

TECHNICAL REPORT



**Guidelines for end-of-life information provided by manufacturers and recyclers
and for recyclability rate calculation of electrical and electronic equipment**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE



ICS 13.020.30; 31.020

ISBN 978-2-83220-413-9

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions.....	8
4 End-of-life treatment process principles.....	10
5 Provision of product information.....	12
5.1 General.....	12
5.2 Product identification.....	13
5.3 Identification of potential hazards.....	13
5.4 Parts identification for dismantling.....	13
5.4.1 General.....	13
5.4.2 Condition for part reuse.....	13
5.4.3 Condition for parts that required selective treatment to mitigate environmental hazards (de-pollution).....	14
5.4.4 Condition for parts made of single recyclable materials.....	14
5.4.5 Condition for parts difficult to process.....	15
6 Provision for end-of-life treatment information.....	15
6.1 General.....	15
6.2 End-of-life process identification.....	16
6.3 Measures for pollution prevention.....	16
6.4 EoL scenario information.....	16
6.4.1 General.....	16
6.4.2 Reuse system documentation and data.....	16
6.4.3 Recovery of single recyclable materials documentation and data.....	16
6.4.4 Requirements for part difficult to process.....	17
6.4.5 Material separation effectiveness documentation and data.....	17
6.4.6 Disposal documentation and data.....	17
7 Calculation method for recyclability and recoverability rate.....	17
7.1 General.....	17
7.2 End-of-life treatment scenario selection.....	18
7.3 Calculation of recyclability and recoverability rate.....	18
7.3.1 Variables and their symbols.....	18
7.3.2 Recyclability rate.....	19
7.3.3 Recoverability rate.....	19
7.3.4 Calculation flow.....	19
7.4 Recyclability and recoverability rate communication.....	19
Annex A (informative) Indicative list of materials or parts to be identified for selective treatment.....	20
Annex B (informative) Example format for manufacturer product end-of-life information.....	21
Annex C (informative) Framework of information from recyclers.....	22
Annex D (informative) Examples of treatment scenarios.....	24
Annex E (informative) Example of recyclability rate calculation.....	31
Bibliography.....	32

Figure 1 – Framework of the main definition covering end-of-life treatment	11
Figure 2 – End-of-life treatment generic scheme	12
Table 1 – Masses – Symbols and definitions	18
Table D.1 – Recycling and recovery rate of product parts which require selective treatment	25
Table D.2 – Recycling and recovery rate of product parts with a single recyclable material	26
Table D.3 – Recycling and recovery rate of product parts difficult to process	26
Table D.4 – Recycling and recovery rate of product parts which go to separation process	27
Table D.5 – Recycling and recovery rate of product parts which require selective treatment	29
Table D.6 – Recycling and recovery rate of product parts with a single recyclable material	29
Table D.7 – Recycling and recovery rate of product parts difficult to process	30
Table D.8 – Recycling and recovery rate of product parts which go to separation process	30
Table E.1 – Recyclability rate calculation table	31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**GUIDELINES FOR END-OF-LIFE INFORMATION
PROVIDED BY MANUFACTURERS AND RECYCLERS
AND FOR RECYCLABILITY RATE CALCULATION OF
ELECTRICAL AND ELECTRONIC EQUIPMENT**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC/TR 62635, which is a technical report, has been prepared by IEC technical committee 111: Environmental standardization for electrical and electronic products and systems.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
111/252/DTR	111/267/RVC

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

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

All electrical and electronic equipment (EEE) have an effect on the environment throughout their life cycle. As increasingly higher volumes of EEE reach their end-of-life (EoL) and become wastes of EEE (WEEE), it is essential for manufacturers to implement environmentally conscious design (ECD) as described in IEC 62430 [1]¹, taking into account the optimization of resource efficiency.

One aspect of ECD is an evaluation of potential for recycling of an EEE at the product design phase, hereinafter called the recyclability rate. As described in ISO 22628 [2], this covers road vehicles. The recyclability rate of EEE is dependent on the parts and materials used in the products and also on the EoL treatment process implemented by recyclers where the product is being recycled, as with road vehicles. It is recognized that the calculation of the recyclability rate based on the product mass approach is not the only criteria to ensure a material efficient design (e.g. for rare materials), yet it is considered an important parameter for ECD.

It has also become increasingly important for manufacturers and recyclers to exchange certain specific information to implement both effective ECD and EoL treatment operations, while complying with regional and national regulations and recognizing that actual practices vary throughout the world.

The purpose of this technical report is to provide sufficient data:

to provide developers with data to consider improvements in recyclability, within the context of the environmentally conscious design process, and accurately calculate and inform downstream manufacturers and customers of recyclability rates;

to allow recyclers to safely recycle and to improve their processes.

This technical report covers three main aspects:

- 1) a description of EoL principles including the scope, terms and definitions and description of a generic treatment process of WEEE. It is recognized that the generic treatment process described in this report is but one of many potential scenarios and is intended to be as generic as possible. Actual recycling processes may include or exclude portions of the generic process presented here;
- 2) a description of key product information which is useful when considering the product EoL and exchange of EoL treatment scenario information for manufacturers and recyclers. In order to improve ECD and potentially improve the EoL handling of WEEE, manufacturers need to know the processes taking place at the recyclers and recyclers need to know some specific information such as parts which may need to be treated selectively to carry out effective treatment;
- 3) a description of the method of recyclability and recoverability calculation.

This technical report provides examples of EoL treatment scenario and data in Annex D. It should be noted that each region, nation or enterprise may have their own data. For example, Annex D contains parts or materials and their respective recycling rates (actual rates) and recovery rates (actual rates) which might differ from the examples given. In addition, some enterprises conduct such calculation based on their internal data which are proprietary and cannot be disclosed. Therefore, when implementing recyclability rate calculation according to this technical report, it should be noted that this report provides methodology to document the calculation of recyclability and recoverability and examples of data that can be used but does not intend to cover all scenarios.

As practices within the recycling industry can change quickly, the sample data should be reviewed to assure it adequately describes current practices.

¹ References in square brackets refer to the Bibliography.

By using this technical report, manufacturers can use a common format and method to document and report on the EoL aspect of resource efficiency for ECD. Eventually, this will result in common methodologies for the recyclability rate calculation and effective information exchange between manufacturers and recyclers. The potential also exists to provide relevant stakeholders with more resource efficiency EEE.

GUIDELINES FOR END-OF-LIFE INFORMATION PROVIDED BY MANUFACTURERS AND RECYCLERS AND FOR RECYCLABILITY RATE CALCULATION OF ELECTRICAL AND ELECTRONIC EQUIPMENT

1 Scope

IEC/TR 62635, which is a technical report, provides a methodology for information exchange involving EEE manufacturers and recyclers, and for calculating the recyclability and recoverability rates to

- provide information to recyclers to enable appropriate and optimized EoL treatment operations,
- provide sufficient information to characterize activities at EoL treatment facilities in order to enable manufacturers to implement effective ECD,
- evaluate the recyclability and recoverability rates based on product attributes and reflecting real end-of-life practices.

Furthermore this technical report includes:

- criteria to describe EoL treatment scenarios;
- criteria to determine product parts that might require removal before material separation and related information to be provided by manufacturers (location and material composition);
- a format for information describing EoL scenarios and the results of EoL treatment activities;
- a method for calculating the recyclability and recoverability rate of EEE. The calculation is limited to EoL treatment and does not cover collection. The recyclability rate is expressed as a percentage of the mass of the product that can be recycled or reused, whereas the recoverability rate in addition includes a portion derived from energy recovery. This technical report can be applied to all electrical and electronic equipment;
- some example data corresponding to identified scenarios provided in Annex D.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62474, *Material declaration for products of and for the electrotechnical industry*