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European foreword

This document (EN 17983:2024) has been prepared by Technical Committee CEN/TC 454 “Algae and algae products”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2025, and conflicting national standards shall be withdrawn at the latest by January 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

This document has been prepared by CEN/TC 454 “Algae and algae products”.

The European Committee for Standardization (CEN) was requested by the European Commission (EC) to draft European standards or European Standardization deliverables to support the implementation of Article 3 of Directive 2009/28/EC for algae and algae-based products or intermediates.

This request, presented as Mandate M/547, also contributes to the Communication on “Innovating for Sustainable Growth: A Bio economy for Europe”.

The former working group CEN Technical Board Working Group 218 “Algae” was created in 2016 to develop a work program as part of this Mandate. The technical committee CEN/TC 454 “Algae and algae products” was established to carry out the work program that will prepare a series of standards.

The interest in algae and algae-based products or intermediates has increased significantly in Europe as a valuable source of, including but not limited to, carbohydrates, proteins, lipids, and several pigments. These materials are suitable for use in a wide range of applications from food and feed purposes to other sectors, such as textile, cosmetics, biopolymers, biofuel and fertilizer/biostimulants. Standardization was identified as having an important role in promoting the use of algae and algae products.

The work of CEN/TC 454 should improve the reliability of the supply chain, thereby improving the confidence of industry and consumers in algae, which include macroalgae, microalgae, cyanobacteria, Labyrinthulomycetes, algae-based products or intermediates and will promote and support commercialization of the European algae industry.

In industrial and scientific assessments, many methodological differences occur with regard to mass and energy balances. This constitutes a major issue, as the results often are difficult to compare.

The goal of this document is to define basic metrics for carbon accounting of algae, so as to allow a more scientifically sound comparison between algae systems and other biomass feedstocks.

The need for such metrics and methodology is related to the wide existing differences in algae growth sites and strategies. For example, there are significant differences in the application of the “green box concept” to closed cultivation units and wild harvested algae. However, common sustainability and life cycle assessment (LCA) approaches are needed.

These metrics can be used to apply existing LCA standards to algae systems.

An overview of LCA standards is given in Annex C.

This document aims to provide specific life cycle assessment requirements and guidance for algae cultivation, based on EN ISO 14040 *Environmental management — Life cycle assessment — Principles and framework*, EN ISO 14044 *Environmental management — Life cycle assessment — Requirements and guidelines* and EN 16760 *Bio-based products — Life Cycle Assessment*. These standards are all applicable to algae-based products, but the topic which is not clearly defined in these standards is the accounting of the main parameters of algae cultivation sites. The sustainability aspects of algae cultivation can be assessed either by EN 16751 *Bio-based products — Sustainability criteria* when the outcome is a product, or by ISO 13065 *Sustainability criteria for bioenergy*, when the outcome is energy. Both these documents provide a framework for considering environmental, social and economic aspects that can be used to facilitate the evaluation and comparability of biomass for products or energy, respectively.

This document covers the problem of using fossil CO₂ as photosynthesis feed to algae in relation to EN 16785-1 *Bio-based products — Bio-based content — Part 1: Determination of the bio-based content using the radiocarbon analysis and elemental analysis*. This situation calls for proper application criteria opposite to plant photosynthesis. A similar situation can arise for nitrogen and phosphorus capture in open seas.

1 Scope

This document specifies methods for the measurement of energy content and main elements balances of algae from cultivation or from wild growth and algae products to provide biomass, intended for renewable algal raw material used as bioenergy and in bio-based products.

This document also specifies carbon source parameters specific to algae as bio-based and it is applicable to studies covering algae production life cycle assessment (LCA) e.g. algal biomass farming or wild collection.

This document does not apply to methods of algae and algae products sampling, harvesting and pre/postprocessing.

This document does not apply to algae and algae products intended for the food and feed sector.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 14268, *Irrigation techniques — Meters for irrigation water*

EN 17399, *Algae and algae products — Terms and definitions*

EN 17480, *Algae and algae products — Methods for the determination of productivity of algae growth sites*

EN 17605, *Algae and algae products — Methods of sampling and analysis — Sample treatment*

EN ISO 4064-1, *Water meters for cold potable water and hot water — Part 1: Metrological and technical requirements (ISO 4064-1)*

EN ISO 16948, *Solid biofuels — Determination of total content of carbon, hydrogen and nitrogen (ISO 16948)*

EN ISO 18125, *Solid biofuels — Determination of calorific value (ISO 18125)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 17399, EN 17480, EN 17605 and the following apply.

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

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

3.1

biomass dry matter

material remaining after removal of moisture under specific conditions

Note 1 to entry: It is measured by determination of moisture content.

[SOURCE: EN ISO 16559:2022, 3.71, modified – biomass added to the term, Note 1 to entry added]