

TZM0480 Series Monocular Zoom Objective (MZO)



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1 The Basic Characteristic of TzM0480 Series MZO

1.1 Introduction of TzM0480 Series MZO

TzM0480 series MZO (Monocular Zoom Objective) is an ideal choice for machine vision, industrial inspection, scientific research and education. The design is based on the bilateral parallel light path principle and the modular design concept, with superior optical performance and strong compatibility.



Figure 1 TzM0480 with different module

1.2 The Modular Design of TzM0480 Series MZO

The modular design of TzM0480 series MZO is showed in Figure 2. The design consists of five basic modules, including Middle Zoom Module, Auxiliary Lens Module, TV Lens Module, Bracket Adapter Module and Optional Module.

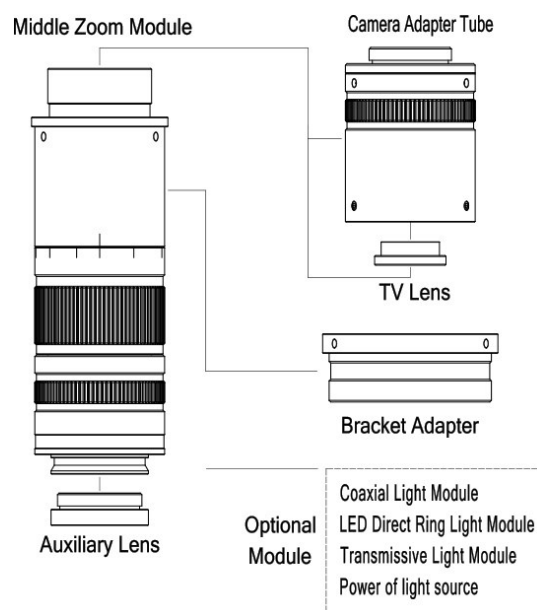


Figure 2 The five basic modules of TzM0480 series MZO.

1.3 The Nomenclature of TZM0480 Series MZO

Because of TZM0480 series MZO's modular design, each module of TZM0480 series MZO is named respectively. The specific naming rules and corresponding parameters of each module are as follows:

1.3.1 Module One: Middle Zoom Module

The Middle Zoom Module (code TZM0480a), which is the main body of TZM0480 series MZO. TZM0480 represents the code of Middle Zoom Module and letter a represents the auxiliary code of Middle Zoom Module. Details are listed in Table 1.

Table 1 The order number and function of the Middle Zoom Module

Order Number	Meaning	TZM0480	Postfix meaning
TZM0480	Ordinary Middle Zoom Module	ZM: Zoom	NA
TZM0480D	Middle Zoom Module with detent to fix the magnification function	0480: 0.4X~8.0X	D: Detent

1.3.2 Module Two: Auxiliary Lens Module

The replaceable Auxiliary Lens (code W3bbb), which can be threaded to the bottom of the Middle Zoom Module, here 3 is the series number, bbb represents the magnification of Auxiliary Lens. Different magnification of Auxiliary Lens defines the entire magnification of TZM0480 series MZO, resulting different working distance as well. For example, W3100 Auxiliary Lens with 1.00x magnification reaches 86mm working distance, while W3050 Auxiliary Lens will have a reduced magnification to half and the working distance will be extended to about 174mm. Auxiliary Lens and its corresponding optical parameters for TZM0480 are shown in Table 2.

Table 2 The order number and optical parameters of Auxiliary Lens

Order number	Magnification	Working distance (mmm)
W3050	0.50X	174
W3075	0.75X	115
W3100	1.00X	86

Note: The same Auxiliary Lens with different TV lens is just used to adapt to different size image sensor, which will not have much impact on the field of view of the MZO.

1.3.3 Module Three: TV Lens

The TV Lens (code TV3ccc), which can be threaded to the top of the Middle Zoom Module, here 3 is the series number, ccc is the magnification of the TV Lens. TV Lens with different magnification is used to adapt to sensors with different size. For example, the same field of view could be obtained when TV3100 is used with a 2/3" size sensor and TV3050 is used with a 1/3" size sensor. TV Lens and its corresponding optical parameters are shown in Table 3.

Table 3 The order number and optical parameters of TV Lens

Order number	Magnification	The maximum compatible sensor size
TV3050	0.50X	1/3"
TV3075	0.75X	1/1.8"
TV3100	1.00X	2/3"

Note: Smaller image sensors can also be used for TV Lens with higher magnification, but in this way, the FOV of MZO will be reduced.

1.3.4 Module Four: Bracket Adapter

Bracket Adapter (code **Add**) used for brackets with different mounting apertures and is sheathed in the middle of **MZO**. **dd** is the diameter of the bracket. Current available **Adds** include **A50** and **A45**. The installation method of the **Bracket Adapter** and bracket is shown in Figure 3.

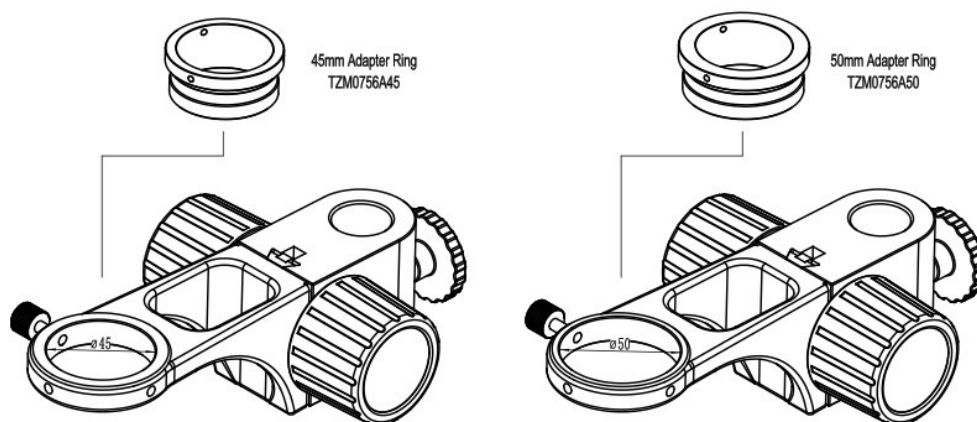


Figure 3 TZM0480 series' Bracket Adapter

1.3.5 Module Five: The Optional Module

The **Optional Modules** include **LED Direct Ring Light Module** (including **LED Direct Ring Light Module** and **LED Direct Ring Polarization Light Module**) and **Coaxial Light Module** (composed of **Coaxial Light Adapter** and **LED Spot Light**). The currently possible samples are shown in Table 4.

Table 4 The Optional Module: Light source module for TZM0480 series MZO

Module	Order Number	Description
Coaxial Light Module	TZM0756CL+TZM0756SL	Coaxial Light Adapter + LED Spot Light
LED Direct Ring Light Module	TZM0756DRL	LED Direct Ring Light (65mm outer diameter)
	TZM0756DRL-85	LED Direct Ring Light (85mm outer diameter)
	TZM0756DRPL	LED Direct Ring Polarization Light
Transmissive Light Module	TZM0756TL	LED Transmissive Light
Power of light source	40600014	US:POWER-U-12V1A(Power Adapter American Standard)
	40600015	DE: POWER-E-12V1A(Power Adapter European standard)

1.3.6 The Nomenclature of TZM0480 Series MZO

We have a special naming format for **TZM0480** series MZO, we name **TZM0480** series products with a series module code, which is a combination of code of different modules and connected with crossbar “-” to form a comprehensive naming. With this paradigm, user can understand the meaning and function briefly. For example, if a MZO is composed of **Middle Zoom Module TZM0480D**, **Auxiliary Lens W3100**(1.00x), **TV Lens TV3050**(0.5x) and 50mm **Bracket Adapter A50**, the final MZO can be expressed as:

TZM0480D-W3100-TV3050-A50

Currently available **TZM0480a**: **TZM0480**, **TZM0480D** (**D** represents Detent);

Currently available **W3bbb**: **W3100**, **W3050**, **W3075**;

Currently available **TV3ccc**: **TV3100**, **TV3050**, **TV3075**;

Currently available Add: A50 and A45;

Currently available Optional Modules are LED Direct Ring Light Module (including LED Direct Ring Light Module and LED Direct Ring Polarization Light Module) and Coaxial Light Module (composed of Coaxial Light Adapter and LED Spot Light).

The other Auxiliary Lens with **b.bb** magnification, TV Lens with **c.cc** magnification and Bracket Adapter with **dd mm** size can be customized according to the requirements.

1.3.7 The Configuration of TZM0480 with Five Modules

TZM0480 series MZO can be combined with Camera Module (optional) to form a digital monocular zoom microscope.

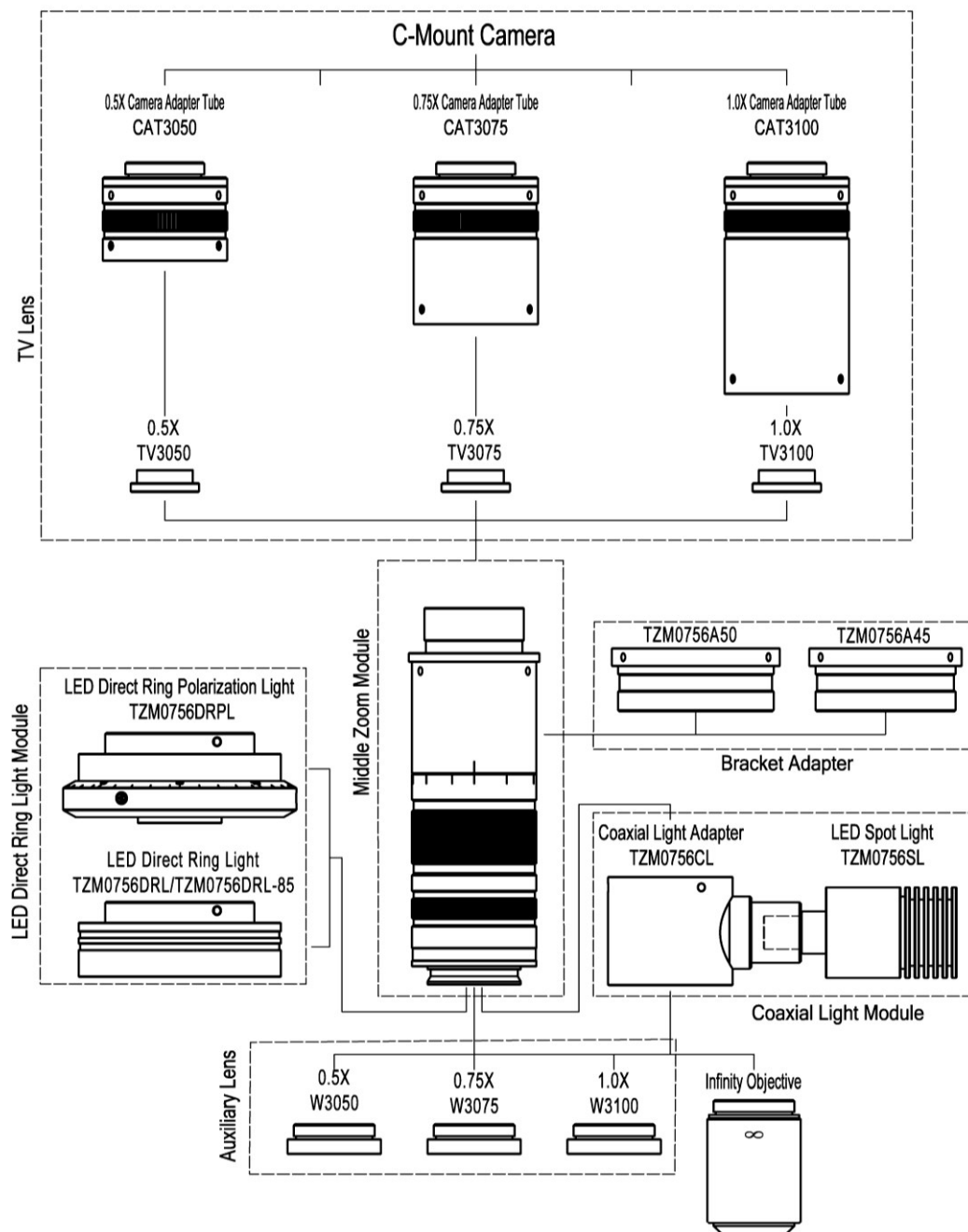


Figure 4 The Five Modules and TZM0480 MZO

1.4 The Basic Characteristics of TZM0480 Series MZO

The basic module of **TZM0480** series monocular zoom object is **TZM0480-W3100-TV3100-A50**. Its main features are shown below:

- With 0.4X~8.0X zoom range, 20X zoom ratio
- Larger NA: 0.01-0.12 (When using 1.00x **Auxiliary Lens**)
- Higher resolution: 27.5um-2.3um (When using 1.00x **Auxiliary Lens**)
- Larger field of view: 1.5mm-60mm (Object plane)
- Larger sensor size: 2/3" (When using 1.00x **TV Lens**)
- Working distance range: 86mm-174mm
- With adjustable BFL, parfocal in zoom range
- With adjustable center, the image center remains unchanged from 8.0x to 0.4x
- Compatible with infinity objectives (both biological and metallographic)
- Compact size: 194 mm (length) × 40 mm (diameter)
- **Auxiliary Lens** with 0.50x, 0.75x, 1.00x magnification (Optional)
- **TV Lens** with 0.50x, 0.75x, 1.00x magnification (Optional)
- Brightness adjustable **LED Direct Ring Light** (Optional)
- Brightness adjustable **LED Direct Ring Polarization Light** (Optional)
- Brightness adjustable **LED coaxial illumination** (Optional)
- **LED Transmissive Light** (Optional)
- 45mm or 50mm **Bracket Adapter** (Optional)

1.5 The Optical Specifications of TZM0480 with Different Auxiliary Lens and TV Lens

The optical specifications of **TZM0480** with different **Auxiliary Lens** and **TV Lens** are shown in Table 5. **Auxiliary Lens** and **TV Lens** with 1.00x are listed in the left-up cell. Its data is the basis of the other parameters in the whole table.

Table 5 TZM0480-W3100-TV3100 and its extensions

Auxiliary Lens	Specification	TV3100 2/3"(D=11mm)		TV3050 1/3"(D=6mm)		TV3075 1/2"(D=8mm)	
W3100 WD 86mm	PMAG	0.40-8.00		0.20-4.00		0.30-6.00	
	DFOV/mm	27.50	1.38	30.00	1.50	26.67	1.33
	NA	0.010	0.112	0.010	0.112	0.010	0.112
W3050 WD 174mm	PMAG	0.20-4.00		0.10-2.00		0.15-3.00	
	DFOV/mm	55.00	2.75	60.00	3.00	53.33	2.67
	NA	0.005	0.056	0.005	0.056	0.005	0.056
W3075 WD 115mm	PMAG	0.30-6.00		0.15-3.00		0.23-4.50	
	DFOV/mm	36.67	1.83	40.00	2.00	35.56	1.78
	NA	0.008	0.084	0.008	0.084	0.008	0.084

WD: Working Distance;

PMAG: Primary Magnification;

FOV: Field of View in the object side;

NA: Numerical Aperture;

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

1.6 The Dimension of TZM0480 Series MZO

The dimension of TZM0480 series MZO with different Auxiliary Lens and TV Lens are shown in Figure 5. The length of the MZO with different TV Lens will be slightly different. The length of TZM0480-W3100-TV3100-A50 is 194mm.

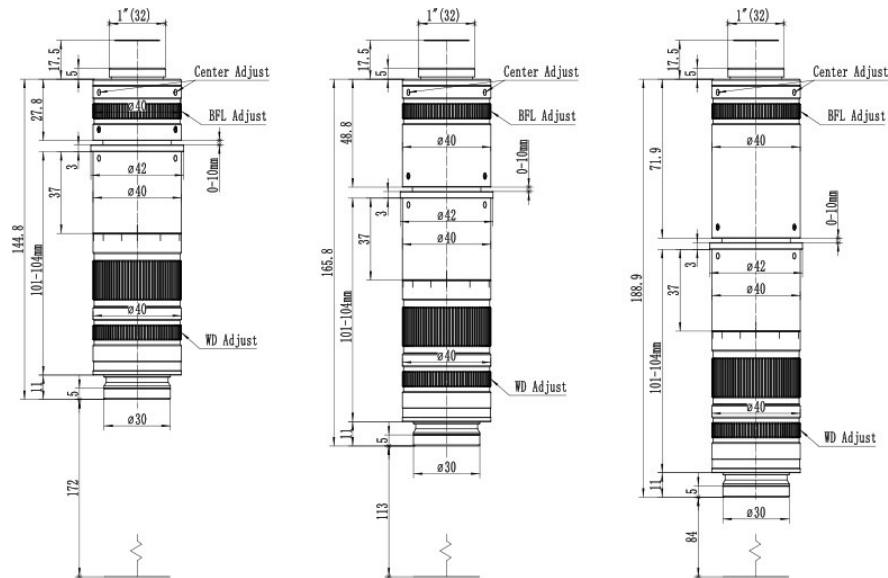


Figure 5 Dimension of TZM0480 series MZO with different Auxiliary Lens and TV Lens

a) TZM0480-W3050-TV3050; b) TZM0480-W3075-TV3075 c) TZM0480-W3100-TV3100

The dimensions of TZM0480-W3100-TV3100-A50 with different light are shown in Figure 6.

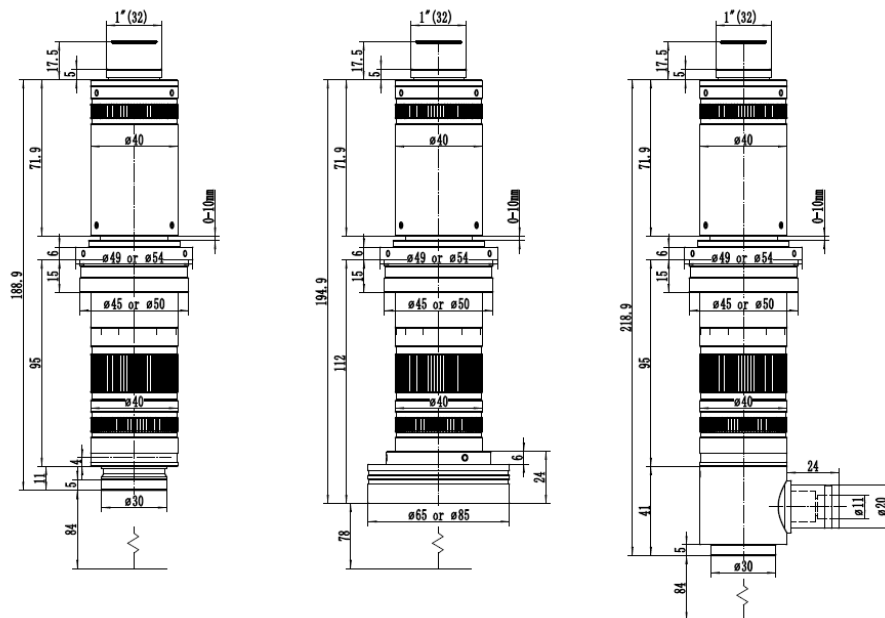


Figure 6 Dimensions of TZM0480-W3100-TV3100-A50 with different light module

a) TZM0480-W3100-TV3100-A50 without light module,

b) TZM0480-W3100-TV3100-A50 equipped with Direct Ring Light Module,

c) TZM0480-W3100-TV3100-A50 equipped with Coaxial Light Module

1.7 How to Configure TZM0480 Series MZO

The corresponding parameters of TZM0480 series MZO are listed in Table 6. A specific combination can be determined according to the following steps.

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 right TV Lens.
4. Choose the 45mm or 50 mm adapter according to the diameter of the bracket hole diameter .
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.

Table 6 The combinations of different the Auxiliary Lens, The Middle Zoom Module and the TV Lens. With this figure, user can configure Monocular Zoom Objective with different magnification to fit different sensor and different application

Camera	Auxiliary Lens-Main Zoom Module-TV Lens	WD(mm)	PMAG	DFOV(mm)	NAO
1/3inch	TZM0480- W3050-TV3050	174	0.1X-2.0X	60.00-3.00	0.005-0.056
	TZM0480- W3075-TV3050	115	0.15X-3.0X	40.00-2.00	0.008-0.084
	TZM0480- W3100-TV3050	86	0.2X-4.0X	30.00-1.50	0.010-0.112
1/2inch	TZM0480- W3050-TV3075	174	0.15X-3.0X	53.33-2.67	0.005-0.056
	TZM0480- W3075-TV3075	115	0.23X-4.5X	35.56-1.78	0.008-0.084
	TZM0480- W3100-TV3075	86	0.3X-6.0X	26.67-1.33	0.010-0.112
2/3inch	TZM0480- W3050-TV3100	174	0.2X-4.0X	55.00-2.75	0.005-0.056
	TZM0480- W3075-TV3100	115	0.3X-6.0X	36.67-1.83	0.008-0.084
	TZM0480- W3100-TV3100	86	0.4X-8.0X	27.50-1.38	0.010-0.112

2 The Connection of TZM0480 Series MZO and Camera



Figure 7 TZM0480-W3100- TV3050+TZM0756DRL (LED Direct Ring Light Module)+
HDMI Camera XCAMLite1080P A(Circular)+TPS-20A+SCRN

3 Pictures Taken with TZM0480 Series MZO

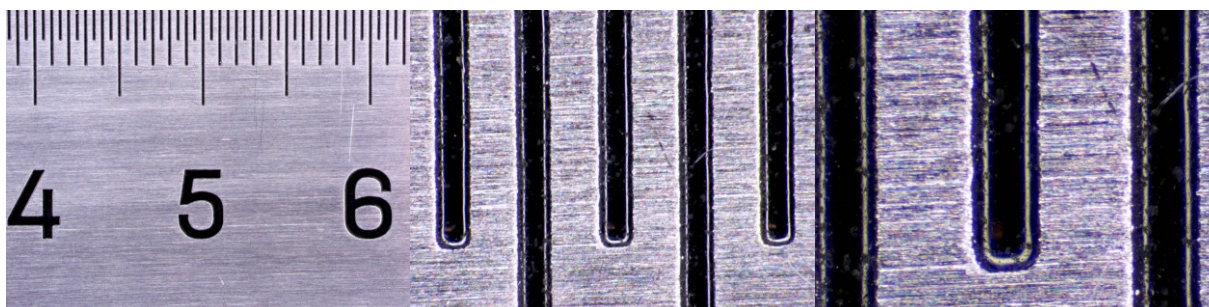


Figure 8 Pictures of steel ruler taken with TZM0480-W3100-TV3050 under LED Direct Ring Light illumination
left) 0.4X, middle) 4.0X, right)8.0X

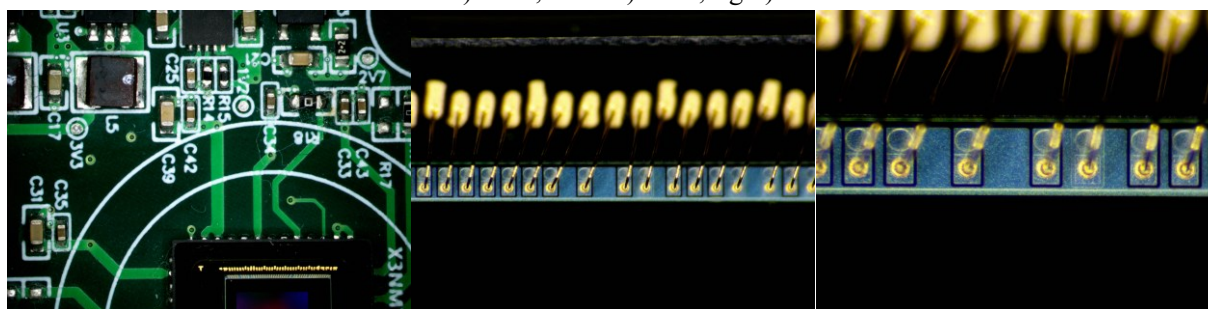


Figure 9 Pictures of Circuit board taken with TZM0480-W3100-TV3050
left) 0.4X, middle) 4.0X, right) 8.0X

4 TZM0480 Series MZO Packing List

The packing information of the [TZM0480](#) series MZO is as follows:



Figure 10 The TZM0480 Main Body, including Auxiliary Lens Module, Middle Zoom Module, TV Lens, Camera Adapter Tube and Bracket Adapter

The packing information of [TZM0756DRL](#) is as follows:



Figure 11 TZM0756DRL, including LED Direct Ring Light and Power Adapter

The packing information of [TZM0756DRPL](#) is as follows:



Figure 12 TZM0756DRPL, including LED Direct Ring Polarization Light and Power Adapter

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



Figure 13 TZM0480 Coaxial Light Module, including TZM0756CL (Coaxial Light Adapter), TZM0756SL (LED Spot Light) and Power Adapter

5 Order List of TZM0480 Series MZO

TZM0480 Series Monocular Zoom Object Package Order List

Order number		Quantity	Remarks
Package Name	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
	TZM0480□-W3□□□-TV3□□□-A□□		
Remarks			
Remarks: Users or salesmen can directly write the corresponding module name, number of sets, and other special requirements in the remarks with their own professional knowledge.			

TZM0480 Order List of Other Accessories

Module	Order number	Quantity	Remarks	Description
Auxiliary Lens Module	W3050			0.50X Object Lens
	W3075			0.75X Object Lens
	W3100			1.0X Object Lens
	ON-XX			Biological Objective
	ON-YY			Metallographic Objective
	Objective Adapter			M26x0.706 to M20x0.706
TV Lens	TV3050			For 1/3" Sensor
	TV3075			For 1/1.8" Sensor
	TV3100			For 2/3" Sensor
Bracket Adapter	A45			45mm Bracket Adapter
	A50			50mm Bracket Adapter
Coaxial Light Module	TZM0756CL +TZM0756SL			Coaxial Light Adapter + LED Spot Light
LED Direct Ring Light Module	TZM0756DRL			LED Direct Ring Light (65mm outer diameter)
	TZM0756DRL-85			LED Direct Ring Light (85mm outer diameter)
	TZM0756DRPL			LED Direct Ring Polarization Light
Transmissive Light Module	TZM0756TL			LED Transmissive Light
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

TZM0480 Function Module Optional Order List

Module	Order number	Quantity	Remarks	Description
Middle Zoom	TZM0480			Ordinary Middle Zoom Module
Module	TZM0480D			Middle Zoom Module with detent
Auxiliary Lens Module	W3050			0.50X Object Lens
	W3075			0.75X Object Lens
	W3100			1.0X Object Lens
	ON-XX			Biological Objective
	ON-YY			Metallographic Objective
	Objective Adapter			M26x0.706 to M20x0.706
TV Lens	TV3050			For 1/3" Sensor
	TV3075			For 1/1.8" Sensor
	TV3100			For 2/3" Sensor
Bracket Adapter	A45			45mm Bracket Adapter
	A50			50mm Bracket Adapter
Coaxial Light Module	TZM0756CL +TZM0756SL			Coaxial Light Adapter + LED Spot Light
LED Direct Ring Light Module	TZM0756DRL			LED Direct Ring Light (65mm outer diameter)
	TZM0756DRL-85			LED Direct Ring Light (85mm outer diameter)
	TZM0756DRPL			LED Direct Ring Polarization Light
Transmissive Light Module	TZM0756TL			LED Transmissive Light
Power of Light Source	40600014			POWER-U-12V1A(American Standard)
	40600015			POWER-E-12V1A(European standard)

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