



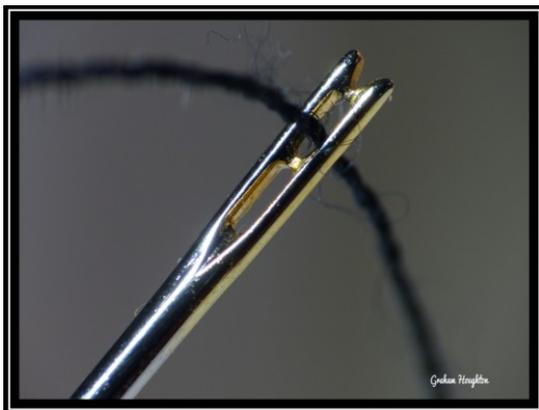
**Using Raynox® Macro Lenses**

**With the**

**Panasonic Lumix FZ200**

Graham Houghton July 2015

Macro, or close up photography, turns ordinary objects into extraordinary ones. With this genre of photography we can turn everyday objects into some fantastic images.



Going in close can reveal textures and structures that we might struggle to see with the unaided eye. Traditionally this type of imagery was created using dedicated 'macro' lenses on DSLR cameras.

These are specialised lenses however they carry a premium price tag. With the use of simple close up lenses users are able to reduce the closest focus distance of their kit lenses and achieve acceptable results. These lenses are often sold as sets of 3 or 4 lenses usually described as #1,#2,#4 and #10.



These are not the magnification but simply the strength of the supplementary lens in 'dioptries'. The magnifying power of these lenses is calculated from the following equation:

$$\text{Magnification} = \text{Dioptrie} / 4 + 1.$$

So this gives us 1.25, 1.5, 2 and 3.5 magnification of the subject.

Unfortunately these simple close up lenses consist of just 1 glass element and do not compensate for things like colour fringing and are often blurred at the outside edges of the image, more so with the higher power lenses.

To overcome these problems close up lenses designed with two or three elements were manufactured. These lenses are often termed 'achromatic' lenses, as they do not cause the colour fringing.

They focus the red, green and blue components of light from the image at the same focal plane. The Raynox® lenses are an example of this type of construction.

The most popular two lenses from them are the 150 and 250 lenses. The 150 has a dioptric power of 4.8 giving a magnification of 2.3 and the 250 has a strength of 8 dioptries giving a magnification of 3.

So why do we need these close up lenses to achieve larger images when we can move the FZ200 to within 2-3cms of the subject when the lens is set to its widest zoom setting of 25mm? Well lets take a look at the images when we do just that.



This image was taken with the FZ200 at a distance of 3cms away from the little doll that measures just 10cms high. The image covers about 50% of the subject so the magnification is about 50% or 1:2. This might be okay for some subjects like wildflowers or fungi where you may want to show the habitat of the subject as well. Perspective distortion also shows up in images shot this close

It doesn't though take us into the realm of true close up or macro photography. True macro photography is really reserved for when we have magnifications of 1:1 or greater. In this article we will consider close up and macro to be the same term although some of the resulting magnifications using the Raynox lenses may not achieve the 1:1 criteria when using low zoom settings.

Let's look at some of the reasons for choosing either the 150 or the 250 lenses to create our images. Considering first of all the 150 lens.

This would be my recommended lens to newcomers to this type of photography. It is a little more forgiving on focus requirements as the 'depth of field' or the total amount of the image which is acceptably sharp from the front to the rear of the subject can be extremely shallow when we use the lenses with high levels of zoom applied to the FZ200 main lens.

The overall magnification, depth of field and focus range will be dictated by the zoom setting of the FZ200. The 250 lens has a higher magnification and the working distance is a lot closer to the subject than that of the 150 lens. This has implications if your subject is likely to be disturbed by the close proximity of you, and your camera, to it. This could apply to subjects like flies, butterflies or moths. In the table below you will see the image width and the lens to subject distance for each of the lenses. The lens is **set to infinity focus** for the measurements and the distance is from the front face of the Raynox lens.

At minimum zoom x3 before vignetting at 4:3 aspect ratio.

Lens type	Lens to subject mm	Subject width mm
150	210	80
250	109	47

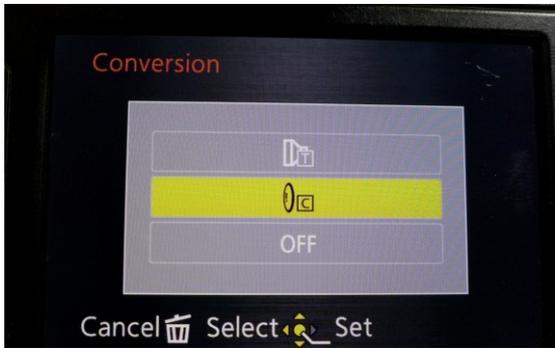
At maximum zoom x24

Lens type	Lens to subject mm	Subject width mm
150	210	14
250	110	8

Because the Raynox® lenses have a 43mm rear thread this causes the lens to vignette when it is clipped onto the FZ200 lens front threads using the supplied UAC2000 adapter.



To overcome this vignette you need to use a minimum of x 3 zoom. Alternatively you can set the Conversion menu to "C" in the REC Set up menu. You'll find this on page 5.



It's a useful feature as not only does it set the minimum zoom to be x4 but also limits the largest aperture to F4. This will ensure you have good sharpness and reasonable depth of field.

There is no need to use the recommended LA7 conversion tube as this would vignette even more and would need you to zoom to at least x8 to overcome it.

If you wanted to be really efficient you could set the conversion menu to "C" and then save this in say the C2-2 custom profile. Whenever you wanted to shoot macro you would just turn the top control dial to C2 and then select C2-2 from the option!

To return to normal shooting just select your preferred shooting mode (hopefully this will be A aperture priority mode!)

Although the lens does come with an adapter clip (UAC2000) I do recommend that you use a 52mm to 43mm step down filter ring instead.

This ensures the lens is held exactly on the optical axis and parallel to the sensor plane. This is important especially if you are going to be using higher magnification as it can prevent across the frame focus variations due to misalignment of the lenses. Additionally I would recommend the use of a 49mm lens hood or a 52mm lens hood fitted with a 49mm to 52mm step up ring. This helps to maintain contrast in your images, especially sl



As you approach higher magnification settings the camera shutter speed becomes more of a key player in obtaining blur free images.

The image stabiliser within the camera can accommodate a certain amount of handshake but it is not programmed for such a degree of magnification.

The gyro sensors only know the camera is moving and not that you have a macro lens attached which is magnifying the image movement at the sensor plane.

It is important then to use a much higher shutter speed.

The more your image is magnified (by changing to a higher zoom setting) the more you will have to consider the safe shutter speed to use.

You will be using ISO 100 if you want the best image quality and if you use the "C" setting aperture of F4 then you will be seeing shutter speeds of faster than 1/500 sec in bright sunshine (possibly 1/1000) so this is sufficient.

If your shutter speed is dropping below 1/500 and you are using more than x10 zoom you will need to raise the ISO in order to allow you to see a faster shutter speed displayed.

Limit your ISO to 400 for best results.

In an ideal world with good lighting you should be looking to use F7.1 to maximise your depth of field. This might mean using too high an ISO in order to get the required shutter speed minimum value at high magnification.

In these situations, if your subject matter permits, you should think about mounting the camera on a tripod, or for lower magnifications, maybe a monopod if a tripod is not for you!

For greater flexibility and ease of focus it is probably worth the investment in a focus slider to attach to the camera when mounted on a tripod such as in the image below.



This slide arrangement allows you to set the camera in the manual focus mode and then adjust the camera such that the image is sharp on the back of the LCD. You can use the traversing knob to seesaw about the focus point to ensure you have the exact focus point selected.

Whilst you can select the macro AF autofocus on the side of the lens barrel and set the focus mode to AFS, you may find that you miss a lot of shots being in precise focus at the area you select to be under the focus square when you press the shutter button.

As the depth of field is usually very narrow any body movement, such as when you are breathing, will dramatically

change the position of the camera relative to the subject. A better way to focus when using these lenses hand held is to set the focus to manual on the side of the lens and then approach the subject looking at the image on the LCD or in the EVF.

When you have found the focus point hold it at that point and then rock your whole body slowly backwards until it goes out of focus and then lean forward until it comes back into focus and then press the shutter button.

If you are using a tripod it may be necessary to adjust the lengths of the legs so that the front leg is slightly shorter so that the whole tripod leans slightly forward to allow you to get the camera closer. Obviously don't take it so far that the camera becomes overbalanced and likely to fall forward!

Some tripods, like the Manfrotto 190 ProB, have the facility to raise the centre column and then rotate it so that it becomes a horizontal extension thus making this type of photography easier especially for outdoor work.



If you are using a monopod to stabilise the camera then you can lean the monopod towards your subject. A head which allows front to back angle change quickly is desirable to make setting up quicker like the Manfrotto 234RC model.



So we have seen some of the reasons for choosing either the 150 or the 250 lens, the camera settings and some of the accessories that will make this genre of photography easier to get better results now let's look at shooting using these lenses in more detail.

As with all photography practice is the key to understanding the areas in which this type of lens is useful and also becoming aware of some of the practical limitations that will prevent you from achieving good quality images.

The biggest disappointment that new users of close up or macro photography need to embrace is the extremely narrow depth of field, especially at higher magnifications with the 250 lens in particular. If you have both lenses and stack then to give an overall magnification of 5 then even with the smallest aperture depth of field is 0.5mm so all the image that needs to be in focus has to be on the same parallel plane to the camera

back. The second issue is blurred images due to either camera shake or subject motion. At high magnification the image stabiliser doesn't take into consideration the fact that you have a close up lens attached, the gyro compass only adjust the lens according to the zoom level set on the camera alone.

Wind moving the subject also destroys image sharpness and some users go to the lengths of surrounding outside subjects with wind shields or staking the plant stems whilst they take their shots.

One of the simplest ways to overcome the issue of subject movement is to use flash exposure. This can either be just a kiss of light from the pop up flash on the camera. However if you use this technique at close range you may need to add a simple diffuser to both soften the flash light and reduce the output slightly. It is okay to use with the 150 as the lens to subject distance is increased and the likely hood of the extended lens casting a shadow on the lower part of your image is reduced. With the 250 you may be restricted to using the infinity focus setting to keep the camera at the maximum subject to lens distance.



More controlled use of flash will be obtained if you use an off camera flash connected by a flash extension cable or a radio triggered set up. If your flash gun is TTL compatible then it is of great benefit in getting the exposure correct.

If you are using a manual flash gun with radio triggering it is a case of trial and error to set the flash output power level and keeping the flash to subject distance consistent.

Some users design elaborate flash rigs to hold one, or two, guns at a consistent angle and distance. Dedicated ring flashes or LED lights can also be used to provide exposure. In the case of the LED ring lights their output power is just sufficient enough to provide the illumination required for this type of photography. There are some "flash" LED rings however the output is about 1/100 sec and may still lead to blurred images.

For internal close up photography then simple anglepoise lamps will provide enough illumination and providing you use tungsten halogen light bulbs the resulting colour balance will be reasonable if using Auto White Balance (AWB) or the pre-set Tungsten setting. Performing a manual white balance will give more precise colour rendition.

Choice of background can also influence how your final image will look. As the background is going to be very much out of focus plain coloured card or fabric material is often the best solution. Try to use a contrasting colour for your background although same colour but a different saturation also works well. Out doors you can position the card loosely behind your subject and indoors you can make the background from rolls of plain paper or even wall paper samples if you find one which is suitable.

If you're looking to produce images of surfaces such as leaves or feathers, you have to ensure that the surface is completely flat. That's why it's important to point your camera straight down onto the surface using a tripod. If your camera is at an angle, even slightly, then the distance from each part of the image to the focus plane is going to be different. Either put the object on a small table or on the floor. If you don't, you'll end up with a band of sharpness moving away into a blur.'

If you look at a bird's feathers, you can see that they're not completely flat. It's not extreme, but in the macro world it makes all the difference!

Because of the very narrow depth of field it is possible to utilise software, which can blend several images, taken with different focus planes into one image. These are so call image-stacking programs. Adobe Photoshop has this facility however the actual process can take a long time with this program. There are commercial programs like Helicon Focus that performs this very quickly without much user intervention.



## Comparison images at various focal lengths.

First the FZ200 without any supplementary lenses set to a lens to subject distance of 38 cms to cover the width of the dolls which are 4cms diameter by 10cms tall.



In the first image you can see the amount of depth of field using the lens at almost x2 zoom which is the 43mm equivalent focal length shown in the image. My measurement is from the second doll from the right to the sensor plane which I have taken to be the index mark opposite the mode selection dial on the top of the camera. All measurements in the following images are taken to the same index mark and not to the front face of the Raynox lens. The initial table of subject distances on page 5 are taken to the front of the lens for easy reference.



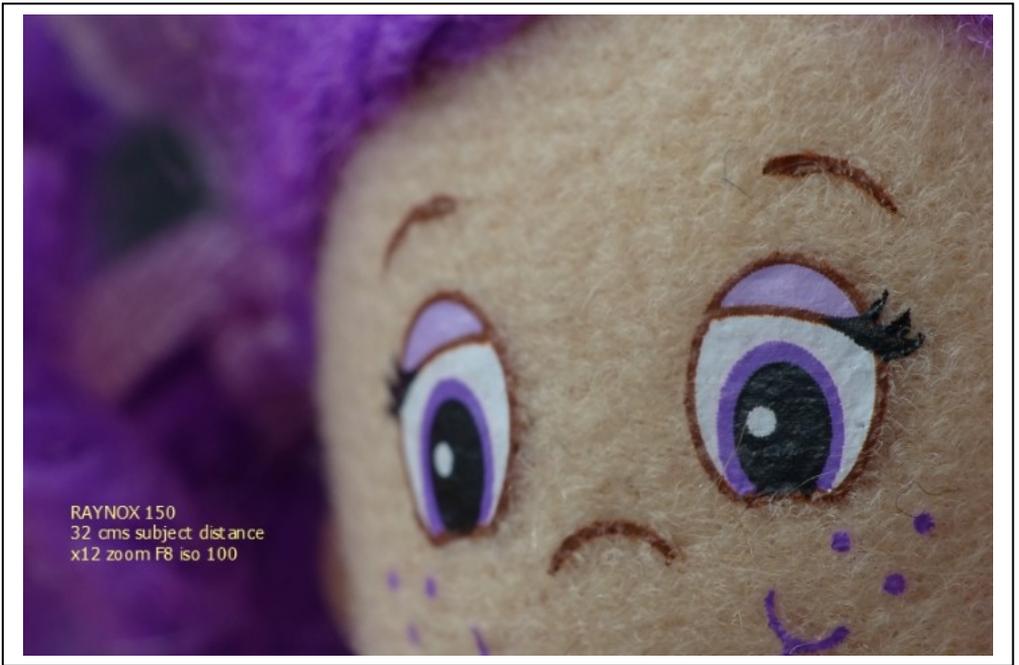
The second image is with almost x3 zoom and moving the camera back to a distance of 70cms. In the third image the camera is set to its closest focus distance of 1.1 metres and the zoom is x5.





In this image the zoom is all the way to x24.  
**Images with the RAYNOX 150 Lens attached**  
First minimum zoom x4





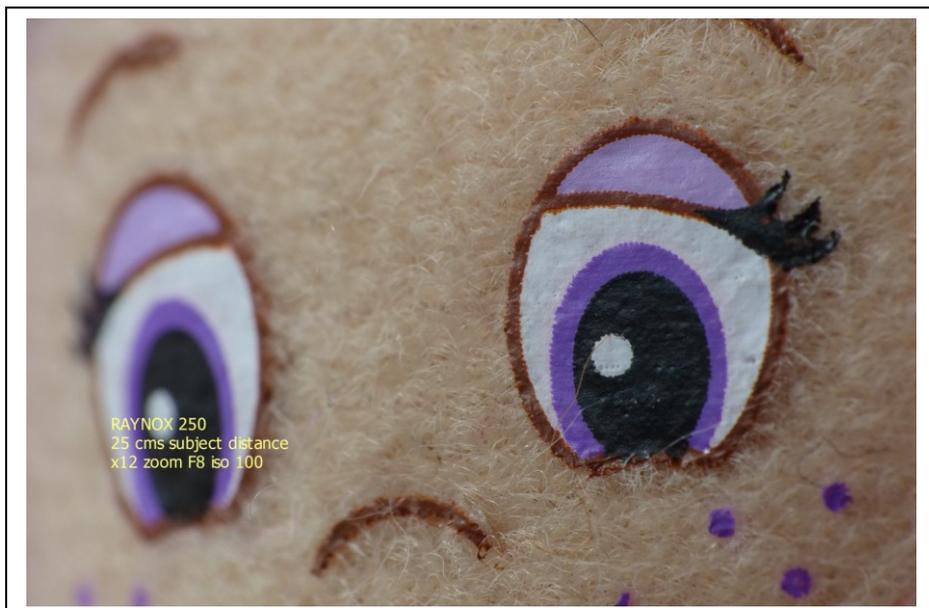
Above zoom set to x12  
Below zoom set to x24



## Images with the RAYNOX 250 lens



Above at minimum zoom  
Below at x12 zoom





The final image is from the 250 lens at x24 zoom

As you can probably see the magnification is much greater with the 250 lens at the reduced working distance. It also has very shallow depth of field in comparison to the 150 lens.

So the lenses give the opportunity for reducing the closest working distance of the camera to the subject and thus allowing you to capture larger images onto the sensor.

How much magnification is needed will depend upon your subject matter.

Combined with the macro setting of the FZ200 you should be able to capture close up pictures at any distance to the subject.