



SLOVENSKI STANDARD SIST EN 14361:2005

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Aluminium and aluminium alloys - Chemical analysis - Sampling from metal melts

Aluminium und Aluminiumlegierungen - Chemische Analyse - Probenahme von Metallschmelzen

Aluminium et alliages d'aluminium - Analyse chimique - Echantillonnage du métal fondu

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ICS:

77.040.30	Kemijska analiza kovin	Chemical analysis of metals
77.120.10	Aluminij in aluminijeve zlitine	Aluminium and aluminium alloys

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EUROPEAN STANDARD

EN 14361

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Aluminium and aluminium alloys - Chemical analysis - Sampling from metal melts

Aluminium et alliages d'aluminium - Analyse chimique -
Echantillonnage du métal fondu

Aluminium und Aluminiumlegierungen - Chemische
Analyse - Probenahme von Metallschmelzen

This European Standard was approved by CEN on 14 October 2004.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This document (EN 14361:2004) has been prepared by Technical Committee CEN/TC 132 "Aluminium and aluminium alloys", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

Within its programme of work, Technical Committee CEN/TC 132 requested CEN/TC 132/WG 17 "Chemical analysis" to prepare the following document:

EN 14361, *Aluminium and aluminium alloys — Chemical analysis — Sampling from metal melts*

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

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Introduction

Melts of aluminium alloys are susceptible to segregation when solidifying. Cast products, therefore, have concentration gradients. Axial and radial segregation profiles affect the representative sampling from melts, cast products or laboratory samples. In the case of direct measurement of solid samples (e.g. spark optical emission spectrometric analysis S-OES, or X-ray fluorescence spectral analysis XRF) measuring signals are influenced by the morphology of solidification and cast structure of the sample.

This document provides requirements which demonstrate the correspondence between the average chemical composition of the cast to be tested and the average chemical composition of the test portion.

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1 Scope

This document specifies criteria for sampling and gives guidance on the sampling from melts in order to verify if the chemical composition of the product fabricated from a metal melt is in conformance with the specification.

NOTE For sampling from product or laboratory samples see EN 14242 or prEN 14726.

2 Normative references

The following referenced documents are indispensable for the application 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 12258-1:1998, *Aluminium and aluminium alloys — Terms and definitions — Part 1: General terms.*

EN 12258-2:2004, *Aluminium and aluminium alloys — Terms and definitions — Part 2: Chemical analysis.*

prEN 14726, *Aluminium and aluminium alloys — Chemical analysis — Guideline for spark optical emission spectrometric analysis.*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12258-1:1998 and EN 12258-2:2004 apply.

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4 Sampling from a melt

4.1 General

The form and the size of a sample, the sampling plan, the preparation of the sampling tools and the metallurgical criteria for a useful sample widely depend on local conditions, so this document can only give certain required criteria.

4.2 Sampling procedure

As a part of the quality management system, the supplier of the metal (manufacturer) shall lay down and maintain a sampling procedure which shall be in conformance with the requirements of this document and shall reflect the special aspects of the casting line, the alloys to be cast and the equipment of the analytical laboratory. Any sample of liquid metal shall be taken in conformance with this procedure.

An example for sampling from metal melts is given in Annex A.

4.3 Form and size of the sampling mould and of the sample taken from liquid metal

The form of the sample shall ensure, after sample preparation, a correct analysis. If S-OES is used, the sample shall allow as many sparks as required according to preliminary tests and prEN 14726, to guarantee the compliances with specifications. The sample form shall allow a portion of drillings, millings or small pieces to be taken that are known, by pre-testing to be representative of the average composition of the whole sample (e.g. a longitudinal segment) for wet chemical analysis.

EN 14361:2004 (E)**4.4 Sampling plan**

A sampling plan shall specify:

- sample volume (defined by the sampling ladle and the sampling mould form);
- number of samples to be taken;
- locations in the liquid metal container (e.g. furnace, crucible or launder), in the cast product where the samples shall be taken;
- timings in the melt holding or casting process when the samples should be taken.

The supplier of the metal shall verify with preliminary tests, that the metal at the sampling location is sufficiently mixed so that the average chemical composition of the sample is representative of the average chemical composition of the whole melt.

If the sample is taken from the launder and any evidence exists that there might be variations in the chemical composition of the liquid metal at particular phases of the cast, e.g. the beginning or the end of the cast, then the samples shall be taken at such phases.

4.5 Preparation of sampling from metal melts

Before each sampling, the tools shall be prepared in such a way that the liquid metal does not come into contact with solidified aluminium, dross, moisture, iron or dust.

During the transfer from the melt to the sampling mould, the sampled liquid metal shall only come in contact with suitable and appropriate materials which are proven not to react with the metal and thus change the chemical composition of the sample.

NOTE Any metal sticking on the walls of the tools after solidification indicates the possibility of a chemical reaction.

The filling of the sampling mould shall be done as quickly as possible and done at an even rate. The sampling mould shall be filled in one single operation without interruption. With one drawing process only one sample shall be poured.

4.6 Requirements for a sound melt sample

After solidification the samples shall be complete. Samples shall be free from cracks, cold shuts, surface irregularities, inclusions and shrinkage holes.

Special care shall be taken to make sure that segregation is minimized and reproducible. The supplier of the metal shall demonstrate, e.g. by a series of tests, that, with regard to the subsequent sample preparation and analytical procedure, the segregation is under control.

4.7 Check of the sampling mould and the sampling ladle

The sampling mould shall be periodically checked and repaired, if necessary. Residues in the sampling mould shall be removed. Attention shall be paid that the specified dimensions of the sampling mould are not being changed during repair.

The sampling ladle shall be periodically checked, recoated and repaired, if necessary. Checks and repairs shall be recorded.

Annex A (informative)

Example for sampling from metal melts

A.1 Principle

With a sampling ladle, a representative portion of molten metal is taken and poured into the sampling mould. The laboratory sample is allowed to solidify, removed from the sampling mould, quenched, if required, and identified. The sampling conditions obtained by pre-tests, which influence the reproducibility of the segregation and cast structure, are recorded (see prEN 14726).

The materials and the shape of the sampling mould, the sampling conditions and the sampling plan are investigated by preliminary tests with respect to reproducible segregation behaviour and cast structures as well as range and uncertainty of the chemical composition.

The ranges of application and the accuracy of the method or any alternative step should be validated by the testing laboratory or other approved laboratory. In order to conform to the procedures for sampling and identification of laboratory samples, the responsibilities and control measures should be documented. Further instructions about sampling conditions, especially the number of laboratory samples per cast and shape of sampling moulds depend on the production and measuring equipment, the requirements for the accuracy of the chemical composition or the process capability.

NOTE Taking a representative laboratory sample for analysis requires well-trained personnel and proper pre-treatment of the sampling tools. Safety instructions are recommended.

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A.2 Equipment

A.2.1 Sampling ladle, long enough to reach into the furnace, trough, launder or crucible. The spoon size should be large enough to cast one sample but no more than one sample per sampling.

A.2.2 Devices, auxiliary materials and documented procedures for cleaning and coating according to experience or preliminary tests.

NOTE There are different ways for cleaning and protection of sampling ladles and sampling moulds. The selection of equipment (e.g. the sampling ladle steel or graphite or protective coating) depends on the purity of the aluminium or on the composition of the aluminium alloys to be analysed.

A.2.3 Sampling mould (e.g. for cylindrical, plate-type or mushroom sample shape).

NOTE The material, the shape of the sampling mould and the sampling conditions should be investigated by preliminary tests with respect to reproducible segregation behaviour and cast structures. Therefore, the distance from the analytical face and from the edge of the laboratory sample at which the analysis is to be performed should be determined for each laboratory sample shape and for each alloy type (criteria see prEN 14726). The shape of sample, the form and material of the sampling mould should allow a rapid solidification free of shrinkage cavities or porosity.