

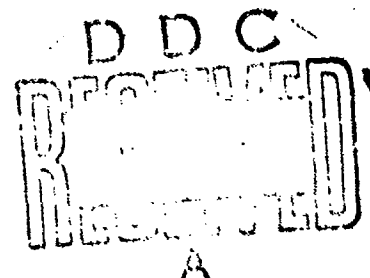
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NOLTR 72-18

A METHOD AND DATA-REDUCTION TABLES
FOR DETERMINING THE RESOLUTION OF
CAMERA SYSTEMS UNDER TYPICAL FIELD
CONDITIONS

By
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20 JUNE 1972



NOL

NAVAL ORDNANCE LABORATORY, WHITE OAK, SILVER SPRING, MARYLAND

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13. ABSTRACT A system is described for evaluating the resolving power of photographic and other optical systems under test conditions typical of their everyday use. The test data thus obtained reflects the effects of atmospheric haze, mount stability, operator focusing error, etc. The 40 x 42 inch test targets, which are based on the "USAF-1951" design, consist of resolution groups "minus six" through "minus one" with line widths varying from 0.56mm through 32mm. To facilitate the analysis of tests performed with the above targets, an extensive set of computer-generated Resolving Power Data Reduction Tables is presented in Appendix C. These tables permit rapid and accurate determination of image plane resolution of camera systems using lens focal lengths from 10mm through 2000mm. Data is provided for twelve selected object distances for each of 48 lenses. A second set of 192 tables enables resolution to be determined for any optical system producing an image magnification between 0.034621 and 0.000139. The selection and use of these latter tables are based solely on the size of the target image; the lens focal length and object distance need not be known. Three examples illustrating typical applications of the resolution targets and data reduction tables are presented. The references in this publication provide the background necessary for the inexperienced user to make full use of the resolving power tests provided in this report.			

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
LENS TESTING LENS RESOLUTION CAMERA SYSTEM TESTING PHOTOGRAPHIC TEST TARGETS IMAGE EVALUATION RESOLUTION TARGET						

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A METHOD AND DATA-REDUCTION TABLES FOR DETERMINING THE RESOLUTION OF
CAMERA SYSTEMS UNDER TYPICAL FIELD CONDITIONS

This report describes a method and presents data reduction tables for use in evaluating the resolution of camera systems under test conditions typical of field use. The test method and data reduction tables were developed by the Photographic Division of the Engineering Services Department of the Naval Ordnance Laboratory (NOL), as part of the "High Acuity Experimentation II" program, which was conducted for Rome Air Development Center, Griffiss Air Force Base, Rome, New York. (MIPR No. F30602-71-X-0003).

The author wishes to thank Mrs. Mary Lou Blessing, of the Computer Applications Division of the Mathematics Department, for writing the computer program which produced the data tables. The author also wishes to thank Frank Pierce of the Publications Division for his editorial assistance in the preparation of this report.

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Commander


E. H. LANGENBECK
By direction

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INTRODUCTION

Resolving power tests have long been used to assess the image quality of photographic systems under laboratory conditions. In an effort to apply the principles of laboratory-type resolving power tests to field testing of complete photographic systems, the Naval Ordnance Laboratory, White Oak, has prepared large-scale resolution targets suitable for use at distances typical of those encountered under field conditions. Although the method by which resolving power test imagery is translated into quantitative data is fairly simple, preparation of data from large quantities of these tests involve numerous time-consuming calculations. To simplify this task, the Laboratory has also prepared a set of computer-generated data reduction tables which are based on the associated large-scale resolution targets.

These data reduction tables can be used to determine the resolving power of camera and other optical systems under actual field conditions. They are also useful to the optical metrologist for designing resolution experiments. The purpose of this report is to explain the use of the data reduction tables, to provide the background by which they were developed, and to suggest possible applications.

The reader who has not had prior experience in performing resolving power tests (such as work with an optical collimator, National Bureau of Standards (NBS) targets at 2l focal lengths, etc.) should familiarize himself with two publications: A Method of Determining the Resolving Power of Photographic Lenses, NBS Circular 533 (available from Superintendent of Documents, Government Printing Office (GPO), Washington, D.C.); and MIL-STD 150A, Photographic Lenses (also available from Superintendent of Documents, GPO, Washington, D.C.).

BACKGROUND

Under a contract with Rome Air Development Center, Griffiss Air Force Base, Rome, New York, (entitled High Acuity Experimentation II, MIPR No. F30602-71-X-0003) the Photographic Division of the Naval Ordnance Laboratory investigated the performance of a number of popular 35mm still cameras. A major portion of the investigation was to quantitatively determine typical field performance, reflecting the effects of atmospheric haze, mount stability, and operator variability among other factors. It was decided to use resolving power tests as the primary means of evaluation because of their simplicity, ease of evaluation, and because the overall program concerned the recording of threshold-quality imagery.

Normally, resolution tests are run under carefully controlled conditions at either relatively close distances or with the aid of an optical collimator. Provisions are made for eliminating camera vibrations and other effects which might degrade the quality of the data.

The test conditions used to determine typical field performance are considerably different, however. For the purposes of the NOL field testing program, the resolution targets had to be suitable for a wide range of conditions, including use with focal lengths of 35 to 1400mm and object distances in excess of one mile. A search was made to locate a suitable off-the-shelf target, but when none could be found, a large-scale resolution target based on the USAF 1951 Design was prepared (see Figure 1). Its 40 x 42 inch size (including margins) permits easy carriage and mounting in field use but it is large enough to be used at typical object distances. The largest resolution pattern can be detected with a 135mm lens at 2000 feet with an effective camera-system resolving power of 72 lines per millimeter.

DETERMINATION OF CAMERA SYSTEM QUALITY USING DATA REDUCTION TABLES

After making a series of negatives of the resolution target and determining the smallest resolvable target on each negative by means of a 30-to 40-power microscope, one would normally compute the image plane resolution using the width of the target bar, the lens focal length, and the object distance. To simplify this task, data reduction tables (provided as Appendix C) have been prepared and especially keyed to the NOL large-scale test target. These tables facilitate direct and rapid determination of the image plane resolution for 48 lens focal lengths of 10 through 2000mm, at each of 12 typical object distances. A second series of tables allows determination of system resolution when the object distance and focal length are either unknown or are not listed in the tables. In either of these latter situations, the user selects a table based on system magnification determined by measuring the actual image size of the target as recorded on the film.

RESOLVING POWER TARGET DESIGN

The NOL large-scale resolution target is based on the design of the "USAF-1951" resolution target. The NOL target (Figure 1) consists of 36 target elements decreasing in spatial frequency as the sixth root of two ($\sqrt[6]{2}$) (approximately 12 percent). The geometric design of the target elements and associated terminology are presented in MIL-STD 150-A. A standard target element consists of two patterns (two sets of lines) which are oriented at right angles to each other as shown in Figure 2. Each pattern in turn consists of three bars and two included spaces, all of equal width. The length of the bars is five times the bar width. A bar or a space is referred to as an interval, while the combination of a bar and a space is referred to as a unit. The unit width is used to compute the spatial frequency of the pattern.

To facilitate the microscopic examination of the test imagery, the 36 elements are organized into sets of six, each set being referred to as a group. Figure 2 illustrates a single target group. The NOL

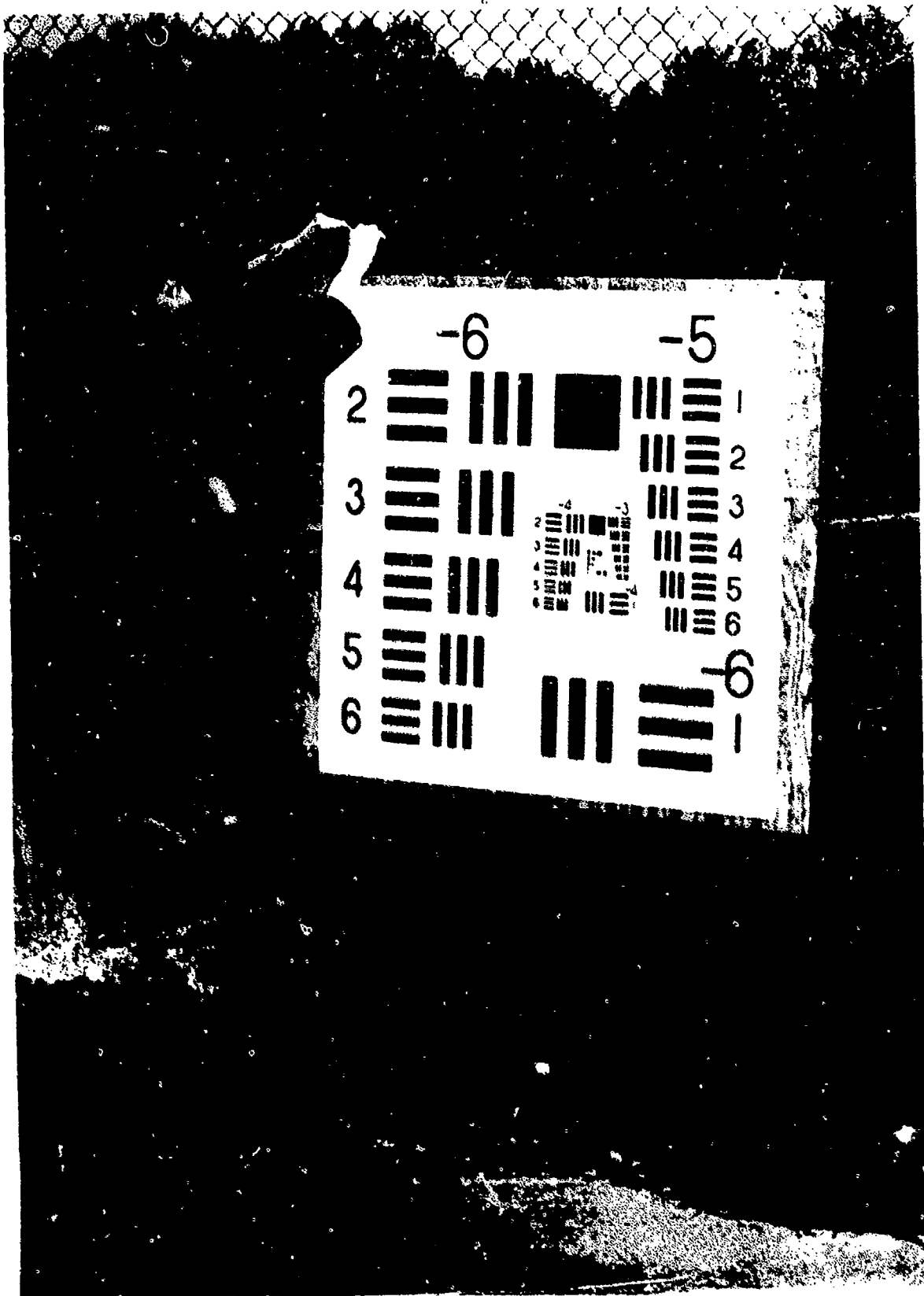


FIG. 1 LARGE-SCALE RESOLUTION TARGET

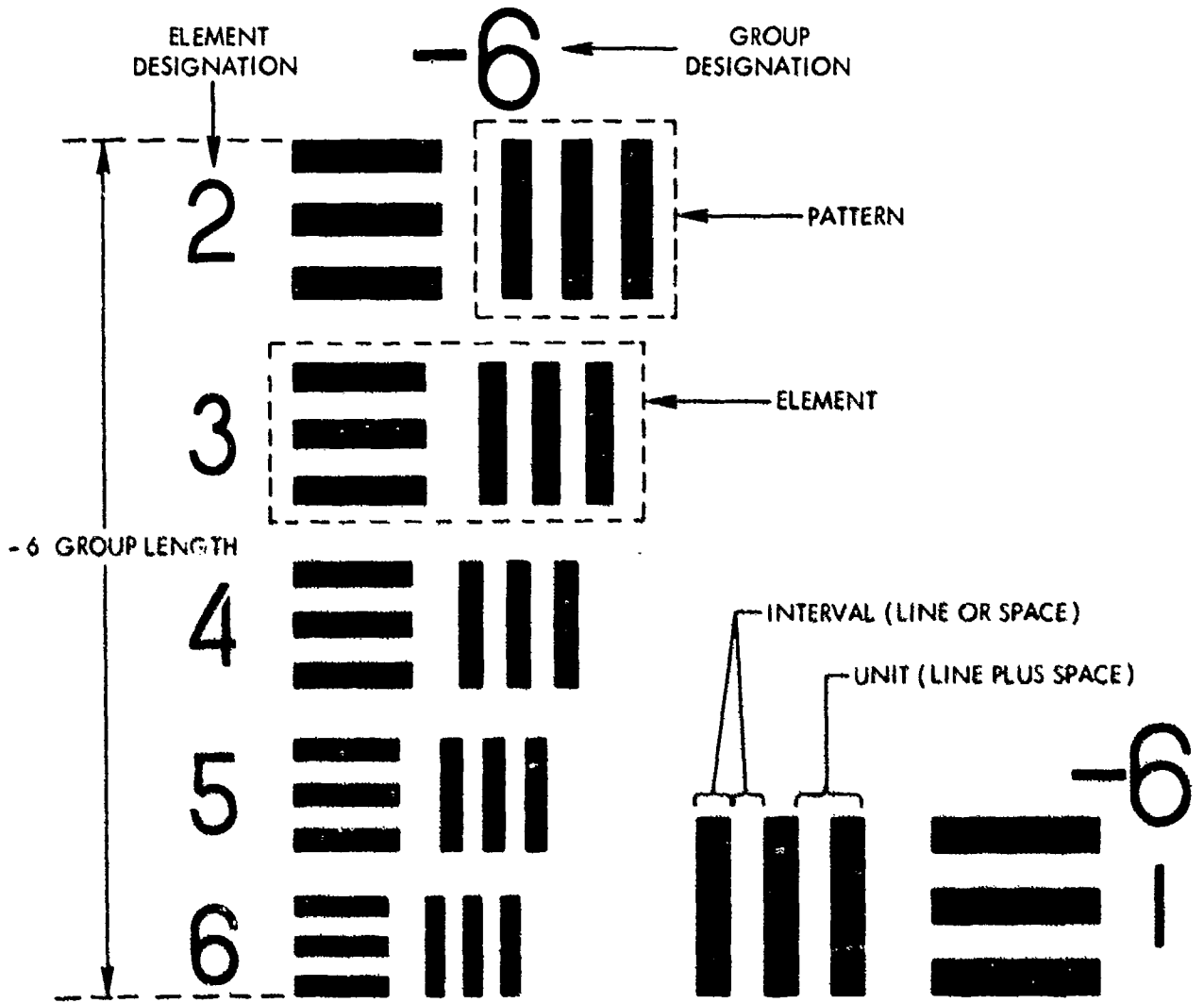


FIG. 2 RESOLUTION GROUP MINUS SIX SHOWING APPLICABLE TERMINOLOGY

target consists of groups "minus six" (-6) through "minus one" (-1). Each group in turn consists of six elements. The group number indicates, in terms of powers of two, the number of lines per millimeter of the largest pattern within the group:

$$\text{Resolution} = 2^k$$

where K is the group designation.

For example, in group "minus three":

$$R = 2^{-3}$$

$$R = \frac{1}{(2)^3}$$

$$R = 1/8 = 0.125 \text{ Lines/mm}$$

The resolution of any pattern can be computed using the formula:

$$R = 2^{K + \frac{N-1}{6}}$$

where K is the group designation and N is the element designation.

The targets were prepared using two techniques. A full size 40 x 42 inch high contrast negative was made on polyester-based lithographic film using a process camera and a smaller format master. This negative was then used to make contact prints on resin-coated (dimensionally stable) photographic paper. Contact prints were made at three levels of contrast. The contrast ratios and density differences of the target lines and spaces were as follows:

High Contrast -	100:1	($\Delta D = 2.00$)
Medium Contrast -	6.3:1	($\Delta D = 0.80$)
Low Contrast -	1.6:1	($\Delta D = 0.20$)

All targets consisted of dark lines on a light background.

Although very satisfactory, photographic targets were expensive to make due to the time required to accurately assemble the matrix of prints into a 40 x 42 inch target. A second set of relatively inexpensive targets was prepared by printing the targets on heavy card stock using offset lithography. These targets, 40 inches high by 42 inches wide, including margins, were produced in high contrast only, having black lines on a white background. The array of resolution patterns (excluding the element and group designations) is approximately thirty inches square.

The Graphic Arts Research Center of Rochester Institute of Technology, Rochester, New York, 14623, is planning to market large-scale resolution targets similar to those described in this report. The targets will be printed on both paper and card stock in high, medium, and low contrast.

DATA REDUCTION TABLES; DESCRIPTION

The Data Reduction Tables* which are included in this report as Appendix C consist of four sections, as follows:

- Section (A) Nominal Dimensions of Resolving Power Test Target;
- Section (B) Resolving Power Data Tables for Specific Lens Focal Length/Object Distance Combinations;
- Section (C) Tabulation of Camera System Magnifications and Resultant Image Sizes;
- Section (D) Resolving Power Data Tables for Specific Camera Magnifications.

A description of each section is provided below:

(A) NOMINAL DIMENSIONS OF RESOLVING POWER TEST TARGET. This single-page section presents the nominal dimensions of the interval widths and unit widths of elements one through six of groups "minus six" through "minus one". Dimensions are given in terms of inches as well as millimeters. The data reflects the theoretical design goals; the actual dimensions on the targets vary from these values due to limitations of the reproduction process. Definitions are presented for pertinent terminology.

(B) RESOLVING POWER DATA REDUCTION TABLES FOR SPECIFIC LENS FOCAL LENGTH/OBJECT DISTANCE COMBINATIONS. This section contains data reduction tables for 48 lens focal lengths at each of 12 selected object distances. The lens focal lengths presented range from 10mm to 2000mm. The 12 object distances vary depending on the lens focal length. (The tables for 35mm lenses range from 10 feet to 400 feet, whereas the tables for 1000mm lenses range from 150 feet to 5000 feet.) Above each data table is a four-line heading containing the following information:

- Lens focal length in millimeters;
- Object distance in feet and meters;
- Image magnification;
- Size of image in millimeters and inches.

*A description of the computer program used in generating the data reduction tables and the program itself are provided in Appendices A and B.

Each data table consists of a six-by-six array of resolution values. The vertical columns denote groups "minus six" through "minus one", while the horizontal rows denote the elements.

The resolution values, which are presented in terms of lines-per-millimeter, represent computed theoretical data, not test data. The data presented in the tables is independent of the quality of the optical system under evaluation. The quality of the optical system comes into play by determining the smallest target which is resolved. For a given lens focal length and object distance, a quality system may resolve the "minus four" group, "element three" target, (79.9 lines per millimeter); whereas a poorer system might resolve only the "minus five" group, element two target, (35.6 lines per millimeter).

Tests using a focal length/object distance combination not explicitly listed can often be readily evaluated by applying a simple factor to one of the existing tables. As an example, there is no table presented for evaluation of a 75mm lens at 750 feet. To compute the resolution of this combination, one refers to the 150mm/1500-foot table. The resolution value may be read directly from the table because the computed data for a 75mm lens at 750 feet would be identical to that provided for the 150mm lens at twice the distance. As long as the ratio of focal length to distance remains the same (e.g., 250mm at 1000 feet vs 1000mm at 4000 feet, etc.), the results can be read directly from any analogous table. This type of substitution does not result in any error.

If no ratio extension is available, another method may be employed. For example, data is not presented for evaluating a 135mm lenses at 125 feet and no multiples of the 135mm focal length are presented. However, a table does present data for 135mm lenses at 250 feet. Although the ratio is not the same, a resolution value can be approximated by reference to the 250-foot table and multiplying the value by two. This multiplication compensates for the two-to-one ratio of the object distances. Performance values determined by this method will generally be accurate within one percent. This is not a significant error considering that the selection of the target image resolved involves a choice of elements which vary by 12 percent.

To simplify the format of the data tables, all computed resolution values which are equal to or exceed 1000 lines per millimeter are given as 999.9.

The tables presented in Section B can be used to good advantage by anyone designing resolution experiments. If the object distance which is selected for a particular test is too short, all targets will be resolved and the test would yield no data. Conversely, if the distance is excessive, none of the targets will be resolved. The following procedures can be followed to eliminate these situations however:

1. Make an estimate of the number of lines per millimeter which can be resolved by the system. Past experience with the film/lens/camera combination is a good guide.

2. Refer to the page containing the lens focal length to be tested.

3. Scan the tables to locate a table based on any convenient object distance which lists the estimated system performance in groups "minus two" through "minus five." Groups "minus one" and "minus six" are for safety margins only and should not be used in determining the test distance.

As an example, consider a system which has an estimated resolving power of 80 lines per millimeter. If the test is to be performed at an object distance which lists 80 lines per millimeter at group "minus five," "element three." If the actual resolution of the system is only 40 lines per millimeter, a target will still be available to provide the data. In this case, it would be the group "minus six," "element three," target which the table indicates is equal to 40 lines per millimeter. Had we selected the distance where 80 lines per millimeter was listed at "minus six," "element three," no target would be resolved.

(C) TABULATION OF CAMERA SYSTEM MAGNIFICATIONS AND RESULTANT IMAGE SIZES. In some testing situations, the object distance, focal length, or both will be unknown. A determination of system resolution can still be made under these conditions by determining the image size of the target on the resulting test film. This measurement, referred to as the "-6 Group Length," will then allow the selection of an appropriate data table.

A traveling-stage microscope or other suitable instrument can be used to measure the length of the "minus six" group from the top of its second element to the bottom of its sixth element (Figure 2). The measurement may be in millimeters or inches, whichever is more convenient.

Turning to the "-6 Group Length" table (Section C of Appendix C), one then scans the appropriate inch or millimeter column to locate the entry closest to the measured value. The corresponding value of magnification can be read from the adjacent column. The tabulation of values in this table range from a magnification of 0.000139 to 0.034621 and vary with the 24th root of 2 ($\sqrt[24]{2}$). Using the selected magnification value, one can refer to Section D which provides image plane resolution tables by magnification rather than by focal length and object distance.

(D) RESOLVING POWER DATA TABLES FOR SPECIFIC CAMERA MAGNIFICATIONS. Format and use of these tables are identical to those in Section B of Appendix C. System resolutions are determined from these tables in the manner previously described. Note that each table is valid for any system which produces the stated image size and magnification, regardless of the specific focal length and object distance used.

APPLICATIONS OF LARGE-SCALE RESOLUTION TESTS

There are numerous practical applications for large-scale resolution targets. Three typical examples are discussed below.

Example 1

Large-scale resolution targets allow photographic and other optical systems to be tested under conditions which are typical of their everyday applications. As such, these tests provide a quantitative measurement of the effectiveness of the system under the conditions normally encountered during actual use.

The data gathered by these tests reflect the effects of atmospheric haze and shimmer, focusing accuracy, camera mount stability, etc. In many applications, these degradations are the dominant factors in determining the performance of the system.

Example 2

It is frequently worthwhile to compare actual field tests with reference or "control" tests (laboratory tests of the same equipment, or field tests made under more stringent conditions). Comparison tests of this type can reveal (1) the percentage of resolution loss due to atmospheric haze, (2) the minimum shutter speed which can be used to hand-hold a long lens while still maintaining a desired level of resolution, (3) the minimum shutter speed required when photographing a moving object, or (4) the stability of one tripod versus another.

The comparison of the two test conditions can identify that point (a minimum shutter speed for example) where field data is not degraded with respect to control data, or it can be used to indicate percent resolution loss of field tests versus control tests.

Example 3

Large-scale resolution tests can be used to assess the object space resolution* of pictorial imagery. This technique was utilized in a recent NOL investigation which was concerned with determining the minimum image quality requirements necessary for identification of people. Typical results of increasing image quality and the associated increase in certainty of identification are shown in Figure 3.

This problem area was divided into three levels of pictorial quality:

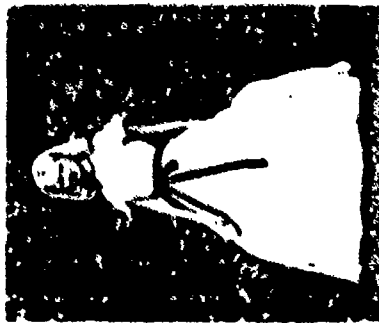
*Object space resolution: The spatial frequency of the target or the width of the target bar which is resolved in the photographic record.

25'
 TARGET RESOLVED:
 GROUP "2" ELEMENT "4"
 LINE WIDTH 1.41 MM (0.055")



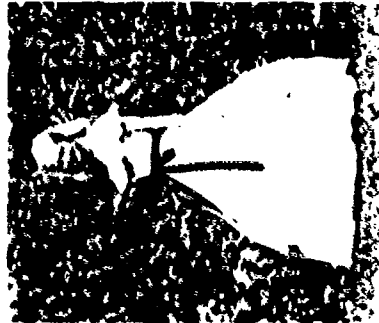
MAGNIFICATION • 11X

50'
 TARGET RESOLVED:
 GROUP "3" ELEMENT "3"
 LINE WIDTH 3.18 MM (0.125")



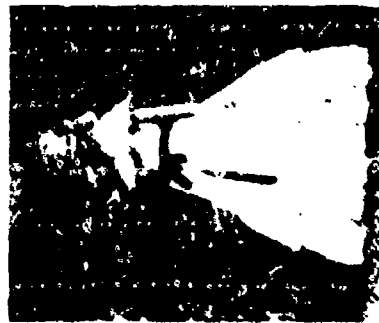
MAGNIFICATION • 22X

100'
 TARGET RESOLVED:
 GROUP "4" ELEMENT "3"
 LINE WIDTH 6.35 MM (0.250")



MAGNIFICATION • 44X

200'
 TARGET RESOLVED:
 GROUP "5" ELEMENT 4
 LINE WIDTH 11.31 MM (0.445")



MAGNIFICATION • 88X

SHOWN ARE MATCHED PHOTOGRAPHS OF A MODEL AND A LARGE-SCALE RESOLUTION TARGET, PHOTOGRAPHED AT FOUR REPRESENTATIVE DISTANCES FROM 25' TO 200'. THE FOUR PHOTOGRAPH PAIRS ARE FROM A SET OF 14 PAIRS MADE AT DISTANCES FROM 20' TO 400' TO DETERMINE THE MINIMUM OBJECT-SPACE RESOLUTION WHICH WOULD ALLOW IDENTIFICATION OF AN INDIVIDUAL.

CAMERA: 35 MM BESSLER TOPCON SUPER D
 LENS: 58 MM AT f/11
 IMAGE PLANE RESOLUTION, ALL FRAMES:
 46 LINES/MM ± 12% (± 1 ELEMENT)
 FILM: TRI-X

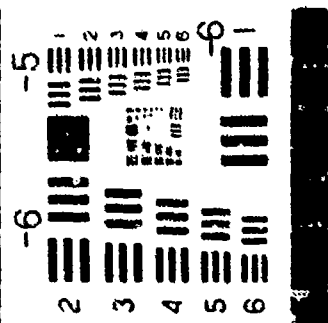
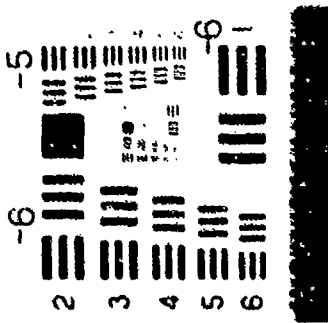
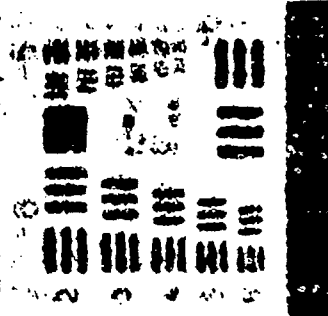


FIG. 3 DETERMINATION OF OBJECT-SPACE RESOLUTION

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- (1) Personnel Detection: To differentiate personnel from the adjacent background and to count the number of people present in the photograph;
- (2) Personnel Recognition: To provide general descriptions of the personnel present in a photograph, i.e., sex, height, weight, hair color and length, presence of glasses, etc.; and
- (3) Personnel Identification: To identify beyond reasonable doubt the presence of a specific individual.

To meet each one of these standards successively, an increasing improvement in pictorial quality is required.

An experiment was performed to determine the degree of object space resolution required for the above levels. Using a 58mm lens and Tri-X film, a group of five people and a large-scale resolution target were photographed at 14 separate distances, varying from 50 to 2016 feet.* The resulting film was then analyzed to determine the smallest resolvable target at each distance. The width of the selected target bars was a direct measurement of the object-space resolution present in each negative. (Note that previous examples have been concerned with lines per millimeter on the film; here we are concerned with the minimum size of the actual target lines which were successfully recorded.) A set of 40X enlargements was then produced. These prints were then examined by several qualified interpreters to determine the lowest level of pictorial quality which could be tolerated and still enable the interpreter to extract the information at the three required levels. (Although final conclusions have not been made, it appears that an object-space resolution of 1/8 inch is necessary if one is to meet the "personnel identification" criteria.)

Other Applications

The NOL large-scale resolution targets and associated data reduction tables can also be used to evaluate night vision devices, surveyor's transits, telescopes, binoculars, and a variety of other optical devices under field conditions.

*For this experiment, a second set of data reduction tables were prepared similar to those in Appendix C. The 24 object distances per lens focal length varied with the $\sqrt[3]{L}$; e.g., 100, 126, 159, 200, 318 feet, etc.

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REFERENCES

A Method of Determining the Resolving Power of Photographic Lenses; NBS Circular 533. Superintendent of Documents, Government Printing Office, Washington, D.C.

MIL-STD 150A; Photographic Lenses. Superintendent of Documents, Government Printing Office, Washington, D.C.

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APPENDIX A
DESCRIPTION OF COMPUTER PROGRAM

APPENDIX A

DESCRIPTION OF COMPUTER PROGRAM

The computer program used to generate the Resolving Power Data Reduction Tables is presented in Appendix B. The following description of the program's functions and its data deck structure should enable others to modify the program to generate tables for focal lengths and object distances not contained in Appendix C.

The Fortran IV program was written to present resolving power data tables for (1) given lens focal lengths and associated object distances and (2) generated magnifications. The main program acts basically as an executive calling in the various subroutines to perform computations, printing, etc.

Subroutine FOCAL computes the image magnification, "-6 Group Length," and resolving power data for a given focal length and object distance. The resolving power for group "minus six," "element one" of each table (referred to in program as "result") is computed from the above variables, the remaining data in each six-by-six array is arrived at by multiplying the "result" by each of 35 stored constants. This routine also stores the resolution data along with the test conditions, magnification, and "-6 group length".

Subroutine GENER generates a series of magnification values based on chosen (by data card) limits and power of two.

Subroutine MAGNIFY computes the resolving power data tables for the generated magnifications values.

Subroutine IMAGPRT prints the tabulation of generated magnification values and the associated "-6 group lengths".

Subroutine HEADER prints the tabulation of nominal target dimensions, notes, and nomenclature.

Subroutine PAGPRT prints the 12 data tables per focal length and the heading above each table which lists the test conditions and associated data.

Constraints within the program limit the number of input object distances, per data card, and the number of tables per page in the output to 12. Also, the total number of magnifications at any one time during execution (either generated or computed from focal lengths) is limited to 900. It should also be noted that any resolution value equal to or in excess of 1000.0 is set to 999.9.

On a CDC 6400, the program required an octal field length of 31,000 during execution and required 33 seconds of central processor time to execute under the Fortran Extended Compiler.

The data deck is structured as follows:

<u>CARD NO.</u>	<u>COLUMNS</u>	<u>VARIABLE</u>	<u>DEFINITION</u>
1	1-5	N	- Number of tables per page, not to exceed 12 (Right Adjusted). To obtain 24 object distances per focal length, use two input data cards per lens.
	6-10	MAG	- Indicator of method of computation to be used: a value of minus one (-1) will produce both the focal length tables (Section B) and the magnification tables (Section D). A value of zero (0) will produce only the focal length tables; a value of plus one (+1) will produce only the magnification tables (Right adjusted).
	11-15	NF	- Total number of focal length data cards (Right adjusted).
2 through (NF+1)	1-5, 6-10 11-15---56-60, 61-65		- One focal length and up to 12 object distances (feet) per card (Right adjusted).
NF+2	1-10	XMAX	- Maximum desired value of generated magnifications (floating point).
	11-20	XMIN	- Minimum desired value of generated magnifications (floating point).
	21-30	ROOT 2	- Root of two (2) used to build magnification values (floating point). A value of 24 was used to obtain the Section D tables which vary the magnification value by the 24th root of 2.

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APPENDIX B
COMPUTER PROGRAM

```

PROGRAM FOLEGT(INPUT,OUTPUT)
DIMENSION GROUP(36)
COMMON RESULT,LENGTH,OBJECT(12),A(12,36),SAVE (900),SAVE1(900)
1)SAVE2(900),SAVE3(900),K,MAX,XMIN,ROOT2,NUMBER,N,II,NF
COMMON SAVEA(900)
COMMON MAG
COMMON IN
COMMON NN
COMMON NN
INTEGER OBJECT
DATA GROUP/1.,1.1225,1.2599,1.4142,1.5974,1.7618,
12.,2.2452,2.5198,2.8284,3.1749,3.5636,
24.,4.495,5.0397,5.6549,6.3496,7.1272,
36.,8.98,10.0794,11.3137,12.6992,14.2544,
416.,17.96,20.1587,22.6274,25.3984,28.5098,
532.,35.92,40.3175,45.2546,50.7968,57.0175/
NUMBER = 0
K=0
I=0
C READ IN THE NUMBER OF TABLES PER PAGE, OR THE NUMBER OF OBJECT DISTANCES
C PER FOCAL LENGTH(N), WHETHER TO GENERATE MAGNIFICATIONS, COMPUTE THEM,
C OR DO BOTH (MAG) AND THE NUMBER OF FOCAL LENGTHS(NF) IF NEEDED
101 FORMAT(3I5)
IF(MAG.EQ.0) GO TO 50
NN=K
CALL HEADER(GROUP)
DO 40 LR=1,NF
C READ IN ONE FOCAL LENGTH AND THE ASSOCIATED OBJECT DISTANCES
102 READ 102, LENGTH,(OBJECT(I),I=1,N)
102 FORMAT(13I5)
DO 30 II=1,N
CCALCULATES THE MAGNIFICATIONS AND RESULT FOR A GIVEN FOCAL LENGTH AND OBJECT
C DISTANCE
35 CALL FOCAL
DO 30 I=1,36
A(II,I)= GROUP(I)*RESULT
IF (A(II,I) .GT. 999.9) A(II,I) = 999.9
30 CONTINUE
C PRINTS THE TABLES(12/PAGE) ONE PAGE AT A TIME
CALL PAGPRY
40 CONTINUE
CTHIS ROUTINE PRINTS A SORTED CROSS-REFERENCE LISTING OF THE MAGNIFICATIONS AND
CTHE ASSOCIATED LENGTHS
45 IF(MAG .GT. 0) GO TO 1800
MAG=0
CONTINUE
50 CONTINUE
NF=0
C READ IN A MAXIMUM ,MINIMUM AND THE POWER OF 2 TO BE USED IN COMPUTING THE
CMAGNIFICATIONS
103 READ 103,MAX,MIN, ROOT2
C THIS ROUTINE GENERATES THE MAGNIFICATIONS

```

```

65      CALL GENER
        CALL XPASPT
        CMERE THE NUMBER OF TABLES NEEDED IS COMPUTED
        IF (MOD(NUMBER,M)) 65,00,65
        60      QU=NUMBER/M
            GO TO 66
        65      NUM=(NUMBER/M)+1
            DO 75 K=1,MUM
            66      DO 70 I=1,M
                IF ((K-1)*M+I) .GT. NUMBER ) GO TO 73
                THIS ROUTINE COMPUTES THE RESULT
                CALL MAGNIFY
                NNN=N
                DO 70 I=1,36
                    A(I,I)=GROUP(I)*RESULT
                IF (A(I,I) .GT. 999.9) A(I,I) = 999.9
                70      GO TO 175
            73      NNN=N+1
                M=I-1
                CALL PASPT
                75      CONTINUE
            1000 STOP
                END
    
```

```

SUBROUTINE FOCAL
COMMON RESULT,LENGTH,OBJECTD(12),A(12,36),SAVE (900),SAVE1(900)
11,SAVE2(900),SAVE3(900),K,EMAX,XINH,MOOT2,NUMBER,H,II,WF
COMMON SAVE(900)
COMMON MAG
COMMON IN
COMMON NNN
INTEGER OBJECTD
K=1
OBJECT=OBJECTD(II)*10**6
KIMAG=(OBJECT*LENGTH)/(OBJECT-LENGTH)
MAG= XIMAGE/OBJECT
RESULT 01./100.*MAG)
SAVE(K)=XIMAG
SAVE1(K)= XIMAGE
SAVE2(K)=LENGTH
SAVE3(K)= OBJECTD(II)
WHERE THE -- GROUP LENGTHS ARE FORMED FROM THE MAGNIFICATIONS
SAVE4(K)= 703.*XIMAG
RETURN
END

```

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SUBROUTINE HEADER FURTHAN EXTENDED VERSION 2.0

900 FORMAT (20A,0GROUP -30,37X,0GROUP -2*37X,0GROUP -10)

PRINT 5

111111111

GO TO 75

CONTINUE

PRINT 15

PRINT 10

54,0INTERVAL SIZE,0X,0UNIT SIZE,0LX,0

54,0INTERVAL SIZE,0X,0UNIT SIZE /

54,0MINIMAL DIMENSIONS OF RESOLVING POWER TEST TARGET,0

54,0MINIMAL INTERVAL AND UNIT SPACING,0

60,37X,0GROUP -30,37X,0GROUP -20

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

64,0INTERVAL WIDTH,0X,0UNIT WIDTH,0LX,0

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```

SUBROUTINE XHAGPRT
COMMON RESULT,LENGTH,OBJECTD(12),A(12,36),SAVE (900),SAVE1(900)
1)SAVE2(900),SAVE3(900),K,XMAX,XMIN,ROOT2,NUMBER,N,II,NF
COMMON SAVE4(900)
COMMON MAG
COMMON IN
COMMON MNN
INTEGER OBJECTD
1010 PRINT 1015
C THE CONVERSION OF OBJECT DISTANCES AND - 6 GROUP LENGTHS INTO INCHES
110 DC 100 J=1, K
C TS= SAVE3(J)*12.0*.0254
ST = SAVE4(J) /25.4
1020 PRINT 1025, SAVE(J),SAVE4(J),ST
1025 FORMAT(F13.6,F14.3,F16.7)
120 IN =IN +1
C THIS IS TO ENSURE PRINTING OF 0 MORE THAN 56 LINES PER PAGE
NM=(MOD(IN,56)
IF (NM .NE. 0 ) GO TO 100
1030 PRINT 1015
100 CONTINUE
1015 FORMAT(1H1,3X,MAGNIFICATION,9X,--6 GROUP LENGTH,10X/25X,MM,0.1
11X,0INCH)
RETURN
END

```

```

SUBROUTINE PABPRT
  DIMENSION TSAVE(900),QSAVE(900)
  COMMON RESULT,LENGTH,OBJECT(12),A(12,36),SAVE (900),SAVE1(900)
  1)SAVE2(900),SAVE3(900),K,MAX,XMIN,ROOT2,NUMBER,M,I,NF
  COMMON SAVE4(900)
  COMMON MAG
  COMMON IN
  COMMON MMN
  INTEGER OBJECTD
  I=1./25.4
  IF (MAG.EQ. 0) GO TO 1100
  C FOR MAG.NE. 0 - K REPRESENTS THE KTH MAGNIFICATION VALUE,BUT FOR MAG.EQ. 0
  C IT REPRESENTS THE PAGE NUMBER
  KLM = K+1-N
  KKL = KLM * (K-1)
  GO TO 900
  1100 KLM = (K-1)*MMN+1
  KKL = KLM * (K-1)
  DO 100 IK = KLM,KKL
  TSAVE(IK) = SAVE3(IK) * 12.0*.0254
  QSAVE(IK) = SAVE4(IK) * X
  IF (MAG.EQ. 0) GO TO 210
  PRINT I,LENGTH
  1)FORMAT (I1,29X,'IMAGE PLANE RESOLUTION (LINES PER MILLIMETER),FOR
  X=.15,9M FOCAL LENGTH LENSES//')
  GO TO 260
  210 PRINT 202
  202)FORMAT (I1,44X,'IMAGE PLANE RESOLUTION (LINES PER MILLIMETER),')
  250 M = (K-1) * MMN + 1
  M1=M+1
  M2=M+2
  GO TO 1500
  M=K+1-N
  M1=M+1
  M2=M+2
  DO 1000 I=1,N * 3
  I1=I+1
  I2=I+2
  IF (MAG.EQ. 0) GO TO 240
  PRINT 2,LENGTH,LENGTH,LENGTH
  2)FORMAT(2(9X,'FOCAL LENGTH -',I7,MM,11X),9X,'FOCAL LENGTH -',
  A,17,MM)
  PRINT 3,SAVE3(M),TSAVE(M),SAVE3(M1),TSAVE(M1),SAVE3(M2),TSAVE(M2)
  3)FORMAT(2(9X,'OBJECT DISTANCE-',F6.0,'FT. (',F7.2,MM),1X),
  A 9X,'OBJECT DISTANCE-',F6.0,'FT. (',F7.2,MM),')
  IF (MAG.NE. 0) GO TO 270
  240 PRINT 1700
  1700)FORMAT(1M, '/')
  PRINT 4,SAVE (M),SAVE (M1),SAVE (M2)
  4)FORMAT(2(9X,'MAGNIFICATION -',F10.6,10X),
  (9X,'MAGNIFICATION -',F10.6) )
  PRINT 5,SAVE4(M),QSAVE (M),SAVE4 (M1),QSAVE (M1),SAVE4 (M2),QSAVE (M2)
  5)FORMAT(2(9X,'-G GROUP LENGTH-',F6.3,MM(,F7.2,MM),1X),
  
```

```

55       X      9X,6-6 GROUP LENGTH=0,F6.3,9MH(0,F6.4,9IN.0)
        PRINT 6
        FORMAT(3I20X,6GROUP,20X)
        PRINT 7
        FORMAT(3I2X,0E,7X,0-0-0-4X,0-5-4X,0-0-0-4X,0-3-0-4X,0-2-0-4X,0-1-0-4X,
        X)
        PRINT 8,4I( 1),4I( 7),4I(13),4I(19),4I(25),4I(31)
        A(11,1),A(11,7),A(11,13),A(11,19),A(11,25),A(11,31)
        A(12,1),A(12,7),A(12,13),A(12,19),A(12,25),A(12,31)
        PRINT 9,4I( 2),4I( 8),4I(14),4I(20),4I(26),4I(32)
        A(11,2),A(11,8),A(11,14),A(11,20),A(11,26),A(11,32)
        A(12,2),A(12,8),A(12,14),A(12,20),A(12,26),A(12,32)
        PRINT 10,4I( 3),4I( 9),4I(15),4I(21),4I(27),4I(33)
        A(11,3),A(11,9),A(11,15),A(11,21),A(11,27),A(11,33)
        A(12,3),A(12,9),A(12,15),A(12,21),A(12,27),A(12,33)
        PRINT 11,4I( 4),4I(10)
        A(11,4),A(11,10)
        A(11,16),A(11,22),A(11,28),A(11,34)
        A(12,4),A(12,10)
        A(12,16),A(12,22),A(12,28),A(12,34)
        PRINT 12,4I( 5),4I(11)
        A(11,5),A(11,11)
        A(11,17),A(11,23),A(11,29),A(11,35)
        A(12,5),A(12,11)
        A(12,17),A(12,23),A(12,29),A(12,35)
        PRINT 13,4I( 6),4I(12)
        A(11,6),A(11,12)
        A(11,18),A(11,24),A(11,30),A(11,36)
        A(12,6),A(12,12)
        A(12,18),A(12,24),A(12,30),A(12,36)
        FORMAT(3I2X,0E,1X,0-1-0-2X,0F6.1,2X)
        FORMAT(3I2X,0E,1X,0-2-0-2X,0F6.1,2X)
        FORMAT(3I2X,0E,1X,0-3-0-2X,0F6.1,2X)
        FORMAT(3I2X,0E,1X,0-4-0-2X,0F6.1,2X)
        FORMAT(3I2X,0E,1X,0-5-0-2X,0F6.1,2X)
        FORMAT(3I2X,0E,1X,0-6-0-2X,0F6.1,2X)
        M=4+3
        M1=MI+3
        M2=M2+3
        CONTINUE
        IF (MAG.NE.0) PRINT 10000.LENGTH
        10000 FORMAT(1M,20X,'IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)FOR
        X=15,9MM FOCAL LENGTH LENSES')
        RETURN
        END

```

```

SUBROUTINE GENER
  DIMENSION GUESS1(450),GUESS2(450)
  COMMON RESULT,LENGTH,OBJECTD(12),A(12,36),SAVE (900),SAVE1(900)
  I1=SAVE2(900),SAVE3(900),K,XMAX,XMIN,ROOT2,NUMBER,N,I1,NF
  COMMON SAVE(900)
  COMMON MAG
  COMMON IN
  COMMON NNM
  INTEGER OBJECTD
  C STARTING POINT FOR THE GENERATION TAKEN TO BE .01
  GUESS1(1)=.01
  DO 20 LX1=2,300
  C GOING UP TO THE MAXIMUM
  GUESS1(LX1)=GUESS1(LX1-1)*2.**(.1./ROOT2)
  IF (GUESS1(LX1) .GE. XMAX) GO TO 25
  20 CONTINUE
  25 GUESS2(1)= .01
  DO 30 LX2= 2,300
  C GOING DOWN TO THE MINIMUM VALUE
  GUESS2(LX2)=GUESS2(LX2-1) /2.**(.1./ROOT2)
  IF (GUESS2(LX2) .LE. XMIN) GO TO 35
  30 CONTINUE
  C TOTAL NUMBER OF MAGNIFICATIONS GENERATED = NUMBER
  35 NUMBER = LX1+LX2-1
  DO 40 LK=1,LX2
  LKX=LX2+1-LK
  SAVE(LK) = GUESS2(LKX)
  LKX=LK2+1
  DO 50 LK=LKX+NUMBER
  LKX=LK-LX2 +1
  SAVE(LK)=GUESS1(LKX)
  LKX=LK
  LKX=NUMBER
  IF (MAG.NE.-1) GO TO 55
  LKX=NF+1
  LKX=NF+NUMBER
  DO 60 KK=LK1-LK2
  SAVE(KK) = SAVE(KK) *766.
  SAVE2(KK) = 9999.
  SAVE3(KK) = 9999.
  60 CONTINUE
  LENGTH= 99999
  RETURN
  END
  
```

05 GEN01100
 10 GEN01110
 GEN01120
 15 GE%01150
 %EN01180
 GEN01190
 20 GEN01220
 GEN01240
 GEN01250
 GEN01260
 GEN01270
 GEN01280
 GEN01290
 GEN01310
 35 GEN01340
 GEN01350
 40 GEN01360
 GEN01370

SUBROUTINE MAGNIFY FORTRAN EXTENDED VERSION 2.0

05/01/72

10.55.56.

PAGE NO. 1

MAG01400

05 SUBROUTINE MAGNIFY

COMMON RESULT,LENGTH,OBJECTD(12),A(12,36),SAVE (900),SAVE1(900)

1) *SAVE2(900),SAVE3(900),K,KMAX,XMIN,ROOT2,NUMBER,N,II,NF

COMMON SAVE4(900)

COMMON MAG

COMMON IN

COMMON NNW

INTEGER OBJECTD

NNW (K-1) * II

10 RESULT = 1. / (6. * SAVE(MN))

RETURN

END

MAG01420

MAG01430

MAG01440

NOLTR 72-18

APPENDIX C (DATA REDUCTION TABLES)

SECTION (A)

NOMINAL DIMENSIONS OF RESOLVING
POWER TEST TARGETS

NOMINAL DIMENSIONS OF RESOLVING POWER TEST TARGET

	GROUP -6		GROUP -5		GROUP -4	
	INTERVAL MM	UNIT WIDTH INCH	INTERVAL MM	UNIT WIDTH MM	INTERVAL MM	UNIT WIDTH INCH
E 1	32.000	1.266	16.000	32.000	8.000	16.000
E 2	28.508	1.122	14.254	28.508	7.127	14.254
M 3	25.399	1.000	12.699	25.399	6.350	12.699
E 4	22.628	.891	11.314	22.628	5.657	11.314
M 5	20.159	.794	10.079	20.159	5.040	10.079
T 6	17.959	.707	8.950	17.959	4.490	8.950

	GROUP -3		GROUP -2		GROUP -1	
	INTERVAL MM	UNIT WIDTH INCH	INTERVAL MM	UNIT WIDTH MM	INTERVAL MM	UNIT WIDTH INCH
E 1	4.000	.157	2.000	4.000	1.000	2.000
E 2	3.563	.142	1.782	3.563	.891	1.782
M 3	3.175	.125	1.587	3.175	.794	1.587
E 4	2.828	.111	1.414	2.828	.707	1.414
M 5	2.520	.099	1.260	2.520	.630	1.260
T 6	2.245	.088	1.122	2.245	.561	1.122

NOTES - (1) LENGTH OF -6 GROUP (TOP OF 2ND ELEMENT TO BOTTOM OF 6TH ELEMENT) 176MM, 30.02 INCHES
 (2) INTERVAL LENGTH EQUALS FIVE TIMES INTERVAL WIDTH

NOMENCLATURE

- INTERVAL - A LINE (BAR) OR A SPACE
- UNIT - A LINE AND ADJACENT SPACE
- PATTERN - THREE LINES AND TWO INCLUDED SPACES
- ELEMENT - AN ARRANGEMENT OF TWO PATTERNS SET AT RIGHT ANGLES TO EACH OTHER AND SEPARATED BY ONE UNIT SPACE
- GROUP - AN ARRAY OF SIX ELEMENTS

NOLTR 72-18

SECTION (B)

RESOLVING POWER DATA TABLES FOR SPECIFIC
LENS FOCAL LENGTH/OBJECT DISTANCE COMBINATIONS

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 10MM FOCAL LENGTH LENSES

10MM		10MM		10MM		10MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
5. FT. (1.52M)	7. FT. (2.13M)	10MM	10MM	10MM	10MM	10MM	10MM
0.00405	0.04709	7. FT. (2.13M)	7. FT. (2.13M)	7. FT. (2.13M)	7. FT. (2.13M)	7. FT. (2.13M)	7. FT. (2.13M)
5.040MM (.1984IN.)	3.593MM (.1415IN.)	3.593MM (.1415IN.)	3.593MM (.1415IN.)	3.593MM (.1415IN.)	3.593MM (.1415IN.)	3.593MM (.1415IN.)	3.593MM (.1415IN.)
-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-3	-2	-1	-3	-2	-1	-1
-4	-4	-4	-4	-4	-4	-4	-4
-3	-5	-5	-5	-5	-5	-5	-5
-2	-6	-6	-6	-6	-6	-6	-6
-1	-7	-7	-7	-7	-7	-7	-7
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

10MM		10MM		10MM		10MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
15. FT. (4.57M)	25. FT. (7.62M)	10MM	10MM	10MM	10MM	10MM	10MM
0.02192	0.01314	25. FT. (7.62M)	25. FT. (7.62M)	25. FT. (7.62M)	25. FT. (7.62M)	25. FT. (7.62M)	25. FT. (7.62M)
1.673MM (.0658IN.)	1.003MM (.0395IN.)	1.003MM (.0395IN.)	1.003MM (.0395IN.)	1.003MM (.0395IN.)	1.003MM (.0395IN.)	1.003MM (.0395IN.)	1.003MM (.0395IN.)
-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-4	-3	-2	-1	-1	-1	-1
-4	-4	-4	-4	-4	-4	-4	-4
-3	-5	-5	-5	-5	-5	-5	-5
-2	-6	-6	-6	-6	-6	-6	-6
-1	-7	-7	-7	-7	-7	-7	-7
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

10MM		10MM		10MM		10MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
50. FT. (15.24M)	75. FT. (22.86M)	10MM	10MM	10MM	10MM	10MM	10MM
0.00057	0.00438	75. FT. (22.86M)	75. FT. (22.86M)	75. FT. (22.86M)	75. FT. (22.86M)	75. FT. (22.86M)	75. FT. (22.86M)
.501MM (.0197IN.)	.334MM (.0131IN.)	.334MM (.0131IN.)	.334MM (.0131IN.)	.334MM (.0131IN.)	.334MM (.0131IN.)	.334MM (.0131IN.)	.334MM (.0131IN.)
-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-4	-3	-2	-1	-1	-1	-1
-4	-4	-4	-4	-4	-4	-4	-4
-3	-5	-5	-5	-5	-5	-5	-5
-2	-6	-6	-6	-6	-6	-6	-6
-1	-7	-7	-7	-7	-7	-7	-7
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

10MM		10MM		10MM		10MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
150. FT. (45.72M)	200. FT. (60.96M)	10MM	10MM	10MM	10MM	10MM	10MM
0.00219	0.00164	200. FT. (60.96M)	200. FT. (60.96M)	200. FT. (60.96M)	200. FT. (60.96M)	200. FT. (60.96M)	200. FT. (60.96M)
.167MM (.0066IN.)	.125MM (.0049IN.)	.125MM (.0049IN.)	.125MM (.0049IN.)	.125MM (.0049IN.)	.125MM (.0049IN.)	.125MM (.0049IN.)	.125MM (.0049IN.)
-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-	-6 GROUP LENGTH-
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-4	-3	-2	-1	-1	-1	-1
-4	-4	-4	-4	-4	-4	-4	-4
-3	-5	-5	-5	-5	-5	-5	-5
-2	-6	-6	-6	-6	-6	-6	-6
-1	-7	-7	-7	-7	-7	-7	-7
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 10MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 13MM FOCAL LENGTH LENSES

13MM		13MM		13MM		13MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
5.5	11.0	21.9	43.6	7.3	29.1	58.1	116.1
6.2	12.3	24.6	49.2	8.2	32.6	65.2	131.0
6.9	13.8	27.6	55.2	9.2	36.6	73.5	147.1
7.7	15.5	31.0	62.0	10.3	41.1	82.5	165.1
8.7	17.4	34.8	69.6	11.5	46.1	92.6	185.3
9.8	19.5	39.1	78.1	12.9	51.6	104.0	208.0

13MM		13MM		13MM		13MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
10.3	20.5	44.1	82.1	14.6	61.6	124.6	252.6
11.5	23.0	46.1	92.2	16.2	67.8	136.6	278.6
12.9	25.9	51.7	103.4	18.0	74.9	150.9	308.9
14.5	29.0	58.1	116.1	20.2	82.6	166.6	342.6
16.3	32.6	65.2	130.3	22.8	91.3	184.3	380.3

13MM		13MM		13MM		13MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
18.3	36.6	73.2	146.4	25.9	103.5	207.1	414.1
20.5	41.1	82.2	164.5	28.6	114.6	229.2	458.2
23.1	46.1	92.2	184.5	32.6	129.6	259.6	519.6
25.9	51.6	103.5	207.1	36.6	146.4	292.6	588.6
29.1	58.1	116.2	232.4	40.7	166.6	332.4	666.6
32.6	65.2	130.4	260.9	45.6	191.3	380.3	758.3

13MM		13MM		13MM		13MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
36.6	73.2	146.4	292.6	51.6	259.6	519.6	1039.6
41.1	82.2	164.5	328.6	58.1	289.6	579.6	1159.6
46.1	92.2	184.5	368.6	65.2	322.6	645.2	1292.6
51.6	103.5	207.1	414.1	72.6	362.6	726.6	1442.6
58.1	116.2	232.4	466.6	80.3	408.3	816.3	1616.3
65.2	130.4	260.9	521.9	88.6	460.6	920.6	1810.6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 13MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)FOR 18MM FOCAL LENGTH LENSES

18MM		18MM		18MM		18MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
5. FT. (1.52M)	7. FT. (2.13M)	7. FT. (2.13M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-5	-3	-2	-1	-1	-1	-1
L 1	10.5	20.9	41.8	14.7	29.4	58.8	14.7
L 2	5.2	10.5	20.9	7.3	14.7	29.4	14.7
M 3	2.6	5.2	10.5	3.7	7.3	14.7	14.7
E 4	1.5	3.0	4.0	2.1	2.8	3.7	4.0
M 5	1.0	1.5	2.0	1.5	2.0	2.8	3.7
T 6	0.7	1.0	1.5	1.0	1.5	2.0	2.8

18MM		18MM		18MM		18MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
5. FT. (1.52M)	7. FT. (2.13M)	7. FT. (2.13M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-5	-3	-2	-1	-1	-1	-1
L 1	10.5	20.9	41.8	14.7	29.4	58.8	14.7
L 2	5.2	10.5	20.9	7.3	14.7	29.4	14.7
M 3	2.6	5.2	10.5	3.7	7.3	14.7	14.7
E 4	1.5	3.0	4.0	2.1	2.8	3.7	4.0
M 5	1.0	1.5	2.0	1.5	2.0	2.8	3.7
T 6	0.7	1.0	1.5	1.0	1.5	2.0	2.8

18MM		18MM		18MM		18MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
5. FT. (1.52M)	7. FT. (2.13M)	7. FT. (2.13M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-5	-3	-2	-1	-1	-1	-1
L 1	10.5	20.9	41.8	14.7	29.4	58.8	14.7
L 2	5.2	10.5	20.9	7.3	14.7	29.4	14.7
M 3	2.6	5.2	10.5	3.7	7.3	14.7	14.7
E 4	1.5	3.0	4.0	2.1	2.8	3.7	4.0
M 5	1.0	1.5	2.0	1.5	2.0	2.8	3.7
T 6	0.7	1.0	1.5	1.0	1.5	2.0	2.8

18MM		18MM		18MM		18MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
5. FT. (1.52M)	7. FT. (2.13M)	7. FT. (2.13M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)	10. FT. (3.05M)
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-5	-3	-2	-1	-1	-1	-1
L 1	10.5	20.9	41.8	14.7	29.4	58.8	14.7
L 2	5.2	10.5	20.9	7.3	14.7	29.4	14.7
M 3	2.6	5.2	10.5	3.7	7.3	14.7	14.7
E 4	1.5	3.0	4.0	2.1	2.8	3.7	4.0
M 5	1.0	1.5	2.0	1.5	2.0	2.8	3.7
T 6	0.7	1.0	1.5	1.0	1.5	2.0	2.8

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)FOR 18MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 21MM FOCAL LENGTH LENSES

21MM		21MM		21MM		21MM		21MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE
5. FT. (1.52M)	7. FT. (2.13M)	10. FT. (3.05M)	10. FT. (3.05M)	5. FT. (1.52M)	7. FT. (2.13M)	10. FT. (3.05M)	10. FT. (3.05M)	5. FT. (1.52M)	7. FT. (2.13M)
0.00460	0.00940	0.01372	0.01372	0.00460	0.00940	0.01372	0.01372	0.00460	0.00940
10.661MM (.4197IN.)	7.584MM (.2986IN.)	5.293MM (.2083IN.)	5.293MM (.2083IN.)	10.661MM (.4197IN.)	7.584MM (.2986IN.)	5.293MM (.2083IN.)	5.293MM (.2083IN.)	10.661MM (.4197IN.)	7.584MM (.2986IN.)
-6	-5	-4	-3	-2	-1	-1	-2	-3	-4
1.1	2.2	4.5	8.9	17.9	35.8	35.8	17.9	8.9	4.5
1.3	2.5	5.0	10.0	20.1	40.2	40.2	20.1	10.0	5.0
1.4	2.8	5.6	11.3	22.5	45.1	45.1	22.5	11.3	5.6
1.6	3.2	6.3	12.7	25.3	50.6	50.6	25.3	12.7	6.3
1.8	3.6	7.1	14.2	28.4	56.8	56.8	28.4	14.2	7.1
2.0	4.0	8.0	15.9	31.9	63.8	63.8	31.9	15.9	8.0
E 1	L 1	E 2	L 1	E 1	L 1	E 2	L 1	E 1	L 1
E 2	L 2	E 3	L 2	E 2	L 2	E 3	L 2	E 2	L 2
E 4	M 3	E 4	M 3	E 4	M 3	E 4	M 3	E 4	M 3
M 5	E 4	M 5	E 4	M 5	E 4	M 5	E 4	M 5	E 4
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

21MM		21MM		21MM		21MM		21MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE
15. FT. (4.57M)	25. FT. (7.62M)	35. FT. (10.67M)	35. FT. (10.67M)	15. FT. (4.57M)	25. FT. (7.62M)	35. FT. (10.67M)	35. FT. (10.67M)	15. FT. (4.57M)	25. FT. (7.62M)
0.00460	0.00764	0.01172	0.01172	0.00460	0.00764	0.01172	0.01172	0.00460	0.00764
3.521MM (.1386IN.)	2.109MM (.0830IN.)	1.585MM (.0592IN.)	1.585MM (.0592IN.)	3.521MM (.1386IN.)	2.109MM (.0830IN.)	1.585MM (.0592IN.)	1.585MM (.0592IN.)	3.521MM (.1386IN.)	2.109MM (.0830IN.)
-6	-5	-4	-3	-2	-1	-1	-2	-3	-4
3.4	6.8	13.5	27.1	54.2	108.4	108.4	54.2	27.1	13.5
3.8	7.6	15.2	30.4	60.4	120.8	120.8	60.4	30.4	15.2
4.2	8.5	17.1	34.1	68.3	136.5	136.5	68.3	34.1	17.1
4.8	9.6	19.2	38.3	76.6	153.2	153.2	76.6	38.3	19.2
5.4	10.8	21.5	43.0	86.0	172.0	172.0	86.0	43.0	21.5
6.0	12.1	24.1	48.3	96.5	193.1	193.1	96.5	48.3	24.1
E 1	L 1	E 2	L 1	E 1	L 1	E 2	L 1	E 1	L 1
E 2	L 2	E 3	L 2	E 2	L 2	E 3	L 2	E 2	L 2
M 3	M 3	E 4	M 3	E 4	M 3	E 4	M 3	E 4	M 3
E 4	E 4	M 5	E 4	M 5	E 4	M 5	E 4	M 5	E 4
T 4	T 4	T 6	T 4	T 6	T 4	T 6	T 4	T 6	T 4

21MM		21MM		21MM		21MM		21MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE
50. FT. (15.24M)	75. FT. (22.86M)	100. FT. (30.48M)	100. FT. (30.48M)	50. FT. (15.24M)	75. FT. (22.86M)	100. FT. (30.48M)	100. FT. (30.48M)	50. FT. (15.24M)	75. FT. (22.86M)
0.01280	0.00919	0.00659	0.00659	0.01280	0.00919	0.00659	0.00659	0.01280	0.00919
1.053MM (.0414IN.)	.702MM (.0276IN.)	.526MM (.0207IN.)	.526MM (.0207IN.)	1.053MM (.0414IN.)	.702MM (.0276IN.)	.526MM (.0207IN.)	.526MM (.0207IN.)	1.053MM (.0414IN.)	.702MM (.0276IN.)
-6	-5	-4	-3	-2	-1	-1	-2	-3	-4
11.3	22.6	45.3	90.6	181.2	362.4	362.4	181.2	90.6	45.3
12.7	25.4	50.8	101.7	203.4	406.7	406.7	203.4	101.7	50.8
14.3	28.5	57.1	114.1	228.3	456.5	456.5	228.3	114.1	57.1
16.0	32.0	64.1	128.1	256.2	512.5	512.5	256.2	128.1	64.1
18.0	36.0	71.9	143.8	287.6	575.2	575.2	287.6	143.8	71.9
20.2	40.4	80.7	161.6	322.8	645.6	645.6	322.8	161.6	80.7
E 1	L 1	E 2	L 1	E 1	L 1	E 2	L 1	E 1	L 1
E 2	L 2	E 3	L 2	E 2	L 2	E 3	L 2	E 2	L 2
M 3	M 3	E 4	M 3	E 4	M 3	E 4	M 3	E 4	M 3
E 4	E 4	M 5	E 4	M 5	E 4	M 5	E 4	M 5	E 4
T 4	T 4	T 6	T 4	T 6	T 4	T 6	T 4	T 6	T 4

21MM		21MM		21MM		21MM		21MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE
150. FT. (45.72M)	200. FT. (60.96M)	250. FT. (76.20M)	250. FT. (76.20M)	150. FT. (45.72M)	200. FT. (60.96M)	250. FT. (76.20M)	250. FT. (76.20M)	150. FT. (45.72M)	200. FT. (60.96M)
0.00460	0.00345	0.00276	0.00276	0.00460	0.00345	0.00276	0.00276	0.00460	0.00345
.351MM (.0138IN.)	.263MM (.0104IN.)	.210MM (.0083IN.)	.210MM (.0083IN.)	.351MM (.0138IN.)	.263MM (.0104IN.)	.210MM (.0083IN.)	.210MM (.0083IN.)	.351MM (.0138IN.)	.263MM (.0104IN.)
-6	-5	-4	-3	-2	-1	-1	-2	-3	-4
34.0	68.0	136.0	272.0	544.0	1088.0	1088.0	544.0	272.0	136.0
38.2	76.3	152.7	305.3	610.7	1221.4	1221.4	610.7	305.3	152.7
42.8	85.7	171.4	342.7	685.4	1370.9	1370.9	685.4	342.7	171.4
48.1	96.2	192.1	384.1	768.4	1536.8	1536.8	768.4	384.1	192.1
54.0	108.0	215.9	431.8	863.5	1727.0	1727.0	863.5	431.8	215.9
60.6	121.2	242.3	484.7	969.4	1938.8	1938.8	969.4	484.7	242.3
E 1	L 1	E 2	L 1	E 1	L 1	E 2	L 1	E 1	L 1
E 2	L 2	E 3	L 2	E 2	L 2	E 3	L 2	E 2	L 2
M 3	M 3	E 4	M 3	E 4	M 3	E 4	M 3	E 4	M 3
E 4	E 4	M 5	E 4	M 5	E 4	M 5	E 4	M 5	E 4
T 4	T 4	T 6	T 4	T 6	T 4	T 6	T 4	T 6	T 4

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 21MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 25MM FOCAL LENGTH LENSES

25MM		25MM		25MM		25MM		25MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE
10.81 (3.05M)	15.57 (4.57M)	.005498	4.195MM (.1652IN.)	15.57 (4.57M)	15.57 (4.57M)	.005498	4.195MM (.1652IN.)	15.57 (4.57M)	15.57 (4.57M)
.008270	.005498	.005498	.005498	.005498	.005498	.005498	.005498	.005498	.005498
6.310MM (.2484IN.)	4.195MM (.1652IN.)	4.195MM (.1652IN.)	4.195MM (.1652IN.)	4.195MM (.1652IN.)	4.195MM (.1652IN.)	4.195MM (.1652IN.)	4.195MM (.1652IN.)	4.195MM (.1652IN.)	4.195MM (.1652IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-6	-6	-6	-6	-6	-6	-6	-6	-6	-6
-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

25MM		25MM		25MM		25MM		25MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE
15.57 (4.57M)	50.57 (15.24M)	.001643	1.254MM (.0494IN.)	50.57 (15.24M)	50.57 (15.24M)	.001643	1.254MM (.0494IN.)	50.57 (15.24M)	50.57 (15.24M)
.002249	.001643	.001643	.001643	.001643	.001643	.001643	.001643	.001643	.001643
1.792MM (.0704IN.)	1.254MM (.0494IN.)	1.254MM (.0494IN.)	1.254MM (.0494IN.)	1.254MM (.0494IN.)	1.254MM (.0494IN.)	1.254MM (.0494IN.)	1.254MM (.0494IN.)	1.254MM (.0494IN.)	1.254MM (.0494IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-6	-6	-6	-6	-6	-6	-6	-6	-6	-6
-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

25MM		25MM		25MM		25MM		25MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE
100.57 (30.48M)	150.57 (45.72M)	.000547	.817MM (.0322IN.)	150.57 (45.72M)	150.57 (45.72M)	.000547	.817MM (.0322IN.)	150.57 (45.72M)	150.57 (45.72M)
.000821	.000547	.000547	.000547	.000547	.000547	.000547	.000547	.000547	.000547
.828MM (.0327IN.)	.817MM (.0322IN.)	.817MM (.0322IN.)	.817MM (.0322IN.)	.817MM (.0322IN.)	.817MM (.0322IN.)	.817MM (.0322IN.)	.817MM (.0322IN.)	.817MM (.0322IN.)	.817MM (.0322IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-6	-6	-6	-6	-6	-6	-6	-6	-6	-6
-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

25MM		25MM		25MM		25MM		25MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE
250.57 (76.20M)	400.57 (121.92M)	.000328	.250MM (.0098IN.)	400.57 (121.92M)	400.57 (121.92M)	.000328	.250MM (.0098IN.)	400.57 (121.92M)	400.57 (121.92M)
.000328	.000328	.000328	.000328	.000328	.000328	.000328	.000328	.000328	.000328
.250MM (.0098IN.)	.250MM (.0098IN.)	.250MM (.0098IN.)	.250MM (.0098IN.)	.250MM (.0098IN.)	.250MM (.0098IN.)	.250MM (.0098IN.)	.250MM (.0098IN.)	.250MM (.0098IN.)	.250MM (.0098IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-6	-6	-6	-6	-6	-6	-6	-6	-6	-6
-5	-5	-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 25MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 28MM FOCAL LENGTH LENSES

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 10.FT. (3.05M)
 MAGNIFICATION - .009272
 -6 GROUP LENGTH- 7.074MM (.2785IN.)

E 1 1.7 3.4 6.7 13.5 27.0 53.9
 E 2 1.9 3.8 7.6 15.1 30.3 60.5
 M 3 2.1 4.2 8.5 17.0 34.0 67.9
 E 4 2.4 4.8 9.5 19.1 38.1 76.3
 N 5 2.7 5.4 10.7 21.4 42.8 85.6
 T 6 3.0 6.0 12.0 24.0 48.0 96.1

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 15.FT. (4.57M)
 MAGNIFICATION - .006162
 -6 GROUP LENGTH- 4.702MM (.1851IN.)

E 1 1 2.5 5.1 10.1 20.3 40.6 81.1
 E 2 2.8 5.7 11.4 22.8 45.5 91.1
 M 3 3.2 6.4 12.8 25.6 51.1 102.2
 E 4 3.6 7.2 14.3 28.7 57.4 114.8
 N 5 4.0 8.1 16.1 32.2 64.4 128.8
 T 6 4.5 9.0 18.1 36.1 72.3 144.6

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 25.FT. (7.62M)
 MAGNIFICATION - .003638
 -6 GROUP LENGTH- 2.818MM (.1108IN.)

E 1 1 4.2 8.5 16.9 33.9 67.8 135.6
 E 2 4.8 9.5 19.0 38.0 76.1 152.2
 M 3 5.3 10.7 21.4 42.7 85.4 170.8
 E 4 6.0 12.0 24.0 47.9 95.8 191.7
 N 5 6.7 13.5 26.9 53.8 107.6 215.2
 T 6 7.5 15.1 30.2 60.4 120.8 241.6

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 35.FT. (10.67M)
 MAGNIFICATION - .002632
 -6 GROUP LENGTH- 2.008MM (.0791IN.)

E 1 5.9 11.9 23.7 47.5 95.0 190.0
 E 2 6.7 13.3 26.7 53.3 106.6 213.3
 M 3 7.5 15.0 29.9 59.8 119.7 239.4
 E 4 8.4 16.8 33.6 67.2 134.4 268.7
 N 5 9.4 18.8 37.7 75.4 150.8 301.6
 T 6 10.6 21.2 42.3 84.6 169.3 338.5

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 50.FT. (15.24M)
 MAGNIFICATION - .001841
 -6 GROUP LENGTH- 1.404MM (.0553IN.)

E 1 1 8.5 17.0 34.0 67.9 135.8 271.6
 E 2 9.5 19.1 38.1 76.2 152.5 304.9
 M 3 10.7 21.4 42.8 85.6 171.1 342.2
 E 4 12.0 24.0 48.0 96.0 192.1 384.2
 N 5 13.5 27.0 53.9 107.8 215.6 431.2
 T 6 15.1 30.3 60.5 121.0 242.0 484.0

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 75.FT. (22.86M)
 MAGNIFICATION - .001226
 -6 GROUP LENGTH- .935MM (.0368IN.)

E 1 1 12.7 25.5 51.0 101.9 203.9 407.7
 E 2 14.3 28.6 57.2 114.4 228.8 457.7
 M 3 16.1 32.1 64.2 128.4 256.8 513.7
 E 4 18.0 36.0 72.1 144.1 288.3 576.6
 N 5 20.2 40.5 80.9 161.8 323.6 647.2
 T 6 22.7 45.4 90.8 181.6 363.2 726.5

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 100.FT. (30.48M)
 MAGNIFICATION - .000919
 -6 GROUP LENGTH- .702MM (.0276IN.)

E 1 17.0 34.0 68.0 135.9 271.9 543.8
 E 2 19.1 38.1 76.3 152.6 305.2 610.4
 M 3 21.4 42.8 85.6 171.3 342.6 685.1
 E 4 24.0 48.1 96.1 192.3 384.5 769.0
 N 5 27.0 54.0 107.9 215.8 431.6 863.2
 T 6 30.3 60.6 121.1 242.2 484.5 968.9

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 150.FT. (45.72M)
 MAGNIFICATION - .000613
 -6 GROUP LENGTH- .468MM (.0184IN.)

E 1 1 25.5 51.0 102.0 204.0 408.0 815.9
 E 2 28.6 57.2 114.5 229.0 457.9 915.9
 M 3 32.1 64.2 128.5 257.0 514.0 999.9
 E 4 36.1 72.1 144.2 288.5 576.9 999.9
 N 5 40.5 81.0 161.9 323.8 647.6 999.9
 T 6 45.4 90.9 181.7 363.5 726.9 999.9

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 200.FT. (60.96M)
 MAGNIFICATION - .000460
 -6 GROUP LENGTH- .351MM (.0138IN.)

E 1 1 34.0 68.0 136.0 272.0 544.0 999.9
 E 2 38.2 76.3 152.7 305.3 610.7 999.9
 M 3 42.6 85.7 171.4 342.7 685.4 999.9
 E 4 48.1 96.2 192.3 384.7 769.4 999.9
 N 5 54.0 108.0 215.9 431.8 863.6 999.9
 T 6 60.6 121.2 242.3 484.7 969.4 999.9

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 250.FT. (76.20M)
 MAGNIFICATION - .000368
 -6 GROUP LENGTH- .280MM (.0110IN.)

E 1 42.5 85.0 170.0 340.0 680.0 1360.0
 E 2 47.7 95.4 190.8 381.7 763.4 999.9
 M 3 53.6 107.1 214.2 428.4 856.9 999.9
 E 4 60.1 120.2 240.5 480.9 961.8 999.9
 N 5 67.5 135.0 270.0 539.8 999.9 999.9
 T 6 75.7 151.5 303.0 605.9 999.9 999.9

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 300.FT. (91.44M)
 MAGNIFICATION - .000306
 -6 GROUP LENGTH- .234MM (.0092IN.)

E 1 1 51.0 102.0 204.0 408.0 816.0 1632.0
 E 2 57.3 114.5 229.0 458.1 916.2 999.9
 M 3 64.3 128.5 257.1 514.2 999.9 999.9
 E 4 72.1 144.3 288.6 577.1 999.9 999.9
 N 5 81.0 162.0 323.9 647.8 999.9 999.9
 T 6 90.9 181.8 363.6 727.1 999.9 999.9

FOCAL LENGTH - 28MM
 OBJECT DISTANCE - 400.FT. (121.92M)
 MAGNIFICATION - .000230
 -6 GROUP LENGTH- .175MM (.0069IN.)

E 1 1 68.0 136.0 272.0 544.0 999.9 999.9
 E 2 76.4 152.7 305.4 610.8 999.9 999.9
 M 3 85.7 171.4 342.8 685.6 999.9 999.9
 E 4 96.2 192.4 384.8 769.6 999.9 999.9
 N 5 108.0 216.0 431.9 863.8 999.9 999.9
 T 6 121.2 242.4 484.8 969.6 999.9 999.9

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 28MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 35MM FOCAL LENGTH LENSES

FOCAL LENGTH		35MM		FOCAL LENGTH		35MM		FOCAL LENGTH		35MM	
OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-3	-2	-1	-1	-1	-1	-1	-1
L 1	1.3	2.7	5.4	10.8	21.5	43.0	86.0	172.0	344.0	688.0	1376.0
L 2	1.5	3.0	6.0	12.1	24.2	48.3	96.6	193.2	386.4	772.8	1545.6
M 3	1.7	3.4	6.8	13.6	27.1	54.2	108.4	216.8	433.6	867.2	1734.4
E 4	1.9	3.8	7.6	15.2	30.4	60.8	121.6	243.2	486.4	972.8	1945.6
M 5	2.1	4.3	8.5	17.1	34.1	68.3	136.5	273.0	546.0	1092.0	2184.0
T 6	2.4	4.8	9.6	19.2	38.3	76.7	153.4	306.8	613.6	1227.2	2454.4

FOCAL LENGTH		35MM		FOCAL LENGTH		35MM		FOCAL LENGTH		35MM	
OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-3	-2	-1	-1	-1	-1	-1	-1
L 1	4.7	9.5	19.0	38.0	76.0	151.9	303.8	607.6	1215.2	2430.4	4860.8
L 2	5.3	10.7	21.3	42.6	85.3	170.5	341.0	682.0	1364.0	2728.0	5456.0
M 3	6.0	12.0	23.9	47.8	95.7	191.4	382.8	765.6	1531.2	3062.4	6124.8
E 4	6.7	13.4	26.9	53.7	107.4	214.8	429.6	859.2	1718.4	3436.8	6873.6
M 5	7.5	15.1	30.1	60.3	120.6	241.1	482.2	964.4	1928.8	3857.6	7715.2
T 6	8.5	16.9	33.8	67.7	135.3	270.7	541.4	1082.8	2165.6	4331.2	8662.4

FOCAL LENGTH		35MM		FOCAL LENGTH		35MM		FOCAL LENGTH		35MM	
OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-3	-2	-1	-1	-1	-1	-1	-1
L 1	12.6	27.2	54.4	108.7	217.5	435.0	870.0	1740.0	3480.0	6960.0	13920.0
L 2	15.3	30.5	61.0	122.1	244.1	488.2	976.4	1952.8	3905.6	7811.2	15622.4
M 3	17.1	34.2	68.5	137.0	274.0	548.0	1096.0	2192.0	4384.0	8768.0	17536.0
E 4	19.2	38.4	76.9	153.6	307.5	615.1	1230.2	2460.4	4920.8	9841.6	19683.2
M 5	21.6	43.2	86.3	172.6	345.2	690.4	1380.8	2761.6	5523.2	11046.4	22092.8
T 6	24.2	48.4	96.9	193.7	387.5	775.0	1550.0	3100.0	6200.0	12400.0	24800.0

FOCAL LENGTH		35MM		FOCAL LENGTH		35MM		FOCAL LENGTH		35MM	
OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION	OBJECT DISTANCE-	MAGNIFICATION
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-3	-2	-1	-1	-1	-1	-1	-1
L 1	24.0	48.0	96.0	192.0	384.0	768.0	1536.0	3072.0	6144.0	12288.0	24576.0
L 2	28.0	56.0	112.0	224.0	448.0	896.0	1792.0	3584.0	7168.0	14336.0	28672.0
M 3	32.0	64.0	128.0	256.0	512.0	1024.0	2048.0	4096.0	8192.0	16384.0	32768.0
E 4	36.0	72.0	144.0	288.0	576.0	1152.0	2304.0	4608.0	9216.0	18432.0	36864.0
M 5	40.0	80.0	160.0	320.0	640.0	1280.0	2560.0	5120.0	10240.0	20480.0	40960.0
T 6	45.0	90.0	180.0	360.0	720.0	1440.0	2880.0	5760.0	11520.0	23040.0	46080.0

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 40MM FOCAL LENGTH LENSES

40MM		40MM		40MM		40MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
10. FT. (3.05M)	25. FT. (7.62M)	.013298	4.028MM (.1588IN.)	15. FT. (4.57M)	79. FT. (23.81M)	.021753	1.337MM (.0527IN.)
-6 GROUP LENGTH=10.146MM (.3985IN.)	-6 GROUP LENGTH=4.028MM (.1588IN.)	-6 GROUP LENGTH=10.146MM (.3985IN.)	-6 GROUP LENGTH=4.028MM (.1588IN.)	-6 GROUP LENGTH=15.24MM (.5999IN.)	-6 GROUP LENGTH=15.24MM (.5999IN.)	-6 GROUP LENGTH=15.24MM (.5999IN.)	-6 GROUP LENGTH=15.24MM (.5999IN.)
E	E	E	E	E	E	E	E
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
L 2	L 2	L 2	L 2	L 2	L 2	L 2	L 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

40MM		40MM		40MM		40MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
100. FT. (30.48M)	200. FT. (60.96M)	.001314	1.003MM (.0395IN.)	150. FT. (45.72M)	200. FT. (60.96M)	.000876	.668MM (.0263IN.)
-6 GROUP LENGTH=1.003MM (.0395IN.)	-6 GROUP LENGTH=1.003MM (.0395IN.)	-6 GROUP LENGTH=1.003MM (.0395IN.)	-6 GROUP LENGTH=1.003MM (.0395IN.)	-6 GROUP LENGTH=150.24MM (.5999IN.)	-6 GROUP LENGTH=150.24MM (.5999IN.)	-6 GROUP LENGTH=150.24MM (.5999IN.)	-6 GROUP LENGTH=150.24MM (.5999IN.)
E	E	E	E	E	E	E	E
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
L 2	L 2	L 2	L 2	L 2	L 2	L 2	L 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

40MM		40MM		40MM		40MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
250. FT. (76.20M)	400. FT. (121.92M)	.000525	.401MM (.0158IN.)	300. FT. (91.44M)	400. FT. (121.92M)	.000328	.250MM (.0099IN.)
-6 GROUP LENGTH=.401MM (.0158IN.)	-6 GROUP LENGTH=.401MM (.0158IN.)	-6 GROUP LENGTH=.401MM (.0158IN.)	-6 GROUP LENGTH=.401MM (.0158IN.)	-6 GROUP LENGTH=300.48MM (.1183IN.)	-6 GROUP LENGTH=300.48MM (.1183IN.)	-6 GROUP LENGTH=300.48MM (.1183IN.)	-6 GROUP LENGTH=300.48MM (.1183IN.)
E	E	E	E	E	E	E	E
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
L 2	L 2	L 2	L 2	L 2	L 2	L 2	L 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

40MM		40MM		40MM		40MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
100. FT. (30.48M)	200. FT. (60.96M)	.001314	1.003MM (.0395IN.)	150. FT. (45.72M)	200. FT. (60.96M)	.000876	.668MM (.0263IN.)
-6 GROUP LENGTH=1.003MM (.0395IN.)	-6 GROUP LENGTH=1.003MM (.0395IN.)	-6 GROUP LENGTH=1.003MM (.0395IN.)	-6 GROUP LENGTH=1.003MM (.0395IN.)	-6 GROUP LENGTH=150.24MM (.5999IN.)	-6 GROUP LENGTH=150.24MM (.5999IN.)	-6 GROUP LENGTH=150.24MM (.5999IN.)	-6 GROUP LENGTH=150.24MM (.5999IN.)
E	E	E	E	E	E	E	E
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
L 2	L 2	L 2	L 2	L 2	L 2	L 2	L 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 45MM FOCAL LENGTH LENSES

FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM			
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -		
-6 GROUP LENGTH= 11.43MM (.450IN.)		-6 GROUP LENGTH= 7.58MM (.2986IN.)		-6 GROUP LENGTH= 15.0FT. (4.57M)		-6 GROUP LENGTH= 4.53MM (.1785IN.)			
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP		
E	-6	-5	-4	-6	-5	-4	-3	-2	-1
L	1.0	2.1	4.2	6.3	12.6	25.1	50.3	100.6	201.2
E	2	2.3	4.7	7.1	14.1	28.2	56.5	113.0	226.0
M	3	2.6	5.3	8.0	16.0	32.0	64.0	128.0	256.0
E	4	2.9	5.9	8.8	17.6	35.2	70.4	140.8	281.6
M	5	3.3	6.6	10.0	20.0	40.0	80.0	160.0	320.0
E	6	3.7	7.4	11.2	22.4	44.8	89.6	179.2	358.4
T	6	3.7	7.4	11.2	22.4	44.8	89.6	179.2	358.4

FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM			
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -		
-6 GROUP LENGTH= 11.43MM (.450IN.)		-6 GROUP LENGTH= 7.58MM (.2986IN.)		-6 GROUP LENGTH= 15.0FT. (4.57M)		-6 GROUP LENGTH= 4.53MM (.1785IN.)			
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP		
E	-6	-5	-4	-6	-5	-4	-3	-2	-1
L	3.7	7.4	14.8	29.5	59.0	118.0	236.0	472.0	944.0
E	4	6.3	12.6	25.1	50.3	100.6	201.2	402.4	804.8
M	7	9.3	18.6	37.2	74.4	148.7	297.4	594.8	1189.6
E	8	10.4	20.9	41.7	83.5	166.9	333.8	667.6	1335.2
M	9	11.7	23.4	46.8	93.7	187.4	374.8	749.6	1499.2
E	10	13.1	26.3	52.6	105.2	210.3	420.6	841.2	1682.4
T	10	13.1	26.3	52.6	105.2	210.3	420.6	841.2	1682.4

FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM			
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -		
-6 GROUP LENGTH= 100.0FT. (30.48M)		-6 GROUP LENGTH= 150.0FT. (45.72M)		-6 GROUP LENGTH= 200.0FT. (60.96M)		-6 GROUP LENGTH= 250.0FT. (76.20M)			
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP		
E	-6	-5	-4	-6	-5	-4	-3	-2	-1
L	10.6	21.1	42.3	84.5	169.1	338.2	676.4	1352.8	2705.6
E	11.9	23.7	47.4	94.9	189.8	379.6	759.2	1518.4	3036.8
M	13.3	26.6	53.3	106.5	213.0	426.1	852.2	1704.4	3408.8
E	14.9	29.9	59.8	119.6	239.1	478.2	956.4	1912.8	3825.6
M	16.6	33.0	67.1	134.2	268.4	536.8	1073.6	2147.2	4294.4
E	18.8	37.7	75.3	150.6	301.3	602.5	1205.0	2410.0	4820.0
T	18.8	37.7	75.3	150.6	301.3	602.5	1205.0	2410.0	4820.0

FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM		FOCAL LENGTH - 45MM			
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -		
-6 GROUP LENGTH= 11.43MM (.450IN.)		-6 GROUP LENGTH= 7.58MM (.2986IN.)		-6 GROUP LENGTH= 15.0FT. (4.57M)		-6 GROUP LENGTH= 4.53MM (.1785IN.)			
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP		
E	-6	-5	-4	-6	-5	-4	-3	-2	-1
L	26.4	52.9	105.8	211.5	423.1	846.2	1692.4	3384.8	6769.6
E	29.7	59.4	118.7	237.5	475.0	950.0	1900.0	3800.0	7600.0
M	33.3	66.6	133.3	266.5	533.1	1066.2	2132.4	4264.8	8529.6
E	37.4	74.8	149.6	299.2	598.3	1196.6	2393.2	4786.4	9572.8
M	42.0	84.0	167.9	335.8	671.6	1343.2	2686.4	5372.8	10745.6
E	47.1	94.2	188.5	376.9	753.8	1507.6	3015.2	6030.4	12060.8
T	47.1	94.2	188.5	376.9	753.8	1507.6	3015.2	6030.4	12060.8

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 50MM FOCAL LENGTH LENSES

FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	
E 1	10.9	1.9	3.7	7.5	15.0	30.0	10.9	37.8
E 2	1.1	2.1	4.2	6.4	16.8	33.7	21.2	42.5
M 3	1.2	2.4	4.7	9.4	18.9	37.8	23.8	47.4
E 4	1.3	2.6	5.3	10.6	21.2	42.4	26.8	53.8
M 5	1.5	3.0	5.9	11.9	23.6	47.6	30.6	61.1
T 6	1.7	3.3	6.7	13.4	26.7	53.4	33.7	67.4

FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	4.7	9.5	19.0	38.0	75.9	151.9	304.3
E 2	5.3	10.7	21.3	42.6	85.3	170.5	341.6
M 3	6.0	12.0	23.9	47.8	95.7	191.4	383.4
E 4	6.7	13.4	26.9	53.7	107.4	214.8	430.3
M 5	7.5	15.1	30.1	60.3	120.6	241.1	483.0
T 6	8.5	16.9	33.8	67.7	135.3	270.7	542.2

FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	14.3	28.5	57.1	114.2	228.3	456.7	913.4
E 2	16.0	32.0	64.1	128.2	256.3	512.6	1025.2
M 3	18.0	36.0	71.9	143.9	287.7	575.4	1150.8
E 4	20.2	40.4	80.7	161.5	322.9	645.9	1291.9
M 5	22.7	45.3	90.6	181.2	362.5	725.0	1450.0
T 6	25.4	50.9	101.7	203.4	406.9	813.7	1627.4

FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM		FOCAL LENGTH - 50MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	28.6	57.1	114.2	228.5	457.0	913.9	1827.8
E 2	32.1	64.1	128.2	256.5	512.9	1025.9	2051.8
M 3	36.0	72.0	143.9	287.9	575.7	1151.4	2302.8
E 4	40.4	80.8	161.6	323.1	646.2	1292.4	2584.8
M 5	45.3	90.7	181.3	362.7	725.4	1450.8	2901.6
T 6	50.9	101.8	203.5	407.1	814.2	1628.4	3256.8

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 52MM FOCAL LENGTH LENSES

FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH-13.243MM (.5214IN.)		-6 GROUP LENGTH-15.5FT. (4.57M)		-6 GROUP LENGTH-15.5FT. (4.57M)		-6 GROUP LENGTH-15.5FT. (4.57M)		-6 GROUP LENGTH-15.5FT. (4.57M)	
GROUP		GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-6	-5	-4	-3	-2	-1
L	1	1.8	3.6	1.4	2.7	5.4	10.9	21.7	43.5
E	2	1.0	2.0	1.5	3.0	6.1	12.2	24.4	48.8
M	3	1.1	2.3	1.7	3.4	6.8	13.7	27.4	54.8
E	4	1.3	2.5	1.9	3.8	7.7	15.4	30.7	61.5
M	5	1.4	2.9	2.2	4.3	8.6	17.2	34.5	69.0
T	6	1.6	3.2	2.4	4.8	9.7	19.4	38.7	77.4

FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH-2.012MM (.1028IN.)		-6 GROUP LENGTH-1.740MM (.0685IN.)		-6 GROUP LENGTH-1.740MM (.0685IN.)		-6 GROUP LENGTH-1.740MM (.0685IN.)		-6 GROUP LENGTH-1.740MM (.0685IN.)	
GROUP		GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-6	-5	-4	-3	-2	-1
L	1	4.6	9.1	6.9	13.7	27.4	54.8	109.7	219.3
E	2	5.1	10.2	7.7	15.4	30.8	61.5	122.9	245.8
M	3	5.7	11.5	8.6	17.2	34.5	69.0	137.4	274.8
E	4	6.5	12.9	9.7	19.4	38.7	77.4	154.8	309.6
M	5	7.2	14.5	10.9	21.7	43.5	87.0	174.1	348.1
T	6	8.1	16.3	12.2	24.4	48.8	97.7	195.4	390.8

FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH-0.869MM (.0342IN.)		-6 GROUP LENGTH-0.869MM (.0342IN.)		-6 GROUP LENGTH-0.869MM (.0342IN.)		-6 GROUP LENGTH-0.869MM (.0342IN.)		-6 GROUP LENGTH-0.869MM (.0342IN.)	
GROUP		GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-6	-5	-4	-3	-2	-1
L	1	13.7	27.4	54.9	109.8	219.6	439.1	878.2	1756.4
E	2	15.4	30.8	61.5	123.0	246.0	492.0	984.0	1968.0
M	3	17.3	34.6	69.2	138.3	276.6	553.3	1106.6	2213.2
E	4	19.4	38.8	77.6	155.3	310.5	621.0	1242.0	2484.0
M	5	21.8	43.6	87.1	174.3	348.5	697.1	1394.2	2788.4
T	6	24.5	48.9	97.6	195.6	391.2	782.4	1564.8	3129.6

FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM		FOCAL LENGTH - 52MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH-0.334MM (.0131IN.)		-6 GROUP LENGTH-0.334MM (.0131IN.)		-6 GROUP LENGTH-0.334MM (.0131IN.)		-6 GROUP LENGTH-0.334MM (.0131IN.)		-6 GROUP LENGTH-0.334MM (.0131IN.)	
GROUP		GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-6	-5	-4	-3	-2	-1
L	1	27.5	54.9	109.8	219.7	439.4	878.8	1757.6	3515.2
E	2	30.8	61.6	123.3	246.6	493.2	986.4	1972.8	3945.6
M	3	34.6	69.2	138.4	276.8	553.6	1107.2	2214.4	4428.8
E	4	38.8	77.6	155.3	310.7	621.4	1242.8	2485.6	4971.2
M	5	43.6	87.2	174.3	348.7	697.4	1394.8	2789.6	5579.2
T	6	48.9	97.8	195.7	391.4	782.8	1565.6	3131.2	6262.4

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 52MM FOCAL LENGTH LENSES

IMAGE PLATE RESOLUTION (LINES PER MILLIMETER) FOR 55MM FOCAL LENGTH LENSES

55MM		55MM		55MM		55MM		55MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH
E 1	1.7	3.0	10.3	-5	1.3	2.6	5.1	-4	10.3
E 2	1.9	3.4	11.5	-5	1.4	2.9	5.8	-4	11.5
M 3	2.1	4.3	12.9	-5	1.6	3.2	6.5	-4	12.9
E 4	2.4	5.0	14.5	-5	1.8	3.6	7.3	-4	14.5
M 5	2.7	5.8	16.3	-5	2.0	4.1	8.1	-4	16.3
T 6	3.0	6.6	18.3	-5	2.3	4.6	9.1	-4	18.3

55MM		55MM		55MM		55MM		55MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH
E 1	1.7	3.0	10.3	-5	1.3	2.6	5.1	-4	10.3
E 2	1.9	3.4	11.5	-5	1.4	2.9	5.8	-4	11.5
M 3	2.1	4.3	12.9	-5	1.6	3.2	6.5	-4	12.9
E 4	2.4	5.0	14.5	-5	1.8	3.6	7.3	-4	14.5
M 5	2.7	5.8	16.3	-5	2.0	4.1	8.1	-4	16.3
T 6	3.0	6.6	18.3	-5	2.3	4.6	9.1	-4	18.3

55MM		55MM		55MM		55MM		55MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH
E 1	1.7	3.0	10.3	-5	1.3	2.6	5.1	-4	10.3
E 2	1.9	3.4	11.5	-5	1.4	2.9	5.8	-4	11.5
M 3	2.1	4.3	12.9	-5	1.6	3.2	6.5	-4	12.9
E 4	2.4	5.0	14.5	-5	1.8	3.6	7.3	-4	14.5
M 5	2.7	5.8	16.3	-5	2.0	4.1	8.1	-4	16.3
T 6	3.0	6.6	18.3	-5	2.3	4.6	9.1	-4	18.3

55MM		55MM		55MM		55MM		55MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH
E 1	1.7	3.0	10.3	-5	1.3	2.6	5.1	-4	10.3
E 2	1.9	3.4	11.5	-5	1.4	2.9	5.8	-4	11.5
M 3	2.1	4.3	12.9	-5	1.6	3.2	6.5	-4	12.9
E 4	2.4	5.0	14.5	-5	1.8	3.6	7.3	-4	14.5
M 5	2.7	5.8	16.3	-5	2.0	4.1	8.1	-4	16.3
T 6	3.0	6.6	18.3	-5	2.3	4.6	9.1	-4	18.3

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 58MM FOCAL LENGTH LENSES

58MM		58MM		58MM		58MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION
E 1	10.0	15.0	1.50	E 1	10.0	15.0	1.50
E 2	10.0	15.0	1.50	E 2	10.0	15.0	1.50
E 3	10.0	15.0	1.50	E 3	10.0	15.0	1.50
E 4	10.0	15.0	1.50	E 4	10.0	15.0	1.50
E 5	10.0	15.0	1.50	E 5	10.0	15.0	1.50
T A	10.0	15.0	1.50	T A	10.0	15.0	1.50

58MM		58MM		58MM		58MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION
E 1	10.0	15.0	1.50	E 1	10.0	15.0	1.50
E 2	10.0	15.0	1.50	E 2	10.0	15.0	1.50
E 3	10.0	15.0	1.50	E 3	10.0	15.0	1.50
E 4	10.0	15.0	1.50	E 4	10.0	15.0	1.50
E 5	10.0	15.0	1.50	E 5	10.0	15.0	1.50
T A	10.0	15.0	1.50	T A	10.0	15.0	1.50

58MM		58MM		58MM		58MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION
E 1	10.0	15.0	1.50	E 1	10.0	15.0	1.50
E 2	10.0	15.0	1.50	E 2	10.0	15.0	1.50
E 3	10.0	15.0	1.50	E 3	10.0	15.0	1.50
E 4	10.0	15.0	1.50	E 4	10.0	15.0	1.50
E 5	10.0	15.0	1.50	E 5	10.0	15.0	1.50
T A	10.0	15.0	1.50	T A	10.0	15.0	1.50

58MM		58MM		58MM		58MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION
E 1	10.0	15.0	1.50	E 1	10.0	15.0	1.50
E 2	10.0	15.0	1.50	E 2	10.0	15.0	1.50
E 3	10.0	15.0	1.50	E 3	10.0	15.0	1.50
E 4	10.0	15.0	1.50	E 4	10.0	15.0	1.50
E 5	10.0	15.0	1.50	E 5	10.0	15.0	1.50
T A	10.0	15.0	1.50	T A	10.0	15.0	1.50

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 60MM FOCAL LENGTH LENSES

60MM				60MM				60MM			
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
10.FT. (3.05M)	15.FT. (4.57M)	25.FT. (7.62M)		15.FT. (4.57M)	25.FT. (7.62M)	40.FT. (12.19M)		25.FT. (7.62M)	40.FT. (12.19M)	60.FT. (18.29M)	
0.00080	0.013298	0.07937		0.013298	0.07937	0.23841N.)		0.07937	0.23841N.)	0.45682N.)	
-5 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=	-5 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=	-5 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=
15.32MM (.467IN.)	10.146MM (.3095IN.)	6.956MM (.2384IN.)	4.57MM (.143IN.)	10.146MM (.3095IN.)	6.956MM (.2384IN.)	4.57MM (.143IN.)	3.05MM (.093IN.)	6.956MM (.2384IN.)	4.57MM (.143IN.)	3.05MM (.093IN.)	2.38MM (.073IN.)
E	L 1	L 2	M 1	E	L 1	L 2	M 1	E	L 1	L 2	M 1
1.0	1.7	3.0	3.5	0.2	12.4	20.0	20.9	1.2	2.3	4.7	9.4
1.0	2.0	3.9	7.8	1.3	10.6	21.1	42.2	1.3	2.6	5.3	10.6
1.1	2.2	4.4	8.8	1.5	9.9	23.7	47.4	1.5	3.0	6.0	11.8
1.2	2.5	5.0	10.0	1.7	9.4	26.6	53.2	1.7	3.3	6.6	13.3
1.4	2.8	5.6	11.2	1.9	9.0	29.8	59.7	1.9	3.7	7.5	14.9
				2.1	8.4	33.5	67.0	2.1	4.2	8.4	16.7

60MM				60MM				60MM			
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
35.FT. (10.67M)	50.FT. (15.24M)	75.FT. (22.86M)		50.FT. (15.24M)	75.FT. (22.86M)	100.FT. (30.48M)		50.FT. (15.24M)	75.FT. (22.86M)	100.FT. (30.48M)	
0.004058	0.03953	0.02632		0.03953	0.02632	0.01726		0.03953	0.02632	0.01726	
-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=	-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=	-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=
4.315MM (.1699IN.)	3.016MM (.1187IN.)	2.008MM (.0791IN.)	1.527MM (.0475IN.)	3.016MM (.1187IN.)	2.008MM (.0791IN.)	1.527MM (.0475IN.)	1.019MM (.0323IN.)	3.016MM (.1187IN.)	2.008MM (.0791IN.)	1.527MM (.0475IN.)	1.019MM (.0323IN.)
E	L 1	L 2	M 1	E	L 1	L 2	M 1	E	L 1	L 2	M 1
2.8	5.5	11.0	22.1	4.0	7.9	15.8	31.6	4.0	7.9	15.8	31.6
3.1	6.2	12.4	24.8	4.4	8.8	17.7	35.5	4.4	8.8	17.7	35.5
3.5	7.0	14.0	28.0	5.0	10.0	20.0	40.0	5.0	10.0	20.0	40.0
4.0	8.0	16.0	32.0	5.6	11.2	22.4	44.7	5.6	11.2	22.4	44.7
4.5	9.0	18.0	36.0	6.3	12.6	25.1	50.2	6.3	12.6	25.1	50.2
5.0	10.0	20.0	40.0	7.0	14.0	28.0	56.0	7.0	14.0	28.0	56.0

60MM				60MM				60MM			
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
100.FT. (30.48M)	150.FT. (45.72M)	200.FT. (60.96M)		150.FT. (45.72M)	200.FT. (60.96M)	260.FT. (79.25M)		150.FT. (45.72M)	200.FT. (60.96M)	260.FT. (79.25M)	
0.011972	0.01314	0.00986		0.01314	0.00986	0.00722		0.01314	0.00986	0.00722	
-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=	-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=	-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=
1.503MM (.0475IN.)	1.003MM (.0395IN.)	0.752MM (.0296IN.)	0.567MM (.0176IN.)	1.003MM (.0395IN.)	0.752MM (.0296IN.)	0.567MM (.0176IN.)	0.425MM (.0131IN.)	1.003MM (.0395IN.)	0.752MM (.0296IN.)	0.567MM (.0176IN.)	0.425MM (.0131IN.)
E	L 1	L 2	M 1	E	L 1	L 2	M 1	E	L 1	L 2	M 1
7.9	15.8	31.7	63.4	11.9	23.8	47.6	95.1	11.9	23.8	47.6	95.1
8.9	17.8	35.6	71.2	13.3	26.7	53.4	106.8	13.3	26.7	53.4	106.8
10.0	20.0	40.0	80.0	15.0	30.0	60.0	120.0	15.0	30.0	60.0	120.0
11.2	22.4	44.7	89.4	16.8	33.6	67.3	134.5	16.8	33.6	67.3	134.5
12.6	25.2	50.4	100.8	18.9	37.8	75.5	151.0	18.9	37.8	75.5	151.0
14.1	28.2	56.4	112.7	21.2	42.4	84.7	169.5	21.2	42.4	84.7	169.5

60MM				60MM				60MM			
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
250.FT. (76.20M)	300.FT. (91.44M)	400.FT. (121.92M)		300.FT. (91.44M)	400.FT. (121.92M)	500.FT. (152.40M)		300.FT. (91.44M)	400.FT. (121.92M)	500.FT. (152.40M)	
0.000788	0.00657	0.00492		0.00657	0.00492	0.00369		0.00657	0.00492	0.00369	
-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=	-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=	-6 GROUP LENGTH=	-4 GROUP LENGTH=	-3 GROUP LENGTH=	-2 GROUP LENGTH=
0.61mm (.0237IN.)	0.501MM (.0197IN.)	0.376MM (.0148IN.)	0.282MM (.0111IN.)	0.501MM (.0197IN.)	0.376MM (.0148IN.)	0.282MM (.0111IN.)	0.215MM (.0084IN.)	0.501MM (.0197IN.)	0.376MM (.0148IN.)	0.282MM (.0111IN.)	0.215MM (.0084IN.)
E	L 1	L 2	M 1	E	L 1	L 2	M 1	E	L 1	L 2	M 1
19.4	38.8	77.6	155.2	23.8	47.6	95.2	190.4	23.8	47.6	95.2	190.4
22.3	44.5	89.0	178.0	26.7	53.4	106.8	213.6	26.7	53.4	106.8	213.6
25.0	50.0	100.0	200.0	30.0	60.0	120.0	240.0	30.0	60.0	120.0	240.0
26.0	52.0	104.0	208.0	33.7	67.3	134.6	269.2	33.7	67.3	134.6	269.2
31.5	63.0	126.0	252.0	37.8	75.5	151.0	302.0	37.8	75.5	151.0	302.0
35.3	70.6	141.2	282.4	42.4	84.7	169.5	339.0	42.4	84.7	169.5	339.0

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 60MM FOCAL LENGTH LENSES

IMAGE PLATE RESOLUTION (LINES PER MILLIMETER) FOR 65MM FOCAL LENGTH LENSES

65PM		65MM		65MM		65MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-3	-2	-1	-1
L 1	1.4	2.9	5.7	11.5	22.9	45.8	91.6
L 2	1.5	3.0	6.0	12.0	24.0	48.0	96.0
M 3	1.6	3.2	6.4	12.8	25.6	51.2	102.4
M 4	1.7	3.4	6.8	13.6	27.2	54.4	108.8
N 5	1.8	3.6	7.2	14.4	28.8	57.6	115.2
T 6	1.9	3.8	7.6	15.2	30.4	60.8	121.6

65PM		65MM		65MM		65MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-3	-2	-1	-1
L 1	2.5	5.1	10.2	20.4	40.8	81.6	163.2
L 2	2.6	5.2	10.4	20.8	41.6	83.2	166.4
M 3	2.7	5.4	10.8	21.6	43.2	86.4	172.8
M 4	2.8	5.6	11.2	22.4	44.8	89.6	179.2
N 5	2.9	5.8	11.6	23.2	46.4	92.8	185.6
T 6	3.0	6.0	12.0	24.0	48.0	96.0	192.0

65PM		65MM		65MM		65MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-3	-2	-1	-1
L 1	7.3	14.6	29.2	58.4	116.7	233.4	466.8
L 2	7.5	15.0	30.0	60.0	120.0	240.0	480.0
M 3	7.7	15.4	30.8	61.6	123.2	246.4	492.8
M 4	7.9	15.8	31.6	63.2	126.4	252.8	505.6
N 5	8.1	16.2	32.4	64.8	129.6	259.2	518.4
T 6	8.3	16.6	33.2	66.4	132.8	265.6	531.2

65PM		65MM		65MM		65MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP		GROUP		GROUP		GROUP	
E	-6	-5	-4	-3	-2	-1	-1
L 1	16.3	32.6	65.2	130.4	260.8	521.6	1043.2
L 2	16.5	33.0	66.0	132.0	264.0	528.0	1056.0
M 3	16.7	33.4	66.8	133.6	267.2	534.4	1068.8
M 4	16.9	33.8	67.6	135.2	270.4	540.8	1081.6
N 5	17.1	34.2	68.4	136.8	273.6	547.2	1094.4
T 6	17.3	34.6	69.2	138.4	276.8	553.6	1107.2

IMAGE PLATE RESOLUTION (LINES PER MILLIMETER) FOR 80MM FOCAL LENGTH LENSES

FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH= 13.589MM (.5350IN.)		-6 GROUP LENGTH= 13.589MM (.5350IN.)		-6 GROUP LENGTH= 13.589MM (.5350IN.)		-6 GROUP LENGTH= 13.589MM (.5350IN.)	
E 1	1.5	2.9	5.9	11.8	23.6	47.1	94.1
E 2	1.7	3.3	6.6	13.2	26.4	52.8	105.6
M 3	1.9	3.7	7.4	14.8	29.7	59.4	118.8
E 4	2.1	4.2	8.4	16.3	32.6	65.2	130.4
M 5	2.3	4.7	9.4	18.1	36.2	72.4	144.8
T 6	2.6	5.2	10.5	21.0	42.0	84.0	168.0

FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH= 15.851MM (.6237IN.)		-6 GROUP LENGTH= 15.851MM (.6237IN.)		-6 GROUP LENGTH= 15.851MM (.6237IN.)		-6 GROUP LENGTH= 15.851MM (.6237IN.)	
E 1	1.8	3.6	7.2	14.3	28.6	57.2	114.4
E 2	2.0	4.0	8.0	16.0	32.0	64.0	128.0
M 3	2.2	4.4	8.8	17.6	35.2	70.4	140.8
E 4	2.4	4.8	9.6	19.2	38.4	76.8	153.6
M 5	2.6	5.2	10.4	21.6	43.2	86.4	172.8
T 6	3.0	6.0	12.0	25.2	50.4	100.8	201.6

FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH= 20.596MM (.8112IN.)		-6 GROUP LENGTH= 20.596MM (.8112IN.)		-6 GROUP LENGTH= 20.596MM (.8112IN.)		-6 GROUP LENGTH= 20.596MM (.8112IN.)	
E 1	2.5	5.0	10.0	20.6	41.2	82.4	164.8
E 2	2.8	5.6	11.2	23.2	46.4	92.8	185.6
M 3	3.0	6.0	12.0	24.0	48.0	96.0	192.0
E 4	3.2	6.4	12.8	25.6	51.2	102.4	204.8
M 5	3.4	6.8	13.6	27.2	54.4	108.8	217.6
T 6	4.0	8.0	16.0	32.0	64.0	128.0	256.0

FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM		FOCAL LENGTH - 80MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH= 25.341MM (.9977IN.)		-6 GROUP LENGTH= 25.341MM (.9977IN.)		-6 GROUP LENGTH= 25.341MM (.9977IN.)		-6 GROUP LENGTH= 25.341MM (.9977IN.)	
E 1	3.5	7.0	14.0	29.3	58.6	117.2	234.4
E 2	3.8	7.6	15.2	31.6	63.2	126.4	252.8
M 3	4.0	8.0	16.0	32.7	65.4	130.8	261.6
E 4	4.2	8.4	16.8	34.4	68.8	137.6	275.2
M 5	4.4	8.8	17.6	36.0	72.0	144.0	288.0
T 6	5.0	10.0	20.0	41.7	83.4	166.8	333.6

IMAGE PLATE RESOLUTION (LINES PER MILLIMETER) FOR 80MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 85MM FOCAL LENGTH LENSES

E	FOCAL LENGTH		85MM		FOCAL LENGTH		85MM	
	OBJECT DISTANCE	MAGNIFICATION	50.FT. (15.24M)	100.FT. (30.48M)	OBJECT DISTANCE	MAGNIFICATION	75.FT. (22.86M)	150.FT. (45.72M)
L 1	1.0	1.0	11.1	22.2	11.1	22.2	11.1	22.2
L 2	1.5	1.5	14.4	28.8	14.4	28.8	14.4	28.8
M 3	2.0	2.0	17.8	35.6	17.8	35.6	17.8	35.6
N 4	2.5	2.5	22.2	44.4	22.2	44.4	22.2	44.4
T 5	3.0	3.0	26.7	53.4	26.7	53.4	26.7	53.4
		-6 GROUP LENGTH	1.0	1.0	1.0	1.0	1.0	1.0
		GROUP	1.0	1.0	1.0	1.0	1.0	1.0

E	FOCAL LENGTH		85MM		FOCAL LENGTH		85MM	
	OBJECT DISTANCE	MAGNIFICATION	150.FT. (45.72M)	300.FT. (91.44M)	OBJECT DISTANCE	MAGNIFICATION	200.FT. (60.96M)	400.FT. (121.92M)
L 1	1.0	1.0	11.1	22.2	11.1	22.2	11.1	22.2
L 2	1.5	1.5	14.4	28.8	14.4	28.8	14.4	28.8
M 3	2.0	2.0	17.8	35.6	17.8	35.6	17.8	35.6
N 4	2.5	2.5	22.2	44.4	22.2	44.4	22.2	44.4
T 5	3.0	3.0	26.7	53.4	26.7	53.4	26.7	53.4
		-6 GROUP LENGTH	1.0	1.0	1.0	1.0	1.0	1.0
		GROUP	1.0	1.0	1.0	1.0	1.0	1.0

E	FOCAL LENGTH		85MM		FOCAL LENGTH		85MM	
	OBJECT DISTANCE	MAGNIFICATION	300.FT. (91.44M)	600.FT. (182.88M)	OBJECT DISTANCE	MAGNIFICATION	400.FT. (121.92M)	800.FT. (243.84M)
L 1	1.0	1.0	11.1	22.2	11.1	22.2	11.1	22.2
L 2	1.5	1.5	14.4	28.8	14.4	28.8	14.4	28.8
M 3	2.0	2.0	17.8	35.6	17.8	35.6	17.8	35.6
N 4	2.5	2.5	22.2	44.4	22.2	44.4	22.2	44.4
T 5	3.0	3.0	26.7	53.4	26.7	53.4	26.7	53.4
		-6 GROUP LENGTH	1.0	1.0	1.0	1.0	1.0	1.0
		GROUP	1.0	1.0	1.0	1.0	1.0	1.0

E	FOCAL LENGTH		85MM		FOCAL LENGTH		85MM	
	OBJECT DISTANCE	MAGNIFICATION	750.FT. (228.60M)	1500.FT. (457.20M)	OBJECT DISTANCE	MAGNIFICATION	1000.FT. (304.80M)	2000.FT. (609.60M)
L 1	1.0	1.0	11.1	22.2	11.1	22.2	11.1	22.2
L 2	1.5	1.5	14.4	28.8	14.4	28.8	14.4	28.8
M 3	2.0	2.0	17.8	35.6	17.8	35.6	17.8	35.6
N 4	2.5	2.5	22.2	44.4	22.2	44.4	22.2	44.4
T 5	3.0	3.0	26.7	53.4	26.7	53.4	26.7	53.4
		-6 GROUP LENGTH	1.0	1.0	1.0	1.0	1.0	1.0
		GROUP	1.0	1.0	1.0	1.0	1.0	1.0

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 85MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 90MM FOCAL LENGTH LENSES

90MM		90MM		90MM		90MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
25. FT. (7.62M)	50. FT. (15.24M)	50. FT. (15.24M)	50. FT. (15.24M)	75. FT. (22.86M)	75. FT. (22.86M)	75. FT. (22.86M)	75. FT. (22.86M)
.017 12	.005941	.005941	.005941	.003953	.003953	.003953	.003953
-6 GROUP LENGTH= 9.110MM (.3590IN.)	-6 GROUP LENGTH= 4.533MM (.1785IN.)	-6 GROUP LENGTH= 4.533MM (.1785IN.)	-6 GROUP LENGTH= 4.533MM (.1785IN.)	-6 GROUP LENGTH= 3.016MM (.1187IN.)	-6 GROUP LENGTH= 3.016MM (.1187IN.)	-6 GROUP LENGTH= 3.016MM (.1187IN.)	-6 GROUP LENGTH= 3.016MM (.1187IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
N 5	N 5	N 5	N 5	N 5	N 5	N 5	N 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

90MM		90MM		90MM		90MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
100. FT. (30.48M)	150. FT. (45.72M)	150. FT. (45.72M)	150. FT. (45.72M)	200. FT. (60.96M)	200. FT. (60.96M)	200. FT. (60.96M)	200. FT. (60.96M)
.002962	.001972	.001972	.001972	.001479	.001479	.001479	.001479
-6 GROUP LENGTH= 2.250MM (.0890IN.)	-6 GROUP LENGTH= 1.505MM (.0592IN.)	-6 GROUP LENGTH= 1.505MM (.0592IN.)	-6 GROUP LENGTH= 1.505MM (.0592IN.)	-6 GROUP LENGTH= 1.128MM (.0444IN.)	-6 GROUP LENGTH= 1.128MM (.0444IN.)	-6 GROUP LENGTH= 1.128MM (.0444IN.)	-6 GROUP LENGTH= 1.128MM (.0444IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
N 5	N 5	N 5	N 5	N 5	N 5	N 5	N 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

90MM		90MM		90MM		90MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
250. FT. (76.20M)	300. FT. (91.44M)	300. FT. (91.44M)	300. FT. (91.44M)	400. FT. (121.92M)	400. FT. (121.92M)	400. FT. (121.92M)	400. FT. (121.92M)
.001182	.000985	.000985	.000985	.000739	.000739	.000739	.000739
-6 GROUP LENGTH= .902MM (.3559IN.)	-6 GROUP LENGTH= .752MM (.2961IN.)	-6 GROUP LENGTH= .752MM (.2961IN.)	-6 GROUP LENGTH= .752MM (.2961IN.)	-6 GROUP LENGTH= .564MM (.2221IN.)	-6 GROUP LENGTH= .564MM (.2221IN.)	-6 GROUP LENGTH= .564MM (.2221IN.)	-6 GROUP LENGTH= .564MM (.2221IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
N 5	N 5	N 5	N 5	N 5	N 5	N 5	N 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

90MM		90MM		90MM		90MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
500. FT. (152.40M)	750. FT. (228.60M)	750. FT. (228.60M)	750. FT. (228.60M)	1000. FT. (304.80M)	1000. FT. (304.80M)	1000. FT. (304.80M)	1000. FT. (304.80M)
.000591	.000394	.000394	.000394	.000295	.000295	.000295	.000295
-6 GROUP LENGTH= .451MM (.1774IN.)	-6 GROUP LENGTH= .301MM (.1181IN.)	-6 GROUP LENGTH= .301MM (.1181IN.)	-6 GROUP LENGTH= .301MM (.1181IN.)	-6 GROUP LENGTH= .225MM (.0886IN.)	-6 GROUP LENGTH= .225MM (.0886IN.)	-6 GROUP LENGTH= .225MM (.0886IN.)	-6 GROUP LENGTH= .225MM (.0886IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
N 5	N 5	N 5	N 5	N 5	N 5	N 5	N 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 105MM FOCAL LENGTH LENSES

FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM	
OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -
MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -
-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP
E 1	25.5 FT. (7.62M)	50. FT. (15.24M)	105MM	75. FT. (22.86M)	50. FT. (15.24M)	105MM	75. FT. (22.86M)
E 2	.013472	.006938	.006938	.004614	.006938	.006938	.004614
E 3	.01971M (.61971IN.)	5.293MM (.2084IN.)	5.293MM (.2084IN.)	3.521MM (.1386IN.)	5.293MM (.2084IN.)	5.293MM (.2084IN.)	3.521MM (.1386IN.)
E 4	-3	-4	-4	-3	-4	-4	-3
E 5	8.9	17.9	18.0	36.0	18.0	18.0	36.0
E 6	10.0	20.1	20.2	40.2	20.2	20.2	40.2
L 1	2.5	5.1	5.1	10.2	5.1	5.1	10.2
L 2	2.8	5.7	5.7	11.4	5.7	5.7	11.4
M 3	3.2	6.4	6.4	12.7	6.4	6.4	12.7
M 4	3.6	7.2	7.2	14.3	7.2	7.2	14.3
N 5	4.0	8.0	8.0	16.1	8.0	8.0	16.1
T 6	4.0	8.0	8.0	16.1	8.0	8.0	16.1

FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM	
OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -
MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -
-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP
E 1	100. FT. (30.48M)	150. FT. (45.72M)	105MM	200. FT. (60.96M)	150. FT. (45.72M)	105MM	200. FT. (60.96M)
E 2	.003457	.002302	.002302	.001725	.002302	.002302	.001725
E 3	2.638MM (.1034IN.)	1.756MM (.0691IN.)	1.756MM (.0691IN.)	1.316MM (.0518IN.)	1.756MM (.0691IN.)	1.756MM (.0691IN.)	1.316MM (.0518IN.)
E 4	-3	-4	-4	-3	-4	-4	-3
E 5	36.2	72.3	72.3	144.6	72.3	72.3	144.6
E 6	40.6	81.2	81.2	162.4	81.2	81.2	162.4
L 1	9.0	18.1	18.1	36.2	18.1	18.1	36.2
L 2	10.1	20.3	20.3	40.7	20.3	20.3	40.7
M 3	11.4	22.8	22.8	45.6	22.8	22.8	45.6
M 4	12.8	25.6	25.6	51.2	25.6	25.6	51.2
N 5	14.9	29.8	29.8	59.6	29.8	29.8	59.6
T 6	16.1	32.2	32.2	64.4	32.2	32.2	64.4

FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM	
OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -
MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -
-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP
E 1	250. FT. (76.20M)	300. FT. (91.44M)	105MM	400. FT. (121.92M)	300. FT. (91.44M)	105MM	400. FT. (121.92M)
E 2	.001380	.001150	.001150	.000862	.001150	.001150	.000862
E 3	1.053MM (.0414IN.)	.877MM (.0345IN.)	.877MM (.0345IN.)	.658MM (.0259IN.)	1.053MM (.0414IN.)	1.053MM (.0414IN.)	.877MM (.0345IN.)
E 4	-3	-4	-4	-3	-4	-4	-3
E 5	90.6	181.2	181.2	362.4	181.2	181.2	362.4
E 6	101.7	203.4	203.4	406.7	203.4	203.4	406.7
L 1	45.3	90.7	90.7	181.4	90.7	90.7	181.4
L 2	50.9	101.8	101.8	203.6	101.8	101.8	203.6
M 3	57.1	114.2	114.2	228.4	114.2	114.2	228.4
M 4	64.1	128.2	128.2	256.5	128.2	128.2	256.5
N 5	71.9	143.8	143.8	287.6	143.8	143.8	287.6
T 6	80.7	161.4	161.4	322.8	161.4	161.4	322.8

FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM		FOCAL LENGTH - 105MM	
OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -	OBJECT DISTANCE -
MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -	MAGNIFICATION -
-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP	-6 GROUP LENGTH- GROUP
E 1	500. FT. (152.40M)	750. FT. (226.60M)	105MM	1000. FT. (304.80M)	750. FT. (226.60M)	105MM	1000. FT. (304.80M)
E 2	.000689	.000460	.000460	.000345	.000460	.000460	.000345
E 3	.528MM (.0207IN.)	.351MM (.0138IN.)	.351MM (.0138IN.)	.263MM (.0104IN.)	.528MM (.0207IN.)	.528MM (.0207IN.)	.351MM (.0138IN.)
E 4	-3	-4	-4	-3	-4	-4	-3
E 5	141.3	282.6	282.6	565.2	282.6	282.6	565.2
E 6	161.5	323.0	323.0	646.1	323.0	323.0	646.1
L 1	70.7	141.4	141.4	282.8	141.4	141.4	282.8
L 2	77.1	154.2	154.2	308.4	154.2	154.2	308.4
M 3	84.1	168.2	168.2	336.5	168.2	168.2	336.5
M 4	91.9	183.8	183.8	367.6	183.8	183.8	367.6
N 5	100.7	201.4	201.4	402.8	201.4	201.4	402.8
T 6	111.5	223.0	223.0	446.1	223.0	223.0	446.1

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 105MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 120MM FOCAL LENGTH LENSES

120MM		120MM		120MM		120MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
25.5 FT. (7.82M)	50. FT. (15.24M)	.007937	6.056MM (.238IN.)	50. FT. (15.24M)	50. FT. (15.24M)	.007937	6.056MM (.238IN.)
-6 GROUP LENGTH= 12.20MM (.480IN.)		-6 GROUP LENGTH= 12.20MM (.480IN.)		-6 GROUP LENGTH= 12.20MM (.480IN.)		-6 GROUP LENGTH= 12.20MM (.480IN.)	
E	L 1	L 2	M 3	E	L 1	L 2	M 3
L 1	L 1	L 2	M 3	E	L 1	L 2	M 3
E 2	L 2	M 3	N 4	E 2	L 2	M 3	N 4
E 3	M 3	N 4	T 6	E 3	M 3	N 4	T 6
E 4	N 4	T 6		E 4	N 4	T 6	
E 5	T 6			E 5	T 6		
T 6				T 6			

120MM		120MM		120MM		120MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
100. FT. (30.48M)	150. FT. (45.72M)	.002632	2.008MM (.0791IN.)	150. FT. (45.72M)	150. FT. (45.72M)	.002632	2.008MM (.0791IN.)
-6 GROUP LENGTH= 3.01MM (.118IN.)		-6 GROUP LENGTH= 3.01MM (.118IN.)		-6 GROUP LENGTH= 3.01MM (.118IN.)		-6 GROUP LENGTH= 3.01MM (.118IN.)	
E	L 1	L 2	M 3	E	L 1	L 2	M 3
L 1	L 1	L 2	M 3	E	L 1	L 2	M 3
E 2	L 2	M 3	N 4	E 2	L 2	M 3	N 4
E 3	M 3	N 4	T 6	E 3	M 3	N 4	T 6
E 4	N 4	T 6		E 4	N 4	T 6	
E 5	T 6			E 5	T 6		
T 6				T 6			

120MM		120MM		120MM		120MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
250. FT. (76.20M)	300. FT. (91.44M)	.001314	1.003MM (.0395IN.)	300. FT. (91.44M)	300. FT. (91.44M)	.001314	1.003MM (.0395IN.)
-6 GROUP LENGTH= 1.233MM (.047IN.)		-6 GROUP LENGTH= 1.233MM (.047IN.)		-6 GROUP LENGTH= 1.233MM (.047IN.)		-6 GROUP LENGTH= 1.233MM (.047IN.)	
E	L 1	L 2	M 3	E	L 1	L 2	M 3
L 1	L 1	L 2	M 3	E	L 1	L 2	M 3
E 2	L 2	M 3	N 4	E 2	L 2	M 3	N 4
E 3	M 3	N 4	T 6	E 3	M 3	N 4	T 6
E 4	N 4	T 6		E 4	N 4	T 6	
E 5	T 6			E 5	T 6		
T 6				T 6			

120MM		120MM		120MM		120MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
500. FT. (152.40M)	750. FT. (228.60M)	.000788	.401MM (.0158IN.)	750. FT. (228.60M)	750. FT. (228.60M)	.000788	.401MM (.0158IN.)
-6 GROUP LENGTH= .501MM (.0237IN.)		-6 GROUP LENGTH= .501MM (.0237IN.)		-6 GROUP LENGTH= .501MM (.0237IN.)		-6 GROUP LENGTH= .501MM (.0237IN.)	
E	L 1	L 2	M 3	E	L 1	L 2	M 3
L 1	L 1	L 2	M 3	E	L 1	L 2	M 3
E 2	L 2	M 3	N 4	E 2	L 2	M 3	N 4
E 3	M 3	N 4	T 6	E 3	M 3	N 4	T 6
E 4	N 4	T 6		E 4	N 4	T 6	
E 5	T 6			E 5	T 6		
T 6				T 6			

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 127MM FOCAL LENGTH LENSES

		127MM		127MM		127MM		127MM	
		FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
E	-6	1.0	25.0	0.01549	-4	1.0	50.0	0.00403	-4
L 1	-5	1.8	7.4	3.7	-3	1.9	14.9	29.7	-1
L 2	1.0	2.1	8.3	4.2	2.1	2.1	16.7	33.4	59.5
M 3	1.2	2.3	4.4	9.3	2.3	4.7	18.7	37.5	66.8
E 4	1.3	2.6	5.2	10.4	2.6	5.3	10.5	42.1	75.0
M 5	1.5	2.9	5.4	11.7	3.0	5.9	11.8	47.2	84.1
T 6	1.6	3.3	6.4	13.1	3.3	6.6	13.3	53.0	106.0

		127MM		127MM		127MM		127MM	
		FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
E	-6	3.7	100.0	0.004184	-4	3.7	150.0	0.02786	-4
L 1	-5	7.5	24.9	3.7	-3	5.6	11.2	22.4	-1
L 2	4.2	4.4	16.4	33.5	4.2	6.3	12.6	25.2	179.5
M 3	4.7	9.4	18.4	37.6	7.1	15.9	31.7	63.5	226.2
E 4	5.3	10.6	21.1	42.2	8.9	17.8	35.6	71.2	284.9
M 5	5.9	11.9	23.7	47.4	10.0	20.0	40.0	80.0	319.8
T 6	6.7	13.3	26.0	53.2	10.0	20.0	40.0	80.0	319.8

		127MM		127MM		127MM		127MM	
		FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
E	-6	9.4	250.0	0.01659	-4	9.4	300.0	0.01391	-4
L 1	-5	14.7	37.4	7.9	-3	11.2	22.4	22.4	-1
L 2	10.5	21.0	42.1	46.0	17.6	25.2	50.4	100.7	201.5
M 3	11.8	23.4	47.2	94.3	14.2	28.3	56.6	113.2	226.5
E 4	13.2	26.5	52.9	105.9	15.9	31.8	63.6	127.1	254.2
M 5	14.9	29.7	54.4	114.9	17.8	35.7	71.3	142.7	289.3
T 6	16.7	33.4	66.7	133.4	20.0	48.0	80.1	160.1	320.3

		127MM		127MM		127MM		127MM	
		FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
E	-6	18.7	74.9	0.00234	-4	18.7	750.0	0.00556	-4
L 1	-5	17.5	74.9	149.9	28.1	56.2	112.4	224.9	449.7
L 2	21.0	42.1	84.1	126.2	31.6	63.6	126.2	252.4	504.8
M 3	23.6	47.2	94.4	149.8	35.4	70.8	141.7	283.3	565.6
E 4	26.5	53.0	106.0	212.0	39.8	79.5	159.0	318.0	630.0
M 5	29.7	54.5	119.9	237.9	44.6	89.2	178.5	357.0	713.9
T 6	33.4	66.7	133.4	267.0	50.1	100.2	200.3	400.7	801.4

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 127MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 135MM FOCAL LENGTH LENSES

135MM		135MM		135MM		135MM		135MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE
E 1	17.6	35.2	70.5	141.0	282.1	564.2	999.9	135MM	75.0 FT. (22.60M)
E 2	19.8	30.6	79.2	158.3	316.7	633.3	999.9	MAGNIFICATION	.005941
M 1	22.9	26.9	88.4	177.6	355.3	710.8	999.9	-6 GROUP LENGTH	4.533MM (.1785IN.)
E 4	28.0	21.9	104.4	209.2	418.4	836.8	999.9	GROUP	
M 5	31.4	19.4	115.2	230.4	460.8	921.6	999.9	-5	-2
T 6	35.2	17.6	126.0	252.0	504.0	1008.0	999.9	-4	-1
L 1	39.6	15.8	138.0	276.0	552.0	1104.0	999.9	-3	-2
E 2	44.4	14.1	151.2	302.4	604.8	1209.6	999.9	-2	-1
M 3	49.9	12.6	165.0	330.0	660.0	1320.0	999.9	-1	-1
E 4	56.0	11.2	180.0	360.0	720.0	1440.0	999.9		
M 5	62.8	10.0	196.8	393.6	787.2	1574.4	999.9		
T 6	70.5	9.0	216.0	432.0	864.0	1728.0	999.9		

135MM		135MM		135MM		135MM		135MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE
E 1	17.6	35.2	70.5	141.0	282.1	564.2	999.9	135MM	200. FT. (60.96M)
E 2	19.8	30.6	79.2	158.3	316.7	633.3	999.9	MAGNIFICATION	.002219
M 1	22.9	26.9	88.4	177.6	355.3	710.8	999.9	-6 GROUP LENGTH	1.693MM (.0667IN.)
E 4	28.0	21.9	104.4	209.2	418.4	836.8	999.9	GROUP	
M 5	31.4	19.4	115.2	230.4	460.8	921.6	999.9	-5	-2
T 6	35.2	17.6	126.0	252.0	504.0	1008.0	999.9	-4	-1
L 1	39.6	15.8	138.0	276.0	552.0	1104.0	999.9	-3	-2
E 2	44.4	14.1	151.2	302.4	604.8	1209.6	999.9	-2	-1
M 3	49.9	12.6	165.0	330.0	660.0	1320.0	999.9	-1	-1
E 4	56.0	11.2	180.0	360.0	720.0	1440.0	999.9		
M 5	62.8	10.0	196.8	393.6	787.2	1574.4	999.9		
T 6	70.5	9.0	216.0	432.0	864.0	1728.0	999.9		

135MM		135MM		135MM		135MM		135MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE
E 1	17.6	35.2	70.5	141.0	282.1	564.2	999.9	135MM	400. FT. (121.92M)
E 2	19.8	30.6	79.2	158.3	316.7	633.3	999.9	MAGNIFICATION	.001109
M 1	22.9	26.9	88.4	177.6	355.3	710.8	999.9	-6 GROUP LENGTH	.846MM (.0333IN.)
E 4	28.0	21.9	104.4	209.2	418.4	836.8	999.9	GROUP	
M 5	31.4	19.4	115.2	230.4	460.8	921.6	999.9	-5	-2
T 6	35.2	17.6	126.0	252.0	504.0	1008.0	999.9	-4	-1
L 1	39.6	15.8	138.0	276.0	552.0	1104.0	999.9	-3	-2
E 2	44.4	14.1	151.2	302.4	604.8	1209.6	999.9	-2	-1
M 3	49.9	12.6	165.0	330.0	660.0	1320.0	999.9	-1	-1
E 4	56.0	11.2	180.0	360.0	720.0	1440.0	999.9		
M 5	62.8	10.0	196.8	393.6	787.2	1574.4	999.9		
T 6	70.5	9.0	216.0	432.0	864.0	1728.0	999.9		

135MM		135MM		135MM		135MM		135MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE
E 1	17.6	35.2	70.5	141.0	282.1	564.2	999.9	135MM	1000. FT. (304.80M)
E 2	19.8	30.6	79.2	158.3	316.7	633.3	999.9	MAGNIFICATION	.000443
M 1	22.9	26.9	88.4	177.6	355.3	710.8	999.9	-6 GROUP LENGTH	.338MM (.0133IN.)
E 4	28.0	21.9	104.4	209.2	418.4	836.8	999.9	GROUP	
M 5	31.4	19.4	115.2	230.4	460.8	921.6	999.9	-5	-2
T 6	35.2	17.6	126.0	252.0	504.0	1008.0	999.9	-4	-1
L 1	39.6	15.8	138.0	276.0	552.0	1104.0	999.9	-3	-2
E 2	44.4	14.1	151.2	302.4	604.8	1209.6	999.9	-2	-1
M 3	49.9	12.6	165.0	330.0	660.0	1320.0	999.9	-1	-1
E 4	56.0	11.2	180.0	360.0	720.0	1440.0	999.9		
M 5	62.8	10.0	196.8	393.6	787.2	1574.4	999.9		
T 6	70.5	9.0	216.0	432.0	864.0	1728.0	999.9		

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 135MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 150MM FOCAL LENGTH LENSES

FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH - 7.534MM (.298IN.)		-6 GROUP LENGTH - 5.040MM (.198IN.)		-6 GROUP LENGTH - 2.000MM (.079IN.)		-6 GROUP LENGTH - 1.254MM (.049IN.)	
E	-6	-6	-6	-6	-6	-6	-6
L 1	1.6	2.4	3.2	4.0	4.8	5.6	6.4
L 2	1.8	2.7	3.6	4.5	5.4	6.3	7.2
M 3	2.0	3.0	4.0	5.0	6.0	7.0	8.0
E 4	2.2	3.3	4.4	5.5	6.6	7.7	8.8
M 5	2.5	3.8	5.1	6.4	7.7	9.0	10.3
T 6	2.8	4.2	5.6	7.0	8.4	9.8	11.2

FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH - 2.512MM (.099IN.)		-6 GROUP LENGTH - 1.682MM (.073IN.)		-6 GROUP LENGTH - 1.024MM (.040IN.)		-6 GROUP LENGTH - .640MM (.025IN.)	
E	-6	-6	-6	-6	-6	-6	-6
L 1	4.7	6.3	8.0	9.7	11.3	12.9	14.5
L 2	5.3	7.1	8.9	10.7	12.5	14.3	16.1
M 3	6.0	8.0	10.0	12.0	14.0	16.0	18.0
E 4	6.7	9.0	11.3	13.6	15.9	18.2	20.5
M 5	7.5	10.1	12.4	14.7	17.0	19.3	21.6
T 6	8.5	11.2	13.5	15.8	18.1	20.4	22.7

FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH - .940MM (.037IN.)		-6 GROUP LENGTH - .752MM (.029IN.)		-6 GROUP LENGTH - .501MM (.019IN.)		-6 GROUP LENGTH - .300MM (.012IN.)	
E	-6	-6	-6	-6	-6	-6	-6
L 1	12.7	15.9	19.1	22.3	25.5	28.7	31.9
L 2	14.2	17.8	21.0	24.2	27.4	30.6	33.8
M 3	16.0	20.0	24.0	28.0	32.0	36.0	40.0
E 4	17.9	22.4	26.9	31.4	35.9	40.4	44.9
M 5	20.1	25.2	30.5	35.8	41.1	46.4	51.7
T 6	22.6	28.3	34.4	40.5	46.6	52.7	58.8

FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM		FOCAL LENGTH - 150MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH - .376MM (.015IN.)		-6 GROUP LENGTH - .250MM (.010IN.)		-6 GROUP LENGTH - .188MM (.0074IN.)		-6 GROUP LENGTH - .146MM (.0058IN.)	
E	-6	-6	-6	-6	-6	-6	-6
L 1	31.7	47.6	63.5	79.4	95.3	111.2	127.1
L 2	35.6	53.4	71.2	88.9	106.4	123.9	141.4
M 3	40.0	60.0	80.0	100.0	120.0	140.0	160.0
E 4	44.9	67.3	89.7	112.1	134.5	156.9	179.3
M 5	50.4	75.6	100.8	126.0	151.2	176.4	201.6
T 6	56.5	84.8	113.1	142.1	171.0	199.9	228.8

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 150MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 180MM FOCAL LENGTH LENSES

180MM		180MM		180MM		180MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
50.0 FT. (15.24M)	75.0 FT. (22.86M)	75.0 FT. (22.86M)	100.0 FT. (30.48M)	100.0 FT. (30.48M)	100.0 FT. (30.48M)	100.0 FT. (30.48M)	100.0 FT. (30.48M)
MAGNIFICATION: .011952	MAGNIFICATION: .007937	MAGNIFICATION: .007937	MAGNIFICATION: .005941	MAGNIFICATION: .005941	MAGNIFICATION: .005941	MAGNIFICATION: .005941	MAGNIFICATION: .005941
-6 GROUP LENGTH: 9.120MM (.359IN.)	-6 GROUP LENGTH: 6.056MM (.238IN.)	-6 GROUP LENGTH: 6.056MM (.238IN.)	-6 GROUP LENGTH: 4.533MM (.178IN.)	-6 GROUP LENGTH: 4.533MM (.178IN.)	-6 GROUP LENGTH: 4.533MM (.178IN.)	-6 GROUP LENGTH: 4.533MM (.178IN.)	-6 GROUP LENGTH: 4.533MM (.178IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-2	-3	-2	-3	-2	-3	-2
-4	-1	-4	-1	-4	-1	-4	-1
1.3	2.0	3.9	7.9	15.7	31.5	63.0	126.0
1.5	2.9	4.8	9.9	19.8	39.7	79.4	158.8
1.6	3.3	5.0	9.9	19.8	39.7	79.4	158.8
1.8	3.7	5.6	11.1	22.3	44.5	89.1	178.2
2.1	4.2	6.3	12.5	25.0	50.0	100.0	200.0
2.3	4.7	7.0	14.0	28.1	56.1	112.3	224.6
E	L	E	L	E	L	E	L
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6

180MM		180MM		180MM		180MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
150.0 FT. (45.72M)	200.0 FT. (60.96M)	200.0 FT. (60.96M)	300.0 FT. (91.44M)	300.0 FT. (91.44M)	300.0 FT. (91.44M)	300.0 FT. (91.44M)	300.0 FT. (91.44M)
MAGNIFICATION: .003453	MAGNIFICATION: .002962	MAGNIFICATION: .002962	MAGNIFICATION: .001972	MAGNIFICATION: .001972	MAGNIFICATION: .001972	MAGNIFICATION: .001972	MAGNIFICATION: .001972
-6 GROUP LENGTH: 3.018MM (.118IN.)	-6 GROUP LENGTH: 2.260MM (.089IN.)	-6 GROUP LENGTH: 2.260MM (.089IN.)	-6 GROUP LENGTH: 1.505MM (.059IN.)	-6 GROUP LENGTH: 1.505MM (.059IN.)	-6 GROUP LENGTH: 1.505MM (.059IN.)	-6 GROUP LENGTH: 1.505MM (.059IN.)	-6 GROUP LENGTH: 1.505MM (.059IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-2	-3	-2	-3	-2	-3	-2
-4	-1	-4	-1	-4	-1	-4	-1
4.0	7.9	15.7	31.5	63.0	126.0	252.0	504.0
4.4	8.9	17.7	35.4	70.8	141.6	283.2	566.4
5.0	10.0	19.8	39.7	79.4	158.8	317.6	635.2
5.6	11.2	22.4	44.8	89.6	179.2	358.4	716.8
6.3	12.6	25.1	50.2	100.4	200.8	401.6	803.2
7.0	14.1	28.2	56.3	112.7	225.4	450.8	901.6
E	L	E	L	E	L	E	L
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6

180MM		180MM		180MM		180MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
100.0 FT. (30.48M)	500.0 FT. (152.40M)	500.0 FT. (152.40M)	750.0 FT. (228.60M)	750.0 FT. (228.60M)	750.0 FT. (228.60M)	750.0 FT. (228.60M)	750.0 FT. (228.60M)
MAGNIFICATION: .001479	MAGNIFICATION: .001182	MAGNIFICATION: .001182	MAGNIFICATION: .000768	MAGNIFICATION: .000768	MAGNIFICATION: .000768	MAGNIFICATION: .000768	MAGNIFICATION: .000768
-6 GROUP LENGTH: 1.178MM (.046IN.)	-6 GROUP LENGTH: .902MM (.355IN.)	-6 GROUP LENGTH: .902MM (.355IN.)	-6 GROUP LENGTH: .601MM (.237IN.)	-6 GROUP LENGTH: .601MM (.237IN.)	-6 GROUP LENGTH: .601MM (.237IN.)	-6 GROUP LENGTH: .601MM (.237IN.)	-6 GROUP LENGTH: .601MM (.237IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-2	-3	-2	-3	-2	-3	-2
-4	-1	-4	-1	-4	-1	-4	-1
10.8	21.6	42.3	84.6	169.2	338.4	676.8	1353.6
11.9	23.7	47.4	94.8	189.6	379.2	758.4	1516.8
13.3	26.6	53.3	106.6	213.2	426.4	852.8	1705.6
14.9	29.9	59.8	119.6	239.2	478.4	956.8	1913.6
16.8	33.6	67.1	134.2	268.4	536.8	1073.6	2147.2
18.8	37.7	75.3	150.6	301.3	602.6	1205.2	2410.4
E	L	E	L	E	L	E	L
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6

180MM		180MM		180MM		180MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
1000.0 FT. (304.80M)	1500.0 FT. (457.20M)	1500.0 FT. (457.20M)	2000.0 FT. (609.60M)	2000.0 FT. (609.60M)	2000.0 FT. (609.60M)	2000.0 FT. (609.60M)	2000.0 FT. (609.60M)
MAGNIFICATION: .000591	MAGNIFICATION: .000394	MAGNIFICATION: .000394	MAGNIFICATION: .000295	MAGNIFICATION: .000295	MAGNIFICATION: .000295	MAGNIFICATION: .000295	MAGNIFICATION: .000295
-6 GROUP LENGTH: .451MM (.017IN.)	-6 GROUP LENGTH: .301MM (.0118IN.)	-6 GROUP LENGTH: .301MM (.0118IN.)	-6 GROUP LENGTH: .225MM (.0089IN.)	-6 GROUP LENGTH: .225MM (.0089IN.)	-6 GROUP LENGTH: .225MM (.0089IN.)	-6 GROUP LENGTH: .225MM (.0089IN.)	-6 GROUP LENGTH: .225MM (.0089IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-2	-3	-2	-3	-2	-3	-2
-4	-1	-4	-1	-4	-1	-4	-1
26.4	52.8	158.7	317.4	634.8	1269.6	2539.2	5078.4
29.7	59.4	178.1	356.3	712.6	1425.2	2850.4	5700.8
33.3	66.6	199.9	399.8	799.6	1599.2	3198.4	6396.8
37.4	74.8	224.4	448.8	897.6	1795.2	3590.4	7180.8
42.0	84.0	251.9	503.8	1007.6	2015.2	4030.4	8060.8
47.1	94.2	282.7	565.4	1131.4	2262.8	4525.6	9051.2
E	L	E	L	E	L	E	L
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6

IMAGE PLATE RESOLUTION (LINES PER MILLIMETER) FOR 200MM FOCAL LENGTH LENSES

200MM		200MM		200MM		200MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
50.FT. (15.24M)	75.FT. (22.86M)	.011298	6.73MM (.2651IN.)	100.FT. (30.48M)	100.FT. (30.48M)	.006608	5.040MM (.1984IN.)
GROUP		GROUP		GROUP		GROUP	
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

200MM		200MM		200MM		200MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
150.FT. (45.72M)	200.FT. (60.96M)	.006394	2.512MM (.0989IN.)	300.FT. (91.44M)	300.FT. (91.44M)	.002192	1.673MM (.0658IN.)
GROUP		GROUP		GROUP		GROUP	
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

200MM		200MM		200MM		200MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
500.FT. (152.40M)	500.FT. (152.40M)	.001314	1.003MM (.0395IN.)	750.FT. (228.60M)	750.FT. (228.60M)	.000276	.668MM (.0263IN.)
GROUP		GROUP		GROUP		GROUP	
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

200MM		200MM		200MM		200MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
1500.FT. (457.20M)	1500.FT. (457.20M)	.000438	.334MM (.0131IN.)	2900.FT. (893.16M)	2900.FT. (893.16M)	.000328	.250MM (.0099IN.)
GROUP		GROUP		GROUP		GROUP	
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 205MM FOCAL LENGTH LENSES

205MM		205MM		205MM		205MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
E 1	49.0 FT. (15.2M)	.009049	-6	75.0 FT. (22.66M)	.009049	-6	-6
E 2	49.0 FT. (15.2M)	.009049	-5	75.0 FT. (22.66M)	.009049	-5	-5
E 3	49.0 FT. (15.2M)	.009049	-4	75.0 FT. (22.66M)	.009049	-4	-4
E 4	49.0 FT. (15.2M)	.009049	-3	75.0 FT. (22.66M)	.009049	-3	-3
E 5	49.0 FT. (15.2M)	.009049	-2	75.0 FT. (22.66M)	.009049	-2	-2
E 6	49.0 FT. (15.2M)	.009049	-1	75.0 FT. (22.66M)	.009049	-1	-1
-6 GROUP LENGTH= 5.166MM (.2034IN.)				-6 GROUP LENGTH= 5.166MM (.2034IN.)			

205MM		205MM		205MM		205MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
E 1	100.0 FT. (30.48M)	.006771	-6	100.0 FT. (30.48M)	.006771	-6	-6
E 2	100.0 FT. (30.48M)	.006771	-5	100.0 FT. (30.48M)	.006771	-5	-5
E 3	100.0 FT. (30.48M)	.006771	-4	100.0 FT. (30.48M)	.006771	-4	-4
E 4	100.0 FT. (30.48M)	.006771	-3	100.0 FT. (30.48M)	.006771	-3	-3
E 5	100.0 FT. (30.48M)	.006771	-2	100.0 FT. (30.48M)	.006771	-2	-2
E 6	100.0 FT. (30.48M)	.006771	-1	100.0 FT. (30.48M)	.006771	-1	-1
-6 GROUP LENGTH= 1.714MM (.0675IN.)				-6 GROUP LENGTH= 1.714MM (.0675IN.)			

205MM		205MM		205MM		205MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
E 1	150.0 FT. (45.72M)	.003374	-6	150.0 FT. (45.72M)	.003374	-6	-6
E 2	150.0 FT. (45.72M)	.003374	-5	150.0 FT. (45.72M)	.003374	-5	-5
E 3	150.0 FT. (45.72M)	.003374	-4	150.0 FT. (45.72M)	.003374	-4	-4
E 4	150.0 FT. (45.72M)	.003374	-3	150.0 FT. (45.72M)	.003374	-3	-3
E 5	150.0 FT. (45.72M)	.003374	-2	150.0 FT. (45.72M)	.003374	-2	-2
E 6	150.0 FT. (45.72M)	.003374	-1	150.0 FT. (45.72M)	.003374	-1	-1
-6 GROUP LENGTH= 2.575MM (.1014IN.)				-6 GROUP LENGTH= 2.575MM (.1014IN.)			

205MM		205MM		205MM		205MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP
E 1	200.0 FT. (60.96M)	.002247	-6	200.0 FT. (60.96M)	.002247	-6	-6
E 2	200.0 FT. (60.96M)	.002247	-5	200.0 FT. (60.96M)	.002247	-5	-5
E 3	200.0 FT. (60.96M)	.002247	-4	200.0 FT. (60.96M)	.002247	-4	-4
E 4	200.0 FT. (60.96M)	.002247	-3	200.0 FT. (60.96M)	.002247	-3	-3
E 5	200.0 FT. (60.96M)	.002247	-2	200.0 FT. (60.96M)	.002247	-2	-2
E 6	200.0 FT. (60.96M)	.002247	-1	200.0 FT. (60.96M)	.002247	-1	-1
-6 GROUP LENGTH= 1.014MM (.0400IN.)				-6 GROUP LENGTH= 1.014MM (.0400IN.)			

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 205MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 210MM FOCAL LENGTH LENSES

210MM		210MM		210MM		210MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION
E	10.661MM (.4197IN.)	75. FT. (22.86M)	.009272	E	10.661MM (.4197IN.)	75. FT. (22.86M)	.009272
L 1	4.5	17.9	35.8	L 1	4.5	17.9	35.8
L 2	2.2	8.9	17.9	L 2	2.2	8.9	17.9
M 3	1.4	5.5	11.3	M 3	1.4	5.5	11.3
E 4	1.0	4.0	8.0	E 4	1.0	4.0	8.0
M 5	0.7	2.8	5.6	M 5	0.7	2.8	5.6
N 6	0.5	2.0	4.0	N 6	0.5	2.0	4.0
T 6	0.4	1.6	3.2	T 6	0.4	1.6	3.2

210MM		210MM		210MM		210MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION
E	10.661MM (.4197IN.)	75. FT. (22.86M)	.009272	E	10.661MM (.4197IN.)	75. FT. (22.86M)	.009272
L 1	4.5	17.9	35.8	L 1	4.5	17.9	35.8
L 2	2.2	8.9	17.9	L 2	2.2	8.9	17.9
M 3	1.4	5.5	11.3	M 3	1.4	5.5	11.3
E 4	1.0	4.0	8.0	E 4	1.0	4.0	8.0
M 5	0.7	2.8	5.6	M 5	0.7	2.8	5.6
N 6	0.5	2.0	4.0	N 6	0.5	2.0	4.0
T 6	0.4	1.6	3.2	T 6	0.4	1.6	3.2

210MM		210MM		210MM		210MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION
E	10.661MM (.4197IN.)	75. FT. (22.86M)	.009272	E	10.661MM (.4197IN.)	75. FT. (22.86M)	.009272
L 1	4.5	17.9	35.8	L 1	4.5	17.9	35.8
L 2	2.2	8.9	17.9	L 2	2.2	8.9	17.9
M 3	1.4	5.5	11.3	M 3	1.4	5.5	11.3
E 4	1.0	4.0	8.0	E 4	1.0	4.0	8.0
M 5	0.7	2.8	5.6	M 5	0.7	2.8	5.6
N 6	0.5	2.0	4.0	N 6	0.5	2.0	4.0
T 6	0.4	1.6	3.2	T 6	0.4	1.6	3.2

210MM		210MM		210MM		210MM	
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION
E	10.661MM (.4197IN.)	75. FT. (22.86M)	.009272	E	10.661MM (.4197IN.)	75. FT. (22.86M)	.009272
L 1	4.5	17.9	35.8	L 1	4.5	17.9	35.8
L 2	2.2	8.9	17.9	L 2	2.2	8.9	17.9
M 3	1.4	5.5	11.3	M 3	1.4	5.5	11.3
E 4	1.0	4.0	8.0	E 4	1.0	4.0	8.0
M 5	0.7	2.8	5.6	M 5	0.7	2.8	5.6
N 6	0.5	2.0	4.0	N 6	0.5	2.0	4.0
T 6	0.4	1.6	3.2	T 6	0.4	1.6	3.2

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 210MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 230MM FOCAL LENGTH LENSES

230MM		230MM		230MM		230MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH		-6 GROUP LENGTH		-6 GROUP LENGTH		-6 GROUP LENGTH	
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E 1	3.0	3.0	32.6	3.0	32.6	3.0	32.6
L 1	4.2	4.2	18.3	4.2	18.3	4.2	18.3
E 2	4.9	4.9	16.6	4.9	16.6	4.9	16.6
M 3	5.1	5.1	20.4	5.1	20.4	5.1	20.4
E 4	5.4	5.4	23.1	5.4	23.1	5.4	23.1
M 5	6.5	6.5	12.9	6.5	12.9	6.5	12.9
T 6	7.1	7.1	14.5	7.1	14.5	7.1	14.5

230MM		230MM		230MM		230MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH		-6 GROUP LENGTH		-6 GROUP LENGTH		-6 GROUP LENGTH	
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E 1	3.1	3.1	48.9	3.1	48.9	3.1	48.9
L 2	3.5	3.5	55.5	3.5	55.5	3.5	55.5
M 3	3.8	3.8	15.1	3.8	15.1	3.8	15.1
E 4	4.4	4.4	8.7	4.4	8.7	4.4	8.7
M 5	4.9	4.9	19.4	4.9	19.4	4.9	19.4
T 6	5.5	5.5	11.3	5.5	11.3	5.5	11.3

230MM		230MM		230MM		230MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH		-6 GROUP LENGTH		-6 GROUP LENGTH		-6 GROUP LENGTH	
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E 1	3.1	3.1	132.3	3.1	132.3	3.1	132.3
L 2	3.7	3.7	148.5	3.7	148.5	3.7	148.5
M 3	4.1	4.1	164.7	4.1	164.7	4.1	164.7
E 4	4.6	4.6	175.1	4.6	175.1	4.6	175.1
M 5	4.9	4.9	210.0	4.9	210.0	4.9	210.0
T 6	5.5	5.5	117.4	5.5	117.4	5.5	117.4

230MM		230MM		230MM		230MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH		-6 GROUP LENGTH		-6 GROUP LENGTH		-6 GROUP LENGTH	
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E 1	3.1	3.1	145.3	3.1	145.3	3.1	145.3
L 2	3.5	3.5	195.4	3.5	195.4	3.5	195.4
M 3	3.8	3.8	204.6	3.8	204.6	3.8	204.6
E 4	4.4	4.4	244.1	4.4	244.1	4.4	244.1
M 5	4.7	4.7	267.8	4.7	267.8	4.7	267.8
T 6	5.5	5.5	147.4	5.5	147.4	5.5	147.4

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 250MM FOCAL LENGTH LENSES

250MM			250MM			250MM			250MM		
FOCAL LENGTH -	75.0MM		FOCAL LENGTH -	75.0MM		FOCAL LENGTH -	100.0MM		FOCAL LENGTH -	100.0MM	
OBJECT DISTANCE -	50.0FT. (15.24M)		OBJECT DISTANCE -	75.0FT. (22.86M)		OBJECT DISTANCE -	100.0FT. (30.48M)		OBJECT DISTANCE -	100.0FT. (30.48M)	
MAGNIFICATION -	.01027		MAGNIFICATION -	.01107		MAGNIFICATION -	.01107		MAGNIFICATION -	.01107	
-5 GROUP LENGTH -	12.775MM (.401IN.)		-4 GROUP LENGTH -	0.437MM (.0172IN.)		-4 GROUP LENGTH -	0.437MM (.0172IN.)		-5 GROUP LENGTH -	0.310MM (.0122IN.)	
GROUP			GROUP			GROUP			GROUP		
E 1	-6	-5	E 1	-6	-5	E 1	-6	-5	E 1	-6	-5
L 1	1.9	3.7	L 1	1.6	2.8	L 1	1.6	2.8	L 1	1.9	3.8
L 2	1.1	1.4	L 2	1.6	3.2	L 2	1.6	3.2	L 2	2.1	4.2
M 3	1.2	2.4	M 3	1.8	3.6	M 3	1.8	3.6	M 3	2.7	5.3
E 4	1.3	2.6	E 4	2.0	4.0	E 4	2.0	4.0	E 4	2.7	5.3
M 4	1.5	3.0	M 4	2.2	4.5	M 4	2.2	4.5	M 4	3.0	6.0
T 4	1.7	3.3	T 4	2.5	5.0	T 4	2.5	5.0	T 4	3.4	6.7

E 1	-3	-2	E 1	-3	-2	E 1	-3	-2	E 1	-3	-2
L 1	7.5	15.0	L 1	11.3	22.6	L 1	11.3	22.6	L 1	15.1	30.2
L 2	4.6	9.2	L 2	12.7	25.4	L 2	12.7	25.4	L 2	17.0	33.9
M 3	4.7	9.4	M 3	14.2	28.5	M 3	14.2	28.5	M 3	19.0	38.1
E 4	5.3	10.6	E 4	16.0	32.0	E 4	16.0	32.0	E 4	21.4	42.8
M 4	5.7	11.4	M 4	17.9	35.9	M 4	17.9	35.9	M 4	24.0	48.0
T 4	6.7	13.4	T 4	20.1	40.3	T 4	20.1	40.3	T 4	26.9	53.8

E 1	-4	-3	E 1	-4	-3	E 1	-4	-3	E 1	-4	-3
L 1	3.7	7.4	L 1	3.4	6.8	L 1	3.4	6.8	L 1	5.7	11.4
L 2	2.4	4.8	L 2	3.4	6.8	L 2	3.4	6.8	L 2	6.4	12.8
M 3	2.4	4.8	M 3	3.6	7.2	M 3	3.6	7.2	M 3	7.2	14.4
E 4	4.0	8.0	E 4	4.2	8.4	E 4	4.2	8.4	E 4	8.1	16.1
M 4	4.0	8.0	M 4	4.6	9.2	M 4	4.6	9.2	M 4	9.0	18.1
T 4	5.1	10.2	T 4	5.4	10.8	T 4	5.4	10.8	T 4	10.2	20.3

E 1	-5	-4	E 1	-5	-4	E 1	-5	-4	E 1	-5	-4
L 1	2.7	5.4	L 1	3.8	7.6	L 1	3.8	7.6	L 1	5.7	11.4
L 2	1.8	3.6	L 2	4.3	8.6	L 2	4.3	8.6	L 2	6.4	12.8
M 3	1.8	3.6	M 3	4.8	9.6	M 3	4.8	9.6	M 3	7.2	14.4
E 4	3.0	6.0	E 4	5.4	10.8	E 4	5.4	10.8	E 4	8.1	16.1
M 4	3.0	6.0	M 4	6.0	12.0	M 4	6.0	12.0	M 4	9.0	18.1
T 4	3.6	7.2	T 4	6.8	13.6	T 4	6.8	13.6	T 4	10.2	20.3

E 1	-6	-5	E 1	-6	-5	E 1	-6	-5	E 1	-6	-5
L 1	2.0	4.0	L 1	3.8	7.6	L 1	3.8	7.6	L 1	5.7	11.4
L 2	1.3	2.6	L 2	4.3	8.6	L 2	4.3	8.6	L 2	6.4	12.8
M 3	1.3	2.6	M 3	4.8	9.6	M 3	4.8	9.6	M 3	7.2	14.4
E 4	2.0	4.0	E 4	5.4	10.8	E 4	5.4	10.8	E 4	8.1	16.1
M 4	2.0	4.0	M 4	6.0	12.0	M 4	6.0	12.0	M 4	9.0	18.1
T 4	2.4	4.8	T 4	6.8	13.6	T 4	6.8	13.6	T 4	10.2	20.3

E 1	-7	-6	E 1	-7	-6	E 1	-7	-6	E 1	-7	-6
L 1	1.5	3.0	L 1	3.8	7.6	L 1	3.8	7.6	L 1	5.7	11.4
L 2	1.0	2.0	L 2	4.3	8.6	L 2	4.3	8.6	L 2	6.4	12.8
M 3	1.0	2.0	M 3	4.8	9.6	M 3	4.8	9.6	M 3	7.2	14.4
E 4	1.5	3.0	E 4	5.4	10.8	E 4	5.4	10.8	E 4	8.1	16.1
M 4	1.5	3.0	M 4	6.0	12.0	M 4	6.0	12.0	M 4	9.0	18.1
T 4	1.8	3.6	T 4	6.8	13.6	T 4	6.8	13.6	T 4	10.2	20.3

E 1	-8	-7	E 1	-8	-7	E 1	-8	-7	E 1	-8	-7
L 1	1.2	2.4	L 1	3.8	7.6	L 1	3.8	7.6	L 1	5.7	11.4
L 2	0.8	1.6	L 2	4.3	8.6	L 2	4.3	8.6	L 2	6.4	12.8
M 3	0.8	1.6	M 3	4.8	9.6	M 3	4.8	9.6	M 3	7.2	14.4
E 4	1.2	2.4	E 4	5.4	10.8	E 4	5.4	10.8	E 4	8.1	16.1
M 4	1.2	2.4	M 4	6.0	12.0	M 4	6.0	12.0	M 4	9.0	18.1
T 4	1.4	2.8	T 4	6.8	13.6	T 4	6.8	13.6	T 4	10.2	20.3

E 1	-9	-8	E 1	-9	-8	E 1	-9	-8	E 1	-9	-8
L 1	1.0	2.0	L 1	3.8	7.6	L 1	3.8	7.6	L 1	5.7	11.4
L 2	0.7	1.4	L 2	4.3	8.6	L 2	4.3	8.6	L 2	6.4	12.8
M 3	0.7	1.4	M 3	4.8	9.6	M 3	4.8	9.6	M 3	7.2	14.4
E 4	1.0	2.0	E 4	5.4	10.8	E 4	5.4	10.8	E 4	8.1	16.1
M 4	1.0	2.0	M 4	6.0	12.0	M 4	6.0	12.0	M 4	9.0	18.1
T 4	1.2	2.4	T 4	6.8	13.6	T 4	6.8	13.6	T 4	10.2	20.3

E 1	-10	-9	E 1	-10	-9	E 1	-10	-9	E 1	-10	-9
L 1	0.8	1.6	L 1	3.8	7.6	L 1	3.8	7.6	L 1	5.7	11.4
L 2	0.5	1.0	L 2	4.3	8.6	L 2	4.3	8.6	L 2	6.4	12.8
M 3	0.5	1.0	M 3	4.8	9.6	M 3	4.8	9.6	M 3	7.2	14.4
E 4	0.8	1.6	E 4	5.4	10.8	E 4	5.4	10.8	E 4	8.1	16.1
M 4	0.8	1.6	M 4	6.0	12.0	M 4	6.0	12.0	M 4	9.0	18.1
T 4	0.9	1.8	T 4	6.8	13.6	T 4	6.8	13.6	T 4	10.2	20.3

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 275MM FOCAL LENGTH LENSES

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
E 2	1.1	1.1	1.1	1.1	1.1	1.1	1.1
E 3	1.2	1.2	1.2	1.2	1.2	1.2	1.2
E 4	1.3	1.3	1.3	1.3	1.3	1.3	1.3
E 5	1.4	1.4	1.4	1.4	1.4	1.4	1.4
E 6	1.5	1.5	1.5	1.5	1.5	1.5	1.5

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	1.7	1.7	1.7	1.7	1.7	1.7	1.7
E 2	1.9	1.9	1.9	1.9	1.9	1.9	1.9
E 3	2.1	2.1	2.1	2.1	2.1	2.1	2.1
E 4	2.3	2.3	2.3	2.3	2.3	2.3	2.3
E 5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
E 6	2.7	2.7	2.7	2.7	2.7	2.7	2.7

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	3.0	3.0	3.0	3.0	3.0	3.0	3.0
E 2	3.3	3.3	3.3	3.3	3.3	3.3	3.3
E 3	3.6	3.6	3.6	3.6	3.6	3.6	3.6
E 4	3.9	3.9	3.9	3.9	3.9	3.9	3.9
E 5	4.2	4.2	4.2	4.2	4.2	4.2	4.2
E 6	4.5	4.5	4.5	4.5	4.5	4.5	4.5

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	5.2	5.2	5.2	5.2	5.2	5.2	5.2
E 2	5.5	5.5	5.5	5.5	5.5	5.5	5.5
E 3	5.8	5.8	5.8	5.8	5.8	5.8	5.8
E 4	6.1	6.1	6.1	6.1	6.1	6.1	6.1
E 5	6.4	6.4	6.4	6.4	6.4	6.4	6.4
E 6	6.7	6.7	6.7	6.7	6.7	6.7	6.7

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	10.4	10.4	10.4	10.4	10.4	10.4	10.4
E 2	11.6	11.6	11.6	11.6	11.6	11.6	11.6
E 3	12.8	12.8	12.8	12.8	12.8	12.8	12.8
E 4	14.0	14.0	14.0	14.0	14.0	14.0	14.0
E 5	15.2	15.2	15.2	15.2	15.2	15.2	15.2
E 6	16.4	16.4	16.4	16.4	16.4	16.4	16.4

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	20.7	20.7	20.7	20.7	20.7	20.7	20.7
E 2	23.3	23.3	23.3	23.3	23.3	23.3	23.3
E 3	26.1	26.1	26.1	26.1	26.1	26.1	26.1
E 4	29.3	29.3	29.3	29.3	29.3	29.3	29.3
E 5	32.9	32.9	32.9	32.9	32.9	32.9	32.9
E 6	36.9	36.9	36.9	36.9	36.9	36.9	36.9

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	41.4	41.4	41.4	41.4	41.4	41.4	41.4
E 2	46.5	46.5	46.5	46.5	46.5	46.5	46.5
E 3	52.2	52.2	52.2	52.2	52.2	52.2	52.2
E 4	58.6	58.6	58.6	58.6	58.6	58.6	58.6
E 5	65.8	65.8	65.8	65.8	65.8	65.8	65.8
E 6	73.8	73.8	73.8	73.8	73.8	73.8	73.8

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	103.8	103.8	103.8	103.8	103.8	103.8	103.8
E 2	116.5	116.5	116.5	116.5	116.5	116.5	116.5
E 3	130.8	130.8	130.8	130.8	130.8	130.8	130.8
E 4	146.8	146.8	146.8	146.8	146.8	146.8	146.8
E 5	164.7	164.7	164.7	164.7	164.7	164.7	164.7
E 6	184.9	184.9	184.9	184.9	184.9	184.9	184.9

FOCAL LENGTH - 275MM		275MM		275MM		275MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP
E 1	207.6	207.6	207.6	207.6	207.6	207.6	207.6
E 2	233.0	233.0	233.0	233.0	233.0	233.0	233.0
E 3	261.5	261.5	261.5	261.5	261.5	261.5	261.5
E 4	293.5	293.5	293.5	293.5	293.5	293.5	293.5
E 5	329.5	329.5	329.5	329.5	329.5	329.5	329.5
E 6	369.9	369.9	369.9	369.9	369.9	369.9	369.9

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 300MM FOCAL LENGTH LENSES

300MM			300MM			300MM			300MM			300MM			300MM			300MM																		
GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	GROUP	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION					
E	1.6	3.1	5.3	12.6	25.2	50.3	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
L 1	1.8	3.5	7.1	14.1	28.2	56.5	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
E 2	2.0	4.0	7.9	15.8	31.7	63.4	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
M 3	2.2	4.4	8.9	17.8	35.6	71.1	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
E 4	2.5	5.0	10.0	20.0	40.0	80.0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
M 5	2.8	5.6	11.2	22.4	44.8	89.6	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
T 6							-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
E	1.6	3.1	5.3	12.6	25.2	50.3	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
L 1	1.8	3.5	7.1	14.1	28.2	56.5	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
E 2	2.0	4.0	7.9	15.8	31.7	63.4	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
M 3	2.2	4.4	8.9	17.8	35.6	71.1	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
E 4	2.5	5.0	10.0	20.0	40.0	80.0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
M 5	2.8	5.6	11.2	22.4	44.8	89.6	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30
T 6							-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 350MM FOCAL LENGTH LENSES

350MM		350MM		350MM		350MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
100.FT. (30.48M)	150.FT. (45.72M)	.00771	5.886MM (.2317IN.)	200.FT. (60.96M)	150.FT. (45.72M)	.00771	5.886MM (.2317IN.)
-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

350MM		350MM		350MM		350MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
100.FT. (30.48M)	400.FT. (121.92M)	.002979	2.197MM (.0865IN.)	500.FT. (152.40M)	400.FT. (121.92M)	.002979	2.197MM (.0865IN.)
-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

350MM		350MM		350MM		350MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
750.FT. (228.60M)	1000.FT. (304.80M)	.001150	.877MM (.0345IN.)	1500.FT. (457.20M)	1000.FT. (304.80M)	.001150	.877MM (.0345IN.)
-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

350MM		350MM		350MM		350MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
200.FT. (60.96M)	3000.FT. (914.40M)	.000368	.292MM (.0115IN.)	4000.FT. (1219.20M)	3000.FT. (914.40M)	.000368	.292MM (.0115IN.)
-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=	-6 GROUP LENGTH=
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
-5	-5	-5	-5	-5	-5	-5	-5
-4	-4	-4	-4	-4	-4	-4	-4
-3	-3	-3	-3	-3	-3	-3	-3
-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-1	-1	-1	-1	-1	-1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 400MM FOCAL LENGTH LENSES

FOCAL LENGTH - 400MM		FOCAL LENGTH - 400MM		FOCAL LENGTH - 400MM		FOCAL LENGTH - 400MM		FOCAL LENGTH - 400MM		FOCAL LENGTH - 400MM		FOCAL LENGTH - 400MM		FOCAL LENGTH - 400MM		
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	
-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	-6 GROUP LENGTH -	GROUP	
E 1	1.2	2.3	5.1	4.4	18.4	37.6	-1	-3	-2	-1	-3	-2	-1	-3	-2	-1
E 2	1.3	2.6	5.3	10.6	21.1	42.2	-1	1.8	3.5	7.1	14.2	28.3	56.7	113.4	226.8	453.6
M 3	1.5	3.0	5.9	11.8	23.7	47.4	-1	2.0	4.0	7.9	15.9	31.8	63.6	127.2	254.4	508.8
E 4	1.7	3.3	6.6	13.3	26.6	53.2	-1	2.5	5.0	10.0	20.0	40.1	80.1	160.2	320.4	640.8
N 5	1.9	3.7	7.4	14.8	29.6	59.2	-1	2.8	5.6	11.2	22.5	45.0	89.9	179.8	359.6	719.2
T 6	2.1	4.2	8.4	16.7	33.5	67.0	-1	3.2	6.3	12.6	25.2	50.5	100.9	201.8	403.6	807.2
E 1	3.6	7.1	14.2	28.3	56.7	113.4	-1	4.7	9.5	19.0	38.0	75.9	151.9	303.8	607.6	1215.2
E 2	4.0	8.0	16.0	31.9	63.9	127.8	-1	5.3	10.7	21.3	42.6	85.3	170.5	341.0	682.0	1364.0
M 3	4.5	9.0	18.0	35.9	71.7	143.4	-1	6.0	12.0	23.9	47.8	95.7	191.4	382.8	765.6	1531.2
E 4	5.0	10.1	20.1	40.2	80.5	160.9	-1	6.7	13.4	26.9	53.7	107.4	214.8	429.6	859.2	1718.4
N 5	5.6	11.2	22.4	44.8	89.6	179.2	-1	7.5	15.1	30.1	60.3	120.6	241.1	482.2	964.4	1928.8
T 6	6.3	12.7	25.3	50.7	101.4	202.8	-1	9.5	18.9	37.8	75.7	151.3	302.6	605.2	1210.4	2420.8
E 1	8.4	17.0	33.7	67.4	134.8	269.6	-1	11.8	23.6	47.2	94.4	188.8	377.6	755.2	1510.4	3020.8
E 2	10.3	20.6	41.2	82.4	164.8	329.6	-1	13.3	26.7	53.4	106.8	213.6	427.1	854.2	1708.4	3416.8
M 3	11.2	22.5	45.0	90.0	180.0	360.0	-1	15.0	30.0	59.9	119.9	239.7	479.4	958.8	1917.6	3835.2
E 4	12.6	25.2	50.4	100.8	201.6	403.2	-1	16.8	33.6	67.3	134.5	269.1	538.1	1076.2	2152.4	4304.8
N 5	14.2	28.3	56.6	113.2	226.4	452.8	-1	18.4	36.8	75.5	151.0	302.0	604.0	1208.0	2416.0	4832.0
T 6	15.9	31.8	63.6	127.2	254.4	508.8	-1	21.2	42.4	84.7	169.5	339.0	678.0	1356.0	2712.0	5424.0
E 1	23.4	47.0	94.0	188.0	376.0	752.0	-1	26.7	53.4	106.8	213.6	427.1	854.2	1708.4	3416.8	6833.6
E 2	26.7	53.4	106.8	213.6	427.1	854.2	-1	30.0	60.0	120.0	240.0	480.0	960.0	1920.0	3840.0	7680.0
M 3	30.0	60.0	120.0	240.0	480.0	960.0	-1	33.6	67.3	134.5	269.1	538.1	1076.2	2152.4	4304.8	8609.6
E 4	33.7	67.3	134.5	269.1	538.1	1076.2	-1	37.8	75.5	151.0	302.0	604.0	1208.0	2416.0	4832.0	9664.0
N 5	37.4	74.8	149.6	299.2	598.4	1196.8	-1	42.4	84.7	169.5	339.0	678.0	1356.0	2712.0	5424.0	10848.0
T 6	42.4	84.8	169.6	339.2	678.4	1356.8	-1	47.2	94.4	188.8	377.6	755.2	1510.4	3020.8	6041.6	12083.2

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 500MM FOCAL LENGTH LENSES

500MM		500MM		500MM		500MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	100.0	30.48M	0.11057	150.0	45.72M	0.11057	6.310M
L 1	3.7	15.0	3.7	11.3	22.6	45.2	1.9
L 2	4.7	16.3	3.3	12.7	25.4	50.8	2.1
M 3	6.7	17.8	3.6	14.2	28.5	57.0	4.2
E 4	9.3	19.6	4.0	16.0	32.0	64.0	5.3
M 5	11.9	21.5	4.5	17.9	35.9	71.8	6.0
T 6	14.6	23.5	5.0	20.1	40.3	80.6	6.7

500MM		500MM		500MM		500MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	100.0	41.44M	0.04118	400.0	121.92M	0.04118	2.512M
L 1	7.7	45.4	4.0	30.4	60.7	121.4	4.7
L 2	12.7	51.7	4.3	34.1	68.1	136.3	5.3
M 3	16.1	57.1	4.6	38.2	76.5	153.0	6.0
E 4	19.6	62.3	5.0	42.9	85.9	171.7	6.7
M 5	23.5	67.3	5.4	48.2	96.4	192.7	7.5
T 6	28.3	72.2	6.0	54.1	108.2	216.3	8.5

500MM		500MM		500MM		500MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	100.0	224.60M	0.01643	1000.0	304.60M	0.01643	1500.0
L 1	28.7	240.1	4.0	76.1	152.0	304.3	14.3
L 2	45.4	260.0	4.3	85.4	170.8	341.6	16.0
M 3	62.3	277.6	4.6	95.6	191.7	383.4	18.0
E 4	79.6	292.6	5.0	107.6	215.2	430.3	20.2
M 5	97.3	305.1	5.4	120.8	241.5	483.0	22.7
T 6	116.3	315.2	6.0	135.6	271.1	542.2	25.4

500MM		500MM		500MM		500MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	100.0	404.00M	0.0057	3000.0	914.40M	0.0057	4000.0
L 1	142.3	404.4	4.0	114.2	228.5	456.9	38.1
L 2	180.9	411.3	4.3	128.2	256.5	512.9	42.7
M 3	219.6	418.7	4.6	143.9	287.9	575.7	48.0
E 4	259.3	426.6	5.0	161.6	323.1	646.2	53.9
M 5	299.0	435.1	5.4	181.3	362.7	725.4	60.5
T 6	338.7	444.2	6.0	203.5	407.1	814.2	67.9

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 500MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 600MM FOCAL LENGTH LENSES

FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH - 10.146MM (.3995IN.)		-6 GROUP LENGTH - 10.146MM (.3995IN.)		-6 GROUP LENGTH - 10.146MM (.3995IN.)		-6 GROUP LENGTH - 10.146MM (.3995IN.)	
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-6	-5	-4	-3	-2	-1	
L	1.6	2.3	4.7	9.4	18.8	37.6	
E	1	1.2	2.3	4.7	9.4	18.8	37.6
L	1.7	3.5	7.0	14.0	28.0	56.0	
E	2	1.3	2.6	5.3	10.6	21.1	42.2
L	1.0	2.0	3.7	6.2	13.3	26.6	53.2
E	3	1.1	2.2	4.4	8.9	17.8	35.6
L	1.1	2.2	4.4	8.9	17.8	35.6	71.1
E	4	1.2	2.5	5.0	10.0	20.0	39.9
L	1.2	2.5	5.0	10.0	20.0	39.9	79.8
E	5	1.4	2.8	5.6	11.2	22.4	44.8
L	1.4	2.8	5.6	11.2	22.4	44.8	89.6

FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH - 10.187IN.)		-6 GROUP LENGTH - 10.187IN.)		-6 GROUP LENGTH - 10.187IN.)		-6 GROUP LENGTH - 10.187IN.)	
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-6	-5	-4	-3	-2	-1	
L	2.6	4.7	9.5	19.0	38.0	76.0	
E	1	2.7	5.3	10.6	21.2	42.5	85.0
L	2.7	5.3	10.6	21.2	42.5	85.0	170.0
E	2	3.0	6.0	12.0	24.0	48.0	96.0
L	3.0	6.0	12.0	24.0	48.0	96.0	192.0
E	3	3.3	6.7	13.4	26.8	53.6	107.2
L	3.3	6.7	13.4	26.8	53.6	107.2	214.4
E	4	3.6	7.2	14.4	28.8	57.6	115.2
L	3.6	7.2	14.4	28.8	57.6	115.2	230.4
E	4	4.2	8.4	16.8	33.6	67.2	134.4
L	4.2	8.4	16.8	33.6	67.2	134.4	268.8

FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH - 10.592IN.)		-6 GROUP LENGTH - 10.592IN.)		-6 GROUP LENGTH - 10.592IN.)		-6 GROUP LENGTH - 10.592IN.)	
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-6	-5	-4	-3	-2	-1	
L	5.9	11.8	23.6	47.2	94.4	188.8	
E	1	6.7	13.3	26.7	53.3	106.6	213.3
L	6.7	13.3	26.7	53.3	106.6	213.3	426.6
E	2	7.5	15.0	30.0	60.0	120.0	240.0
L	7.5	15.0	30.0	60.0	120.0	240.0	480.0
E	3	8.4	16.8	33.6	67.2	134.4	268.8
L	8.4	16.8	33.6	67.2	134.4	268.8	537.6
E	4	9.4	18.8	37.6	75.2	150.4	300.8
L	9.4	18.8	37.6	75.2	150.4	300.8	601.6
E	5	10.6	21.2	42.4	84.8	169.6	339.2
L	10.6	21.2	42.4	84.8	169.6	339.2	678.4

FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM		FOCAL LENGTH - 600MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH - 10.929IN.)		-6 GROUP LENGTH - 10.929IN.)		-6 GROUP LENGTH - 10.929IN.)		-6 GROUP LENGTH - 10.929IN.)	
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-6	-5	-4	-3	-2	-1	
L	15.9	31.7	63.4	126.8	253.6	507.2	
E	1	17.4	34.8	69.6	139.2	278.4	556.8
L	17.4	34.8	69.6	139.2	278.4	556.8	1113.6
E	2	20.0	40.0	80.0	160.0	320.0	640.0
L	20.0	40.0	80.0	160.0	320.0	640.0	1280.0
E	3	22.4	44.8	89.6	179.2	358.4	716.8
L	22.4	44.8	89.6	179.2	358.4	716.8	1433.6
E	4	25.2	50.4	100.8	201.6	403.2	806.4
L	25.2	50.4	100.8	201.6	403.2	806.4	1612.8
E	5	28.3	56.6	113.2	226.4	452.8	905.6
L	28.3	56.6	113.2	226.4	452.8	905.6	1811.2

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 710MM FOCAL LENGTH LENSES

710MM		710MM		710MM		710MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E 1	1.0	2.0	4.0	1.0	2.0	4.0	1.0
E 2	1.1	2.2	4.4	1.1	2.2	4.4	1.1
M 3	1.2	2.5	5.0	1.2	2.5	5.0	1.2
E 4	1.4	2.8	5.6	1.4	2.8	5.6	1.4
M 5	1.5	3.1	6.2	1.5	3.1	6.2	1.5
T 6	1.6	3.5	7.0	1.6	3.5	7.0	1.6

710MM		710MM		710MM		710MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E 1	2.7	5.4	10.8	2.7	5.4	10.8	2.7
E 2	3.0	6.0	12.0	3.0	6.0	12.0	3.0
M 3	3.4	6.7	13.4	3.4	6.7	13.4	3.4
E 4	3.8	7.5	15.0	3.8	7.5	15.0	3.8
M 5	4.2	8.4	16.8	4.2	8.4	16.8	4.2
T 6	4.6	9.2	18.4	4.6	9.2	18.4	4.6

710MM		710MM		710MM		710MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E 1	6.7	13.4	26.8	6.7	13.4	26.8	6.7
E 2	7.5	15.0	30.0	7.5	15.0	30.0	7.5
M 3	8.4	16.8	33.6	8.4	16.8	33.6	8.4
E 4	9.5	19.0	38.0	9.5	19.0	38.0	9.5
M 5	10.6	21.2	42.4	10.6	21.2	42.4	10.6
T 6	11.9	23.8	47.6	11.9	23.8	47.6	11.9

710MM		710MM		710MM		710MM	
FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE	FOCAL LENGTH	OBJECT DISTANCE
MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION	MAGNIFICATION
-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH	-6 GROUP LENGTH
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E 1	20.1	40.2	80.4	20.1	40.2	80.4	20.1
E 2	22.6	45.1	90.2	22.6	45.1	90.2	22.6
M 3	25.3	50.7	101.3	25.3	50.7	101.3	25.3
E 4	28.4	56.8	113.6	28.4	56.8	113.6	28.4
M 5	31.9	63.8	127.6	31.9	63.8	127.6	31.9
T 6	35.8	71.7	143.3	35.8	71.7	143.3	35.8

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 800MM FOCAL LENGTH LENSES

FOCAL LENGTH GROUP		800MM		200.FT. (60.96M)		800MM		300.FT. (91.44M)	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP
E 1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
E 2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
M 3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
E 4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
N 5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
T 6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6

FOCAL LENGTH GROUP		800MM		500.FT. (152.40M)		800MM		750.FT. (228.60M)	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP
E 1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
E 2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
M 3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
E 4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
N 5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
T 6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6

FOCAL LENGTH GROUP		800MM		1500.FT. (457.20M)		800MM		2000.FT. (609.60M)	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP
E 1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
E 2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
M 3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
E 4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
N 5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
T 6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6

FOCAL LENGTH GROUP		800MM		4000.FT. (1219.20M)		800MM		5000.FT. (1524.00M)	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP	-6 GROUP LENGTH	-5 GROUP
E 1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
E 2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
M 3	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
E 4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
N 5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
T 6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 1000MM FOCAL LENGTH LENSES

FOCAL LENGTH = 1000MM		FOCAL LENGTH = 1000MM		FOCAL LENGTH = 1000MM	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
100.0 FT. (30.48M)	.01197	200.0 FT. (60.96M)	.016678	300.0 FT. (91.44M)	.01197
-6 GROUP LENGTH= 17.462MM (.6711IN.)		-6 GROUP LENGTH= 12.725MM (.5010IN.)		-6 GROUP LENGTH= 8.437MM (.3321IN.)	
E 1	1.4	E 1	1.9	E 1	2.8
L 1	3.0	L 1	4.2	L 1	5.7
M 1	3.1	M 1	4.2	M 1	5.7
E 2	1.6	E 2	2.1	E 2	3.2
L 2	6.3	L 2	12.5	L 2	18.2
M 2	1.7	M 2	2.5	M 2	3.5
E 3	1.7	E 3	2.5	E 3	3.5
L 3	7.0	L 3	14.1	L 3	21.2
M 3	1.7	M 3	2.5	M 3	3.5
E 4	2.0	E 4	3.0	E 4	4.0
L 4	8.0	L 4	15.4	L 4	22.4
M 4	2.0	M 4	3.0	M 4	4.0
E 5	2.2	E 5	3.0	E 5	4.0
L 5	8.4	L 5	17.7	L 5	26.7
M 5	2.2	M 5	3.0	M 5	4.0
E 6	2.5	E 6	3.3	E 6	4.3
L 6	10.0	L 6	19.9	L 6	29.8
M 6	2.5	M 6	3.3	M 6	4.3

FOCAL LENGTH = 1000MM		FOCAL LENGTH = 1000MM		FOCAL LENGTH = 1000MM	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
400.0 FT. (121.92M)	.08420	500.0 FT. (152.40M)	.066605	750.0 FT. (228.60M)	.094394
-6 GROUP LENGTH= 6.310MM (.2484IN.)		-6 GROUP LENGTH= 5.040MM (.1984IN.)		-6 GROUP LENGTH= 3.352MM (.1320IN.)	
E 1	1.9	E 1	2.4	E 1	3.6
L 1	7.4	L 1	9.5	L 1	14.2
M 1	1.9	M 1	2.4	M 1	3.6
E 2	4.2	E 2	5.7	E 2	8.0
L 2	15.0	L 2	18.9	L 2	28.0
M 2	4.2	M 2	5.7	M 2	8.0
E 3	4.2	E 3	5.7	E 3	8.0
L 3	17.0	L 3	23.8	L 3	35.8
M 3	4.2	M 3	5.7	M 3	8.0
E 4	5.3	E 4	6.7	E 4	10.1
L 4	10.7	L 4	13.4	L 4	20.1
M 4	5.3	M 4	6.7	M 4	10.1
E 5	6.0	E 5	7.5	E 5	11.3
L 5	12.0	L 5	15.0	L 5	22.6
M 5	6.0	M 5	7.5	M 5	11.3
E 6	6.7	E 6	8.2	E 6	12.7
L 6	13.5	L 6	16.9	L 6	25.3
M 6	6.7	M 6	8.2	M 6	12.7

FOCAL LENGTH = 1000MM		FOCAL LENGTH = 1000MM		FOCAL LENGTH = 1000MM	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
1000.0 FT. (304.80M)	.03292	1500.0 FT. (457.20M)	.02192	2000.0 FT. (609.60M)	.01643
-6 GROUP LENGTH= 2.512MM (.0984IN.)		-6 GROUP LENGTH= 1.673MM (.0658IN.)		-6 GROUP LENGTH= 1.254MM (.0494IN.)	
E 1	1.9	E 1	2.4	E 1	3.6
L 1	7.4	L 1	9.5	L 1	14.2
M 1	1.9	M 1	2.4	M 1	3.6
E 2	4.2	E 2	5.7	E 2	8.0
L 2	15.0	L 2	18.9	L 2	28.0
M 2	4.2	M 2	5.7	M 2	8.0
E 3	4.2	E 3	5.7	E 3	8.0
L 3	17.0	L 3	23.8	L 3	35.8
M 3	4.2	M 3	5.7	M 3	8.0
E 4	5.3	E 4	6.7	E 4	10.1
L 4	10.7	L 4	13.4	L 4	20.1
M 4	5.3	M 4	6.7	M 4	10.1
E 5	6.0	E 5	7.5	E 5	11.3
L 5	12.0	L 5	15.0	L 5	22.6
M 5	6.0	M 5	7.5	M 5	11.3
E 6	6.7	E 6	8.2	E 6	12.7
L 6	13.5	L 6	16.9	L 6	25.3
M 6	6.7	M 6	8.2	M 6	12.7

FOCAL LENGTH = 1000MM		FOCAL LENGTH = 1000MM		FOCAL LENGTH = 1000MM	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
3000.0 FT. (914.40M)	.008295	4000.0 FT. (1219.20M)	.00621	5000.0 FT. (1524.00M)	.004957
-6 GROUP LENGTH= .835MM (.0329IN.)		-6 GROUP LENGTH= .626MM (.0247IN.)		-6 GROUP LENGTH= .501MM (.0197IN.)	
E 1	14.0	E 1	19.0	E 1	23.6
L 1	57.1	L 1	76.1	L 1	106.8
M 1	14.0	M 1	19.0	M 1	23.6
E 2	14.0	E 2	19.0	E 2	23.6
L 2	57.1	L 2	76.1	L 2	106.8
M 2	14.0	M 2	19.0	M 2	23.6
E 3	18.0	E 3	24.0	E 3	30.0
L 3	71.4	L 3	95.6	L 3	126.0
M 3	18.0	M 3	24.0	M 3	30.0
E 4	20.2	E 4	26.9	E 4	33.7
L 4	80.8	L 4	107.6	L 4	146.4
M 4	20.2	M 4	26.9	M 4	33.7
E 5	22.4	E 5	29.5	E 5	37.8
L 5	89.6	L 5	120.9	L 5	161.0
M 5	22.4	M 5	29.5	M 5	37.8
E 6	25.4	E 6	33.9	E 6	42.4
L 6	101.6	L 6	135.7	L 6	181.1
M 6	25.4	M 6	33.9	M 6	42.4

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 1000MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 1060MM FOCAL LENGTH LENSES

FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM	
OBJECT DISTANCE = 150.FT. (45.72M)	OBJECT DISTANCE = 200.FT. (60.96M)	OBJECT DISTANCE = 250.FT. (76.20M)	OBJECT DISTANCE = 300.FT. (91.44M)	OBJECT DISTANCE = 350.FT. (106.68M)	OBJECT DISTANCE = 400.FT. (121.92M)	OBJECT DISTANCE = 450.FT. (137.16M)	OBJECT DISTANCE = 500.FT. (152.40M)
MAGNIFICATION = .023735	MAGNIFICATION = .017896	MAGNIFICATION = .014317	MAGNIFICATION = .011735	MAGNIFICATION = .009792	MAGNIFICATION = .008320	MAGNIFICATION = .007204	MAGNIFICATION = .006304
-6 GROUP LENGTH = 10.110MM (.397IN.)	-6 GROUP LENGTH = 13.502MM (.5316IN.)	-6 GROUP LENGTH = 17.000MM (.6693IN.)	-6 GROUP LENGTH = 20.498MM (.8070IN.)	-6 GROUP LENGTH = 24.000MM (.9449IN.)	-6 GROUP LENGTH = 27.500MM (1.0828IN.)	-6 GROUP LENGTH = 31.000MM (1.2207IN.)	-6 GROUP LENGTH = 34.500MM (1.3586IN.)
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM	
OBJECT DISTANCE = 100.FT. (30.60M)	OBJECT DISTANCE = 150.FT. (45.72M)	OBJECT DISTANCE = 200.FT. (60.96M)	OBJECT DISTANCE = 250.FT. (76.20M)	OBJECT DISTANCE = 300.FT. (91.44M)	OBJECT DISTANCE = 350.FT. (106.68M)	OBJECT DISTANCE = 400.FT. (121.92M)	OBJECT DISTANCE = 450.FT. (137.16M)
MAGNIFICATION = .03490	MAGNIFICATION = .02618	MAGNIFICATION = .01942	MAGNIFICATION = .01456	MAGNIFICATION = .01117	MAGNIFICATION = .00878	MAGNIFICATION = .00720	MAGNIFICATION = .00630
-6 GROUP LENGTH = 2.633MM (.1033IN.)	-6 GROUP LENGTH = 3.511MM (.1382IN.)	-6 GROUP LENGTH = 4.389MM (.1728IN.)	-6 GROUP LENGTH = 5.267MM (.2074IN.)	-6 GROUP LENGTH = 6.145MM (.2420IN.)	-6 GROUP LENGTH = 7.023MM (.2766IN.)	-6 GROUP LENGTH = 7.901MM (.3112IN.)	-6 GROUP LENGTH = 8.779MM (.3458IN.)
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM	
OBJECT DISTANCE = 100.FT. (30.60M)	OBJECT DISTANCE = 150.FT. (45.72M)	OBJECT DISTANCE = 200.FT. (60.96M)	OBJECT DISTANCE = 250.FT. (76.20M)	OBJECT DISTANCE = 300.FT. (91.44M)	OBJECT DISTANCE = 350.FT. (106.68M)	OBJECT DISTANCE = 400.FT. (121.92M)	OBJECT DISTANCE = 450.FT. (137.16M)
MAGNIFICATION = .03490	MAGNIFICATION = .02618	MAGNIFICATION = .01942	MAGNIFICATION = .01456	MAGNIFICATION = .01117	MAGNIFICATION = .00878	MAGNIFICATION = .00720	MAGNIFICATION = .00630
-6 GROUP LENGTH = 2.633MM (.1033IN.)	-6 GROUP LENGTH = 3.511MM (.1382IN.)	-6 GROUP LENGTH = 4.389MM (.1728IN.)	-6 GROUP LENGTH = 5.267MM (.2074IN.)	-6 GROUP LENGTH = 6.145MM (.2420IN.)	-6 GROUP LENGTH = 7.023MM (.2766IN.)	-6 GROUP LENGTH = 7.901MM (.3112IN.)	-6 GROUP LENGTH = 8.779MM (.3458IN.)
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM		FOCAL LENGTH = 1060MM	
OBJECT DISTANCE = 100.FT. (30.60M)	OBJECT DISTANCE = 150.FT. (45.72M)	OBJECT DISTANCE = 200.FT. (60.96M)	OBJECT DISTANCE = 250.FT. (76.20M)	OBJECT DISTANCE = 300.FT. (91.44M)	OBJECT DISTANCE = 350.FT. (106.68M)	OBJECT DISTANCE = 400.FT. (121.92M)	OBJECT DISTANCE = 450.FT. (137.16M)
MAGNIFICATION = .03490	MAGNIFICATION = .02618	MAGNIFICATION = .01942	MAGNIFICATION = .01456	MAGNIFICATION = .01117	MAGNIFICATION = .00878	MAGNIFICATION = .00720	MAGNIFICATION = .00630
-6 GROUP LENGTH = 2.633MM (.1033IN.)	-6 GROUP LENGTH = 3.511MM (.1382IN.)	-6 GROUP LENGTH = 4.389MM (.1728IN.)	-6 GROUP LENGTH = 5.267MM (.2074IN.)	-6 GROUP LENGTH = 6.145MM (.2420IN.)	-6 GROUP LENGTH = 7.023MM (.2766IN.)	-6 GROUP LENGTH = 7.901MM (.3112IN.)	-6 GROUP LENGTH = 8.779MM (.3458IN.)
E 1	E 1	E 1	E 1	E 1	E 1	E 1	E 1
L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
E 2	E 2	E 2	E 2	E 2	E 2	E 2	E 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 1060MM FOCAL LENGTH LENSES

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 1200MM FOCAL LENGTH LENSES

1200MM		1200MM		1200MM		1200MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
170.FT. (45.72M)	200.FT. (60.96M)	.020080	.6032IN. (.0152M)	200.FT. (60.96M)	300.FT. (91.44M)	.013208	10.146M (.3995IN.)
-6 GROUP LENGTH=20.566mm (.8137IN.)	-6 GROUP LENGTH=15.321MM (.6032IN.)	-6 GROUP LENGTH=15.321MM (.6032IN.)	-6 GROUP LENGTH=15.321MM (.6032IN.)	-6 GROUP LENGTH=15.321MM (.6032IN.)	-6 GROUP LENGTH=10.146M (.3995IN.)	-6 GROUP LENGTH=10.146M (.3995IN.)	-6 GROUP LENGTH=10.146M (.3995IN.)
Group	Group	Group	Group	Group	Group	Group	Group
-5	-2	-1	-5	-3	-2	-1	-5
1.2	2.1	3.1	1.6	3.1	6.2	12.5	2.3
1.3	2.1	3.1	1.7	3.5	7.0	14.0	2.6
1.5	2.4	3.4	2.0	3.9	7.8	15.7	3.0
1.7	2.7	3.7	2.2	4.4	8.8	17.6	3.3
1.9	3.0	4.0	2.5	4.9	9.9	19.8	3.7
2.1	3.3	4.3	2.8	5.5	11.1	22.2	4.2
E	L 1	L 1	E	L 1	L 1	L 1	E
L 1	L 2	L 2	E 2	L 2	L 2	L 2	L 1
M 3	M 3	M 3	E 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	E 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	E 6	T 6	T 6	T 6	T 6

1200MM		1200MM		1200MM		1200MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
100.FT. (30.48M)	500.FT. (152.40M)	.007937	.2384IN. (.6056MM)	500.FT. (152.40M)	750.FT. (228.60M)	.005277	4.026MM (.1585IN.)
-6 GROUP LENGTH=7.54mm (.297IN.)	-6 GROUP LENGTH=6.056MM (.2384IN.)	-6 GROUP LENGTH=6.056MM (.2384IN.)	-6 GROUP LENGTH=6.056MM (.2384IN.)	-6 GROUP LENGTH=6.056MM (.2384IN.)	-6 GROUP LENGTH=4.026MM (.1585IN.)	-6 GROUP LENGTH=4.026MM (.1585IN.)	-6 GROUP LENGTH=4.026MM (.1585IN.)
Group	Group	Group	Group	Group	Group	Group	Group
-4	-3	-2	-6	-5	-4	-3	-6
1.6	3.1	6.2	2.0	3.9	7.9	15.7	3.0
1.8	3.5	7.0	2.2	4.4	8.8	17.7	3.3
2.0	4.0	8.0	2.5	5.0	9.9	19.8	3.7
2.2	4.4	8.8	2.8	5.6	11.1	22.2	4.2
2.5	5.0	10.0	3.1	6.3	12.5	25.0	4.7
2.8	5.6	11.2	3.5	7.0	14.0	28.2	5.3
E	L 1	L 1	E	L 1	L 1	L 1	E
L 1	L 2	L 2	E 2	L 2	L 2	L 2	L 1
M 3	M 3	M 3	E 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	E 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	E 6	T 6	T 6	T 6	T 6

1200MM		1200MM		1200MM		1200MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
100.FT. (30.48M)	1500.FT. (457.20M)	.002632	.0791IN. (2.008MM)	1500.FT. (457.20M)	2000.FT. (609.60M)	.001772	1.505MM (.0592IN.)
-6 GROUP LENGTH=3.314mm (.1307IN.)	-6 GROUP LENGTH=2.008MM (.0791IN.)	-6 GROUP LENGTH=2.008MM (.0791IN.)	-6 GROUP LENGTH=2.008MM (.0791IN.)	-6 GROUP LENGTH=2.008MM (.0791IN.)	-6 GROUP LENGTH=1.505MM (.0592IN.)	-6 GROUP LENGTH=1.505MM (.0592IN.)	-6 GROUP LENGTH=1.505MM (.0592IN.)
Group	Group	Group	Group	Group	Group	Group	Group
-4	-3	-2	-6	-5	-4	-3	-6
7.9	15.8	31.6	5.9	11.9	23.8	47.5	7.9
8.8	17.6	35.2	6.7	13.4	26.7	53.3	8.9
9.9	19.8	39.6	7.5	15.0	29.9	59.8	10.0
11.1	22.2	44.4	8.4	16.8	33.6	67.2	11.2
12.5	25.0	50.0	9.4	18.8	37.6	75.4	12.6
14.0	28.2	56.4	10.6	21.2	42.3	84.6	14.1
E	L 1	L 1	E	L 1	L 1	L 1	E
L 1	L 2	L 2	E 2	L 2	L 2	L 2	L 1
M 3	M 3	M 3	E 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	E 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	E 6	T 6	T 6	T 6	T 6

1200MM		1200MM		1200MM		1200MM	
FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH	FOCAL LENGTH	OBJECT DISTANCE	MAGNIFICATION	-6 GROUP LENGTH
1000.FT. (304.80M)	5000.FT. (1524.00M)	.000788	.0237IN. (.601MM)	5000.FT. (1524.00M)	7000.FT. (2133.60M)	.000585	1.700MM (.0670IN.)
-6 GROUP LENGTH=1.007mm (.0396IN.)	-6 GROUP LENGTH=.752MM (.0296IN.)	-6 GROUP LENGTH=.752MM (.0296IN.)	-6 GROUP LENGTH=.752MM (.0296IN.)	-6 GROUP LENGTH=.752MM (.0296IN.)	-6 GROUP LENGTH=1.700MM (.0670IN.)	-6 GROUP LENGTH=1.700MM (.0670IN.)	-6 GROUP LENGTH=1.700MM (.0670IN.)
Group	Group	Group	Group	Group	Group	Group	Group
-4	-3	-2	-6	-5	-4	-3	-6
15.8	31.6	63.2	11.9	23.8	47.5	95.0	15.8
17.6	35.2	70.4	13.4	26.7	53.3	106.6	17.6
19.8	39.6	79.2	15.0	29.9	59.8	119.7	19.8
22.2	44.4	88.8	16.8	33.6	67.2	134.4	22.2
25.0	50.0	100.0	18.8	37.6	75.4	150.8	25.0
28.2	56.4	112.8	21.2	42.3	84.6	169.3	28.2
E	L 1	L 1	E	L 1	L 1	L 1	E
L 1	L 2	L 2	E 2	L 2	L 2	L 2	L 1
M 3	M 3	M 3	E 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	E 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	E 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 1400MM FOCAL LENGTH LENSES

1400MM		1400MM		1400MM		1400MM	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
400.FT. (121.92M)	.011616	300.FT. (91.44M)	.015549	300.FT. (91.44M)	.015549	400.FT. (121.92M)	.011616
-6 GROUP LENGTH= 8.863MM (.3499IN.)		-6 GROUP LENGTH= 11.864MM (.4671IN.)		-6 GROUP LENGTH= 11.864MM (.4671IN.)		-6 GROUP LENGTH= 8.863MM (.3499IN.)	
E 1	1.7	E 1	1.0	E 1	1.0	E 1	1.3
E 2	1.5	E 2	1.1	E 2	1.1	E 2	1.5
E 3	1.4	E 3	1.3	E 3	1.3	E 3	1.7
E 4	1.9	E 4	1.4	E 4	1.4	E 4	1.9
N 5	1.1	E 5	1.6	E 5	1.6	E 5	2.1
T 6	1.2	F 6	1.8	F 6	1.8	T 6	2.4

1400MM		1400MM		1400MM		1400MM	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
400.FT. (121.92M)	.011616	750.FT. (228.60M)	.006162	750.FT. (228.60M)	.006162	1000.FT. (304.80M)	.004814
-6 GROUP LENGTH= 7.074MM (.2783IN.)		-6 GROUP LENGTH= 4.702MM (.1851IN.)		-6 GROUP LENGTH= 4.702MM (.1851IN.)		-6 GROUP LENGTH= 3.521MM (.1386IN.)	
E 1	1.7	E 1	2.5	E 1	2.5	E 1	3.4
E 2	1.9	E 2	2.6	E 2	2.6	E 2	3.6
E 3	2.1	E 3	3.2	E 3	3.2	E 3	4.3
E 4	2.9	E 4	4.0	E 4	4.0	E 4	5.4
N 5	2.7	E 5	4.5	E 5	4.5	E 5	6.0
T 6	3.3	F 6	6.5	F 6	6.5	T 6	10.8

1400MM		1400MM		1400MM		1400MM	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
400.FT. (121.92M)	.011616	2000.FT. (609.60M)	.002302	2000.FT. (609.60M)	.002302	3000.FT. (914.40M)	.001533
-6 GROUP LENGTH= 2.384MM (.0941IN.)		-6 GROUP LENGTH= 1.756MM (.0691IN.)		-6 GROUP LENGTH= 1.756MM (.0691IN.)		-6 GROUP LENGTH= 1.170MM (.0461IN.)	
E 1	5.1	E 1	6.8	E 1	6.8	E 1	10.2
E 2	5.7	E 2	7.6	E 2	7.6	E 2	11.4
E 3	6.4	E 3	8.6	E 3	8.6	E 3	12.6
E 4	7.2	E 4	9.6	E 4	9.6	E 4	14.4
N 5	4.1	E 5	10.6	E 5	10.6	E 5	16.2
T 6	9.1	F 6	12.1	F 6	12.1	T 6	18.2

1400MM		1400MM		1400MM		1400MM	
OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION	OBJECT DISTANCE	MAGNIFICATION
400.FT. (121.92M)	.011616	500.FT. (152.40M)	.004772	500.FT. (152.40M)	.004772	750.FT. (228.60M)	.003115
-6 GROUP LENGTH= 1.7915MM (.0705IN.)		-6 GROUP LENGTH= 1.274MM (.0501IN.)		-6 GROUP LENGTH= 1.274MM (.0501IN.)		-6 GROUP LENGTH= .8345MM (.033IN.)	
E 1	3.7	E 1	4.7	E 1	4.7	E 1	5.7
E 2	4.1	E 2	5.1	E 2	5.1	E 2	6.1
E 3	4.5	E 3	5.5	E 3	5.5	E 3	6.5
E 4	4.9	E 4	5.9	E 4	5.9	E 4	6.9
N 5	3.3	E 5	6.3	E 5	6.3	E 5	7.3
T 6	3.6	F 6	7.3	F 6	7.3	T 6	8.3

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 1600MM FOCAL LENGTH LENSES

FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM	
OBJECT DISTANCE = 228 FT. (69.90M)	OBJECT DISTANCE = 300 FT. (91.44M)	OBJECT DISTANCE = 300 FT. (91.44M)	OBJECT DISTANCE = 300 FT. (91.44M)	OBJECT DISTANCE = 400 FT. (121.92M)	OBJECT DISTANCE = 400 FT. (121.92M)	OBJECT DISTANCE = 400 FT. (121.92M)	OBJECT DISTANCE = 400 FT. (121.92M)
MAGNIFICATION = .228/160	MAGNIFICATION = .300/160	MAGNIFICATION = .300/160	MAGNIFICATION = .300/160	MAGNIFICATION = .400/160	MAGNIFICATION = .400/160	MAGNIFICATION = .400/160	MAGNIFICATION = .400/160
-6 GROUP LENGTH = 20.56MM (.0643IN.)	-6 GROUP LENGTH = 20.56MM (.0643IN.)	-6 GROUP LENGTH = 20.56MM (.0643IN.)	-6 GROUP LENGTH = 20.56MM (.0643IN.)	-6 GROUP LENGTH = 10.14MM (.0312IN.)	-6 GROUP LENGTH = 10.14MM (.0312IN.)	-6 GROUP LENGTH = 10.14MM (.0312IN.)	-6 GROUP LENGTH = 10.14MM (.0312IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-6	-5	-4	-3	-2	-1	
L 1	1.2	1.2	1.2	1.2	1.2	1.2	
L 2	2.3	2.3	2.3	2.3	2.3	2.3	
M 1	3.3	3.3	3.3	3.3	3.3	3.3	
M 2	4.3	4.3	4.3	4.3	4.3	4.3	
M 3	5.3	5.3	5.3	5.3	5.3	5.3	
N 1	6.3	6.3	6.3	6.3	6.3	6.3	
N 2	7.3	7.3	7.3	7.3	7.3	7.3	
N 3	8.3	8.3	8.3	8.3	8.3	8.3	
T 1	9.3	9.3	9.3	9.3	9.3	9.3	
T 2	10.3	10.3	10.3	10.3	10.3	10.3	

FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM	
OBJECT DISTANCE = 500 FT. (152.40M)	OBJECT DISTANCE = 750 FT. (228.60M)	OBJECT DISTANCE = 750 FT. (228.60M)	OBJECT DISTANCE = 750 FT. (228.60M)	OBJECT DISTANCE = 1000 FT. (304.80M)	OBJECT DISTANCE = 1000 FT. (304.80M)	OBJECT DISTANCE = 1000 FT. (304.80M)	OBJECT DISTANCE = 1000 FT. (304.80M)
MAGNIFICATION = .500/160	MAGNIFICATION = .750/160	MAGNIFICATION = .750/160	MAGNIFICATION = .750/160	MAGNIFICATION = .002632	MAGNIFICATION = .002632	MAGNIFICATION = .002632	MAGNIFICATION = .002632
-6 GROUP LENGTH = 0.95MM (.0295IN.)	-6 GROUP LENGTH = 5.37MM (.1681IN.)	-6 GROUP LENGTH = 5.37MM (.1681IN.)	-6 GROUP LENGTH = 5.37MM (.1681IN.)	-6 GROUP LENGTH = 4.02MM (.1235IN.)	-6 GROUP LENGTH = 4.02MM (.1235IN.)	-6 GROUP LENGTH = 4.02MM (.1235IN.)	-6 GROUP LENGTH = 4.02MM (.1235IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-6	-5	-4	-3	-2	-1	
L 1	1.5	1.5	1.5	1.5	1.5	1.5	
L 2	2.5	2.5	2.5	2.5	2.5	2.5	
M 1	3.5	3.5	3.5	3.5	3.5	3.5	
M 2	4.5	4.5	4.5	4.5	4.5	4.5	
M 3	5.5	5.5	5.5	5.5	5.5	5.5	
N 1	6.5	6.5	6.5	6.5	6.5	6.5	
N 2	7.5	7.5	7.5	7.5	7.5	7.5	
N 3	8.5	8.5	8.5	8.5	8.5	8.5	
T 1	9.5	9.5	9.5	9.5	9.5	9.5	
T 2	10.5	10.5	10.5	10.5	10.5	10.5	

FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM	
OBJECT DISTANCE = 1000 FT. (304.80M)	OBJECT DISTANCE = 2000 FT. (609.60M)	OBJECT DISTANCE = 2000 FT. (609.60M)	OBJECT DISTANCE = 2000 FT. (609.60M)	OBJECT DISTANCE = 3000 FT. (914.40M)	OBJECT DISTANCE = 3000 FT. (914.40M)	OBJECT DISTANCE = 3000 FT. (914.40M)	OBJECT DISTANCE = 3000 FT. (914.40M)
MAGNIFICATION = .001316	MAGNIFICATION = .002632	MAGNIFICATION = .002632	MAGNIFICATION = .002632	MAGNIFICATION = .001753	MAGNIFICATION = .001753	MAGNIFICATION = .001753	MAGNIFICATION = .001753
-6 GROUP LENGTH = 2.54MM (.0787IN.)	-6 GROUP LENGTH = 2.00MM (.0610IN.)	-6 GROUP LENGTH = 2.00MM (.0610IN.)	-6 GROUP LENGTH = 2.00MM (.0610IN.)	-6 GROUP LENGTH = 1.337MM (.0412IN.)	-6 GROUP LENGTH = 1.337MM (.0412IN.)	-6 GROUP LENGTH = 1.337MM (.0412IN.)	-6 GROUP LENGTH = 1.337MM (.0412IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-6	-5	-4	-3	-2	-1	
L 1	1.0	1.0	1.0	1.0	1.0	1.0	
L 2	2.0	2.0	2.0	2.0	2.0	2.0	
M 1	3.0	3.0	3.0	3.0	3.0	3.0	
M 2	4.0	4.0	4.0	4.0	4.0	4.0	
M 3	5.0	5.0	5.0	5.0	5.0	5.0	
N 1	6.0	6.0	6.0	6.0	6.0	6.0	
N 2	7.0	7.0	7.0	7.0	7.0	7.0	
N 3	8.0	8.0	8.0	8.0	8.0	8.0	
T 1	9.0	9.0	9.0	9.0	9.0	9.0	
T 2	10.0	10.0	10.0	10.0	10.0	10.0	

FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM		FOCAL LENGTH = 1600MM	
OBJECT DISTANCE = 4000 FT. (1219.20M)	OBJECT DISTANCE = 5000 FT. (1524.00M)	OBJECT DISTANCE = 5000 FT. (1524.00M)	OBJECT DISTANCE = 5000 FT. (1524.00M)	OBJECT DISTANCE = 7500 FT. (2286.00M)	OBJECT DISTANCE = 7500 FT. (2286.00M)	OBJECT DISTANCE = 7500 FT. (2286.00M)	OBJECT DISTANCE = 7500 FT. (2286.00M)
MAGNIFICATION = .00116	MAGNIFICATION = .00145	MAGNIFICATION = .00145	MAGNIFICATION = .00145	MAGNIFICATION = .001051	MAGNIFICATION = .001051	MAGNIFICATION = .001051	MAGNIFICATION = .001051
-6 GROUP LENGTH = 1.023MM (.0312IN.)	-6 GROUP LENGTH = .802MM (.0244IN.)	-6 GROUP LENGTH = .802MM (.0244IN.)	-6 GROUP LENGTH = .802MM (.0244IN.)	-6 GROUP LENGTH = .534MM (.0163IN.)	-6 GROUP LENGTH = .534MM (.0163IN.)	-6 GROUP LENGTH = .534MM (.0163IN.)	-6 GROUP LENGTH = .534MM (.0163IN.)
GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP	GROUP
E	-6	-5	-4	-3	-2	-1	
L 1	1.0	1.0	1.0	1.0	1.0	1.0	
L 2	2.0	2.0	2.0	2.0	2.0	2.0	
M 1	3.0	3.0	3.0	3.0	3.0	3.0	
M 2	4.0	4.0	4.0	4.0	4.0	4.0	
M 3	5.0	5.0	5.0	5.0	5.0	5.0	
N 1	6.0	6.0	6.0	6.0	6.0	6.0	
N 2	7.0	7.0	7.0	7.0	7.0	7.0	
N 3	8.0	8.0	8.0	8.0	8.0	8.0	
T 1	9.0	9.0	9.0	9.0	9.0	9.0	
T 2	10.0	10.0	10.0	10.0	10.0	10.0	

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 2000MM FOCAL LENGTH LENSES

FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH=10.166MM (.3995IN.)		-6 GROUP LENGTH=12.725MM (.5010IN.)		-6 GROUP LENGTH=17.402MM (.6851IN.)		-6 GROUP LENGTH=24.600MM (.9687IN.)	
E 1	1.2	1.9	2.7	3.7	5.4	7.1	9.8
E 2	2.6	4.2	6.4	8.4	11.2	14.2	18.4
E 3	5.0	7.6	11.2	14.8	19.6	25.6	33.6
E 4	9.0	13.6	20.4	27.2	35.2	45.6	60.0
E 5	15.0	22.4	33.6	44.8	58.4	76.0	100.0
E 6	24.0	36.0	52.8	70.4	91.2	118.4	156.0

FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-5 GROUP LENGTH=3.352MM (.1320IN.)		-5 GROUP LENGTH=5.060MM (.1992IN.)		-5 GROUP LENGTH=7.080MM (.2787IN.)		-5 GROUP LENGTH=9.760MM (.3843IN.)	
E 1	3.6	5.4	7.2	9.6	12.8	16.8	22.4
E 2	7.2	10.8	14.4	19.2	25.6	33.6	44.8
E 3	10.8	16.2	21.6	28.8	38.4	50.4	67.2
E 4	14.4	21.6	28.8	38.4	50.4	67.2	89.6
E 5	21.6	32.4	43.2	57.6	76.8	100.8	134.4
E 6	36.0	54.0	72.0	96.0	128.0	168.0	224.0

FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-5 GROUP LENGTH=1.071MM (.0421IN.)		-5 GROUP LENGTH=1.671MM (.0658IN.)		-5 GROUP LENGTH=2.371MM (.0933IN.)		-5 GROUP LENGTH=3.371MM (.1328IN.)	
E 1	1.2	1.8	2.4	3.2	4.8	6.4	9.6
E 2	2.4	3.6	4.8	6.4	9.6	12.8	19.2
E 3	3.6	5.4	7.2	9.6	14.4	19.2	28.8
E 4	4.8	7.2	9.6	12.8	19.2	28.8	43.2
E 5	7.2	10.8	14.4	19.2	28.8	38.4	57.6
E 6	12.0	18.0	24.0	32.0	48.0	64.0	96.0

FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM		FOCAL LENGTH = 2000MM	
OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -	OBJECT DISTANCE -	MAGNIFICATION -
-6 GROUP LENGTH=1.071MM (.0421IN.)		-6 GROUP LENGTH=1.671MM (.0658IN.)		-6 GROUP LENGTH=2.371MM (.0933IN.)		-6 GROUP LENGTH=3.371MM (.1328IN.)	
E 1	1.2	1.8	2.4	3.2	4.8	6.4	9.6
E 2	2.4	3.6	4.8	6.4	9.6	12.8	19.2
E 3	3.6	5.4	7.2	9.6	14.4	19.2	28.8
E 4	4.8	7.2	9.6	12.8	19.2	28.8	43.2
E 5	7.2	10.8	14.4	19.2	28.8	38.4	57.6
E 6	12.0	18.0	24.0	32.0	48.0	64.0	96.0

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER) FOR 2000MM FOCAL LENGTH LENSES

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SECTION (C)

TABULATION OF CAMERA SYSTEM MAGNIFICATIONS
AND RESULTANT IMAGE SIZES

IDENTIFICATION

IDENTIFICATION	MM	GROUP LENGTH	INDEX
.000139	.157		.00420
.000143	.110		.00432
.000147	.113		.00445
.000152	.116		.00458
.000156	.120		.00471
.000161	.123		.00485
.000166	.127		.00499
.000170	.131		.00514
.000175	.134		.00529
.000181	.138		.00544
.000186	.142		.00559
.000191	.147		.00574
.000197	.151		.00589
.000202	.155		.00611
.000209	.160		.00629
.000215	.164		.00647
.000221	.169		.00666
.000227	.174		.00686
.000234	.179		.00706
.000241	.185		.00727
.000248	.190		.00748
.000255	.196		.00770
.000263	.201		.00792
.000270	.207		.00816
.000278	.213		.00840
.000287	.220		.00864
.000295	.226		.00890
.000304	.233		.00916
.000312	.239		.00942
.000322	.246		.00970
.000331	.254		.00998
.000341	.261		.01028
.000351	.269		.01058
.000361	.277		.01089
.000372	.285		.01121
.000383	.293		.01154
.000394	.302		.01187
.000405	.310		.01222
.000417	.320		.01258
.000429	.329		.01295
.000442	.339		.01333
.000455	.348		.01372
.000468	.359		.01412
.000482	.369		.01453
.000496	.380		.01496
.000511	.391		.01540
.000526	.403		.01585
.000541	.414		.01631
.000557	.427		.01678
.000573	.439		.01728
.000590	.452		.01779
.000607	.465		.01831
.000625	.479		.01885
.000643	.493		.01940
.000662	.507		.01997
.000682	.522		.02055

MAGNIFICATION

GROUP LENGTH

MAGNIFICATION	MM	GROUP LENGTH	I _{CA}
.020702	.537	.02116	.02116
.020722	.553	.02178	.02178
.020743	.569	.02241	.02241
.020765	.586	.02307	.02307
.020787	.603	.02375	.02375
.020811	.621	.02444	.02444
.020834	.639	.02516	.02516
.020859	.659	.02590	.02590
.020884	.677	.02666	.02666
.020910	.697	.02744	.02744
.020936	.717	.02824	.02824
.020964	.738	.02907	.02907
.020992	.760	.02992	.02992
.021021	.782	.03080	.03080
.021051	.805	.03170	.03170
.021082	.829	.03263	.03263
.021114	.853	.03358	.03358
.021146	.878	.03457	.03457
.021180	.904	.03558	.03558
.021214	.930	.03662	.03662
.021250	.957	.03770	.03770
.021287	.986	.03880	.03880
.021324	1.014	.03994	.03994
.021363	1.044	.04111	.04111
.021403	1.075	.04231	.04231
.021444	1.106	.04355	.04355
.021487	1.139	.04483	.04483
.021530	1.172	.04614	.04614
.021575	1.206	.04750	.04750
.021621	1.242	.04889	.04889
.021669	1.278	.05032	.05032
.021717	1.316	.05179	.05179
.021768	1.354	.05331	.05331
.021820	1.394	.05487	.05487
.021873	1.435	.05646	.05646
.021928	1.477	.05814	.05814
.021984	1.520	.05984	.05984
.022042	1.564	.06159	.06159
.022102	1.610	.06340	.06340
.022164	1.658	.06526	.06526
.022227	1.706	.06717	.06717
.022293	1.756	.06914	.06914
.022360	1.808	.07116	.07116
.022429	1.860	.07325	.07325
.022500	1.915	.07539	.07539
.022573	1.971	.07760	.07760
.022649	2.029	.07988	.07988
.022726	2.088	.08222	.08222
.022806	2.150	.08462	.08462
.022888	2.213	.08711	.08711
.022973	2.277	.08966	.08966
.023060	2.344	.09229	.09229
.023150	2.413	.09499	.09499
.023242	2.483	.09777	.09777
.023337	2.556	.10064	.10064
.023435	2.631	.10359	.10359

MAGNIFICATION

INCH

MM

GROUP LENGTH

.003536	2.766	.1662
.003639	2.788	.16975
.003760	2.809	.17290
.003850	2.833	.17627
.003969	2.850	.17968
.004085	2.879	.18319
.004204	2.921	.18680
.004328	2.915	.19051
.004454	2.912	.19434
.004585	2.912	.19827
.004719	2.915	.20232
.004858	2.921	.20649
.005000	2.930	.21079
.005147	2.942	.21521
.005297	2.958	.21976
.005453	2.977	.22443
.005612	2.999	.22925
.005777	3.025	.23421
.005946	3.055	.23932
.006120	3.088	.24457
.006300	3.125	.24998
.006484	3.167	.25553
.006674	3.212	.26122
.006870	3.262	.26717
.007071	3.316	.27325
.007278	3.375	.27948
.007492	3.439	.28583
.007711	3.507	.29235
.007937	3.580	.29906
.008170	3.658	.30597
.008409	3.741	.31309
.008655	3.830	.32042
.008909	3.924	.32797
.009170	4.024	.33573
.009439	4.130	.34371
.009713	4.242	.35191
.010000	4.360	.36033
.010293	4.484	.36897
.010595	4.615	.37783
.010905	4.753	.38691
.011225	4.898	.39621
.011554	5.050	.40573
.011892	5.209	.41547
.012241	5.376	.42543
.012599	5.551	.43561
.012968	5.734	.44601
.013348	5.924	.45663
.013740	6.121	.46747
.014142	6.325	.47853
.014557	6.533	.48981
.014983	6.747	.50131
.015422	6.967	.51303
.015874	7.193	.52497
.016339	7.425	.53713
.016816	7.663	.54951
.017311	7.908	.56211

MAGNIFICATION

MAGNIFICATION	MM	INCH
.017616	13.049	.51735
.018340	14.049	.55309
.018877	14.460	.56930
.019431	14.884	.58598
.020000	15.320	.60315
.020586	15.769	.62082
.021189	16.231	.63901
.021810	16.707	.65774
.022449	17.196	.67701
.023107	17.700	.69685
.023784	18.219	.71727
.024481	18.753	.73829
.025198	19.302	.75992
.025937	19.866	.78219
.026697	20.450	.80511
.027479	21.049	.82870
.028284	21.666	.85298
.029113	22.301	.87798
.029966	22.954	.90370
.030844	23.627	.93016
.031748	24.319	.95744
.032678	25.032	.98550
.033636	25.765	1.01437
.034621	26.520	1.04410

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SECTION (D)

RESOLVING POWER DATA TABLES
FOR SPECIFIC CAMERA MAGNIFICATIONS

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION -		.000139		.000147	
-6 GROUP LENGTH-		.107MM (.0042IN.)		.113MM (.0044IN.)	
GROUP		GROUP		GROUP	
E	-5	-4	-3	-2	-1
L 1	112.2	224.5	449.0	898.0	999.9
L 2	126.0	252.0	504.0	999.9	999.9
E 2	141.4	282.8	565.7	999.9	999.9
M 3	158.7	317.5	635.0	999.9	999.9
E 4	178.2	356.4	712.7	999.9	999.9
M 5	200.0	400.0	800.0	999.9	999.9
T 6					

MAGNIFICATION -		.000152		.000156	
-6 GROUP LENGTH-		.116MM (.0044IN.)		.120MM (.0047IN.)	
GROUP		GROUP		GROUP	
E	-5	-4	-3	-2	-1
L 1	102.9	205.9	411.7	823.4	999.9
L 2	115.5	231.1	462.2	924.3	999.9
E 2	129.7	259.4	518.7	999.9	999.9
M 3	145.6	291.1	582.3	999.9	999.9
E 4	163.4	326.8	653.6	999.9	999.9
M 5	183.4	366.8	733.6	999.9	999.9
T 6					

MAGNIFICATION -		.000166		.000170	
-6 GROUP LENGTH-		.127MM (.0050IN.)		.131MM (.0051IN.)	
GROUP		GROUP		GROUP	
E	-5	-4	-3	-2	-1
L 1	94.4	188.8	377.5	755.1	999.9
L 2	105.9	211.9	423.8	847.6	999.9
E 2	118.9	237.8	475.7	951.4	999.9
M 3	133.5	267.0	533.9	999.9	999.9
E 4	149.8	299.7	599.3	999.9	999.9
M 5	168.2	336.4	672.7	999.9	999.9
T 6					

MAGNIFICATION -		.000181		.000186	
-6 GROUP LENGTH-		.138MM (.0054IN.)		.142MM (.0056IN.)	
GROUP		GROUP		GROUP	
E	-5	-4	-3	-2	-1
L 1	86.6	173.1	346.2	692.4	999.9
L 2	97.2	194.3	388.6	777.2	999.9
E 2	109.0	218.0	436.0	872.0	999.9
M 3	122.4	244.8	489.6	979.2	999.9
E 4	137.4	274.8	549.6	999.9	999.9
M 5	154.2	308.4	616.8	999.9	999.9
T 6					

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH
.000197		.151MM (.0054IN.)	.000203		.155MM (.0061IN.)	.000209		.160MM (.0063IN.)
-6	-6	-4	-6	-6	-4	-6	-6	-4
79.4	58.7	317.5	635.0	499.9	999.9	74.9	149.8	299.7
89.1	172.2	356.4	712.7	599.9	999.9	84.1	168.2	336.4
100.0	200.0	400.0	800.0	999.9	999.9	94.4	188.8	377.6
112.2	224.4	448.8	898.0	999.9	999.9	105.9	211.8	423.6
126.0	252.0	504.0	999.9	999.9	999.9	118.9	237.8	475.6
141.4	282.8	565.7	999.9	999.9	999.9	133.5	267.0	533.9
E 1	L 1	E 2	L 2	E 3	L 3	E 4	L 4	E 5
L 1	L 1	E 2	L 2	E 3	L 3	E 4	L 4	E 5
M 3	M 3	E 4	L 4	E 5	L 5	E 6	L 6	E 7
N 5	N 5	E 6	L 6	E 7	L 7	E 8	L 8	E 9
T 6	T 6	E 9	L 9	E 10	L 10	E 11	L 11	E 12

MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH
.000215		.164MM (.0065IN.)	.000221		.169MM (.0067IN.)	.000227		.174MM (.0069IN.)
-6	-6	-4	-6	-6	-4	-6	-6	-4
72.8	145.6	291.1	582.3	999.9	999.9	68.7	137.4	274.8
81.7	163.4	326.8	653.6	999.9	999.9	77.1	154.2	308.5
91.7	183.4	366.8	733.6	999.9	999.9	86.6	173.1	346.2
102.9	205.8	411.7	823.4	999.9	999.9	97.2	194.3	388.6
115.5	231.1	462.1	924.3	999.9	999.9	109.1	218.1	436.2
129.7	259.4	518.7	999.9	999.9	999.9	122.4	244.8	489.6
E 1	L 1	E 2	L 2	E 3	L 3	E 4	L 4	E 5
L 1	L 1	E 2	L 2	E 3	L 3	E 4	L 4	E 5
M 3	M 3	E 4	L 4	E 5	L 5	E 6	L 6	E 7
N 5	N 5	E 6	L 6	E 7	L 7	E 8	L 8	E 9
T 6	T 6	E 9	L 9	E 10	L 10	E 11	L 11	E 12

MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH
.000234		.179MM (.0071IN.)	.000241		.185MM (.0073IN.)	.000248		.190MM (.0075IN.)
-6	-6	-4	-6	-6	-4	-6	-6	-4
66.7	133.5	267.0	533.9	999.9	999.9	63.0	126.0	252.0
74.9	149.8	299.7	599.9	999.9	999.9	70.7	141.4	282.8
84.1	168.2	336.4	672.7	999.9	999.9	79.4	158.7	317.5
94.4	188.8	377.6	755.1	999.9	999.9	89.1	178.2	356.4
105.9	211.9	423.8	847.6	999.9	999.9	100.0	200.0	400.0
118.9	237.8	475.7	951.4	999.9	999.9	112.2	224.4	448.8
E 1	L 1	E 2	L 2	E 3	L 3	E 4	L 4	E 5
L 1	L 1	E 2	L 2	E 3	L 3	E 4	L 4	E 5
M 3	M 3	E 4	L 4	E 5	L 5	E 6	L 6	E 7
N 5	N 5	E 6	L 6	E 7	L 7	E 8	L 8	E 9
T 6	T 6	E 9	L 9	E 10	L 10	E 11	L 11	E 12

MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH
.000255		.196MM (.0077IN.)	.000263		.201MM (.0079IN.)	.000270		.207MM (.0082IN.)
-6	-6	-4	-6	-6	-4	-6	-6	-4
61.2	122.4	244.8	489.6	999.9	999.9	57.8	115.5	231.1
68.7	137.4	274.8	549.6	999.9	999.9	64.8	129.7	259.4
77.1	154.2	308.5	616.9	999.9	999.9	72.8	145.6	291.1
86.6	173.1	346.2	692.7	999.9	999.9	81.7	163.4	326.8
97.2	194.3	388.6	777.2	999.9	999.9	91.7	183.4	366.8
109.1	218.1	436.2	868.0	999.9	999.9	102.9	205.8	411.7
122.4	244.8	489.6	962.1	999.9	999.9	115.5	231.1	462.1
E 1	L 1	E 2	L 2	E 3	L 3	E 4	L 4	E 5
L 1	L 1	E 2	L 2	E 3	L 3	E 4	L 4	E 5
M 3	M 3	E 4	L 4	E 5	L 5	E 6	L 6	E 7
N 5	N 5	E 6	L 6	E 7	L 7	E 8	L 8	E 9
T 6	T 6	E 9	L 9	E 10	L 10	E 11	L 11	E 12

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH
.000270			.000287			.000295		
.213MM (.0084IN.)			.220MM (.0086IN.)			.226MM (.0089IN.)		
-6	-5	-4	-6	-5	-4	-6	-5	-4
54.1	112.2	224.5	54.5	109.1	218.1	52.0	105.9	211.9
63.0	126.0	252.0	61.2	122.4	244.8	59.5	118.9	237.8
70.7	141.4	282.8	68.7	137.4	274.8	66.7	133.5	267.0
79.4	158.7	317.5	77.1	154.2	308.4	74.9	149.8	299.7
89.1	178.2	356.4	86.6	173.1	346.2	84.1	168.2	336.4
100.0	200.0	400.0	97.2	194.3	388.6	94.4	188.6	377.6
E	L	L	E	L	L	E	L	L
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6

MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH
.000306			.000312			.000322		
.233MM (.0092IN.)			.239MM (.0094IN.)			.245MM (.0097IN.)		
-6	-5	-4	-6	-5	-4	-6	-5	-4
51.5	102.9	205.9	50.0	100.0	200.0	46.6	97.2	194.3
57.6	115.3	231.1	56.1	112.3	224.5	50.5	107.1	216.1
64.6	129.7	259.4	63.0	126.0	252.0	61.2	122.4	244.8
72.6	145.6	291.1	70.7	141.4	282.8	68.7	137.4	274.8
81.7	163.4	326.6	79.4	158.7	317.5	77.1	154.2	308.4
91.7	183.4	366.6	89.1	178.2	356.4	86.6	173.1	346.2
E	L	L	E	L	L	E	L	L
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6

MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH
.000331			.000341			.000351		
.254MM (.0100IN.)			.261MM (.0103IN.)			.269MM (.0106IN.)		
-6	-5	-4	-6	-5	-4	-6	-5	-4
47.2	94.4	188.8	45.9	91.7	183.4	44.5	89.1	178.2
53.0	105.9	211.9	51.5	102.9	205.9	50.0	100.0	200.0
59.5	118.9	237.8	57.6	115.3	231.1	56.1	112.3	224.5
66.7	133.5	267.0	64.6	129.7	259.4	63.0	126.0	252.0
74.9	149.8	299.7	72.6	145.6	291.1	70.7	141.4	282.8
84.1	168.2	336.4	81.7	163.4	326.6	79.4	158.7	317.5
E	L	L	E	L	L	E	L	L
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6

MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH	MAGNIFICATION	GROUP	LENGTH
.000361			.000372			.000383		
.277MM (.0109IN.)			.285MM (.0112IN.)			.293MM (.0115IN.)		
-6	-5	-4	-6	-5	-4	-6	-5	-4
43.3	86.6	173.1	42.0	84.0	168.0	40.8	81.7	163.4
48.6	97.2	194.3	47.2	94.4	188.8	45.9	91.7	183.4
54.5	109.1	218.1	53.0	105.9	211.9	51.5	102.9	205.9
61.2	122.4	244.8	59.5	118.9	237.8	57.6	115.3	231.1
68.7	137.4	274.8	66.7	133.5	267.0	64.6	129.7	259.4
77.1	154.2	308.4	74.9	149.8	299.7	72.6	145.6	291.1
86.6	173.1	346.2	84.1	168.2	336.4	81.7	163.4	326.6
E	L	L	E	L	L	E	L	L
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION		.000396		.000405		.000417	
-6 GROUP LENGTH-		.302MM (.0119IN.)		.310MM (.0122IN.)		.320MM (.0126IN.)	
GROUP		GROUP		GROUP		GROUP	
-6	-5	-6	-5	-6	-5	-6	-5
39.7	79.4	39.6	77.1	39.6	77.1	37.5	74.9
44.5	89.1	43.3	86.6	43.3	86.6	42.0	84.1
50.0	100.0	48.6	97.2	48.6	97.2	47.2	94.4
56.1	112.2	54.5	109.0	54.5	109.0	53.0	105.9
62.8	125.4	61.2	122.4	61.2	122.4	59.5	118.9
70.7	141.4	68.7	137.4	68.7	137.4	66.7	133.5
E 1	L 1	E 1	L 1	E 1	L 1	E 1	L 1
E 2	L 2	E 2	L 2	E 2	L 2	E 2	L 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

MAGNIFICATION		.000429		.000442		.000455	
-6 GROUP LENGTH-		.326MM (.0129IN.)		.339MM (.0133IN.)		.348MM (.0137IN.)	
GROUP		GROUP		GROUP		GROUP	
-6	-5	-6	-5	-6	-5	-6	-5
38.4	72.8	35.4	70.7	35.4	70.7	34.3	68.7
49.0	81.7	46.5	89.1	46.5	89.1	43.3	86.6
51.5	102.9	50.0	100.0	50.0	100.0	48.6	97.2
57.8	115.5	56.1	112.2	56.1	112.2	54.5	109.0
64.8	129.7	63.0	126.0	63.0	126.0	61.2	122.4
E 1	L 1	E 1	L 1	E 1	L 1	E 1	L 1
E 2	L 2	E 2	L 2	E 2	L 2	E 2	L 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

MAGNIFICATION		.000489		.000482		.000496	
-6 GROUP LENGTH-		.359MM (.0141IN.)		.369MM (.0145IN.)		.380MM (.0150IN.)	
GROUP		GROUP		GROUP		GROUP	
-6	-5	-6	-5	-6	-5	-6	-5
33.4	66.7	32.4	64.8	32.4	64.8	31.5	63.0
37.5	74.9	36.4	72.8	36.4	72.8	35.4	70.7
42.0	84.1	40.6	81.7	40.6	81.7	39.7	79.4
47.2	94.4	45.8	91.7	45.8	91.7	44.5	89.1
53.0	105.9	51.5	102.9	51.5	102.9	50.0	100.0
59.5	118.9	57.8	115.5	57.8	115.5	56.1	112.2
E 1	L 1	E 1	L 1	E 1	L 1	E 1	L 1
E 2	L 2	E 2	L 2	E 2	L 2	E 2	L 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

MAGNIFICATION		.000511		.000526		.000541	
-6 GROUP LENGTH-		.391MM (.0154IN.)		.403MM (.0158IN.)		.414MM (.0163IN.)	
GROUP		GROUP		GROUP		GROUP	
-6	-5	-6	-5	-6	-5	-6	-5
30.6	61.2	29.7	59.5	29.7	59.5	28.9	57.8
34.3	68.7	33.4	66.7	33.4	66.7	32.4	64.8
38.4	77.1	37.5	74.9	37.5	74.9	36.4	72.8
43.3	86.6	42.0	84.1	42.0	84.1	40.6	81.7
48.6	97.2	47.2	94.4	47.2	94.4	45.8	91.7
54.5	109.0	53.0	105.9	53.0	105.9	51.5	102.9
61.2	122.4	60.7	119.9	60.7	119.9	59.5	117.9
E 1	L 1	E 1	L 1	E 1	L 1	E 1	L 1
E 2	L 2	E 2	L 2	E 2	L 2	E 2	L 2
M 3	M 3	M 3	M 3	M 3	M 3	M 3	M 3
E 4	E 4	E 4	E 4	E 4	E 4	E 4	E 4
M 5	M 5	M 5	M 5	M 5	M 5	M 5	M 5
T 6	T 6	T 6	T 6	T 6	T 6	T 6	T 6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION = .000590
 -6 GROUP LENGTH = .452MM (.0178IN.)

MAGNIFICATION = .000573
 -6 GROUP LENGTH = .439MM (.0173IN.)

E 1 26.5 53.0 105.9 211.9 423.8 847.6
 L 1 29.7 59.5 118.9 237.8 475.7 951.4
 M 1 33.4 66.7 133.5 267.0 533.9 999.9
 N 1 37.5 74.9 149.8 299.7 599.3 999.9
 T 1 42.0 84.1 168.2 336.4 672.7 999.9
 Y 1 47.2 94.4 188.8 377.6 755.1 999.9

E 1 27.3 54.5 109.1 218.1 436.2 872.4
 L 1 30.6 61.2 122.4 244.8 489.6 979.3
 M 1 34.3 68.7 137.4 274.8 549.6 999.9
 N 1 38.4 77.1 154.2 308.4 616.9 999.9
 T 1 43.3 86.6 173.1 346.2 692.4 999.9
 Y 1 48.4 97.2 194.3 388.6 777.2 999.9

MAGNIFICATION = .000557
 -6 GROUP LENGTH = .427MM (.0168IN.)

E 1 28.1 56.1 112.2 224.5 449.0 898.0
 L 1 31.5 63.0 126.0 252.0 504.0 999.9
 M 1 35.4 70.7 141.4 282.8 565.7 999.9
 N 1 39.7 79.4 158.7 317.5 635.0 999.9
 T 1 44.5 89.1 178.2 356.4 712.7 999.9
 Y 1 50.0 102.0 204.0 408.0 816.0 999.9

MAGNIFICATION = .000643
 -6 GROUP LENGTH = .493MM (.0194IN.)

E 1 24.3 48.6 97.2 194.3 388.6 777.2
 L 1 27.3 54.5 109.1 218.1 436.2 872.4
 M 1 30.6 61.2 122.4 244.8 489.6 979.3
 N 1 34.3 68.7 137.4 274.8 549.6 999.9
 T 1 38.6 77.1 154.2 308.4 616.9 999.9
 Y 1 43.3 86.6 173.1 346.2 692.4 999.9

MAGNIFICATION = .000625
 -6 GROUP LENGTH = .479MM (.0188IN.)

E 1 25.0 50.0 100.0 200.0 400.0 800.0
 L 1 28.1 56.1 112.3 224.5 449.0 898.0
 M 1 31.5 63.0 126.0 252.0 504.0 999.9
 N 1 35.4 70.7 141.4 282.8 565.7 999.9
 T 1 39.7 79.4 158.7 317.5 635.0 999.9
 Y 1 44.5 89.1 178.2 356.4 712.7 999.9

MAGNIFICATION = .000807
 -6 GROUP LENGTH = .465MM (.0183IN.)

E 1 23.7 47.4 94.8 189.6 379.2 758.4
 L 1 28.9 57.8 115.5 231.1 462.2 924.4
 M 1 32.4 64.8 129.6 259.2 518.4 999.9
 N 1 36.4 72.8 145.6 291.1 582.3 999.9
 T 1 40.8 81.7 163.4 326.8 653.6 999.9
 Y 1 45.9 91.7 183.4 366.8 733.6 999.9

MAGNIFICATION = .000702
 -6 GROUP LENGTH = .537MM (.0212IN.)

E 1 22.3 44.5 89.1 178.2 356.4 712.7
 L 1 25.0 50.0 100.0 200.0 400.0 800.0
 M 1 28.1 56.1 112.2 224.5 449.0 898.0
 N 1 31.5 63.0 126.0 252.0 504.0 999.9
 T 1 35.4 70.7 141.4 282.8 565.7 999.9
 Y 1 39.7 79.4 158.7 317.5 635.0 999.9

MAGNIFICATION = .000682
 -6 GROUP LENGTH = .522MM (.0206IN.)

E 1 22.9 45.9 91.7 183.4 366.8 733.6
 L 1 25.7 51.5 102.9 205.9 411.7 823.5
 M 1 28.9 57.8 115.5 231.1 462.2 924.4
 N 1 32.4 64.8 129.6 259.2 518.4 999.9
 T 1 36.4 72.8 145.6 291.1 582.3 999.9
 Y 1 40.8 81.7 163.4 326.8 653.6 999.9

MAGNIFICATION = .000942
 -6 GROUP LENGTH = .507MM (.0200IN.)

E 1 23.6 47.2 94.4 188.8 377.6 755.1
 L 1 28.5 57.0 114.0 228.0 456.0 912.0
 M 1 32.7 65.4 130.8 261.6 523.2 999.9
 N 1 37.3 74.6 149.2 298.4 596.8 999.9
 T 1 42.0 84.0 168.0 336.0 672.0 999.9

MAGNIFICATION = .000765
 -6 GROUP LENGTH = .586MM (.0231IN.)

E 1 20.4 40.8 81.7 163.4 326.8 653.6
 L 1 22.9 45.9 91.7 183.4 366.8 733.6
 M 1 25.7 51.5 102.9 205.9 411.7 823.5
 N 1 28.9 57.8 115.5 231.1 462.2 924.4
 T 1 32.4 64.8 129.6 259.2 518.4 999.9
 Y 1 36.4 72.8 145.6 291.1 582.3 999.9

MAGNIFICATION = .000743
 -6 GROUP LENGTH = .569MM (.0224IN.)

E 1 21.0 42.0 84.0 168.0 336.0 672.0
 L 1 23.6 47.2 94.4 188.8 377.6 755.1
 M 1 26.5 53.0 105.9 211.9 423.8 847.6
 N 1 29.7 59.5 118.9 237.8 475.7 951.4
 T 1 33.4 66.7 133.5 267.0 533.9 999.9
 Y 1 37.5 74.9 149.8 299.7 599.3 999.9

MAGNIFICATION = .000722
 -6 GROUP LENGTH = .583MM (.0231IN.)

E 1 21.0 42.0 84.0 168.0 336.0 672.0
 L 1 23.6 47.2 94.4 188.8 377.6 755.1
 M 1 26.5 53.0 105.9 211.9 423.8 847.6
 N 1 29.7 59.5 118.9 237.8 475.7 951.4
 T 1 33.4 66.7 133.5 267.0 533.9 999.9
 Y 1 37.5 74.9 149.8 299.7 599.3 999.9

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION = .000787		.000811		.000834	
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP	
E 1	18.2	19.3	20.4	18.7	19.7
E 2	22.3	24.5	27.1	23.5	25.7
E 3	25.0	28.0	31.4	26.0	28.2
E 4	28.1	32.1	36.2	29.5	32.7
E 5	31.5	36.0	41.2	33.4	36.7
E 6	35.4	40.7	46.7	37.5	41.9
L 1	150.2	158.7	167.1	149.8	158.2
L 2	178.2	188.4	198.4	178.2	188.4
M 3	198.0	209.0	220.4	198.0	209.0
E 4	112.2	124.5	137.4	105.9	118.9
M 5	129.0	142.8	157.1	122.6	137.4
T 6	141.4	156.3	171.6	133.5	149.6

MAGNIFICATION = .000859		.000884		.000910	
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP	
E 1	18.2	19.3	20.4	17.2	18.3
E 2	22.4	24.6	27.1	21.6	23.8
E 3	25.0	28.0	31.4	24.3	26.5
E 4	28.1	32.1	36.2	27.3	29.5
E 5	31.5	36.0	41.2	30.6	33.4
E 6	35.4	40.7	46.7	34.5	38.6
L 1	145.4	154.2	163.1	137.4	146.3
L 2	173.1	183.6	194.3	164.2	175.1
M 3	194.3	206.2	218.3	183.6	196.2
E 4	109.1	121.3	133.6	97.2	110.4
M 5	122.6	135.6	149.6	109.1	123.1
T 6	137.4	151.6	166.3	122.4	138.2

MAGNIFICATION = .000924		.000964		.000992	
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP	
E 1	18.2	19.3	20.4	15.7	16.8
E 2	22.4	24.6	27.1	17.7	19.0
E 3	25.0	28.0	31.4	19.8	21.2
E 4	28.1	32.1	36.2	22.3	23.8
E 5	31.5	36.0	41.2	25.0	26.6
E 6	35.4	40.7	46.7	28.1	29.8
L 1	133.8	141.4	149.6	126.0	134.2
L 2	158.4	167.1	176.3	141.4	151.1
M 3	176.3	186.2	196.2	158.4	169.2
E 4	102.9	112.2	122.6	89.1	99.0
M 5	119.6	130.0	141.2	102.9	114.2
T 6	137.4	149.6	162.1	112.2	124.5

MAGNIFICATION = .001021		.001051		.001082	
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP	
E 1	18.2	19.3	20.4	14.4	15.5
E 2	22.4	24.6	27.1	16.2	17.4
E 3	25.0	28.0	31.4	18.2	19.5
E 4	28.1	32.1	36.2	20.4	21.8
E 5	31.5	36.0	41.2	22.9	24.4
E 6	35.4	40.7	46.7	25.7	27.3
L 1	122.4	129.0	135.6	115.9	122.6
L 2	149.6	158.4	167.1	132.8	142.8
M 3	167.1	176.3	185.6	149.6	159.6
E 4	94.0	102.9	112.2	81.7	91.6
M 5	109.1	118.9	128.8	94.0	104.0
T 6	124.5	134.4	144.3	109.1	119.6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION - .001180		MAGNIFICATION - .001146		MAGNIFICATION - .001144		MAGNIFICATION - .001146	
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP		GROUP	
E	1	10.9	20.1	13.6	27.3	13.6	27.3
E	2	15.7	31.5	19.3	39.4	19.3	39.4
E	3	17.7	35.4	17.2	34.3	17.2	34.3
E	4	19.6	39.7	19.3	39.4	19.3	39.4
E	5	22.3	44.5	21.6	43.2	21.6	43.2
E	6	25.0	50.0	24.3	48.6	24.3	48.6
E	1	13.2	26.5	13.6	27.3	13.6	27.3
E	2	14.9	29.7	15.3	30.6	15.3	30.6
E	3	16.7	33.6	17.2	34.3	17.2	34.3
E	4	18.7	37.5	19.3	39.4	19.3	39.4
E	5	21.0	42.0	21.6	43.2	21.6	43.2
E	6	23.6	47.2	24.3	48.6	24.3	48.6

MAGNIFICATION - .001287		MAGNIFICATION - .001250		MAGNIFICATION - .001287		MAGNIFICATION - .001287	
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP		GROUP	
E	1	12.1	24.2	12.5	25.0	12.5	25.0
E	2	13.6	27.3	14.0	28.1	14.0	28.1
E	3	15.3	30.6	15.7	31.5	15.7	31.5
E	4	17.2	34.3	17.7	35.4	17.7	35.4
E	5	19.3	38.6	19.6	39.7	19.6	39.7
E	6	21.6	43.2	22.3	44.5	22.3	44.5
E	1	12.1	24.2	12.5	25.0	12.5	25.0
E	2	13.6	27.3	14.0	28.1	14.0	28.1
E	3	15.3	30.6	15.7	31.5	15.7	31.5
E	4	17.2	34.3	17.7	35.4	17.7	35.4
E	5	19.3	38.6	19.6	39.7	19.6	39.7
E	6	21.6	43.2	22.3	44.5	22.3	44.5

MAGNIFICATION - .001403		MAGNIFICATION - .001363		MAGNIFICATION - .001403		MAGNIFICATION - .001403	
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP		GROUP	
E	1	11.1	22.3	11.5	22.9	11.5	22.9
E	2	12.6	25.0	12.8	25.7	12.8	25.7
E	3	14.0	28.1	14.4	28.9	14.4	28.9
E	4	15.7	31.5	16.2	32.4	16.2	32.4
E	5	17.7	35.4	18.2	36.4	18.2	36.4
E	6	19.6	39.7	20.4	40.8	20.4	40.8
E	1	11.1	22.3	11.5	22.9	11.5	22.9
E	2	12.6	25.0	12.8	25.7	12.8	25.7
E	3	14.0	28.1	14.4	28.9	14.4	28.9
E	4	15.7	31.5	16.2	32.4	16.2	32.4
E	5	17.7	35.4	18.2	36.4	18.2	36.4
E	6	19.6	39.7	20.4	40.8	20.4	40.8

MAGNIFICATION - .001530		MAGNIFICATION - .001487		MAGNIFICATION - .001530		MAGNIFICATION - .001530	
-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-		-6 GROUP LENGTH-	
GROUP		GROUP		GROUP		GROUP	
E	1	10.2	20.4	10.5	21.0	10.5	21.0
E	2	11.6	22.9	11.8	23.6	11.8	23.6
E	3	12.9	25.7	13.2	26.5	13.2	26.5
E	4	14.4	28.9	14.9	29.7	14.9	29.7
E	5	16.4	32.4	16.7	33.4	16.7	33.4
E	6	18.2	36.4	18.1	37.5	18.1	37.5
E	1	10.2	20.4	10.5	21.0	10.5	21.0
E	2	11.6	22.9	11.8	23.6	11.8	23.6
E	3	12.9	25.7	13.2	26.5	13.2	26.5
E	4	14.4	28.9	14.9	29.7	14.9	29.7
E	5	16.4	32.4	16.7	33.4	16.7	33.4
E	6	18.2	36.4	18.1	37.5	18.1	37.5

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION = .001875		MAGNIFICATION = .001621		MAGNIFICATION = .001669	
-6 GROUP LENGTH= 1.208MM (.0675IN.)		-6 GROUP LENGTH= 1.282MM (.0489IN.)		-6 GROUP LENGTH= 1.278MM (.0503IN.)	
GROUP	-5	-4	-3	-2	-1
E 1	9.0	19.0	39.0	79.0	158.0
L 1	9.4	19.7	39.4	78.8	157.6
E 2	11.1	22.3	44.5	89.1	178.2
L 2	11.5	23.0	46.0	92.0	184.0
E 3	12.5	25.0	50.0	100.0	200.0
L 3	13.0	26.5	53.0	106.0	212.0
E 4	14.0	28.1	56.1	112.1	224.1
L 4	14.5	29.7	59.5	119.0	238.0
E 5	15.3	30.6	61.2	122.4	244.8
L 5	15.7	31.4	62.8	125.6	251.2
E 6	17.7	35.4	70.7	141.4	282.8
L 6	18.2	36.4	72.8	145.6	291.2

MAGNIFICATION = .001717		MAGNIFICATION = .001768		MAGNIFICATION = .001828	
-6 GROUP LENGTH= 1.318MM (.0518IN.)		-6 GROUP LENGTH= 1.354MM (.0533IN.)		-6 GROUP LENGTH= 1.394MM (.0549IN.)	
GROUP	-5	-4	-3	-2	-1
E 1	9.1	18.2	36.4	72.8	145.6
L 1	9.6	19.2	38.4	76.8	153.6
E 2	10.2	20.4	40.8	81.6	163.2
L 2	10.7	21.4	42.8	85.6	171.2
E 3	11.5	22.9	45.8	91.6	183.2
L 3	12.0	24.0	48.0	96.0	192.0
E 4	12.9	25.7	51.5	102.9	205.8
L 4	13.4	26.8	53.6	107.2	214.4
E 5	14.4	28.6	57.2	114.4	228.8
L 5	14.9	29.7	59.5	119.0	238.0
E 6	16.2	32.4	64.8	129.6	259.2
L 6	16.7	33.4	66.7	133.4	266.8

MAGNIFICATION = .001873		MAGNIFICATION = .001920		MAGNIFICATION = .001984	
-6 GROUP LENGTH= 1.435MM (.0565IN.)		-6 GROUP LENGTH= 1.477MM (.0581IN.)		-6 GROUP LENGTH= 1.526MM (.0603IN.)	
GROUP	-5	-4	-3	-2	-1
E 1	9.3	18.7	37.3	74.6	149.2
L 1	9.8	19.7	39.4	79.0	158.4
E 2	10.5	21.0	42.0	84.0	168.0
L 2	11.0	22.0	44.0	88.0	176.0
E 3	11.8	23.6	47.2	94.4	188.8
L 3	12.2	24.5	49.0	98.0	196.0
E 4	13.2	26.5	53.0	106.0	212.0
L 4	13.6	27.5	55.0	110.0	220.0
E 5	14.4	28.7	57.4	114.8	229.6
L 5	14.9	29.7	59.5	119.0	238.0
E 6	16.0	31.4	62.8	125.6	251.2
L 6	16.5	32.4	64.8	129.6	259.2

MAGNIFICATION = .002042		MAGNIFICATION = .002102		MAGNIFICATION = .002164	
-6 GROUP LENGTH= 1.586MM (.0624IN.)		-6 GROUP LENGTH= 1.610MM (.0631IN.)		-6 GROUP LENGTH= 1.658MM (.0653IN.)	
GROUP	-5	-4	-3	-2	-1
E 1	7.7	15.3	30.6	61.2	122.4
L 1	8.2	16.2	32.4	64.8	129.6
E 2	8.6	17.2	34.4	68.8	137.6
L 2	9.1	18.2	36.4	72.8	145.6
E 3	9.6	19.2	38.4	76.8	153.6
L 3	10.1	20.2	40.4	80.8	161.6
E 4	10.8	21.4	42.8	85.6	171.2
L 4	11.3	22.4	44.8	89.6	179.2
E 5	12.1	23.6	47.2	94.4	188.8
L 5	12.6	24.5	49.0	98.0	196.0
E 6	13.6	25.7	51.5	102.9	205.8
L 6	14.1	26.8	53.6	107.2	214.4

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION = .002227
 -6 GROUP LENGTH = 1.706MM (.0672IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		7.0	14.0	28.1	56.1	112.2
E 2		7.9	15.7	31.5	63.0	126.0
M 3		8.8	17.7	35.4	70.7	141.4
E 4		9.9	19.8	39.7	79.4	158.7
M 5		11.1	22.3	44.5	89.1	178.2
T 6		12.5	25.0	50.0	100.0	200.0

MAGNIFICATION = .002293
 -6 GROUP LENGTH = 1.756MM (.0691IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		6.3	13.6	27.3	54.5	109.1
E 2		7.7	15.3	30.6	61.2	122.4
M 3		8.6	17.2	34.3	68.7	137.4
E 4		9.6	19.3	38.6	77.1	154.2
M 5		10.8	21.6	43.3	86.6	173.1
T 6		12.1	24.3	48.6	97.2	194.3

MAGNIFICATION = .002360
 -6 GROUP LENGTH = 1.806MM (.0712IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		6.6	13.2	26.5	53.0	105.9
E 2		7.4	14.9	29.7	59.5	118.9
M 3		8.3	16.7	33.4	66.7	133.5
E 4		9.4	18.7	37.5	74.9	149.8
M 5		10.5	21.0	42.0	84.1	168.2
T 6		11.8	23.6	47.2	94.4	188.8

MAGNIFICATION = .002427
 -6 GROUP LENGTH = 1.860MM (.0732IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		6.4	12.9	25.7	51.5	102.9
E 2		7.2	14.4	28.9	57.8	115.5
M 3		8.1	16.2	32.4	64.8	129.7
E 4		9.1	18.2	36.4	72.6	145.1
M 5		10.2	20.4	40.9	81.7	163.4
T 6		11.5	22.9	45.9	91.7	183.4

MAGNIFICATION = .002500
 -6 GROUP LENGTH = 1.915MM (.0754IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		6.3	12.5	25.0	50.0	100.0
E 2		7.0	14.0	28.1	56.1	112.2
M 3		7.9	15.7	31.5	63.0	126.0
E 4		8.8	17.7	35.4	70.7	141.4
M 5		9.9	19.8	39.7	79.4	158.7
T 6		11.1	22.3	44.5	89.1	178.2

MAGNIFICATION = .002573
 -6 GROUP LENGTH = 1.971MM (.0776IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		6.1	12.1	24.3	48.6	97.2
E 2		6.8	13.6	27.3	54.5	109.1
M 3		7.7	15.3	30.6	61.2	122.4
E 4		8.6	17.2	34.3	68.7	137.4
M 5		9.6	19.3	38.6	77.1	154.2
T 6		10.8	21.6	43.3	86.6	173.1

MAGNIFICATION = .002609
 -6 GROUP LENGTH = 2.029MM (.0799IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		5.9	11.8	23.6	47.2	94.4
E 2		6.6	13.2	26.5	53.0	105.9
M 3		7.4	14.9	29.7	59.5	118.9
E 4		8.3	16.7	33.4	66.7	133.5
M 5		9.4	18.7	37.5	74.9	149.8
T 6		10.5	21.0	42.0	84.1	168.2

MAGNIFICATION = .002725
 -6 GROUP LENGTH = 2.088MM (.0822IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		5.7	11.5	22.9	45.9	91.7
E 2		6.4	12.9	25.7	51.5	102.9
M 3		7.2	14.4	28.9	57.8	115.5
E 4		8.1	16.2	32.4	64.8	129.7
M 5		9.1	18.2	36.4	72.6	145.1
T 6		10.2	20.4	40.9	81.7	163.4

MAGNIFICATION = .002806
 -6 GROUP LENGTH = 2.150MM (.0846IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		5.6	11.1	22.3	44.5	89.1
E 2		6.3	12.5	25.0	50.0	100.0
M 3		7.0	14.0	28.1	56.1	112.2
E 4		7.9	15.7	31.5	63.0	126.0
M 5		8.8	17.7	35.4	70.7	141.4
T 6		9.9	19.8	39.7	79.4	158.7

MAGNIFICATION = .002888
 -6 GROUP LENGTH = 2.213MM (.0871IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		5.4	10.8	21.6	43.3	86.6
E 2		6.1	12.1	24.3	48.6	97.2
M 3		6.8	13.6	27.3	54.5	109.1
E 4		7.7	15.3	30.6	61.2	122.4
M 5		8.6	17.2	34.3	68.7	137.4
T 6		9.6	19.3	38.6	77.1	154.2

MAGNIFICATION = .002973
 -6 GROUP LENGTH = 2.279MM (.0897IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		5.3	10.5	21.0	42.0	84.1
E 2		5.9	11.8	23.6	47.2	94.4
M 3		6.6	13.2	26.5	53.0	105.9
E 4		7.4	14.9	29.7	59.5	118.9
M 5		8.3	16.7	33.4	66.7	133.5
T 6		9.4	18.7	37.5	74.9	149.8

MAGNIFICATION = .003060
 -6 GROUP LENGTH = 2.344MM (.0923IN.)

MAGNIFICATION	GROUP	-5	-4	-3	-2	-1
E 1		5.1	10.2	20.4	40.8	81.7
E 2		5.7	11.5	22.9	45.9	91.7
M 3		6.4	12.9	25.7	51.5	102.9
E 4		7.2	14.4	28.9	57.8	115.5
M 5		8.1	16.2	32.4	64.8	129.7
T 6		9.1	18.2	36.4	72.6	145.1

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION - .003150		MAGNIFICATION - .003242		MAGNIFICATION - .003337	
-6 GROUP LENGTH- 2.413MM (.095IN.)		-6 GROUP LENGTH- 2.483MM (.0978IN.)		-6 GROUP LENGTH- 2.556MM (.1006IN.)	
GROUP		GROUP		GROUP	
E	-6	E	-6	E	-6
L 1	5.0	L 1	4.8	L 1	4.7
L 2	5.6	L 2	5.4	L 2	4.7
M 3	6.2	M 3	6.1	M 3	5.9
E 4	7.0	E 4	6.8	E 4	6.6
M 5	7.9	M 5	7.7	M 5	7.4
T 6	8.8	T 6	8.6	T 6	8.3
	9.9		9.6		9.4
	11.1		10.8		10.5
	12.5		12.1		11.8
	14.0		13.6		13.2
	15.7		15.3		14.9
	17.7		17.2		16.7
	19.4		19.3		18.7
	22.3		21.6		21.0
	25.0		24.3		23.6
	28.1		27.3		26.5
	31.5		30.6		29.7
	35.4		34.3		33.4
	39.7		38.6		37.5
	44.5		43.3		42.0
	50.0		48.6		47.2
	56.1		54.5		53.0
	63.0		61.2		59.5
	70.7		68.7		66.7
	79.4		77.1		74.9
	89.1		86.6		84.1
	100.0		109.1		105.9
	112.2		122.4		118.9
	126.0		137.4		133.5
	141.4		154.2		149.8
	158.7		173.1		168.8
	178.2		194.3		189.4
	200.0		218.1		211.9
	224.5		244.8		237.8
	252.0		274.4		267.0

MAGNIFICATION - .003363		MAGNIFICATION - .003536		MAGNIFICATION - .003639	
-6 GROUP LENGTH- 2.708MM (.1066IN.)		-6 GROUP LENGTH- 2.708MM (.1066IN.)		-6 GROUP LENGTH- 2.780MM (.1097IN.)	
GROUP		GROUP		GROUP	
E	-6	E	-6	E	-6
L 1	4.5	L 1	4.4	L 1	4.3
L 2	5.1	L 2	5.0	L 2	4.8
M 3	5.7	M 3	5.6	M 3	5.4
E 4	6.4	E 4	6.2	E 4	6.1
M 5	7.2	M 5	7.0	M 5	6.8
T 6	8.1	T 6	7.9	T 6	7.7
	9.1		8.8		8.6
	10.2		9.9		9.6
	11.5		11.1		10.8
	12.9		12.5		12.1
	14.4		14.0		13.6
	16.2		15.7		15.3
	18.2		17.7		17.2
	20.4		19.8		19.3
	22.9		22.2		21.6
	25.7		25.0		24.3
	28.9		28.1		27.3
	32.4		31.5		30.6
	36.4		35.4		34.3
	40.8		39.7		38.6
	45.9		44.5		43.3
	51.5		50.0		48.6
	57.8		56.1		54.5
	64.0		63.0		61.2
	72.4		70.7		68.7
	81.7		79.4		77.1
	91.7		89.1		86.6
	102.9		100.0		97.2
	115.5		112.2		109.1
	129.7		126.0		122.4
	145.6		141.4		137.4
	163.4		158.7		154.2
	183.4		178.2		173.1
	205.9		200.0		194.3
	231.1		224.5		218.1
	259.4		252.0		244.8

MAGNIFICATION - .003740		MAGNIFICATION - .003850		MAGNIFICATION - .003969	
-6 GROUP LENGTH- 2.869MM (.1132IN.)		-6 GROUP LENGTH- 2.953MM (.1163IN.)		-6 GROUP LENGTH- 3.040MM (.1197IN.)	
GROUP		GROUP		GROUP	
E	-6	E	-6	E	-6
L 1	4.2	L 1	4.1	L 1	3.9
L 2	4.7	L 2	4.5	L 2	4.4
M 3	5.3	M 3	5.1	M 3	5.0
E 4	5.9	E 4	5.7	E 4	5.6
M 5	6.6	M 5	6.4	M 5	6.2
T 6	7.4	T 6	7.2	T 6	7.0
	8.3		8.1		7.9
	9.4		9.1		8.8
	10.5		10.2		9.9
	11.8		11.5		11.1
	13.2		12.9		12.5
	14.9		14.4		14.0
	16.7		16.2		15.7
	18.7		18.2		17.7
	20.9		20.4		19.8
	23.3		22.9		22.3
	25.9		25.7		25.0
	28.7		28.9		28.1
	31.5		31.5		30.6
	34.3		32.4		34.3
	37.5		36.4		38.6
	42.0		40.8		43.3
	47.2		45.9		48.6
	53.0		51.5		54.5
	59.5		57.8		61.2
	66.7		64.0		68.7
	74.9		72.4		77.1
	84.1		81.7		86.6
	94.4		91.7		97.2
	105.9		102.9		109.1
	118.9		115.5		122.4
	133.5		129.7		137.4
	149.8		145.6		154.2
	168.8		163.4		173.1
	189.4		183.4		194.3
	211.9		205.9		218.1
	237.8		231.1		244.8

MAGNIFICATION - .004085		MAGNIFICATION - .004204		MAGNIFICATION - .004320	
-6 GROUP LENGTH- 3.129MM (.1232IN.)		-6 GROUP LENGTH- 3.221MM (.1268IN.)		-6 GROUP LENGTH- 3.315MM (.1305IN.)	
GROUP		GROUP		GROUP	
E	-6	E	-6	E	-6
L 1	3.8	L 1	3.7	L 1	3.6
L 2	4.3	L 2	4.2	L 2	4.1
M 3	4.8	M 3	4.7	M 3	4.5
E 4	5.4	E 4	5.3	E 4	5.1
M 5	6.1	M 5	5.9	M 5	5.7
T 6	6.8	T 6	6.6	T 6	6.4
	7.7		7.4		7.2
	8.7		8.3		8.0
	9.8		9.4		9.1
	10.9		10.5		10.2
	12.2		11.8		11.5
	13.6		13.2		12.9
	15.3		14.9		14.4
	17.2		16.7		16.2
	19.3		18.7		18.2
	21.6		21.0		20.4
	24.3		23.6		22.9
	27.3		26.5		25.7
	30.6		29.7		28.9
	34.3		33.4		32.4
	38.6		37.5		36.4
	43.3		42.0		40.8
	48.6		47.2		45.9
	54.5		53.0		50.0
	61.2		59.5		56.1
	68.7		66.7		64.0
	77.1		74.9		72.4
	86.6		84.1		81.7
	97.2		94.4		91.7
	109.1		105.9		102.9
	122.4		118.9		115.5
	137.4		133.5		129.7
	154.2		149.8		145.6
	173.1		168.8		163.4
	194.3		189.4		183.4
	218.1		211.9		205.9
	244.8		237.8		231.1

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION = .004454
-6 GROUP LENGTH = 3.412MM (.1343IN.)

E	-6	3.5	7.0	14.0	28.1	56.1	112.2	-1
L	-5	3.9	7.9	15.7	31.5	63.0	126.0	-2
E	-4	4.4	8.8	17.7	35.4	70.7	141.4	-3
L	-3	5.0	9.9	19.9	39.7	79.4	158.7	-4
E	-2	5.6	11.1	22.3	44.5	89.1	178.2	-5
L	-1	6.3	12.5	25.0	50.0	100.0	200.0	-6

MAGNIFICATION = .004585
-6 GROUP LENGTH = 3.512MM (.1383IN.)

E	-6	3.4	6.8	13.6	27.3	54.5	109.1	-1
L	-5	3.8	7.7	15.3	30.6	61.2	122.4	-2
E	-4	4.3	8.6	17.2	34.3	68.7	137.4	-3
L	-3	4.8	9.6	19.3	38.6	77.1	154.2	-4
E	-2	5.4	10.8	21.6	43.3	86.6	173.1	-5
L	-1	6.1	12.1	24.3	48.6	97.2	194.3	-6

MAGNIFICATION = .004719
-6 GROUP LENGTH = 3.615MM (.1423IN.)

E	-6	3.3	6.6	13.2	26.5	53.0	105.9	-1
L	-5	3.7	7.4	14.9	29.7	59.5	118.9	-2
E	-4	4.2	8.3	16.7	33.4	66.7	133.5	-3
L	-3	4.7	9.4	18.7	37.5	74.9	149.8	-4
E	-2	5.3	10.5	21.0	42.0	84.1	168.2	-5
L	-1	5.9	11.8	23.6	47.2	94.4	188.6	-6

MAGNIFICATION = .004858
-6 GROUP LENGTH = 3.721MM (.1465IN.)

E	-6	3.2	6.4	12.9	25.7	51.5	102.9	-1
L	-5	3.6	7.2	14.4	28.9	57.8	115.5	-2
E	-4	4.1	8.1	16.2	32.4	64.8	129.7	-3
L	-3	4.5	9.1	18.2	36.4	72.9	145.6	-4
E	-2	5.1	10.2	20.4	40.8	81.7	163.4	-5
L	-1	5.7	11.5	22.9	45.9	91.7	183.4	-6

MAGNIFICATION = .005000
-6 GROUP LENGTH = 3.830MM (.1508IN.)

E	-6	3.1	6.3	12.5	25.0	50.0	100.0	-1
L	-5	3.5	7.0	14.0	28.1	56.1	112.2	-2
E	-4	3.9	7.9	15.7	31.5	63.0	126.0	-3
L	-3	4.4	8.8	17.7	35.4	70.7	141.4	-4
E	-2	5.0	9.9	19.8	39.7	79.4	158.7	-5
L	-1	5.6	11.1	22.3	44.5	89.1	178.2	-6

MAGNIFICATION = .005147
-6 GROUP LENGTH = 3.942MM (.1552IN.)

E	-6	3.0	6.1	12.1	24.3	48.6	97.2	-1
L	-5	3.4	6.8	13.6	27.3	54.5	109.1	-2
E	-4	3.8	7.7	15.3	30.6	61.2	122.4	-3
L	-3	4.3	8.6	17.2	34.3	68.7	137.4	-4
E	-2	4.8	9.6	19.3	38.6	77.1	154.2	-5
L	-1	5.4	10.8	21.6	43.3	86.6	173.1	-6

MAGNIFICATION = .005297
-6 GROUP LENGTH = 4.058MM (.1594IN.)

E	-6	2.9	5.9	11.8	23.6	47.2	94.4	-1
L	-5	3.3	6.6	13.2	26.5	53.0	105.9	-2
E	-4	3.7	7.4	14.9	29.7	59.5	118.9	-3
L	-3	4.2	8.3	16.7	33.4	66.7	133.5	-4
E	-2	4.7	9.4	18.7	37.5	74.9	149.8	-5
L	-1	5.3	10.5	21.0	42.0	84.1	168.2	-6

MAGNIFICATION = .005453
-6 GROUP LENGTH = 4.177MM (.1644IN.)

E	-6	2.9	5.7	11.5	22.9	45.9	91.7	-1
L	-5	3.2	6.4	12.9	25.7	51.5	102.9	-2
E	-4	3.6	7.2	14.4	28.9	57.8	115.5	-3
L	-3	4.1	8.1	16.2	32.4	64.8	129.7	-4
E	-2	4.5	9.1	18.2	36.4	72.9	145.6	-5
L	-1	5.1	10.2	20.4	40.8	81.7	163.4	-6

MAGNIFICATION = .005612
-6 GROUP LENGTH = 4.299MM (.1693IN.)

E	-6	2.8	5.6	11.1	22.3	44.5	89.1	-1
L	-5	3.1	6.3	12.5	25.0	50.0	100.0	-2
E	-4	3.5	7.0	14.0	28.1	56.1	112.2	-3
L	-3	3.9	7.9	15.7	31.5	63.0	126.0	-4
E	-2	4.4	8.8	17.7	35.4	70.7	141.4	-5
L	-1	5.0	9.9	19.8	39.7	79.4	158.7	-6

MAGNIFICATION = .005777
-6 GROUP LENGTH = 4.425MM (.1742IN.)

E	-6	2.7	5.4	10.9	21.8	43.6	87.2	-1
L	-5	3.0	6.1	12.1	24.3	48.6	97.2	-2
E	-4	3.4	6.8	13.6	27.3	54.5	109.1	-3
L	-3	3.8	7.7	15.3	30.6	61.2	122.4	-4
E	-2	4.3	8.6	17.2	34.3	68.7	137.4	-5
L	-1	4.8	9.6	19.3	38.6	77.1	154.2	-6

MAGNIFICATION = .005946
-6 GROUP LENGTH = 4.555MM (.1793IN.)

E	-6	2.6	5.3	10.5	21.0	42.0	84.1	-1
L	-5	2.9	5.9	11.8	23.6	47.2	94.4	-2
E	-4	3.3	6.6	13.2	26.5	53.0	105.9	-3
L	-3	3.7	7.4	14.9	29.7	59.5	118.9	-4
E	-2	4.2	8.3	16.7	33.4	66.7	133.5	-5
L	-1	4.7	9.4	18.7	37.5	74.9	149.8	-6

MAGNIFICATION = .006120
-6 GROUP LENGTH = 4.688MM (.1846IN.)

E	-6	2.6	5.1	10.2	20.4	40.8	81.7	-1
L	-5	2.9	5.7	11.5	22.9	45.9	91.7	-2
E	-4	3.2	6.4	12.9	25.7	51.5	102.9	-3
L	-3	3.6	7.2	14.4	28.9	57.8	115.5	-4
E	-2	4.1	8.1	16.2	32.4	64.8	129.7	-5
L	-1	4.5	9.1	18.2	36.4	72.9	145.6	-6

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION - .006306		MAGNIFICATION - .006484		MAGNIFICATION - .006674	
-6 GROUP LENGTH- .1902IN.1		-6 GROUP LENGTH- .1955IN.1		-6 GROUP LENGTH- .2013IN.1	
GROUP		GROUP		GROUP	
-6	5.0	-6	4.8	-6	4.7
-5	5.0	-5	5.4	-5	5.3
-4	11.1	-4	10.8	-4	10.5
-3	22.3	-3	21.6	-3	21.0
-2	44.5	-2	43.3	-2	42.0
-1	89.0	-1	86.6	-1	84.4
E 1	178.0	E 1	173.2	E 1	168.8
E 2	356.0	E 2	346.6	E 2	337.6
M 3	544.0	M 3	524.9	M 3	506.4
E 4	1088.0	E 4	1049.8	E 4	1012.8
M 5	1632.0	M 5	1574.7	M 5	1519.2
N 6	2176.0	N 6	2109.6	N 6	2027.2
Y 6	4352.0	Y 6	4219.2	Y 6	4054.4

MAGNIFICATION - .007071		MAGNIFICATION - .007270		MAGNIFICATION - .007937	
-6 GROUP LENGTH- .2132IN.1		-6 GROUP LENGTH- .2195IN.1		-6 GROUP LENGTH- .2394IN.1	
GROUP		GROUP		GROUP	
-6	4.4	-6	4.3	-6	4.3
-5	4.4	-5	4.8	-5	4.8
-4	9.1	-4	9.6	-4	9.6
-3	18.2	-3	17.7	-3	17.2
-2	36.4	-2	35.4	-2	34.3
-1	72.8	-1	70.7	-1	68.7
E 1	145.6	E 1	141.4	E 1	137.4
E 2	291.2	E 2	282.8	E 2	274.8
M 3	436.8	M 3	424.2	M 3	412.2
E 4	873.6	E 4	848.4	E 4	824.4
M 5	1310.4	M 5	1272.6	M 5	1236.6
N 6	1747.2	N 6	1697.2	N 6	1645.2
Y 6	3494.4	Y 6	3394.4	Y 6	3290.4

MAGNIFICATION - .008409		MAGNIFICATION - .008655	
-6 GROUP LENGTH- .2536IN.1		-6 GROUP LENGTH- .2610IN.1	
GROUP		GROUP	
-6	3.3	-6	3.6
-5	3.3	-5	3.6
-4	6.6	-4	7.2
-3	13.2	-3	14.4
-2	26.4	-2	28.8
-1	52.8	-1	57.6
E 1	105.6	E 1	115.2
E 2	211.2	E 2	230.4
M 3	316.8	M 3	345.6
E 4	633.6	E 4	691.2
M 5	950.4	M 5	1036.8
N 6	1300.8	N 6	1414.4
Y 6	2601.6	Y 6	2828.8

MAGNIFICATION - .008409		MAGNIFICATION - .008655	
-6 GROUP LENGTH- .2536IN.1		-6 GROUP LENGTH- .2610IN.1	
GROUP		GROUP	
-6	3.3	-6	3.6
-5	3.3	-5	3.6
-4	6.6	-4	7.2
-3	13.2	-3	14.4
-2	26.4	-2	28.8
-1	52.8	-1	57.6
E 1	105.6	E 1	115.2
E 2	211.2	E 2	230.4
M 3	316.8	M 3	345.6
E 4	633.6	E 4	691.2
M 5	950.4	M 5	1036.8
N 6	1300.8	N 6	1414.4
Y 6	2601.6	Y 6	2828.8

IMAGE PLANE RESOLUTION LINES PER MILLIMETER

MAGNIFICATION - .009439		MAGNIFICATION - .009170		MAGNIFICATION - .009439	
-6 GROUP LENGTH- 7.230MM (.2866IN.)		-6 GROUP LENGTH- 7.024MM (.2765IN.)		-6 GROUP LENGTH- 7.230MM (.2866IN.)	
GROUP		GROUP		GROUP	
E 1	1.7	E 1	1.7	E 1	1.7
L 1	1.9	L 1	1.9	L 1	1.9
E 2	2.1	L 2	1.9	E 2	2.1
M 3	2.3	M 3	2.1	M 3	2.3
E 4	2.6	E 4	2.4	E 4	2.6
N 5	2.9	N 5	2.7	N 5	2.9
T 6	2.9	T 6	3.0	T 6	2.9

MAGNIFICATION - .010293		MAGNIFICATION - .010000		MAGNIFICATION - .010293	
-6 GROUP LENGTH- 7.864MM (.3104IN.)		-6 GROUP LENGTH- 7.660MM (.3016IN.)		-6 GROUP LENGTH- 7.864MM (.3104IN.)	
GROUP		GROUP		GROUP	
E 1	1.5	E 1	1.6	E 1	1.5
L 1	1.7	L 1	1.6	L 1	1.7
E 2	1.9	L 2	1.8	E 2	1.9
M 3	2.1	M 3	2.0	M 3	2.1
E 4	2.4	E 4	2.2	E 4	2.4
N 5	2.7	N 5	2.5	N 5	2.7
T 6	2.7	T 6	2.8	T 6	2.7

MAGNIFICATION - .011225		MAGNIFICATION - .010905		MAGNIFICATION - .011225	
-6 GROUP LENGTH- 8.596MM (.3385IN.)		-6 GROUP LENGTH- 8.353MM (.3289IN.)		-6 GROUP LENGTH- 8.596MM (.3385IN.)	
GROUP		GROUP		GROUP	
E 1	1.4	E 1	1.4	E 1	1.4
L 1	1.6	L 1	1.4	L 1	1.6
E 2	1.8	L 2	1.6	E 2	1.8
M 3	2.0	M 3	1.8	M 3	2.0
E 4	2.2	E 4	2.0	E 4	2.2
N 5	2.5	N 5	2.3	N 5	2.5
T 6	2.5	T 6	2.6	T 6	2.5

MAGNIFICATION - .011554		MAGNIFICATION - .011892		MAGNIFICATION - .012241	
-6 GROUP LENGTH- 9.466MM (.3727IN.)		-6 GROUP LENGTH- 9.109MM (.3586IN.)		-6 GROUP LENGTH- 9.376MM (.3691IN.)	
GROUP		GROUP		GROUP	
E 1	1.4	E 1	1.3	E 1	1.3
L 1	1.5	L 1	1.5	L 1	1.3
E 2	1.7	L 2	1.5	E 2	1.4
M 3	1.9	M 3	1.7	M 3	1.6
E 4	2.1	E 4	1.9	E 4	1.8
N 5	2.4	N 5	2.1	N 5	2.0
T 6	2.4	T 6	2.3	T 6	2.3

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION = .012599 -6 GROUP LENGTH=9.95MM (.391IN.)		MAGNIFICATION = .012968 -6 GROUP LENGTH=9.93MM (.391IN.)		MAGNIFICATION = .013348 -6 GROUP LENGTH=10.225MM (.4026IN.)							
GROUP	-5	-4	-3	-2	-1	GROUP	-5	-4	-3	-2	-1
E 1	1.2	2.3	4.5	9.1	18.2	E 1	1.2	2.3	4.7	9.4	18.7
E 2	1.6	3.1	6.1	12.1	24.1	E 2	1.3	2.6	5.3	10.5	21.0
M 3	2.1	4.1	8.1	16.1	32.1	M 3	1.5	2.9	5.9	11.8	23.6
E 4	2.8	5.5	11.0	22.0	44.0	E 4	1.7	3.3	6.6	13.2	26.5
M 5	3.7	7.3	14.6	29.1	58.1	M 5	1.9	3.7	7.4	14.9	29.7
T 6	4.9	9.7	19.4	38.7	77.3	T 6	2.1	4.2	8.3	16.7	33.4

MAGNIFICATION = .013760 -6 GROUP LENGTH=10.52MM (.414IN.)		MAGNIFICATION = .014162 -6 GROUP LENGTH=10.83MM (.4265IN.)		MAGNIFICATION = .014557 -6 GROUP LENGTH=11.15MM (.4390IN.)							
GROUP	-5	-4	-3	-2	-1	GROUP	-5	-4	-3	-2	-1
E 1	1.1	2.3	4.5	9.1	18.2	E 1	1.1	2.1	4.3	8.6	17.2
E 2	1.4	2.9	5.7	11.5	22.9	E 2	1.2	2.4	4.8	9.6	19.3
M 3	1.9	3.7	7.4	14.8	29.5	M 3	1.4	2.7	5.4	10.8	21.6
E 4	2.5	5.1	10.1	20.1	40.1	E 4	1.5	3.0	6.1	12.1	24.3
M 5	3.3	6.6	13.1	26.2	52.4	M 5	1.7	3.4	6.8	13.6	27.3
T 6	4.4	8.8	17.6	35.1	70.1	T 6	1.9	3.8	7.7	15.3	30.6

MAGNIFICATION = .014883 -6 GROUP LENGTH=11.37MM (.451IN.)		MAGNIFICATION = .015422 -6 GROUP LENGTH=11.81MM (.4651IN.)		MAGNIFICATION = .015874 -6 GROUP LENGTH=12.15MM (.4787IN.)							
GROUP	-5	-4	-3	-2	-1	GROUP	-5	-4	-3	-2	-1
E 1	1.0	2.1	4.2	8.4	16.7	E 1	1.0	2.0	3.9	7.9	15.7
E 2	1.3	2.7	5.4	10.7	21.4	E 2	1.1	2.2	4.4	8.8	17.7
M 3	1.8	3.6	7.2	14.4	28.7	M 3	1.2	2.5	5.0	9.9	19.8
E 4	2.4	4.8	9.6	19.1	38.1	E 4	1.4	2.8	5.6	11.1	22.3
M 5	3.2	6.4	12.8	25.5	51.0	M 5	1.6	3.1	6.2	12.5	25.0
T 6	4.2	8.4	16.8	33.6	67.1	T 6	1.8	3.5	7.0	14.0	28.1

MAGNIFICATION = .016339 -6 GROUP LENGTH=12.51MM (.4927IN.)		MAGNIFICATION = .016818 -6 GROUP LENGTH=12.88MM (.5072IN.)		MAGNIFICATION = .017311 -6 GROUP LENGTH=13.26MM (.5220IN.)							
GROUP	-5	-4	-3	-2	-1	GROUP	-5	-4	-3	-2	-1
E 1	1.0	2.0	4.0	8.0	16.0	E 1	0.9	1.8	3.6	7.2	14.4
E 2	1.3	2.6	5.2	10.4	20.8	E 2	1.0	2.0	4.1	8.1	16.2
M 3	1.8	3.6	7.2	14.4	28.7	M 3	1.1	2.3	4.5	9.1	18.2
E 4	2.4	4.8	9.6	19.1	38.1	E 4	1.3	2.6	5.1	10.2	20.4
M 5	3.2	6.4	12.8	25.5	51.0	M 5	1.4	2.9	5.7	11.4	22.9
T 6	4.2	8.4	16.8	33.6	67.1	T 6	1.6	3.1	6.2	12.5	25.0

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION - .017x10		MAGNIFICATION - .0183x0		MAGNIFICATION - .018877	
-6 GROUP LENGTH-13.049MM (.537IN.)		-6 GROUP LENGTH-14.049MM (.553IN.)		-6 GROUP LENGTH-14.460MM (.5693IN.)	
GROUP	MAGNIFICATION	GROUP	MAGNIFICATION	GROUP	MAGNIFICATION
E 1	1.0	1.0	1.0	1.0	1.0
E 2	1.1	1.1	1.1	1.1	1.1
M 3	1.2	1.2	1.2	1.2	1.2
E 4	1.3	1.3	1.3	1.3	1.3
N 5	1.4	1.4	1.4	1.4	1.4
T 6	1.5	1.5	1.5	1.5	1.5

MAGNIFICATION - .019x31		MAGNIFICATION - .020000		MAGNIFICATION - .020586	
-6 GROUP LENGTH-14.049MM (.548IN.)		-6 GROUP LENGTH-15.320MM (.603IN.)		-6 GROUP LENGTH-15.769MM (.6208IN.)	
GROUP	MAGNIFICATION	GROUP	MAGNIFICATION	GROUP	MAGNIFICATION
E 1	1.0	1.0	1.0	1.0	1.0
E 2	1.1	1.1	1.1	1.1	1.1
M 3	1.2	1.2	1.2	1.2	1.2
E 4	1.3	1.3	1.3	1.3	1.3
N 5	1.4	1.4	1.4	1.4	1.4
T 6	1.5	1.5	1.5	1.5	1.5

MAGNIFICATION - .021819		MAGNIFICATION - .021810		MAGNIFICATION - .022449	
-6 GROUP LENGTH-16.211MM (.634IN.)		-6 GROUP LENGTH-16.707MM (.6577IN.)		-6 GROUP LENGTH-17.196MM (.6770IN.)	
GROUP	MAGNIFICATION	GROUP	MAGNIFICATION	GROUP	MAGNIFICATION
E 1	1.0	1.0	1.0	1.0	1.0
E 2	1.1	1.1	1.1	1.1	1.1
M 3	1.2	1.2	1.2	1.2	1.2
E 4	1.3	1.3	1.3	1.3	1.3
N 5	1.4	1.4	1.4	1.4	1.4
T 6	1.5	1.5	1.5	1.5	1.5

MAGNIFICATION - .023107		MAGNIFICATION - .023784		MAGNIFICATION - .024481	
-6 GROUP LENGTH-17.200MM (.677IN.)		-6 GROUP LENGTH-18.219MM (.7173IN.)		-6 GROUP LENGTH-18.753MM (.7383IN.)	
GROUP	MAGNIFICATION	GROUP	MAGNIFICATION	GROUP	MAGNIFICATION
E 1	1.0	1.0	1.0	1.0	1.0
E 2	1.1	1.1	1.1	1.1	1.1
M 3	1.2	1.2	1.2	1.2	1.2
E 4	1.3	1.3	1.3	1.3	1.3
N 5	1.4	1.4	1.4	1.4	1.4
T 6	1.5	1.5	1.5	1.5	1.5

IMAGE PLANE RESOLUTION (LINES PER MILLIMETER)

MAGNIFICATION = .025198
 -A GROUP LENGTH=19.12MM (.759IN.)

MAGNIFICATION = .025937
 -A GROUP LENGTH=19.86MM (.7822IN.)

E	-5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
L 1	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
E 2	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
M 3	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
E 4	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
N 5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
T 6	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0

MAGNIFICATION = .027079
 -A GROUP LENGTH=21.79MM (.8617IN.)

MAGNIFICATION = .028284
 -A GROUP LENGTH=21.66MM (.8530IN.)

E	-5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
L 1	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
E 2	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
M 3	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
E 4	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
N 5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
T 6	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0

MAGNIFICATION = .027440
 -A GROUP LENGTH=22.45MM (.8835IN.)

MAGNIFICATION = .030844
 -A GROUP LENGTH=23.62MM (.9302IN.)

E	-5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
L 1	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
E 2	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
M 3	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
E 4	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
N 5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
T 6	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0

MAGNIFICATION = .032070
 -A GROUP LENGTH=25.42MM (.9984IN.)

MAGNIFICATION = .033636
 -A GROUP LENGTH=25.765MM (1.014IN.)

E	-5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
L 1	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
E 2	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
M 3	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
E 4	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
N 5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0
T 6	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0	21.0