TZM0660 0.6-6.0X MZO(10)

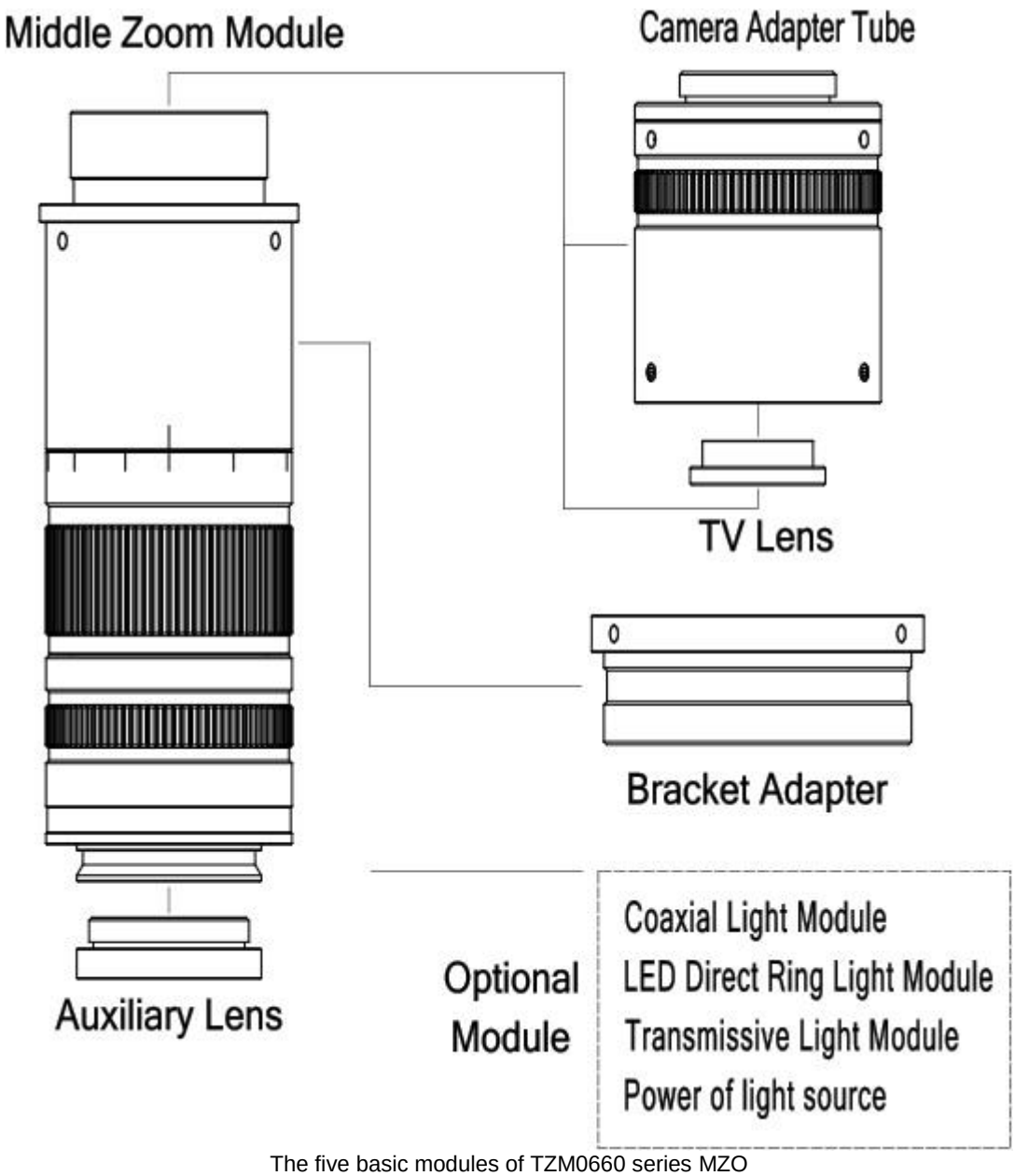
- With 0.6X~6.0X zoom range, 10X zoom ratio
- Larger NA: 0.015-0.09 (When using 1.00x Auxiliary Lens)
- Higher resolution:18.3um-3.1um (When using 1.00x Auxiliary Lens)
- Larger field of view: 1.78mm-40mm (Object plane)
- Larger sensor size: 2/3” (When using 1.00x TV Lens)
- Working distance range: 86mm-174mm
- With adjustable BFL, parfocal in zoom range
- With adjustable center, the image center remains unchanged from 6.0x to 0.6x
- 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)

Introduction of TZM0660 Series MZO

TZM0660 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.

The Modular Design of TZM0660 Series MZO

The modular design of TZM0660 series MZO is showed in Figure below. The design consists of five basic modules, including Middle Zoom Module, Auxiliary Lens Module, TV Lens Module, Bracket Adapter Module and Optional Module.



The five basic modules of TZM0660 series MZO

The Nomenclature of TZM0660 Series MZO

Because of TZM0660 series MZO's modular design, each module of TZM0660 series MZO is named respectively. The specific naming rules and corresponding parameters of each module are as follows:

Module One: Middle Zoom Module

The Middle Zoom Module (code TZM0660a), which is the main body of TZM0660 series MZO. TZM0660 represents the code of Middle Zoom Module and letter a represents the auxiliary code of Middle Zoom Module. Details are listed in Table below:

The order number and function of the Middle Zoom Module

Order Number	Meaning	TZM0660	Postfix meaning
TZM0660	Ordinary Middle Zoom Module	0.6X~6.0X	NA
TZM0660D	Middle Zoom Module with detent to fix the magnification function	0.6X~6.0X	D：Detent

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 TZM0660 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 TZM0660 are shown in Table below.

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.

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 below:

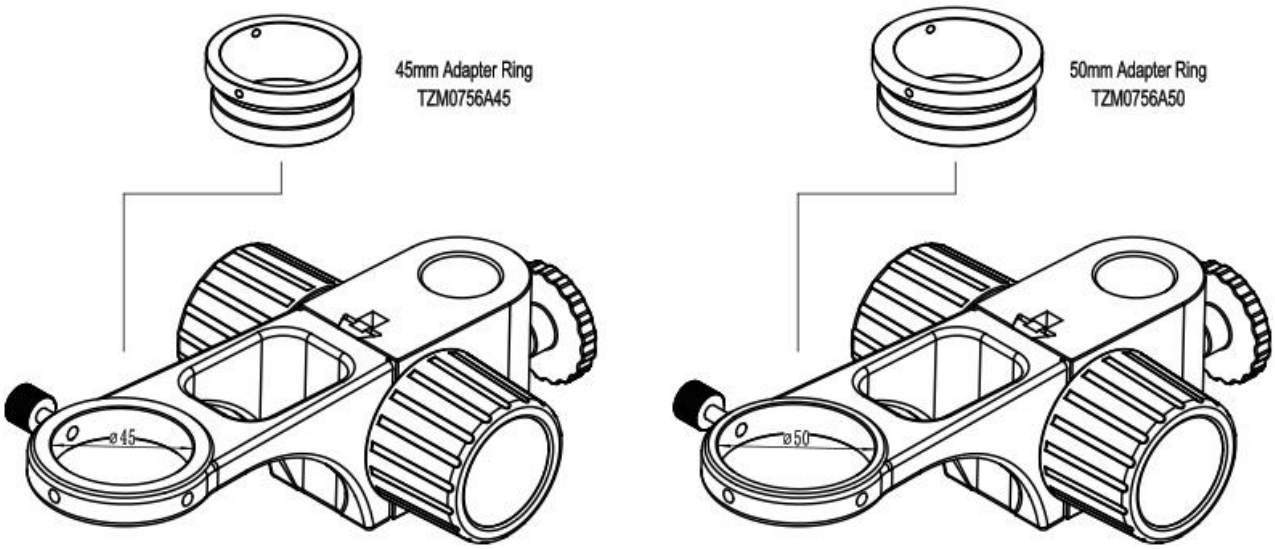
The order number and optical parameters of TV Lens

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.

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 below:



TZM0660 series' Bracket Adapter

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 below:.

The Optional Module: Light source module for TZM0660 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

The Naming of TZM0660 Series MZO

We have a special naming format for TZM0660 series MZO, we name TZM0660 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 TZM0660D, Auxiliary

Lens W3100(1.00x), TV Lens TV3050(0.5x) and 50mm Bracket Adapter A50, the final MZO can be expressed as:

TZM0660D-W3100-TV3050-A50

Currently available TZM0660a: TZM0660, TZM0660D (D represents Detent);

Currently available W3bbb: W3100, W3050, W3075;

Currently available TV3ccc: TV3100, TV3050, TV3075;

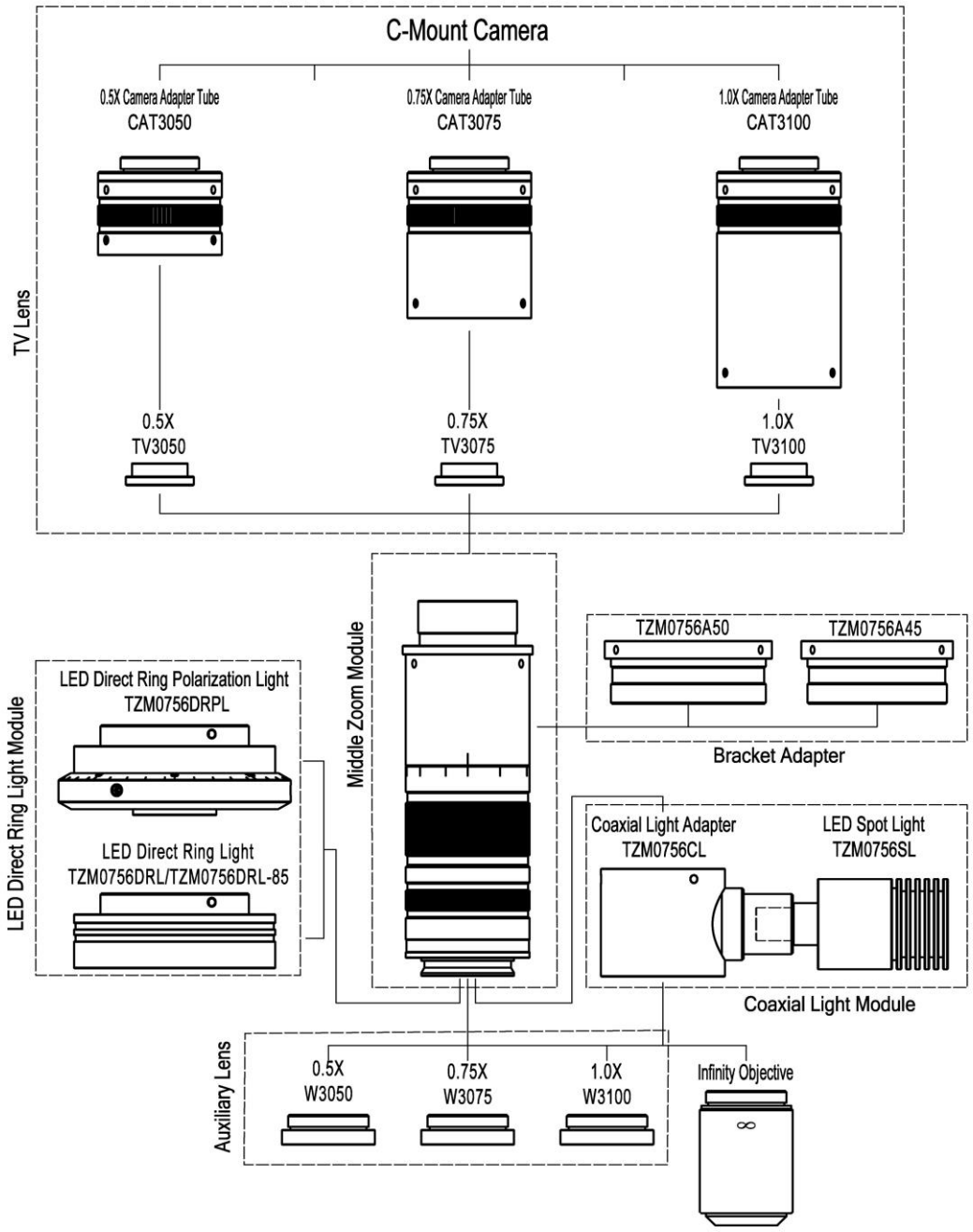
Currently available Add: A50 and A45;

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.

The Configuration of TZM0660 with Five Modules

The Configuration of TZM0660 with Five Modules is shown below, with this configuration, user can configure required TZM0660 MZO at ease. TZM0660 series MZO can be combined with Camera Module (optional) to form a digital monocular zoom microscope.



The five modules and TZM0660 MZO

The Optical Specifications of TZM0660 with Different Auxiliary Lens and TV Lens

The optical specifications of TZM0660 with different Auxiliary Lens and TV Lens are shown in Table below. 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.

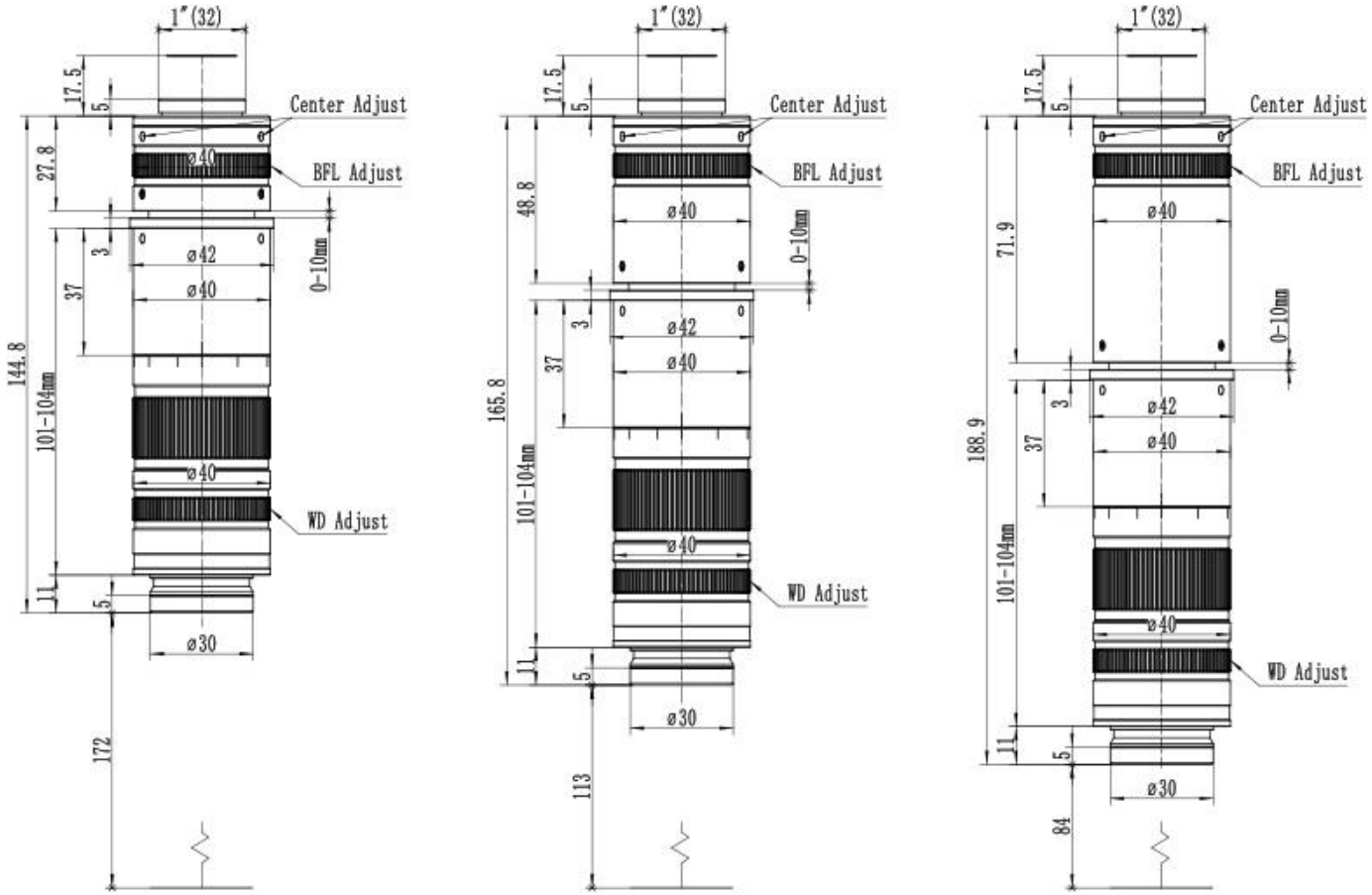
TZM0660-W3100-TV3100 and its extensions

Auxiliary Lens	Specification	TV3100 2/3"(D=11mm)		TV3050 1/3"(D=6mm)		TV3075 1/2"(D=8mm)	
W3100 WD 86mm	PMAG	0.60-6.00		0.30-3.00		0.45-4.50	
	DFOV/mm	18.33	1.83	20	2	17.78	1.78
	NA	0.015	0.09	0.015	0.09	0.015	0.09
W3050 WD 174mm	PMAG	0.30-3.00		0.15-1.50		0.23-2.25	
	DFOV/mm	36.67	3.67	40	4	35.56	3.56
	NA	0.007	0.045	0.007	0.045	0.007	0.045
W3075 WD 115mm	PMAG	0.45-4.50		0.23-2.25		0.34-3.38	
	DFOV/mm	24.44	2.44	26.67	2.67	23.7	2.37
	NA	0.011	0.068	0.011	0.068	0.011	0.068

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.

The Dimension of TZM0660 Series MZO

The dimension of TZM0660 series MZO with different Auxiliary Lens and TV Lens a) TZM0660-W3050-TV3050; b) TZM0660-W3075-TV3075; c) TZM0660-W3100-TV3100 are showed in Figure below. The length of the MZO with different TV Lens will be slightly different. The length of TZM0660-W3100-TV3100-A50 is 194mm.



Dimension of TZM0660 series MZO with different Auxiliary Lens and TV Lens a) TZM0660-W3050-TV3050; b) TZM0660-W3075-TV3075 c) TZM0660-W3100-TV3100

How to Configure TZM0660 Series MZO

The corresponding parameters of TZM0660 series MZO are listed in Table below. 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.

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	TZM0660-W3050-TV3050	174	0.15X-1.5X	40.00-4.00	0.007-0.045
	TZM0660-W3075-TV3050	115	0.23X-2.3X	26.67-2.67	0.011-0.068
	TZM0660-W3100-TV3050	86	0.3X-3.0X	20.00-2.00	0.015-0.09
1/2inch	TZM0660-W3050-TV3075	174	0.23X-2.3X	35.56-3.56	0.007-0.045
	TZM0660-W3075-TV3075	115	0.34X-3.4X	23.7-2.37	0.011-0.068
	TZM0660-W3100-TV3075	86	0.45X-4.5X	17.78-1.78	0.015-0.09
2/3inch	TZM0660-W3050-TV3100	174	0.3X-3.0X	36.67-3.67	0.007-0.045
	TZM0660-W3075-TV3100	115	0.45X-4.5X	24.44-2.44	0.011-0.068
	TZM0660-W3100-TV3100	86	0.6X-6.0X	18.33-1.83	0.015-0.09