

Optem® FUSION

Micro-Inspection Lens System

Covering the optical, mechanical,
and operational parameters of
FUSION system components.

Now including Fetura+ Advanced Zoom Lens

3rd Edition



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How to use this guide

Optem FUSION is a modular Lens System which can be modified to affect form, function and performance. Follow the steps outlined herein to configure an Optem FUSION Lens System to meet your specific optical, functional and physical configuration requirements. Refer to the **Optical Performance Chart** that matches your chosen Fixed-magnification or Zoom configuration (e.g., with or without Objectives, with Standard or Mini Camera Tubes). Following the flow lines in the **FUSION Component Matrix** (p. 4-5), you can identify the components you will require to configure the lens performance you desire.

1 The first step in configuring your Optem FUSION Lens System is to determine whether you require **fixed** field-of-view or a **zoom** range of fields-of-view. If you require zoom, determine how much zoom range you require, 7:1 or 12.5:1. This decision will direct you to the correct FUSION **Optical Performance chart** (p. 06 - 31).

2 Your second choice is determining what working distance you require for your system. Specify the correct Lower Lens to best fit your working distance requirements. Working distance is the mechanical space between the bottom of the lens system and your specimen. The addition of a ringlight or right-angle module to the bottom of the system will further reduce this working distance. Using the shortest working distance will provide the best resolution for all systems. Choose longer working distances when necessary to increase your desired field-of-view. Working distances for each Lower

Lens is listed just below the Lower Lenses shown across the top of each **Optical Performance chart**. You need to know your intended camera format (chip size) to determine the field-of-view for your lens system. If you do not have a particular camera format in mind, use the numbers in the chart to help you determine the best camera chip size selection for your Optem FUSION Lens System.

3 Navigate from the top of the **Component Matrix** down to the Lower Lenses to identify the components needed to complete your FUSION Lens System. Fixed Magnification systems require the Aperture Module 35-07-20-000 for best performance. The correct aperture diameter is provided in the **Fixed Optical Performance Chart** (p. 07 - 13).

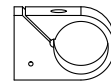
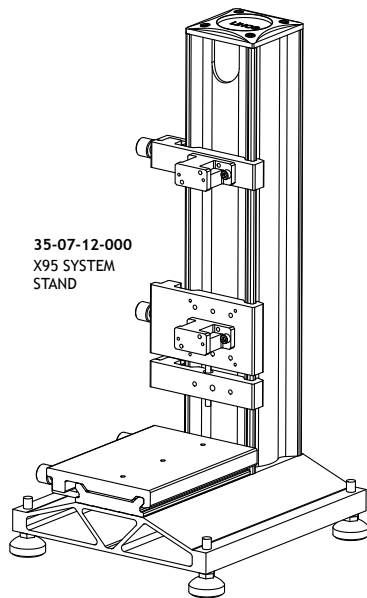
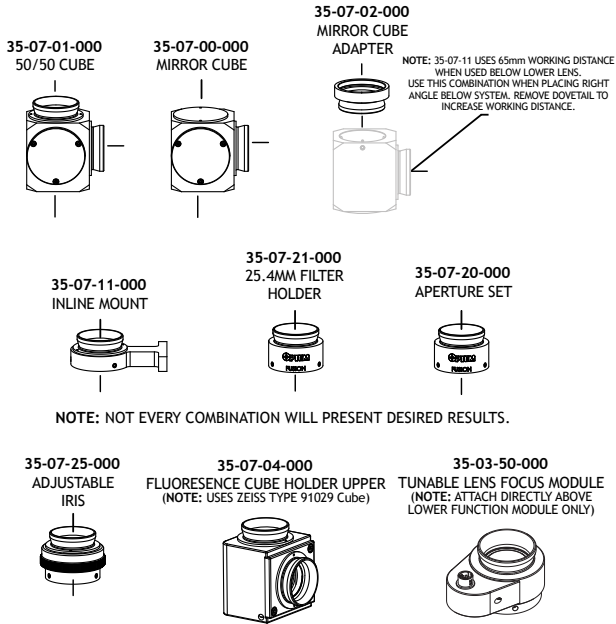
These steps above are a general guide in configuring your Lens System. Your application may require choosing components in a different order than detailed herein. In this case, refer to the appropriate **Optical Performance chart** and identify your desired parameters (typically field-of-view at high- and low-end zoom) as it relates to your intended camera format.

NOTE: with the Optem FUSION System, the optical magnification is the product of the magnification of the Lower Lens, Zoom dial setting (if Zoom) and the magnification of the Camera Tube. This formula works even when using Qioptiq Microscope Objectives.

Contact your Qioptiq representative or your Qioptiq dealer for additional help determining your specific requirements.

Optem® FUSION Component Matrix

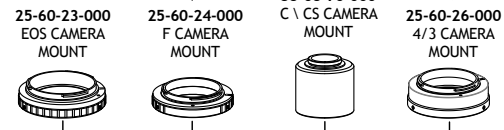
ACCESSORIES



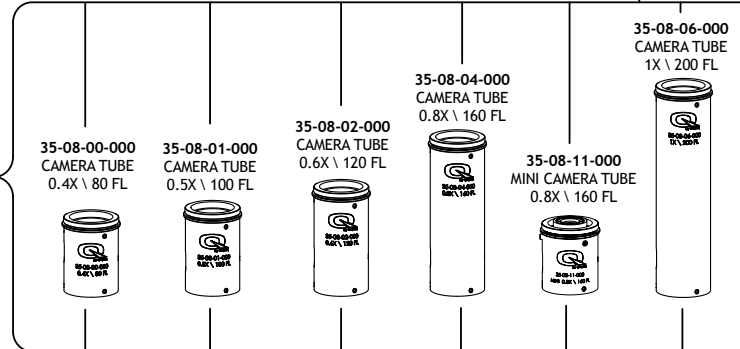
- 35-07-14-000 TUBE CLAMP MOUNT, 76mm dia.
- 35-07-15-000 TUBE CLAMP MOUNT, 82mm dia.
- 35-07-16-000 TUBE CLAMP MOUNT, 83mm dia.
- 35-07-17-000 TUBE CLAMP MOUNT, 84mm dia.

CAMERA

CAMERA MOUNTS

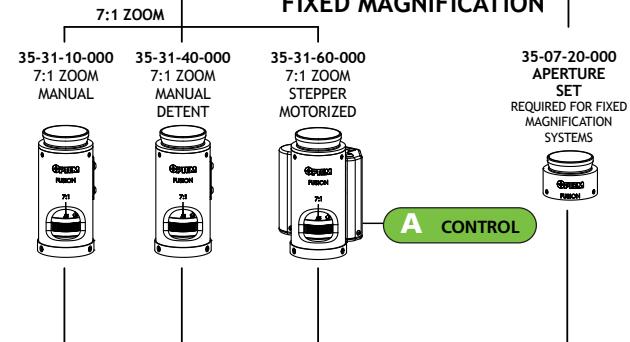


CAMERA TUBES

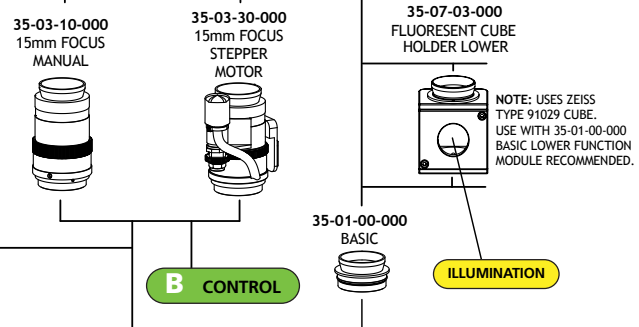


ACCESSORIES

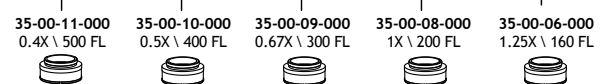
FIXED MAGNIFICATION



LOWER FUNCTION MODULES



LOWER LENSES



ILLUMINATION

25-60-27-000
MICRO 4/3
CAMERA MOUNT

25-60-28-000
SONY ALPHA
CAMERA MOUNT

25-60-29-000
PENTAX K
CAMERA MOUNT

MINI CAMERA TUBES

35-08-12-000
MINI
CAMERA TUBE
1X \ 200 FL

35-08-13-000
MINI CAMERA TUBE
1.5X \ 300 FL

35-08-14-000
MINI CAMERA TUBE
2X \ 400 FL

35-08-15-000
MINI CAMERA TUBE
2.5X \ 500 FL

35-08-16-000
MINI CAMERA TUBE
3X \ 600 FL

12.5:1 ZOOM

35-41-10-000
12.5:1 ZOOM
MANUAL

35-41-40-000
12.5:1 ZOOM
MANUAL
DETENT

35-41-60-000
12.5:1 ZOOM
STEPPER
MOTORIZED

4401-572-000-20
FETURA+
12.5:1 ZOOM
SELF-CONTROLLED

ACCESSORIES

A CONTROL

35-04-00-000
COAX
ILLUMINATION

35-04-03-000
COAX
ILLUMINATION
WITH
ANALYZER

35-04-10-000
COAX ILLUMINATION 5mm FOCUS
MANUAL

35-04-13-000
COAX ILLUMINATION 5mm FOCUS
MANUAL W/ANALYZER

35-04-30-000
COAX ILLUMINATION 5mm FOCUS
STEPPER MOTOR

35-04-33-000
COAX ILLUMINATION 5mm FOCUS
STEPPER MOTOR
W/ANALYZER

ACCESSORIES

ILLUMINATION

35-00-05-000
1.43X \ 140 FL

35-00-04-000
1.67X \ 120 FL

35-00-03-000
2X \ 100 FL

35-00-01-000
3X \ 67 FL

35-00-02-000
4X \ 50 FL

NOTE: COAX ILLUMINATION HAS LIMITED FIELD ILLUMINATION WITH LARGE FOVS.

LIGHTING ACCESSORIES

29-69-02-000
POLARIZER

30-16-02-000
FIBER OPTIC
LAMPHOUSE

30-16-01-000
10mm FIBER
OPTIC ADAPTER

35-07-50-000
LED COAX
ILLUMINATOR

29-69-13-000
LED COAX
RIGHT ANGLE

30-16-60-000
60" FLEXIBLE
FIBER OPTIC

COAX

OBLIQUE

29-69-21-000
FIBER OPTIC
RINGLIGHT
ADAPTER

29-60-81-000
FIBER OPTIC
RINGLIGHT

35-07-40-000
LED RINGLIGHT
ADAPTER

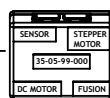
35-07-41-000
LED
RINGLIGHT

29-60-83-000
110v HALOGEN
ILLUMINATOR

29-60-84-000
220v HALOGEN
ILLUMINATOR

A CONTROL

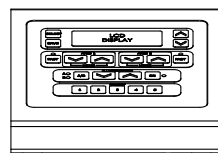
B CONTROL



35-05-99-000
CONTROLLER
ADAPTER
FOR FOCUS
MODULES
(REQUIRED FOR
ALL MOTORIZED
FOCUS MODULES.)

35-05-20-000
2 AXIS STEPPER CONTROLLER
24v POWER SUPPLY INC

35-05-00-000
2 AXIS STEPPER CONTROLLER
OEM BOARD



30-17-37-000
(N. AMER CORD)

30-17-36-000
(EURO CORD)

30-17-33-000
(U.K. CORD)

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

28-20-44-000 5X HI-RES

28-20-45-000 10X HI-RES

28-20-46-000 20X HI-RES

CERTAIN LIMITATIONS APPLY WITH HI-RES OBJECTIVES.
SEE BROCHURE FOR DETAILS.

30-17-03-000
OBJECTIVE
ADAPTER



30-16-50-000
OBJECTIVE RINGLIGHT
40 INCHES

Optical Performance - Fixed Magnification with Lower

Chart 1A

				0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm				0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm				0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm				1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm			
Max FOV Dia.				100				80				60				40			
Max Coax FOV Dia.				13				13				14				12			
0.4X Camera Tube 35-08-00-000 EFL: 80mm 5mm Stop	NA Res (lp/mm) Mag DOF (mm)			0.0050				0.0063				0.0083				0.013			
				15				19				25				38			
				0.16				0.20				0.27				0.40			
				23				15				8.2				3.6			
	FOV (mm) Cam Format	1/3"	23	x	30	18	x	24	14	x	18	9.0	x	12					
		1/2"	30	x	40	24	x	32	18	x	24	12	x	16					
		2/3"	41	x	55	33	x	44	25	x	33	17	x	22					
0.5X Camera Tube 35-08-01-000 EFL: 100mm 5mm Stop	NA Res (lp/mm) Mag DOF (mm)			0.0050				0.0063				0.0083				0.013			
				15				19				25				38			
				0.20				0.25				0.33				0.50			
				23				15				8.2				3.6			
	FOV (mm) Cam Format	1/3"	18	x	24	14	x	19	11	x	14	7.2	x	9.6					
		1/2"	24	x	32	19	x	26	14	x	19	9.6	x	13					
		2/3"	33	x	44	26	x	35	20	x	26	13	x	18					
0.6X Camera Tube 35-08-02-000 EFL: 120mm 8mm Stop	NA Res (lp/mm) Mag DOF (mm)			0.0080				0.010				0.013				0.020			
				24				30				40				60			
				0.24				0.30				0.40				0.60			
				8.9				5.7				3.2				1.4			
	FOV (mm) Cam Format	1/3"	15	x	20	12	x	16	9.0	x	12	6.0	x	8.0					
		1/2"	20	x	27	16	x	21	12	x	16	8.0	x	11					
		2/3"	28	x	37	22	x	29	17	x	22	11	x	15					
0.8X Camera Tube 35-08-04-000 EFL: 160mm 12mm Stop	NA Res (lp/mm) Mag DOF (mm)			0.012				0.015				0.020				0.030			
				36				45				60				90			
				0.32				0.40				0.53				0.80			
				3.9				2.5				1.4				0.63			
	FOV (mm) Cam Format	1/3"	11	x	15	9.0	x	12	6.8	x	9.0	4.5	x	6.0					
		1/2"	15	x	20	12	x	16	9.0	x	12	6.0	x	8.0					
		2/3"	21	x	28	17	x	22	12	x	17	8.3	x	11					
1X Camera Tube 35-08-06-000 EFL: 200mm 18mm Stop	NA Res (lp/mm) Mag DOF (mm)			0.018				0.023				0.030				0.045			
				54				68				90				135			
				0.40				0.50				0.67				1.0			
				1.8				1.1				0.63				0.28			
	FOV (mm) Cam Format	1/3"	9.0	x	12	7.2	x	9.6	5.4	x	7.2	3.6	x	4.8					
		1/2"	12	x	16	9.6	x	13	7.2	x	9.6	4.8	x	6.4					
		2/3"	17	x	22	13	x	18	9.9	x	13	6.6	x	8.8					

 -- Useable FOV Limited by Coax illumination (>50% Illumination)

 -- FOV Limited by vignetting

Lenses

1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm	1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm	1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm	2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm	3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm	4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm
32	28	24	20	15	10
12	13	14	15	15	10
0.016	0.018	0.021	0.025	0.037	0.050
47	54	63	75	112	150
0.50	0.57	0.67	0.80	1.2	1.6
2.3	1.8	1.3	0.91	0.40	0.23
7.2 x 9.6	6.3 x 8.4	5.4 x 7.2	4.5 x 6.0	3.0 x 4.0	2.3 x 3.0
9.6 x 13	8.4 x 11	7.2 x 9.6	6.0 x 8.0	4.0 x 5.3	3.0 x 4.0
13 x 18	12 x 15	9.9 x 13	8.3 x 11	5.5 x 7.3	4.1 x 5.5
0.016	0.018	0.021	0.025	0.037	0.050
47	54	63	75	112	150
0.63	0.71	0.83	1.0	1.5	2.0
2.3	1.8	1.3	0.91	0.40	0.23
5.8 x 7.7	5.0 x 6.7	4.3 x 5.8	3.6 x 4.8	2.4 x 3.2	1.8 x 2.4
7.7 x 10	6.7 x 9.0	5.8 x 7.7	4.8 x 6.4	3.2 x 4.3	2.4 x 3.2
11 x 14	9.2 x 12	7.9 x 11	6.6 x 8.8	4.4 x 5.9	3.3 x 4.4
0.025	0.029	0.033	0.040	0.060	0.080
75	86	100	120	180	240
0.75	0.86	1.0	1.2	1.8	2.4
0.91	0.69	0.51	0.35	0.16	0.089
4.8 x 6.4	4.2 x 5.6	3.6 x 4.8	3.0 x 4.0	2.0 x 2.7	1.5 x 2.0
6.4 x 8.5	5.6 x 7.5	4.8 x 6.4	4.0 x 5.3	2.7 x 3.6	2.0 x 2.7
8.8 x 12	7.7 x 10	6.6 x 8.8	5.5 x 7.3	3.7 x 4.9	2.8 x 3.7
0.038	0.043	0.050	0.060	0.090	0.12
113	129	150	180	270	360
1.0	1.1	1.3	1.6	2.4	3.2
0.40	0.31	0.23	0.16	0.070	0.039
3.6 x 4.8	3.2 x 4.2	2.7 x 3.6	2.3 x 3.0	1.5 x 2.0	1.1 x 1.5
4.8 x 6.4	4.2 x 5.6	3.6 x 4.8	3.0 x 4.0	2.0 x 2.7	1.5 x 2.0
6.6 x 8.8	5.8 x 7.7	5.0 x 6.6	4.1 x 5.5	2.8 x 3.7	2.1 x 2.8
0.056	0.064	0.075	0.090	0.13	0.18
169	193	225	270	405	540
1.25	1.43	1.67	2.0	3.0	4.0
0.18	0.14	0.10	0.070	0.031	0.018
2.9 x 3.8	2.5 x 3.4	2.2 x 2.9	1.8 x 2.4	1.2 x 1.6	0.90 x 1.2
3.8 x 5.1	3.4 x 4.5	2.9 x 3.8	2.4 x 3.2	1.6 x 2.1	1.2 x 1.6
5.3 x 7.0	4.6 x 6.2	4.0 x 5.3	3.3 x 4.4	2.2 x 2.9	1.7 x 2.2

Optical Performance - Fixed Magnification with Lower

Chart 1B

			0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm			0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm			0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm			1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm		
Max FOV Dia.			100			80			60			40		
Max Coax FOV Dia.			13			13			14			12		
1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm 12mm Stop	FOV (mm)	Cam Format	NA	0.012		0.015		0.020		0.030				
			Res (lp/mm)	36		45		60		90				
			Mag	0.60		0.75		1.0		1.5				
			DOF (mm)	3.9		2.5		1.4		0.63				
			2/3"	11	x	15	8.8	x	12	6.6	x	8.8	4.4	x
		1"	16	x	21	13	x	17	9.6	x	13	6.4	x	8.5
		4/3"	23	x	30	18	x	24	14	x	18	9.0	x	12
		APS-C	28	x	42	22	x	33	17	x	25	11	x	17
		2X Mini Camera Tube 35-08-14-000 EFL: 400mm 18mm Stop	FOV (mm)	Cam Format	NA	0.018		0.023		0.030		0.045		
					Res (lp/mm)	54		68		90		135		
Mag	0.80				1.0		1.3		2.0					
DOF (mm)	1.8				1.1		0.63		0.28					
2/3"	8.3				x	11	6.6	x	8.8	5.0	x	6.6	3.3	x
1"	12			x	16	9.6	x	13	7.2	x	9.6	4.8	x	6.4
4/3"	17			x	23	14	x	18	10	x	14	6.8	x	9.0
APS-C	21			x	31	17	x	25	13	x	19	8.4	x	13
2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm 18mm Stop	FOV (mm)			Cam Format	NA	0.018		0.023		0.030		0.045		
					Res (lp/mm)	54		68		90		135		
		Mag	1.0		1.3		1.7		2.5					
		DOF (mm)	1.8		1.1		0.63		0.28					
		1"	9.6		x	13	7.7	x	10	5.8	x	7.7	3.8	x
		4/3"	14	x	18	11	x	14	8.1	x	11	5.4	x	7.2
		APS-C	17	x	25	13	x	20	10	x	15	6.7	x	10
		35mm (FULL)	24	x	36	19	x	29	14	x	22	9.6	x	14
		3X Mini Camera Tube 35-08-16-000 EFL: 600mm 18mm Stop	FOV (mm)	Cam Format	NA	0.018		0.023		0.030		0.045		
					Res (lp/mm)	54		68		90		135		
Mag	1.2				1.5		2.0		3.0					
DOF (mm)	1.8				1.1		0.63		0.28					
1"	8.0				x	11	6.4	x	8.5	4.8	x	6.4	3.2	x
4/3"	11			x	15	9.0	x	12	6.8	x	9.0	4.5	x	6.0
APS-C	14			x	21	11	x	17	8.4	x	13	5.6	x	8.4
35mm (FULL)	20			x	30	16	x	24	12	x	18	8.0	x	12

- Useable FOV Limited by Coax illumination (>50% Illumination)
- FOV Limited by vignetting

	Height	x	Width	Diag.
2/3"	6.6	x	8.8	11
1"	9.6	x	12.8	16
4/3"	13.5	x	18	22.5
APS-C*	16.7	x	25.1	30
35mm (Full)	24	x	36	43.3

*Also known as Half Frame 35mm format

Lenses - Mini Camera Tubes

1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm	1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm	1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm	2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm	3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm	4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm
32	28	24	20	15	10
12	13	14	15	15	10
0.038	0.043	0.050	0.060	0.090	0.12
113	129	150	180	270	360
1.9	2.1	2.5	3.0	4.5	6.0
0.40	0.31	0.23	0.16	0.070	0.039
3.5 x 4.7	3.1 x 4.1	2.6 x 3.5	2.2 x 2.9	1.5 x 2.0	1.1 x 1.5
5.1 x 6.8	4.5 x 6.0	3.8 x 5.1	3.2 x 4.3	2.1 x 2.8	1.6 x 2.1
7.2 x 9.6	6.3 x 8.4	5.4 x 7.2	4.5 x 6.0	3.0 x 4.0	2.3 x 3.0
8.9 x 13	7.8 x 12	6.7 x 10	5.6 x 8.4	3.7 x 5.6	2.8 x 4.2
0.056	0.064	0.075	0.090	0.13	0.18
169	193	225	270	405	540
2.5	2.9	3.3	4.0	6.0	8.0
0.18	0.14	0.101	0.070	0.031	0.018
2.6 x 3.5	2.3 x 3.1	2.0 x 2.6	1.7 x 2.2	1.1 x 1.5	0.83 x 1.1
3.8 x 5.1	3.4 x 4.5	2.9 x 3.8	2.4 x 3.2	1.6 x 2.1	1.2 x 1.6
5.4 x 7.2	4.7 x 6.3	4.1 x 5.4	3.4 x 4.5	2.3 x 3.0	1.7 x 2.3
6.7 x 10	5.8 x 8.8	5.0 x 7.5	4.2 x 6.3	2.8 x 4.2	2.1 x 3.1
0.056	0.064	0.075	0.090	0.13	0.18
169	193	225	270	405	540
3.1	3.6	4.2	5.0	7.5	10
0.18	0.14	0.10	0.070	0.031	0.018
3.1 x 4.1	2.7 x 3.6	2.3 x 3.1	1.9 x 2.6	1.3 x 1.7	0.96 x 1.3
4.3 x 5.8	3.8 x 5.0	3.2 x 4.3	2.7 x 3.6	1.8 x 2.4	1.4 x 1.8
5.3 x 8.0	4.7 x 7.0	4.0 x 6.0	3.3 x 5.0	2.2 x 3.3	1.7 x 2.5
7.7 x 12	6.7 x 10	5.8 x 8.6	4.8 x 7.2	3.2 x 4.8	2.4 x 3.6
0.056	0.064	0.075	0.090	0.13	0.18
169	193	225	270	405	540
3.8	4.3	5.0	6.0	9.0	12
0.18	0.14	0.10	0.070	0.031	0.018
2.6 x 3.4	2.2 x 3.0	1.9 x 2.6	1.6 x 2.1	1.1 x 1.4	0.80 x 1.1
3.6 x 4.8	3.2 x 4.2	2.7 x 3.6	2.3 x 3.0	1.5 x 2.0	1.1 x 1.5
4.5 x 6.7	3.9 x 5.9	3.3 x 5.0	2.8 x 4.2	1.9 x 2.8	1.4 x 2.1
6.4 x 9.6	5.6 x 8.4	4.8 x 7.2	4.0 x 6.0	2.7 x 4.0	2.0 x 3.0

Optical Performance - Fixed Magnification with LWD

Chart 1C

		2X M Plan Apo 28-21-02-000 WD: 34mm			5X M Plan Apo 28-21-05-000 WD: 34mm			10X M Plan Apo 28-21-10-000 WD: 34mm			20X M Plan Apo 28-21-11-000 WD: 20mm		
Max FOV Dia.		17			16			10			5.4		
Max Coax FOV Dia.		16			11			5.0			2.6		
0.4X Camera Tube 35-08-00-000 EFL: 80mm NO Stop	NA	0.057			0.14			0.30			0.42		
	Res (lp/mm)	170			420			900			1260		
	Mag	0.80			2.0			4.0			8.0		
	DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm)												
	Cam Format												
	1/3"	4.5	x	6.0	1.8	x	2.4	0.90	x	1.2	0.45	x	0.60
	1/2"	6.0	x	8.0	2.4	x	3.2	1.2	x	1.6	0.60	x	0.80
	2/3"	8.3	x	11	3.3	x	4.4	1.7	x	2.2	0.83	x	1.1
0.5X Camera Tube 35-08-01-000 EFL: 100mm NO Stop	NA	0.057			0.14			0.30			0.42		
	Res (lp/mm)	170			420			900			1260		
	Mag	1.0			2.5			5.0			10		
	DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm)												
	Cam Format												
	1/3"	3.6	x	4.8	1.4	x	1.9	0.72	x	0.96	0.36	x	0.48
	1/2"	4.8	x	6.4	1.9	x	2.6	0.96	x	1.3	0.48	x	0.64
	2/3"	6.6	x	8.8	2.6	x	3.5	1.3	x	1.8	0.66	x	0.88
0.6X Camera Tube 35-08-02-000 EFL: 120mm NO Stop	NA	0.057			0.14			0.30			0.42		
	Res (lp/mm)	170			420			900			1260		
	Mag	1.2			3.0			6.0			12		
	DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm)												
	Cam Format												
	1/3"	3.0	x	4.0	1.2	x	1.6	0.60	x	0.80	0.30	x	0.40
	1/2"	4.0	x	5.3	1.6	x	2.1	0.80	x	1.1	0.40	x	0.53
	2/3"	5.5	x	7.3	2.2	x	2.9	1.1	x	1.5	0.55	x	0.73
0.8X Camera Tube 35-08-04-000 EFL: 160mm NO Stop	NA	0.057			0.14			0.30			0.42		
	Res (lp/mm)	170			420			900			1260		
	Mag	1.6			4.0			8.0			16		
	DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm)												
	Cam Format												
	1/3"	2.3	x	3.0	0.90	x	1.2	0.45	x	0.60	0.23	x	0.30
	1/2"	3.0	x	4.0	1.2	x	1.6	0.60	x	0.80	0.30	x	0.40
	2/3"	4.1	x	5.5	1.7	x	2.2	0.83	x	1.1	0.41	x	0.55
1X Camera Tube 35-08-06-000 EFL: 200mm NO Stop	NA	0.057			0.14			0.30			0.42		
	Res (lp/mm)	170			420			900			1260		
	Mag	2.0			5.0			10			20		
	DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm)												
	Cam Format												
	1/3"	1.8	x	2.4	0.72	x	0.96	0.36	x	0.48	0.18	x	0.24
	1/2"	2.4	x	3.2	0.96	x	1.3	0.48	x	0.64	0.24	x	0.32
	2/3"	3.3	x	4.4	1.3	x	1.8	0.66	x	0.88	0.33	x	0.44

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

Objectives

50X M Plan Apo 28-21-50-000 WD: 13mm				5X HiRes 28-20-44-000 WD: 34mm			10X HiRes 28-20-45-000 WD: 19mm			20X HiRes 28-20-46-000 WD: 13mm		
2.3				10			5.2			4.5		
1.1				7.0			2.8			2.1		
0.55				0.225			0.45			0.60		
1650				675			1350			1800		
20				2.0			4.0			8.0		
0.0019				0.011			0.0028			0.0016		
0.18	x	0.24		1.8	x	2.4	0.90	x	1.2	0.45	x	0.60
0.24	x	0.32		2.4	x	3.2	1.2	x	1.6	0.60	x	0.80
0.33	x	0.44		3.3	x	4.4	1.7	x	2.2	0.83	x	1.1
0.55				0.225			0.45			0.60		
1650				675			1350			1800		
25				2.5			5.0			10		
0.0019				0.011			0.0028			0.0016		
0.14	x	0.19		1.4	x	1.9	0.72	x	0.96	0.36	x	0.48
0.19	x	0.26		1.9	x	2.6	0.96	x	1.3	0.48	x	0.64
0.26	x	0.35		2.6	x	3.5	1.3	x	1.8	0.66	x	0.88
0.55				0.225			0.45			0.60		
1650				675			1350			1800		
30				3.0			6.0			12		
0.0019				0.011			0.0028			0.0016		
0.12	x	0.16		1.2	x	1.6	0.60	x	0.80	0.30	x	0.40
0.16	x	0.21		1.6	x	2.1	0.80	x	1.1	0.40	x	0.53
0.22	x	0.29		2.2	x	2.9	1.1	x	1.5	0.55	x	0.73
0.55				0.225			0.45			0.60		
1650				675			1350			1800		
40				4.0			8.0			16		
0.0019				0.011			0.0028			0.0016		
0.090	x	0.12		0.90	x	1.2	0.45	x	0.60	0.23	x	0.30
0.12	x	0.16		1.2	x	1.6	0.60	x	0.80	0.30	x	0.40
0.17	x	0.22		1.7	x	2.2	0.83	x	1.1	0.41	x	0.55
0.55				0.225			0.45			0.60		
1650				675			1350			1800		
50				5.0			10			20		
0.0019				0.011			0.0028			0.0016		
0.072	x	0.096		0.72	x	0.96	0.36	x	0.48	0.18	x	0.24
0.096	x	0.13		0.96	x	1.3	0.48	x	0.64	0.24	x	0.32
0.13	x	0.18		1.3	x	1.8	0.66	x	0.88	0.33	x	0.44

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - Fixed Magnification with LWD

Chart 1D

		2X M Plan Apo 28-21-02-000 WD: 34mm			5X M Plan Apo 28-21-05-000 WD: 34mm			10X M Plan Apo 28-21-10-000 WD: 34mm			20X M Plan Apo 28-21-11-000 WD: 20mm			
Max FOV Dia.		17			16			10			5.4			
Max Coax FOV Dia.		16			11			5.0			2.6			
1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm NO Stop		NA	0.057			0.14			0.30			0.42		
		Res (lp/mm)	170			420			900			1260		
		Mag	3.0			7.5			15			30		
		DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm) Cam Format	2/3 "	2.2	x	2.9	0.88	x	1.2	0.44	x	0.59	0.22	x	0.29
		1 "	3.2	x	4.3	1.3	x	1.7	0.64	x	0.85	0.32	x	0.43
		4/3 "	4.5	x	6.0	1.8	x	2.4	0.90	x	1.2	0.45	x	0.60
		APS-C	5.6	x	8.4	2.2	x	3.3	1.1	x	1.7	0.56	x	0.84
2X Mini Camera Tube 35-08-14-000 EFL: 400mm NO Stop		NA	0.057			0.14			0.30			0.42		
		Res (lp/mm)	170			420			900			1260		
		Mag	4.0			10			20			40		
		DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm) Cam Format	2/3 "	1.7	x	2.2	0.66	x	0.88	0.33	x	0.44	0.17	x	0.22
		1 "	2.4	x	3.2	0.96	x	1.3	0.48	x	0.64	0.24	x	0.32
		4/3 "	3.4	x	4.5	1.4	x	1.8	0.68	x	0.90	0.34	x	0.45
		APS-C	4.2	x	6.3	1.7	x	2.5	0.84	x	1.3	0.42	x	0.63
2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm NO Stop		NA	0.057			0.14			0.30			0.42		
		Res (lp/mm)	170			420			900			1260		
		Mag	5.0			12.5			25			50		
		DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm) Cam Format	1 "	1.9	x	2.6	0.77	x	1.0	0.38	x	0.51	0.19	x	0.26
		4/3 "	2.7	x	3.6	1.1	x	1.4	0.54	x	0.72	0.27	x	0.36
		APS-C	3.3	x	5.0	1.3	x	2.0	0.67	x	1.0	0.33	x	0.50
		35mm(Full)	4.8	x	7.2	1.9	x	2.9	1.0	x	1.4	0.48	x	0.72
3X Mini Camera Tube 35-08-16-000 EFL: 600mm NO Stop		NA	0.057			0.14			0.30			0.42		
		Res (lp/mm)	170			420			900			1260		
		Mag	6.0			15			30			60		
		DOF (mm)	0.18			0.029			0.0063			0.0032		
	FOV (mm) Cam Format	1 "	1.6	x	2.1	0.64	x	0.85	0.32	x	0.43	0.16	x	0.21
		4/3 "	2.3	x	3.0	0.90	x	1.2	0.45	x	0.60	0.23	x	0.30
		APS-C	2.8	x	4.2	1.1	x	1.7	0.56	x	0.84	0.28	x	0.42
		35mm(Full)	4.0	x	6.0	1.6	x	2.4	0.80	x	1.2	0.40	x	0.60

 -- Useable FOV Limited by Coax illumination (>50% Illumination)

 -- FOV Limited by vignetting

	Height	x	Width	Diag.
2/3"	6.6	x	8.8	11
1"	9.6	x	12.8	16
4/3"	13.5	x	18	22.5
APS-C*	16.7	x	25.1	30
35mm (Full)	24	x	36	43.3

*Also known as Half Frame 35mm format

Objectives - Mini Camera Tubes

50X M Plan Apo 28-21-50-000 WD: 13mm	5X HiRes 28-20-44-000 WD: 34mm	10X HiRes 28-20-45-000 WD: 19mm	20X HiRes 28-20-46-000 WD: 13mm
2.3	10	5.2	4.5
1.1	7.0	2.8	2.1
0.55	0.225	0.45	0.60
1650	675	1350	1800
75	7.5	15	30
0.0019	0.011	0.0028	0.0016
0.088 x 0.12	0.88 x 1.2	0.44 x 0.59	0.22 x 0.29
0.13 x 0.17	1.3 x 1.7	0.64 x 0.85	0.32 x 0.43
0.18 x 0.24	1.8 x 2.4	0.90 x 1.2	0.45 x 0.60
0.22 x 0.33	2.2 x 3.3	1.1 x 1.7	0.56 x 0.84
0.55	0.225	0.45	0.60
1650	675	1350	1800
100	10	20	40
0.0019	0.011	0.0028	0.0016
0.066 x 0.088	0.66 x 0.88	0.33 x 0.44	0.17 x 0.22
0.096 x 0.13	0.96 x 1.3	0.48 x 0.64	0.24 x 0.32
0.14 x 0.18	1.4 x 1.8	0.68 x 0.90	0.34 x 0.45
0.17 x 0.25	1.7 x 2.5	0.84 x 1.3	0.42 x 0.63
0.55	0.225	0.45	0.60
1650	675	1350	1800
125	12.5	25	50
0.0019	0.011	0.0028	0.0016
0.08 x 0.10	0.77 x 1.0	0.38 x 0.51	0.19 x 0.26
0.11 x 0.14	1.1 x 1.4	0.54 x 0.72	0.27 x 0.36
0.13 x 0.20	1.3 x 2.0	0.67 x 1.0	0.33 x 0.50
0.19 x 0.29	1.9 x 2.9	0.96 x 1.4	0.48 x 0.72
0.55	0.225	0.45	0.60
1650	675	1350	1800
150	15	30	60
0.0019	0.011	0.0028	0.0016
0.064 x 0.085	0.64 x 0.85	0.32 x 0.43	0.16 x 0.21
0.090 x 0.12	0.90 x 1.2	0.45 x 0.60	0.23 x 0.30
0.11 x 0.17	1.1 x 1.7	0.56 x 0.84	0.28 x 0.42
0.16 x 0.24	1.6 x 2.4	0.80 x 1.2	0.40 x 0.60

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - OPTEM 7:1 Zoom with Lower

Chart 2A

		0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm		0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm		0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm		1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm		
Max FOV Dia.		156		125		94		63		
Max Coax FOV Dia.		NR		NR		NR		19		
		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	
0.4X Camera Tube 35-08-00-000 EFL: 80mm	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039	
		14	47	18	58	24	78	35	116	
		0.067	0.46	0.084	0.58	0.11	0.77	0.17	1.2	
		25	2.4	16	1.5	9.2	0.85	4.1	0.38	
	FOV (mm) Cam Format	1/3"	54 x 71	7.8 x 10	43 x 57	6.2 x 8.3	32 x 43	4.7 x 6.2	21 x 29	3.1 x 4.1
		1/2"	71 x 95	10 x 14	57 x 76	8.3 x 11	43 x 57	6.2 x 8.3	29 x 38	4.1 x 5.5
		2/3"	98 x 131	14 x 19	79 x 105	11 x 15	59 x 79	8.5 x 11	39 x 52	5.7 x 7.6
	0.5X Camera Tube 35-08-01-000 EFL: 100mm	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
			14	47	18	58	24	78	35	116
			0.084	0.58	0.11	0.73	0.14	0.97	0.21	1.5
25			2.4	16	1.5	9.2	0.85	4.1	0.38	
FOV (mm) Cam Format		1/3"	43 x 57	6.2 x 8.3	34 x 46	5.0 x 6.6	26 x 34	3.7 x 5.0	17 x 23	2.5 x 3.3
		1/2"	57 x 76	8.3 x 11	46 x 61	6.6 x 8.8	34 x 46	5.0 x 6.6	23 x 30	3.3 x 4.4
		2/3"	79 x 105	11 x 15	63 x 84	9.1 x 12	47 x 63	6.8 x 9.1	31 x 42	4.6 x 6.1
0.6X Camera Tube 35-08-02-000 EFL: 120mm		NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
			14	47	18	58	24	78	35	116
			0.10	0.70	0.13	0.87	0.17	1.2	0.25	1.7
	25		2.4	16	1.5	9.2	0.85	4.1	0.38	
	FOV (mm) Cam Format	1/3"	36 x 48	5.2 x 6.9	29 x 38	4.1 x 5.5	21 x 29	3.1 x 4.1	14 x 19	2.1 x 2.8
		1/2"	48 x 63	6.9 x 9.2	38 x 51	5.5 x 7.4	29 x 38	4.1 x 5.5	19 x 25	2.8 x 3.7
		2/3"	65 x 87	9.5 x 13	52 x 70	7.6 x 10	39 x 52	5.7 x 7.6	26 x 35	3.8 x 5.1
	0.8X Camera Tube 35-08-04-000 EFL: 160mm	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
			14	47	18	58	24	78	35	116
			0.13	0.93	0.17	1.2	0.22	1.5	0.34	2.3
25			2.4	16	1.5	9.2	0.85	4.1	0.38	
FOV (mm) Cam Format		1/3"	27 x 36	3.9 x 5.2	21 x 29	3.1 x 4.1	16 x 21	2.3 x 3.1	11 x 14	1.6 x 2.1
		1/2"	36 x 48	5.2 x 6.9	29 x 38	4.1 x 5.5	21 x 29	3.1 x 4.1	14 x 19	2.1 x 2.8
		2/3"	49 x 65	7.1 x 9.5	39 x 52	5.7 x 7.6	29 x 39	4.3 x 5.7	20 x 26	2.8 x 3.8
1X Camera Tube 35-08-06-000 EFL: 200mm		NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
			14	47	18	58	24	78	35	116
			0.17	1.2	0.21	1.5	0.28	1.9	0.42	2.9
	25		2.4	16	1.5	9.2	0.85	4.1	0.38	
	FOV (mm) Cam Format	1/3"	21 x 29	3.1 x 4.1	17 x 23	2.5 x 3.3	13 x 17	1.9 x 2.5	8.6 x 11	1.2 x 1.7
		1/2"	29 x 38	4.1 x 5.5	23 x 30	3.3 x 4.4	17 x 23	2.5 x 3.3	11 x 15	1.7 x 2.2
		2/3"	39 x 52	5.7 x 7.6	31 x 42	4.6 x 6.1	24 x 31	3.4 x 4.6	16 x 21	2.3 x 3.0

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

NR = Not recommended for Coax illumination

Lens

1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm		1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm		1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm		2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm		3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm		4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm	
50		44		38		31		21		16	
19		19		18		19		13		9.4	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
0.21	1.5	0.24	1.7	0.28	1.9	0.34	2.3	0.50	3.5	0.67	4.6
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
17 x 23	2.5 x 3.3	15 x 20	2.2 x 2.9	13 x 17	1.9 x 2.5	11 x 14	1.6 x 2.1	7.1 x 9.5	1.0 x 1.4	5.4 x 7.1	0.78 x 1.0
23 x 30	3.3 x 4.4	20 x 27	2.9 x 3.9	17 x 23	2.5 x 3.3	14 x 19	2.1 x 2.8	9.5 x 13	1.4 x 1.8	7.1 x 10	1.0 x 1.4
31 x 42	4.6 x 6.1	28 x 37	4.0 x 5.3	24 x 31	3.4 x 4.6	20 x 26	2.8 x 3.8	13 x 17	1.9 x 2.5	10 x 13	1.4 x 1.9
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
0.26	1.8	0.30	2.1	0.35	2.4	0.42	2.9	0.63	4.3	0.84	5.8
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
14 x 18	2.0 x 2.6	12 x 16	1.7 x 2.3	10 x 14	1.5 x 2.0	8.6 x 11	1.24 x 1.7	5.7 x 7.6	0.83 x 1.1	4.3 x 5.7	0.62 x 0.83
18 x 24	2.6 x 3.5	16 x 21	2.3 x 3.1	14 x 18	2.0 x 2.6	11 x 15	1.7 x 2.2	7.6 x 10	1.1 x 1.5	5.7 x 7.6	0.83 x 1.1
25 x 34	3.6 x 4.9	22 x 29	3.2 x 4.2	19 x 25	2.7 x 3.6	16 x 21	2.3 x 3.0	10 x 14	1.5 x 2.0	7.9 x 10	1.1 x 1.5
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
0.32	2.2	0.36	2.5	0.42	2.9	0.50	3.5	0.76	5.2	1.0	7.0
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
11 x 15	1.7 x 2.2	10 x 13	1.4 x 1.9	8.6 x 11	1.2 x 1.7	7.1 x 9.5	1.0 x 1.4	4.8 x 6.4	0.69 x 0.92	3.6 x 4.8	0.52 x 0.69
15 x 20	2.2 x 2.9	13 x 18	1.9 x 2.6	11 x 15	1.7 x 2.2	9.5 x 13	1.4 x 1.8	6.4 x 8.5	0.92 x 1.2	4.8 x 6.3	0.69 x 0.92
21 x 28	3.0 x 4.0	18 x 24	2.7 x 3.5	16 x 21	2.3 x 3.0	13 x 17	1.9 x 2.5	8.7 x 12	1.3 x 1.7	6.5 x 8.7	0.95 x 1.3
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
0.42	2.9	0.48	3.3	0.56	3.9	0.67	4.6	1.0	7.0	1.3	9.3
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
8.6 x 11	1.2 x 1.7	7.5 x 10	1.1 x 1.4	6.4 x 8.6	0.93 x 1.2	5.4 x 7.1	0.78 x 1.0	3.6 x 4.8	0.52 x 0.69	2.7 x 3.6	0.39 x 0.52
11 x 15	1.7 x 2.2	10 x 13	1.4 x 1.9	8.6 x 11	1.2 x 1.7	7.1 x 9.5	1.0 x 1.4	4.8 x 6.4	0.69 x 0.92	3.6 x 4.8	0.52 x 0.69
16 x 21	2.3 x 3.0	14 x 18	2.0 x 2.7	12 x 16	1.7 x 2.3	9.8 x 13	1.4 x 1.9	6.6 x 8.7	0.95 x 1.3	4.9 x 6.5	0.71 x 0.95
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
0.53	3.6	0.60	4.1	0.70	4.8	0.84	5.8	1.3	8.7	1.7	12
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
6.9 x 9.1	0.99 x 1.3	6.0 x 8.0	0.87 x 1.2	5.1 x 6.9	0.74 x 0.99	4.3 x 5.7	0.62 x 0.83	2.9 x 3.8	0.41 x 0.55	2.1 x 2.9	0.31 x 0.41
9.1 x 12	1.3 x 1.8	8.0 x 11	1.2 x 1.5	6.9 x 9.1	0.99 x 1.3	5.7 x 7.6	0.83 x 1.1	3.8 x 5.1	0.55 x 0.74	2.9 x 3.8	0.41 x 0.55
13 x 17	1.8 x 2.4	11 x 15	1.6 x 2.1	9.4 x 13	1.4 x 1.8	7.9 x 10	1.1 x 1.5	5.2 x 7.0	0.76 x 1.0	3.9 x 5.2	0.57 x 0.76

Optical Performance - OPTEM 7:1 Zoom with Lower

Chart 2B

		0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm		0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm		0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm		1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm	
Max FOV Dia.		156		125		94		63	
Max Coax FOV Dia.		NR		NR		NR		19	
		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
		14	47	18	58	24	78	35	116
		0.25	1.7	0.32	2.2	0.42	2.9	0.63	4.4
		25	2.4	16	1.5	9.2	0.85	4.1	0.38
	FOV (mm) Cam Format 2/3" 1" 4/3" APS-C	26 x 35	3.8 x 5.1	21 x 28	3.0 x 4.0	16 x 21	2.3 x 3.0	10 x 14	1.5 x 2.0
		38 x 51	5.5 x 7.4	30 x 41	4.4 x 5.9	23 x 30	3.3 x 4.4	15 x 20	2.2 x 2.9
		54 x 71	7.8 x 10	43 x 57	6.2 x 8.3	32 x 43	4.7 x 6.2	21 x 29	3.1 x 4.1
		66 x 100	10 x 14	53 x 80	7.7 x 12	40 x 60	5.8 x 8.7	27 x 40	3.8 x 5.8
	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
		14	47	18	58	24	78	35	116
		0.34	2.3	0.42	2.9	0.56	3.9	0.84	5.8
		25	2.4	16	1.5	9.2	0.85	4.1	0.38
2X Mini Camera Tube 35-08-14-000 EFL: 400mm	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
		14	47	18	58	24	78	35	116
		0.34	2.3	0.42	2.9	0.56	3.9	0.84	5.8
		25	2.4	16	1.5	9.2	0.85	4.1	0.38
	FOV (mm) Cam Format 2/3" 1" 4/3" APS-C	20 x 26	2.8 x 3.8	16 x 21	2.3 x 3.0	12 x 16	1.7 x 2.3	7.9 x 10	1.1 x 1.5
		29 x 38	4.1 x 5.5	23 x 30	3.3 x 4.4	17 x 23	2.5 x 3.3	11 x 15	1.7 x 2.2
		40 x 54	5.8 x 7.8	32 x 43	4.7 x 6.2	24 x 32	3.5 x 4.7	16 x 21	2.3 x 3.1
		50 x 75	7.2 x 11	40 x 60	5.8 x 8.7	30 x 45	4.3 x 6.5	20 x 30	2.9 x 4.3
	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
		14	47	18	58	24	78	35	116
		0.42	2.9	0.53	3.6	0.70	4.8	1.1	7.3
		25	2.4	16	1.5	9.2	0.85	4.1	0.38
2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
		14	47	18	58	24	78	35	116
		0.42	2.9	0.53	3.6	0.70	4.8	1.1	7.3
		25	2.4	16	1.5	9.2	0.85	4.1	0.38
	FOV (mm) Cam Format 1" 4/3" APS-C 35mm(Full)	23 x 30	3.3 x 4.4	18 x 24	2.6 x 3.5	14 x 18	2.0 x 2.6	9.1 x 12	1.3 x 1.8
		32 x 43	4.7 x 6.2	26 x 34	3.7 x 5.0	19 x 26	2.8 x 3.7	13 x 17	1.9 x 2.5
		40 x 60	5.8 x 8.7	32 x 48	4.6 x 6.9	24 x 36	3.5 x 5.2	16 x 24	2.3 x 3.5
		57 x 86	8.3 x 12	46 x 69	6.6 x 9.9	34 x 51	5.0 x 7.4	23 x 34	3.3 x 5.0
	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
		14	47	18	58	24	78	35	116
		0.50	3.5	0.63	4.4	0.84	5.8	1.3	8.7
		25	2.4	16	1.5	9.2	0.85	4.1	0.38
3X Mini Camera Tube 35-08-16-000 EFL: 600mm	NA Res (lp/mm) Mag DOF (mm)	0.0047	0.016	0.0059	0.019	0.0079	0.026	0.012	0.039
		14	47	18	58	24	78	35	116
		0.50	3.5	0.63	4.4	0.84	5.8	1.3	8.7
		25	2.4	16	1.5	9.2	0.85	4.1	0.38
	FOV (mm) Cam Format 1" 4/3" APS-C 35mm(Full)	19 x 25	2.8 x 3.7	15 x 20	2.2 x 2.9	11 x 15	1.7 x 2.2	7.6 x 10	1.1 x 1.5
		27 x 36	3.9 x 5.2	21 x 29	3.1 x 4.1	16 x 21	2.3 x 3.1	11 x 14	1.6 x 2.1
		33 x 50	4.8 x 7.2	27 x 40	3.8 x 5.8	20 x 30	2.9 x 4.3	13 x 20	1.9 x 2.9
		48 x 71	6.9 x 10	38 x 57	5.5 x 8.3	29 x 43	4.1 x 6.2	19 x 29	2.8 x 4.1

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

NR = Not recommended for Coax illumination

	Height	x	Width	Diag.
2/3"	6.6	x	8.8	11
1"	9.6	x	12.8	16
4/3"	13.5	x	18	22.5
APS-C*	16.7	x	25.1	30
35mm (Full)	24	x	36	43.3

*Also known as Half Frame 35mm format

Lens - Mini Camera Tubes

1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm		1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm		1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm		2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm		3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm		4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm	
50		44		38		31		21		16	
19		19		18		19		13		9.4	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
0.79	5.4	0.90	6.2	1.1	7.3	1.3	8.7	1.9	13	2.5	17
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
8.4 x 11	1.2 x 1.6	7.3 x 10	1.1 x 1.4	6.3 x 8.4	0.91 x 1.2	5.2 x 7.0	0.76 x 1.0	3.5 x 4.7	0.51 x 0.67	2.6 x 3.5	0.38 x 0.51
12 x 16	1.8 x 2.4	11 x 14	1.5 x 2.1	9.1 x 12	1.3 x 1.8	7.6 x 10	1.1 x 1.5	5.1 x 6.8	0.74 x 0.98	3.8 x 5.1	0.55 x 0.74
17 x 23	2.5 x 3.3	15 x 20	2.2 x 2.9	13 x 17	1.9 x 2.5	11 x 14	1.6 x 2.1	7.1 x 9.5	1.0 x 1.4	5.4 x 7.1	0.78 x 1.0
21 x 32	3.1 x 4.6	19 x 28	2.7 x 4.0	16 x 24	2.3 x 3.5	13 x 20	1.9 x 2.9	8.8 x 13	1.3 x 1.9	6.6 x 10	0.96 x 1.4
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
1.1	7.3	1.2	8.3	1.4	9.7	1.7	12	2.5	17	3.4	23
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
6.3 x 8.4	0.91 x 1.2	5.5 x 7.3	0.80 x 1.1	4.7 x 6.3	0.68 x 0.91	3.9 x 5.2	0.57 x 0.76	2.6 x 3.5	0.38 x 0.51	2.0 x 2.6	0.28 x 0.38
9.1 x 12	1.3 x 1.8	8.0 x 11	1.2 x 1.5	6.9 x 9.1	0.99 x 1.3	5.7 x 7.6	0.83 x 1.1	3.8 x 5.1	0.55 x 0.74	2.9 x 3.8	0.41 x 0.55
13 x 17	1.9 x 2.5	11 x 15	1.6 x 2.2	9.6 x 13	1.4 x 1.9	8.0 x 11	1.2 x 1.6	5.4 x 7.1	0.78 x 1.0	4.0 x 5.4	0.58 x 0.78
16 x 24	2.3 x 3.5	14 x 21	2.0 x 3.0	12 x 18	1.7 x 2.6	9.9 x 15	1.4 x 2.2	6.6 x 10	0.96 x 1.4	5.0 x 7.5	0.72 x 1.1
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
1.3	9.1	1.5	10	1.8	12	2.1	15	3.1	22	4.2	29
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
7.3 x 9.8	1.1 x 1.4	6.4 x 8.5	0.93 x 1.2	5.5 x 7.3	0.79 x 1.1	4.6 x 6.1	0.66 x 0.88	3.0 x 4.1	0.44 x 0.59	2.3 x 3.0	0.33 x 0.44
10 x 14	1.5 x 2.0	9.0 x 12	1.3 x 1.7	7.7 x 10	1.1 x 1.5	6.4 x 8.6	0.93 x 1.2	4.3 x 5.7	0.62 x 0.83	3.2 x 4.3	0.47 x 0.62
13 x 19	1.8 x 2.8	11 x 17	1.6 x 2.4	9.5 x 14	1.4 x 2.1	8.0 x 12	1.2 x 1.7	5.3 x 8.0	0.77 x 1.2	4.0 x 6.0	0.58 x 0.87
18 x 27	2.6 x 4.0	16 x 24	2.3 x 3.5	14 x 21	2.0 x 3.0	11 x 17	1.7 x 2.5	7.6 x 11	1.1 x 1.7	5.7 x 8.6	0.83 x 1.2
0.015	0.048	0.017	0.055	0.020	0.065	0.024	0.078	0.035	0.12	0.047	0.16
44	145	51	166	59	194	71	233	106	349	142	465
1.6	11	1.8	12	2.1	15	2.5	17	3.8	26	5.0	35
2.6	0.24	2.0	0.19	1.5	0.14	1.0	0.094	0.45	0.042	0.25	0.024
6.1 x 8.1	0.88 x 1.2	5.3 x 7.1	0.77 x 1.0	4.6 x 6.1	0.66 x 0.88	3.8 x 5.1	0.55 x 0.74	2.5 x 3.4	0.37 x 0.49	1.9 x 2.5	0.28 x 0.37
8.6 x 11	1.2 x 1.7	7.5 x 10	1.1 x 1.4	6.4 x 8.6	0.93 x 1.2	5.4 x 7.1	0.78 x 1.0	3.6 x 4.8	0.52 x 0.69	2.7 x 3.6	0.39 x 0.52
11 x 16	1.5 x 2.3	9.3 x 14	1.3 x 2.0	8.0 x 12	1.2 x 1.7	6.6 x 10	0.96 x 1.4	4.4 x 6.6	0.64 x 0.96	3.3 x 5.0	0.48 x 0.72
15 x 23	2.2 x 3.3	13 x 20	1.9 x 2.9	11 x 17	1.7 x 2.5	9.5 x 14	1.4 x 2.1	6.4 x 9.5	0.92 x 1.4	4.8 x 7.1	0.69 x 1.0

Optical Performance - OPTEM 7:1 Zoom with LWD

Chart 2C

		2X M Plan Apo 28-21-02-000 WD: 34mm		5X M Plan Apo 28-21-05-000 WD: 34mm		10X M Plan Apo 28-21-10-000 WD: 34mm		
Max FOV Dia.		14		6.9		3.2		
Max Coax FOV Dia.		11		6.5		2.2		
		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	
0.4X Camera Tube 35-08-00-000 EFL: 80mm	NA Res (lp/mm) Mag DOF (mm)		0.024	0.057	0.059	0.14	0.12	0.30
			71	170	177	420	354	900
			0.34	2.3	0.84	5.8	1.7	12
			1.0	0.18	0.16	0.029	0.041	0.0063
	FOV (mm) Cam Format	1/3"	11 x 14	1.6 x 2.1	4.3 x 5.7	0.62 x 0.83	2.1 x 2.9	0.31 x 0.41
		1/2"	14 x 19	2.1 x 2.8	5.7 x 7.6	0.83 x 1.1	2.9 x 3.8	0.41 x 0.55
		2/3"	20 x 26	2.8 x 3.8	7.9 x 10	1.1 x 1.5	3.9 x 5.2	0.57 x 0.76
0.5X Camera Tube 35-08-01-000 EFL: 100mm	NA Res (lp/mm) Mag DOF (mm)		0.024	0.057	0.059	0.14	0.12	0.30
			71	170	177	420	354	900
			0.42	2.9	1.1	7.3	2.1	15
			1.0	0.18	0.16	0.029	0.041	0.0063
	FOV (mm) Cam Format	1/3"	8.6 x 11	1.2 x 1.7	3.4 x 4.6	0.50 x 0.66	1.7 x 2.3	0.25 x 0.33
		1/2"	11 x 15	1.7 x 2.2	4.6 x 6.1	0.66 x 0.88	2.3 x 3.0	0.33 x 0.44
		2/3"	16 x 21	2.3 x 3.0	6.3 x 8.4	0.91 x 1.2	3.1 x 4.2	0.46 x 0.61
0.6X Camera Tube 35-08-02-000 EFL: 120mm	NA Res (lp/mm) Mag DOF (mm)		0.024	0.057	0.059	0.14	0.12	0.30
			71	170	177	420	354	900
			0.50	3.5	1.3	8.7	2.5	17
			1.0	0.18	0.16	0.029	0.041	0.0063
	FOV (mm) Cam Format	1/3"	7.1 x 9.5	1.0 x 1.4	2.9 x 3.8	0.41 x 0.55	1.4 x 1.9	0.21 x 0.28
		1/2"	9.5 x 13	1.4 x 1.8	3.8 x 5.1	0.55 x 0.74	1.9 x 2.5	0.28 x 0.37
		2/3"	13 x 17	1.9 x 2.5	5.2 x 7.0	0.76 x 1.0	2.6 x 3.5	0.38 x 0.51
0.8X Camera Tube 35-08-04-000 EFL: 160mm	NA Res (lp/mm) Mag DOF (mm)		0.024	0.057	0.059	0.14	0.12	0.30
			71	170	177	420	354	900
			0.67	4.6	1.7	12	3.4	23
			1.0	0.18	0.16	0.029	0.041	0.0063
	FOV (mm) Cam Format	1/3"	5.4 x 7.1	0.78 x 1.0	2.1 x 2.9	0.31 x 0.41	1.1 x 1.4	0.16 x 0.21
		1/2"	7.1 x 9.5	1.0 x 1.4	2.9 x 3.8	0.41 x 0.55	1.4 x 1.9	0.21 x 0.28
		2/3"	9.8 x 13	1.4 x 1.9	3.9 x 5.2	0.57 x 0.76	2.0 x 2.6	0.28 x 0.38
1X Camera Tube 35-08-06-000 EFL: 200mm	NA Res (lp/mm) Mag DOF (mm)		0.024	0.057	0.059	0.14	0.12	0.30
			71	170	177	420	354	900
			0.84	5.8	2.1	15	4.2	29
			1.0	0.18	0.16	0.029	0.041	0.0063
	FOV (mm) Cam Format	1/3"	4.3 x 5.7	0.62 x 0.83	1.7 x 2.3	0.25 x 0.33	0.86 x 1.1	0.12 x 0.17
		1/2"	5.7 x 7.6	0.83 x 1.1	2.3 x 3.0	0.33 x 0.44	1.1 x 1.5	0.17 x 0.22
		2/3"	7.9 x 10	1.1 x 1.5	3.1 x 4.2	0.46 x 0.61	1.6 x 2.1	0.23 x 0.30

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

50X M Plan Apo is NOT recommended for use with a 7:1 Zoom
0.4X and 0.5X Camera Tubes are not recommended for use with
a 7:1 Zoom and Microscope Objectives.

Objectives

20X M Plan Apo 28-21-11-000 WD: 20mm		5X HiRes 28-20-44-000 WD: 34mm		10X HiRes 28-20-45-000 WD: 19mm		20X HiRes 28-20-46-000 WD: 13mm	
1.2		6.4		3.1		1.7	
0.83		4.9		2.2		1.1	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
3.4	23	0.84	5.8	1.7	12	3.4	23
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.00158
1.1 x 1.4	0.16 x 0.21	4.3 x 5.7	0.62 x 0.83	2.1 x 2.9	0.31 x 0.41	1.1 x 1.4	0.16 x 0.21
1.4 x 1.9	0.21 x 0.28	5.7 x 7.6	0.83 x 1.1	2.9 x 3.8	0.41 x 0.55	1.4 x 1.9	0.21 x 0.28
2.0 x 2.6	0.28 x 0.38	7.9 x 10	1.1 x 1.5	3.9 x 5.2	0.57 x 0.76	2.0 x 2.6	0.28 x 0.38
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
4.2	29	1.1	7.3	2.1	15	4.2	29
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.00158
0.86 x 1.1	0.12 x 0.17	3.4 x 4.6	0.50 x 0.66	1.7 x 2.3	0.25 x 0.33	0.9 x 1.1	0.12 x 0.17
1.1 x 1.5	0.17 x 0.22	4.6 x 6.1	0.66 x 0.88	2.3 x 3.0	0.33 x 0.44	1.1 x 1.5	0.17 x 0.22
1.6 x 2.1	0.23 x 0.30	6.3 x 8.4	0.91 x 1.2	3.1 x 4.2	0.46 x 0.61	1.6 x 2.1	0.23 x 0.30
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
5.0	35	1.3	8.7	2.5	17	5.0	35
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.00158
0.71 x 0.95	0.10 x 0.14	2.9 x 3.8	0.41 x 0.55	1.4 x 1.9	0.21 x 0.28	0.71 x 0.95	0.10 x 0.14
0.95 x 1.3	0.14 x 0.18	3.8 x 5.1	0.55 x 0.74	1.9 x 2.5	0.28 x 0.37	0.95 x 1.3	0.14 x 0.18
1.3 x 1.7	0.19 x 0.25	5.2 x 7.0	0.76 x 1.0	2.6 x 3.5	0.38 x 0.51	1.3 x 1.7	0.19 x 0.25
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
6.7	46	1.7	12	3.4	23	6.7	46
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.00158
0.54 x 0.71	0.078 x 0.10	2.1 x 2.9	0.31 x 0.41	1.1 x 1.4	0.16 x 0.21	0.54 x 0.71	0.078 x 0.10
0.71 x 0.95	0.10 x 0.14	2.9 x 3.8	0.41 x 0.55	1.4 x 1.9	0.21 x 0.28	0.71 x 0.95	0.10 x 0.14
0.98 x 1.3	0.14 x 0.19	3.9 x 5.2	0.57 x 0.76	2.0 x 2.6	0.28 x 0.38	0.98 x 1.3	0.14 x 0.19
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
8.4	58	2.1	15	4.2	29	8.4	58
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.00158
0.43 x 0.57	0.062 x 0.083	1.7 x 2.3	0.25 x 0.33	0.86 x 1.1	0.12 x 0.17	0.43 x 0.57	0.062 x 0.083
0.57 x 0.76	0.083 x 0.11	2.3 x 3.0	0.33 x 0.44	1.1 x 1.5	0.17 x 0.22	0.57 x 0.76	0.083 x 0.11
0.79 x 1.0	0.11 x 0.15	3.1 x 4.2	0.46 x 0.61	1.6 x 2.1	0.23 x 0.30	0.79 x 1.0	0.11 x 0.15

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - OPTEM 7:1 Zoom with LWD

Chart 2D

		2X M Plan Apo 28-21-02-000 WD: 34mm		5X M Plan Apo 28-21-05-000 WD: 34mm		10X M Plan Apo 28-21-10-000 WD: 34mm	
Max FOV Dia.		14		6.9		3.2	
Max Coax FOV Dia.		11		6.5		2.2	
		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
1.5X Mini Camera Tube	NA Res (lp/mm) Mag DOF (mm)	0.024	0.057	0.059	0.14	0.12	0.30
		71	170	177	420	354	900
		1.3	8.7	3.2	22	6.30	44
		1.0	0.18	0.16	0.029	0.041	0.0063
35-08-13-000 EFL: 300mm	FOV (mm) Cam Format 2/3" 1" 4/3" APS-C	5.2 x 7.0	0.76 x 1.0	2.1 x 2.8	0.30 x 0.40	1.0 x 1.4	0.15 x 0.20
		7.6 x 10	1.1 x 1.5	3.0 x 4.1	0.44 x 0.59	1.5 x 2.0	0.22 x 0.29
		11 x 14	1.6 x 2.1	4.3 x 5.7	0.62 x 0.83	2.1 x 2.9	0.31 x 0.41
		13 x 20	1.9 x 2.9	5.3 x 8.0	0.77 x 1.2	2.7 x 4.0	0.38 x 0.58
2X Mini Camera Tube	NA Res (lp/mm) Mag DOF (mm)	0.024	0.057	0.059	0.14	0.12	0.30
		71	170	177	420	354	900
		1.7	12	4.2	29	8.4	58
		1.0	0.18	0.16	0.029	0.041	0.0063
35-08-14-000 EFL: 400mm	FOV (mm) Cam Format 2/3" 1" 4/3" APS-C	3.9 x 5.2	0.57 x 0.76	1.6 x 2.1	0.23 x 0.30	0.79 x 1.0	0.11 x 0.15
		5.7 x 7.6	0.83 x 1.1	2.3 x 3.0	0.33 x 0.44	1.1 x 1.5	0.17 x 0.22
		8.0 x 11	1.2 x 1.6	3.2 x 4.3	0.47 x 0.62	1.6 x 2.1	0.23 x 0.31
		10 x 15	1.4 x 2.2	4.0 x 6.0	0.58 x 0.87	2.0 x 3.0	0.29 x 0.43
2.5X Mini Camera Tube	NA Res (lp/mm) Mag DOF (mm)	0.024	0.057	0.059	0.14	0.12	0.30
		71	170	177	420	354	900
		2.1	15	5.3	36	11	73
		1.0	0.18	0.16	0.029	0.041	0.0063
35-08-15-000 EFL: 500mm	FOV (mm) Cam Format 1" 4/3" APS-C 35mm(Full)	4.6 x 6.1	0.66 x 0.88	1.8 x 2.4	0.26 x 0.35	0.91 x 1.2	0.13 x 0.18
		6.4 x 8.6	0.93 x 1.2	2.6 x 3.4	0.37 x 0.50	1.3 x 1.7	0.19 x 0.25
		8.0 x 12	1.2 x 1.7	3.2 x 4.8	0.46 x 0.69	1.6 x 2.4	0.23 x 0.35
		11 x 17	1.7 x 2.5	4.6 x 6.9	0.66 x 0.99	2.3 x 3.4	0.33 x 0.50
3X Mini Camera Tube	NA Res (lp/mm) Mag DOF (mm)	0.024	0.057	0.059	0.14	0.12	0.30
		71	170	177	420	354	900
		2.5	17	6.3	44	13	87
		1.0	0.18	0.16	0.029	0.041	0.0063
35-08-16-000 EFL: 600mm	FOV (mm) Cam Format 1" 4/3" APS-C 35mm(Full)	3.8 x 5.1	0.55 x 0.74	1.5 x 2.0	0.22 x 0.29	0.76 x 1.0	0.11 x 0.15
		5.4 x 7.1	0.78 x 1.0	2.1 x 2.9	0.31 x 0.41	1.1 x 1.4	0.16 x 0.21
		6.6 x 10	0.96 x 1.4	2.7 x 4.0	0.38 x 0.58	1.3 x 2.0	0.19 x 0.29
		10 x 14	1.4 x 2.1	3.8 x 5.7	0.55 x 0.83	1.9 x 2.9	0.28 x 0.41

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

50X M Plan Apo is NOT recommended for use with a 7:1 Zoom
0.4X and 0.5X Camera Tubes are not recommended for use with
a 7:1 Zoom and Microscope Objectives.

	Height	x	Width	Diag.
2/3"	6.6	x	8.8	11
1"	9.6	x	12.8	16
4/3"	13.5	x	18	22.5
APS-C*	16.7	x	25.1	30
35mm (Full)	24	x	36	43.3

*Also known as Half Frame 35mm format

Objectives - Mini Camera Tubes

20X M Plan Apo 28-21-11-000 WD: 20mm		5X HiRes 28-20-44-000 WD: 34mm		10X HiRes 28-20-45-000 WD: 19mm		20X HiRes 28-20-46-000 WD: 13mm	
1.2		6.4		3.1		1.7	
0.83		4.9		2.2		1.1	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
13	87	3.2	22	6.3	44	13	87
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.0016
0.52 x 0.70	0.076 x 0.10	2.1 x 2.8	0.30 x 0.40	1.0 x 1.4	0.15 x 0.20	0.52 x 0.70	0.076 x 0.10
0.76 x 1.0	0.11 x 0.15	3.0 x 4.1	0.44 x 0.59	1.5 x 2.0	0.22 x 0.29	0.76 x 1.02	0.11 x 0.15
1.1 x 1.4	0.16 x 0.21	4.3 x 5.7	0.62 x 0.83	2.1 x 2.9	0.31 x 0.41	1.1 x 1.4	0.16 x 0.21
1.3 x 2.0	0.19 x 0.29	5.3 x 8.0	0.77 x 1.2	2.7 x 4.0	0.38 x 0.58	1.3 x 2.0	0.19 x 0.29
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
17	116	4.2	29	8.4	58	17	116
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.0016
0.39 x 0.52	0.057 x 0.076	1.6 x 2.1	0.23 x 0.30	0.79 x 1.0	0.11 x 0.15	0.39 x 0.52	0.057 x 0.076
0.57 x 0.76	0.083 x 0.11	2.3 x 3.0	0.33 x 0.44	1.1 x 1.5	0.17 x 0.22	0.57 x 0.76	0.083 x 0.11
0.80 x 1.1	0.12 x 0.16	3.2 x 4.3	0.47 x 0.62	1.6 x 2.1	0.23 x 0.31	0.80 x 1.1	0.12 x 0.16
0.99 x 1.5	0.14 x 0.22	4.0 x 6.0	0.58 x 0.87	2.0 x 3.0	0.29 x 0.43	0.99 x 1.5	0.14 x 0.22
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
21	145	5.3	36	11	73	21	145
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.0016
0.46 x 0.61	0.066 x 0.088	1.8 x 2.4	0.26 x 0.35	0.91 x 1.2	0.13 x 0.18	0.46 x 0.61	0.066 x 0.088
0.64 x 0.86	0.093 x 0.12	2.6 x 3.4	0.37 x 0.50	1.3 x 1.7	0.19 x 0.25	0.64 x 0.86	0.093 x 0.12
0.80 x 1.2	0.12 x 0.17	3.2 x 4.8	0.46 x 0.69	1.6 x 2.4	0.23 x 0.35	0.80 x 1.2	0.12 x 0.17
1.1 x 1.7	0.17 x 0.25	4.6 x 6.9	0.66 x 0.99	2.3 x 3.4	0.33 x 0.50	1.1 x 1.7	0.17 x 0.25
0.24	0.42	0.059	0.19	0.12	0.39	0.24	0.60
708	1260	177	581	354	1163	708	1800
25	174	6.3	44	13	87	25	174
0.010	0.0032	0.16	0.015	0.041	0.0038	0.010	0.0016
0.38 x 0.51	0.055 x 0.074	1.5 x 2.0	0.22 x 0.29	0.76 x 1.0	0.11 x 0.15	0.38 x 0.51	0.055 x 0.074
0.54 x 0.71	0.078 x 0.10	2.1 x 2.9	0.31 x 0.41	1.1 x 1.4	0.16 x 0.21	0.54 x 0.71	0.078 x 0.10
0.66 x 1.0	0.096 x 0.14	2.7 x 4.0	0.38 x 0.58	1.3 x 2.0	0.19 x 0.29	0.66 x 1.0	0.096 x 0.14
0.95 x 1.4	0.14 x 0.21	3.8 x 5.7	0.55 x 0.83	1.9 x 2.9	0.28 x 0.41	0.95 x 1.4	0.14 x 0.21

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - OPTEM 12.5:1 Zoom and Chart 3A

		0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm		0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm		0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm		1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm		
Max FOV Dia.		145		116		87		58		
Max Coax FOV Dia.		NR		NR		NR		20		
		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	
0.4X Camera Tube 35-08-00-000 EFL: 80mm	NA Res (lp/mm) Mag DOF (mm)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048	
		11	58	14	72	18	96	27	144	
		0.045	0.55	0.056	0.69	0.075	0.92	0.11	1.4	
		44	1.5	28	0.98	16	0.55	7.0	0.25	
	FOV (mm) Cam Format	1/3"	80 x 107	6.5 x 8.7	64 x 86	5.2 x 7.0	48 x 64	3.9 x 5.2	32 x 43	2.6 x 3.5
		1/2"	107 x 143	8.7 x 12	86 x 114	7.0 x 9.3	64 x 86	5.2 x 7.0	43 x 57	3.5 x 4.6
		2/3"	147 x 196	12 x 16	118 x 157	9.6 x 13	88 x 118	7.2 x 9.6	59 x 79	4.8 x 6.4
	0.5X Camera Tube 35-08-01-000 EFL: 100mm	NA Res (lp/mm) Mag DOF (m m)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
			11	58	14	72	18	96	27	144
			0.056	0.69	0.070	0.86	0.093	1.2	0.14	1.7
44			1.5	28	0.98	16	0.55	7.0	0.25	
FOV (mm) Cam Format		1/3"	64 x 86	5.2 x 7.0	51 x 69	4.2 x 5.6	39 x 51	3.1 x 4.2	26 x 34	2.1 x 2.8
		1/2"	86 x 114	7.0 x 9.3	69 x 91	5.6 x 7.4	51 x 69	4.2 x 5.6	34 x 46	2.8 x 3.7
		2/3"	118 x 157	9.6 x 13	94 x 126	7.7 x 10	71 x 94	5.7 x 7.7	47 x 63	3.8 x 5.1
0.6X Camera Tube 35-08-02-000 EFL: 120mm		NA Res (lp/mm) Mag DOF (mm)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
			11	58	14	72	18	96	27	144
			0.067	0.83	0.084	1.0	0.11	1.4	0.17	2.1
	44		1.5	28	0.98	16	0.55	7.0	0.25	
	FOV (mm) Cam Format	1/3"	54 x 71	4.3 x 5.8	43 x 57	3.5 x 4.6	32 x 43	2.6 x 3.5	21 x 29	1.7 x 2.3
		1/2"	71 x 95	5.8 x 7.7	57 x 76	4.6 x 6.2	43 x 57	3.5 x 4.6	29 x 38	2.3 x 3.1
		2/3"	98 x 131	8.0 x 11	79 x 105	6.4 x 8.5	59 x 79	4.8 x 6.4	39 x 52	3.2 x 4.3
	0.8X Camera Tube 35-08-04-000 EFL: 160mm	NA Res (lp/mm) Mag DOF (mm)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
			11	58	14	72	18	96	27	144
			0.090	1.1	0.11	1.4	0.15	1.8	0.22	2.8
44			1.5	28	0.98	16	0.55	7.0	0.25	
FOV (mm) Cam Format		1/3"	40 x 54	3.3 x 4.3	32 x 43	2.6 x 3.5	24 x 32	2.0 x 2.6	16 x 21	1.3 x 1.7
		1/2"	54 x 71	4.3 x 5.8	43 x 57	3.5 x 4.6	32 x 43	2.6 x 3.5	21 x 29	1.7 x 2.3
		2/3"	74 x 98	6.0 x 8.0	59 x 79	4.8 x 6.4	44 x 59	3.6 x 4.8	29 x 39	2.4 x 3.2
1X Camera Tube 35-08-06-000 EFL: 200mm		NA Res (lp/mm) Mag DOF (mm)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
			11	58	14	72	18	96	27	144
			0.11	1.4	0.14	1.7	0.19	2.3	0.28	3.5
	44		1.5	28	0.98	16	0.55	7.0	0.25	
	FOV (mm) Cam Format	1/3"	32 x 43	2.6 x 3.5	26 x 34	2.1 x 2.8	19 x 26	1.6 x 2.1	13 x 17	1.0 x 1.4
		1/2"	43 x 57	3.5 x 4.6	34 x 46	2.8 x 3.7	26 x 34	2.1 x 2.8	17 x 23	1.4 x 1.9
		2/3"	59 x 79	4.8 x 6.4	47 x 63	3.8 x 5.1	35 x 47	2.9 x 3.8	24 x 31	1.9 x 2.6

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

NR = Not recommended for Coax illumination

Fetura+ with Lower Lens

1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm		1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm		1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm		2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm		3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm		4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm	
46		41		35		29		19		15	
19		19		17		20		13		9.9	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
0.14	1.7	0.16	2.0	0.19	2.3	0.22	2.8	0.34	4.1	0.45	5.5
4.5	0.16	3.4	0.12	2.5	0.089	1.8	0.062	0.78	0.027	0.44	0.015
26 x 34	2.1 x 2.8	23 x 30	1.8 x 2.4	19 x 26	1.6 x 2.1	16 x 21	1.3 x 1.7	11 x 14	0.87 x 1.2	8.0 x 11	0.65 x 0.87
34 x 46	2.8 x 3.7	30 x 40	2.4 x 3.2	26 x 34	2.1 x 2.8	21 x 29	1.7 x 2.3	14 x 19	1.2 x 1.5	11 x 14	0.87 x 1.2
47 x 63	3.8 x 5.1	41 x 55	3.3 x 4.5	35 x 47	2.9 x 3.8	29 x 39	2.4 x 3.2	20 x 26	1.6 x 2.1	15 x 20	1.2 x 1.6
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
0.18	2.2	0.20	2.5	0.23	2.9	0.28	3.5	0.42	5.2	0.56	6.9
4.5	0.16	3.4	0.12	2.5	0.089	1.8	0.062	0.78	0.027	0.44	0.015
21 x 27	1.7 x 2.2	18 x 24	1.5 x 1.9	15 x 21	1.3 x 1.7	13 x 17	1.0 x 1.4	8.6 x 11	0.70 x 0.9	6.4 x 8.6	0.52 x 0.70
27 x 37	2.2 x 3.0	24 x 32	1.9 x 2.6	21 x 27	1.7 x 2.2	17 x 23	1.4 x 1.9	11 x 15	0.9 x 1.2	8.6 x 11	0.70 x 0.93
38 x 50	3.1 x 4.1	33 x 44	2.7 x 3.6	28 x 38	2.3 x 3.1	24 x 31	1.9 x 2.6	16 x 21	1.3 x 1.7	12 x 16	0.96 x 1.3
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
0.21	2.6	0.24	3.0	0.28	3.5	0.34	4.1	0.50	6.2	0.67	8.3
4.5	0.16	3.4	0.12	2.5	0.089	1.8	0.062	0.78	0.027	0.44	0.015
17 x 23	1.4 x 1.9	15 x 20	1.2 x 1.6	13 x 17	1.0 x 1.4	11 x 14	0.87 x 1.2	7.1 x 10	0.58 x 0.77	5.4 x 7.1	0.43 x 0.58
23 x 30	1.9 x 2.5	20 x 27	1.6 x 2.2	17 x 23	1.4 x 1.9	14 x 19	1.2 x 1.5	10 x 13	0.77 x 1.0	7.1 x 9.5	0.58 x 0.77
31 x 42	2.6 x 3.4	28 x 37	2.2 x 3.0	24 x 31	1.9 x 2.6	20 x 26	1.6 x 2.1	13 x 17	1.1 x 1.4	9.8 x 13	0.80 x 1.1
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
0.28	3.5	0.32	3.9	0.37	4.6	0.45	5.5	0.67	8	0.90	11
4.5	0.16	3.4	0.12	2.5	0.089	1.8	0.062	0.78	0.027	0.44	0.015
13 x 17	1.0 x 1.4	11 x 15	0.91 x 1.2	9.6 x 13	0.78 x 1.0	8.0 x 11	0.65 x 0.87	5.4 x 7.1	0.44 x 0.58	4.0 x 5.4	0.33 x 0.43
17 x 23	1.4 x 1.9	15 x 20	1.2 x 1.6	13 x 17	1.0 x 1.4	11 x 14	0.87 x 1.2	7.1 x 10	0.58 x 0.77	5.4 x 7.1	0.43 x 0.58
24 x 31	1.9 x 2.6	21 x 28	1.7 x 2.2	18 x 24	1.4 x 1.9	15 x 20	1.2 x 1.6	10 x 13	0.80 x 1.1	7.4 x 9.8	0.60 x 0.80
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
0.35	4.3	0.40	4.9	0.47	5.8	0.56	6.9	0.84	10.3	1.1	14
4.5	0.16	3.4	0.12	2.5	0.089	1.8	0.062	0.78	0.027	0.44	0.015
10 x 14	0.83 x 1.1	9.0 x 12	0.73 x 0.97	7.7 x 10	0.63 x 0.83	6.4 x 8.6	0.52 x 0.70	4.3 x 5.7	0.35 x 0.46	3.2 x 4.3	0.26 x 0.35
14 x 18	1.1 x 1.5	12 x 16	0.97 x 1.3	10 x 14	0.83 x 1.1	8.6 x 11	0.70 x 0.93	5.7 x 7.6	0.46 x 0.62	4.3 x 5.7	0.35 x 0.46
19 x 25	1.5 x 2.0	17 x 22	1.3 x 1.8	14 x 19	1.1 x 1.5	12 x 16	0.96 x 1.3	7.9 x 10	0.64 x 0.85	5.9 x 7.9	0.48 x 0.64

Optical Performance - OPTEM 12.5:1 Zoom and Chart 3B

		0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm		0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm		0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm		1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm	
Max FOV Dia.		145		116		87		58	
Max Coax FOV Dia.		NR		NR		NR		20	
		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm	NA Res (lp/mm) Mag DOF (mm)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
		11	58	14	72	18	96	27	144
		0.17	2.1	0.21	2.6	0.28	3.5	0.42	5.2
		44	1.5	28	0.98	16	0.55	7.0	0.25
	FOV (mm) Cam Format 2/3" 1" 4/3" APS-C	39 x 52	3.2 x 4.3	31 x 42	2.6 x 3.4	24 x 31	1.9 x 2.6	16 x 21	1.3 x 1.7
		57 x 76	4.6 x 6.2	46 x 61	3.7 x 4.9	34 x 46	2.8 x 3.7	23 x 30	1.9 x 2.5
		80 x 107	6.5 x 8.7	64 x 86	5.2 x 7.0	48 x 64	3.9 x 5.2	32 x 43	2.6 x 3.5
		99 x 149	8.1 x 12	80 x 120	6.5 x 9.7	60 x 90	4.8 x 7.3	40 x 60	3.2 x 4.9
	NA Res (lp/mm) Mag DOF (m m)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
		11	58	14	72	18	96	27	144
		0.22	2.8	0.28	3.5	0.37	4.6	0.56	6.9
		44	1.5	28	0.98	16	0.55	7.0	0.25
	FOV (mm) Cam Format 2/3" 1" 4/3" APS-C	29 x 39	2.4 x 3.2	24 x 31	1.9 x 2.6	18 x 24	1.4 x 1.9	12 x 16	0.96 x 1.3
		43 x 57	3.5 x 4.6	34 x 46	2.8 x 3.7	26 x 34	2.1 x 2.8	17 x 23	1.4 x 1.9
		60 x 80	4.9 x 6.5	48 x 64	3.9 x 5.2	36 x 48	2.9 x 3.9	24 x 32	2.0 x 2.6
		75 x 112	6.1 x 9.1	60 x 90	4.8 x 7.3	45 x 67	3.6 x 5.5	30 x 45	2.4 x 3.6
2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm	NA Res (lp/mm) Mag DOF (mm)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
		11	58	14	72	18	96	27	144
		0.28	3.5	0.35	4.3	0.47	5.8	0.70	8.6
		44	1.5	28	0.98	16	0.55	7.0	0.25
	FOV (mm) Cam Format 1" 4/3" APS-C 35mm(Full)	34 x 46	2.8 x 3.7	27 x 37	2.2 x 3.0	21 x 27	1.7 x 2.2	14 x 18	1.1 x 1.5
		48 x 64	3.9 x 5.2	39 x 51	3.1 x 4.2	29 x 39	2.3 x 3.1	19 x 26	1.6 x 2.1
		60 x 90	4.8 x 7.3	48 x 72	3.9 x 5.8	36 x 54	2.9 x 4.4	24 x 36	1.9 x 2.9
		86 x 129	7.0 x 10	69 x 103	5.6 x 8.3	51 x 77	4.2 x 6.3	34 x 51	2.8 x 4.2
	NA Res (lp/mm) Mag DOF (mm)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
		11	58	14	72	18	96	27	144
		0.34	4.1	0.42	5.2	0.56	6.9	0.84	10
		44	1.5	28	0.98	16	0.55	7.0	0.25
	FOV (mm) Cam Format 1" 4/3" APS-C 35mm(Full)	29 x 38	2.3 x 3.1	23 x 30	1.9 x 2.5	17 x 23	1.4 x 1.9	11 x 15	0.93 x 1.2
		40 x 54	3.3 x 4.3	32 x 43	2.6 x 3.5	24 x 32	2.0 x 2.6	16 x 21	1.3 x 1.7
		50 x 75	4.0 x 6.1	40 x 60	3.2 x 4.9	30 x 45	2.4 x 3.6	20 x 30	1.6 x 2.4
		71 x 107	5.8 x 8.7	57 x 86	4.6 x 7.0	43 x 64	3.5 x 5.2	29 x 43	2.3 x 3.5
3X Mini Camera Tube 35-08-16-000 EFL: 600mm	NA Res (lp/mm) Mag DOF (mm)	0.0036	0.019	0.0045	0.024	0.0060	0.032	0.0090	0.048
		11	58	14	72	18	96	27	144
		0.34	4.1	0.42	5.2	0.56	6.9	0.84	10
		44	1.5	28	0.98	16	0.55	7.0	0.25
	FOV (mm) Cam Format 1" 4/3" APS-C 35mm(Full)	29 x 38	2.3 x 3.1	23 x 30	1.9 x 2.5	17 x 23	1.4 x 1.9	11 x 15	0.93 x 1.2
		40 x 54	3.3 x 4.3	32 x 43	2.6 x 3.5	24 x 32	2.0 x 2.6	16 x 21	1.3 x 1.7
		50 x 75	4.0 x 6.1	40 x 60	3.2 x 4.9	30 x 45	2.4 x 3.6	20 x 30	1.6 x 2.4
		71 x 107	5.8 x 8.7	57 x 86	4.6 x 7.0	43 x 64	3.5 x 5.2	29 x 43	2.3 x 3.5

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

NR = Not recommended for Coax illumination

	Height	x	Width	Diag.
2/3"	6.6	x	8.8	11
1"	9.6	x	12.8	16
4/3"	13.5	x	18	22.5
APS-C*	16.7	x	25.1	30
35mm (Full)	24	x	36	43.3

*Also known as Half Frame 35mm format

Fetura+ with Lower Lens - Mini Camera Tubes

1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm		1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm		1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm		2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm		3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm		4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm	
46		41		35		29		19		15	
19		19		17		20		13		9.9	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
0.53	6.5	0.60	7.4	0.70	8.6	0.84	10	1.3	16	1.7	21
4.5	0.16	3.4	0.12	2.5	0.089	1.8	0.062	0.78	0.027	0.44	0.015
13 x 17	1.0 x 1.4	11 x 15	0.89 x 1.2	9.4 x 13	0.77 x 1.0	7.9 x 10	0.64 x 0.85	5.2 x 7.0	0.43 x 0.57	3.9 x 5.2	0.32 x 0.43
18 x 24	1.5 x 2.0	16 x 21	1.3 x 1.7	14 x 18	1.1 x 1.5	11 x 15	0.93 x 1.2	7.6 x 10	0.62 x 0.82	5.7 x 7.6	0.46 x 0.62
26 x 34	2.1 x 2.8	23 x 30	1.8 x 2.4	19 x 26	1.6 x 2.1	16 x 21	1.3 x 1.7	11 x 14	0.87 x 1.2	8.0 x 11	0.65 x 0.87
32 x 48	2.6 x 3.9	28 x 42	2.3 x 3.4	24 x 36	1.9 x 2.9	20 x 30	1.6 x 2.4	13 x 20	1.1 x 1.6	9.9 x 15	0.81 x 1.2
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
0.70	8.6	0.80	9.9	0.93	12	1.1	14	1.7	21	2.2	28
4.5	0.16	3.4	0.12	2.5	0.089	1.8	0.062	0.78	0.027	0.44	0.015
9.4 x 13	0.77 x 1.0	8.3 x 11	0.67 x 0.89	7.1 x 9.4	0.57 x 0.77	5.9 x 7.9	0.48 x 0.64	3.9 x 5.2	0.32 x 0.43	2.9 x 3.9	0.24 x 0.32
14 x 18	1.1 x 1.5	12 x 16	0.97 x 1.3	10 x 14	0.83 x 1.1	8.6 x 11	0.70 x 0.93	5.7 x 7.6	0.46 x 0.62	4.3 x 5.7	0.35 x 0.46
19 x 26	1.6 x 2.1	17 x 23	1.4 x 1.8	14 x 19	1.2 x 1.6	12 x 16	0.98 x 1.3	8.0 x 11	0.65 x 0.87	6.0 x 8.0	0.49 x 0.65
24 x 36	1.9 x 2.9	21 x 31	1.7 x 2.5	18 x 27	1.5 x 2.2	15 x 22	1.2 x 1.8	9.9 x 15	0.81 x 1.2	7.5 x 11	0.61 x 0.91
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
0.88	11	1.0	12	1.2	14	1.4	17	2.1	26	2.8	35
4.5	0.16	3.4	0.12	2.5	0.09	1.8	0.062	0.78	0.027	0.44	0.015
11 x 15	0.89 x 1.2	9.6 x 13	0.78 x 1.0	8.2 x 11	0.67 x 0.89	6.9 x 9.1	0.56 x 0.74	4.6 x 6.1	0.37 x 0.49	3.4 x 4.6	0.28 x 0.37
15 x 21	1.3 x 1.7	14 x 18	1.1 x 1.5	12 x 15	0.94 x 1.3	9.6 x 13	0.78 x 1.0	6.4 x 8.6	0.52 x 0.70	4.8 x 6.4	0.39 x 0.52
19 x 29	1.5 x 2.3	17 x 25	1.4 x 2.0	14 x 22	1.2 x 1.7	12 x 18	0.97 x 1.5	8.0 x 12	0.65 x 0.97	6.0 x 9.0	0.48 x 0.73
27 x 41	2.2 x 3.3	24 x 36	1.9 x 2.9	21 x 31	1.7 x 2.5	17 x 26	1.4 x 2.1	11 x 17	0.93 x 1.4	8.6 x 13	0.70 x 1.0
0.011	0.060	0.013	0.069	0.015	0.080	0.018	0.096	0.027	0.14	0.036	0.19
34	180	39	206	45	240	54	288	81	432	108	576
1.1	13	1.2	15	1.4	17	1.7	21	2.5	31	3.4	41
4.5	0.16	3.4	0.12	2.5	0.089	1.8	0.062	0.78	0.027	0.44	0.015
9.1 x 12	0.74 x 0.99	8.0 x 11	0.65 x 0.87	6.9 x 9.1	0.56 x 0.74	5.7 x 7.6	0.46 x 0.62	3.8 x 5.1	0.31 x 0.41	2.9 x 3.8	0.23 x 0.31
13 x 17	1.0 x 1.4	11 x 15	0.91 x 1.2	9.6 x 13	0.78 x 1.0	8.0 x 11	0.65 x 0.87	5.4 x 7.1	0.44 x 0.58	4.0 x 5.4	0.33 x 0.43
16 x 24	1.3 x 1.9	14 x 21	1.1 x 1.7	12 x 18	0.97 x 1.5	9.9 x 15	0.81 x 1.2	6.6 x 10	0.54 x 0.81	5.0 x 7.5	0.40 x 0.61
23 x 34	1.9 x 2.8	20 x 30	1.6 x 2.4	17 x 26	1.4 x 2.1	14 x 21	1.2 x 1.7	9.5 x 14	0.77 x 1.2	7.1 x 11	0.58 x 0.87

Optical Performance - OPTEM 12.5:1 Zoom and Chart 3C

		2X M Plan Apo 28-21-02-000 WD: 34mm				5X M Plan Apo 28-21-05-000 WD: 34mm				10X M Plan Apo 28-21-10-000 WD: 34mm											
Max FOV Dia.		14				6.8				3.3											
Max Coax FOV Dia.		11				4.6				2.2											
0.4X Camera Tube 35-08-00-000 EFL: 80mm			Low Mag		High Mag		Low Mag		High Mag		Low Mag		High Mag								
	NA Res (lp/mm) Mag DOF (mm)		0.018		0.057		0.045		0.14		0.090		0.30								
			54		170		135		420		270		900								
			0.22		2.8		0.56		6.9		1.1		14								
			1.8		0.18		0.28		0.029		0.070		0.0063								
	FOV (mm) Cam Format	1/3 "		16	x	21	1.3	x	1.7	6.4	x	8.6	0.52	x	0.70	3.2	x	4.3	0.26	x	0.35
		1/2 "		21	x	29	1.7	x	2.3	8.6	x	11	0.70	x	0.93	4.3	x	5.7	0.35	x	0.46
		2/3 "		29	x	39	2.4	x	3.2	12	x	16	0.96	x	1.3	5.9	x	7.9	0.48	x	0.64
0.5X Camera Tube 35-08-01-000 EFL: 100mm	NA Res (lp/mm) Mag DOF (m m)		0.018		0.057		0.045		0.14		0.090		0.30								
			54		170		135		420		270		900								
			0.28		3.5		0.70		8.6		1.4		17								
			1.8		0.18		0.28		0.029		0.070		0.0063								
	FOV (mm) Cam Format	1/3 "		13	x	17	1.0	x	1.4	5.1	x	6.9	0.42	x	0.56	2.6	x	3.4	0.21	x	0.28
		1/2 "		17	x	23	1.4	x	1.9	6.9	x	9.1	0.56	x	0.74	3.4	x	4.6	0.28	x	0.37
		2/3 "		24	x	31	1.9	x	2.6	9.4	x	13	0.77	x	1.0	4.7	x	6.3	0.38	x	0.51
	0.6X Camera Tube 35-08-02-000 EFL: 120mm	NA Res (lp/mm) Mag DOF (mm)		0.018		0.057		0.045		0.14		0.090		0.30							
54				170		135		420		270		900									
0.34				4.1		0.84		10		1.7		21									
1.8				0.18		0.28		0.029		0.070		0.0063									
FOV (mm) Cam Format		1/3 "		11	x	14	0.87	x	1.2	4.3	x	5.7	0.35	x	0.46	2.1	x	2.9	0.17	x	0.23
		1/2 "		14	x	19	1.2	x	1.5	5.7	x	7.6	0.46	x	0.62	2.9	x	3.8	0.23	x	0.31
		2/3 "		20	x	26	1.6	x	2.1	7.9	x	10	0.64	x	0.85	3.9	x	5.2	0.32	x	0.43
0.8X Camera Tube 35-08-04-000 EFL: 160mm		NA Res (lp/mm) Mag DOF (mm)		0.018		0.057		0.045		0.14		0.090		0.30							
	54			170		135		420		270		900									
	0.45			5.5		1.1		14		2.2		28									
	1.8			0.18		0.28		0.029		0.070		0.0063									
	FOV (mm) Cam Format	1/3 "		8.0	x	11	0.65	x	0.87	3.2	x	4.3	0.26	x	0.35	1.6	x	2.1	0.13	x	0.17
		1/2 "		11	x	14	0.87	x	1.2	4.3	x	5.7	0.35	x	0.46	2.1	x	2.9	0.17	x	0.23
		2/3 "		15	x	20	1.2	x	1.6	5.9	x	7.9	0.48	x	0.64	2.9	x	3.9	0.24	x	0.32
	1X Camera Tube 35-08-06-000 EFL: 200mm	NA Res (lp/mm) Mag DOF (mm)		0.018		0.057		0.045		0.14		0.090		0.30							
54				170		135		420		270		900									
0.56				6.9		1.4		17		2.8		35									
1.8				0.18		0.28		0.029		0.070		0.0063									
FOV (mm) Cam Format		1/3 "		6.4	x	8.6	0.52	x	0.70	2.6	x	3.4	0.21	x	0.28	1.3	x	1.7	0.10	x	0.14
		1/2 "		8.6	x	11	0.70	x	0.93	3.4	x	4.6	0.28	x	0.37	1.7	x	2.3	0.14	x	0.19
		2/3 "		12	x	16	0.96	x	1.3	4.7	x	6.3	0.38	x	0.51	2.4	x	3.1	0.19	x	0.26

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

50X M Plan Apo is NOT recommended for use with a 12.5:1 Zoom
0.4X and 0.5X Camera Tubes are not recommended for use with
a 12.5:1 Zoom and Microscope Objectives.

Fetura+ with LWD Objectives

20X M Plan Apo 28-21-11-000 WD: 20mm		5X HiRes 28-20-44-000 WD: 34mm		10X HiRes 28-20-45-000 WD: 19mm		20X HiRes 28-20-46-000 WD: 13mm	
1.2		6.6		3.2		1.6	
0.83		5.0		2.3		1.1	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.18	0.42	0.045	0.23	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
2.2	28	0.56	6.9	1.1	14	2.2	28
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
1.6 x 2.1	0.13 x 0.17	6.4 x 8.6	0.52 x 0.70	3.2 x 4.3	0.26 x 0.35	1.6 x 2.1	0.13 x 0.17
2.1 x 2.9	0.17 x 0.23	8.6 x 11	0.70 x 0.93	4.3 x 5.7	0.35 x 0.46	2.1 x 2.9	0.17 x 0.23
2.9 x 3.9	0.24 x 0.32	12 x 16	0.96 x 1.3	5.9 x 7.9	0.48 x 0.64	2.9 x 3.9	0.24 x 0.32
0.18	0.42	0.045	0.23	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
2.8	35	0.70	8.6	1.4	17	2.8	35
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
1.3 x 1.7	0.10 x 0.14	5.1 x 6.9	0.42 x 0.56	2.6 x 3.4	0.21 x 0.28	1.3 x 1.7	0.10 x 0.14
1.7 x 2.3	0.14 x 0.19	6.9 x 9.1	0.56 x 0.74	3.4 x 4.6	0.28 x 0.37	1.7 x 2.3	0.14 x 0.19
2.4 x 3.1	0.19 x 0.26	9.4 x 13	0.77 x 1.0	4.7 x 6.3	0.38 x 0.51	2.4 x 3.1	0.19 x 0.26
0.18	0.42	0.045	0.23	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
3.4	41	0.84	10.4	1.7	21	3.4	41
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
1.1 x 1.4	0.087 x 0.12	4.3 x 5.7	0.35 x 0.46	2.1 x 2.9	0.17 x 0.23	1.1 x 1.4	0.087 x 0.12
1.4 x 1.9	0.12 x 0.15	5.7 x 7.6	0.46 x 0.62	2.9 x 3.8	0.23 x 0.31	1.4 x 1.9	0.12 x 0.15
2.0 x 2.6	0.16 x 0.21	7.9 x 10	0.64 x 0.85	3.9 x 5.2	0.32 x 0.43	2.0 x 2.6	0.16 x 0.21
0.18	0.42	0.045	0.23	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
4.5	55	1.1	14	2.2	28	4.5	55
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
0.80 x 1.1	0.065 x 0.087	3.2 x 4.3	0.26 x 0.35	1.6 x 2.1	0.13 x 0.17	0.80 x 1.1	0.065 x 0.087
1.1 x 1.4	0.087 x 0.12	4.3 x 5.7	0.35 x 0.46	2.1 x 2.9	0.17 x 0.23	1.1 x 1.4	0.087 x 0.12
1.5 x 2.0	0.12 x 0.16	5.9 x 7.9	0.48 x 0.64	2.9 x 3.9	0.24 x 0.32	1.5 x 2.0	0.12 x 0.16
0.18	0.42	0.045	0.23	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
5.6	69	1.4	17	2.8	35	5.6	69
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
0.64 x 0.86	0.052 x 0.070	2.6 x 3.4	0.21 x 0.28	1.3 x 1.7	0.10 x 0.14	0.64 x 0.86	0.052 x 0.070
0.86 x 1.1	0.070 x 0.093	3.4 x 4.6	0.28 x 0.37	1.7 x 2.3	0.14 x 0.19	0.86 x 1.1	0.070 x 0.093
1.2 x 1.6	0.096 x 0.13	4.7 x 6.3	0.38 x 0.51	2.4 x 3.1	0.19 x 0.26	1.2 x 1.6	0.096 x 0.13

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - OPTEM 12.5:1 Zoom and Chart 3D

		2X M Plan Apo 28-21-02-000 WD: 34mm		5X M Plan Apo 28-21-05-000 WD: 34mm		10X M Plan Apo 28-21-10-000 WD: 34mm	
Max FOV Dia.		14		6.8		3.3	
Max Coax FOV Dia.		11		4.6		2.2	
		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm	NA	0.018	0.057	0.045	0.14	0.090	0.30
	Res (lp/mm)	54	170	135	420	270	900
	Mag	0.84	10	2.1	26	4.2	52
	DOF (mm)	1.8	0.18	0.28	0.029	0.070	0.0063
	FOV (mm)	7.9 x 10	0.64 x 0.85	3.1 x 4.2	0.26 x 0.34	1.6 x 2.1	0.13 x 0.17
	Cam Format	2/3"	1"	4/3"	APS-C		
		11 x 15	0.93 x 1.2	4.6 x 6.1	0.37 x 0.49	2.3 x 3.0	0.19 x 0.25
		16 x 21	1.3 x 1.7	6.4 x 8.6	0.52 x 0.70	3.2 x 4.3	0.26 x 0.35
		20 x 30	1.6 x 2.4	8.0 x 12	0.65 x 0.97	4.0 x 6.0	0.32 x 0.49
2X Mini Camera Tube 35-08-14-000 EFL: 400mm	NA	0.018	0.057	0.045	0.14	0.090	0.30
	Res (lp/mm)	54	170	135	420	270	900
	Mag	1.1	14	2.8	35	5.6	69
	DOF (m m)	1.8	0.178	0.28	0.029	0.070	0.0063
	FOV (mm)	5.9 x 7.9	0.48 x 0.64	2.4 x 3.1	0.19 x 0.26	1.2 x 1.6	0.096 x 0.13
	Cam Format	2/3"	1"	4/3"	APS-C		
		8.6 x 11	0.70 x 0.93	3.4 x 4.6	0.28 x 0.37	1.7 x 2.3	0.14 x 0.19
		12 x 16	0.98 x 1.3	4.8 x 6.4	0.39 x 0.52	2.4 x 3.2	0.20 x 0.26
		15 x 22	1.2 x 1.8	6.0 x 9.0	0.48 x 0.73	3.0 x 4.5	0.24 x 0.36
2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm	NA	0.018	0.057	0.045	0.14	0.090	0.30
	Res (lp/mm)	54	170	135	420	270	900
	Mag	1.4	17	3.5	43	7.0	86
	DOF (mm)	1.8	0.18	0.28	0.029	0.070	0.0063
	FOV (mm)	6.9 x 9.1	0.56 x 0.74	2.7 x 3.7	0.22 x 0.30	1.4 x 1.8	0.11 x 0.15
	Cam Format	1"	4/3"	APS-C	35mm(Full)		
		9.6 x 13	0.78 x 1.0	3.9 x 5.1	0.31 x 0.42	1.9 x 2.6	0.16 x 0.21
		12 x 18	0.97 x 1.5	4.8 x 7.2	0.39 x 0.58	2.4 x 3.6	0.19 x 0.29
		17 x 26	1.4 x 2.1	6.9 x 10	0.56 x 0.83	3.4 x 5.1	0.28 x 0.42
3X Mini Camera Tube 35-08-16-000 EFL: 600mm	NA	0.018	0.057	0.045	0.14	0.090	0.30
	Res (lp/mm)	54	170	135	420	270	900
	Mag	1.7	21	4.2	52	8.4	104
	DOF (mm)	1.8	0.18	0.28	0.029	0.070	0.0063
	FOV (mm)	5.7 x 7.6	0.46 x 0.62	2.3 x 3.0	0.19 x 0.25	1.1 x 1.5	0.093 x 0.12
	Cam Format	1"	4/3"	APS-C	35mm(Full)		
		8.0 x 11	0.65 x 0.87	3.2 x 4.3	0.26 x 0.35	1.6 x 2.1	0.13 x 0.17
		9.9 x 15	0.81 x 1.2	4.0 x 6.0	0.32 x 0.49	2.0 x 3.0	0.16 x 0.24
		14 x 21	1.2 x 1.7	5.7 x 8.6	0.46 x 0.70	2.9 x 4.3	0.23 x 0.35

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

50X M Plan Apo is NOT recommended for use with a 12.5:1 Zoom
0.4X and 0.5X Camera Tubes are not recommended for use with
a 12.5:1 Zoom and Microscope Objectives.

	Height	x	Width	Diag.
2/3"	6.6	x	8.8	11
1"	9.6	x	12.8	16
4/3"	13.5	x	18	22.5
APS-C*	16.7	x	25.1	30
35mm (Full)	24	x	36	43.3

*Also known as Half Frame 35mm format

Fetura+ with LWD Objectives - Mini Camera Tubes

20X M Plan Apo 28-21-11-000 WD: 20mm		5X HiRes 28-20-44-000 WD: 34mm		10X HiRes 28-20-45-000 WD: 19mm		20X HiRes 28-20-46-000 WD: 13mm	
1.2		6.6		3.2		1.6	
0.83		5.0		2.3		1.1	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.18	0.42	0.045	0.225	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
8.4	104	2.1	26	4.2	52	8.4	104
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
0.79 x 1.0	0.064 x 0.085	3.1 x 4.2	0.26 x 0.34	1.6 x 2.1	0.13 x 0.17	0.79 x 1.0	0.064 x 0.085
1.1 x 1.5	0.093 x 0.12	4.6 x 6.1	0.37 x 0.49	2.3 x 3.0	0.19 x 0.25	1.1 x 1.5	0.093 x 0.12
1.6 x 2.1	0.13 x 0.17	6.4 x 8.6	0.52 x 0.70	3.2 x 4.3	0.26 x 0.35	1.6 x 2.1	0.13 x 0.17
2.0 x 3.0	0.16 x 0.24	8.0 x 12	0.65 x 0.97	4.0 x 6.0	0.32 x 0.49	2.0 x 3.0	0.16 x 0.24
0.18	0.42	0.045	0.225	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
11	138	2.8	35	5.6	69	11	138
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
0.59 x 0.79	0.048 x 0.064	2.4 x 3.1	0.19 x 0.26	1.2 x 1.6	0.096 x 0.13	0.59 x 0.79	0.048 x 0.064
0.86 x 1.1	0.070 x 0.093	3.4 x 4.6	0.28 x 0.37	1.7 x 2.3	0.14 x 0.19	0.86 x 1.1	0.070 x 0.093
1.2 x 1.6	0.098 x 0.13	4.8 x 6.4	0.39 x 0.52	2.4 x 3.2	0.20 x 0.26	1.2 x 1.6	0.098 x 0.13
1.5 x 2.2	0.12 x 0.18	6.0 x 9.0	0.48 x 0.73	3.0 x 4.5	0.24 x 0.36	1.5 x 2.2	0.12 x 0.18
0.18	0.42	0.045	0.225	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
14	173	3.5	43	7.0	86	14	173
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
0.69 x 0.91	0.056 x 0.074	2.7 x 3.7	0.22 x 0.30	1.4 x 1.8	0.11 x 0.15	0.69 x 0.91	0.056 x 0.074
0.96 x 1.3	0.078 x 0.10	3.9 x 5.1	0.31 x 0.42	1.9 x 2.6	0.16 x 0.21	0.96 x 1.3	0.078 x 0.10
1.2 x 1.8	0.097 x 0.15	4.8 x 7.2	0.39 x 0.58	2.4 x 3.6	0.19 x 0.29	1.2 x 1.8	0.097 x 0.15
1.7 x 2.6	0.14 x 0.21	6.9 x 10	0.56 x 0.83	3.4 x 5.1	0.28 x 0.42	1.7 x 2.6	0.14 x 0.21
0.18	0.42	0.045	0.225	0.090	0.45	0.18	0.60
540	1260	135	675	270	1350	540	1800
17	207	4.2	52	8.4	104	17	207
0.018	0.0032	0.28	0.011	0.070	0.0028	0.018	0.0016
0.57 x 0.76	0.046 x 0.062	2.3 x 3.0	0.19 x 0.25	1.1 x 1.5	0.093 x 0.12	0.57 x 0.76	0.046 x 0.062
0.80 x 1.1	0.065 x 0.087	3.2 x 4.3	0.26 x 0.35	1.6 x 2.1	0.13 x 0.17	0.80 x 1.1	0.065 x 0.087
0.99 x 1.5	0.081 x 0.12	4.0 x 6.0	0.32 x 0.49	2.0 x 3.0	0.16 x 0.24	0.99 x 1.5	0.081 x 0.12
1.4 x 2.1	0.12 x 0.17	5.7 x 8.6	0.46 x 0.70	2.9 x 4.3	0.23 x 0.35	1.4 x 2.1	0.12 x 0.17

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - Infinity Macro Lens with 2X

Chart 4

42-35-41-000

		WD: 500mm 0.14X	WD: 400mm 0.17X	WD: 300mm 0.21X
Max FOV Dia.		275	225	175
Fixed Mag. 1X Camera Tube	NA	0.0061	0.0075	0.0096
	Res (lp/mm)	18	22	29
	Mag	0.14	0.17	0.21
	DOF (mm)	15	10	6.2
35-08-06-000	FOV (mm) Cam Format	1/3"	26 x 35	22 x 29
18mm Stop		1/2"	35 x 47	29 x 39
		2/3"	49 x 65	40 x 53

		240		200		150	
Max FOV Dia.		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
7:1 Zoom 1X Camera Tube	NA	0.0016	0.0053	0.0020	0.0064	0.0025	0.0083
	Res (lp/mm)	4.8	16	5.9	19	7.5	25
	Mag	0.057	0.39	0.070	0.48	0.090	0.62
	DOF (mm)	220	20	148	14	90	8.3
35-08-06-000	FOV (mm) Cam Format	1/3"	63 x 84	9.1 x 12	52 x 69	7.5 x 10	40 x 54
		1/2"	84 x 112	12 x 16	69 x 92	10 x 13	54 x 71
		2/3"	116 x 154	17 x 22	95 x 126	14 x 18	74 x 98

		210		175		135	
Max FOV Dia.		Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
12:1 Zoom 1X Camera Tube	NA	0.0012	0.0065	0.0015	0.0080	0.0019	0.010
	Res (lp/mm)	3.7	20	4.5	24	5.8	31
	Mag	0.038	0.47	0.046	0.57	0.060	0.74
	DOF (mm)	378	13	255	8.9	154	5.4
35-08-06-000	FOV (mm) Cam Format	1/3"	95 x 126	7.7 x 10	78 x 103	6.3 x 8.4	60 x 80
		1/2"	126 x 168	10 x 14	103 x 138	8.4 x 11	80 x 107
		2/3"	173 x 231	14 x 19	142 x 190	12 x 15	111 x 147

 -- FOV Limited by vignetting

1X Camera Tube shown. For other Camera tubes, multiply the magnification in the chart by the Camera tube mag., and divide the FOV values by the Camera tube mag. NA, Resolution, and DOF are not affected by the Camera Tube.

NOTE: Wide Angle Objective is not recommended for use with coaxial Illumination.

The Wide Angle Objective can be focused out to infinity. At WDs greater than 1m, it can be thought of as a video lens.

Fixed Mag:	
EFL:	73 *CT mag
f/# :	200/Stop Diameter*CT mag

NOTE: The Camera Tube Magnification will affect the EFL and the f/# of the video lens.

7:1 Zoom:	
EFL (low mag):	30*CT mag
EFL (high mag):	210*CT mag
f/#: (low mag):	18*CT mag
f/#: (high mag):	38*CT mag

Lower Lens

35-00-03-000

WD: 200mm 0.30X	WD: 150mm 0.38X	WD: 100mm 0.50X	WD: 50mm 0.75X
125	100	75	50
0.013	0.017	0.023	0.034
40	51	68	103
0.30	0.38	0.50	0.77
3.1	2.0	1.1	0.48
12 x 16	9.6 x 13	7.1 x 9.5	4.7 x 6.3
16 x 21	13 x 17	9.5 x 13	6.3 x 8.4
22 x 29	18 x 23	13 x 17	8.6 x 11

110		85		65		43	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.0035	0.012	0.0044	0.015	0.0059	0.020	0.0090	0.030
11	35	13	44	18	59	27	89
0.13	0.87	0.16	1.1	0.21	1.5	0.32	2.2
45	4.2	29	2.7	16	1.5	6.9	0.64
29 x 38	4.1 x 5.5	23 x 30	3.3 x 4.4	17 x 23	2.5 x 3.3	11 x 15	1.6 x 2.2
38 x 51	5.5 x 7.4	30 x 41	4.4 x 5.9	23 x 30	3.3 x 4.4	15 x 20	2.2 x 2.9
52 x 70	7.6 x 10	42 x 56	6.1 x 8.1	31 x 42	4.5 x 6.0	21 x 27	3.0 x 4.0

95		77		58		38	
Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag	Low Mag	High Mag
0.0027	0.014	0.0034	0.018	0.0045	0.024	0.0069	0.037
8.1	43	10	54	14	73	21	110
0.084	1.0	0.11	1.3	0.14	1.7	0.21	2.6
78	2.7	50	1.7	28	0.97	12	0.42
43 x 57	3.5 x 4.6	34 x 46	2.8 x 3.7	26 x 34	2.1 x 2.8	17 x 22	1.4 x 1.8
57 x 76	4.6 x 6.2	46 x 61	3.7 x 4.9	34 x 45	2.8 x 3.7	22 x 30	1.8 x 2.4
79 x 105	6.4 x 8.5	63 x 84	5.1 x 6.8	47 x 62	3.8 x 5.1	31 x 41	2.5 x 3.3

12.5:1 Zoom:	
EFL (low mag):	20*CT mag
EFL (high mag):	250*CT mag
f/#: (low mag):	15.5*CT mag
f/#: (high mag):	36*CT mag



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