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**Rubber compounding ingredients —  
Determination of multipoint nitrogen  
surface area (NSA) and statistical  
thickness surface area (STSA)**

*Ingrédients de mélange du caoutchouc — Détermination de la  
surface par adsorption d'azote (NSA) et de la surface par épaisseur  
statistique (STSA) par méthode multipoints*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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](http://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](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 3, *Raw materials (including latex) for use in the rubber industry*.

This third edition cancels and replaces the second edition (ISO 18852:2012), which has been technically revised with the following changes:

- [Clause 6](#): deletion of the description of what operators do not have to do; specification of what operators have to do. The verification of measured values was moved to [Clause 8](#) for measurement procedure;
- [Clauses 7](#) and [10](#): addition of explanations for operators to carry out the procedure easily;
- [Clause 8](#): the description for selecting data points has been modified;
- the specification of sample mass has been moved to [Clause 7](#) for sample preparation, and the previous [Clause 9](#) was deleted.

# Rubber compounding ingredients — Determination of multipoint nitrogen surface area (NSA) and statistical thickness surface area (STSA)

**WARNING** — Persons using this International Standard should be familiar with normal laboratory practice. This International Standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

## 1 Scope

This International Standard specifies a method for the determination of the nitrogen surface area (NSA) of carbon blacks and other rubber compounding ingredients, like silicas and zinc oxides, based on the Brunauer, Emmett and Teller (BET) theory of gas adsorption using a multipoint determination as well as the determination of the statistical thickness surface area (STSA), otherwise known as the external surface area. STSA, however, is not applicable to silica and zinc oxide.

The method can also be used for verifying “single-point” procedures described in ISO 4652 and other standards.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4652:2012, *Rubber compounding ingredients — Carbon black — Determination of specific surface area by nitrogen adsorption methods — Single-point procedures*

ISO 5794-1:2010, *Rubber compounding ingredients — Silica, precipitated, hydrated — Part 1: Non-rubber tests*

## 3 Principle

A sample of carbon black, silica, zinc oxide, etc., is placed in a cell of known volume and degassed. Known volume of nitrogen gas is dosed into the cell that is kept at the temperature of liquid nitrogen. The pressure in the cell decreases to the equilibrium due to the adsorption by the sample. The adsorbed amount at the equilibrium is derived from the difference between the amount of the dosed gas and that of remainder in the cell. The pressure is measured together with the temperature in the system, and the volume of the system is measured with a gas that does not adsorb such as helium before the test. NSA is determined by the BET analysis on the adsorption amount obtained, and STSA is determined by t-plot analysis.

## 4 Apparatus

**4.1 Automatic volumetric adsorption measurement apparatus**, consisting of a pressure gauge or transducer, a calibration volume, a Dewar flask and all other accessories required for the analysis.

The pressure gauge or transducer shall have the  $\pm 0,25$  % accuracy of full scale at the range from 0 kPa to 133 kPa.

Calibration volume is where the volume of the nitrogen to be adsorbed is measured and shall have a known internal volume with a valve or stopcock. It shall have been calibrated by its manufacturer prior to testing.