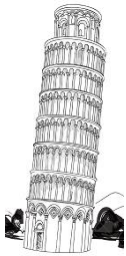


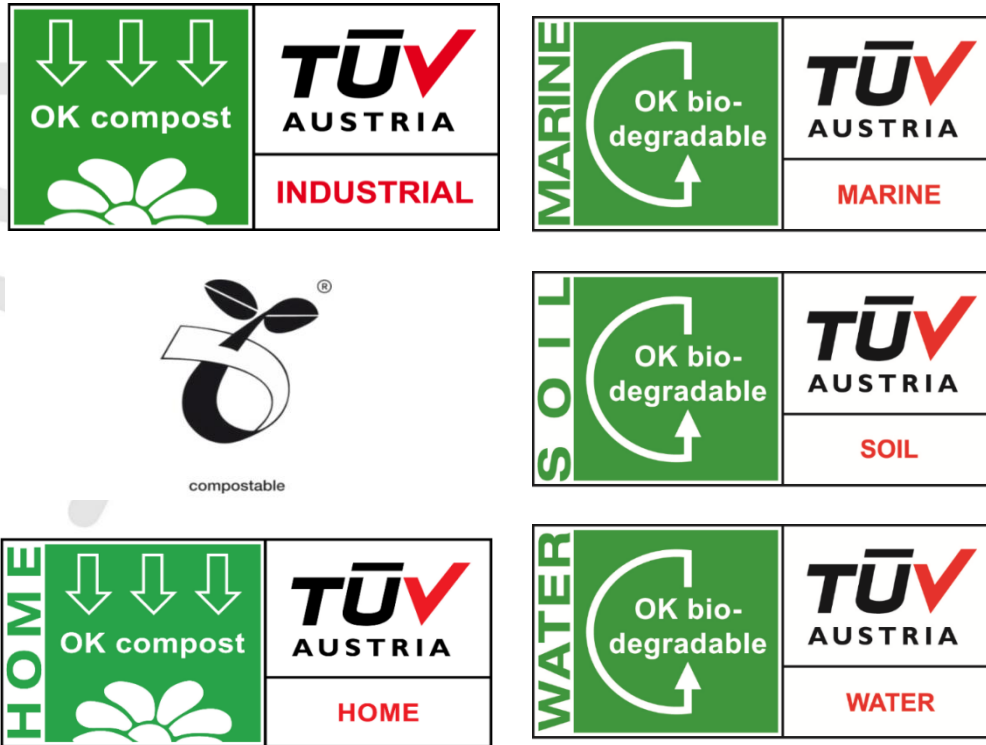
ARCHA



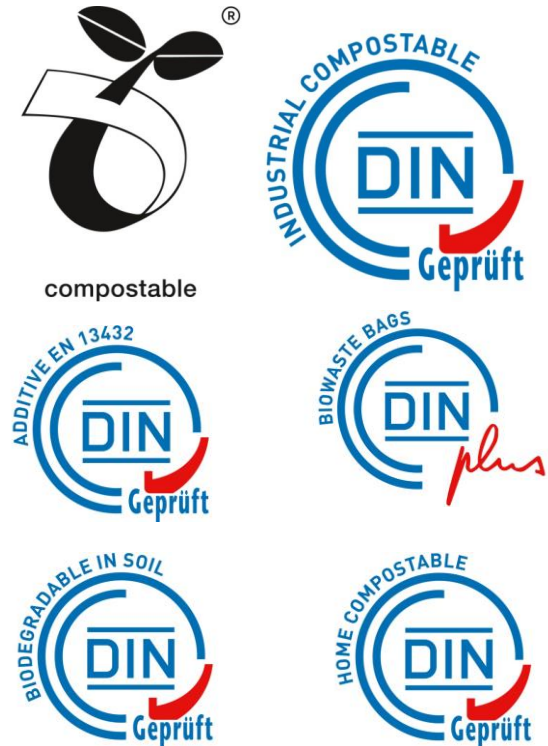
ARCHA, acronym of »Analysis and Research of Chemical Applied«, was founded in Pisa in 1989

Biodegradability and compostability expertises

ARCHA Certification schemes and recognitions (TÜV Austria – DIN CERTCO)



Precisely Right.



TÜV Austria
All certification schemes for
biodegradability and compostability in all
environments

DINCERTCO – All certification
schemes for biodegradability and
compostability in all environments

Regulation EN 13432:2000 – Industrial composting

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13432

September 2000

ICS 13.030.99; 55.020

English version

Packaging - Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging

Emballage - Exigences relatives aux emballages valorisables par compostage et biodegradation - Programme d'essai et critères d'évaluation de l'acceptation finale des emballages

Verpackung - Anforderungen an die Verwertung von Verpackungen durch Kompostierung und biologischen Abbau - Prüfschema und Bewertungskriterien für die Einstufung von Verpackungen

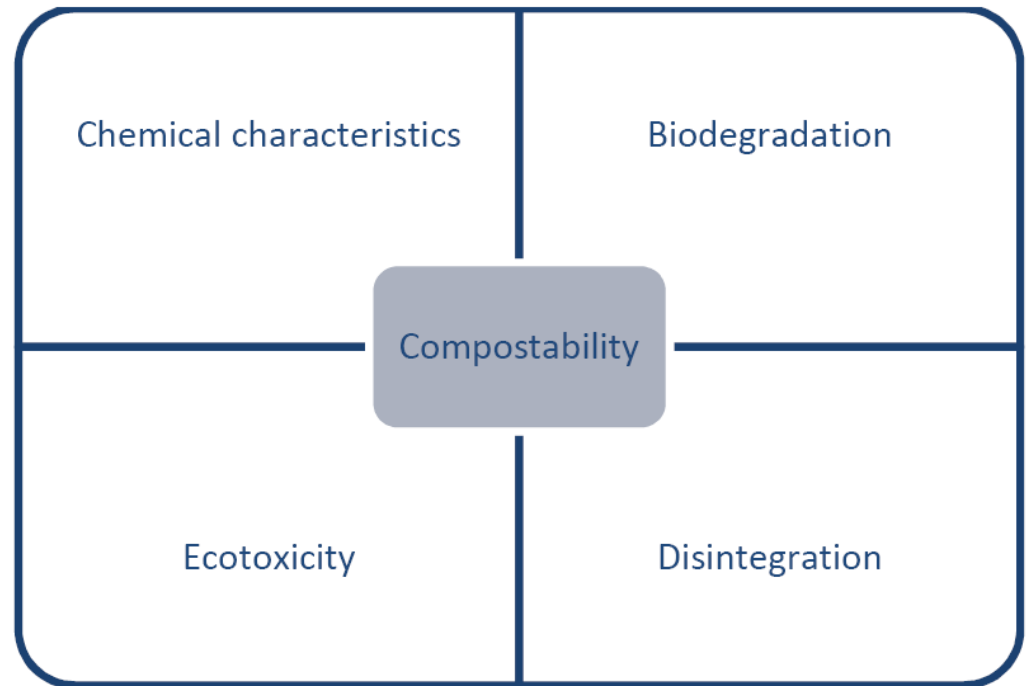
This European Standard was approved by CEN on 4 June 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

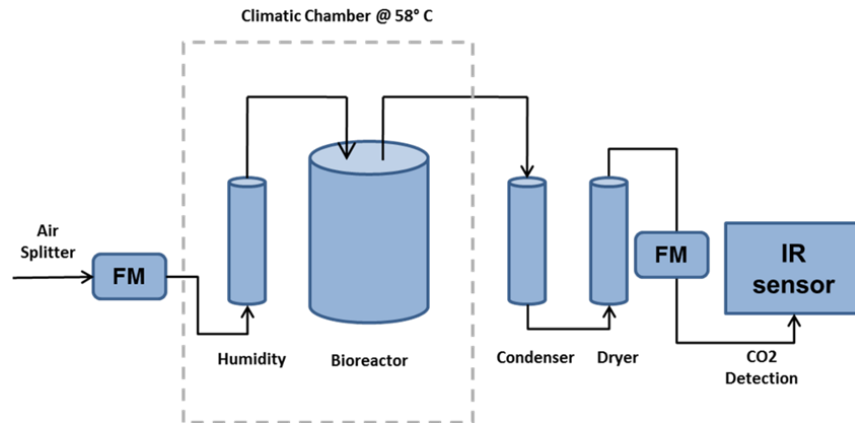
*Packaging—Requirements for packaging recoverable through **composting and biodegradation**—Test scheme and evaluation criteria for the final acceptance of packaging*



Regulation EN 13432:2000 – Industrial composting

Biodegradability tests are carried according to official method ISO 14855-1:2012

Test methods determine the degree and the rate of aerobic biodegradation of plastic materials on exposure to a controlled-composting environment



DESCRIPTION:

- ✚ Test is performed on 3 replicates for every specimen and employs a cellulose as biodegradability positive control, a blank control containing only the inoculum and the test material;
- ✚ **Requirement.** Test material can be defined “biodegradable under composting conditions” if its degradation results at least 90% in less than 6 months.

Regulation EN 13432:2000 – Industrial composting

ISO 16929:2021 “Plastics - Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test”

DESCRIPTION:

- ✚ Pieces of the plastic test material are mixed with a prepared solid matrix (synthetic solid waste and mature compost). Test is performed on 2 replicates for every specimen.
- ✚ Each reactor is placed in an air-circulation oven for 12 weeks.
- ✚ The degree of disintegration is determined after a composting cycle, by sieving the final matrix through a 2 mm sieve in order to recover the non-disintegrated residues.
- ✚ The disintegration test occurs efficiently if less than 10% of the original mass of loaded samples is above 2 mm sieve after 12 weeks.



OECD Guidelines for the Testing of Chemicals, Section 2 / Test No. 208: Terrestrial Plant Test: Seedling Emergence and Seedling Growth Test

DESCRIPTION:

- ✚ Tests evaluate the differences in toxic or phytotoxic potency between control compost (blank sample) and final compost obtained from the degradation of the developed materials, at two levels of concentrations
- ✚ According to EN 13432, the determination of phytotoxic effects can be performed:
 - ✚ germination test
 - ✚ **plant growth test**

Requirement: *the germination rate and the plant biomass of both plant species, at each dilution tested, must be 90% greater than or equal to that of the control test*



Home composting

Applicable Standard: European standard EN 13432 : "Packaging - Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging"

Adapted for home compostability – at low temperature



Requirements

- Test material can be defined “biodegradable under home composting conditions” if its degradation is at least 90% in less than 12 months.
- Test material can be defined “disintegrable under home composting conditions” if its disintegration is at least 90% in less than 6 months.

Soil biodegradability

Biodegradability is carried on according to ASTM D5988:2018 official method "Standard Test Method for Determining Aerobic Biodegradation in Soil of Plastic Materials or Residual Plastic Materials After Composting"

DESCRIPTION:

- ✚ Test is performed on 3 replicates for every specimen and employs a cellulose as biodegradability positive control, a blank control containing only the inoculum (mix of soils) and the test material;
- ✚ Test temperature range: the biodegradability test in soil was carried on at fixed temperature ($26 \pm 2^{\circ}\text{C}$)
- ✚ Test material can be defined "biodegradable under soil conditions" if its degradation is at least 90% in less than 2 years.



Marine biodegradability & disintegration

Biodegradability & disintegration tests are carried on according to ASTM D6691:2017 "Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials in the Marine Environment by a Defined Microbial Consortium or Natural Sea Water Inoculum"

DESCRIPTION:

- ✚ Test is performed on 3 replicates for every specimen and employs a cellulose as biodegradability positive control, a blank control containing only the inoculum (seawater) and the test material;
- ✚ Test temperature range: the biodegradability test in marine water is carried on at fixed temperature (30°C)
- ✚ Test material can be defined "biodegradable under marine conditions" if its degradation is at least 90% in less than 6 months.



Marine ecotoxicity

Ecotoxicity test is carried on according to OECD Guidelines for the Testing of Chemicals, Section 2 / Test No. 202 "Daphnia sp. Acute Immobilisation Test"

DESCRIPTION:

- ✚ Toxicity is evaluated by means of *Daphnia magna*, a freshwater crustacean, of which the newborns obtained from dormant forms (ephippia) are used;
- ✚ Test temperature range: the test is carried on at fixed temperature (30°C)
- ✚ The average mobility and immobility (percentage) of the *Daphnia* neonates after 24 hours and after 48 hours, and their standard deviation are measured
- ✚ at least 90% of the tested organisms should remain mobile at the end of the test (48 hours)



Daphnia ephippium (top) and two nauplii

Fresh water biodegradability

Biodegradability test is carried on according to ISO 14852:2021 “Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium – Method by analysis of evolved carbon dioxide”

DESCRIPTION:

- ✚ Test is performed on 3 replicates for every specimen and employs a cellulose as biodegradability positive control, a blank control containing only the inoculum (water and sludge from municipal wastewater treatment plant) and the test material;
- ✚ Test temperature range: the biodegradability test in marine water is carried on at fixed temperature (23°C)
- ✚ Test material can be defined “biodegradable under marine conditions” if its degradation is at least 90% in 56 days.

