
**Surface chemical analysis — Scanning-
probe microscopy — Determination
of geometric quantities using SPM:
Calibration of measuring systems**

*Analyse chimique des surfaces — Microscopie à sonde à balayage
— Détermination des quantités géométriques en utilisant des
microscopes à sonde à balayage: Étalonnage des systèmes de mesure*





COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	v
Introduction	ix
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols	2
5 Characteristics of SPMs	4
5.1 Components of an SPM	4
5.2 Metrological categories of SPMs	6
5.3 Block diagram of an SPM	6
5.3.1 For category C:	6
5.3.2 Additionally, for category B:	6
5.3.3 Additionally, for category A:	7
5.4 Calibration interval	7
6 Preliminary characterization of the measuring system	8
6.1 Overview of the instrument characteristics and influencing factors to be investigated	8
6.2 Waiting times after interventions in the measuring system (e.g. instrument installation, intrinsic effects, carrying out operation, warm-up, tip/specimen change)	10
6.2.1 Adjustment of the instrument to ambient conditions	10
6.2.2 Potential causes of drift	10
6.2.3 Procedure	10
6.3 External influences	11
6.3.1 Sources of external influences	11
6.3.2 Consequences of external influences and countermeasures	11
6.4 Summary	11
7 Calibration of scan axes	12
7.1 General	12
7.2 Measurement standards	12
7.2.1 Requirements for measurement standards	12
7.2.2 Handling of measurement standards	13
7.3 <i>Xy</i> -scanner guidance deviations of the <i>x</i> - and <i>y</i> -axes (<i>xtz</i> , <i>yzt</i>)	13
7.3.1 Definition of <i>xy</i> -scanner guidance deviations in vertical direction (<i>z</i> -plane)	13
7.3.2 Measurement strategy	13
7.3.3 Flatness measurement standards	14
7.3.4 Measurements	15
7.3.5 Evaluation of results	15
7.3.6 Summary	16
7.3.7 Extended calibration measurements	16
7.4 Calibration of <i>x</i> - and <i>y</i> -axis (<i>C_x</i> , <i>C_y</i>) and of rectangularity (ϕ_{xy}) and determination of deviations (<i>xtx</i> , <i>yty</i> , <i>ywx</i>)	17
7.4.1 General	17
7.4.2 Definition of pitch <i>p_x</i> and <i>p_y</i> and rectangularity (ϕ_{xy}) in the <i>x-y</i> -plane	17
7.4.3 Measurement strategy	17
7.4.4 Selection of lateral measurement standards	18
7.4.5 Basic calibration — Adjustments and measurements	19
7.4.6 Extended calibrations (scan speed, angle, and eccentric measurements)	20
7.4.7 Evaluation	21
7.4.8 Extended evaluations: nonlinearity of the <i>x-y</i> -axis	24
7.4.9 Summary	25
7.5 Calibration of the <i>z</i> -axis <i>C_z</i> , ϕ_{xz} , and ϕ_{yz} , and determination of the deviations <i>ztz</i> , <i>zwx</i> , and <i>zwy</i>	26
7.5.1 General	26