
**Carbonaceous materials for the
production of aluminium — Cathode
block materials —**

Part 1:
**Determination of the expansion due to
sodium penetration with application
of pressure**

*Produits carbonés utilisés pour la production de l'aluminium — Blocs
cathodiques —*

*Partie 1: Détermination de l'expansion due à la pénétration du
sodium avec application de pression*

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 226, *Materials for the production of primary aluminium*.

This third edition cancels and replaces the second edition (ISO 15379-1:2015), which has been technically revised. The main changes to the previous edition are as follows:

- ASTM E 220 has been removed from [Clause 2](#) and [5.3](#);
- minor changes have been made in [6.2](#), [6.3](#), [6.4](#) and [6.5](#);
- [Clause 10](#) has been aligned with test reports in other ISO/TC 226 standards.

A list of all parts in the ISO 15379 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Expansion due to sodium penetration is an important property of carbon cathode blocks. As soon as alumina electrolysis starts, sodium penetrates into the carbon cathode blocks causing swelling of these blocks. This increase in volume creates mechanical stresses within the blocks and/or bulging of the bottom block plate. This can lead to cracks through which liquid aluminium and/or liquid electrolyte can flow, reaching the thermal insulation beneath the blocks and destroying these ceramic materials. In such cases, the electrolysis cell has to be relined, resulting in loss of aluminium production and high expenses. Therefore, cathode blocks produced with materials allowing only low sodium penetration and with the lowest possible expansion due to sodium penetration are preferred.

The study can be supplemented by measuring electrical resistivity (see ISO 11713) before and after the test.

Due to thermal and sodium expansion when heating up the cathode blocks in the electrolysis cells to operational temperature, the block will be subject to pressure from the steel shell; therefore, in the present method, 5 MPa is chosen as a realistic maximum pressure.

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