Close-up photography is very enjoyable and does not have to be costly. Canon’s high performance double-element close-up ‘D’ lenses are relatively inexpensive and easy to use.

<table>
<thead>
<tr>
<th>Benefits of close-up lenses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The most obvious benefit of close-up lenses is price</strong> – they are an economical way of trying out close-up photography. But they also have several other advantages over extension tubes, macro lenses, and reversed lenses – the other most common ways of taking macro photos.</td>
<td></td>
</tr>
<tr>
<td>• <strong>There is no light loss</strong> Extension tubes and macro lenses suffer from light loss as the lens approaches its minimum focusing distance. With close-up lenses, you can use a faster shutter speed or a wider aperture with a lower ISO.</td>
<td></td>
</tr>
<tr>
<td>• <strong>Autoexposure metering and autofocusing is retained</strong> The reverse lens technique breaks electrical contact with the lens, making it more difficult to set the lens aperture.</td>
<td></td>
</tr>
<tr>
<td>• <strong>They are smaller and lighter than macro lenses and extension tubes</strong> Close-up lenses are easy to store in a gadget bag or pocket, ready for immediate use.</td>
<td></td>
</tr>
<tr>
<td>• <strong>They work well with zoom and telephoto lenses</strong> Close-up lenses give more magnification at longer focal lengths. Extension tubes give more magnification with shorter focal lengths. The decision on which to buy may depend on the focal lengths of the lenses you already own.</td>
<td></td>
</tr>
<tr>
<td>• <strong>They are easy to use</strong> There are no complex techniques to learn – you just screw the close-up lens into the filter thread of the lens on your camera.</td>
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</tr>
</tbody>
</table>

There are some types of photography that seem suited for the summer months. Close-up photography is one – who can resist taking photos of flowers or insects on a balmy summer day?

You may think that macro and close-up photography are expensive genres. They certainly can be – a new macro lens plus a specialist flash unit like the Macro Twin Lite MT-24 EX can set you back well over a thousand pounds. Yet close-up photography doesn’t have to be expensive. Natural light will serve just as well as flash in most situations, and a close-up lens is much less expensive than a macro lens.

**Close-up lenses**

When is a lens not a lens? You may think that a close-up lens, like every other type of lens that Canon makes for EOS, attaches to your camera’s lens mount. But a close-up lens is different – it screws into the filter thread of an existing lens just like a filter. For this reason they are also known as close-up filters or supplementary lenses.

In effect, a close-up lens is a high quality magnifying glass positioned in front of your existing lens. Canon makes two close-up lenses, the 250D and 500D (not to be confused with the EOS 500D camera).

**Optical quality**

Close-up lenses are an economical way into macro photography, but as with most things photographic there can be a trade off – here it is with optical quality.

There are two types of close-up lens; those with a single element construction and those with a double element construction.

Single element lenses have one element that magnifies the image. They tend to suffer from chromatic aberrations and poor definition at the edges. Single element lenses are inexpensive and a good way of trying out close-up photography if you’re on a budget or you just want to have some fun without worrying too much about image quality.

Double element close-up lenses have two elements. The second element corrects the chromatic aberrations of the first element. The image is sharper, especially at the edges, which is important if you’re photographing flat objects like postage stamps or postcards. Double element close-up lenses are heavier and more expensive than single element lenses. The Canon 250D and 500D close-up lenses are both double element lenses (it’s what the ‘D’ stands for).

The optical quality you get from a close-up lens also depends on which lens you use it with. The photos from Ernst Vikne, used to illustrate this article, were taken with either an EF 70-200 f2.8L or an EF 100-400mm f4.5-5.6L lens combined with a Canon 500D double element close-up lens. The image quality and detail are excellent.
How close can I go?

Getting closer

A regular camera lens is limited by its minimum focusing distance. Close-up lenses reduce the minimum focusing distance, allowing you to move the camera closer to the subject and obtain greater magnification. This diagram shows what happens when you use an EF 85mm f1.8 lens with a 500D or 250D close-up lens. The close-up lens reduces both the minimum and maximum focusing distances of the 85mm lens. These figures will change depending on the lens used with the close-up lenses.

Close-up lenses work by decreasing the minimum focus of your lens. With a close-up lens fitted you can move the camera lens closer to your subject and gain a higher level of magnification.

Focusing distances

The minimum focusing distance of the Canon EF 85mm f1.8 lens, used for some of the comparison photos in this article, is 85cm. It cannot focus on anything closer than that distance. Its maximum focusing distance is infinity – the same as all Canon EF lenses.

Attaching a 500D close-up lens to the front of the lens reduces the minimum focusing distance to 43cm. Moving the lens closer to the subject makes the subject appear larger in the frame. The maximum focusing distance is also reduced – from infinity to 65cm. The lens cannot focus on anything further than 65cm from the sensor plane.

A 250D close-up lens reduces the minimum and maximum focusing distances even further. The lens can now only focus on objects between 33cm and 45cm from the camera.

Comparing lenses

Just how close can you get with close-up lenses? We started by comparing the Canon EF 50mm f1.4 and EF 85mm f1.8 lenses. The 85mm has a minimum focusing distance of 85cm, which means that it doesn’t get very close by itself. But with a 500D or 250D close-up lens, you can get much closer.

The photos taken with the 50mm lens show that you don’t get the same level of magnification as the 85mm lens with the close-up lenses. This is why close-up lenses work best with short to medium length telephoto lenses.

We also took some photos with the Canon EF-S 60mm f2.8 macro lens. You can get much closer with this lens, especially when combined with one of the close-up lenses. With regard to image quality we couldn’t tell the difference between the photo taken with the 60mm macro lens and the 85mm lens with a 250D close-up lens. The macro lens required two stops more exposure to cope with light fall off at such short focusing distances.

Macro zoom

Then we took some photos with a Canon EF 28-105mm f3.5-4.5 II lens. This zoom lens says ‘Macro’ on the side, but it’s not true macro (which would be a 1:1 reproduction). The use of the word macro by Canon simply indicates that the lens can focus quite closely, in this case 50cm from the subject. The photos from this lens weren’t as sharp as the others, which is to be expected (prime lenses give sharper images with close-up).

Finally we took some photos with a Canon EF-S 18-55mm f3-5.6 II lens. This lens doesn’t have a dedicated manual focus ring, making it a little harder, but still possible, to use manual focus.

Another difference we noticed between the lenses is that the 50mm and 85mm primes were easier to use because the lenses have wider maximum apertures and the viewfinder image is brighter. The 60mm macro and 24-105mm zoom were more difficult to focus (all focusing was done manually).

Conclusion

The conclusion? The results from using a close-up lens and the prime 50mm and 85mm lenses were as good as those from the 60mm macro. However, the 60mm macro lens gave the most magnification. For even more magnification you can combine the close-up lenses with extension tubes or, if you have one, a true macro lens like the 60mm macro.

Camera lens limitations

If all a close-up lens does is decrease your the minimum focusing distance of your camera lens, then why does your lens not have this capability in the first place? Turn the focusing ring on your camera lens and you will see that the front element extends as the distance between the sensor plane and the focal point decreases.

The minimum focusing distance is reached when the front element is fully extended. It could be decreased by allowing the front element to move further forward. But doing so creates its own problems. Non-macro lenses are optimised for optical performance at regular focusing distances. Quality decreases as you move the lens closer to your subject. Macro lenses are optimised for close-up performance. They contain a group of moving elements which change position to ensure sharp photos all the way through the focusing range. This design makes the lens more expensive to make, and impractical to include on all lenses.
Magnification and closest focusing distance are always included in the specifications of Canon lenses. The EF 50mm f/1.8 lens, for example, can focus as closely as 45cm, giving a magnification of 0.15x.

This simply means that the subject is reproduced at roughly 1/7th of its actual size. Attaching a 250D close-up lens to the 50mm camera lens reduces the minimum focusing distance of the lens and gives a magnification of 0.35x, or 1/3rd of the subject’s size.

The effect is much greater with telephoto lenses. Canon’s EF 100-400mm f/4.5-5.6L IS lens has a minimum focusing distance of 1.8 metres and a magnification of 0.2x – not much greater than the 50mm lens. But add a 500D close-up lens and the magnification increases to 0.8x – much closer to true macro photography.

Calculating magnification

How is magnification calculated? Simply divide the focal length of the camera lens by the focal length of the close-up lens. Conveniendy, the focal length of the close-up lens is the number used to identify it. So if you are using a 50mm lens with the 250D close-up lens, the magnification is 50/250, or 0.2x.

This figure is for when the lens is focused at infinity. Magnification is greater at closer focusing distances. Unfortunately, as different lenses that share the same focal length have varying minimum focusing distances, there is no formula for working out the magnification. But the information for some common Canon lenses is provided in the table on the right.

Above Emerald Damselfly. The low noise capabilities of the EOS 5D Mk II make it easy for the photographer to work at a high ISO. EOS 5D Mk II, EF 70-200mm f/2.8L IS USM lens set to 200mm and with 500D close-up lens attached. 1/160 second, f7, ISO 800.

### Magnification with EF lenses

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### Table

This table provides a comparison of the normal maximum magnification for a selection of EF lenses and the increased magnification possible with the addition of a Canon close-up lens.

<table>
<thead>
<tr>
<th>Lens</th>
<th>Normal</th>
<th>Type 250D</th>
<th>Type 500D</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF50mm f/1.4</td>
<td>0.15x</td>
<td>0.30x</td>
<td>0.25x</td>
</tr>
<tr>
<td>EF58mm f/1.2 II</td>
<td>0.15x</td>
<td>0.35x</td>
<td>0.26x</td>
</tr>
<tr>
<td>EF58mm f/1.4</td>
<td>0.50x</td>
<td>0.68x</td>
<td>0.59x</td>
</tr>
<tr>
<td>EF100mm f/2</td>
<td>0.13x</td>
<td>0.50x</td>
<td>0.31x</td>
</tr>
<tr>
<td>EF100mm f/2.8</td>
<td>0.14x</td>
<td>0.57x</td>
<td>0.36x</td>
</tr>
<tr>
<td>EF100mm f/2.8 Macro</td>
<td>1.00x</td>
<td>1.41x</td>
<td>1.21x</td>
</tr>
<tr>
<td>EF135mm f/2.8</td>
<td>0.12x</td>
<td>0.70x</td>
<td>0.41x</td>
</tr>
<tr>
<td>EF200mm f/2.8L</td>
<td>0.16x</td>
<td>0.57x</td>
<td></td>
</tr>
<tr>
<td>EF50mm f/1.8</td>
<td>0.15x</td>
<td>-</td>
<td>0.70x</td>
</tr>
<tr>
<td>EF400mm f/5.6L</td>
<td>0.13x</td>
<td>-</td>
<td>0.91x</td>
</tr>
<tr>
<td>EF35-80mm f/4-5.6 III</td>
<td>0.23x</td>
<td>0.49x</td>
<td>0.36x</td>
</tr>
<tr>
<td>EF50-300mm f/4.5-5.6</td>
<td>0.16x</td>
<td>0.66x</td>
<td>0.37x</td>
</tr>
<tr>
<td>EF35-135mm f/4.5-6.3</td>
<td>0.15x</td>
<td>0.54x</td>
<td>0.32x</td>
</tr>
<tr>
<td>EF70-200mm f/4.5-5.6</td>
<td>0.25x</td>
<td>1.54x</td>
<td>0.89x</td>
</tr>
<tr>
<td>EF70-200mm f/2.8 II IS</td>
<td>0.16x</td>
<td>-</td>
<td>0.56x</td>
</tr>
<tr>
<td>EF70-200mm f/2.8 II IS</td>
<td>0.17x</td>
<td>-</td>
<td>0.56x</td>
</tr>
<tr>
<td>EF70-200mm f/3.5-5.6</td>
<td>0.17x</td>
<td>0.85x</td>
<td>0.51x</td>
</tr>
<tr>
<td>EF100L f/2.8</td>
<td>0.20x</td>
<td>1.22x</td>
<td>0.70x</td>
</tr>
<tr>
<td>EF100-400mm f/4.5-5.6 L IS</td>
<td>0.20x</td>
<td>-</td>
<td>0.80x</td>
</tr>
</tbody>
</table>

Natural light

Summer is a good time for taking macro and close-up photos. Not only are the birds and insects out but there is plenty of light, which makes taking photos in natural light much easier.

Try to avoid taking photos in direct sunlight. The high contrast levels make it difficult to record all the tones and you will get distracting highlights in the background. Try taking photos at a time of day when your subject is in the shade. You can also create shade by positioning your body between your subject and the sun.

Another good time for taking close-up and macro photos is at the beginning or end of the day, when the sun is low in the sky. The light is warm and soft at these times. You can experiment with backlighting to create photos with a rim of warm light around the subject.

### Close-ups and depth-of-field

One thing you will notice straight away when you’re looking through your camera’s viewfinder is that in close-up photography you don’t have much depth-of-field. The closer you get, the less depth-of-field you have. The image you see in your viewfinder is at the maximum aperture of the lens, so if you are using a lens with a wide maximum aperture of f/2.2 to f/2, you will see an image with much smaller depth-of-field than if you are using a lens with a maximum aperture of f4 or f5.6. Regardless of which lens you use, expect to have to stop down to around f8 or more to get a reasonable amount of depth-of-field. Even at these small apertures you won’t get back to front sharpness.

This means that you may need to use a high ISO of 800 or 1600 in order to get both reasonable depth-of-field and a fast enough shutter speed to take a photo without camera shake, especially if you are using natural light rather than flash. Don’t worry too much about this, you may be surprised at the image quality you can get even at high ISOs. The out-of-focus parts of the photo can take on a pleasing ‘painterly’ aspect.

Right Odd things can happen at wide apertures in close-up photography. The top photo was taken at f/8; the depth-of-field was so narrow the entire photo appears out of focus. It took an aperture of f/4 (bottom) to get a sharp image. Both photos taken with an 85mm lens with a 250D close-up lens attached.
Close-up technique

Manual focus
Focusing is a key skill in close-up photography, and it’s normally best done manually. Try this exercise. Switch your camera lens to manual focus and set the focus ring to the minimum focusing distance. Now choose a subject, such as a flower, and move your camera towards it until the flower is in focus. If you do this without a close-up lens, you will see how closely you can focus with the lenses you already have.

Now, attach a close-up lens to the front and try the same exercise. You will be able to get a lot closer to your subject. Fine tune focus by moving your body closer or further away from your subject. This is how professional macro photographers work.

Telephoto lenses
Camera lenses with longer focal lengths are best for macro and close-up photography as you can take photos further away from your subject. Lenses with shorter focal lengths require you to be closer, blocking the light and potentially scaring away animals or insects.

Close-up photography
A close-up photo is one where the subject is recorded somewhere between its actual size (life size) and one-tenth of its size on the sensor (or film).

Macro photography
Strictly speaking, this gives images that are life-size or larger on the sensor or film. However, the term is often used to refer to close-up photography. The Canon MP-E65 is a specialist macro lens that gives a magnification of up to 5x life size.

Image sharpness
Camera shake is always an issue with close-up photography as the effect of camera shake is magnified at higher magnifications.

It seems logical to mount your camera on a sturdy tripod. But in practice if you are photographing insects or flowers you will probably find that a tripod gets in the way. A tripod only helps if your subject is stationary.

Another approach is to hand-hold the camera. This makes it much easier to move around and search for different angles. Even a small adjustment of position can make a big difference to a close-up photo. However, you will need to make sure you’re using a high enough shutter speed to avoid the effects of camera shake (an image stabiliser lens will help).

The shutter speed you need depends on the lens you’re using, the magnification of the close-up lens and how steady your grip is – the more magnification your set-up gives you the harder it is to hand-hold. Experiment by taking a series of photos at different shutter speeds, but expect to have to use a shutter speed of at least 1/125 second.

A monopod offers the best of both options. It gives you the manoeuvrability of hand-holding, but makes supporting the camera much easier, especially at high magnifications. It’s the method we prefer.

Canon close-up lenses

You can buy close-up lenses made by third-party manufacturers in the camera stores, as well as Canon’s 250D and 500D close-up lenses. The D stands for double element, and the number tells you the focal length of the close-up lens in millimetres. The 250D close-up lens gives twice as much magnification as the 500D.

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Close-up lenses are often sold in kits with three or four lenses of different strengths. You can combine close-up lenses for larger magnifications (+4 dioptre close-up lens combined with a +3 dioptre lens gives you a total magnification of +7 dioptres), but with a subsequent loss of image quality from the combined aberrations of both lenses. Canon also made single-element close-up lenses which have since been discontinued – the 240, 250, 450 and 500 close-up lenses.

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