

Non-toleranced Data

ISO 10110-11

- ISO 10110 standardizes tolerances when not called out.
- “Default” tolerances
- Entirely different than “shop tolerances” of ASME Y14’s.
- WARNING: Tolerances are very loose and may lead to undesirable consequences if not carefully considered.
- Note that tolerances scale with size of parts – a European practice rarely seen in U.S.

Property	Range of maximum (diagonal) dimension of the part [mm]			
	up to 10	over 10 up to 30	over 30 up to 100	over 100 up to 300
Edge length, diameter [mm]	±0.2	±0.5	±1	±1.5
Thickness [mm]	±0.1	±0.2	±0.4	±0.8
Angle deviation of prisms and plate	±30'	±30'	±30'	±30'
Width of protective chamfer [mm]	0.1 - 0.3	0.2 - 0.5	0.3 - 0.8	0.5 - 1.8
Stress birefringence acc. to ISO/DIS 10110-2 [nm/cm]	0/20	0/20	-	-
Bubbles and inclusions acc. to ISO/DIS 10110-3	1/3x0.16	1/5x0.25	1/5x0.4	1/5x0.63
Inhomogeneity and striae acc. to ISO/DIS 10110-4	2/1;1	2/1;1	-	-
Surface form tolerances acc. to ISO/DIS 10110-5	3/5(1)	3/10(2)	3/10(2) (all Ø 30)	3/10(2) (all Ø 60)
Centring tolerances acc. to ISO/DIS 10110-6	4/30'	4/20'	4/10'	4/10'
Surface imperfection tolerances acc. to ISO/DIS 10110-7	5/3x0.16	5/5x0.25	5/5x0.4	5/5x0.63

Iso 10110 Drawing Standards

British Standards Institution

The logo of the British Standards Institution, featuring a red circular emblem with a white stylized 'B' inside, positioned to the right of the text.

Iso 10110 Drawing Standards:

ISO 10110 Optics and Optical Instruments Ronald K. Kimmel, Robert Eugene Parks, 2002 Implementation of ISO 10110 Optics Drawing Standards for the National Ignition Facility, 1999 The National Ignition Facility NIF project elected to implement ISO 10110 standard for the specifications of NIF optics drawings in 1996 More than 7 000 NIF large optics and 20 000 NIF small optics will be manufactured based on ISO 10110 indications ISO 10110 standard meets many of the needs of the NIF optics specifications It allows the optical engineer to quantify and clearly communicate the desired optical specifications While no single drawing standard specifies all the requirements of high energy laser system a combination of ISO 10110 standard with detailed notes make it possible to apply international drawing standards to the NIF laser system This paper will briefly describe LLNL's interpretation and implementation of the ISO 10110 drawing standard present some examples of NIF optics drawings and discuss pros and cons of the indications from the perspective of this application

Emphasis will be given to the surface imperfection specifications known as 5 for the NIF optics **Modern Optics Drawings** Eric Herman, David Aikens, Richard N. Youngworth, 2021 Preface Acknowledgments Chapter 1 Drawing Notation and Default Tolerances Chapter 2 Optical Materials Chapter 3 Surface Figure and Form Chapter 4 Surface Texture Roughness and Waviness Chapter 5 Surface Imperfection Tolerances Chapter 6 Laser Damage Chapter 7 Surface Treatment and Coating Chapter 8 Centering and Tilt Tolerances Chapter 9 Nonspherical Surfaces Chapter 10 System Evaluation Chapter 11 Environmental Testing Chapter 12 Standards in Practice References Epilogue The Path Forward Index

Handbook of Optomechanical Engineering Anees Ahmad, 2018-12-07 Good optical design is not in itself adequate for optimum performance of optical systems The mechanical design of the optics and associated support structures is every bit as important as the optics themselves Optomechanical engineering plays an increasingly important role in the success of new laser systems space telescopes and instruments biomedical and optical communication equipment imaging entertainment systems and more This is the first handbook on the subject of optomechanical engineering a subject that has become very important in the area of optics during the last decade Covering all major aspects of optomechanical engineering from conceptual design to fabrication and integration of complex optical systems this handbook is comprehensive The practical information within is ideal for optical and optomechanical engineers and scientists involved in the design development and integration of modern optical systems for commercial space and military applications Charts tables figures and photos augment this already impressive handbook The text consists of ten chapters each authored by a world renowned expert This unique collaboration makes the Handbook a comprehensive source of cutting edge information and research in the important field of optomechanical engineering Some of the current research trends that are covered include *Modern Optics Drawings* Eric Herman, 2022 The international standard for optics drawing notations ISO 10110 uses a set of coded notations to indicate optical tolerances and requirements to mitigate any ambiguity in an optics drawing This set of notations can be

very confusing for the uninitiated but once understood it simplifies communication between designer and manufacturer This book provides a foundation for understanding the fundamentals of ISO 10110 It is meant as a guide for users to familiarize themselves with the notation and symbology leading to a better understanding of the ISO 10110 drawing notation system Its purpose is to explain not only the ISO 10110 drawing format but also the various other standards that enable a greater understanding and implementation of ISO 10110 Each chapter discusses different subjects of optical properties and tolerances showing the implementation of ISO 10110 through various examples each highlighting a separate subject or tolerance on an optical component drawing A detailed example of an optical system is also provided

Fundamentals of Optomechanics Daniel Vukobratovich, Paul Yoder, 2018-01-29 When Galileo designed the tube of his first telescope optomechanics was born Concerned with the shape and position of surfaces in an optical system optomechanics is a subfield of physics that is arguably as old as optics However while universities offer courses on the subject there is a scarcity in textbook selections that skillfully and properly convey optomechanical fundamentals to aspiring engineers Complemented by tutorial examples and exercises this textbook rectifies this issue by providing instructors and departments with a better choice for transmitting to students the basic principles of optomechanics and allowing them to comfortably gain familiarity with the field's content Practicing optical engineers who engage in self study and wish to enhance the extent of their knowledge will also find benefit from the vast experience of the authors The book begins with a discussion of materials based on optomechanical figures of merit and features chapters on windows prisms and lenses The authors also cover topics related to design parameter mounting small mirrors metal mirrors with a discussion of infrared applications and kinematic design Overall Fundamentals of Optomechanics outfits students and practitioners with a stellar foundation for exploring the design and support of optical system surfaces under a wide variety of conditions Provides the fundamentals of optomechanics Presents self contained student friendly prose written by top scientists in the field Discusses materials windows individual lenses and multiple lenses Includes design mounting and performance of mirrors Includes homework problems and a solutions manual for adopting professors

Opto-Mechanical Systems Design, Volume 1 Paul Yoder, Daniel Vukobratovich, 2017-12-19 Opto Mechanical Systems Design Fourth Edition is different in many ways from its three earlier editions coauthor Daniel Vukobratovich has brought his broad expertise in materials opto mechanical design analysis of optical instruments large mirrors and structures to bear throughout the book Jan Nijenhuis has contributed a comprehensive new chapter on kinematics and applications of flexures and several other experts in special aspects of opto mechanics have contributed portions of other chapters An expanded feature a total of 110 worked out design examples has been added to several chapters to show how the theory equations and analytical methods can be applied by the reader Finally the extended text new illustrations new tables of data and new references have warranted publication of this work in the form of two separate but closely entwined volumes This first volume Design and Analysis of Opto Mechanical Assemblies addresses topics

pertaining primarily to optics smaller than 50 cm aperture It summarizes the opto mechanical design process considers pertinent environmental influences lists and updates key parameters for materials illustrates numerous ways for mounting individual and multiple lenses shows typical ways to design and mount windows and similar components details designs for many types of prisms and techniques for mounting them suggests designs and mounting techniques for small mirrors explains the benefits of kinematic design and uses of flexures describes how to analyze various types of opto mechanical interfaces demonstrates how the strength of glass can be determined and how to estimate stress generated in optics and explains how changing temperature affects opto mechanical assemblies

Optical Engineering Science Stephen Rolt, 2020-02-10 A practical guide for engineers and students that covers a wide range of optical design and optical metrology topics Optical Engineering Science offers a comprehensive and authoritative review of the science of optical engineering The book bridges the gap between the basic theoretical principles of classical optics and the practical application of optics in the commercial world Written by a noted expert in the field the book examines a range of practical topics that are related to optical design optical metrology and manufacturing The book fills a void in the literature by covering all three topics in a single volume Optical engineering science is at the foundation of the design of commercial optical systems such as mobile phone cameras and digital cameras as well as highly sophisticated instruments for commercial and research applications It spans the design manufacture and testing of space or aerospace instrumentation to the optical sensor technology for environmental monitoring Optics engineering science has a wide variety of applications both commercial and research This important book Offers a comprehensive review of the topic of optical engineering Covers topics such as optical fibers waveguides aspheric surfaces Zernike polynomials polarisation birefringence and more Targets engineering professionals and students Filled with illustrative examples and mathematical equations Written for professional practitioners optical engineers optical designers optical systems engineers and students Optical Engineering Science offers an authoritative guide that covers the broad range of optical design and optical metrology topics and their applications

Technical Drawing: Reviewed from ISO Standards Ir. Muttaqin Rahmat Pangaribawa, S.T., M.Eng., This Book offers a clear and structured introduction to technical drawing progressing from basic principles to advanced applications It covers fundamental techniques such as orthographic projection scaling and tolerancing with precision Emphasis is placed on ISO standards highlighting their role in establishing global benchmarks and ensuring quality Practical skills are developed through dimensioning schematic drawing and manufacturing detail exercises The use of traditional drafting tools and modern CAD methods is addressed Islamic perspectives are thoughtfully integrated into discussions on ethics and standardization Readers are guided toward producing accurate legible and compliant engineering drawings Key practices and real world applications are underscored throughout Summaries exercises and a comprehensive glossary reinforce learning This text is ideal for students lecturers and practitioners striving for professional mastery

ISO 10110 Optics and Optical Instruments Ronald K. Kimmel, OSA Standards

Committee,1995-01-01 **Opto-Mechanical Systems Design, Two Volume Set** Paul Yoder,Daniel

Vukobratovich,2018-12-14 Opto Mechanical Systems Design Fourth Edition is different in many ways from its three earlier editions coauthor Daniel Vukobratovich has brought his broad expertise in materials opto mechanical design analysis of optical instruments large mirrors and structures to bear throughout the book Jan Nijenhuis has contributed a comprehensive new chapter on kinematics and applications of flexures and several other experts in special aspects of opto mechanics have contributed portions of other chapters An expanded feature a total of 110 worked out design examples has been added to several chapters to show how the theory equations and analytical methods can be applied by the reader Finally the extended text new illustrations new tables of data and new references have warranted publication of this work in the form of two separate but closely entwined volumes The first volume Design and Analysis of Opto Mechanical Assemblies addresses topics pertaining primarily to optics smaller than 50 cm aperture It summarizes the opto mechanical design process considers pertinent environmental influences lists and updates key parameters for materials illustrates numerous ways for mounting individual and multiple lenses shows typical ways to design and mount windows and similar components details designs for many types of prisms and techniques for mounting them suggests designs and mounting techniques for small mirrors explains the benefits of kinematic design and uses of flexures describes how to analyze various types of opto mechanical interfaces demonstrates how the strength of glass can be determined and how to estimate stress generated in optics and explains how changing temperature affects opto mechanical assemblies The second volume Design and Analysis of Large Mirrors and Structures concentrates on the design and mounting of significantly larger optics and their structures including a new and important topic detailed consideration of factors affecting large mirror performance The book details how to design and fabricate very large single substrate segmented and lightweight mirrors describes mountings for large mirrors with their optical axes in vertical horizontal and variable orientations indicates how metal and composite mirrors differ from ones made of glass explains key design aspects of optical instrument structural design and takes a look at an emerging technology the evolution and applications of silicon and silicon carbide in mirrors and other types of components for optical applications

Handbook of Laser Technology and Applications Colin Webb,Julian D.C. Jones,2020-09-29 The invention of the laser was one of the towering achievements of the twentieth century At the opening of the twenty first century we are witnessing the burgeoning of the myriad technical innovations to which that invention has led The Handbook of Laser Technology and Applications is a practical and long lasting reference source for scientists and engineers who work with lasers The Handbook provides a comprehensive guide to the current status of lasers and laser systems it is accessible to science or engineering graduates needing no more than standard undergraduate knowledge of optics Whilst being a self contained reference work the Handbook provides extensive references to contemporary work and is a basis for studying the professional journal literature on the subject It covers applications through detailed case studies and is therefore well suited

to readers who wish to use it to solve specific problems of their own The first of the three volumes comprises an introduction to the basic scientific principles of lasers laser beams and non linear optics The second volume describes the mechanisms and operating characteristics of specific types of laser including crystalline solid state lasers semiconductor diode lasers fibre lasers gas lasers chemical lasers dye lasers and many others as well as detailing the optical and electronic components which tailor the laser s performance and beam delivery systems The third volume is devoted to case studies of applications in a wide range of subjects including materials processing optical measurement techniques medicine telecommunications data storage spectroscopy earth sciences and astronomy and plasma fusion research This vast compendium of knowledge on laser science and technology is the work of over 130 international experts many of whom are recognised as the world leaders in their respective fields Whether the reader is engaged in the science technology industrial or medical applications of lasers or is researching the subject as a manager or investor in technical enterprises they cannot fail to be informed and enlightened by the wide range of information the Handbook supplies Opto-Mechanical Systems Design Paul R. Yoder Jr.,2005-12-09

After nearly two decades Paul Yoder s Opto Mechanical Systems Design continues to be the reference of choice for professionals fusing optical and mechanical components into advanced high performance instruments Yoder s authoritative systems oriented coverage and down to earth approach fosters the deep seated knowledge needed to continually push

Optics Manufacturing Christoph Gerhard,2017-12-14 Optical components are essential key elements in modern engineering and everyday life The education of skilled personnel and specialists in the fields of theoretical and practical optics manufacturing is of essential importance for next generation technologies Against this background this book provides the basis for the education and advanced training of precision and ophthalmic optics technicians craftsmen and foremen and it is an extensive reference work for students academics optical designers or shop managers and production engineers It not only covers particularly used and applied machines working materials testing procedures and machining steps for classical optics manufacturing but it also addresses the production and specification of optical glasses as well as unconventional production techniques and novel approaches Optics Manufacturing Components and Systems furthermore covers the basics of light propagation and provides an overview on optical materials and components presents an introduction and explanation of the necessary considerations and procedures for the initial definition of manufacturing tolerances and the relevant industrial standards for optics manufacturing and addresses the production of micro optics the assembly of opto mechanical setups and possible manufacturing errors and the impact of the resulting inaccuracies In order to allow fast and clear access to the most essential information each chapter ends with a short summary of the most important aspects including an explanation of relevant equations symbols and abbreviations For further reading extensive lists of references are also provided Finally exercises on the covered basic principles of optics approaches and techniques of optics manufacturing including their corresponding detailed solutions are found in the appendix Introduction to Lens Design José

Sasián,2019-09-26 A concise introduction to lens design including the fundamental theory concepts methods and tools used in the field Covering all the essential concepts and providing suggestions for further reading at the end of each chapter this book is an essential resource for graduate students working in optics and photonics **Handbook of Laser Technology and Applications (Three- Volume Set)** Colin Webb,Julian D. C. Jones,2003-12-01 The invention of the laser was one of the towering achievements of the twentieth century At the opening of the twenty first century we are witnessing the burgeoning of the myriad technical innovations to which that invention has led The Handbook of Laser Technology and Applications is a practical and long lasting reference source for scientists a *Opto-Mechanical Systems Design, Second Edition*, Paul Yoder,Daniel Vukobratovich,Roger A. Paquin,1992-10-29 Rewritten and updated this text provides information on opto mechanical systems design guidelines and their day to day applications in real environments It emphasizes proven techniques for accomplishing design tasks and outlines techniques for mounting various optical elements and groupings

Handbook of Laser Technology and Applications Chunlei Guo,Subhash Chandra Singh,2021-06-23 This comprehensive handbook gives a fully updated guide to lasers and laser technologies including the complete range of their technical applications The first volume outlines the fundamental components of lasers their properties and working principles Key Features Offers a complete update of the original bestselling work including many brand new chapters Deepens the introduction to fundamentals from laser design and fabrication to host matrices for solid state lasers energy level diagrams hosting materials dopant energy levels and lasers based on nonlinear effects Covers new laser types including quantum cascade lasers silicon based lasers titanium sapphire lasers terahertz lasers bismuth doped fiber lasers and diode pumped alkali lasers Discusses the latest applications e g lasers in microscopy high speed imaging attosecond metrology 3D printing optical atomic clocks time resolved spectroscopy polarization and profile measurements pulse measurements and laser induced fluorescence detection Adds new sections on laser materials processing laser spectroscopy lasers in imaging lasers in environmental sciences and lasers in communications This handbook is the ideal companion for scientists engineers and students working with lasers including those in optics electrical engineering physics chemistry biomedicine and other relevant areas **Optical Manufacturing and Testing** ,1999 **BS ISO 10110-16. Optics and Photonics. Preparation of Drawings for Optical Elements and Systems** British Standards Institution,2022

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