

<b>STN</b>	<b>Geometrické špecifikácie výrobkov (GPS). Filtrácia. Časť 40: Morfológické profilové filtre: Základná koncepcia (ISO 16610-40: 2015).</b>	<b>STN EN ISO 16610-40</b>  01 4453
------------	---	---

Geometrical product specifications (GPS) - Filtration - Part 40: Morphological profile filters: Basic concepts (ISO 16610-40:2015)

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 10/15

Obsahuje: EN ISO 16610-40:2015, ISO 16610-40:2015

**121726**

EUROPEAN STANDARD

**EN ISO 16610-40**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2015

ICS 17.040.20

English Version

**Geometrical product specifications (GPS) - Filtration - Part 40:  
Morphological profile filters: Basic concepts (ISO 16610-  
40:2015)**

Spécification géométrique des produits (GPS) - Filtrage -  
Partie 40: Filtres de profil morphologiques: Concepts de  
base (ISO 16610-40:2015)

Geometrische Produktspezifikation (GPS) - Filterung - Teil  
40: Morphologische Profilfilter: Grundlegende Konzepte  
(ISO 16610-40:2015)

This European Standard was approved by CEN on 21 February 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

<b>Contents</b>	<b>Page</b>
Foreword.....	<b>3</b>

## **Foreword**

This document (EN ISO 16610-40:2015) has been prepared by Technical Committee ISO/TC 213 "Dimensional and geometrical product specifications and verification" in collaboration with Technical Committee CEN/TC 290 "Dimensional and geometrical product specification and verification" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2015, and conflicting national standards shall be withdrawn at the latest by December 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

### **Endorsement notice**

The text of ISO 16610-40:2015 has been approved by CEN as EN ISO 16610-40:2015 without any modification.

First edition  
2015-06-01

Corrected version  
2015-10-01

---

---

**Geometrical product specifications  
(GPS) — Filtration —**

Part 40:  
**Morphological profile filters: Basic  
concepts**

*Spécification géométrique des produits (GPS) — Filtrage —  
Partie 40: Filtres de profil morphologiques: Concepts de base*



Reference number  
ISO 16610-40:2015(E)

© ISO 2015



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, 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  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Basic concepts</b> .....	<b>3</b>
4.1 Minkowski sums.....	3
4.1.1 General.....	3
4.1.2 Minkowski addition.....	3
4.1.3 Minkowski subtraction.....	4
4.2 Morphological operations.....	4
4.2.1 General.....	4
4.2.2 Dilation.....	4
4.2.3 Erosion.....	5
4.2.4 Opening.....	5
4.2.5 Closing.....	6
4.2.6 Higher order morphological operations.....	6
4.2.7 Properties of morphological operations.....	7
<b>5 Morphological filters</b> .....	<b>7</b>
5.1 General.....	7
5.2 Fill transform.....	7
5.3 Discrete morphological filters.....	8
5.4 Envelope filters.....	8
5.5 Sampling and reconstruction.....	8
<b>Annex A (informative) Concept diagram</b> .....	<b>13</b>
<b>Annex B (informative) Relationship to the filtration matrix model</b> .....	<b>14</b>
<b>Annex C (informative) Relationship to the GPS matrix model</b> .....	<b>15</b>
<b>Bibliography</b> .....	<b>16</b>

## 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 213, *Dimensional and geometrical product specifications and verification*.

This first edition of ISO 16610-40 cancels and replaces ISO/TS 16610-40:2006 which has been technically revised.

This corrected version of ISO 16610-40:2015 incorporates the following corrections:

- 4.1.3 and 4.2.3: The font substitution errors (“!” instead of the sign  $\ominus$  in the PDF) have been fixed.

ISO 16610 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Filtration*:

- *Part 1: Overview and basic concepts*
- *Part 20: Linear profile filters: Basic concepts*
- *Part 21: Linear profile filters: Gaussian filters*
- *Part 22: Linear profile filters: Spline filters*
- *Part 28: Profile filters: End effects*
- *Part 29: Linear profile filters: Spline wavelets*
- *Part 30: Robust profile filters: Basic concepts*
- *Part 31: Robust profile filters: Gaussian regression filters*
- *Part 32: Robust profile filters: Spline filters*
- *Part 40: Morphological profile filters: Basic concepts*
- *Part 41: Morphological profile filters: Disk and horizontal line-segment filters*

- *Part 49: Morphological profile filters: Scale space techniques*
- *Part 60: Linear areal filters: Basic concepts*
- *Part 61: Linear areal filters: Gaussian filters*
- *Part 71: Robust areal filters: Gaussian regression filters*
- *Part 85: Morphological areal filters: Segmentation*

The following parts are planned:

- *Part 26: Linear profile filters: Filtration on nominally orthogonal grid planar data sets*
- *Part 27: Linear profile filters: Filtration on nominally orthogonal grid cylindrical data sets*
- *Part 45: Morphological profile filters: Segmentation*
- *Part 62: Linear areal filters: Spline filters*
- *Part 69: Linear areal filters: Spline wavelets*
- *Part 70: Robust areal filters: Basic concepts*
- *Part 72: Robust areal filters: Spline filters*
- *Part 80: Morphological areal filters: Basic concepts*
- *Part 81: Morphological areal filters: Sphere and horizontal planar segment filters*
- *Part 89: Morphological areal filters: Scale space techniques*

## Introduction

This part of ISO 16610 is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO/TR 14638). It influences the chain links 3 and 5 of all chains of standards.

The ISO/GPS Masterplan given in ISO 14638 gives an overview of the ISO/GPS system of which this part of ISO 16610 is a part. The fundamental rules of ISO/GPS given in ISO 8015 apply to this part of ISO 16610 and the default decision rules given in ISO 14253-1 apply to specifications made in accordance with this part of ISO 16610, unless otherwise indicated.

For more detailed information about the relation of this part of ISO 16610 to the GPS matrix model, see [Annex C](#).

This part of ISO 16610 develops the terminology and concepts for morphological operations and filters, including envelope filters.

# Geometrical product specifications (GPS) — Filtration —

## Part 40:

# Morphological profile filters: Basic concepts

## 1 Scope

This part of ISO 16610 sets out the basic concepts and terminology for morphological operations and filters, including envelope filters.

## 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 17450-1:2011, *Geometrical product specifications (GPS) — Geometrical concepts — Part 1: Model for geometrical specification and verification*

ISO 16610-1:2015, *Geometrical product specifications (GPS) — Filtration — Part 1: Overview and basic concepts*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**