Draft for Public Comment

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Interested committees:

Title: Draft BS ISO 4508 Surface chemical analysis - Scanning probe microscopy - Guideline for the method and procedure for determining the temperature effects on AFM dimensional measurements.

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex **(e.g. 3.1)**	Paragraph/ Figure/Table/Note	**Type of comment**	**Commend (justification for change) by the MB**	**Proposed change by the MB**	**Secretariat observations on each comment submitted**
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

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DRAFT International Standard

ISO/DIS 4508

Surface chemical analysis — Scanning probe microscopy — Guideline for the method and procedure for determining the temperature effects on AFM dimensional measurements

ICS: 71.040.40

ISO/TC **201**/SC **9**

Secretariat: **KATS**

Voting begins on:
2025-02-06

Voting terminates on:
2025-05-01

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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).

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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 201, *Surface chemical analysis*, Subcommittee SC 9, *Scanning probe microscopy*.

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Introduction

Atomic force microscopy (AFM) serves as a technique of great importance in nanoscience and nanotechnology. Tens of thousands of AFMs are now used across the globe in both academic and industrial institutions. Quantitative dimensional measurement at the micro- and nanoscales by AFM is one of its most important applications. It becomes even more crucial due to the increasing demands in the semiconductor industry for measuring critical dimensions that are shrinking rapidly. Like many other apparatuses, dimensional measurements by AFM are influenced by the environmental temperature. Differences in the coefficients of thermal expansion between key instrument components would lead to variations of the measurement results under different environmental temperatures. Preliminary experiments have indeed shown significant dependence of AFM dimensional measurement results on the environmental temperature.[1-2] This hinders the applications of AFM for such as semiconductor dimensional metrology, where uncertainties of well below 1 nm could be required. It is therefore desirable that AFM manufacturers provide information on how the environment temperature influence their instruments' dimensional measurements, and that AFM users are informed of how to determine the effects on their own. Therefore, practical methods and procedures to characterize the temperature effects on AFM dimensional measurements at the micro- and nanoscales are required.

This International Standard describes the method and procedure to determine the temperature effects on AFM dimensional measurements. Two types of environmental temperature conditions, respectively in a large chamber containing the whole AFM microscope and in a local chamber containing only the sample and the probe holder, were considered. These two are the most practical environmental control approaches that are used among AFM users. In each case, the effects of temperature on AFM dimensional measurements are evaluated for both the X-Y plane and the Z-axis. Temperature variations in the range over 10 to 35 °C are described in this International Standard as examples, however users may, of course, set their own temperature ranges by following the safety instructions of their instruments. According to this International Standard, AFM manufacturers and users can get guidance to determine the environmental temperature effects on their AFM's dimensional measurements.

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