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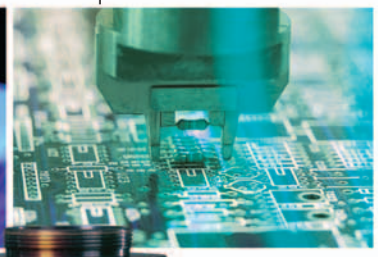
OPTEM

OPTICAL LENS SYSTEMS

INSPECTION | MACHINE VISION | RESEARCH









OPTEM ZOOM 70XL

7:1 OPTICAL SYSTEM

EXCEPTIONAL RELIABILITY

250,000 Zoom Cycles Guaranteed

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Table of Contents

New Features 2
How to Specify.....3
Upper Zoom Modules 3
Lower Function Modules 3
Illumination Options 4
Motorization Options.....4
Magnification Options 4
Coaxial Performance 5
System Diagram.....6
Oblique Performance 8



OPTOMECHANICAL RELIABILITY

The Zoom 70XL is specifically designed to stand up to the grueling conditions of today's automated imaging.

"XL" Stands For Xtended Life



Backed by superior engineering and only the highest-quality components and materials, the Optem™ Zoom 70XL delivers a guaranteed 250,000 cycles without mechanical failure! This robust reliability makes the Zoom 70XL the ideal solution for demanding and mission critical applications.

Zoom 70XL Specs

Zoom Range	7:1
Magnification Range	0.75 – 5.25X
Resolution	72 – 240 lp/mm
Numerical Aperture	0.0240 – 0.080
Depth-of-Field	0.98 – 0.09 mm
Field-of-View (Low-Mag.)	6.40 x 8.53 mm
Field-of-View (High-Mag.)	0.91 x 1.22 mm
Working Distance	89 mm

Nominal 1X/1X Configuration with 1/2" Camera

NEW FOR ZOOM 70XL

NEW LED Coaxial Illuminators

Programmable 1-Watt white-light Coaxial LED Illuminators feature compact design and lightweight cable for streamlined OEM integration. PAGE 4

NEW Dual-Magnification Accessory

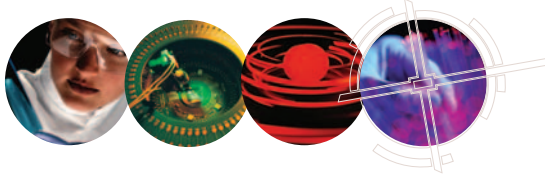
Now you can simultaneously integrate two upper lens modules with independent cameras over the same subject. Mix and match Zoom 70 and FMOS upper modules for added versatility. PAGE 4

NEW Long-Working Right Angle Module

Integrate a 90° turn in the optical path above the Lower Function Module. Unlike the below system right-angle adapter, this unique accessory affords configuration flexibility to integrate all lower functions without sacrificing any working distance. PAGE 4

NEW Optem M-Plan APO Objectives

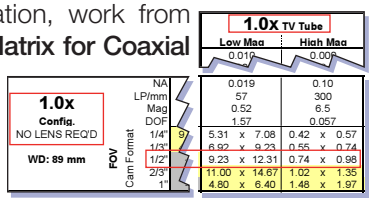
Get the most from your high magnification imaging. Specify the newly expanded line of Optem Long-Working Distance Objectives, including the new M-Plan APO family for exceptional color accuracy and field-flatness. PAGE 4



HOW TO SPECIFY YOUR ZOOM 70XL LENS SYSTEM

Follow the seven easy steps below to configure the Zoom 70XL Lens System that meets your optical, functional and physical configuration needs.

1 Referring to the **Optical Performance Matrix for Substage or Oblique Illumination** on the back cover, locate your desired performance parameters *(typically field-of-view at high- and low-end zoom as relates to your intended camera format 1/4" – 1")*. If you desire coaxial illumination, work from the **Optical Performance Matrix for Coaxial illumination.** PAGE 5



2 Cross reference your desired performance block and note the **TV Tube magnification** *(TOP axis)* and **Auxiliary Lens magnification** *(LEFT axis)* to arrive at the combination of magnification components needed to yield your desired field-of-view [FOV]... consider the varying resolution, depth of field and/or working distance factors that are dictated by the magnification components.

3 Once you have determined the **TV Tube** and **Auxiliary Lens magnifications** required, navigate down through the System Diagram (PAGE 6-7) starting from the camera. Select the physical shape of TV Tube and/or camera mount type desired.

4 Select the **Upper Zoom Module** with the functional features you require... Manual, Iris, detent and DC or Stepper motorized Zoom options are available.

5 Combine the Upper Zoom Module with one of the **Lower Function Modules** that incorporates manual or motorized fine focus and/or coaxial illumination options. If you have chosen both motorized zoom and focus, the compact frame constraints of Zoom 70Xl require that you order a Dual-Motorized Non-Modular Zoom 70XL (see System Diagram) PAGE 6-7

6 Now Specify the correct **Auxiliary Lens magnification** to complete the optical components of your Zoom 70XL Lens System as dictated in step 1 above. By default, the Zoom 70XL yields a 1X configuration without an Auxiliary Lens.

7 Finally outfit your Zoom 70XL Lens System with the appropriate **Coaxial** or **Ringlight Illumination accessories**. If you chose motorized zoom or focus functions, select the appropriate **DC or Stepper controller and power supply**. You may also wish to specify **mounting hardware** to ease integration.

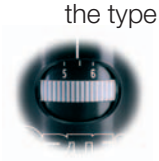


Components of Functional Zoom 70XL

- TV Tube (Top Magnification)
- Upper Zoom Module
- Lower Function Module
- Auxiliary Lens (Bottom Magnification)

UPPER ZOOM MODULES

The specific Upper Zoom Module selected will determine the type of zoom operation for your Zoom 70XL System.



Manual Module – Provides basic hand-driven 7:1 zoom function.



Iris Diaphragm Module – Provides manual 7:1 zoom while also allowing better illumination control. With Iris, you can increase depth-of-field and/or maintain more consistent image brightness across your entire field.



Detent Module – Obtain specific and repeatable magnification stops throughout the 7:1 zoom range without the complexity and cost of motorization. Detents are ideal for metrology applications where each position can be calibrated.



Motorized Zoom Module – Provides programmable automated zoom in either DC or Stepper Motorized Versions. All Stepper Motorized Models come complete with programmable homing sensors.

LOWER FUNCTION MODULES

When configuring your Zoom 70XL Lens System, you may choose between the following Manual or motorized Lower Function Module options:

- Standard Module
- Internal Focus Module
- Coaxial Illumination Module
- Internal Focus with Coaxial Module

Variable Working Distance Auxiliary Lens - Intended for applications requiring working distances between 127mm (5") and 432mm (17"). Covers magnification factors 0.288X at 127mm, and 0.109X at 432mm. *See "Variable Working Distance Auxiliary Lens" Chart available as a download at www.qioptiqimaging.com.*



Objective Modules - Incorporate Infinity-Corrected Objectives utilizing one of four Objective Lower Function Modules. All are equipped with M26 x 36T threads to accept Optem and Mitutoyo Objectives. An RMS thread adapter is available for use with Nikon and Olympus Objectives.

DUAL MOTORIZED NON-MODULAR MODELS



With it's extremely space efficient design, the Zoom 70XL must be ordered in a non-modular configuration when both motorized zoom and focus functions are desired. Select from four single-bodied Dual-Motorized Zoom 70XLs in either DC or Stepper motorization with various illumination options.



ILLUMINATION OPTIONS

The Zoom 70XL Lens System offers a variety of illumination options to meet a variety of imaging requirements.

LED Coaxial Illuminators – Compatible with all Zoom 70XL Coaxial Lower Function Modules, new Programmable 1-Watt LED Coaxial illuminators offer reduced power requirement and heat generation with substantial service life gains.



NEW Available in Straight and Right-angle configurations, Optem Coaxial LEDs feature compact designs and simplified cable management. 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 illuminator.

Fiber Optic Coaxial Illuminators – Available with 40 and 60-inch flexible fiber bundles powered by 110V or 220V Optem VSI Fiber Optic Illuminators.

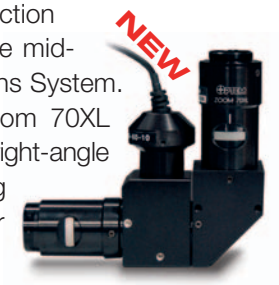
Polarized Light – When imaging highly reflective subjects, Polarizer Modules with built-in Analyzers are available to introduce polarization to both LED and Fiber Optic Coaxial Illumination paths.

Fiber Optic Ring Lights – Oblique ringlight Illumination is ideal to better define features of dimension-rich subjects. Driven with the same VSI Fiber Optic Illuminator as conventional coaxial systems, Optem Ringlights feature optional horizontal, vertical and Objective configurations.

CONFIGURATION ACCESSORIES

Extend the versatility of your Zoom 70XL Lens System with two new innovations in form and function.

Long-Working, Right-Angle Module – This accessory allows the introduction of a 90° of your optical axis at the mid-body point of your Zoom 70XL Lens System. Users can now integrate any Zoom 70XL Lower Function Module below the right-angle turn maintaining full working distance and affording greater configuration flexibility.



NEW



NEW **Dual-Magnification Module** – Simultaneously integrate two Zoom 70 or Optem FMOS upper modules over one subject. Mix and match fixed and zoom magnifications, camera types/formats. Choose from the full range of Zoom 70XL Lower Function Modules or integrate compact Coaxial illumination through the coaxial block.

MOTORIZING ZOOM 70XL



The Zoom 70XL Optical System can be specified with motorized zoom and/or focus functions.

Stepper Motor Models – Stepper Motors feature Hall-Effect Sensors to ensure pinpoint mechanical accuracy and repeatability. Control and power are easily integrated through RS232 serial port interface with a Rocker Switch controller and Windows GUI. An OEM Board is available for more streamlined OEM integration.. A Stepper Motor VI library is available for LabVIEW.



DC Motor Models



DC Motors allow continuous movement throughout either the zoom or focus range. Two RS232 Serial ports in the back of the joystick DC Motor Controller accept both zoom and focus motorized functions.

OPTEM LONG-WORKING DISTANCE OBJECTIVES

NEW Achieve significantly higher magnifications and increased resolution. Combine your Zoom 70XL with the expanded line of Optem infinity-corrected objectives.



Optem M-Plan APO – Eliminate Chromatic aberration across exceptionally flat fields for the ultimate in high-magnification accuracy. Select from 2X, 5X, 10X, 20X and 50X Long-Working Distance Objectives. These objectives are exact replacements for Mitutoyo 378 series objectives and are ideal for metrology applications.



Optem High-Resolution – Specifically designed to capture maximum resolution at the high-end magnifications of Optem Zoom Lenses, the 5X, 10X and 20X Optem HR Objectives are ideal for applications where distinguishing every finite detail is critical.

Coaxial Illumination Zoom 70XL Optical Performance Matrix

NOTE: 0.18x, 0.25x and 0.5x Aux Lenses NOT recommended w/ coax illumination

			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
0.75X Aux Lens 29-20-39-000 **WD: 114 mm**		NA	0.018	0.060	0.018	0.060	0.018	0.060	0.018	0.060	0.018	0.060	0.018	0.060
		LP/mm	54	180	54	180	54	180	54	180	54	180	54	180
		Mag	0.21	1.47	0.28	1.96	0.38	2.66	0.56	3.92	0.85	5.95	1.10	7.70
		DOF	1.75	0.16	1.75	0.16	1.75	0.16	1.75	0.16	1.75	0.16	1.75	0.16
	FOV Cam Format	1/4"	7.70 x 10.26	1.88 x 2.50	7.01 x 9.35	1.41 x 1.88	6.10 x 8.14	1.04 x 1.38	4.91 x 6.54	0.70 x 0.94	3.27 x 4.36	0.46 x 0.62	2.45 x 3.27	0.36 x 0.48
		1/3"	7.76 x 10.34	2.45 x 3.27	8.00 x 10.67	1.84 x 2.45	6.82 x 9.10	1.35 x 1.80	5.82 x 7.76	0.92 x 1.22	4.27 x 5.69	0.61 x 0.81	3.20 x 4.27	0.47 x 0.62
		1/2"	-- x --	-- x --	7.76 x 10.34	2.45 x 3.27	7.96 x 10.61	1.80 x 2.41	6.56 x 8.75	1.22 x 1.63	5.17 x 6.90	0.81 x 1.08	4.27 x 5.69	0.62 x 0.83
		2/3"	-- x --	-- x --	-- x --	-- x --	7.96 x 10.61	2.48 x 3.31	7.82 x 10.43	1.68 x 2.24	6.52 x 8.69	1.11 x 1.48	5.33 x 7.11	0.86 x 1.14
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	7.76 x 10.34	2.45 x 3.27	7.59 x ####	1.61 x 2.15	6.56 x 8.75	1.25 x 1.66
1.0X Config. NO LENS REQ'D **WD: 89 mm**		NA	0.024	0.080	0.024	0.080	0.024	0.080	0.024	0.080	0.024	0.080	0.024	0.080
		LP/mm	72	240	72	240	72	240	72	240	72	240	72	240
		Mag	0.29	2.03	0.38	2.66	0.50	3.50	0.75	5.25	1.10	7.70	1.50	10.50
		DOF	0.98	0.089	0.98	0.089	0.98	0.089	0.98	0.089	0.98	0.089	0.98	0.089
	FOV Cam Format	1/4"	8.18 x 10.90	1.36 x 1.81	7.36 x 9.81	1.04 x 1.38	5.49 x 7.32	0.79 x 1.05	3.68 x 4.91	0.53 x 0.70	2.45 x 3.27	0.36 x 0.48	1.84 x 2.45	0.26 x 0.35
		1/3"	6.74 x 8.98	1.77 x 2.36	8.73 x 11.64	1.35 x 1.80	7.16 x 9.55	1.03 x 1.37	4.80 x 6.40	0.69 x 0.91	3.20 x 4.27	0.47 x 0.62	2.40 x 3.20	0.34 x 0.46
		1/2"	-- x --	-- x --	6.74 x 8.98	1.80 x 2.41	8.68 x 11.58	1.37 x 1.83	6.40 x 8.53	0.91 x 1.22	4.27 x 5.69	0.62 x 0.83	3.20 x 4.27	0.46 x 0.61
		2/3"	-- x --	-- x --	-- x --	-- x --	6.57 x 8.76	1.89 x 2.51	8.80 x 11.73	1.26 x 1.68	5.87 x 7.82	0.86 x 1.14	4.40 x 5.87	0.63 x 0.84
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	6.74 x 8.98	1.83 x 2.44	8.53 x ####	1.25 x 1.66	6.40 x 8.53	0.91 x 1.22
1.5X Aux Lens 29-20-40-000 **WD: 52 mm**		NA	0.036	0.12	0.036	0.12	0.036	0.12	0.036	0.12	0.036	0.12	0.036	0.12
		LP/mm	108	360	108	360	108	360	108	360	108	360	108	360
		Mag	0.43	3.00	0.56	3.90	0.75	5.25	1.10	7.70	1.70	11.90	2.30	16.10
		DOF	0.44	0.039	0.44	0.039	0.44	0.039	0.44	0.039	0.44	0.039	0.44	0.039
	FOV Cam Format	1/4"	5.03 x 6.71	0.92 x 1.23	4.91 x 6.54	0.71 x 0.94	3.66 x 4.88	0.53 x 0.70	2.45 x 3.27	0.36 x 0.48	1.64 x 2.18	0.23 x 0.31	1.23 x 1.64	0.17 x 0.23
		1/3"	4.06 x 5.42	1.20 x 1.60	4.92 x 6.56	0.92 x 1.23	4.78 x 6.37	0.69 x 0.91	3.20 x 4.27	0.47 x 0.62	2.13 x 2.84	0.30 x 0.40	1.60 x 2.13	0.22 x 0.30
		1/2"	-- x --	-- x --	4.06 x 5.42	1.23 x 1.64	4.90 x 6.53	0.91 x 1.22	4.27 x 5.69	0.62 x 0.83	2.84 x 3.79	0.40 x 0.54	2.13 x 2.84	0.30 x 0.40
		2/3"	-- x --	-- x --	-- x --	-- x --	3.98 x 5.31	1.26 x 1.68	5.33 x 7.11	0.86 x 1.14	3.91 x 5.21	0.55 x 0.74	2.93 x 3.91	0.41 x 0.55
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	4.06 x 5.42	1.25 x 1.66	5.69 x 7.59	0.81 x 1.08	4.27 x 5.69	0.60 x 0.80
2.0X Aux Lens 29-20-41-000 **WD: 32 mm**		NA	0.048	0.16	0.048	0.16	0.048	0.16	0.048	0.16	0.048	0.16	0.048	0.16
		LP/mm	144	480	144	480	144	480	144	480	144	480	144	480
		Mag	0.57	3.99	0.75	5.25	1.00	7.00	1.50	10.50	2.30	16.10	3.00	21.00
		DOF	0.25	0.022	0.25	0.022	0.25	0.022	0.25	0.022	0.25	0.022	0.25	0.022
	FOV Cam Format	1/4"	2.34 x 3.12	0.69 x 0.92	2.45 x 3.27	0.53 x 0.70	2.50 x 3.33	0.39 x 0.53	1.84 x 2.45	0.26 x 0.35	1.23 x 1.64	0.17 x 0.23	0.92 x 1.23	0.13 x 0.18
		1/3"	2.06 x 2.75	0.90 x 1.20	2.29 x 3.05	0.69 x 0.91	2.39 x 3.18	0.51 x 0.69	2.40 x 3.20	0.34 x 0.46	1.60 x 2.13	0.22 x 0.30	1.20 x 1.60	0.17 x 0.23
		1/2"	-- x --	-- x --	-- x --	-- x --	2.27 x 3.03	0.69 x 0.91	2.46 x 3.28	0.46 x 0.61	2.13 x 2.84	0.30 x 0.40	1.60 x 2.13	0.23 x 0.30
		2/3"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	2.32 x 3.09	0.63 x 0.84	2.67 x 3.56	0.41 x 0.55	2.20 x 2.93	0.31 x 0.42
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	2.37 x 3.16	0.60 x 0.80	2.46 x 3.28	0.46 x 0.61
OPTEM Infinity-Corrected Objectives														
OPTEM 2X M Plan Apo 28-21-02-000 **WD: 34 mm**		NA	0.020	0.060	0.020	0.060	0.020	0.060	0.020	0.060	0.020	0.060	0.020	0.060
		LP/mm	60	180	60	180	60	180	60	180	60	180	60	180
		Mag	0.27	1.89	0.36	2.52	0.48	3.38	0.72	5.04	1.08	7.56	1.44	10.08
		DOF	1.01	0.19	1.01	0.19	1.01	0.19	1.01	0.19	1.01	0.19	1.01	0.19
	FOV Cam Format	1/4"	3.88 x 5.17	1.46 x 1.95	4.26 x 5.68	1.10 x 1.46	5.20 x 6.94	0.82 x 1.09	3.83 x 5.11	0.55 x 0.73	2.56 x 3.41	0.37 x 0.49	1.92 x 2.55	0.27 x 0.37
		1/3"	-- x --	-- x --	3.85 x 5.13	1.43 x 1.90	4.39 x 5.85	1.07 x 1.42	5.00 x 6.67	0.71 x 0.95	3.33 x 4.44	0.48 x 0.63	2.22 x 2.96	0.36 x 0.48
		1/2"	-- x --	-- x --	-- x --	-- x --	3.83 x 5.10	1.42 x 1.90	4.44 x 5.93	0.95 x 1.27	4.44 x 5.93	0.63 x 0.85	3.33 x 4.44	0.48 x 0.63
		2/3"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	3.99 x 5.31	1.31 x 1.75	4.70 x 6.27	0.87 x 1.16	4.58 x 6.11	0.65 x 0.87
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	4.04 x 5.39	1.27 x 1.69	4.44 x 5.93	0.95 x 1.27
OPTEM 5X M Plan Apo 28-21-05-000 **WD: 32 mm**		NA	0.06	0.14	0.06	0.14	0.06	0.14	0.06	0.14	0.06	0.14	0.06	0.14
		LP/mm	180	420	180	420	180	420	180	420	180	420	180	420
		Mag	0.68	4.88	0.89	6.41	1.19	8.60	1.78	12.83	2.66	19.24	3.55	25.66
		DOF	0.16	0.029	0.16	0.03	0.16	0.029	0.16	0.029	0.16	0.029	0.16	0.029
	FOV Cam Format	1/4"	2.24 x 2.99	0.57 x 0.75	2.56 x 3.41	0.43 x 0.57	2.29 x 3.05	0.32 x 0.43	1.53 x 2.04	0.22 x 0.29	1.02 x 1.36	0.14 x 0.19	0.77 x 1.02	0.11 x 0.14
		1/3"	1.88 x 2.51	0.74 x 0.98	2.22 x 2.96	0.56 x 0.75	2.71 x 3.62	0.42 x 0.56	2.00 x 2.67	0.28 x 0.37	1.33 x 1.78	0.19 x 0.25	0.89 x 1.19	0.14 x 0.19
		1/2"	-- x --	-- x --	1.84 x 2.45	0.75 x 1.00	2.34 x 3.12	0.56 x 0.74	2.05 x 2.74	0.37 x 0.50	1.78 x 2.37	0.25 x 0.33	1.33 x 1.78	0.19 x 0.25
		2/3"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	1.75 x 2.33	0.51 x 0.69	2.44 x 3.26	0.34 x 0.46	1.83 x 2.44	0.26 x 0.34
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	2.37 x 3.16	0.50 x 0.67	2.67 x 3.56	0.37 x 0.50
OPTEM 10X M Plan Apo 28-21-10-000 **WD: 33 mm**		NA	0.12	0.30	0.12	0.30	0.12	0.30	0.12	0.30	0.12	0.30	0.12	0.30
		LP/mm	343	867	343	867	343	867	343	867	343	867	343	867
		Mag	1.35	9.75	1.78	12.83	2.38	17.19	3.55	25.66	5.33	38.49	7.11	49.74
		DOF	0.040	0.0063	0.040	0.0063	0.040	0.0063	0.040	0.0063	0.040	0.0063	0.040	0.0063
	FOV Cam Format	1/4"	1.06 x 1.42	0.28 x 0.38	1.18 x 1.57	0.22 x 0.29	1.14 x 1.53	0.16 x 0.21	0.77 x 1.02	0.11 x 0.14	0.51 x 0.68	0.07 x 0.10	0.38 x 0.51	0.06 x 0.07
		1/3"	-- x --	-- x --	1.05 x 1.40	0.28 x 0.37	1.24 x 1.66	0.21 x 0.28	1.00 x 1.33	0.14 x 0.19	0.67 x 0.89	0.09 x 0.12	0.80 x 1.07	0.07 x 0.10
		1/2"	-- x --	-- x --	-- x --	-- x --	1.11 x 1.47	0.28 x 0.37	1.03 x 1.37	0.19 x 0.25	0.89 x 1.19	0.12 x 0.17	0.67 x 0.89	0.10 x 0.13
		2/3"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.92 x 1.22	0.26 x 0.34	1.22 x 1.63	0.17 x 0.23	0.92 x 1.22	0.13 x 0.18
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	1.11 x 1.48	0.25 x 0.33	1.33 x 1.78	0.19 x 0.26
OPTEM 20X M Plan Apo 28-21-11-000 **WD: 20 mm**		NA	0.24	0.39	0.24	0.39	0.24	0.39	0.24	0.39	0.24	0.39	0.24	0.39
		LP/mm	686	1128	686	1128	686	1128	686	1128	686	1128	686	1128
		Mag	2.70	19.50	3.55	25.66	4.76	34.38	7.11	51.32	10.66	76.97	14.21	99.47
		DOF	0.010	0.0037	0.010	0.0037	0.010	0.0037	0.010	0.0037	0.010	0.0037	0.010	0.0037
	FOV Cam Format	1/4"	0.48 x 0.64	0.14 x 0.19	0.51 x 0.68	0.11 x 0.14	0.57 x 0.76	0.08 x 0.11	0.38 x 0.51	0.05 x 0.07	0.26 x 0.34	0.04 x 0.05	0.19 x 0.26	0.028 x 0.037
		1/3"	-- x --	-- x --	0.48 x 0.63	0.14 x 0.19	0.50 x 0.66	0.10 x 0.14	0.45 x 0.61	0.07 x 0.09	0.33 x 0.44	0.05 x 0.06	0.33 x 0.44	0.036 x 0.048
		1/2"	-- x --	-- x --	-- x --	-- x --	0.47 x 0.63	0.14 x 0.19	0.42 x 0.56	0.09 x 0.12	0.44 x 0.59	0.06 x 0.08	0.33 x 0.44	0.048 x 0.064
		2/3"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.38 x 0.51	0.13 x 0.17	0.56 x 0.74	0.09 x 0.11	0.46 x 0.61	0.066 x 0.088
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.49 x 0.66	0.12 x 0.17	0.51 x 0.68	0.097 x 0.129
OPTEM 50X M Plan Apo 28-21-50-000 **WD: 13 mm**		NA	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
		LP/mm	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440	1440
		Mag	6.75	48.75	9.00	65.00	12.06	87.10	18.00	130.00	27.00	195.00	36.00	252.00
		DOF	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
	FOV Cam Format	1/4"	0.22 x 0.30	0.06 x 0.08	0.24 x 0.31	0.04 x 0.06	0.23 x 0.31	0.03 x 0.04	0.15 x 0.20	0.02 x 0.03	0.10 x 0.14	0.014 x 0.019	0.08 x 0.10	0.011 x 0.015
		1/3"	0.21 x 0.28	0.07 x 0.10	0.24 x 0.31	0.06 x 0.07	0.25 x 0.33	0.041 x 0.055	0.17 x 0.22	0.03 x 0.04	0.13 x 0.18	0.018 x 0.025	0.09 x 0.12	0.014 x 0.019
		1/2"	-- x --	-- x --	0.21 x 0.27	0.07 x 0.10	0.23 x 0.31	0.055 x 0.073	0.17 x 0.22	0.04 x 0.05	0.18 x 0.24	0.025 x 0.033	0.13 x 0.18	0.019 x 0.025
		2/3"	-- x --	-- x --	-- x --	-- x --	0.20 x 0.27	0.076 x 0.101	0.17 x 0.23	0.05 x 0.07	0.24 x 0.33	0.034 x 0.045	0.18 x 0.24	0.026 x 0.035
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.24 x 0.32	0.049 x 0.066	0.24 x 0.32	0.038 x 0.051
OPTEM 5X High-Res 28-20-44-000 **WD: 34 mm**		NA	0.059	0.225	0.059	0.225	0.059	0.225	0.059	0.225	0.059	0.225	0.059	0.225
		LP/mm	171	651	171	651	171	651	171	651	171	651	171	651
		Mag	0.68	4.88	0.89	6.41	1.19	8.60	1.78	12.83	2.66	19.24	3.55	24.87
		DOF	0.16	0.011	0.16	0.011	0.16	0.011	0.16	0.011	0.16	0.011	0.16	0.011
	FOV Cam Format	1/4"	2.24 x 2.99	0.57 x 0.75	2.56 x 3.41	0.43 x 0.57	2.29 x 3.05	0.32 x 0.43	1.53 x 2.04	0.22 x 0.29	1.02 x 1.36	0.14 x 0.19	0.77 x 1.02	0.11 x 0.15
		1/3"	1.88 x 2.51	0.74 x 0.98	2.22 x 2.96	0.56 x 0.75	2.49 x 3.32	0.42 x 0.56	2.00 x 2.67	0.28 x 0.37	1.33 x 1.78	0.19 x 0.25	0.89 x 1.19	0.14 x 0.19
		1/2"	-- x --	-- x --	1.84 x 2.45	0.75 x 1.00	2.21 x 2.95	0.56 x 0.74	1.78 x 2.37	0.37 x 0.50	1.78 x 2.37	0.25 x 0.33	1.33 x 1.78	0.19 x 0.26
		2/3"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	1.83 x 2.44	0.51 x 0.69	2.44 x 3.26	0.34 x 0.46	1.83 x 2.44	0.27 x 0.35
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	2.37 x 3.16	0.50 x 0.67	2.67 x 3.56	0.39 x 0.51
OPTEM 10X High-Res 28-20-45-000 **WD: 19 mm**		NA	0.12	0.45	0.12	0.45	0.12	0.45	0.12	0.45	0.12	0.45	0.12	0.45
		LP/mm	343	1301	343	1301	343	1301	343	1301	343	1301	343	1301
		Mag	1.35	9.75	1.78	12.83	2.38	17.19	3.55	25.66	5.33	38.49	7.11	49.74
		DOF	0.040	0.0028	0.040	0.0028	0.040	0.0028	0.040	0.0028	0.040	0.0028	0.040	0.0028
	FOV Cam Format	1/4"	0.88 x 1.17	0.28 x 0.38	0.77 x 1.02	0.22 x 0.29	0.82 x 1.09	0.16 x 0.21	0.77 x 1.02	0.11 x 0.14	0.51 x 0.68	0.072 x 0.096	0.38 x 0.51	0.055 x 0.074
		1/3"	-- x --	-- x --	0.77 x 1.03	0.28 x 0.37	0.75 x 1.00	0.21 x 0.28	0.71 x 0.95	0.14 x 0.19	0.67 x 0.89	0.094 x 0.125	0.44 x 0.59	0.072 x 0.097
		1/2"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.67 x 0.89	0.19 x 0.25	0.89 x 1.19	0.125 x 0.166	0.67 x 0.89	0.097 x 0.129
		2/3"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.87 x 1.16	0.171 x 0.229	0.92 x 1.22	0.133 x 0.177
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.89 x 1.19	0.249 x 0.333	0.74 x 0.99	0.193 x 0.257
OPTEM 20X High-Res 28-20-46-000 **WD: 13 mm**		NA	0.24	0.60	0.24	0.6000	0.24	0.60	0.24	0.60	0.24	0.60	0.24	0.60
		LP/mm	686	1735	686	1735	686	1735	686	1735	686	1735	686	1735
		Mag	2.70	19.50	3.55	25.66	4.76	34.38	7.11	51.32	10.66	76.97	14.21	99.47
		DOF	0.010	0.0016	0.010	0.0016	0.010	0.0016	0.010	0.0016	0.010	0.0016	0.010	0.0016
	FOV Cam Format	1/4"	0.48 x 0.64	0.14 x 0.19	0.59 x 0.79	0.11 x 0.14	0.57 x 0.76	0.08 x 0.11	0.38 x 0.51	0.054 x 0.072	0.26 x 0.34	0.036 x 0.048	0.19 x 0.26	0.028 x 0.037
		1/3"	-- x --	-- x --	0.48 x 0.63	0.14 x 0.19	0.47 x 0.62	0.10 x 0.14	0.45 x 0.61	0.070 x 0.094	0.33 x 0.44	0.047 x 0.062	0.22 x 0.30	0.036 x 0.048
		1/2"	-- x --	-- x --	-- x --	-- x --	0.43 x 0.58	0.14 x 0.19	0.42 x 0.56	0.094 x 0.125	0.44 x 0.59	0.062 x 0.083	0.33 x 0.44	0.048 x 0.064
		2/3"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.38 x 0.51	0.129 x 0.171	0.56 x 0.74	0.086 x 0.114	0.46 x 0.61	0.066 x 0.088
		1"	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	-- x --	0.49 x 0.66	0.125 x 0.166	0.56 x 0.74	0.097 x 0.129

-- Limited vignetting at low magnifications

-- Configuration not recommended

Tube Clamp Mounts

29-50-10-000
UNIVERSAL CLAMP
(top view)



30-65-34-000
FLAT MOUNT
(for Motorized versions)





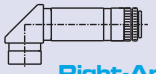
30-25-76-000
76mm O.D. TUBE CLAMP
(OLYMPUS, NIKON, LEICA)

30-25-82-000
82mm O.D. TUBE CLAMP
(UNITRON)

30-25-83-000
83mm O.D. TUBE CLAMP
(GENERIC)

30-25-84-000
84mm O.D. TUBE CLAMP
(MEIJI)

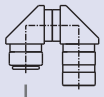
Mini TV Tubes



Right-Angle TV Tubes

29-90-86-000 – 0.5X RA
29-90-87-000 – 0.67X RA
29-90-74-000 – 1.0X RA
29-90-88-000 – 1.5X RA
29-90-89-000 – 2.0X RA

29-90-81-000
1.0X U-BEND
TV TUBE



U-Bend TV Tube

29-90-26-000
0.5X MINI
TV TUBE



29-90-27-000
0.67X MINI
TV TUBE



29-90-90-000
1.0X MINI
TV TUBE

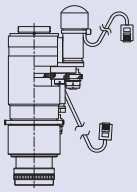


29-90-28-000
1.5X MINI
TV TUBE

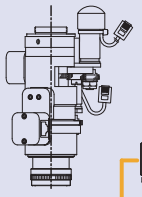


Non-Modular | Dual-Motorized Zooms

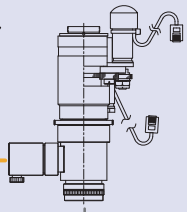
39-26-20-000
70XL 12mm FOCUS
DC MOTORIZED BOTH



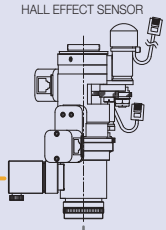
39-26-37-000
70XL 12mm FOCUS
STEPPING MOTOR BOTH
HALL EFFECT SENSOR



39-28-20-000
70XL 3mm COAX. DC
MOTORIZED BOTH



39-28-37-000
70XL 3mm COAX.
STEPPING MOTOR BOTH
HALL EFFECT SENSOR



29-60-83-000
VSI 110 ILLUMINATOR
110 VOLT / 150 WATT

29-60-84-000
VSI 220 ILLUMINATOR
220VOLT / 150 WATT



30-16-40-000
40" FLEX
BUNDLE

30-16-60-000
60" FLEX
BUNDLE





33-04-00-000
LOW PROFILE, R.A.
COAXIAL LAMPHOUSE
(Replaces standard
bottom module lamphouse)



30-16-01-000
10MM ADAPTER

30-16-01-000
10MM ADAPTER



29-65-14-000
STANDARD
COAXIAL LAMPHOUSE



396010-810
SINGLE-CHANNEL
PROGRAMMABLE
LED CONTROLLER



39-60-10-000
STRAIGHT
1-WATT COAXIAL LED
NEW



Illumination

396010-810
SINGLE-CHANNEL
PROGRAMMABLE
LED CONTROLLER



39-60-10-000
STRAIGHT
1-WATT COAXIAL LED



NEW

NEW



39-60-20-000
FMOS RIGHT-ANGLE
1-WATT COAXIAL LED

27-60-07-000
110/6 VOLT VARIABLE

27-60-17-000
220/6 VOLT VARIABLE



29-60-09-000
10 WATT
HALOGEN LAMP



Lower Function Modules

29-25-15-000
ZOOM 70XL VARIABLE
AUXILIARY LENS



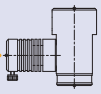
299510-310
BASIC FUNCTION
MODULE



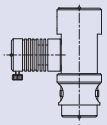
299591-310
INTERNAL FOCUS
MODULE



296515-310
VERTICAL ILLUM.
MODULE



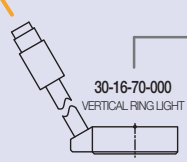
296591-310
VERTICAL ILLUM &
FOCUS MODULE



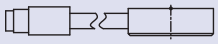
33-03-03-000
RING LIGHT ADAPTER



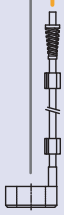
30-16-70-000
VERTICAL RING LIGHT



29-60-81-000
HORIZONTAL
RING LIGHT



29-60-31-000
MINI-ANNULAR
RING PROBE



29-20-09-000
0.18X / 0.25X
CONVERTIBLE
AUX LENS



29-20-11-000
0.5X
AUX LENS

29-20-12-000
0.75X
AUX LENS

29-20-13-000
1.5X
AUX LENS

ZOOM 70XL SYSTEM DIAGRAM

CAMERA

Standard TV Tubes

- **29-90-29-000** 2.0X MINI TV TUBE
- **29-90-82-000** 0.38X TV TUBE
- **29-90-70-000** 0.5X TV TUBE
- **29-90-71-000** 0.67X TV TUBE
- **29-90-72-000** 1.0X TV TUBE
- **29-90-73-000** 1.5X TV TUBE
- **29-90-80-000** 2.0X TV TUBE

Non-Inverting Right-Angle TV Tubes

- **29-90-92-000 –** 0.5X NIRA
- **29-90-93-000 –** 0.67X NIRA
- **29-90-94-000 –** 1.0X NIRA
- **29-90-95-000 –** 1.5X NIRA
- **29-90-96-000 –** 2.0X NIRA

Bayonet TV Tubes

- **29-77-04-000 –** 1.0X F-MOUNT BAYONET
- **29-77-02-000 –** 1.0X 1/2" ENG BAYONET
- **29-77-03-000 –** 1.0X 2/3" ENG BAYONET
- **29-77-01-000 –** 1.0X 1/2" SONY BAYONET

Upper Zoom Modules

- **399510-309** 70XL UPPER MANUAL
- **399610-309** 70XL UPPER IRIS
- **39-19-40-000** 70XL UPPER DETENTED
- **39-19-20-000** 70XL UPPER DC MOTOR
- **39-19-37-000** 70XL UPPER STEPPING MOTOR HALL EFFECT SENSOR

Motorization Control & Power Supply

DC MOTOR

- **28-80-18-000** 110V TRANSFORMER
- **28-80-19-000** 220V TRANSFORMER
- **30-17-20-000** DC MOTOR DRIVER

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
- **37-17-31-000** UNIV. TRANSFORMER (100-240V, 50-60Hz)
- **30-17-37-000** (N. AMER CORD)
- **30-17-36-000** (EUR CORD)
- **30-17-33-000** (UK CORD)

- **29-90-66-000** LONG WORKING RIGHT-ANGLE MODULE — NEW 90°
- NEW x2 — *Can also integrate FMOS Upper Fixed Tubes. Refer to Optem FMOS Brochure*
- **29-90-67-000** DUAL MAGNIFICATION MODULE
- **299067-310** COAX MODULE
- **299066-304** FMOS / ZOOM 70 LOWER MODULE COUPLER
- **299066-306** ZOOM 125 LOWER MODULE COUPLER — *Integrates with Optem Zoom 125C Lower Function Modules. Refer to Zoom 125C Brochure*
- **299066-302** M25x0.75 ADAPTER
- **299066-303** OPTEM / MITU. OBJECTIVES COUPLER
- **299066-305** NIKON / OLY OBJECTIVES COUPLER
- **296084-310** VERT. ILLUM. OBJ. DUAL FOCUS
- **296085-310** VERT. ILLUMINATOR OBJECTIVE MODULE
- **299084-310** OBJECTIVE DUAL FOCUS MODULE
- **299085-310** OBJECTIVE ADAPTER MODULE
- **29-20-31-000** 2X CONVERSION LENS

Auxiliary Lenses

- **29-20-14-000** 2.0X AUX LENS
- **29-20-16-000** 0.5X R. A. AUX LENS
- **29-20-17-000** 0.75X R. A. AUX LENS
- **29-90-59-000** RIGHT ANGLE ADAPTER

MITUTOYO

Optem® LWD Objectives

- **28-20-44-000** - 5X HIGH-RES
- **28-20-45-000** - 10X HIGH-RES
- **28-20-46-000** - 20X HIGH-RES

NEW

Optem® LWD Objectives

- **28-21-02-000** - 2X M PLAN APO
- **28-21-05-000** - 5X M PLAN APO
- **28-21-10-000** - 10X M PLAN APO
- **28-21-11-000** - 20X M PLAN APO
- **28-21-50-000** - 50X M PLAN APO

- **29-20-32-000** RMS ADAPTER
- NIKON/OLYMPUS
- **30-16-50-000** OBJECTIVE RING LIGHT

For an online archive of nominal component dimensions, downloadable schematics, and optical performance specifications, visit the Zoom 70XL Section of our web site.

ZOOM 70XL SPECIFICATIONS

Substage/Ringlight Illumination Zoom 70XL 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
0.18x	NA	0.0043	0.015	0.0043	0.015	0.0043	0.015	0.0043	0.015	0.0043	0.015	0.0043	0.015
Aux Lens	LP/mm	13	45	13	45	13	45	13	45	13	45	13	45
	Mag	0.05	0.36	0.07	0.47	0.09	0.63	0.14	0.94	0.20	1.40	0.27	1.90
29-20-09-000	DOF	30.67	2.52	30.67	2.52	30.67	2.52	30.67	2.52	30.67	2.52	30.67	2.52
	1/4"	54.52 x 72.69	7.67 x 10.22	40.89 x 54.52	5.87 x 7.83	30.51 x 40.69	4.38 x 5.84	20.44 x 27.26	2.94 x 3.91	13.63 x 18.17	1.97 x 2.63	10.22 x 13.63	1.45 x 1.94
	1/3"	71.11 x 94.81	10.00 x 13.33	53.33 x 71.11	7.66 x 10.21	39.80 x 53.07	5.71 x 7.62	26.67 x 35.56	3.83 x 5.11	17.78 x 23.70	2.57 x 3.43	13.33 x 17.78	1.89 x 2.53
WD: 468 mm	1/2"	49.90 x 66.54	13.33 x 17.78	71.11 x 94.81	10.21 x 13.62	53.07 x 70.76	7.62 x 10.16	35.56 x 47.41	5.11 x 6.81	23.70 x 31.60	3.43 x 4.57	17.78 x 23.70	2.53 x 3.37
	2/3"	-- x --	-- x --	48.89 x 65.19	14.04 x 18.72	72.97 x 97.29	10.48 x 13.97	48.89 x 65.19	7.02 x 9.36	32.59 x 43.46	4.71 x 6.29	24.44 x 32.59	3.47 x 4.63
	1"	-- x --	-- x --	-- x --	-- x --	46.15 x 61.53	15.24 x 20.32	71.11 x 94.81	10.21 x 13.62	47.41 x 63.21	6.86 x 9.14	35.56 x 47.41	5.05 x 6.74
0.25x	NA	0.0060	0.020	0.0060	0.020	0.0060	0.020	0.0060	0.020	0.0060	0.020	0.0060	0.020
Aux Lens	LP/mm	18	60	18	60	18	60	18	60	18	60	18	60
	Mag	0.07	0.50	0.09	0.66	0.13	0.88	0.19	1.30	0.28	2.00	0.38	2.60
29-20-09-000	DOF	15.75	1.42	15.75	1.42	15.75	1.42	15.75	1.42	15.75	1.42	15.75	1.42
	1/4"	39.25 x 52.34	5.52 x 7.36	29.44 x 39.25	4.18 x 5.58	21.97 x 29.29	3.14 x 4.18	14.72 x 19.63	2.12 x 2.83	9.81 x 13.08	1.38 x 1.84	7.36 x 9.81	1.06 x 1.42
	1/3"	51.20 x 68.27	7.20 x 9.60	38.40 x 51.20	5.45 x 7.27	28.66 x 38.21	4.09 x 5.45	19.20 x 25.60	2.77 x 3.69	12.80 x 17.07	1.80 x 2.40	9.60 x 12.80	1.38 x 1.85
WD: 310 mm	1/2"	37.93 x 50.57	9.60 x 12.80	51.20 x 68.27	7.27 x 9.70	38.21 x 50.95	5.45 x 7.27	25.60 x 34.13	3.69 x 4.92	17.07 x 22.76	2.40 x 3.20	12.80 x 17.07	1.85 x 2.46
	2/3"	-- x --	-- x --	35.20 x 46.93	10.00 x 13.33	52.54 x 70.05	7.50 x 10.00	35.20 x 46.93	5.08 x 6.77	23.47 x 31.29	3.30 x 4.40	17.60 x 23.47	2.54 x 3.38
	1"	-- x --	-- x --	-- x --	-- x --	31.84 x 42.45	10.91 x 14.55	51.20 x 68.27	7.38 x 9.85	34.13 x 45.51	4.80 x 6.40	25.60 x 34.13	3.69 x 4.92
0.5x	NA	0.0120	0.040	0.0120	0.040	0.0120	0.040	0.0120	0.040	0.0120	0.040	0.0120	0.040
Aux Lens	LP/mm	36	120	36	120	36	120	36	120	36	120	36	120
	Mag	0.14	0.98	0.19	1.33	0.25	1.75	0.38	2.66	0.56	3.92	0.75	5.25
29-20-38-000	DOF	3.94	0.35	3.94	0.35	3.94	0.35	3.94	0.35	3.94	0.35	3.94	0.35
	1/4"	19.63 x 26.17	2.82 x 3.76	14.72 x 19.63	2.08 x 2.77	10.99 x 14.65	1.58 x 2.10	7.36 x 9.81	1.04 x 1.38	4.91 x 6.54	0.70 x 0.94	3.68 x 4.91	0.53 x 0.70
	1/3"	25.60 x 34.13	3.67 x 4.90	19.20 x 25.60	2.71 x 3.61	14.33 x 19.10	2.06 x 2.74	9.60 x 12.80	1.35 x 1.80	6.40 x 8.53	0.92 x 1.22	4.80 x 6.40	0.69 x 0.91
WD: 178 mm	1/2"	17.07 x 22.76	4.90 x 6.53	25.60 x 34.13	3.61 x 4.81	19.10 x 25.47	2.74 x 3.66	12.80 x 17.07	1.80 x 2.41	8.53 x 11.38	1.22 x 1.63	6.40 x 8.53	0.91 x 1.22
	2/3"	-- x --	-- x --	16.00 x 21.33	4.96 x 6.62	26.27 x 35.02	3.77 x 5.03	17.60 x 23.47	2.48 x 3.31	11.73 x 15.64	1.68 x 2.24	8.80 x 11.73	1.26 x 1.68
	1"	-- x --	-- x --	-- x --	-- x --	14.70 x 19.59	5.49 x 7.31	25.60 x 34.13	3.61 x 4.81	17.07 x 22.76	2.45 x 3.27	12.80 x 17.07	1.83 x 2.44
0.75x	NA	0.0180	0.060	0.0180	0.060	0.0180	0.060	0.0180	0.060	0.0180	0.060	0.0180	0.060
Aux Lens	LP/mm	54	180	54	180	54	180	54	180	54	180	54	180
	Mag	0.21	1.47	0.28	1.96	0.38	2.66	0.56	3.92	0.85	5.95	1.10	7.70
	DOF	1.75	0.16	1.75	0.16	1.75	0.16	1.75	0.16	1.75	0.16	1.75	0.16
29-20-39-000	1/4"	13.08 x 17.45	1.88 x 2.50	9.81 x 13.08	1.41 x 1.88	7.32 x 9.76	1.04 x 1.38	4.91 x 6.54	0.70 x 0.94	3.27 x 4.36	0.46 x 0.62	2.45 x 3.27	0.36 x 0.48
	1/3"	17.07 x 22.76	2.45 x 3.27	12.80 x 17.07	1.84 x 2.45	9.55 x 12.74	1.35 x 1.80	6.40 x 8.53	0.92 x 1.22	4.27 x 5.69	0.61 x 0.81	3.20 x 4.27	0.47 x 0.62
WD: 114 mm	1/2"	10.84 x 14.45	3.27 x 4.35	17.07 x 22.76	2.45 x 3.27	12.74 x 16.98	1.80 x 2.41	8.53 x 11.38	1.22 x 1.63	5.69 x 7.59	0.81 x 1.08	4.27 x 5.69	0.62 x 0.83
	2/3"	-- x --	-- x --	10.67 x 14.22	3.37 x 4.49	17.51 x 23.35	2.48 x 3.31	11.73 x 15.64	1.68 x 2.24	7.82 x 10.43	1.11 x 1.48	5.87 x 7.82	0.86 x 1.14
	1"	-- x --	-- x --	-- x --	-- x --	7.96 x 10.61	3.61 x 4.81	17.07 x 22.76	2.45 x 3.27	11.38 x 15.17	1.61 x 2.15	8.53 x 11.38	1.25 x 1.66
1.0x	NA	0.0240	0.080	0.0240	0.080	0.0240	0.080	0.0240	0.080	0.0240	0.080	0.0240	0.080
Config.	LP/mm	72	240	72	240	72	240	72	240	72	240	72	240
NO LENS REQ'I	Mag	0.29	2.03	0.38	2.66	0.50	3.50	0.75	5.25	1.10	7.70	1.50	10.50
	DOF	0.98	0.09	0.98	0.09	0.98	0.09	0.98	0.09	0.98	0.09	0.98	0.09
	1/4"	9.81 x 13.08	1.36 x 1.81	7.36 x 9.81	1.04 x 1.38	5.49 x 7.32	0.79 x 1.05	3.68 x 4.91	0.53 x 0.70	2.45 x 3.27	0.36 x 0.48	1.84 x 2.45	0.26 x 0.35
	1/3"	12.80 x 17.07	1.77 x 2.36	9.60 x 12.80	1.35 x 1.80	7.16 x 9.55	1.03 x 1.37	4.80 x 6.40	0.69 x 0.91	3.20 x 4.27	0.47 x 0.62	2.40 x 3.20	0.34 x 0.46
WD: 89 mm	1/2"	11.38 x 15.17	2.36 x 3.15	12.80 x 17.07	1.80 x 2.41	9.55 x 12.74	1.37 x 1.83	6.40 x 8.53	0.91 x 1.22	4.27 x 5.69	0.62 x 0.83	3.20 x 4.27	0.46 x 0.61
	2/3"	-- x --	-- x --	9.78 x 13.04	2.48 x 3.31	13.13 x 17.51	1.89 x 2.51	8.80 x 11.73	1.26 x 1.68	5.87 x 7.82	0.86 x 1.14	4.40 x 5.87	0.63 x 0.84
	1"	-- x --	-- x --	-- x --	-- x --	8.31 x 11.08	2.74 x 3.66	12.80 x 17.07	1.83 x 2.44	8.53 x 11.38	1.25 x 1.66	6.40 x 8.53	0.91 x 1.22
1.5x	NA	0.0360	0.120	0.0360	0.120	0.0360	0.120	0.0360	0.120	0.0360	0.120	0.0360	0.120
Aux Lens	LP/mm	108	360	108	360	108	360	108	360	108	360	108	360
	Mag	0.43	3.00	0.56	3.90	0.75	5.25	1.10	7.70	1.70	11.90	2.30	16.10
	DOF	0.44	0.04	0.44	0.04	0.44	0.04	0.44	0.04	0.44	0.04	0.44	0.04
29-20-40-000	1/4"	6.54 x 8.72	0.92 x 1.23	4.91 x 6.54	0.71 x 0.94	3.66 x 4.88	0.53 x 0.70	2.45 x 3.27	0.36 x 0.48	1.64 x 2.18	0.23 x 0.31	1.23 x 1.64	0.17 x 0.23
	1/3"	8.53 x 11.38	1.20 x 1.60	6.40 x 8.53	0.92 x 1.23	4.78 x 6.37	0.69 x 0.91	3.20 x 4.27	0.47 x 0.62	2.13 x 2.84	0.30 x 0.40	1.60 x 2.13	0.22 x 0.30
WD: 52 mm	1/2"	7.59 x 10.11	1.60 x 2.13	8.53 x 11.38	1.23 x 1.64	6.37 x 8.49	0.91 x 1.22	4.27 x 5.69	0.62 x 0.83	2.84 x 3.79	0.40 x 0.54	2.13 x 2.84	0.30 x 0.40
	2/3"	-- x --	-- x --	6.90 x 9.20	1.69 x 2.26	8.76 x 11.67	1.26 x 1.68	5.87 x 7.82	0.86 x 1.14	3.91 x 5.21	0.55 x 0.74	2.93 x 3.91	0.41 x 0.55
	1"	-- x --	-- x --	-- x --	-- x --	5.54 x 7.38	1.83 x 2.44	8.53 x 11.38	1.25 x 1.66	5.69 x 7.59	0.81 x 1.08	4.27 x 5.69	0.60 x 0.80
2.0x	NA	0.0480	0.160	0.0480	0.160	0.0480	0.160	0.0480	0.160	0.0480	0.160	0.0480	0.160
Aux Lens	LP/mm	144	480	144	480	144	480	144	480	144	480	144	480
	Mag	0.57	3.99	0.75	5.25	1.00	7.00	1.50	10.50	2.30	16.10	3.00	21.00
	DOF	0.25	0.02	0.25	0.02	0.25	0.02	0.25	0.02	0.25	0.02	0.25	0.02
29-20-41-000	1/4"	4.91 x 6.54	0.69 x 0.92	3.68 x 4.91	0.53 x 0.70	2.75 x 3.66	0.39 x 0.53	1.84 x 2.45	0.26 x 0.35	1.23 x 1.64	0.17 x 0.23	0.92 x 1.23	0.13 x 0.18
	1/3"	6.40 x 8.53	0.90 x 1.20	4.80 x 6.40	0.69 x 0.91	3.58 x 4.78	0.51 x 0.69	2.40 x 3.20	0.34 x 0.46	1.60 x 2.13	0.22 x 0.30	1.20 x 1.60	0.17 x 0.23
WD: 32 mm	1/2"	5.69 x 7.59	1.20 x 1.60	6.40 x 8.53	0.91 x 1.22	4.78 x 6.37	0.69 x 0.91	3.20 x 4.27	0.46 x 0.61	2.13 x 2.84	0.30 x 0.40	1.60 x 2.13	0.23 x 0.30
	2/3"	-- x --	-- x --	5.18 x 6.90	1.26 x 1.68	6.57 x 8.76	0.94 x 1.26	4.40 x 5.87	0.63 x 0.84	2.93 x 3.91	0.41 x 0.55	2.20 x 2.93	0.31 x 0.42
	1"	-- x --	-- x --	-- x --	-- x --	4.15 x 5.54	1.37 x 1.83	6.40 x 8.53	0.91 x 1.22	4.27 x 5.69	0.60 x 0.80	3.20 x 4.27	0.46 x 0.61

-- Limited vignetting at low magnifications

-- Configuration not recommended

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