



Institut luxembourgeois de la normalisation  
de l'accréditation, de la sécurité et qualité  
des produits et services

## ILNAS-EN 17196:2023

### **Construction products: Assessment of release of dangerous substances - Digestion by aqua regia for subsequent analysis of inorganic substances**

Bauprodukte: Bewertung der Freisetzung  
von gefährlichen Stoffen - Königswasser-  
Aufschluss zur anschließenden Analyse  
von anorganischen Stoffen

Produits de construction : Évaluation de  
l'émission de substances dangereuses -  
Digestion par l'eau régale pour une  
analyse ultérieure de substances

11/2023



## National Foreword

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ILNAS-EN 17196:2023

EUROPEAN STANDARD **EN 17196**

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2023

ICS 91.100.01

Supersedes CEN/TS 17196:2018

English Version

**Construction products: Assessment of release of  
dangerous substances - Digestion by aqua regia for  
subsequent analysis of inorganic substances**

Produits de construction : Évaluation de l'émission de  
substances dangereuses - Digestion par l'eau régale  
pour une analyse ultérieure de substances  
inorganiques

Bauprodukte: Bewertung der Freisetzung von  
gefährlichen Stoffen - Königswasser-Aufschluss zur  
anschließenden Analyse von anorganischen Stoffen

This European Standard was approved by CEN on 14 August 2023.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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<b>Contents</b>	<b>Page</b>
European foreword.....	3
Introduction .....	4
1 Scope .....	5
2 Normative references .....	5
3 Terms and definitions .....	6
4 Abbreviations .....	7
5 Principle .....	7
6 Interferences and sources of errors .....	8
7 Reagents .....	8
8 Apparatus.....	8
9 Procedure.....	10
9.1 Sample pre-treatment .....	10
9.2 Blank test .....	10
9.3 Method A: Thermal heating under reflux conditions.....	10
9.4 Method B: Microwave heating with temperature control at 170 °C to 180 °C .....	11
10 Test performance.....	12
11 Test report.....	12
Annex A (informative) Validation results for inorganic substances in <i>aqua regia</i> digests from construction products .....	14
A.1 General.....	14
A.2 Precision data for <i>aqua regia</i> digests from construction products .....	14
Bibliography.....	21

## European foreword

This document (EN 17196:2023) has been prepared by Technical Committee CEN/TC 351 “Construction products: Assessment of release of dangerous substances”, 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 May 2024, and conflicting national standards shall be withdrawn at the latest by May 2024.

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 supersedes CEN/TS 17196:2018.

In comparison with the previous edition, the following technical modifications have been made:

- the addition of performance data and data from intercomparison validation;
- alignment of terms and definitions within the working groups of CEN/TC 351, i.e. through the revised version of EN 16687.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

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

Following an extended evaluation of available methods for content analysis in construction products (CEN/TR 16045) it was concluded that multi matrix and multi-element digestion methods have preference over methods developed for single matrices or small groups of matrices. This implies that for inorganic substances *aqua regia* digestion is preferred for the digestion of construction products for content analysis.

This document has been adopted from the work carried out in the context of CEN/TC 292 and CEN/TC 400 and is very similar to EN 13657 and EN 16174.

This document is part of a modular horizontal approach which was adopted in CEN/TC 351. “Horizontal” means that the methods can be used for a wide range of materials and products with certain properties. “Modular” means that a test standard developed in this approach concerns a specific step in assessing a property and not the whole chain of measurement (from sampling to analyses). Beneficial features of this approach are that modules can be replaced by better ones without jeopardizing the standard chain and duplication of work of in different Technical Committees for Products can be avoided as far as possible.

The modules that relate to the standards developed in CEN/TC 351 are specified in CEN/TR 16220, which distinguishes between the modules. This document belongs to the analytical step.

The use of modular horizontal standards implies the drawing of test schemes as well. Before executing a test on a certain construction product to determine certain characteristics, it is necessary to draw up a protocol in which the adequate modules are selected and together form the basis for the entire test procedure.

**WARNING** — Persons using this document should be familiar with usual laboratory practice. The reagents used in this document are strongly corrosive and partly very toxic. Safety precautions are absolutely necessary, not only due to the strong corrosive reagents, but also to high temperature and high pressure.

The use of laboratory-grade microwave equipment with isolated and corrosion resistant safety devices is required. Domestic (kitchen) type microwave ovens should not be used, as corrosion by acid vapours can compromise the function of the safety devices and prevent the microwave magnetron from shutting off when the door is open, which could result in operator exposure to microwave energy.

By the use of strong oxidising reagents, the formation of explosive organic intermediates is possible, especially when dealing with samples with a high organic content.

The use of this document may involve hazardous materials, operations and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate measures to ensure the safety and health of personnel prior to application of the document and to fulfil statutory and regulatory requirements for this purpose.

**IMPORTANT** — It is absolutely essential that tests conducted according to this document be carried out by suitably trained staff.

## 1 Scope

This document specifies methods for obtaining the *aqua regia* digestible content of construction products. Solutions produced by this method are for analysis by inductively coupled plasma mass spectrometry (ICP-MS) and inductively coupled spectrometry (ICP-OES) for the following 67 elements:

Aluminium (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), bismuth (Bi), boron (B), cadmium (Cd), calcium (Ca), cerium (Ce), caesium (Cs), chromium (Cr), cobalt (Co), copper (Cu), dysprosium (Dy), erbium (Er), europium (Eu), gadolinium (Gd), gallium (Ga), germanium (Ge), gold (Au), hafnium (Hf), holmium (Ho), indium (In), iridium (Ir), iron (Fe), lanthanum (La), lead (Pb), lithium (Li), lutetium (Lu), magnesium (Mg), manganese (Mn), mercury (Hg), molybdenum (Mo), neodymium (Nd), nickel (Ni), palladium (Pd), phosphorus (P), platinum (Pt), potassium (K), praseodymium (Pr), rubidium (Rb), rhenium (Re), rhodium (Rh), ruthenium (Ru), samarium (Sm), scandium (Sc), selenium (Se), silicon (Si), silver (Ag), sodium (Na), strontium (Sr), sulphur (S), tellurium (Te), terbium (Tb), thallium (Tl), thorium (Th), thulium (Tm), tin (Sn), titanium (Ti), tungsten (W), uranium (U), vanadium (V), ytterbium (Yb), yttrium (Y), zinc (Zn), and zirconium (Zr).

Solutions produced by the methods are suitable for analysis by cold vapour atomic absorption or fluorescent spectrometry (CV-AAS, CV-AFS), for mercury (Hg).

The method in this document is applicable to construction products.

Digestion with *aqua regia* will not necessarily accomplish total decomposition of the sample. The extracted analyte concentrations might not necessarily reflect the total content in the sample.

NOTE Construction products include e.g. mineral-based products (S); bituminous products (B); metals (M); wood-based products (W); plastics and rubbers (P); sealants and adhesives (A); paints and coatings (C), see also CEN/TR 16045.

## 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 15936, *Soil, waste, treated biowaste and sludge — Determination of total organic carbon (TOC) by dry combustion*

EN 16687:2023, *Construction products: Assessment of release of dangerous substances — Terminology*

EN 17087, *Construction products: Assessment of release of dangerous substances — Preparation of test portions from the laboratory sample for testing of release and analysis of content*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16687:2023 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

##### **analyte**

determinant

element, ion or substance to be determined by an analytical method

[SOURCE: EN 16687:2023, 3.3.1.11]

#### 3.2

##### ***aqua regia***

solution obtained by mixing one volume of nitric acid and three volumes of hydrochloric acid

[SOURCE: EN 16687:2023, 3.2.2.10]

#### 3.3

##### **digest**

solution resulting from acid digestion of a sample

[SOURCE: EN 16687:2023, 3.2.2.8]

#### 3.4

##### **digestion**

mineralization of the organic matter of a sample and dissolution of its mineral part (as completely as possible) when reacted with a reagent mixture

[SOURCE: EN 16687:2023, 3.2.2.9 – modified, Note 1 to entry removed]

#### 3.5

##### **digestion vessel**

flask where the test portion and the acid solution are mixed together and the digestion is carried out

[SOURCE: EN 16687:2023, 3.2.2.11]

#### 3.6

##### **dry matter**

mass fraction of a sample excluding water expressed as mass fraction calculated by determination of dry residue or water content

[SOURCE: EN 16687:2023, 3.2.2.15]

#### 3.7

##### **laboratory sample**

sample or sub-sample(s) sent to or received by the laboratory

[SOURCE: EN 16687:2023, 3.2.2.1 – modified, Notes to entry removed]