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**Nanotechnologies - Description, measurement and dimensional
quality parameters of gratings**

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1. Structure and drafting rules for standardization documents"

Drafting.

This document is equivalent to IEC TS62622.2012 "Description, measurement and dimensional quality parameters of nanotechnology artificial gratings".

The model was adjusted from the IEC technical specification to my country's national standardization guiding technical document.

The following minimal editorial changes were made to this document.

--- Change the name of the standard to "Description, measurement and dimensional quality parameters of nanotechnology gratings";

--- The terms "relative deviation of characteristic position" and "relative linearity of characteristic position" which are not referenced in IEC TS62622.2012 are replaced by "Deviation" is adjusted to the notes of the terms "deviation of characteristic position" and "deviation of linearity of characteristic position" respectively.

Introduction

Gratings play an important role in the fabrication process of nanoscale structures as well as in the characterization of nanoscale objects.

In the mass production of semiconductor integrated circuits using photolithography, light is used to detect the grating patterns on the mask and silicon wafer to analyze

The optical signals generated by the semiconductor are used to align the photolithography mask and wafer in different lithography steps of the wafer scanning production tool.

In conductor manufacturing and other manufacturing processes that require high positioning accuracy in the nanometer range, grating-based length or angle encoder systems are often used.

Another application area of gratings in nanotechnology is as a standard for calibrating the nanostructures used to characterize them.

Necessary instruments for the analysis include high-resolution microscopes such as scanning probe microscopes, scanning electron microscopes or transmission electron microscopes.

The quality of optical encoders used for position feedback in manufacturing tools often affects the accuracy that can be achieved by alignment or positioning systems.

As a standard for calibrating the magnification of high-resolution microscope images, its quality determines the uncertainty of calibration, thus affecting the final measurement of the microscope.

Measurement uncertainty plays an important role.

This document mainly specifies the quality parameters of grating features, expressed as deviations from the nominal position of the grating features, and provides

An application guide to various measurement and evaluation methods for calibrating and characterizing gratings.

Characterization, measurement and application of nanotechnology gratings

Dimensional quality parameters

1 Scope

This document defines common terminology for explaining global and local quality parameters of gratings in terms of deviations of grating features from nominal positions and provides

Guidelines for the classification of measurement and evaluation methods for determining parameters and for ensuring the production and use of gratings in different areas of nanotechnology application

Quality guide.

The methods defined and described in this document are applicable to different types of

gratings, but this document focuses on one-dimensional (1D) and two-dimensional (2D) gratings.

Gratings are designed to facilitate use among manufacturers, users and calibration laboratories in the field of nanotechnology involving the characterization of grating size quality parameters.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to

This document.

GB/T 30544.1-2014 Nanotechnology Terminology Part 1.Core Terminology (ISO /T S80004-1.2010, IDT)

Note. GB/T 27025-2019 General requirements for the competence of testing and calibration laboratories (ISO /IEC 17025.2017, IDT)

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Basic terminology

3.1.1

Feature

An area within a continuous boundary, referenced to a datum, that has distinct physical properties (parameters) that are different from those of the area outside the boundary.

Example. A feature with a trapezoidal cross section on a substrate, see Figure 1.

Figure 1.Example of a trapezoidal line feature on a substrate.