

A detailed macro photograph of a green leaf, likely a mint leaf, showing its intricate venation and numerous small, round water droplets clinging to its surface. Several large, irregular holes are visible, suggesting damage from insects or disease. The lighting highlights the texture of the leaf and the glistening droplets.

Canon

Intro to Macro & Close-Up
photography guidebook

WELCOME TO THE WORLD OF CLOSE-UP PHOTOGRAPHY

One of the most popular ways for photographers to develop their vision and creativity is to enter the world of close-up photography of small objects. Even the most commonplace, everyday subjects can be transformed from ordinary to extraordinary, by simply moving in close and capturing detailed images of them. There are many reasons that photographers work with close-up subjects... to document a craft or hobby, such as coin collecting; to illustrate a how-to project; to sell small items online; and simply for the creative beauty that close-up images can provide.

And, as we'll explain in a moment, you don't need to invest in specialized gear to get started, or even deeply involved, in close-up imagery. The lenses you own now, especially standard and telephoto zoom lenses, can produce strong images when set to their closest focus distance, and zoomed to a longer telefocal length.



DEFINING A FEW TERMS

In this guidebook, we'll use some industry-standard terminology, but it's helpful to be sure we're all on the same proverbial page. To begin with, however obvious it may be to some, let's be clear on what's meant by close-up photography. We're talking about photography of small subjects and objects, where the subject is a major part of the picture. We're not talking about bringing distant subjects "close" to the camera — that's telephoto photography. And, we're not talking about being able to move close to a large subject, and get the entire subject into the picture — that's wide-angle photography.

Terms used in the industry aren't always precisely quantified, but we'll provide some general guidance here, to clarify information elsewhere in this guidebook.

CLOSE-UP PHOTOGRAPHY

Images of relatively small subjects, that essentially fill the frame. Think of subjects or objects roughly a foot (0.3m) or smaller, in length or height, where we focus close... the picture of the pink flowers is an example.

MACRO PHOTOGRAPHY

Pictures taken with more specialized equipment, where we approach or even exceed "life-size magnification." Here, think of small subjects like a coin, stamp, or an individual flower, where we fill the frame with the subject.



An example of macro photography, where a subject about an inch or so in size essentially fills the frame. Standard camera lenses can't focus this close... either a specialized Macro lens, or dedicated accessories, are required to produce this kind of imagery.

MAGNIFICATION

A very useful specification to understand, especially if you're considering purchasing new gear for close-up and macro shots. Magnification compares the actual size of the subject — like a coin, the grasshopper above, or any other small object — to how large that subject appears on the camera's digital image sensor, or (on a film camera), the piece of film recording the picture.

On a full-frame digital camera, the image sensor is the same size as a traditional 35mm film negative or color slide — 24x36mm, or about 1x1.5 inches (15x22mm for APS-C sensors). If we have a subject like a US quarter coin, which is nearly 1 inch in diameter, and with a full-frame

camera, we fill the frame from top to bottom with that coin, we are essentially at life-size magnification. In other words, the size of the image on the image sensor (or film) is the same as the actual size of the real-life object. You'll see this type of magnification expressed in several ways, in lens specification tables and so on:

- Life-size magnification
- 1:1 reproduction ratio
- 1x magnification

These terms all mean the same thing — the size of the subject on the image sensor is the same as the actual size of the subject. Of course, if you then were to reproduce that digital image onscreen (to something like an online social media page, or a PowerPoint/Keynote presentation), or make a print of it, the subject would look enormous. Most users define "Macro" shooting as shots taken at about 1/2 life-size or greater. In a shot taken at 1/2 life-size, the image would appear at half the size on the film or image sensor as it is in real life. Below are a few examples of different close-up and macro magnifications.

1/4 life-size (1:4, or 0.25 x magnification)



1/2 life-size (1:2, or 0.5 x magnification)



Life-size (1:1, or 1 x magnification)



WORKING DISTANCE

The distance from the front surface of the lens, to the actual in-focus area of a small subject. When photographers ask the question "how close can you get," they are usually referring to the working distance from lens to subject.

MINIMUM FOCUSING DISTANCE

This is different. Minimum focus distance, with any lens, refers to the actual distance from the actual film or imaging sensor — not the front of the lens — to the in-focus plane of the subject, with the lens at its closest focus distance. This is the specification you'll most often see in camera and lens brochures. For general photography, such as shooting portraits, this spec is often sufficient for knowledgeable photographers to determine whether a lens will perform adequately for their needs. However, for close-up and especially for true macro shooting, you'll usually have a much more effective idea of how a lens or accessory will work if you know the "working distance."

MAGNIFICATION VS. WORKING DISTANCE

One place photographers can get misled is asking that question we just mentioned above — "how close can you get?" It's actually the wrong question, if you're trying to determine whether a lens or lens + accessory will deliver the close-up results you want.

The reason? If we consider true macro lenses for a moment, a huge factor is their focal length. For example, the Canon EF-S 35mm f/2.8 IS Macro lens has an actual minimum focus distance of 5.2 inches (a working distance of 1.18 inches, from the front of the lens to the subject), and delivers life-size magnification here. The EF 100mm f/2.8L IS Macro

lens, at the same 1:1 magnification, has a working distance almost six inches from the subject.

Some users might assume since the 35mm lens "gets closer," that it would deliver superior magnification of a small object when set to its minimum focus distance. It wouldn't — the actual magnification is the same! This is why magnification, not minimum focus distance or even working distance, is the first thing a photographer should consider when comparing close-up lenses and accessories.

GETTING STARTED WITH THE LENSES YOU OWN NOW



Each of the images above has something in common — they were taken with everyday zoom lenses. Even with a standard lens like Canon's EF-S 18-55mm, or EF 24-105mm, if you zoom to your longest telephoto setting, and move in close (at or near the lens' minimum focus distance) this is what's possible.

Most of today's standard and popular telephoto zoom lenses (like many in the 70–200mm or 70–300mm class) can deliver magnifications to about 1:4, or 1/4 life-size. Typically, you'll be at about 4 or 5 feet (1.2~1.5m) or so away from a subject, at a tele zoom lens' nearest focus distance — and, zoomed to its longest telephoto focal length.

As shown in the images on page 3, this means you can fill the frame with a subject about the size of a dollar bill, using a full-frame camera. (With a digital camera using a smaller APS-C image sensor, at that same 1:4 magnification, you'd be in even closer to the quarter coin in the sample picture.)

So the point is that the lenses most of you own today are a great start in getting effective close-up images.

WIDE-ANGLE LENSES FOR CLOSE-UPS

Without accessories, most wide-angle and ultra wide-angle lenses won't deliver the same, frame-filling magnification you can get with standard zooms (or certainly with true macro lenses, as we'll discuss shortly). But, at their closest focus distances, they offer another alternative — a strong perspective with the nearest subject taking up even more of the frame, yet with surrounding background visible. It can be a powerful way to add the environment to small objects you want to capture.

The key thing is to get close to the primary subject — work at or near the lens' minimum focus distance. And, since many wide-angle lenses will focus to about a foot (or sometimes less) from a subject, you will often need to really lean in to take maximum advantage of this.

Consider this even with ultra wide-angle zooms, like the Canon EF-S 10–18mm or 10–22mm lenses, or full-frame lenses like the EF 16–35mm or 17–40mm lenses. Again, it can be a powerful way to work with close-up imagery. A few examples are shown below.

It goes without saying that this isn't the right approach for a tight shot of an insect, or a similar small subject. But again, consider an ultra wide-angle lens for a different look, when you leverage its nearest focus distance.



FOCUSING DURING CLOSE-UP SHOOTING

You may find that the AF system in your camera works well, even when you move in super-close to work at or near the lens' minimum focus distance. However, as magnifications progressively increase, it's not uncommon to find AF to be more skittish, so to speak, and to "hunt" back and forth with some subjects.

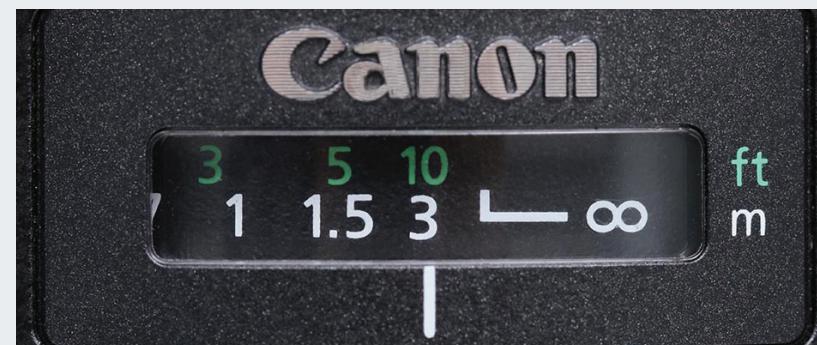
And, you may want to ensure that your lens is indeed at its closest focus distance — not just somewhere near it.

Manual focusing is actually an effective answer in many of these situations. And, the more your magnification increases, the more effective it can become.

Here are some steps to effectively begin using manual focus, when shooting close-ups:

- If you're using a zoom lens, pre-set the zoom to the focal length you want (with standard and tele zooms, this will often mean set the lens to its longest focal length — the highest mm setting on the zoom ring).
- Set the switch on the side of the lens to "MF" or Manual Focus. With Canon EF-M lenses, this will need to be done via the camera's menu, rather than with a sliding switch on the lens.

- Turn your lens focus ring to its minimum focus distance, or a distance/magnification you want to work with. For maximum close-up impact, you'll usually want to be at the minimum focus distance. Once you set it here, leave it alone — you won't get any closer by turning it any further; you've already set it to the closest focus the lens can deliver!



If your lens has a distance scale, like the one pictured above, setting minimum focus distance is easy — just turn the focus ring until the nearest distance, in feet or meters, lines up with the vertical index mark on the lens barrel.



However, many popular, lightweight lenses don't have a distance scale — one example is the Canon EF-S 18-135mm USM lens, pictured to the left. How do you know when a lens like this is focused to its nearest focus distance?

Two things to do here. First, make sure it's mounted on your camera, and that the camera is turned on. Tap the camera's shutter button, to "wake up" the camera.

Be sure you're zoomed to your longest lens focal length, unless you have a distinct reason for using a wider setting. Now, while looking through the viewfinder, turn the focus ring clockwise, until the view through the finder no longer changes. At this point, the lens has been manually focused to its nearest focus distance. Don't turn it any further — you are already at its closest focus distance.

The note about turning the lens focus ring clockwise, as you hold the camera and lens normally and look through the viewfinder, applies to Canon-brand lenses specifically. If you use a third-party lens, you may need to turn the opposite way to move to its closest-focus position.

ACTUALLY USING MANUAL FOCUS FOR CLOSE-UPS

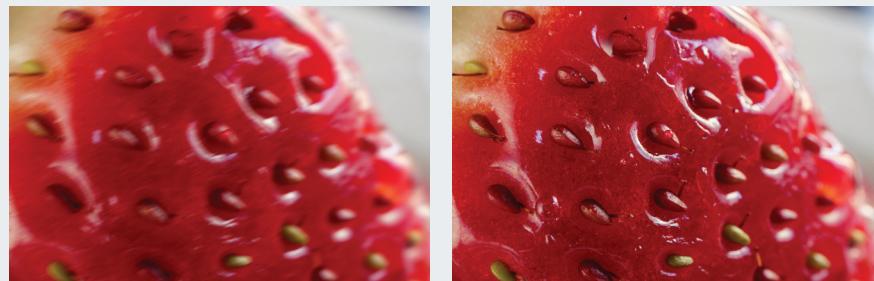
With the lens already set to its nearest focus distance and manual focus engaged, taking pictures is deceptively simple — just move yourself and the camera forward and backward, until you see the point of your subject you want sharpest pop into focus. Once you've practiced this a bit, you may find using manual focus in this way can actually be faster to shoot a series of close-up or even macro shots than using AF.

SHARPNESS IN CLOSE-UP SHOOTING

No question: it can be a challenge to get good, sharp pictures when working close to small subjects. And normally, the higher your magnifications, the more acute the challenges become. There are several distinct challenges to getting sharp close-up and macro images, especially if you're not using flash. We'll look at each individually.

MINIMIZING BLURRED PICTURES FROM CAMERA SHAKE

Even a slight shaking of a hand-held camera can cause a loss of sharpness, throughout an entire image. And the higher your magnifications are, the more of an issue this can become.



Even at these small sizes, it's easy to see how slight camera shake caused blur and a loss of detail in the shot on the left. Good, steady technique can get you a lot more images like the one on the right.

This means any of the following, where possible:

- **Image Stabilization**

If your lens has it, and you're hand-holding the camera, use it!

- **Be mindful of your shutter speeds**

Consider shutter speeds even faster than the traditional "1/lens focal length" often used as a baseline for slow speeds. In other words, again assuming you're not using flash, if you're hand-holding a 100mm lens, try for 1/200 or 1/250, instead of the rule-of-thumb 1/100 speed.

- **Consider using a tripod**

In available-light, close-up shooting, a tripod can deliver the sharpest results.

- **Shoot in the brightest light you can**

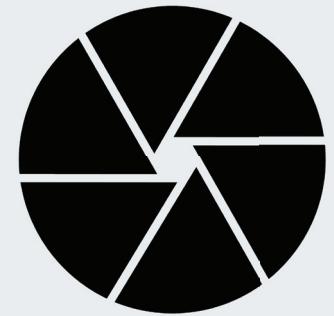
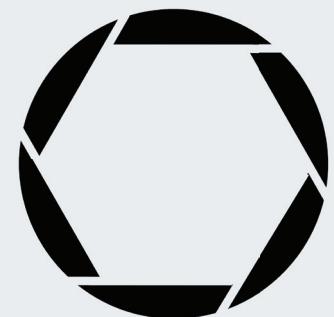
Again, assuming you're not using flash, anything you can do to work in good light will help in getting those faster shutter speeds, to avoid blurs like in the shot on the previous page. Raise ISOs as needed, especially when ambient light isn't too bright.

- **Use flash**

We'll discuss this separately, but one big benefit of using flash in close-up shooting is that the incredibly brief burst of electronic flash can arrest nearly any handheld camera shake, especially if you are at fast enough shutter speeds that there's no "ghosting" from residual ambient light.

GETTING GOOD FRONT-TO-BACK SHARPNESS

This is depth-of-field, to use the traditional photographic term. As you get closer and closer to a small subject, and magnifications increase, the zone of sharpness in your subject gets progressively smaller. You can do two things about it — either pull back and move farther from the subject (normally, reducing its size), or work at smaller lens apertures. An understanding (or at least an awareness) of lens apertures, and their likely effects, can make a huge difference in successful close-up and macro photography.



More so than in most areas of photography, if you want or need front-to-back sharpness in a small, close-up subject, expect to use small lens apertures. The bottom shot of this watch face was taken at f/32, the smallest lens opening with the macro lens used here.

The example on the previous page is a good illustration of the need for small lens apertures in close-up images. But, don't take this too literally — we're not saying you need to shoot all images at f/22 or f/32! In fact, there are good reasons not to in many cases. But never forget that if you just let the camera pick an aperture for you (for instance, in the full-auto Green Zone, or P-mode), you usually won't get that front-to-back sharpness when you work close to small objects.

Several points to help you here, whether you're shooting flowers in your back yard, or carefully arranged product pictures:

- **Pick an appropriate shooting mode**

An exposure mode like Aperture-priority (Av on Canon cameras) gives you direct control over the lens opening the camera is picking, while still providing autoexposure as light changes. Manual exposure mode (M on the mode dial) is another alternative, which of course will lock-in shutter speeds and apertures at the settings you set. Either way, you are directly controlling the lens aperture.

- **Try to shoot squarely into your subject**

In the example images of the watch face on page 8, the camera angle is looking diagonally across the surface of the watch. This means there's inherently a lot of foreground and background area on the watch to try to get into focus, in addition to the plane where sharpest focus was placed (around the word "quartz" on the watch face).

If the photographer had positioned either the watch or the camera so the watch was more squarely into the camera, there's less surface area front-to-back that needs to be brought into focus. A sharp picture might be possible even wide-open, at an f/stop like f/2.8 or f/4, if the watch was absolutely parallel to the surface of the imaging sensor on the camera.

This isn't always possible, of course, but consider changing camera angle as one way to manage depth-of-field issues with close-up or macro shots.

- **Put sharpest focus about 1/3 of the way into the subject**

Again using the shots of the watch as an example, the lens was focused carefully to put the sharpest plane of focus around the word "quartz" on the watch face — about 1/3 of the visual distance from the front to back of the watch. And, this focus position did not change from the wide-open shot to the f/32 shot. Placing sharpest focus here, instead of at the front rim of the watch, or halfway into it, is the surest way to extend sharpness across its surface.

This basic principle applies whether you're shooting a flower, a large object like a car, or even a landscape.

What about the Close-up Mode?



Some EOS models have a fully auto shooting mode with a flower icon, called Close-up Mode. Understand that in this mode, lens apertures are intentionally set to a fairly wide opening, giving a distinct look of focus being limited to a small area —like the first picture of the watch on page 8. If you want extensive depth-of-field in close-up shots, this Close-up Mode is not the answer.

PIN-POINT YOUR SHARPEST FOCUS PRECISELY

Since close-up and especially macro photography inherently limits the depth of sharp focus, even at smaller lens openings, one thing that's always important is to be in charge of where the sharpest point of focus is. We may not be able to get the entire subject in tack-sharp focus in one picture, but if an important part of the scene is tack-sharp, you're on your way to a successful photograph.



Even at f/16, it wasn't possible to get this entire wasp in sharp focus in one picture. But by precisely focusing on its face and eyes, we get the impression of a good, sharp macro image, even though it drifts out of focus as we move toward the background.

If you do use AF, try to manually select a single AF point, or use AF Point Expansion (on cameras that offer it) to precisely tell the AF system exactly where to put sharpest focus. And if focusing manually, again, this actually can be quickly achieved in many cases, if you just pre-set the lens to its closest focus, as mentioned before, and then move until you see max sharpness.

LIVE VIEW — IDEAL FOR CLOSE-UP SHOOTING



Up to now, we've been discussing camera operation with the photographer's eye at the viewfinder. But modern digital SLRs and mirrorless cameras offer another option — Live View, using the camera's LCD monitor as a viewfinder. In close-up and macro shooting, Live View offers some substantial advantages, which users should consider:

- A larger view of the subject, with ability to easily zoom-in to magnify it and verify sharpest focus

- See on the LCD monitor the effect of camera settings like exposure adjustments, changes in white balance, and so on — before you take a picture
- On recent cameras, the ability to use touchscreen technology to just touch the LCD monitor to define where the camera will focus. And, ability to instantly change this, as needed.
- Tremendous ease of viewing if you are using a tripod, and even hand-held, some genuine advantages
- On cameras with Vari-angle or tilting LCD monitors, ease of viewing for low- or high-angle positions
- Pressing the camera's depth-of-field preview button, get a clean look at the effect of smaller lens apertures, without the obvious darkening that occurs when checking D-O-F through an optical viewfinder

No question: Live View for close-up shooting is something we strongly recommend you experiment with, and see if its advantages are helpful for you. It's a perfect answer if you're on a tripod, and again, often great even for hand-held shots.

EXPOSURE CONTROL FOR CLOSE-UPS AND MACRO

We've already touched upon the frequent need for small lens apertures (high f/numbers, like f/11, f/16, or f/22), to get more extensive front-to-back sharpness when shooting closeup images of many small subjects. But along with that is the balancing act of good, overall exposure.

Picking an appropriate exposure mode is part of the equation. As mentioned previously in this document, you often at the very least want to have an awareness of the lens aperture and corresponding shutter speeds you're working with, if you want quality results when shooting close-up and especially macro pictures.



Keep in mind that exposure modes like P and Tv don't allow direct control of your lens aperture, and the P-mode (as well as all full-auto modes, like the Green Zone and aforementioned Close-up mode) will automatically set shutter speeds, too. Full manual control may not be what you're after in continuous-light situations, but at the very least, you'll often want to be in control of either the lens aperture you'll be working with, or sometimes the shutter speed. In macro shooting, one or the other will usually need to be the primary setting, most of the time.

Assuming you're shooting with some form of continuous light — whether it's daylight outside, or indoor continuous lighting — you'll want to ensure several things:

1. That you have a lens aperture that can deliver the range of front-to-back sharpness you want or need
2. That the corresponding shutter speed is sufficiently fast to avoid problems with shaking the camera (already discussed, on page 7), as well as freeze any possible subject movement. Even flowers gently swaying in a breeze can become a source of blurred subjects in a macro photo, if your shutter speeds haven't been raised to a sufficiently fast setting. While something like 1/60 or 1/125 might be absolutely fine with a totally still subject, those swaying flowers might need something like 1/500.
3. Your ISO setting is huge here, with continuous light. Raising it may increase the level of visible digital "noise" in your pictures to some degree, but it can also mean the ability to shoot at safe shutter speeds to minimize or even eliminate the risk of softness from blurs, and also allow you more leeway in setting smaller lens apertures. While every shooter's opinions can vary, we strongly suggest you don't hesitate to raise ISOs to settings up to 1600 or even higher, if that's what's needed to get sufficiently fast speeds and the lens apertures that can deliver sharpness you need. This is particularly true when you're shooting in subdued

light — cloudy days outdoors, in shade, or with indoor continuous lighting.

The bottom line is that for macro and close-up shots in continuous light, your best bet is likely the Av mode if you want automatic exposure control, and Manual exposure mode if you prefer to lock-in whatever exposure setting you initially determine.

FLASH FOR CLOSE-UP AND MACRO



One of the most effective ways to light close-up and macro images is with flash. But usually, this means doing more than simply popping-up your built-in flash, or mounting a Speedlite to your camera's hot shoe and aiming it straight ahead. In our video series, you saw Speedlites used off-camera, with modifiers to soften their light, produce beautiful results. An entire book could be written on the topic, so we can only cover some of the basics here.

Our discussion primarily assumes using Canon Speedlites in their E-TTL automatic flash exposure mode. Be aware that Manual flash mode is also possible, locking-in a given power level from shot-to-shot and thus avoiding possible shifts in exposure if you change compositions, and so on. You're free to experiment with Manual flash mode — not to be confused with the M setting on your camera's Mode Dial! — but we won't go into detail in the limited space we have here.

THE BUILT IN FLASH



While super-convenient, if your camera has a built-in flash, don't expect miracles or even creatively lit pictures if you rely on it alone. Some of its limitations may include:

- Closest distance it may normally fully cover is about 2~3 feet (0.7~1m) from the camera — in other words, if you get any nearer to a subject, you'll likely cast a shadow from the top of the camera lens on the scene
- Very direct, frontal "look"
- May be difficult to modify (diffuse or bounce its light, etc.)

But even with these possible limitations, the built-in flash does have a very important capability we'll speak about shortly. That's its ability to work as a wireless "sender" unit, or triggering device, for one or more off-camera Speedlites. It's a feature sometimes called the Integrated Speedlite Transmitter, and it's available in many (but not all) EOS cameras that do have a built-in flash. We didn't use this feature in our video on close-up and macro shooting, but be aware it's there, and a great way

to get started using a Speedlite off the camera.

EX-SERIES SPEEDLITES

One or more accessory Speedlites can be a terrific way to light close-up and macro subjects. Again, however, you will typically have difficulty if you simply attach a flash to the camera, aim it straight-ahead, and shoot a picture, for the same reasons listed above for the built-in flash. In addition, the flash's additional height means that the closer you get, the more of a shadow you'll see either below (in horizontal shots) or to one side (in vertical compositions) of your subject.

Still, there are times where the convenience of a quick flash-fill picture of flowers in your yard or some other subject dictates shooting a flash-on-camera picture. Here are a few points:

- You will tend to get more consistent results, albeit with a very direct look to the flash illumination, if you shoot with a telephoto lens on the camera, and back away from your subject, rather than work less than 3 feet (1m) from it
- Close to a subject, you may want to manually zoom the flash head to a setting wider than the actual lens you're using — this will tend to give more even lighting if the flash is on-camera. For instance, if you're shooting with a 70-200mm zoom, you might want to consider setting the flash head.
- Use a Speedlite's -7° down bounce setting



In this pair of close-up images, it's easy to see the added fill-flash impact of a Speedlite on-camera (picture on the right). In cases like this, the -7° down bounce setting helps ensure even illumination.

With Canon's 600-series and previous 500-series Speedlites (like the Canon Speedlite 600EX II-RT, Speedlite 580EX II, and Speedlite 580EX), there's a little-known feature that's designed for shooting closer than about 3 feet (1m) from the subject, with a flash on-camera. It's the minus 7 degree bounce setting. You may have noticed if you try to aim a 500- or 600-series Speedlite's head straight forward, it seems like there's a slight downward angle setting below that. There is.

This slight downward bounce position is to shoot closer than 3 feet from the camera. If you combine it with a wider zoom setting on the flash

head (again, to spread the light more evenly), it can become a nice aid for quick close-up and even macro pictures. Technically, this -7° bounce position is for shots from 2~6 feet (0.7~1.7m) from the camera.

Other Canon Speedlites, like the popular 400-series units (Speedlite 430EX III-RT, etc.) and 270EX II don't offer this added close-up ability. If you do use this -7° bounce setting, remember to return it up slightly to its normal, straight-ahead position when you're done, or you'll get flash cut-off on the top portion of shots taken at distances much beyond 6 feet.

BENEFITS OF USING FLASH

Whether it's on-camera, or used as a receiver unit off-camera, a Speedlite can offer some great advantages to close-up and macro photography.

LIGHTING CONTROL

A Speedlite can be a great "main light" if it's used off-camera, and in quick close-up shots outdoors, can be a great way to fill-in shadows (see the pair of images on the left, for one example of this). Either way, it can improve the detail in your pictures through exposure control, in some situations.



One hand-held Speedlite, off to the left of the camera (using Wireless E-TTL flash to trigger it) provided all the light in this image. It shows how a single flash can provide directional lighting, with shadows and texture. And, since flash allowed a small f/16 aperture, the shot is tack-sharp — something which would have been hard to achieve if we'd relied on ambient light and the (effectively) much slower shutter speeds we'd have been forced to work with.

SHARPNESS

Flash can suddenly improve the overall sharpness of close-up and Macro images, for two reasons. The near-instant burst of flash fires at durations of about 1/750 of a second or faster, freezing camera shake and subject movement like plants swaying in the breeze outdoors. Slow shutter speeds, often a by-product of using smaller lens apertures, can to some degree be compensated for by the speed of flash.

And, flash can allow much smaller apertures for greater depth-of-field. Using flash can suddenly make it easy to shoot at f/16 or f/22 when you need to. Either way, even using a Speedlite on-camera with a telephoto lens can be an effective way to get sharp, detailed shots of small subjects.

COLOR

Flash illumination is nearly the same color as daylight, so if you're working outdoors with natural light, there may not be problems with trying to white balance any flash you add to a scene. And unless you're mixing flash with another form of indoor artificial light, when you use Speedlites as a primary source of light, white balance control and natural-looking color are usually pretty easy to achieve.

CAMERA EXPOSURE MODES AND FLASH

The primary consideration here is whether you want to blend whatever-natural, ambient light is present with flash, or use flash as the primary light source. This often comes down to two exposure mode choices:

AV MODE

Av Aperture-priority with Canon Speedlites means the camera will always try to deliver a balanced, natural-looking shot, where the ambient light in the scene is properly-exposed, and flash fills-in nearby subjects. If you want the ease of automatic exposure as you transition from picture to picture, and want a natural-looking appearance, Av mode is often one to consider.

But remember, if you work at smaller lens apertures — a common theme in close-up shooting, and a great reason to use flash — the resulting slow shutter speeds may be too much to overcome. In a totally locked-down, tripod-mounted situation like we see in the accompanying macro videos, this may be no problem at all. But in hand-held shots outside, where you may have wind-blown subjects, this can turn quickly into a source of blurs, secondary "ghost" images, and so on.

M MODE

M Manual mode is actually often best to combine with flash, especially when you want to truly overpower any existing light, and have flash be your dominant light source. Pre-set a fairly modest ISO (for instance, 400 or lower), your fastest x-sync shutter speed (normally 1/200 or 1/250 with most Canon EOS cameras), and an appropriate aperture, and you often are well-set to having flash be your main source of light. And, with Manual mode, once you make those settings, they stay locked-in, and won't try to adjust or change as you move from shot to shot.

Briefly, other shooting modes with flash will typically behave as follows:

- **P mode**

Program Mode will tend to pick wide apertures, based solely on the level of ambient light, and shutter speeds no slower than 1/60. Will try to balance flash and ambient in sunlight or overcast conditions, by raising shutter speeds up to camera's fastest x-sync speed for flash. Speedlite(s) become dominant light source in dimmer lighting, although wide lens apertures will usually be used, too.

P-mode, and most full-auto modes like Green Zone and Close-up Mode are therefore not good choices for close-up work with flash, unless you deliberately want the effect of a wide lens aperture.

• **Tv Mode**

Shutter-priority Mode always tries to balance natural, ambient light and flash, picking what it thinks is an appropriate aperture for whatever shutter speed you've dialed-in. Flash fills in for nearby subjects. This can be effective for close-up flash shots, if you want the look of natural light, are hand-holding and need the security of a known, sufficiently-fast shutter speed, and don't mind that you'll tend to get fairly wide lens openings.

Tv mode could be useful, for instance, if you were shooting a fast-paced series of close-ups with a tele zoom lens at a botanical garden, a trade show, or another scenario where you were moving quickly from one subject to another, wanted natural-looking hand-held shots, and wanted the benefit of flash filling-in shadows and adding a bit of sharpness. But it's rarely the answer if you want to shoot macro images at small lens apertures.

Exposure modes work exactly the same way for flash-on-camera shooting, and for any Wireless E-TTL shooting with one or more flashes off-camera.

16 LENS APERTURES WITH FLASH

Flash frees you up to use pretty much any aperture you want, a huge benefit in macro and close-up shooting. Want that super-small f/22 or f/32 for maximum front-to-back sharpness? You can just dial it in, and in most cases, succeed with flash, as long as your flashes aren't too far from your subject. And, often without the problems associated with otherwise slow shutter speeds you'd be coping with if you did this using only available light.

ISO 800 ISO SETTINGS AND FLASH

Keep in mind the following about using higher ISOs with one or more Canon Speedlites in close-up and macro shooting (aside from the fact that digital "noise" increases as ISOs get higher):

- Less flash power is needed as ISOs increase
- Flash becomes increasingly effective if you've set small lens apertures
- All else being equal, ambient light typically becomes progressively more visible

In general, don't fear raising ISOs when using flash in macro or close-up shooting. Your flashes won't work as hard, you can more easily use small apertures without running out of flash power, and your recycle times may be faster. But be aware of the impact of how ambient light will be recorded, and make decisions accordingly. Nowadays, even critical viewers would probably agree ISOs up to 400 can be considered almost universal, and raising ISOs to 800 or even 1600 is appropriate when conditions require it (like shooting macro images at f/22 or f/32, with flashes positioned away from the subject, or in light-eating modifiers like some umbrellas or softboxes).



FLASH EXPOSURE COMPENSATION

Whether a single flash or multi-flash set-up, the ability to make global changes to raise or lower flash exposure is vital if you're shooting with automatic E-TTL flash exposure. Deliberate lightening or darkening can be done to simply tweak exposure, or for intentional creative effects like silhouettes. You can perform this using controls on the on-camera Speedlite, or in many cases, using controls on the camera body. Use whichever you can access most quickly and effectively.

Flash Exposure Compensation can be a great way to get the amount of fill-in effect you want in close-up subjects, if you're shooting to combine daylight and flash in an outdoor scenario. Think the flash looks too bright or dim at the default settings in your first shot? Adjust it to taste!

Flash Exposure Compensation works exactly the same way to lighten and darken flash output, whether your flash is on or off-camera, and whether you're using one or multiple off-camera flashes. All are adjusted evenly, up or down, by this adjustment. Any flash ratios in a multi-flash set-up may be unaffected, but the total brightness simply goes up or down.

Remember that many mid-range and high-end EOS cameras have Custom Controls, meaning you can dedicate a button to quickly access Flash Exposure Compensation. You're not limited to the way things work when the camera first came out of the box!

FLASH AND LIVE VIEW MODE

Here's an important point if you combine Live View — a great tool for close-up shooting — with flash, especially if you work with Manual mode on the camera and combine small lens apertures with fast shutter speeds. Be sure to turn OFF "Exposure Simulation" in the camera's Live View menu. (This is in the red shooting menu area of most EOS models; some Rebel models do not offer this capability.)

By turning it off, the Live View screen can simply produce the brightness it thinks is normal as you set up and compose your shots. Flash, after all, will be your main source of illumination in a finished image.

If Exposure Simulation is left enabled, it tries to show you what the current camera settings would look like in a finished shot. Often, this would be hopelessly dark and under-exposed, but Exposure Simulation can only show the impact of whatever available light is present, and cannot show you the effect of

flash. Again, if your Live View looks super-dark, and you're going to be shooting with flash, just turn Exposure Simulation for Live View off.

WIRELESS FLASH — GETTING FLASH OFF THE CAMERA

Wireless E-TTL is an ideal way to combine flash and macro images, and you often don't need more than a single Canon EX-series Speedlite with "receiver" (previously called "slave unit") capability to make this happen.

Entire classes and even books have been written on the topic of Wireless flash with Speedlites, so once again, we'll just scratch the surface here. But understand that it's a powerful way to work, and at the outset, may require nothing more than the gear that's already in your camera bag.

The beauty of moving the flash off the camera is the control you have over the direction of the lighting. Even a single Speedlite, held off the camera at a slight angle, can simulate natural sunlight much more effectively than it might if it were mounted on the camera's hot shoe. Between the visual effects of modifying off-camera flash — anything from bouncing it off a wall, using third-party diffusers, umbrellas, or softboxes — to adding additional lights to the scene, the potential is practically unlimited. But keep in mind that in real life, we're used to one light

source, the sun. Adding numerous light sources without regard for their directionality and impact can quickly create an unnatural look.

TWO WIRELESS FLASH METHODS

Canon has two methods to trigger off-camera, EX-series Speedlites:

OPTICAL WIRELESS FLASH

Sometimes mistakenly called "infrared" (it's not), this uses a series of very rapid, low-power flashes from an on-camera triggering device to off-camera receiver flashes. As mentioned previously, the humble built-in flash on some Canon EOS cameras can be set in the camera menu to act as a sender (your menu may say "master" unit; it's the same thing), and trigger an unlimited number of off-camera flashes, as long as they're not too far away.

Limitations include that off-camera flashes may have to be within a somewhat direct line of sight to the on-camera sender unit, and in bright sunlight, you may be forced to jerry-rig "shades" similar to a small visor on the face of receiver flashes, so the modest pre-flashes aren't drowned-out by bright, direct sunlight. Usually, the sender unit on-camera can't be much farther than about 10~15 feet (3~5m) from the receiver Speedlites if you're in daylight, and sometimes built-in flashes may require the receiver units to be even closer for consistent, fuss-free firing in daylight. In the indoor situations shown in the accompanying macro photography video, however, then traditional Optical Wireless E-TTL system would likely work extremely well.

Another advantage of Optical Wireless E-TTL is that many current and past Canon EX-series Speedlites have built-in receiver capability, so many photographers can get a running start with this method.

To fire off-camera flashes optically, the following can be used on-camera as a sender unit:

Built-in flash, set to Wireless "sender/master" mode

EOS Rebel T3i (and higher; models without "i" in name don't have this feature)

EOS 60D and higher

EOS 7D (current versions)

Speedlite with "sender/master" capability

Speedlite 600EX II-RT/600EX-RT

Speedlite 580EX II/580EX; Speedlite 550EX

Note that the 600-series Speedlites have to be set to Optical Wireless mode.

Canon USA's education team has made numerous video and written content available online (<http://www.learn.usa.canon.com>), which can walk users through the steps to get started, and use Optical Wireless E-TTL effectively.

RADIO-BASED WIRELESS E-TTL

This method uses a radio transmitter in an on-camera "sender" unit, and built-in receivers in compatible RT-series Canon Speedlites. As of the time of this video's creation, this means that only Canon Speedlites with RT in their model name can be used on- or off-camera for radio-based wireless flash. But, it also means flashes can be a lot farther from the on-camera sender unit (up to 98 feet/30m away), and can even be totally hidden from the camera's line of sight. Similarly, there's no concern about loss of receiver flash firing reliability if a flash is placed in bright sunlight. Radio-based wireless flash is state-of-the-art technology, and certainly worth exploiting if you do a lot of off-camera flash in your close-up and macro shooting.

RT-compatible sender devices

Radio-based wireless requires an on-camera device to trigger the off-camera flash(es). For Canon's Speedlite system, as of early 2018, that means one of the following, mounted to the camera's hot shoe:

Canon RT-compatible Speedlite

600EX II-RT; 600EX-RT; 430EX III-RT

Optional accessory Canon Speedlite Transmitter

ST-E3-RT

SPECIALIZED MACRO FLASH — MACRO RING LITE MR-14EX II



Canon has two dedicated, specialized flashes exclusively for macro-type shooting. These are certainly worth considering if you are (or evolve into) a serious close-up and macro photographer. Both are completely E-TTL compatible with all current EOS digital SLRs and mirrorless M-series models having a hot shoe.

The first is the MR-14EX II Ring Lite unit. This unit provides essentially flat, frontal illumination for close-up subjects. It makes it easy to fill-in small details on anything from a dental image to a shot of an insect. There are two curved flash tubes which you can independently control, to provide a sense of shadowed, directional lighting.

The front section of the Macro Ring Lite clips directly onto most dedicated Canon Macro lenses, like the EF-S 35mm f/2.8 and 60mm f/2.8 lenses, and the EF 100mm f/2.8 USM lens. Lenses with larger front sections, like the L-series EF 100mm f/2.8L IS Macro, and EF 180mm f/3.5L Macro, require an optional, accessory Macrolite Adapter Ring (67mm and 72mm, respectively) to attach the front section of the ring lite.

One beauty of the Macro Ring Lite is how easy it is to work with in the field, for quick shots of insects and other small subjects. Pre-set a small lens aperture like f/16 or f/22, dial-in a fast shutter speed to kill ambient light and essentially eliminate the risk of blurs (like 1/200 or 1/250), and pre-focus a macro lens to 1:1 or similar magnification. Now, with the lens set to Manual focus, just move close to small subjects until they're sharp, and shoot sharp pictures. The Macro Ring Lite can change this type of challenge into almost point-and-shoot simplicity.



Here's an example where the flat, even lighting from a Macro Ring Lite delivered nice results, paired with a macro lens. When shadows are either not wanted at the subject, or you only want even lighting with a hint of them, the curved flash tubes of the MR-14EX II and a macro lens can deliver superb results.

Similarly, the MR-14EX II (or the previous-generation Macro Ring Lite MR-14EX) can speed up the process of hand-held macro images to simply document small subjects, like jewelry and rings, small mechanical or electronic parts, and so on.

The MR-14EX II (as well as its predecessor, the MR-14EX) can use traditional Optical Wireless technology to trigger one or more off-camera flashes. Be aware that there is currently no RT-compliant wireless transmission; it's Optical only.

And, adding one or more Speedlites off-camera is a bit different than otherwise in the Canon flash system. By default, the system expects any off-camera flashes added to the MR-14EX II to be in the "C" group, and to be used for background or "accent" lighting — not for direct lighting on the primary subject which is lit by the Ring Lite! If you do add one or more flashes and trigger them with the Ring Lite, and you aim them at the primary subject, you'll usually get over-exposure.

If you activate Flash Custom Function 15-1 with the MR-14EX II, however, you change how off-camera Receiver units will operate, and now you can add "A" and "B" units, and add them to illuminate the main subject along with the curved flash tubes of the Ring Lite.

SPECIALIZED MACRO FLASH — MACRO TWIN LITE MT-26EX RT

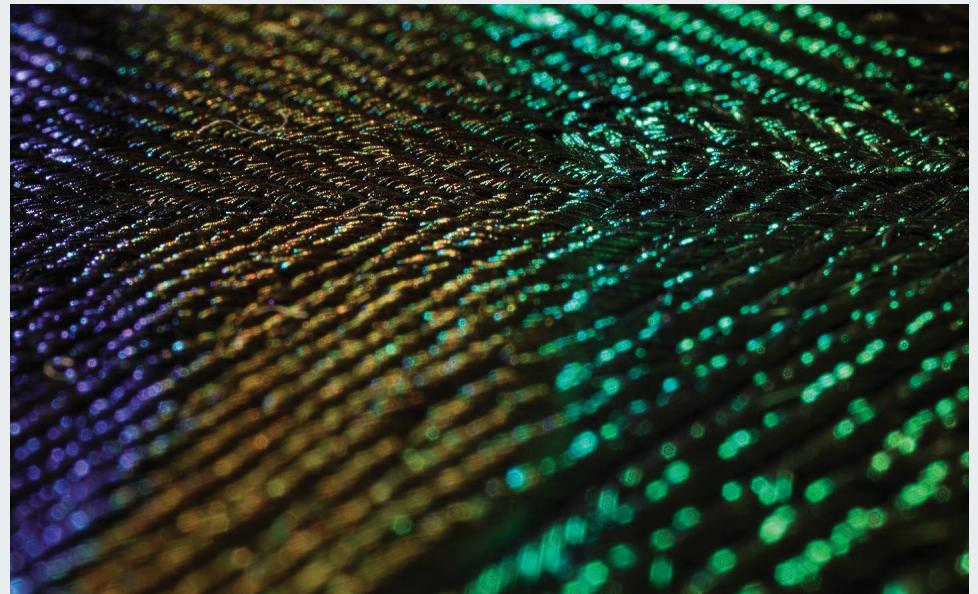


Here's another important, dedicated macro flash for serious macro enthusiasts. The primary difference vs. the Macro Ring Lite? The Twin Lite can provide much more potential for natural-looking, directional lighting of close-up subjects.

Each of the two flash heads

can be moved, tilted, and even removed completely from the front attachment ring. They can be fired together, evenly or at varying ratios, only one can fire, or be combined with flash from other, off-camera Speedlites.

The two heads have a foot shaped to mount into traditional shoe-mount devices, and a threaded tripod-sized socket to further ease attaching to mini tripods, light stands, and other mounting devices. Their coiled cords are not detachable, so they must be positioned within reach of the on-camera controller unit they're connected to. But since this is closeup work, you can often get great, directional lighting without moving the heads more than a foot or two from a macro subject.



There are plenty of times where you will want directional lighting and shadows to give that sense of detail and texture — such as in this shot at 3x magnification of a peacock feather. The Macro Twin Lite MT 26EX RT (or its predecessor, the MT-24EX) are ideally suited for these types of subjects. In this case, only one flash tube was fired, and it was removed and placed behind this small subject to deliver a pronounced back-lit look, and enhance the surface of the feather.

While a bit larger to work with hand-held than the Ring Lite, you can pre-position the flash heads to work effectively with various subjects, and (as discussed above with the Ring Lite) use this flash to shoot relatively quickly in the field. But it truly comes into its own when you move one or both of the heads off the attachment unit, and exploit subject textures and details with directional lighting.

Again, this unit can trigger one or more additional off-camera receiver flash units, via optical or (with the newest MT-26EX II-RT) using radio-based wireless flash technology.

TOOLS OF THE MACRO TRADE

CLOSE-UP LENSES



We mentioned these several times in the video series, and they're an appealing accessory for both first-time macro shooters, and even for experienced enthusiasts and pros.

Close-up lenses attach like a filter to the front of the lens, but they aren't just a flat piece of clear glass. Instead, good close-up lenses use a double-element construction of specially-curved, high-quality optical glass to deliver very good sharpness across the image from center to

corner. They basically "trick" the lens and camera into thinking that the lens they're attached to (like your 70-200 or 70-300mm zoom) can focus much closer than it normally would.

Yet another cool thing: for technical reasons, close-up lenses are the only macro type accessory that doesn't cause a loss of light as you get progressively higher magnifications.



Here's an example of the power of a Canon Close-up Lens 500D, attached to a previous-generation 70-300mm zoom lens. The shot on the left captures these small flowers at the nearest focus distance; there's a stunning change in the magnifications possible with the 500D attached to the front of the lens.

And, they're one of the most affordable ways to get more effective close-up images, especially with longer-than-normal lenses. Close-up lenses tend to be quite effective at longer focal lengths (say, between 100 and 300mm or even 400mm), and lose effectiveness at shorter focal lengths.

Interestingly, the opposite is true of extension tubes — the other primary accessory to break into real close-up shooting. These get more effective, in terms of magnification, as they're attached to shorter focal length lenses.

Canon makes two different Close-up Lenses:

CLOSE-UP LENS 250D

- Optimized for lenses from 50mm thru 135mm
- Available in 52mm and 58mm filter sizes

Close-up Lens 250D is a nice accessory to combine with standard zooms like the EF-S 18-55mm, suddenly turning it into an effective close-up device. And again, this is without the cost of losing light as you focus close.

CLOSE-UP LENS 500D

- Optimized for lenses from 70mm thru 300mm
- Available in 58mm, 72mm, and 77mm filter sizes

The 500D is a simply superb way for to extend the versatility of a telephoto lens, especially a tele zoom with compatible filter sizes, and make it an effective tool for close-up images. A few examples, with the lens zoomed to maximum tele position, and focused to its closest focus setting:

EF 100-400mm f/4.5-5.6L IS II lens (77mm filter size)

Normal maximum magnification — 0.31x

Max. magnification with Close-up Lens 500D — 0.78x

EF 70-200mm f/2.8L IS II lens (77mm filter size)

Normal max. magnification — 0.21x

Max. magnification with Close-up Lens 500D — 0.6x

EF-S 55-250mm f/4-5.6 IS STM (58mm filter size)

Normal max. magnification — 0.29x

Max. magnification with Close-up Lens 250D — 1.0x

Be aware that there is currently no 67mm version of either the close-up Lens 250D or 500D. Canon does not recommend using step-up adapters to fit a larger filter, such as a 72mm or 77mm, onto a 67mm-equipped lens, although users are free to try. And, check your lens' instruction manual carefully — a few Canon lenses specifically recommend against the close-up lenses, because their added weight to the front barrel of the lens can alter the plane of sharpness and thus impact image quality adversely. (This is rare, but still, check your lens manual — with their double-element construction, Canon's close-up Lenses are a lot heavier than a typical screw-in filter.) In general, however, we can continue to recommend close-up Lenses as a great accessory to extend what a tele lens can do in shooting small objects.

In summary, when comparing close-up lenses vs. extension tubes, consider close-up lenses as more effective to combine with tele lenses, and extension tubes as the more effective option to combine with "normal" and wide-angle lenses.

EXTENSION TUBES

The second method to make a conventional lens work more effectively at close-up magnifications is to attach a hollow extension tube between the camera body and the rear of the lens, moving the lens away from the camera. This has long been known as a way to allow much closer focusing, and higher magnifications of close-up subjects. (Just to be clear, we're not talking tele-extenders here! They have a built-in optical system, unlike extension tubes designed strictly for close-up shooting.)

The effect is directly related to the length of the extension tube, and the lens' actual focal length. Canon makes two EF extension tubes, a 12mm version (EF 12 II) and a 25mm long version (EF 25 II).

The closer the extension tube's length is to the lens' actual focal length, the greater the close-up magnification effect will be. And, you'll find you're working much closer to the subject. In extreme cases, you may find with an extension tube in place with a wide-angle lens, that you're nearly touching the front of the lens to a subject to get it in focus!

Basically, what this means is that extension tubes can make a subtle improvement in close focusing when attached to a 200mm or 300mm telephoto lens, and a dramatic change if you attach them to a 50mm or 28mm lens. Here are a few examples:

EF 50mm f/1.8 STM

Normal max. magnification — 0.21x

EF 12 II — 0.45x max. magnification (5 inch working distance)

EF 25 II — 0.74x max. magnification (3.2 inch working distance)

EF-S 18-135mm f/3.5-5.6 IS USM

Normal max. magnification — 0.28x

EF 12 II — 0.43x, at 135mm (4.4 inch working distance)

EF 25 II — 0.61x, at 135mm (2.7 inch working distance)

EF 24-70mm f/2.8L II

Normal max. magnification — 0.09x

EF 12 II — 0.63x, at 28mm (1 inch working distance)

EF 25 II — 0.74x, at 70mm (1.7 inch working distance)

For the most part with extension tubes, you'll be focusing the lens to its nearest focus distance, although you're free to experiment with changing focus distance on the lens manually (effects are usually slight). Autofocus generally will not work when an extension tube is mounted, so expect to use manual focusing. Live View, with its magnification capabilities, can really simplify this, whether you're tripod-mounted or hand-holding the camera.

There will be a light loss when extension tubes are mounted, but it's not consistent — just as magnification varies, depending primarily on the focal length of the lens, light loss may vary similarly. The greater the magnification, the greater the light loss. The good news is that if you expose using continuous light (such as you saw in parts of the Macro video series), the in-camera metering recognizes and accounts for this light loss, so manually-input compensation is usually

only needed if you were using a separate, hand-held light meter to calculate exposure. The same is true if you're using E-TTL flash to expose your pictures...Manual flash mode, however, would require some trial-and-error adjustments at high magnifications.

MACRO LENSES

These are the optimum, albeit most expensive way, to get into macro shooting. They are special-purpose lenses, optimized to deliver two things a bit differently than conventional zoom or fixed focal length lenses:

- Produce their optimum sharpness and contrast when focused at distances much closer than infinity (most lenses, on the other hand, are engineered to deliver best performance at focus distances much farther from the camera)
- Deliver "flat-field" sharpness, for excellent corner and edge sharpness when precisely lined-up to flat objects (such as when copying documents or flat artwork)

In general, if you invest in a genuine macro lens, there's a good chance it'll be the sharpest, or one of the sharpest, lenses you own.

With one exception (as of the time of this writing), Canon's macro lenses can focus close enough at their minimum focus distance to deliver true life-size, or 1:1 (1x) magnification. And, these lenses can focus out to

infinity, so they can be used for many general-purpose types of images, too. In fact, many photographers find a moderate telephoto macro lens to be a tremendous tool for tack-sharp portraits, and even landscape images. Wedding photographers can take posed or candid shots, even in fairly low light, and still have the ability to focus right in on tiny details, from a couple's new wedding rings to details in flowers or on the invitations. A macro lens can be something of a Swiss army knife in the hands of a creative photographer, and not solely a lens for extreme close-up shots.

CANON'S MACRO LENSES

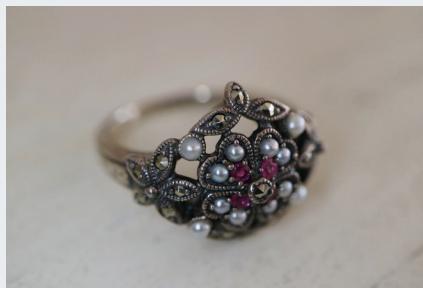
Here is a quick run-down of the different macro lenses available in the Canon EOS system. Some of these are discussed during our video series on macro, but all are available at the time of this writing. Further information and specs can be obtained on Canon USA's web site (www.usa.canon.com). We'll list these in order of their focal lengths, starting with the shortest ones:

EF-M 28MM F/3.5 MACRO IS STM



The EF-M lens series is exclusively for Canon's compact "mirrorless" cameras, such as the EOS M5, M6, and M100 cameras. This is the genuine macro lens for the M-series-camera owner—a very compact and light lens, with built-in Image Stabilization. And, it was the first Canon lens to introduce built-in LED lighting, for close-up subjects. It can focus from infinity down to 1:1 (even greater magnifications of up to 1.2x are possible if it's shifted into its "super macro" mode).

AF uses Canon's STM, or stepping motor, technology, and this works especially well when combined with the Dual Pixel CMOS AF in many of the recent EOS M-series cameras — even more so on those with touchscreen operation.



The EF-M 28mm f/3.5 Macro lens is perhaps the lightest and most compact way to get into true macro shooting in the EOS system. This lens can focus continually down to 1:1 magnification. Its built-in LED lighting was used for the shot of the ring, above.

The 28mm focal length means this lens delivers a field of view equivalent to what you'd see with a 45mm lens on a full-frame camera — a hair wider than "normal." Accordingly, at its nearest focus distances, your subjects will be pretty close to the front of the lens. Optical performance is stellar, and the built-in illumination can really transform what's possible in quick, hand-held shooting. If using a compact camera is an important concern in your macro shooting, an EOS M-series camera combined with the EF-M 28mm f/3.5 Macro IS STM lens should be on your short list.

EF-S 35MM F/2.8 MACRO IS STM



This macro lens looks similar to the EF-M 28mm, but it's an EF-S lens, designed for EOS digital SLRs with the smaller APS-C size image sensor. Any current version of the Canon EOS Rebel, mid-range cameras like the EOS 70D or 80D, and any current version of the EOS 7D can use this superb performance macro lens. Its 35mm focal length means it gives the same field of view that a 56mm lens would provide on a full-frame camera.

It emphasizes compactness, but still can focus from infinity to life-size, using STM focus motor technology that works especially well with Live View and video, and certainly effectively for still images shot through the viewfinder as well.

Like the EF-M 28mm, this macro lens also has built-in LED illumination. This can be turned on or off at any time; there's no obligation to use it. But it offers a very fast option to fill-in shadows of nearby subjects (even in sunlight), as well as illuminate small subjects in dim conditions. Canon's dedicated Macro Lite flashes can also be directly attached to the front of the lens.

This is a supremely sharp, compact and easy to handle lens, that would be an ideal step-up into hand-held macro shooting. And, with its "standard" equivalent focal length, it would double as a fast, f/2.8 general-purpose lens that can focus out to infinity, whenever you desire.

EF-S 60MM F/2.8 USM MACRO



Again, a lens with the EF-S mount, so it's strictly for Canon EOS DSLRs with the APS-C size image sensor — any current EOS digital Rebel, 70D/80D, and the 7D series. It won't work on full-frame cameras.



Here, the 60mm focal length translates into an effective equivalent of a 96mm lens — meaning now we have a true macro lens that'll focus to life size (1:1 magnification), but have a longer working distance to macro subjects. And, at the same time, a true portrait-length, moderate telephoto lens with a fast f/2.8 aperture. This lens could easily double as a very effective portrait lens, or even a lens for low-light candids in controlled situations. It doesn't offer the Image Stabilization of the 35mm macro described directly above, but it

remains an extremely compact and easy lens to hand-hold effectively. And, its modest weight means if you do use a tripod, there's pretty much no concern about a front-heavy camera/lens combination.

This is a proven design, and has been in the Canon EOS system for nearly a decade. It remains a tremendous choice for users who want the option of a macro lens in a longer focal length package, especially for nature shooters who can really use the increased working distance to back-off from live subjects and still get high close-up magnifications. Its Ultrasonic Motor (USM) focusing is fast and quiet, and this is an easy lens to manually focus whenever the need arises, too. Overall, a highly recommended option for Canon users with an APS-C size sensor in their

camera, looking to make a clear step into macro photography.

EF 100MM F/2.8 USM MACRO



There are two EF 100mm macro lenses in the Canon system, as of early 2018. This version has been around the longest, and is a thoroughly proven design. As with the previous macro lenses, this one can focus from infinity down to full life-size, 1:1 magnification. With a full-frame camera body, you can fill the frame with a subject the size of a US quarter coin.

As you'd expect from a 100mm lens, this doubles as a terrific portrait or general medium-telephoto lens, and its wide f/2.8 maximum aperture means it remains effective in many low-light situations. For about 1/4 the price of a 70-200mm f/2.8 lens, you can enter the world of available light shooting, and in addition have the ability to focus down to 1x magnification.

Optical performance is excellent... like most real macro lenses, you will not need to stop this lens down to f/8 or f/11 simply to get good sharpness out of it. It lacks the Image Stabilization of the more-expensive L-series 100mm macro lens, but as a great general-purpose macro lens, and a great value, this lens is tough to beat.



One of the beauties of a macro lens is how sharply they can photograph flat objects, as long as the camera is squarely lined up with the subject.

The longer 100mm focal length can mean working distance from the front of the lens to a subject at life-size magnification is almost 6 inches, so you have room to add lighting, space to avoid spooking nearby live subjects (like a bee on a flower), and minimize the risk of casting shadows from the lens barrel onto nearby subjects.

Canon "EF" lenses can be mounted onto any current Canon EOS digital SLR camera, and with an optional Canon Mount Adapter EF-EOS M, it can be used with mirrorless EOS M-series models as well. This lens functions really well as the equivalent of a 160mm f/2.8 lens when mounted on a Canon EOS camera with the smaller APS-C size image sensor, such as an EOS 7D model. Again, this is the value proposition in the EF lens series among Canon's macro lenses.

EF 100MM F/2.8 USM MACRO



If your goal is to own the sharpest, best-performing Canon macro lens, stop here — this L-series lens is exquisite in its performance, and it sits at the top of the Canon macro lens line. Its outstanding optics are teamed with a very effective, hybrid Image Stabilization system (built into the lens), providing two distinct methods of optical stabilization — one optimized for normal shooting distances, and a different type of stabilization for close-ups and macro shooting. Image Stabilization really changes the character of this lens, and makes it very effective for hand-held shooting, even at the slower shutter speeds often used when macro pictures are taken at smaller lens apertures for added depth-of-field.



The exquisite performance of the Canon EF 100mm f/2.8L IS macro lens isn't limited to macro subjects... it's a spectacular choice for larger subjects, up to and including portraits, fashion images, and more. Here, it was used almost wide-open (at f/4) to photograph part of an antique cash register.

Again, this lens can focus out to infinity, so it's a great choice for portraits, fashion, product shots, and other subjects at "normal" distances. But keep focusing closer, and you can reach life-size (1:1) magnification. It's simply an incredibly practical, professional-grade lens for the serious and critical shooter. As with all current EF lenses, this lens will work with any Canon EOS DSLR, including APS-C

sensor models (on the latter, the 1.6x "crop factor" gives this lens the same field of view as a 160mm lens would have on a full-frame camera).

Like all current Canon L-series lenses, this lens ships with a lens hood for protection from lens flare in outdoor situations. Canon's Macro Lite flashes can be attached, but this lens (unlike the non-L-series 100mm lens, previously mentioned) requires an optional accessory Canon Macro Lite Adapter 67C to connect the flash to the front of the lens.

Working distance from the front element of the lens to a subject is about 5 inches, with the lens at its closest focus distance and 1:1 magnification. Few macro lenses from any manufacturer can match this lens for outstanding, professional-grade results in macro shooting.

EF 180MM F/3.5L MACRO USM



The 180mm macro lens has the distinction of being the longest focal length macro lens in the EOS system, as of early 2018. That alone sets it apart in the EOS system, and its working distance at close-up magnifications is why. At full life-size (1:1) magnification, you can be nearly 11 inches from the front of the lens to the subject — far greater working distance than any other Canon macro lens can provide. For nature photographers shooting live subjects, this can really make a difference in the number of quality shots they can take.



Here's an example of where the added focal length of the EF 180mm f/3.5L Macro lens really shines — its ability to produce life-size magnifications, but with working distances nearly a foot (0.3m) from the front of the lens to the subject. Nature shooters working in the field are far less likely to upset subjects like this bee on a flower.

Once again, the 180mm L-series macro lens can focus out to infinity, and then continuously closer until you reach life-size magnification. It's actually a great choice for longer focal length portraits, fashion shooting, and products where more of a distinct telephoto look is desired.

This has been highly regarded for its sharpness, contrast, and overall optical performance. It lacks the built-in Image Stabilization of the EF 100mm f/2.8L IS lens, but it is equipped with a removable tripod collar, making it an easy lens to use on a tripod or even a monopod. With its larger 72mm front filter size, an optional accessory Canon Macro Lite Adapter 72C ring is required to mount a Canon Macro Lite flash to the front of the 180mm lens.

While arguably a bit too long for tasks like copying documents or flat artwork, this is a macro lens that absolutely comes into its own when shooting nature-type subjects — whether hand-held or using a tripod. In addition, if you do a lot of studio-type macro and close-up work, this added working distance can give you ultimate flexibility in terms of room to light small subjects, with minimal risk of casting shadows on them. And, it's one to consider if outdoor portraits, using a longer focal length lens, are something you do frequently. It's a very compelling alternative to something like a 70–200mm lens, all the more so because of its true macro focusing capability.

MP-E 65MM F/2.8 1-5X MACRO PHOTO



Until now, every Canon macro lens we've discussed has the capacity to focus down to life-size — close enough to fill the frame with a typical-size strawberry. But the critical macro user may reach the point where they need even more magnification, for impressive shots of truly small subjects.

Here's the answer. The Canon MP-E 65mm lens is the most unique macro lens in the entire Canon line-up, with continuous close-focusing from 1x (life-size) to 5x life-size (!). When sharp images of small insects, tiny products or parts, or similar small subjects are needed, this lens answers the call.

A few important points to keep in mind about this special-purpose macro lens:

- The lens can work with any current Canon EOS DSLR, and with mirrorless EOS M-series cameras via the optional Canon Lens Mount Adapter EF-EOS M

- With some EOS cameras having a built-in flash, it's possible the (included) tripod mount adapter can sometimes hit the front housing of the built-in flash. The tripod collar can be removed in such instances.
- This lens will not focus to infinity or anywhere near it... its most distant focus distance produces 1x, life-size magnification. It's exclusively for macro shooting.
- Focusing is manual only — there is no AF capability, regardless of the camera it's mounted to
- As the lens is focused, magnification gets progressively higher... there's a magnification scale engraved on the lens barrel to give you a pretty precise idea of where you're at as you focus the lens
- Working distance is very short, front of the lens to a subject. At 1x, expect to be about 4 inches away; at 5x, your front element will be about 1 inch from the subject.

Two additional points: this lens truly comes into its own when used with flash (either off-camera Speedlites, or a Canon Macro Lite unit attached directly to the front of the MP-E lens). Flash can easily allow the smaller apertures demanded for sharp macro images of 3-dimensional subjects with this lens, even if natural light is subdued.



This picture of a common housefly points out a few salient aspects of the MP-E 65mm f/2.8 1~5x Macrophoto lens. This was taken at 2x magnification, hand-held, using a single Speedlite off to the left of the camera. This enabled an f/11 aperture, and the resulting sharpness. Pre-focusing to 2x magnification, and simply moving in and out until the fly's eyes were sharp, got us this result.

And, in terms of practical focusing this lens, you're dealing with tissue-thin depth-of-field, as magnifications increase. Even if you're using flash and shooting at f/11 or f/16, your best bet is to pre-set the magnification you want to work at, and then move the camera forward and backward until you see critical, sharp focus at the most important point of your subject. Often with this lens, it's impossible to get an entire subject into sharp focus in one picture — best strategy is often to decide upon one part of a subject to be the plane of sharpest focus, and allow focus to drift from there as a viewer's eyes move forward and back in the scene.

An additional point: some serious macro shooters will combine this lens with an accessory, third-party focusing rail, for really precise focusing in situations where they can tripod-mount the camera and lens ahead of time. Canon doesn't make focusing rail accessories, but they are available from well-stocked camera dealers, as well as online.

One of the reasons flash is so effective with this lens is the unavoidable light losses that accumulate as close-up magnification increases. Years ago, in the days of completely manual film cameras and separate, hand-held light meters, this made close-up photography a genuine chore, with constant adjustments to compensate for light loss a constant part of macro shooting. Today, with outstanding built-in meters and E-TTL flash, this is largely a forgotten relic of years past.

However, be aware that there still is light loss with the MP-E 65mm lens. At 1x (life-size), it's effectively transmitting two stops less light than a conventional lens, at "normal" focus distances, would in the same lighting conditions. This increases to about a 5-stop light loss at its maximum 5x magnification. This means that at its smallest f/16 aperture, effectively the lens is transmitting what a "normal" lens would at f/90 (that's not a typo!). Bottom line: use flash, and keep the flash(es) fairly close to your subject, or expect to have lots of natural light on your subject. Raising ISOs in either case won't hurt, either!

SUMMARY

Close-up and especially macro photography can open an entire new visual world to the thinking and creative photographer. As we said previously, even the most ordinary, everyday subjects can look extraordinary when you start getting close to them. These can be as varied as things in your home to exotic details of plants, animals and insects from halfway around the world.

One of the most important virtues for the skillful macro shooter is simply to slow down... don't be in a rush to grab that first picture. Look increasingly carefully at things around you, and let the pictures "come to you."

Use good technique, from where you put sharpest focus and how you compose the picture to good, sensible choices in camera settings. Close-up and especially macro work truly reward the careful, critical photographer.

Think about opportunities to set up scenes in your own home or studio, as we saw in this accompanying video series. But equally important, look for those close-up opportunities that simply happen, whether it's a butterfly landing on a flower close by, or just the way late afternoon sunlight skims across silverware on the kitchen table.

And remember, you can get great close-ups with the conventional, everyday lenses and cameras you own now. If a genuine macro lens looks to be out into your future, work with and make the most of the close-focusing capabilities in the lenses which are in your camera bag today.

Consider adding an EF Extension Tube to a standard zoom lens, or a Close-up Lens 250D or 500D to a compatible tele zoom lens. You'll be amazed at what everyday lenses can deliver.

And, like any form of creative photography, close-up and macro work are always at their best when visual creativity is applied, from composition to how lighting, exposure and color are handled. In the same way that composition is a vital element of good landscape or portrait photography, it's every bit as important to a great close-up image.

Most important of all: simply go out and shoot lots of pictures! Try different techniques, different subjects, different times of day. Like any other form of human endeavor, the more you practice and apply what you've learned, the better you'll become.

Canon USA's education team thanks you for your investment in this video series, and likewise for your confidence in the Canon brand. We hope the series has been inspirational to you, and that this guidebook has been informative and helpful as you move forward in your photographic journey.

