

EHD0756 Monocular Zoom Objective for Digital Imaging



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1 Basic Knowledge about the New Principle Monocular Zoom Objective

1.1 Principle of EHD0756 Monocular Zoom Objective

The principle of the [EHD0756 Monocular Zoom Objective](#) is shown in Figure 1, which is based on the bilateral parallel light path.

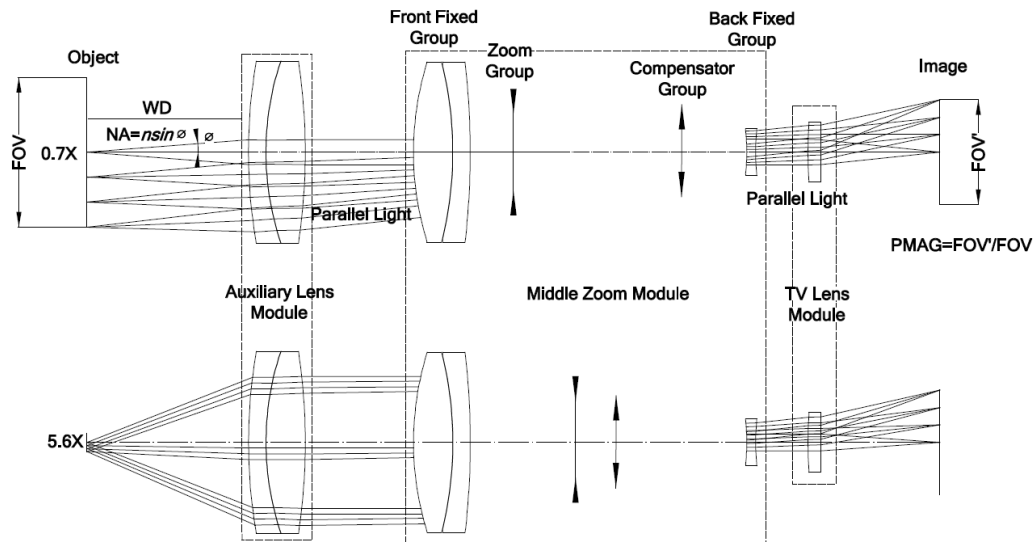


Figure 1 Optical Module of the EHD0756

A complete [EHD0756](#) optical system requires the following 3 main modules: [Auxiliary Lens Module](#), [Middle Zoom Module](#) and [TV Lens Module](#).

The [Object](#) with field size [FOV](#) (mm) is located on the [Auxiliary Lens Module](#)'s front focal plane. the [Object](#) radiated lights are collimated. These collimated lights then enter into the [Middle Zoom Module](#)'s [Front Fixed Group](#) and exit from the [Back Fixed Group](#) with modified [Parallel Light](#) angle. These [Parallel Lights](#) are then focused onto the [Image](#) plane to form the final magnified or reduced [Image](#) ([FOV'](#)). The [Zoom Group](#) and the [Compensator Group](#) are shown in Figure 1 with [Module Lens](#) style zooming the [Object](#).

The [Auxiliary Lens Module](#) defines the basic magnification of the zoom objective. [Auxiliary Lens](#) with smaller exit light angle has higher magnification ([Parallel Light](#) angle between different field). Its infinite optical structural design, in which the light between the [Auxiliary Lens Module](#) and [Middle Zoom Module](#), is "[Parallel Light](#)". Any lens with parallel designed structure can be attached to the [Middle Zoom Module](#) to achieve the required magnification. The modular structure facilitates the addition of different imaging and lighting accessories in the middle of the system ([Parallel Light](#) path) as required.

The [Middle Zoom Module](#) is the basic standard module which constitutes the main body of the zoom objective. The [Middle Zoom Module](#), including [Front Fixed Group](#), [Zoom Group](#), [Compensator Group](#) and [Back Fixed Group](#), receives the [Parallel Light](#) radiated from the [Auxiliary Lens Module](#) to form the newer [Parallel Light](#) with magnified or reduced angle in the exit end after the [Back Fixed Group](#).

The [TV Lens Module](#) receives the [Parallel Light](#) from the [Middle Zoom Module](#) and then focus

it to the sensor plane (**Image** plane) with standard C-Mount threading. User can configure different magnification of **TV Lens Module** compatible with different sensor size (**FOV'**).

The principle of the **Auxiliary Lens** is the same as that of the infinite microscope objective. The combination of the **Middle Zoom Module** and the **TV Lens Module** can be regarded as infinity microscope's **Tube Lens**.

The **Primary Magnification** (**PMAG**) of this system is the ratio of the **Field of View** (**FOV'**, the sensor image size) on the **Image** plane to the **Field of View** (**FOV**) on the object plane.

$$PMAG = \frac{FOV'[\text{or Sensor Size in mm}]}{FOV[\text{Object Size in mm}]}$$

Numerical Aperture (**NA**) refers to the cone of light that is made from a focusing lens and describes the light gathering capability of the lens (similar to $F/\#$). **NA** is defined by the following equation, where n is the index of refraction of the medium (often $n=1$ for air), and $\emptyset$ is the half angle of the cone of light exiting the lens pupil (See Figure 1). In **Zoom Objective**, **NA** can be expressed as:

$$NA = n \sin \emptyset$$

1.2 Possible Vignetting of the EHD0756 Monocular Zoom Objective

When the distance between the **Auxiliary Lens Module** and **Middle Zoom Lens Module** is increased in the lower **PMAG**, the light may be blocked at the edge of the **FOV**, this will reduce the **FOV** after the **Coaxial Light Module** is introduced into the **Parallel Light** path. Figure 2 shows the details for reference. Uneven illumination happens in the lower **PAG** with coaxial illumination when using the same image size camera. For the higher **PAG**, the uneven phenomena will not be very serious.

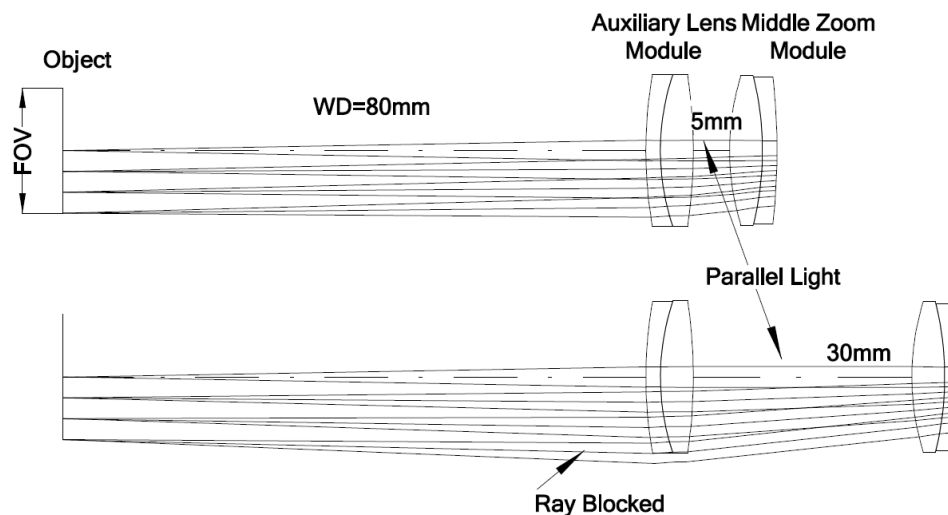


Figure 2 Ray Blocked by the Auxiliary Lens Module after the Distance between Auxiliary Lens Module and Middle Zoom Module is Extended from 5 mm to 30mm

1.3 The Optical Quality of the EHD0756 adopts semi-apochromatic parallel optical imaging system, and uses advanced multi-layer coating technology, which perfectly correct the imaging on the edge of field of view, get high-

resolution and high contrast images, and naturally restore the true colors of observed objects.

The MTF of EHD0756 with 1.0x [Auxiliary Lens](#) and 1.0x [TV Lens](#) at lower magnification 0.7X is shown in Figure 3. User can find the diffraction limited MTF is reached in the design.

The MTF of EHD0756 with 1.0x [Auxiliary Lens](#) and 1.0x [TV Lens](#) at higher 5.6X is shown in Figure 4. User can find the diffraction limited MTF is reached in the design.

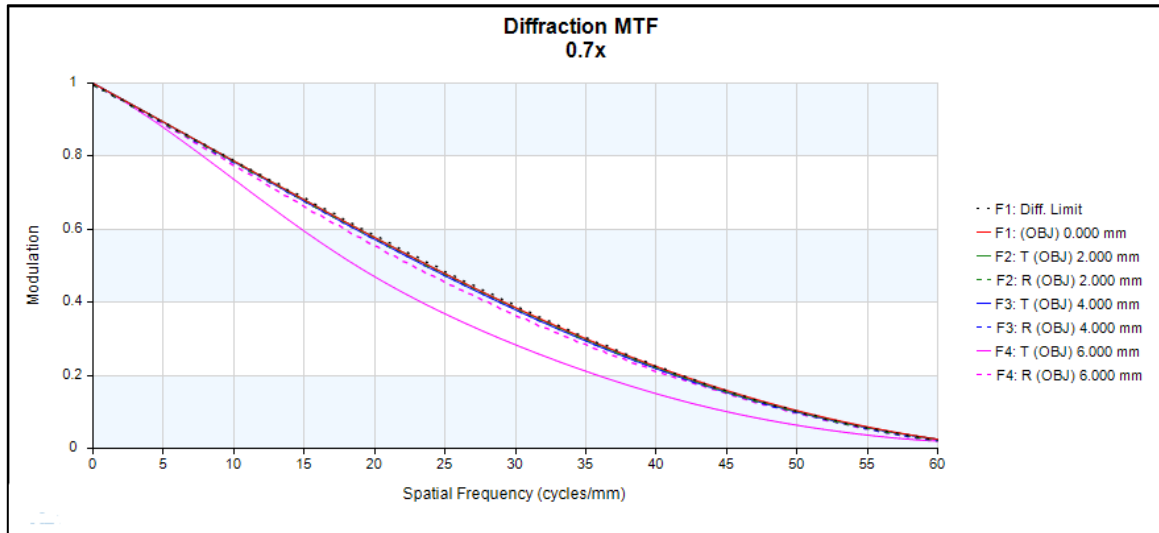


Figure 3 The MTF of EHD0756 at 0.7X PMAG

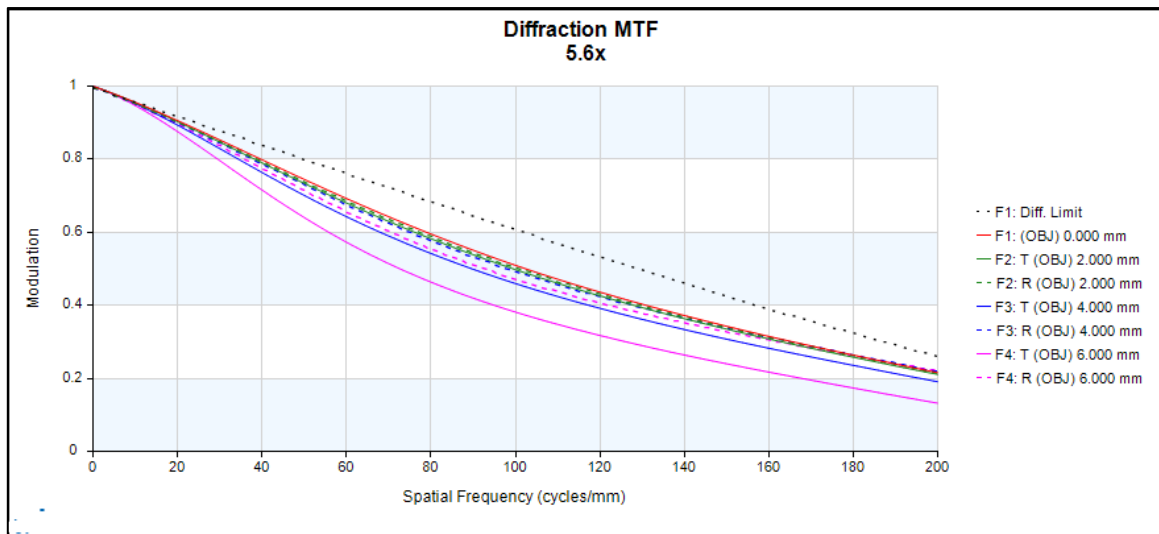


Figure 4 The MTF of EHD0756 at 5.6X PMAG

1.4 The Basic Characteristic of the Bilateral Parallel Light Path Zoom Objective

Because of the bilateral parallel light path characteristic, any lens satisfies the parallel light characteristic or outgoing parallel light with the required angle can be used as the [Auxiliary Lens](#). The larger the focal length for the [Auxiliary Lens](#), the longer the [Working Distance](#) and the lower the magnification for the [Zoom Objective](#).

Further, any lens designed to converge the parallel light to form an image on the sensor plane(also the back focal plane of the lens) can be used as the [TV Lens](#). Their focal lengths determine their specific magnifications. The larger the focal length, the larger the magnification for the [TV Lens](#).

The bilateral parallel light path enables us to insert optical elements into the parallel light path to realize new functions such as coaxial lighting and beam splitting without affecting the performance of the whole system.

Based on the above discussing, we can summarize the features of bilateral parallel light path **Zoom Objective** as follows;

1. With the bilateral parallel light path, **Auxiliary Lens** and **TV Lens** can be designed independently, which is convenient for system expansion
2. With the bilateral parallel light path, the zoom range and **Working Distance** can be obtained by switching the **Auxiliary Lens** with different focal length
3. With the bilateral parallel light path, the image size can be changed by switching **TV Lens** with different focal length to adapt with different sensor size
4. With the bilateral parallel light path, the optical reflective components can be inserted between **Auxiliary Lens** and the **Middle Zoom Lens Module** to realize coaxial illumination
5. With the bilateral parallel light path, the optical splitter can be inserted between the **Middle Zoom Lens Module** and the **TV Lens** to realize the image splitting
6. With the bilateral parallel light path, the whole system accuracy can be decreased without affecting the image quality
7. Bilateral parallel light path **Zoom Objective** has a very compact design, all functions are concentrated in a single tube. It is very suitable for the small installation space in modern equipment.

2 Features and Specification of EHD0756

2.1 The Extension of EHD0756

For applications that require different magnification, [Auxiliary Lens](#) or infinity objectives with different magnification can be attached to the front end of the [Middle Zoom Module](#).

For application that require different sensor size, [TV Lens](#) with different magnification can be attached to the back end of the [Middle Zoom Module](#).

The main body of [EHD0756](#) can realize continuous zoom. [Auxiliary Lens](#) with magnification [Wxxx](#) can form different zoom range. The [TV Lens](#) with magnification [TVyyy](#) determines the image sensor size (FOV'). Finally, with different [Bracket Adapter Module](#) [Azz](#), the naming paradigm can be written as:

EHD0756-Wxxx-TVyyy-Azz

For example, if the [Auxiliary Lens](#) and [TV Lens](#) with 1.0x magnifications are attached to the [EHD0756](#) and [50mm Bracket Adapter](#) is used, the final [Zoom Objective](#) can be named as

EHD0756-W100-TV100-A50

If the [Auxiliary Lens](#) and [TV Lens](#) with 0.75x and 0.50x magnifications are attached to the [EHD0756](#) and [45mm Bracket Adapter](#) is used, the final [Zoom Objective](#) can be named as

EHD0756-W075-TV050-A45

Current available [Wxxx](#) will be [W100](#), [W050](#), [W075](#), [W150](#) and [W200](#);

Current available [TVyyy](#) will be [TV100](#), [TV050](#), [TV075](#), [TV150](#) and [TV200](#);

Current available [Azz](#) will be [A50](#) and [A45](#);

The other [Auxiliary Lens](#) with [Wxxx](#), [TV Lens](#) with [TVyyy](#) magnification and [Bracket Adapter](#) with [Azz](#) size can be customized according to the requirements.

2.2 Feature of EHD0756

The basic module of [EHD0756](#) is [EHD0756-W100-TV100](#), it has 0.7X to 5.6X zoom range and [8X](#) zoom ratio. It is a high-quality precision [Monocular Zoom Objective](#) that provides high resolution and large depth of field.

Its main features are shown below:

1. Provide basic zoom objective EHD0756-W100-TV100 with 0.7X~5.6X zoom range
2. Large optical zoom ratio: 8X
3. Larger NA: 0.018-0.092 (When using 1x Auxiliary Lens)
4. Higher resolution: 18.6um-3.65um (When using 1x Auxiliary Lens)
5. Larger field of view: 0.99mm-31.74mm(Object plane)
6. Larger sensor size: 2/3" (When using 1x TV Lens)
7. Working distance: 37.5mm-160mm
8. Parfocal in zoom range
9. Compatible with infinity objectives (both biological and metallographic)

10. Compact size: 150 mm (length) ×40 mm (diameter)
11. Auxiliary Lens with 0.50x, 0.75x, 1.00x, 1.50x and 2.00x magnification(Optional)
12. TV Lens with 0.50x, 0.75x, 1.00x, 1.50x and 2.00x magnification(Optional)
13. Intensity adjustable LED Direct Ring Light (Optional)
14. Intensity adjustable LED Direct Ring Polarization Light (Optional)
15. Intensity adjustable LED coaxial illumination(Optional)
16. 45mm or 50mm Bracket Adapter(Optional)

The dimensions of EHD0756 with different light a) EHD0756 without light module; b) EHD0756 equipped with Direct Ring Light Module, c) EHD0756 equipped with Coaxial Light Module are showed in Figure 5. The length of EHD0756 is 150.3mm, it is much shorter than most of the Monocular Zoom Objective in the market.

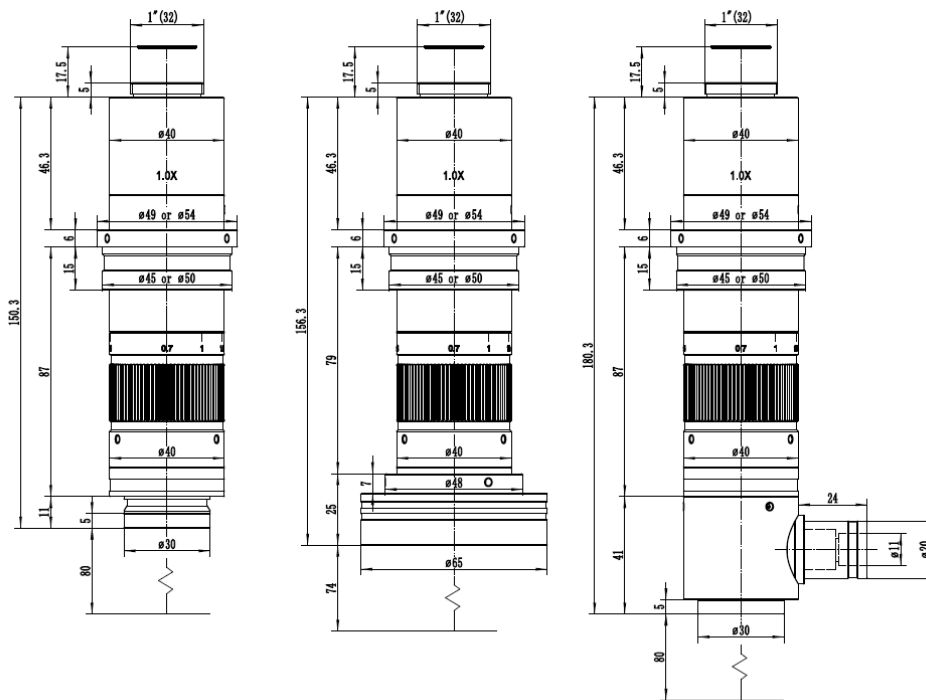


Figure 5 Dimensions of EHD0756 with different light a)EHD0756 without light module; b)EHD0756 equipped with Direct Ring Light Module, b)EHD0756 equipped with Coaxial Light Module)

2.3 Specifications of EHD0756

The specifications of EHD0756 with different Auxiliary Lens and TV Lens are shown in Table 1. Auxiliary Lens and TV Lens with 1.0x are listed in the left-up cell. Its data is the basis of the other parameters in the whole table.

Table 1 EHD0756-W100-TV100 and Its Extensions

Auxiliary Lens	Specs	TV Lens									
		1.0X(For 2/3" Sensors)		0.5X(For 1/3" Sensors)		0.75X(For 1/1.8" Sensors)		1.5X(For 1" Sensors)		2.0X(For 4/3" Sensors)	
		TV100		TV050		TV075		TV150		TV200	
		Low	High	Low	High	Low	High	Low	High	Low	High
	PMAG	0.70X~5.60X		0.35X~2.80X		0.53X~4.20X		1.05X~8.40X		1.40X~11.20X	

1.0X (80mm WD) W100	FOV	15.8mm	1.96mm	15.8mm	1.96mm	15.8mm	1.96mm	15.8mm	1.96mm	15.8mm	1.96mm
	NA	0.018	0.092	0.018	0.092	0.018	0.092	0.018	0.092	0.018	0.092
0.5X (160mm WD) W050	PMAG	0.35X~2.80X		0.18X~1.40X		0.26X~2.10X		0.53X~4.20X		0.70X~5.60X	
	FOV	31.74mm	3.93mm	31.74mm	3.93mm	31.74mm	3.93mm	31.74mm	3.93mm	31.74mm	3.93mm
	NA	0.009	0.046	0.009	0.046	0.009	0.046	0.009	0.046	0.009	0.046
0.75X (105mm WD) W075	PMAG	0.53X~4.20X		0.26X~2.10X		0.40X~3.15X		0.79X~6.30X		1.05X~8.40X	
	FOV	20.99mm	2.61mm	20.99mm	2.61mm	20.99mm	2.61mm	20.99mm	2.61mm	20.99mm	2.61mm
	NA	0.013	0.069	0.013	0.069	0.013	0.069	0.013	0.069	0.013	0.069
1.5X (51.5mm WD) W150	PMAG	1.05X~8.40X		0.53X~4.20X		0.79X~6.30X		1.58X~12.60X		2.10X~16.80X	
	FOV	10.46mm	1.31mm	10.46mm	1.31mm	10.46mm	1.31mm	10.46mm	1.31mm	10.46mm	1.31mm
	NA	0.026	0.138	0.026	0.138	0.026	0.138	0.026	0.138	0.026	0.138
2.0X (37.5mm WD) W200	PMAG	1.40X~11.20X		0.70X~5.60X		1.05X~8.40X		2.10X~16.80X		2.80X~22.40X	
	FOV	7.90mm	1.00mm	7.90mm	0.99mm	7.90mm	0.99mm	7.90mm	0.99mm	7.90mm	0.99mm
	NA	0.035	0.182	0.035	0.182	0.035	0.182	0.035	0.182	0.035	0.182
Remarks	When using coaxial lighting, low magnification may produce vignetting. When using infinity objectives as Auxiliary Lens Module (adapter available), the PMAG、FOV and NA of the EHD0756 depends on the parameters of the objectives.										

WD: Working Distance;

PMAG: Primary Magnification;

FOV: Field of View in the Object side;

NA: Numerical Aperture;

Note: Infinity corrected objectives limit system's usable zoom range due to uneven illumination.

Max sensor format is 2/3".



Figure 6 EHD0756-W100-TV050, EHD0756-W100-TV075 and TZM0756W100-TV100 (W100 indicates that EHD0756 is equipped with 1x auxiliary objective, TV050 is 0.5x TV lens, TV075 is 0.75x TV lens, and TV100 is 1.0x TV lens.)

Figure 6 shows EHD0756-W100-TV050-A45, EHD0756-W100-TV075-A45 and TZM0756W100-TV100-A45 photo (W100 indicates that EHD0756 is equipped with 1x auxiliary objective, TV050 is 0.5x TV lens, TV075 is 0.75x TV lens, and TV100 is 1.0x TV lens. It is not

difficult to find that the length of TV lens increases with the increase of TV lens magnification).

2.4 Application of EHD0756 is an ideal choice for most applications that require multiple magnifications or for those that prohibit continual manual refocusing. The applications of the EHD0756 are:

1. Machine vision
2. Small details inspection
3. Industrial inspection especially electronic components
4. Scientific research
5. Medical industry
6. Education industry

3 Available Function Modules of EHD0756

3.1 How to Configure EHD0756 Monocular Zoom Objective

1. Confirm the possible range of 1) **FOV** and 2) **Working Distance** in the object space to choose the **Auxiliary Lens**
2. Choose the M26x0.705 to M20x0.705 Objective Adapter, if the M20x0.705 infinity objective is used.;
3. Confirm the camera **Image Area Size**, it can be 1) **Sensor Size** (1/x in inch), 2) **Image Diagonal Length**, 3) **Image Width** or 4) **Image Height** to choose the **TV Lens**;
4. Choose the 45mm or 50 mm adapter according to the diameter of the hole in the bracket
5. Choose the **LED Direct Ring Light Module** for the reflective illumination
6. Choose the **Coaxial Light Module** if coaxial illumination is required
7. Choose the **Transmissive Light Module** if transmissive illumination is required
8. Choose the **Camera Module**

3.2 Configuration of EHD0756

The available component descriptions are listed in Table 2, user can choose any part from the table.

Table 2 EHD0756's Accessories and Its Functions

Module	Order Number	Description
Auxiliary Lens Module	TZM0756W050	0.50x Object Lens
	TZM0756W075	0.75x Object Lens
	TZM0756W100	1.0x Object Lens
	TZM0756W150	1.5x Object Lens
	TZM0756W200	2.0x Object Lens
	ON-XX	Biological Objective
	ON-YY	Metallographic Objective
	Objective Adapter	M26x0.706 to M20x0.706
Middle Zoom Module	EHD0756	The main body of EHD0756
TV Lens Module	TZM0756TV040+TZM0756CAT040	0.4XTV Lens+0.4X Camera Adapter Tube
	TZM0756TV050+TZM0756CAT050	0.5XTV Lens+0.5X Camera Adapter Tube
	TZM0756TV075+TZM0756CAT075	0.75X TV Lens+0.75X Camera Adapter Tube
	TZM0756TV100+TZM0756CAT100	1.0XTV Lens+1.0X Camera Adapter Tube
	TZM0756TV150+TZM0756CAT150	1.5X TV Lens+1.5X Camera Adapter Tube
	TZM0756TV200+TZM0756CAT200	2.0XTV Lens+2.0X Camera Adapter Tube
Coaxial Light Module	TZM0756CL+TZM0756SL	Coaxial Light Adapter + LED Spot Light
LED Direct Ring Light Module	TZM0756DRL	LED Direct Ring Light
	TZM0756DRPL	LED Direct Ring Polarization Light
Transmissive Light Module	TZM0756TL	LED Transmissive Light
Bracket Adapter	TZM0756A45	45mm Bracket Adapter
	TZM0756A50	50mm Bracket Adapter

Power of light source	40600014	POWER-U-12V1A(MSA-C1000IC12.0-12H-US), Power Adapter American Standard
	40600015	POWER-E-12V1A(MSA-C1000IC12.0-12W-DE) Power Adapter European standard

Figure 7 describes the basic configurable blocks and the corresponding components of EHD0756. The EHD0756 main body consists of Auxiliary Lens Module, Middle Zoom Module and TV Lens Module.

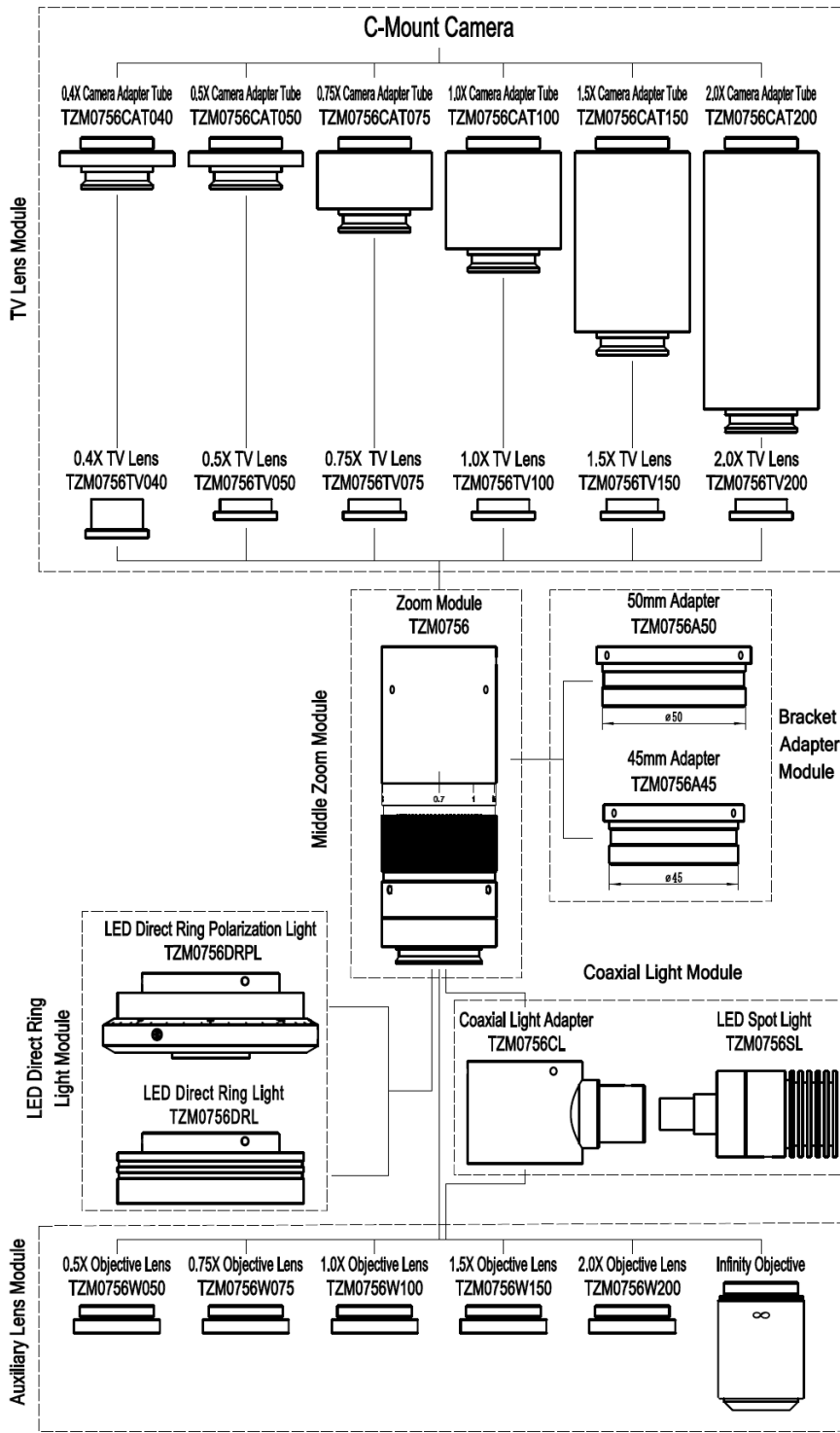


Figure 7 The Basic and Optional Modules of the Monocular Zoom Objective

These 3 modules comprise the main **Monocular Zoom Objective**. User can choose different **Auxiliary Lens** and **TV Lens** to satisfy the specific requirement.

To get good illumination and ensure the image quality, **LED Direct Ring Light Module** (Optional) or **Coaxial Light Module** (Optional) should be chosen according to the application.

To get good and stable support, the **Bracket Adapter Module** should be carefully chosen.

Finally, to form the **Video Monocular Zoom Objective**, **Camera Module** (Optional) should be chosen.

The **Adapter Rings** and their relationship with the **Bracket** are shown in Figure 8.

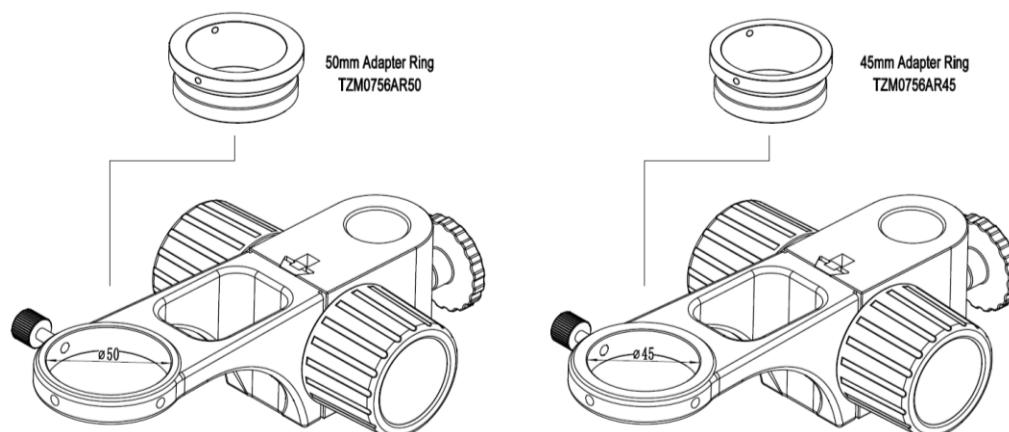


Figure 8 EHD0756 Adapter Ring for the Bracket

The **Direct Ring Light**, **Direct Ring Polarization Light** and the **Coaxial Light** are shown in Figure 9, Figure 10 and Figure 11 respectively.



Figure 9 TZM0756DRL, LED Direct Ring Light. Its interface matches with EHD0756



Figure 10 TZM0756DRPL, LED Direct Ring Polarization Light. Its interface matches with EHD0756



Figure 11 TzM0756CL(Coaxial Light Adapter)+TzM0756SL(LED Spot Light)

4 Connection between EHD0756 and Camera



Figure 12 EHD0756-W100-TV050+TZM0756DRL(LED Direct Ring Light Module)+HDMI Camera



Figure 13 EHD0756-W100-TV050+TZM0756DRPL(LED Direct Ring Polarization Light)+HDMI Camera



Figure 14 EHD0756-W100-TV050+TzM0756CL+ TzM0756SL(Coaxial Light Module)+ HDMI Camera



Figure 15 EHD0756-W100-TV050+TzM0756DRL(LED Direct Ring Light)+USB CMOS Camera



Figure 16 EHD0756-W100-TV050+TZM0756DRPL(LED Direct Ring Polarization Light)+USB CMOS Camera



Figure 17 EHD0756-W100-TV050+TZM0756CL+TZM0756SL(Coaxial Light Module)+ USB CMOS Camera

5 Pictures Taken by EHD0756 under Different Light Illuminations

Figure 18 are pictures of coins taken by TZM0756W100-TV05 under left) LED Direct Ring Light Illumination; middle) LED Direct Ring Polarization Light Illumination; right) Coaxial Light Illumination.



Figure 18 From left to right, there are three pictures of coins taken under left) LED Direct Ring Light Illumination; middle) LED Direct Ring Polarization Light Illumination; right) Coaxial Light Illumination

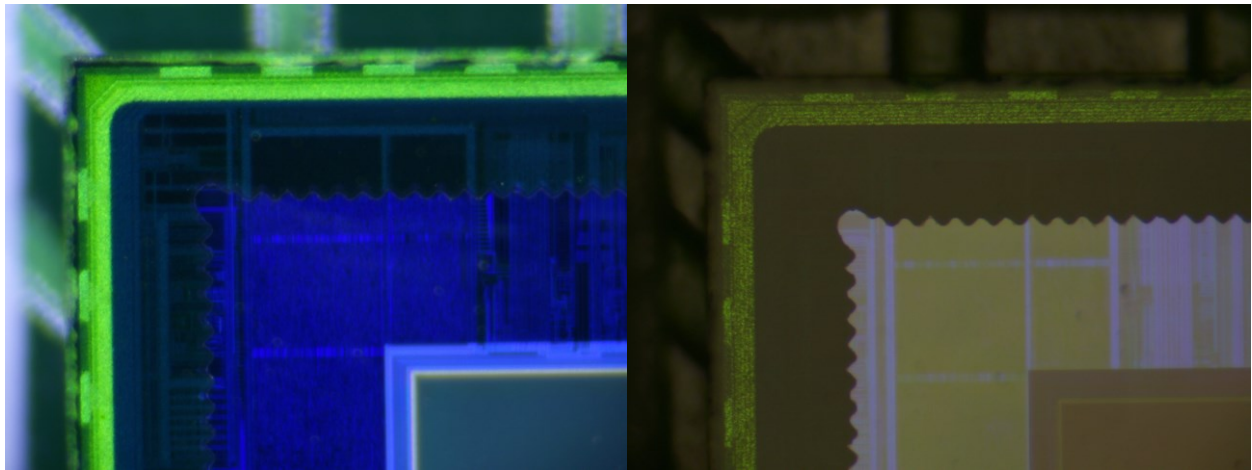


Figure 19 Pictures of CMOS image sensor taken with EHD0756 under LED Direct Ring Light Illumination and Coaxial Light Illumination(5.6X PMAG)

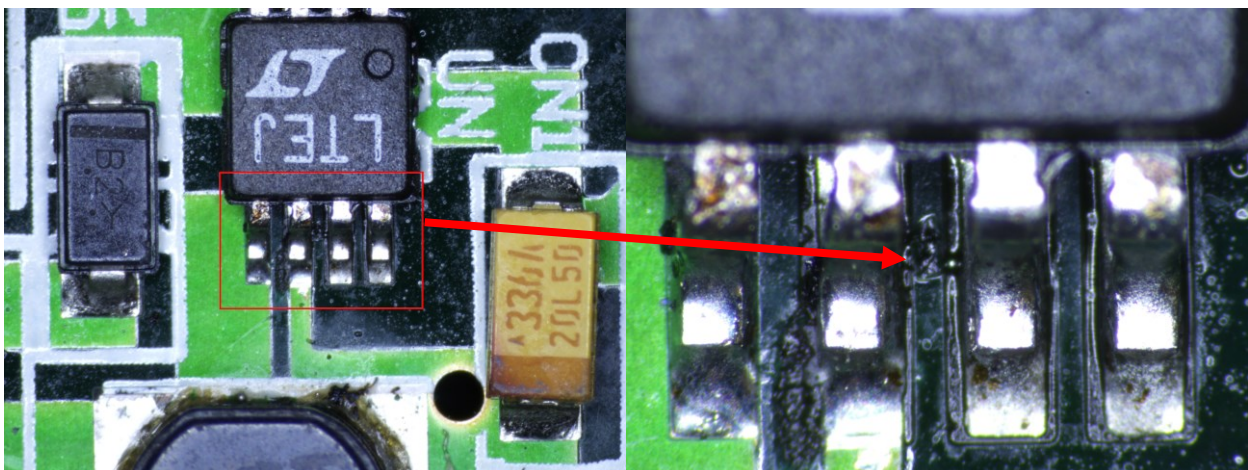


Figure 20 Picture of circuit board taken by EHD0756 under LED Direct Ring Light Illumination, when shooting the left picture, the magnification of EHD0756 is 0.7X, and when shooting the right picture, the magnification of EHD0756 is 2.5X

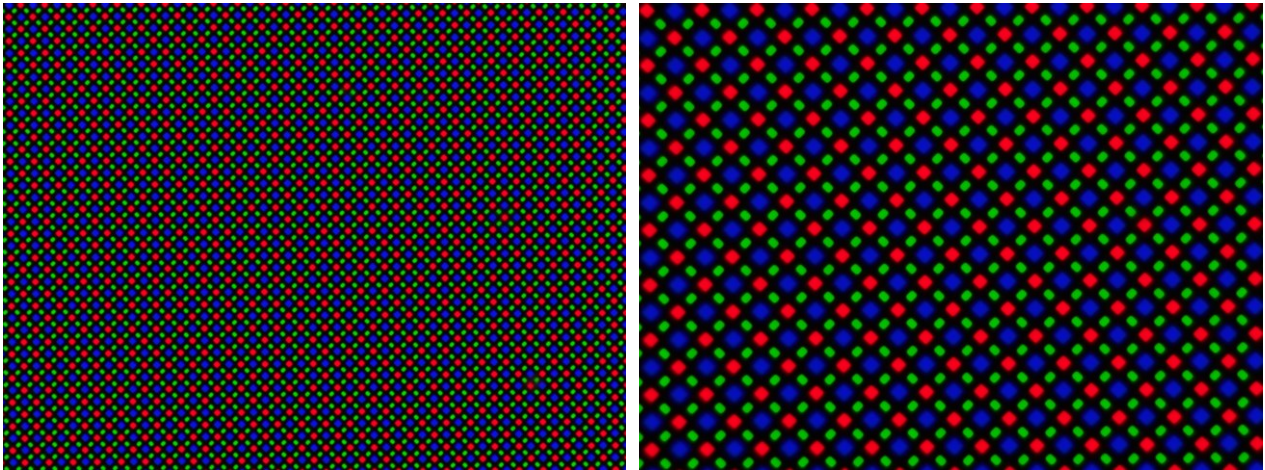


Figure 21 Mobile phone pixels taken by EHD0756, under 2.5X PMAG and 5.6X PMAG

6 EHD0756 Packing List

The package information of [EHD0756](#) is as follows:



Figure 22 EHD0756 Main Body, including Auxiliary Lens Module, Middle Zoom Module, TV Lens, Camera Adapter Tube and Bracket Adapter

The package information of [TzM0756DRL](#) is as follows:



Figure 23 TzM0756DRL, including LED Direct Ring Light and Power Adapter

The package information of [TzM0756DRPL](#) is as follows:



Figure 24 TzM0756DRPL, including LED Direct Ring Polarization Light and Power Adapter

The package information of [Coaxial Light Module](#) is as follows:



Figure 25 EHD0756 Coaxial Light Module, including TSM0756CL(Coaxial Light Adapter), TSM0756SL(LED Spot Light) and Power Adapter

7 Model List of EHD0756

Table 3 list the possible combination of the EHD0756 with Auxiliary Lens and TV Lens. Users can quickly decide the model they need to purchase according to their existing cameras, the required Working Distance(WD), the Primary Magnification(PMAG) or the diagonal field of view(FOV) of the observation object.

Table 3 Model of EHD0756

Camera Size	EHD0756 Model	WD(mm)	Zoom Range	FOV(mm)	NA
1/3"	EHD0756-W050-TV050	160	0.18X-1.40X	31.74-3.93	0.009-0.046
	EHD0756-W075-TV050	105	0.26X-2.10X	20.99-2.61	0.013-0.069
	EHD0756-W100-TV050	80	0.35X-2.80X	15.80-1.96	0.018-0.092
	EHD0756-W150-TV050	52	0.53X-4.20X	10.46-1.31	0.026-0.138
	EHD0756-W200-TV050	38	0.70X-5.60X	7.90-0.99	0.035-0.182
1/1.8"	EHD0756-W050-TV075	160	0.26X-2.10X	31.74-3.93	0.009-0.046
	EHD0756-W075-TV075	105	0.40X-3.15X	20.99-2.61	0.013-0.069
	EHD0756-W100-TV075	80	0.53X-4.20X	15.80-1.96	0.018-0.092
	EHD0756-W150-TV075	52	0.79X-6.30X	10.46-1.31	0.026-0.138
	EHD0756-W200-TV075	38	1.05X-8.40X	7.90-0.99	0.035-0.182
2/3"	EHD0756-W050-TV100	160	0.35X-2.80X	31.74-3.93	0.009-0.046
	EHD0756-W075-TV100	105	0.53X-4.20X	20.99-2.61	0.013-0.069
	EHD0756-W100-TV100	80	0.70X-5.60X	15.80-1.96	0.018-0.092
	EHD0756-W150-TV100	52	1.05X-8.40X	10.46-1.31	0.026-0.138
	EHD0756-W200-TV100	38	1.40X-11.2X	7.90-0.99	0.035-0.182
1"	EHD0756-W050-TV150	160	0.53X-4.20X	31.74-3.93	0.009-0.046
	EHD0756-W075-TV150	105	0.79X-6.30X	20.99-2.61	0.013-0.069
	EHD0756-W100-TV150	80	1.05X-8.40X	15.80-1.96	0.018-0.092
	EHD0756-W150-TV150	52	1.58X-12.6X	10.46-1.31	0.026-0.138
	EHD0756-W200-TV150	38	2.10X-16.8X	7.90-0.99	0.035-0.182
4/3"	EHD0756-W050-TV200	160	0.70X-5.60X	31.74-3.93	0.009-0.046
	EHD0756-W075-TV200	105	1.05X-8.40X	20.99-2.61	0.013-0.069
	EHD0756-W100-TV200	80	1.40X-11.2X	15.80-1.96	0.018-0.092
	EHD0756-W150-TV200	52	2.10X-16.8X	10.46-1.31	0.026-0.138
	EHD0756-W200-TV200	38	2.80X-22.4X	7.90-0.99	0.035-0.182

The Working Distance of EHD0756 decreases with the increase of the magnification of the Auxiliary Lens, and its object NA or Zoom Range increases with the increase of the magnification of the Auxiliary Lens. Therefore, the Auxiliary Lens can be selected according to the Working Distance or Zoom Range (The real Zoom Range is also determined by the Auxiliary Lens).

The core of choosing TV Lens with different magnification is to match your own camera. From the table's Zoom Range column, one can find with the increase of TV Lens' magnification, the Zoom Range of the system increases in the same proportion, but it will not have a great effect on the optical resolution. In order to save money, it is recommended to choose a small size camera, such as 1/3" camera.

Of course, in order to improve the signal-to-noise ratio or imaging quality of the camera, one can also choose a large size camera. Large size often means large pixel size, while large pixel size often means large dynamic range and high signal-to-noise ratio.

EHD imaging GmbH
Zum Rennplatz 15
49401 Damme/Germany
Phone: +49-5491-2090
Fax: +49-5491-2098
web: www.ehd.de
e-mail: info@ehdimaging.de

