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Electrical accessories – Methodology for determining the energy efficiency class of electrical accessories

Petit appareillage – Méthodologie pour déterminer la classe d'efficacité énergétique du petit appareillage

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRICAL ACCESSORIES –

Methodology for determining the energy efficiency class of electrical accessories

FOREWORD

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CDV	Report on voting
23/830/CDV	23/863/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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INTRODUCTION

The electric energy efficiency of homes and buildings is continuously increasing by reducing the electric energy consumption of products. For example, changing from traditional incandescent lighting to LED lighting.

Specific electrical systems and accessories, for example home and building electronic systems (HBES) / building automation control systems (BACS), individual sensors, actors, actuators, dimmers and load shedding equipment (LSE), can contribute to additional energy savings.

Additional savings can also be achieved by managing and monitoring electrical energy use, depending on time, occupancy, inputs and needs from the grid.

HBES/BACS contribute to greater energy savings than the energy they consume to perform this task. However, as every watt counts, it is necessary to optimize their own energy consumption for given functionalities.

In the case of devices with more functionality (e.g. multi-channel switch actuators, control boxes, etc.), this document provides a methodology for determining the energy efficiency class of accessories based on the consumption of each function and their percentage of use. It aims to enable the system designer to determine the most efficient system considering the increasing user demand for additional functionalities.

ELECTRICAL ACCESSORIES –

Methodology for determining the energy efficiency class of electrical accessories

1 Scope

This document provides a methodology for determining the energy efficiency class of electrical accessories, to enable the system designer to determine the most efficient components for an electrical installation, also considering all functionalities.

NOTE Functionalities are for example: wireless communication, network connectivity, timer, energy monitoring.

This methodology is based on the energy consumption, taking into account the individual functions of the accessory.

The energy efficiency class approach contributes to the overall reduction of the energy consumption of an electrical installation.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
OFF mode
mode of the accessory having a direct control where the relevant electric load is deactivated and is able to be activated by deliberate action on the accessory by the user

Note 1 to entry: In this mode, the accessory consumes no energy.

3.2
standby mode
mode of the accessory having a direct control where the relevant electric load is deactivated and is able to be activated by deliberate action to the accessory by the user or the system

Note 1 to entry: In this mode, the accessory consumes energy to perform this function.

Note 2 to entry: This mode includes an interaction through displays regardless of the state of the electric load.

3.3
ON mode
mode of the accessory having a direct control where its electric load is activated and is able to be deactivated by deliberate action to the accessory by the user or the system

Note 1 to entry: In this mode, the accessory consumes energy.

Note 2 to entry: In this mode, the consumed energy can be greater than the energy consumption in the standby mode.

3.4
control mode
mode of the electronic accessory not having direct control of connected loads, performing their functions in such a way that a control signal can be internally generated or an external control signal can be received, by wire or wireless, and processed leading to a change in the load status

3.5
direct control
case where the current to the load flows through the accessory

3.6
standby energy consumption
energy consumed by an accessory in standby mode

3.7
operational energy consumption
energy consumed by an accessory in ON mode

3.8
control energy consumption
energy consumed by an accessory in control mode

3.9
energy efficiency (EE) class
numerical value assigned to an electrical accessory according to its energy performance

4 Description of the methodology

4.1 General

The method consists of different steps in order to obtain an energy efficiency class for a device. This method takes the different functions and their different energy consumptions into account as well as the different usage of the functions.

1) Identify the different functions of a device;
2) Measure the energy consumption of the different functions in their different operational modes;
3) Take into account the different durations of usage of the different operational modes to get a power consumption which considers the operational profile of the different functions;
4) Determine the associated energy efficiency points for every function;
5) Rescale the energy efficiency points according to the energy consumption for the different functions related to the energy consumption of the whole device;
6) Sum up the rescaled energy efficiency points to get the energy efficiency points for the whole device;
7) Determine the energy efficiency class using the energy efficiency points of the whole device.

This method allows for the extension of the energy efficiency tables according to technical developments without the need for rescaling.

4.2 Relationship between accessories, their modes and energy efficiency class relevance

Table 1 shows examples of accessories and energy efficiency class relevance according to mode and type.

Table 1 – Relationship between accessories, their modes and energy efficiency class (examples)

Accessory	Direct control	OFF mode	Standby mode	Control mode	ON mode	Energy efficiency class relevance
Mechanical switch	Yes	Yes	N/A	No	Yes	No [2]
Mechanical switch with indicator light (indicator parallel to switch)	Yes	N/A	Yes	No	Yes	No [2]
Mechanical switch with indicator light (indicator parallel to load)	Yes	Yes	N/A	No	Yes	No [2]
Socket outlet	Yes	Yes, plug not inserted	N/A	No	Yes, plug inserted	No [2]
Socket outlet with further function	Yes	N/A	Yes	No	Yes, plug inserted	Yes
Electronic switch relays (2 wires or 3 wires)	Yes	No	Yes	No	Yes	Yes
Dimmers (2 wires or 3 wires)	Yes	No	Yes	No	Yes	Yes
Three-wire dimmer with mechanical switch (load side)	Yes	No	Yes	No	Yes	Yes
Two-wire dimmer with mechanical switch (load side)	Yes	Yes	N/A	No	Yes	No [2]
Presence/Movement detector	Yes No [1]	No	N/A	Yes No [1]	Yes	No [2]
Presence/Movement detector where the operation can be selected also by mechanical switch	Yes	Yes	Yes	No	Yes	Yes
Presence/Movement detector forced with position by electronic switch	Yes	No	Yes	No	Yes	Yes
Home and building electronic systems (HBES) switches and building automations and control system (BACS) switches	Yes No [1]	N/A	Yes	Yes No [1]	Yes	Yes
Load shedding equipment (LSE)	Yes	N/A	Yes	No	Yes	Yes

[1] Depending on the design.

[2] Owing to the fact that these devices have no other functions, they shall not be considered for the methodology of this document as they cannot contribute to increase the energy efficiency within a system.

4.3 Functions embedded in electrical accessories

Modern accessories have been developed incorporating greater functionality to satisfy user demands (e.g. for comfort and management function), such as remote access, monitoring, automatic and easily programmable functions, network connectivity for interaction with home and building electronic systems (HBES), building automation and control systems (BACS), touch-free operation, for example in hospitals (see Table 2).

Even if more functionalities of the electrical accessories need additional energy, these functions are essential to reduce the consumption of a building via, for example, HBES or BACS controls. For example, remote functions of control applications allow the user to switch off loads without being present.

In order to determine the electric energy efficiency class of an accessory it is necessary to analyse the energy consumption of embedded functionalities.

Since energy consumption also depends on the duration of usage of the various functions of the accessory, the general approach of this document takes only the power into account. It cannot also take into account the installation and use of these accessories.

For this approach, these functions need to be separately measured or separately calculated based on the manufactures' data, see Annex A.

The energy efficiency (EE) classes determined by classification of the individual functions of an electrical accessory are given in Clause 5.

An example of functions is given in Table 2.

Table 2 – Examples of functions in electrical accessories

Accessory	Function
Mechanical switch	Switching
Mechanical switch with indicator light (indicator parallel to switch)	Switching
	Indicator (lamp)
Mechanical switch with indicator light (indicator parallel to load)	Switching
	Indicator (lamp)
Socket outlet	Outlet
	Connection to provide power
	Network connectivity
	RF communication
	Timer
	Energy monitoring
	Switching (relays)
	Sensing (temperature, water, light, etc.)
Electronic switch (2 wires or 3 wires)	Switching
	Display
	RF communication
	Network connectivity
	Timer
	Energy monitoring
	Control inputs, e.g. 1 V to 10 V
	Sensing (temperature, water, light, etc.)
Dimmers (2 wires or 3 wires)	Dimming
	Touch
	RF communication
	Power line communication
	Wired communication
	Network connectivity
	Sensing (temperature, water, light, etc.)
	Measuring (current, etc.)
Dimmers (2 wires or 3 wires) with mechanical switch (load side)	Dimming
	Measuring (current, etc.)

Accessory	Function
Presence and/or movement detector	Presence/movement (passive infrared)
	Presence/movement (radar)
	Switching
	Sensing (temperature, water, light, etc.)
	RF communication
	Wired communication
	Network connectivity
	Measuring (current, etc.)
	Power line communication
	Pre-heating (for cold outdoor area)
HBES/BACS control device	Display
	Dimming
	Switching
	Touch
	RF communication
	Power line communication
	Wired communication
	Network connectivity
	Sensing (temperature, water, light, etc.)
	Measuring (current, etc.)
LSE	Switching
	Display
	Sensing
	RF communication
	Power line communication
	Wired communication
	Network connectivity
	Measuring (current, etc.)
External accessories shall be dealt with separately.	