporting

Manufacturers signatories agree to provide to the European Commission on a yearly basis, starting with the year 2022 covering the figures of 2021, 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 2022 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 requirements 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 – Efficiency Requirements by Power and Performance Classification

The equipment covered by this Code of Conduct shall meet the following minimum efficiency requirements. The minimum efficiency requirements have to be satisfied with guaranteed and measured values of the equipment covered.

B.1 The calculated efficiency requirements referred to in this Code of Conduct are based on:

- the performance classification of basic configurations of UPS are those in the list of *characteristics to be declared by the manufacturer* as defined in the clause 5.3.2 of EN 62040-3 Ed. 3.0 b: 2021.
- the efficiency method of measurements as defined in clause 6.4.1.9 and Annex J of EN 62040-3 Ed. 3.0 b: 2021
- the UPS efficiency requirements are expressed as weighted efficiency and calculated with formulas and weighted factors as described in Annex I of EN 62040-3 Ed. 3.0 b: 2021

B.2 The calculated efficiency values declared by the manufacturer are compliant to this Code of Conduct as "CoC for UPS standard requirements" when are equal to or greater than those in Table 1

Table 1 – Standard weighted UPS efficiency requirements (%) or "CoC for UPS standard requirements"

Power Range (kW)	Performance Classification		
	VFD	VI	VFI
≥ 0,05 to ≤ 0,3	89,0%	88,0%	84,0%
> 0,3 to ≤ 3,5	92,0%	91,0%	86,0%
> 3,5 to ≤ 10	93,7%	92,4%	87,5%
> 10 to ≤ 200	96,0%	93,0%	90,0%
> 200	97,0%	94,0%	92,0%

B.3 The calculated efficiency values declared by the manufacturer are compliant to this Code of Conduct as "CoC for UPS elite requirements" when are equal to or greater than those in Table 2

Table 2 – Elite weighted UPS efficiency requirements (%) or "CoC for UPS elite requirements"

Power Range (kW)	Performance Classification		
	VFD	VI	VFI
≥ 0,05 to ≤ 0,3	91,0%	90,0%	85,5%
> 0,3 to ≤ 3,5	94,0%	93,0%	87,5%
> 3,5 to ≤ 10	95,7%	94,4%	90,0%
> 10 to ≤ 200	97,0%	95,0%	91,5%
> 200	98,0%	96,0%	93,5%

Annex C – Annual Sales Data Reporting Form

Manufacturers' signatories of this Code of Conduct agree to provide the JRC every year, starting with the year 2021, information concerning:

- their UPS sales (number of units sold, in absolute quantities), in the European Union (EU) and EFTA-Countries, categorized by Power and Performance Classification and in accordance with table 3.
- information concerning the UPS model they put on the market in accordance with table 4.

Signing companies intend to supply the figures of 2020 at the beginning of the 2021. These are the so called "starting figures".
Information provided to the EU will be kept confidential.

Table 3 – Reporting Form - Part A

	Manufacturer					
	Reporting Year					
	Performance Classification					
	VI		VFD		VFI	
Power Range (kW)	Above Standard Requirements & below Elite Requirements (Units sold)	Equal to or above Elite Requirements (Units sold)	Above Standard Requirements & below Elite Requirements (Units sold)	Equal to or above Elite Requirements (Units sold)	Above Standard Requirements & below Elite Requirements (Units sold)	Equal to or above Elite Requirements (Units sold)
≥0.05 to ≤0.3						
>0.3 to ≤3.5						
>3.5 to ≤10						
>10 to ≤200						
>200						

Table 4 – Reporting Form - Part B

UPS Topology (VFD, VI or VFI) :		
Product details	Model name	
	kVA Model	
Power efficiency (following EN 62040-3 Ed. 3.0 b: 2021)		
Power Range category	≥0.05 to ≤0.3 kVA	
	>0.3 to ≤3.5 kVA	
	>3.5 to ≤10 kVA	
	>10 to ≤200 kVA	
	>200 kVA	
Placed on the European Union market	Before 1.1.21	
	After 1.1.21 and before 1.1.22	
	After 1.1.22	
UPS Built-in Transformer?	YES	
	NO	
Additional device to reach harmonic currents (UPS with Power factor Correction)	YES	
	NO	

Code of Conduct on Energy Efficiency of AC Uninterruptible Power Systems
Signing form

The company/

……..

declares its willingness to sign the Code of Conduct on Energy Efficiency of AC Uninterruptible Power Systems (Version 2.0, 2021) and to commit itself to abide to the principles described in Section 4 "Commitment" for the equipment it produces, buys or specifies.

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

The company participation is valid for the period: 1 January 2021 – 31 December 2023

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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Information about the Code of Conduct on Energy Efficiency of AC Uninterruptible Power Systems can be found at: https://ec.europa.eu/jrc/en/energy-efficiency/code-conduct/ups

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