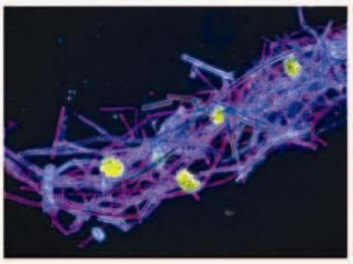
OPTEM

OPTICAL LENS SYSTEMS

INSPECTION | MACHINE VISION | RESEARCH



OPTEM ZOOM 160
16:1 OPTICAL SYSTEM

SUPERIOR OPTICAL PERFORMANCE

The Ultimate in Resolution,
Magnification and Field-of-View

QIOPTIQ
Optics with Intelligence

Qioptiq Imaging Solutions

Table of Contents

THE OPTICAL MUSCLE OF A RESEARCH MICROSCOPE... AND THE VERSATILITY OF AN OPTEM® ZOOM

When resolving the finest details of your subject is mission critical to your application, but the operation of a conventional research microscope is too cumbersome, the Optem® Zoom 160 Optical System is the perfect solution.

With it's unprecedented zoom range and resolution, the Zoom 160 can be easily configured to deliver optical performance rivaling that of benchtop research microscopes. Combine this optical performance with the added versatility of continuous 16:1 field-of-view and magnification flexibility, automatable zoom and focus functions, and crisp video output... and you have a powerful research instrument worthy of today's rapidly advancing high-definition video technologies.

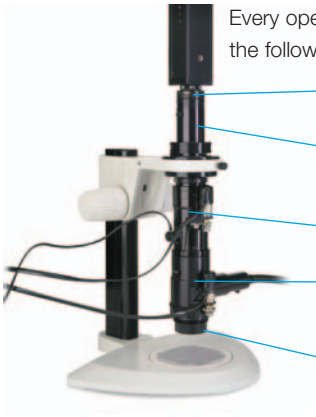
A robust 16:1 zoom ratio covers magnifications from 0.5X to 8.0X at 89mm working distance in nominal configuration. The innovative optical design incorporates the highest-grade glass and is reinforced with equally refined components and accessories. Imaging through these elevated optical standards, the Zoom 160 System offers a maximum resolution of 0.30 NA and 900 lp/mm.

Designed for Your Flexibility

The Zoom 160 features the signature Optem® modular design, affording application-specific configuration flexibility by simply interchanging Upper Zoom Modules and Lower Function Modules with a wide variety of automation, magnification and illumination accessories. This interchangeability requires no special tooling and occurs with no adverse affect on the optical performance and integrity of your system.

Certified under the latest and more rigorous ISO 9001:2000 standard, Optem® Zooms reflect steadfast quality and reliability. These values are firmly engrained in all aspects of our design, engineering and manufacturing processes.

REQUIRED COMPONENTS



Every operational Zoom 160 Optical System requires the following base components:

C-Mount or Bayonet Coupler
Attaches the camera to the dovetail tube

Dovetail TV Tube
Positions the camera at the proper distance from the zoom (rear conjugate)

Upper Zoom Module
Contains the core zoom mechanics

Lower Function Module
Houses internal focus and coaxial illumination options

Objective Lens
Transmits image to the zoom at "infinity"

CONNECTING TO YOUR CAMERA

Customize your Zoom 160 by selecting from a wide array of Dovetail TV Tube configuration options, mount types and magnifications.

Zoom 160 Dovetail TV Tubes require the centerable 1.00x32 C-Mount Coupler to connect your camera and establish the correct focal plane. Optional Bayonet Adapters can be integrated to afford greater camera mount versatility.

Tele Dovetail TV Tubes offer 1.0X – 2.0X magnification adjustment from the same TV Tube to provide greater system flexibility.

Zoom 160 Dovetail TV Tube features include…

- *Internal focus for easier parfocality establishment (except 1.0X Tubes where focus is unaffected).*
- *Magnifications from 0.38X – 2.0X. High-power Tubes increase on-monitor magnification while reducing Tubes provide broader fields-of-view.*
- *Configuration options allow you to vary the orientation and optical path of your Zoom 160 System. Choose from:*
  - **Straight Standard**
  - **Straight Mini**
  - **Bayonet Mount**
  - **Right-Angle**
  - **Non-Inverting Right-Angle**
  - **180° U-Bend**

UPPER ZOOM MODULE OPTIONS

The upper Zoom Module determines the mechanical nature of your zoom function… manual or motorized… detented or DC motorized.

All Zoom 160 Upper Zoom Modules come standard with an iris diaphragm for better light level control and increased depth-of-field.

Manual Zoom Modules – Provides an economical hand-driven 16:1 zoom function.

Detented Manual Zoom Modules – Obtain specific magnification stops throughout your manual zoom range without motorization. Detents are typically used in measuring applications where each position calls for calibration. The factory pre-set stops for the Zoom 160 are located at 0.5X, 1.0X, 2.0X, 3.0X, 4.0X, 5.0X, 6.0X, 7.0X and 8.0X.

Motorized Zoom Modules – Provides remote automated operation of your zoom system. There are two motorized options available. DC motorized versions provide smooth continuous zooming throughout the entire zoom range. Stepper motorized versions provide zoom homing positions for applications requiring repeatable magnification settings. The Stepper Motor modules have a companion RS232 controller which may be purchased as a self-contained unit or as a PC Board for easier OEM integration.

OEM Zoom Module – To afford OEMs with maximum design flexibility, the Zoom 160 OEM Module comes as a core optical unit without the exterior sleeve for easier systems integration.

ZOOM 160 LOWER MODULES

Select from 12 Lower Modules to provide a variety of illumination and focusing options to your Zoom 160. Lower Modules can be attached below a Zoom 160 Upper Module by simply tightening three set screws with the provided allen wrench.

Standard Modules – The fundamental lower function module provides the capability of attaching Objective Lenses to a Zoom 160 without adding internal fine focus or coaxial illumination functions.

Internal 15mm Fine Focus Modules – Ideal for applications without separate focusing support systems. Provides the ability to focus over a 15mm axial distance at the object. Available in manual and motorized options.

Coaxial Illumination Modules – This Module provides a port for the injection of incident light. Available with Internal 5mm Focus in manual or motorized options. All Coaxial Lower Modules are available with an optional, built-in Analyzer for polarized light applications. A Polarizer (30-36-03-000), and a 1/4 Wave Plate (30-36-04-000) are recommended for optimal performance when using the Analyzer (see System Diagram p. 6-7).

OBJECTIVE LENSES

Mandatory for operation of your Zoom 160 System, Objective Lenses attach to the Lower Modules and are available in a variety of magnifications to further expand Zoom 160's imaging capabilities.

For all part numbers, ordering information and configuration options, refer to the System Diagram (p 6-7), or visit the Zoom 160 section of our web site.

The Optem Zoom 160 Lens System offers a variety of illumination options to offer lighting optimized for a wide variety of specimens and subjects. Determined by the Lower Function Module selected, Zoom 160 offers substage, oblique or coaxial Illumination options to meet the specific imaging and physical requirements of your application.

Optem® VSI Fiber Optic Illuminators – Available in 110V or 220V, these compact, lightweight lamphouses yield powerful illumination via a 40" or 60" fiber optic bundle, and can be used with both coaxial and ringlight Zoom 160 illumination components.

COAXIAL ILLUMINATION

NEW **LED Coaxial Illuminators –** Compatible with all Coaxial Lower Function Modules (see System Diagram, p. 6-7), Zoom 160 now offers **1-Watt LED Coaxial illuminators** for streamlined integration and extended service life. Available in Straight (39-60-10-000) and Right-angle (30-16-20-000) configurations, Optem Coaxial LEDs feature compact designs and simplify cable management and integration.

Driven by a compact single-channel programmable controller, Optem Coaxial LEDs emit brilliant cool light in the visible spectrum and deliver virtually identical optical performance to our traditional Fiber Optic Coaxial Systems with extended bulb life and reduced power requirements and heat generation.

Fiber Optic Coaxial Illuminators – Compatible with all Zoom 160 Coaxial Lower Function Modules, traditional fiber optic illuminators are available with 40-in and 60-in flexible bundles.

Polarized Light – When imaging highly reflective subjects, Polarizer Modules with built-in Analyzers are available to introduce polarization to both LED and Fiber Optic Coaxial Illumination paths for Zoom 160.

OBLIQUE ILLUMINATION

The Zoom 160 operates equally well with substage illumination for translucent specimens, or oblique ringlight illumination which is ideal for 3-D objects to cast light rays at an angle onto the object, thus better defining its surface features and dimensionality.

Fiber Optic Ring Lights – Ideal for general purpose lighting applications, the fiber optic cable either exits the ring light horizontally at 90° off vertical, or vertically at 30° off vertical valuable space savings. A specific Objective Ring Light is required when incorporating oblique illumination with Infinity-Corrected Objectives.

Optem® VSI Fiber Optic Illuminators – Available in 110V or 220V, these compact, lightweight lamphouses yield powerful illumination via a 40" or 60" fiber optic cable.

Coaxial Illumination Zoom 160 Optical Performance Matrix

			0.5X TV Tube		0.67X TV Tube		1.0X TV Tube		1.5X TV Tube		2.0X TV Tube	
			Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.25X Aux Lens 30-37-28-000 WD: 310 mm		NA	0.0022	0.038	0.0022	0.038	0.0022	0.038	0.0022	0.038	0.0022	0.038
		Res (lp/mm)	7	114	7	114	7	114	7	114	7	114
		Mag	0.063	1.0	0.084	1.3	0.13	2.0	0.19	3.0	0.25	4.0
		DOF	117	0.39	117	0.39	117	0.39	117	0.39	117	0.39
	FOV Cam Format	1/4"	15.77 x 21.03	2.76 x 3.68	14.98 x 19.97	2.06 x 2.75	13.80 x 18.40	1.38 x 1.84	12.27 x 16.36	0.92 x 1.23	11.04 x 14.72	0.69 x 0.92
		1/3"	16.94 x 22.59	3.60 x 4.80	15.35 x 20.47	2.69 x 3.58	14.40 x 19.20	1.80 x 2.40	13.71 x 18.29	1.20 x 1.60	12.00 x 16.00	0.90 x 1.20
		1/2"	-- x --	-- x --	16.86 x 22.48	3.58 x 4.78	16.00 x 21.33	2.40 x 3.20	14.22 x 18.96	1.60 x 2.13	13.71 x 18.29	1.20 x 1.60
		2/3"	-- x --	-- x --	-- x --	-- x --	16.50 x 22.00	3.30 x 4.40	14.67 x 19.56	2.20 x 2.93	13.20 x 17.60	1.65 x 2.20
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	17.07 x 22.76	3.20 x 4.27	16.00 x 21.33	2.40 x 3.20
0.5X Aux Lens 30-37-29-000 WD: 178 mm		NA	0.0045	0.76	0.0045	0.76	0.0045	0.76	0.0045	0.76	0.0045	0.76
		Res (lp/mm)	14	2280	14	2280	14	2280	14	2280	14	2280
		Mag	0.13	2	0.17	2.7	0.25	4	0.38	6	0.50	8
		DOF	28	0.0010	28	0.0010	28	0.0010	28	0.0010	28	0.0010
	FOV Cam Format	1/4"	15.77 x 21.03	1.38 x 1.84	16.48 x 21.97	1.03 x 1.37	11.04 x 14.72	0.69 x 0.92	7.36 x 9.81	0.46 x 0.61	5.52 x 7.36	0.35 x 0.46
		1/3"	16.00 x 21.33	1.80 x 2.40	15.35 x 20.47	1.34 x 1.79	14.40 x 19.20	0.90 x 1.20	9.60 x 12.80	0.60 x 0.80	7.20 x 9.60	0.45 x 0.60
		1/2"	10.67 x 14.22	2.40 x 3.20	15.92 x 21.23	1.79 x 2.39	16.00 x 21.33	1.20 x 1.60	12.80 x 17.07	0.80 x 1.07	9.60 x 12.80	0.60 x 0.80
		2/3"	-- x --	-- x --	9.85 x 13.13	2.46 x 3.28	16.50 x 22.00	1.65 x 2.20	14.67 x 19.56	1.10 x 1.47	13.20 x 17.60	0.83 x 1.10
		1"	-- x --	-- x --	-- x --	-- x --	10.67 x 14.22	2.40 x 3.20	16.00 x 21.33	1.60 x 2.13	16.00 x 21.33	1.20 x 1.60
0.75X Aux Lens 30-37-30-000 WD: 114 mm		NA	0.0068	0.11	0.0068	0.11	0.0068	0.11	0.0068	0.11	0.0068	0.11
		Res (lp/mm)	20	330	20	330	20	330	20	330	20	330
		Mag	0.19	3.1	0.25	4.1	0.37	6.1	0.56	9.2	0.75	12.3
		DOF	12.3	0.047	12.3	0.047	12.3	0.047	12.3	0.047	12.3	0.047
	FOV Cam Format	1/4"	12.27 x 16.36	0.90 x 1.20	10.99 x 14.65	0.67 x 0.90	7.36 x 9.81	0.45 x 0.60	4.91 x 6.54	0.30 x 0.40	3.68 x 4.91	0.23 x 0.30
		1/3"	12.00 x 16.00	1.17 x 1.57	11.94 x 15.92	0.88 x 1.17	9.60 x 12.80	0.59 x 0.78	6.40 x 8.53	0.39 x 0.52	4.80 x 6.40	0.29 x 0.39
		1/2"	6.40 x 8.53	1.57 x 2.09	11.94 x 15.92	1.17 x 1.56	10.67 x 14.22	0.78 x 1.04	8.53 x 11.38	0.52 x 0.70	6.40 x 8.53	0.39 x 0.52
		2/3"	-- x --	-- x --	-- x --	-- x --	11.00 x 14.67	1.08 x 1.43	11.73 x 15.64	0.72 x 0.96	8.80 x 11.73	0.54 x 0.72
		1"	-- x --	-- x --	-- x --	-- x --	6.40 x 8.53	1.57 x 2.09	12.19 x 16.25	1.04 x 1.39	10.67 x 14.22	0.78 x 1.04
1.0X Aux Lens 30-37-31-000 WD: 89 mm		NA	0.0090	0.15	0.0090	0.15	0.0090	0.15	0.0090	0.15	0.0090	0.15
		Res (lp/mm)	27	450	27	450	27	450	27	450	27	450
		Mag	0.25	4	0.34	5.4	0.51	8	0.76	12	1.01	16
		DOF	7.0	0.025	7.0	0.025	7.0	0.025	7.0	0.025	7.0	0.025
	FOV Cam Format	1/4"	11.04 x 14.72	0.69 x 0.92	8.24 x 10.99	0.51 x 0.69	5.52 x 7.36	0.35 x 0.46	3.68 x 4.91	0.23 x 0.31	2.76 x 3.68	0.17 x 0.23
		1/3"	9.00 x 12.00	0.90 x 1.20	10.75 x 14.33	0.67 x 0.90	7.20 x 9.60	0.45 x 0.60	4.80 x 6.40	0.30 x 0.40	3.60 x 4.80	0.23 x 0.30
		1/2"	-- x --	-- x --	8.96 x 11.94	0.90 x 1.19	9.60 x 12.80	0.60 x 0.80	6.40 x 8.53	0.40 x 0.53	4.80 x 6.40	0.30 x 0.40
		2/3"	-- x --	-- x --	-- x --	-- x --	13.20 x 17.60	0.83 x 1.10	8.80 x 11.73	0.55 x 0.73	6.60 x 8.80	0.41 x 0.55
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	12.80 x 17.07	0.80 x 1.07	9.60 x 12.80	0.60 x 0.80
1.5X Aux Lens 30-37-32-000 WD: 52 mm		NA	0.014	0.23	0.014	0.23	0.014	0.23	0.014	0.23	0.014	0.23
		Res (lp/mm)	42	690	42	690	42	690	42	690	42	690
		Mag	0.37	6	0.50	8	0.75	12	1.1	18	1.5	24
		DOF	2.9	0.011	2.9	0.011	2.9	0.011	2.9	0.011	2.9	0.011
	FOV Cam Format	1/4"	7.36 x 9.81	0.46 x 0.61	5.49 x 7.32	0.34 x 0.46	3.68 x 4.91	0.23 x 0.31	2.45 x 3.27	0.15 x 0.20	1.84 x 2.45	0.12 x 0.15
		1/3"	4.80 x 6.40	0.60 x 0.80	7.16 x 9.55	0.45 x 0.60	4.80 x 6.40	0.30 x 0.40	3.20 x 4.27	0.20 x 0.27	2.40 x 3.20	0.15 x 0.20
		1/2"	-- x --	-- x --	4.78 x 6.37	0.60 x 0.80	6.40 x 8.53	0.40 x 0.53	4.27 x 5.69	0.27 x 0.36	3.20 x 4.27	0.20 x 0.27
		2/3"	-- x --	-- x --	-- x --	-- x --	5.50 x 7.33	0.55 x 0.73	5.87 x 7.82	0.37 x 0.49	4.40 x 5.87	0.28 x 0.37
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	6.10 x 8.13	0.53 x 0.71	6.40 x 8.53	0.40 x 0.53
2.0X Aux Lens 30-37-34-000 WD: 32 mm		NA	0.018	0.30	0.018	0.30	0.018	0.30	0.018	0.30	0.018	0.30
		Res (lp/mm)	54	900	54	900	54	900	54	900	54	900
		Mag	0.51	8	0.68	11	1.0	16	1.5	24	2.0	32
		DOF	1.75	0.0063	1.75	0.0063	1.75	0.0063	1.75	0.0063	1.75	0.0063
	FOV Cam Format	1/4"	3.94 x 5.26	0.35 x 0.46	4.12 x 5.49	0.26 x 0.34	2.76 x 3.68	0.17 x 0.23	1.84 x 2.45	0.12 x 0.15	1.38 x 1.84	0.09 x 0.12
		1/3"	4.00 x 5.33	0.45 x 0.60	4.48 x 5.97	0.34 x 0.45	3.60 x 4.80	0.23 x 0.30	2.40 x 3.20	0.15 x 0.20	1.80 x 2.40	0.11 x 0.15
		1/2"	-- x --	-- x --	3.98 x 5.31	0.45 x 0.60	4.80 x 6.40	0.30 x 0.40	3.20 x 4.27	0.20 x 0.27	2.40 x 3.20	0.15 x 0.20
		2/3"	-- x --	-- x --	-- x --	-- x --	4.13 x 5.50	0.41 x 0.55	4.40 x 5.87	0.28 x 0.37	3.30 x 4.40	0.21 x 0.28
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	4.00 x 5.33	0.40 x 0.53	4.80 x 6.40	0.30 x 0.40

– Limited vignetting at low magnifications – Configuration not recommended

LabVIEW™ VI's

For system integrators working from the LabVIEW platform, Optem Zooms now offer a VI library permitting seamless assimilation of our Stepper Motorized options.

DC Motor Models

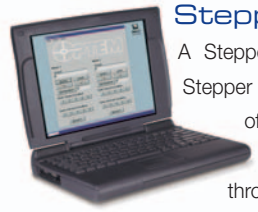
DC Motors allow continuous movement throughout either the zoom or focus range. Two ports in the back of the Motor Driver accept both zoom and focus motorized functions.

MOTORIZING YOUR ZOOM 160

The Zoom 160 Optical System can be specified with built-in motorized zoom, and/or focus functions. Choose from a variety of motorization and control options to best suit your specific application.

Stepper Motor Models – All Stepper Motor equipped Zoom 160s feature Hall-Effect Sensors. This engineering improvement ensures pinpoint mechanical accuracy and repetition for automated applications, and presents a smaller zoom barrel clearance diameter for improved space efficiency in OEM integrations.

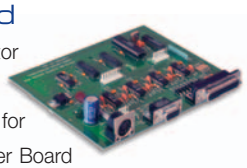
Zoom 160 can be specified in motorized configurations that facilitate computerized control of the Zoom and Focus functions. Stepper Motors permit discrete movement (steps) in fine increments. Homing Sensors are standard on Zoom 160 Stepper Motor models and provide a "zero" position for repeating locations. This permits pre-programming of setups for multiple work pieces.



Stepper Motor Controller

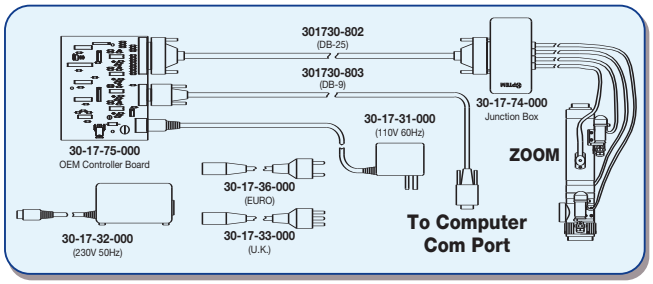
A Stepper Motor Controller is designed to operate the Stepper Motors. Manual operation is available through the use of individual "rocker" switches. Each axis has its own speed control. RS232 operation is implemented through a serial port and a Windows GUI. Software is provided for use with Windows 9X, 2000, XP or NT.

OEM Stepper Motor Board



The use of an OEM Board replaces the Stepper Motor Controller box. The OEM Board has all connections on-board and is available with a code library for modification of functions. Zoom 160 OEM Controller Board connections are detailed in the diagram below.

OEM Controller Board Connections

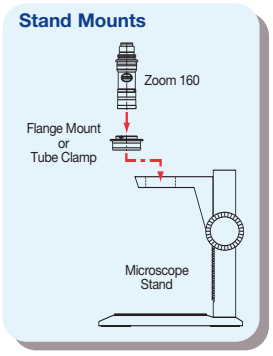


ZOOM 160 MOUNTING OPTIONS

Whether your application calls for using the Zoom 160 as a stand-alone benchtop research instrument, or as an integrated component in your OEM vision system, Qioptiq Imaging Solutions offers several mounting options to ensure streamlined integration and maximum image stability.

Stand-Mounting Zoom 160

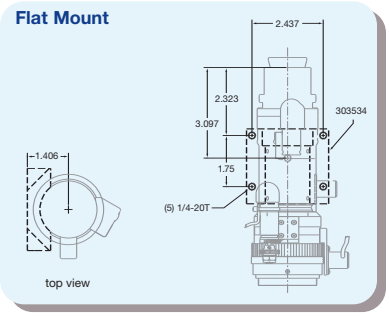
Manual Zoom 160s can be mounted on a microscope stand by means of a Flange Mount that locks onto the external flange of the Zoom 160 Upper Zoom Module itself. The external flange provides a means of securely holding a Zoom 160 in a ring-style mount.



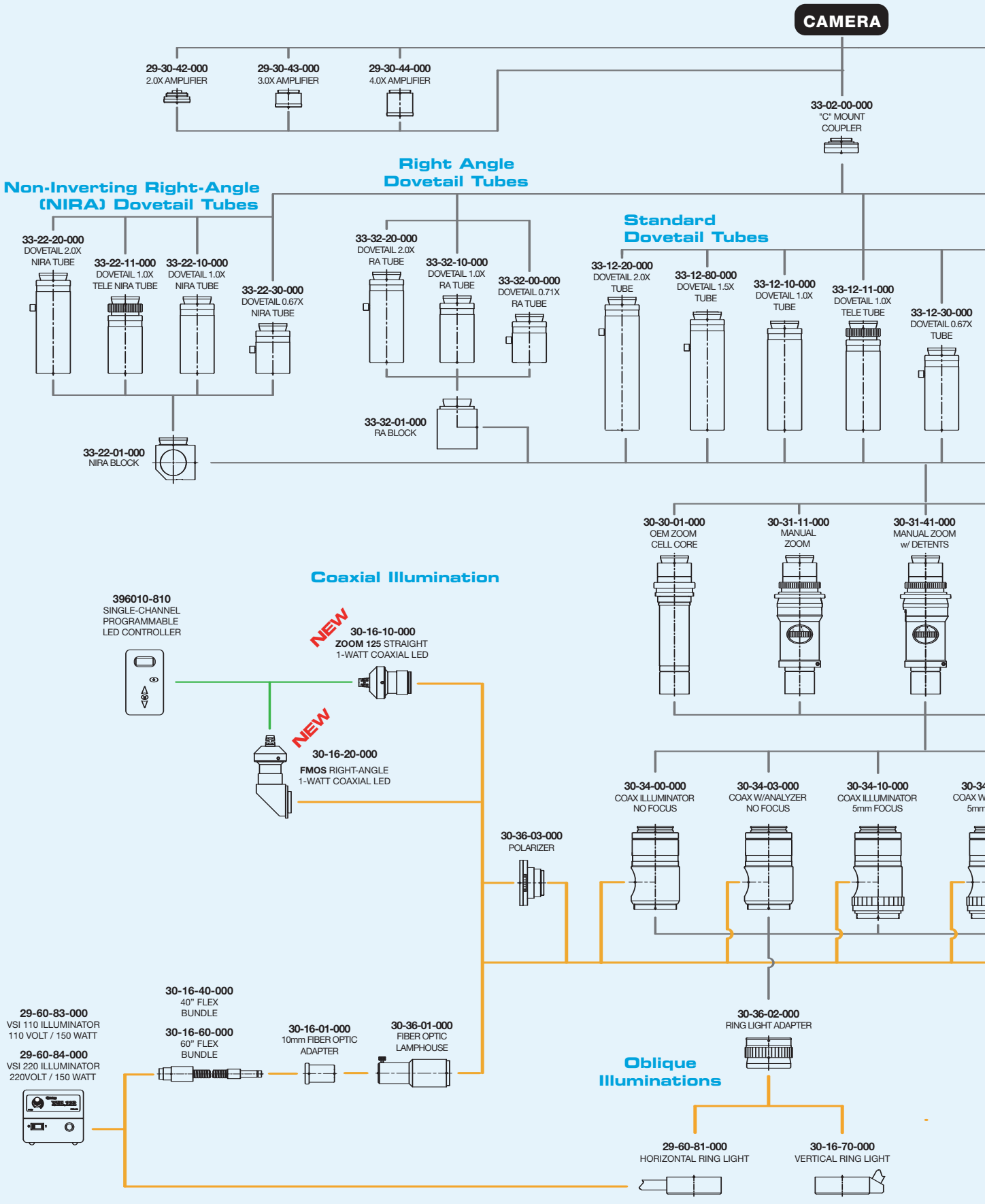
Motorized Zoom 160s cannot be mounted by the external flange due to interference of the motors. Instead, they may be clamped on the Dovetail Tubes with a Tube Clamp or Flat Mount.

Flat Mounting Zoom 160

The Zoom 160 can be securely mounted to a flat surface by utilizing the Zoom Flat Mount (as shown below). Simply locate the pre-tapped holes on the Zoom 160 outer housing and match them to the holes on the Zoom Flat Mount. Flat Mounting the Zoom 160 maximizes stability and improves image quality in applications that are susceptible to vibration.



For all part numbers, ordering information and configuration options, refer to the System Diagram (p. 6-7), or visit the Zoom 160 section of our web site.


CAMERA
29-30-42-000
2.0X AMPLIFIER
29-30-43-000
3.0X AMPLIFIER
29-30-44-000
4.0X AMPLIFIER
33-02-00-000
"C" MOUNT
COUPLER
Non-Inverting Right-Angle
(NIRA) Dovetail Tubes
Right Angle
Dovetail Tubes
Standard
Dovetail Tubes
33-22-20-000
DOVETAIL 2.0X
NIRA TUBE
33-22-11-000
DOVETAIL 1.0X
TELE NIRA TUBE
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DOVETAIL 1.0X
NIRA TUBE
33-22-30-000
DOVETAIL 0.67X
NIRA TUBE
33-22-01-000
NIRA BLOCK
33-32-20-000
DOVETAIL 2.0X
RA TUBE
33-32-10-000
DOVETAIL 1.0X
RA TUBE
33-32-00-000
DOVETAIL 0.71X
RA TUBE
33-32-01-000
RA BLOCK
33-12-20-000
DOVETAIL 2.0X
TUBE
33-12-80-000
DOVETAIL 1.5X
TUBE
33-12-10-000
DOVETAIL 1.0X
TUBE
33-12-11-000
DOVETAIL 1.0X
TELE TUBE
33-12-30-000
DOVETAIL 0.67X
TUBE
30-30-01-000
OEM ZOOM
CELL CORE
30-31-11-000
MANUAL
ZOOM
30-31-41-000
MANUAL ZOOM
w/ DETENTS
Coaxial Illumination
396010-810
SINGLE-CHANNEL
PROGRAMMABLE
LED CONTROLLER
NEW
30-16-10-000
ZOOM 125 STRAIGHT
1-WATT COAXIAL LED
NEW
30-16-20-000
FMOS RIGHT-ANGLE
1-WATT COAXIAL LED
30-34-00-000
COAX ILLUMINATOR
NO FOCUS
30-34-03-000
COAX W/ANALYZER
NO FOCUS
30-34-10-000
COAX ILLUMINATOR
5mm FOCUS
30-36-03-000
POLARIZER
30-16-40-000
40" FLEX
BUNDLE
29-60-83-000
VSI 110 ILLUMINATOR
110 VOLT / 150 WATT
30-16-60-000
60" FLEX
BUNDLE
30-16-01-000
10mm FIBER OPTIC
ADAPTER
30-36-01-000
FIBER OPTIC
LAMPHOUSE
29-60-84-000
VSI 220 ILLUMINATOR
220VOLT / 150 WATT
30-36-02-000
RING LIGHT ADAPTER
Oblique
Illuminations
29-60-81-000
HORIZONTAL RING LIGHT
30-16-70-000
VERTICAL RING LIGHT

Bayonet Adapters

33-02-02-000
1/2" STANDARD

33-02-04-000
1/2" SONY BAYONET

33-02-02-000
2/3" ENG BAYONET

33-02-01-000
"C" MOUNT SPACER

33-02-00-000
"C" MOUNT COUPLER

Manual Mounting

30-35-76-000
76mm O.D.
FLANGE MOUNT
(OLYMPUS, NIKON & LEICA)

30-35-82-000
82mm O.D.
FLANGE MOUNT (UNITRON)

30-35-83-000
83mm O.D.
FLANGE MOUNT

30-35-84-000
84mm O.D.
FLANGE MOUNT (MEIJI)

30-35-00-000
FLANGE FLAT MOUNT

(Manual Zooms ONLY)

Motorized Mounting

30-45-06-000
76mm O.D.
TUBE CLAMP

30-45-02-000
82mm O.D.
TUBE CLAMP

30-45-03-000
83mm O.D.
TUBE CLAMP

30-45-04-000
84mm O.D.
TUBE CLAMP

30-35-34-000
MOTOR FLAT MOUNT

(Motorized Zooms ONLY)

Short and Mini Dovetail Tubes

33-12-40-000
DOVETAIL 0.5X TUBE

33-12-50-000
DOVETAIL 0.38X TUBE

33-42-20-000
DOVETAIL 2.0X SHORT TUBE

33-42-10-000
DOVETAIL 1.0X SHORT TUBE

33-42-11-000
DOVETAIL 1.0X MINI TUBE

33-22-11-000
DOVETAIL 1.0X TELE NIRA TUBE

Upper Zoom Modules

30-31-21-000
DC-MOTORIZED ZOOM

30-31-37-000
STEPPER-MOTORIZED ZOOM
ZOOM w/ HALL EFFECT SENSORS

Motor Controls & Power Supply

STEPPER MOTOR

30-17-70-000
STEPPING MOTOR DRIVER

30-17-74-000
HALL EFFECT SENSOR JUNCTION BOX

30-17-75-000
STEPPING MOTOR O.E.M. BOARD

30-17-31-000
UNIV. TRANSFORMER
(100-240V, 50-60Hz)

30-70-01-000
(N. AMER CORD)

30-17-36-000
(EUR CORD)

30-17-33-000
(UK CORD)

DC MOTOR

28-80-18-000
110V TRANSFORMER

28-80-19-000
220V TRANSFORMER

30-17-20-000
DC MOTOR DRIVER

Lower Function Modules

-13-000
/ANALYZER
FOCUS

30-34-20-000
COAX ILLUMINATOR
DC MOTORIZED FOCUS

30-34-23-000
COAX W/ANALYZER
DC MOTORIZED FOCUS

30-34-37-000
COAX ILLUMINATOR
STEPPING MOTORIZED FOCUS
HALL EFFECT SENSOR

30-34-38-000
COAX W/ANALYZER
STEPPING MOTORIZED FOCUS
HALL EFFECT SENSOR

30-33-10-000
15mm FINE FOCUS
MANUAL

30-33-20-000
15mm FINE FOCUS
DC MOTOR

30-33-37-000
15mm FINE FOCUS
STEPPING MOTOR
HALL EFFECT SENSOR

30-32-00-000
BASIC LOWER MODULE

Magnification Accessories

30-37-34-000
2.0X LENS

30-37-32-000
1.5X LENS

30-37-31-000
1.0X LENS

30-37-30-000
0.75X LENS

30-37-29-000
0.5X LENS

30-37-28-000
0.25X LENS

30-36-04-000
1/4 WAVE PLATE

ZOOM 160 SYSTEM DIAGRAM

For an online archive of nominal component dimensions, downloadable schematics, and optical performance specifications, visit the Zoom 160 Section of our web site.

ZOOM 160 SPECIFICATIONS

Substage/Ringlight Illumination Zoom 160 Optical Performance Matrix

		0.375X TV Tube		0.5X TV Tube		0.67X TV Tube		1.0X TV Tube		1.5X TV Tube		2.0X TV Tube	
		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.25X Aux Lens 30-37-28-000 WD: 310 mm	NA	0.0022	0.038	0.0022	0.038	0.0022	0.038	0.0022	0.038	0.0022	0.038	0.0022	0.038
	Res (lp/mm)	7	114	7	114	7	114	7	114	7	114	7	114
	Mag	0.047	0.75	0.063	1.0	0.084	1.3	0.13	2.0	0.19	3.0	0.25	4.0
	DOF	117	0.39	117	0.39	117	0.39	117	0.39	117	0.39	117	0.39
	FOV Cam Format 1/4"	58.88 x 78.51	3.68 x 4.91	44.16 x 58.88	2.76 x 3.68	32.96 x 43.94	2.06 x 2.75	22.08 x 29.44	1.38 x 1.84	14.72 x 19.63	0.92 x 1.23	11.04 x 14.72	0.69 x 0.92
	1/3"	54.86 x 73.14	4.80 x 6.40	57.60 x 76.80	3.60 x 4.80	42.99 x 57.31	2.69 x 3.58	28.80 x 38.40	1.80 x 2.40	19.20 x 25.60	1.20 x 1.60	14.40 x 19.20	0.90 x 1.20
	1/2"	-- x --	-- x --	54.86 x 73.14	4.80 x 6.40	57.31 x 76.42	3.58 x 4.78	38.40 x 51.20	2.40 x 3.20	25.60 x 34.13	1.60 x 2.13	19.20 x 25.60	1.20 x 1.60
	2/3"	-- x --	-- x --	-- x --	-- x --	49.25 x 65.67	4.93 x 6.57	52.80 x 70.40	3.30 x 4.40	35.20 x 46.93	2.20 x 2.93	26.40 x 35.20	1.65 x 2.20
	1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	54.86 x 73.14	4.80 x 6.40	51.20 x 68.27	3.20 x 4.27	38.40 x 51.20	2.40 x 3.20
0.5X Aux Lens 30-37-29-000 WD: 178 mm	NA	0.0045	0.076	0.0045	0.076	0.0045	0.076	0.0045	0.076	0.0045	0.076	0.0045	0.076
	Res (lp/mm)	14	228	14	228	14	228	14	228	14	228	14	228
	Mag	0.094	1.5	0.13	2	0.17	2.7	0.25	4	0.38	6	0.50	8
	DOF	28	0.00	28	0.0010	28	0.0010	28	0.0010	28	0.0010	28	0.0010
	FOV Cam Format 1/4"	29.44 x 39.25	1.84 x 2.45	22.08 x 29.44	1.38 x 1.84	16.48 x 21.97	1.03 x 1.37	11.04 x 14.72	0.69 x 0.92	7.36 x 9.81	0.46 x 0.61	5.52 x 7.36	0.35 x 0.46
	1/3"	27.43 x 36.57	2.40 x 3.20	28.80 x 38.40	1.80 x 2.40	21.49 x 28.66	1.34 x 1.79	14.40 x 19.20	0.90 x 1.20	9.60 x 12.80	0.60 x 0.80	7.20 x 9.60	0.45 x 0.60
	1/2"	-- x --	-- x --	27.43 x 36.57	2.40 x 3.20	28.66 x 38.21	1.79 x 2.39	19.20 x 25.60	1.20 x 1.60	12.80 x 17.07	0.80 x 1.07	9.60 x 12.80	0.60 x 0.80
	2/3"	-- x --	-- x --	-- x --	-- x --	24.63 x 32.84	2.46 x 3.28	26.40 x 35.20	1.65 x 2.20	17.60 x 23.47	1.10 x 1.47	13.20 x 17.60	0.83 x 1.10
	1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	27.43 x 36.57	2.40 x 3.20	25.60 x 34.13	1.60 x 2.13	19.20 x 25.60	1.20 x 1.60
0.75X Aux Lens 30-37-30-000 WD: 114 mm	NA	0.0068	0.11	0.0068	0.11	0.0068	0.11	0.0068	0.11	0.0068	0.11	0.0068	0.11
	Res (lp/mm)	20	330	20	330	20	330	20	330	20	330	20	330
	Mag	0.14	2.3	0.19	3.1	0.25	4.1	0.37	6.1	0.56	9.2	0.75	12.3
	DOF	12.3	0.047	12.3	0.047	12.3	0.047	12.3	0.047	12.3	0.047	12.3	0.047
	FOV Cam Format 1/4"	19.63 x 26.17	1.20 x 1.60	14.72 x 19.63	0.90 x 1.20	10.99 x 14.65	0.67 x 0.90	7.36 x 9.81	0.45 x 0.60	4.91 x 6.54	0.30 x 0.40	3.68 x 4.91	0.23 x 0.30
	1/3"	18.29 x 24.38	1.57 x 2.09	19.20 x 25.60	1.17 x 1.57	14.33 x 19.10	0.88 x 1.17	9.60 x 12.80	0.59 x 0.78	6.40 x 8.53	0.39 x 0.52	4.80 x 6.40	0.29 x 0.39
	1/2"	-- x --	-- x --	18.29 x 24.38	1.57 x 2.09	19.10 x 25.47	1.17 x 1.56	12.80 x 17.07	0.78 x 1.04	8.53 x 11.38	0.52 x 0.70	6.40 x 8.53	0.39 x 0.52
	2/3"	-- x --	-- x --	-- x --	-- x --	16.42 x 21.89	1.61 x 2.14	17.60 x 23.47	1.08 x 1.43	11.73 x 15.64	0.72 x 0.96	8.80 x 11.73	0.54 x 0.72
	1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	18.29 x 24.38	1.57 x 2.09	17.07 x 22.76	1.04 x 1.39	12.80 x 17.07	0.78 x 1.04
1.0X Aux Lens 30-37-31-000 WD: 89 mm	NA	0.0090	0.15	0.0090	0.15	0.0090	0.15	0.0090	0.15	0.0090	0.15	0.0090	0.15
	Res (lp/mm)	27	450	27	450	27	450	27	450	27	450	27	450
	Mag	0.190	3	0.25	4	0.34	5.4	0.51	8	0.76	12	1.01	16
	DOF	7.0	0.025	7.0	0.025	7.0	0.025	7.0	0.025	7.0	0.025	7.0	0.025
	FOV Cam Format 1/4"	14.72 x 19.63	0.92 x 1.23	11.04 x 14.72	0.69 x 0.92	8.24 x 10.99	0.51 x 0.69	5.52 x 7.36	0.35 x 0.46	3.68 x 4.91	0.23 x 0.31	2.76 x 3.68	0.17 x 0.23
	1/3"	13.71 x 18.29	1.20 x 1.60	14.40 x 19.20	0.90 x 1.20	10.75 x 14.33	0.67 x 0.90	7.20 x 9.60	0.45 x 0.60	4.80 x 6.40	0.30 x 0.40	3.60 x 4.80	0.23 x 0.30
	1/2"	-- x --	-- x --	13.71 x 18.29	1.20 x 1.60	14.33 x 19.10	0.90 x 1.19	9.60 x 12.80	0.60 x 0.80	6.40 x 8.53	0.40 x 0.53	4.80 x 6.40	0.30 x 0.40
	2/3"	-- x --	-- x --	-- x --	-- x --	12.31 x 16.42	1.23 x 1.64	13.20 x 17.60	0.83 x 1.10	8.80 x 11.73	0.55 x 0.73	6.60 x 8.80	0.41 x 0.55
	1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	13.71 x 18.29	1.20 x 1.60	12.80 x 17.07	0.80 x 1.07	9.60 x 12.80	0.60 x 0.80
1.5X Aux Lens 30-37-32-000 WD: 52 mm	NA	0.014	0.23	0.014	0.23	0.014	0.23	0.014	0.23	0.014	0.23	0.014	0.23
	Res (lp/mm)	42	690	42	690	42	690	42	690	42	690	42	690
	Mag	0.28	4.5	0.37	6	0.50	8	0.75	12	1.1	18	1.5	24
	DOF	2.9	0.011	2.9	0.011	2.9	0.011	2.9	0.011	2.9	0.011	2.9	0.011
	FOV Cam Format 1/4"	9.81 x 13.08	0.61 x 0.82	7.36 x 9.81	0.46 x 0.61	5.49 x 7.32	0.34 x 0.46	3.68 x 4.91	0.23 x 0.31	2.45 x 3.27	0.15 x 0.20	1.84 x 2.45	0.12 x 0.15
	1/3"	9.14 x 12.19	0.80 x 1.07	9.60 x 12.80	0.60 x 0.80	7.16 x 9.55	0.45 x 0.60	4.80 x 6.40	0.30 x 0.40	3.20 x 4.27	0.20 x 0.27	2.40 x 3.20	0.15 x 0.20
	1/2"	-- x --	-- x --	9.14 x 12.19	0.80 x 1.07	9.55 x 12.74	0.60 x 0.80	6.40 x 8.53	0.40 x 0.53	4.27 x 5.69	0.27 x 0.36	3.20 x 4.27	0.20 x 0.27
	2/3"	-- x --	-- x --	-- x --	-- x --	8.21 x 10.95	0.82 x 1.09	8.80 x 11.73	0.55 x 0.73	5.87 x 7.82	0.37 x 0.49	4.40 x 5.87	0.28 x 0.37
	1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	9.14 x 12.19	0.80 x 1.07	8.53 x 11.38	0.53 x 0.71	6.40 x 8.53	0.40 x 0.53
2.0X Aux Lens 30-37-34-000 WD: 32 mm	NA	0.018	0.30	0.018	0.30	0.018	0.30	0.018	0.30	0.018	0.30	0.018	0.30
	Res (lp/mm)	54	900	54	900	54	900	54	900	54	900	54	900
	Mag	0.38	6	0.51	8	0.68	11	1.0	16	1.5	24	2.0	32
	DOF	1.75	0.0063	1.75	0.0063	1.75	0.0063	1.75	0.0063	1.75	0.0063	1.75	0.0063
	FOV Cam Format 1/4"	5.26 x 7.01	0.46 x 0.61	5.52 x 7.36	0.35 x 0.46	4.12 x 5.49	0.26 x 0.34	2.76 x 3.68	0.17 x 0.23	1.84 x 2.45	0.12 x 0.15	1.38 x 1.84	0.09 x 0.12
	1/3"	3.20 x 4.27	0.60 x 0.80	5.14 x 6.86	0.45 x 0.60	5.37 x 7.16	0.34 x 0.45	3.60 x 4.80	0.23 x 0.30	2.40 x 3.20	0.15 x 0.20	1.80 x 2.40	0.11 x 0.15
	1/2"	-- x --	-- x --	3.20 x 4.27	0.60 x 0.80	5.12 x 6.82	0.45 x 0.60	4.80 x 6.40	0.30 x 0.40	3.20 x 4.27	0.20 x 0.27	2.40 x 3.20	0.15 x 0.20
	2/3"	-- x --	-- x --	-- x --	-- x --	2.74 x 3.65	0.62 x 0.82	5.50 x 7.33	0.41 x 0.55	4.40 x 5.87	0.28 x 0.37	3.30 x 4.40	0.21 x 0.28
	1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	3.20 x 4.27	0.60 x 0.80	5.33 x 7.11	0.40 x 0.53	4.80 x 6.40	0.30 x 0.40

– Limited vignetting at low magnifications

– Configuration not recommended

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ISO 9001:2000

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