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Optics and photonics — Quality evaluation of optical systems — Determination of distortion

*Optique et photonique — Évaluation de la qualité des systèmes
optiques — Détermination de la distorsion*



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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.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 9039 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 1, *Fundamental standards*.

This second edition cancels and replaces the first edition (ISO 9039:1994) which has been technically revised.

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Introduction

Generally, the function of rotationally symmetric optical systems is to form an image that is geometrically similar to the object, except for some particular systems, such as fish-eye lenses and eyepieces, where this condition is deliberately not maintained. Ideally, this function is accomplished according to the geometry of perspective projection. Departures from the ideal image geometry are called distortion. The distortion is a position-dependent quantity which generally has a vectorial character. In a given image plane (which may also lie at infinity), this vector, representing the difference between theoretical and real image position, has a radial and a tangential component. In optical systems, the tangential component is basically conditioned by imperfect rotational symmetry. The systems manufactured in accordance with the present state of the art have a negligible tangential distortion. A tangential component of the distortion appears, however, as primary aberration in the case of electromagnetically focused electro-optical systems. This International Standard deals only with the radial distortion. For special systems, e.g. certain electro-optical systems, an expansion may become necessary to include vectorial representation.