

Module 3 - Understanding Shutter Speed and ISO

This document follows on from the previous Understanding Aperture document and generally these two are taught as a pair, as they are in effect two sides of a see-saw. To get the correct exposure, when one goes up (to let in more light) the other has to go down (to let in less light).

We have determined that exposure is all about the amount of light that hits the sensor, and that aperture is the size of the hole that the light comes through. Going back to the door analogy, the aperture relates to the size of the door and the shutter speed relates to how long the door is open. In a darkened room, when you open a door of x size, for x amount of time, a specific amount of light comes into the room. So - while you can let in more or less light in the same amount of time by making the door bigger or smaller, you can also let in more or less light (without changing the size of the door) by leaving the door - the shutter - open for more or less time.

Shutter speed is sometimes referred to as 'slow or fast' and sometimes as 'short or long'. To avoid any confusion, a slow shutter speed = a long exposure, and a fast shutter speed = a short exposure. Which kind of makes sense what you think about the door analogy! So with a slow shutter speed, the door is left open for a long amount of time (in relative terms) and for a fast shutter speed the door is only left open for a very short amount of time.

Measuring shutter speed

The exposure is measured by the amount of light hitting the sensor, and this is controlled by those two things - aperture (size of door) and shutter speed (how long you leave the door open). We've now talked about aperture and how you measure the size of the hole - which most photographers agree is pretty confusing - so you'll be pleased to know that shutter speed is measured in a far more conventional way, in fractions of time!

The standard measuring scale of shutter speed is as follows, although you do sometimes get some in between:

1/4000 - one four-thousandth of a second (very fast!)
1/2000 - one two-thousandth of a second
1/1000 - one one-thousandth of a second
1/500 - one five-hundredth of a second
1/250 - one two hundred and fiftieth of a second
1/125 - one one hundred and twenty fifth of a second
1/60 - one sixtieth of a second
1/30 - one thirtieth of a second
1/15 - one fifteenth of a second
1/8 - one eighth of a second
1/4 - one quarter of a second
1/2 - half a second
1" - one second (your camera should hopefully add double speech marks after the number to denote that it is a whole number)
2" - two seconds
4" - four seconds

And so on, all the way up to 60 seconds. We'll talk more on that later, in terms of why you'd want such a long exposure.

When is a shutter speed too slow?

When you first look at this scale, it's easy to think of a second as not very long, but actually, in photography terms that's considered to be quite a 'long' or 'slow' exposure! The key thing that divides the scale is whether you can hold the camera steady enough while the shutter is open in order to get a sharp shot.

If your shots look blurry, this is usually because the camera moved in your hand while the shutter was open, so the image which the sensor captured also included that movement - where your hands were going up and down. It's only fractional, but it's enough to ruin a shot. It's what's referred to as 'camera shake' and can happen at any time - but of course, the faster the shutter speed, then less of that movement is captured by the sensor.

Going to that other extreme, 1/4000 of a second is a very short amount of time, so even if you were intentionally moving the camera while you pressed the shutter, the shot would still look sharp! As long as it was in focus of course - but you get the idea. Likewise if the subject was moving - it should still be sharp at that shutter speed. The image of the dogs on the right is a great example of this.

So why choose to use different shutter speeds? Two reasons, firstly to ensure the correct exposure (the right amount of light hitting the sensor) based on whatever aperture you have selected, and secondly for artistic effect.

Why we use 'aperture priority' and not 'shutter priority'

At this point I'll explain why I and many other photographers use 'aperture priority' (you choose the aperture and the camera chooses the appropriate shutter speed in order to correctly expose the image) - as opposed to 'shutter priority' (you choose the shutter speed and the camera chooses the correct aperture in order to correctly expose the image).



Both the aperture and the shutter speed have an effect on the artistic appearance of the finished shot - but for the majority of shots that you will take, the shutter speed won't make a difference to the finished image, but the aperture will. This is why we use aperture priority.

For any shot you take, you need to make a conscious decision about the depth of field you want. Going back to the previous doc, you need to decide how many of the slices of bread, and which ones, you'd like in focus - between you and the furthest thing you can see. But, unless something in your image is moving (which in the majority of cases it isn't) then the shutter speed doesn't make a difference to the artistic outcome.

How changing the aperture affects shutter speed

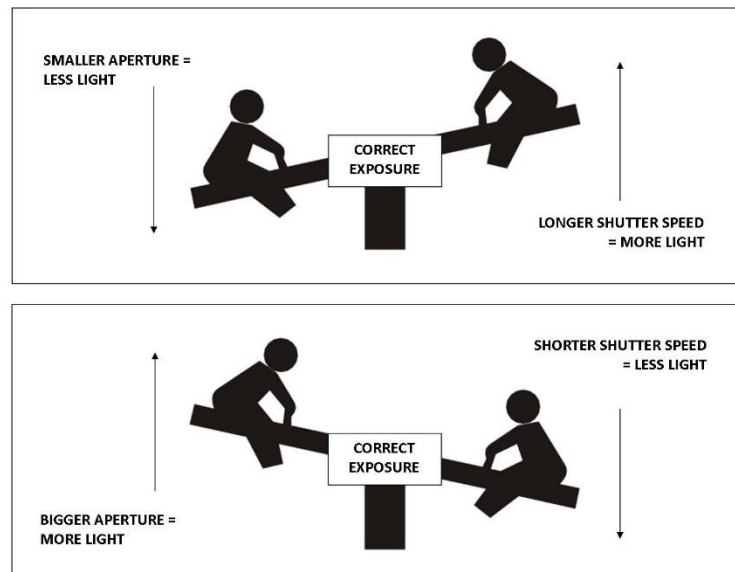
So, going back to basics - if you look at the back of the camera and then change the aperture using the wheel you will see that the other number moves as well. This is because the camera is changing the shutter speed to compensate for you changing the aperture - in order to make sure that that exposure stays the same.

So, when you are out shooting with your camera in aperture priority mode, you need to be aware of what the camera is doing to the shutter speed, as well as what you are doing to the aperture. This is really important.

This is what I call the see-saw effect. If you imagine aperture on one side and shutter speed on the other side, and each side being a quantity of light (regardless of all those numbers that measure it!) - when one goes up (more light) the other must go down (less light), so that the overall amount of light hitting the sensor remains the same.

Being aware of your shutter speed at all times

So, as I said before, when you are out shooting with your camera in aperture priority mode, you need to be aware of what the camera is doing to the shutter speed when you change the aperture. This is to ensure that the camera doesn't choose a shutter speed which is too slow and cause you to end up with camera shake.



In reality, for a normal outdoor shot which doesn't require an especially deep or shallow depth of field (which will be most of what you take) in average lighting conditions, camera shake is unlikely to be an issue. As I mentioned, you should aim to keep your aperture around f8 for the majority of shots you take, unless you are looking for a particularly extreme depth of field, in either direction. So if you're on holiday and just taking snaps, leave it on f8 or thereabouts and you should be pretty much OK. If it's a dull day maybe opt for f7.1 or f6.3 just to let a little more light in.

This mid range is where the majority of lenses are at their absolute sharpest, and it also gives you the most flexibility without having to keep changing your settings. Think of it as a base to work from. At around f8 you have a medium sized hole in the lens and so your camera will choose a medium shutter speed (assuming average lighting conditions) - and this should be fine. But, if the lighting conditions are poor - an overcast day, after sunset, or indoors for example - then the shutter speed it chooses may be too slow, leading to camera shake.

This is why you need to know what your camera is doing, and why you need to keep an eye on the shutter speed each time you take a shot. There nothing worse than taking what would have been a fab shot, only to find out that you have camera shake due to a too slow shutter speed, and it's all blurry.

So, what is 'too slow'?

This is an interesting question, and depends largely on how steady your hands are! Some people can hold the camera steady enough for a whole second, but this is very rare and I wouldn't recommend it.

As a rule of thumb, I would aim never to go below 1/100 of a second when holding the camera (known as 'hand-held', as opposed to being on a tripod or another solid object like a wall!) - and in the main this should ensure a sharp shot, assuming nothing in your image is moving. If things are moving, even trees blowing in the wind, then 1/250 or 1/500 as a minimum would be better - as long as the lighting conditions allow.

ISO – the 'get out of jail free' setting

If your camera is giving you a shutter speed that is too slow, because of poor light, and you don't want to make your aperture any wider – or if you are already on the widest aperture possible – then there is a way round it. Camera sensors can be made 'more sensitive' by increasing what is known as ISO, and this enables the sensor to capture more light. As a rough illustration, if the sensor can capture '10 candles' worth of light in a second on 100 ISO (usually the lowest option – and the best one for image quality) – increasing that to 200 ISO will double the amount of light it captures – so 20 candles and so on.

Check your camera's instruction book for how to alter the ISO, which will probably be set to 'auto' at the start. Change this to 100, or the lowest setting available – as this is essential for learning the 'see-saw' relationship between aperture and shutter speed more quickly. This is because you can see the effect that changing the aperture has on the shutter speed, without the camera overriding those settings by using the auto ISO.

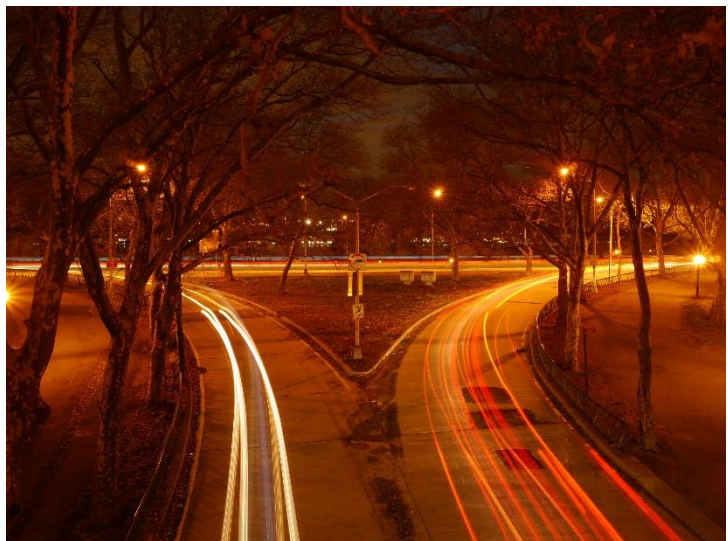
The base level for ISO is usually 100 or near to that. Using a high ISO (6400 or more on most cameras) will make your images look 'grainy' or mottled, so the ideal is to stick to the lowest ISO you possibly can. But if you can't get a fast enough shutter speed (and your aperture is wide open or you need a narrower one for artistic reasons) – then put the ISO up until your shutter speed comes back to about 1/100, or whatever speed you need for the shot you're taking, bearing in mind that moving subjects need faster shutter speeds. It's always better to have grain than it is to have a blurry shot due to camera shake!

Intentional long exposures

Everything we've talked about so far is all about trying to get everything in the image as sharp as possible. And for everyday shots this is what you are trying to achieve. But, as I said earlier, the other purpose of shutter speed is for artistic effect.

You have probably seen all those images of 'silky' moving water in waterfalls, or light trails at night, like the shot on the right - and this is where shutter speed makes all the difference.

If you shoot a waterfall at 1/1000, then all the water droplets will be 'frozen' sharp because they barely moved in that one thousandth of a second. But if you shoot the same scene at say half a second, the water will have moved during that time and it will give you the effect of the water actually moving.



Likewise in the shot on the previous page, the cars moved during the time the shutter was open, and so all you see are the light trails. And because it's night time, and light levels are already low, you don't have any issues with the shot over-exposing due to the long shutter speed, as you would if you tried to do the same thing in daylight.

On that note, going back to the 'silky water' effect, you're now shooting in daylight - and if you have the shutter open for longer, you're going to over expose the shot. So you need to reduce the aperture accordingly (remember the see-saw effect!) to reduce the amount of light hitting the sensor.

The image on the right was a 1.6 second exposure. This created the moving effect – but in normal conditions it would have over exposed even on the smallest aperture. So to fix this I used something called an ND or 'Neutral Density' filter, which is basically just a dark piece of glass that goes in front of the lens and cuts down the amount of light that gets onto the sensor during long exposures. Like sunglasses for your camera!

Nothing to worry about now, but we can maybe look at filters further down the line – you can do some fun stuff with them.

