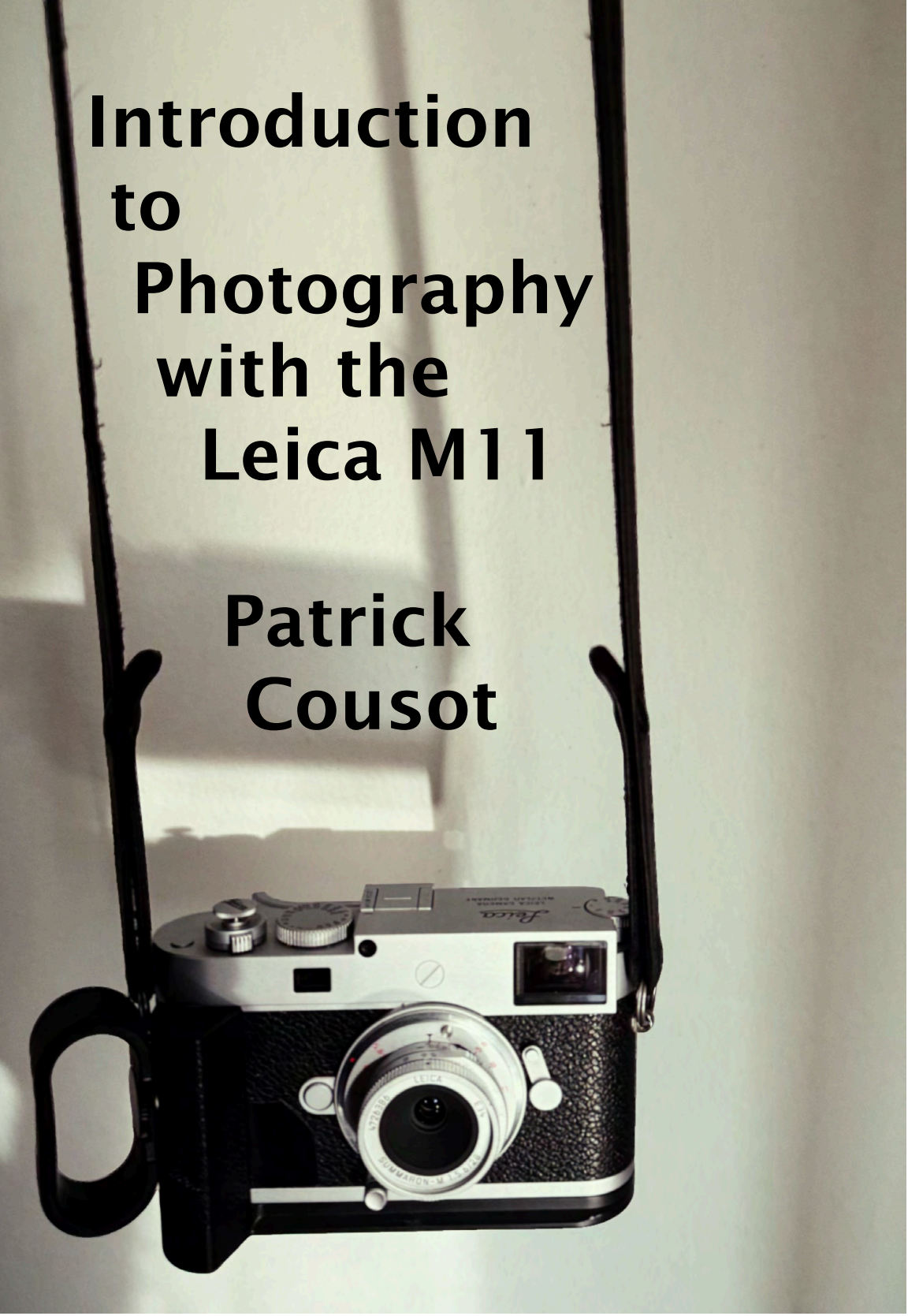
Introduction to Photography with the Leica M11

Patrick Cousot



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To Lucie, Maël, Margot, Maxime, and Sacha

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Introduction to Photography with the Leica M11

Patrick Cousot

Abstract

A short, simple, and illustrated introduction to the fundamental concepts of photography and their practical application with a Leica M11.

1 The Leica M11-P Camera

(here with a handgrip (doubling as a tripod mount), a finger loop, a thumb support, a soft release button, a carry strap,

and a M-mount SUMMILUX-M 1:1.4/35 ASPH lens with UV filter (see section 34) and screwed lens hood). The Leica M11-P has an upgraded rear screen and quadrupled internal storage compared to the Leica M11 (minus the red Leica logo replaced by a screw on the M11-P). The Leica M cameras have a viewfinder (for composition/framing, see section 11) and a rangefinder (for manual focusing, see section 18.2),

Always carry the camera while holding the strap to avoid falls.

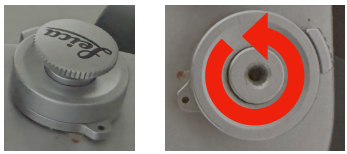
We explain in simple terms how to use the Leica M11 (clicking on dark blue text refers to Wikipedia for more detailed and scientific explanations).

2 Preparation of the Leica M11

Before taking a photo, the Leica M11 must be prepared by inserting a SD card (Secure Digital card), a battery, initializing the SD card, and mounting a lens.

2.1 Inserting a SD Card and the Battery

- Make sure the camera is off,



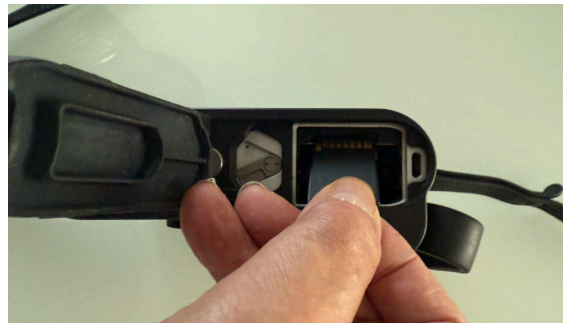
  by turning the main switch anti-clockwise;

- Take the bottom cover of the camera off (by unscrewing it, or, with the handgrip, by lifting the rubber cover);

- Insert an new blank SD card;

  - Orient the SD card so as to see the contacts, as shown on the camera battery slot;

  - Push the SD card, visible contacts down, into its reader until it clicks (to unload, slightly and quickly push the SD card down, and then pull the card out).



- Charge the battery (Leica BP-SCL7 Lithium-Ion Battery).

which may take 3.5 hours for a full charge, reaching 80% in about 2 hours (when the orange indicator lights up).

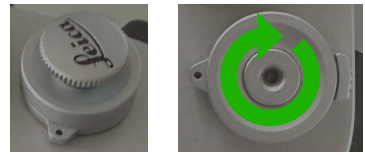
- Insert the charged battery,

Push the battery into its compartment until it clicks (to unload turn the battery release lever so that the battery pushes out slightly, then push down the battery with a brief impulse, and then pull the battery out).

- Put back the bottom cover of the camera,

2.2 Initialize your SD card (the first time only)

- Turn the camera on,



by turning the main switch clockwise;

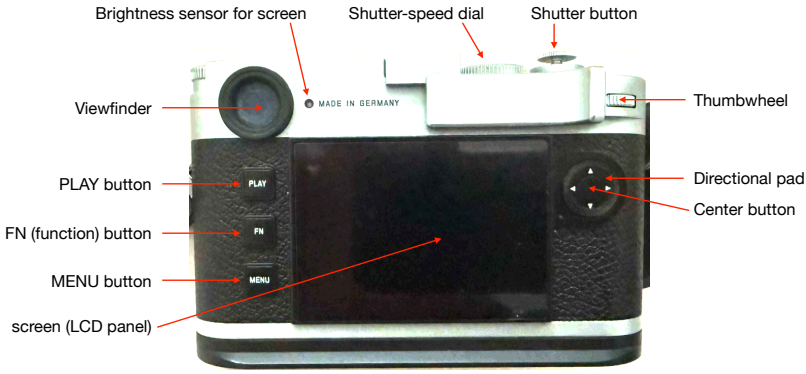
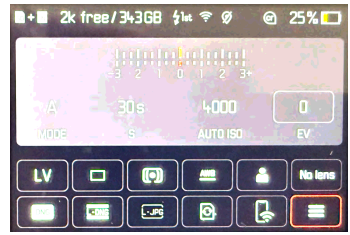
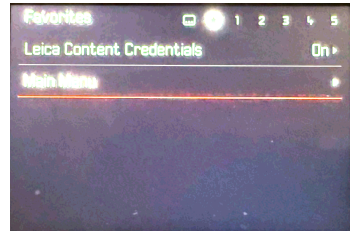


Figure 1: Back of the Leica M11-P

- Look at the back of the camera (see figure 1) and press the PLAY button  to make sure there are no photos on the card. Press PLAY again to exit the photo review mode.
- Press the MENU button  ;
- Use the down arrow of the directional pad  to select the menu  to obtain the following screen:

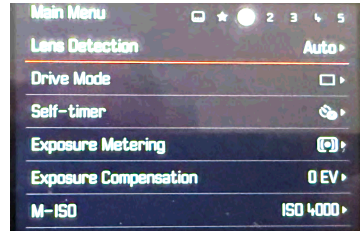


– Press again the Center button, and then press the down arrow to move to Main Menu.



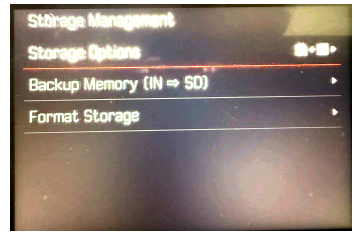
(the Camera Settings may have already been changed so that the Main Menu might be further down on the first or second page of the menu);

– Press the Center button to select the Main Menu and get:

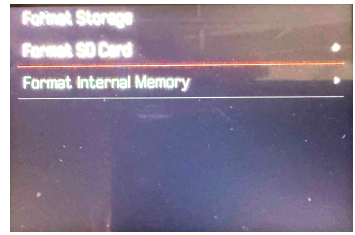


– Press three times the MENU button to select the fourth submenu (marked ④) to get:

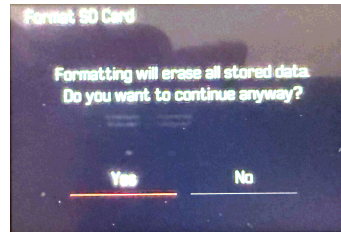
– Press the down arrow on the directional pad to select Storage Management. Then press the Center button to get



– Press the down arrow on the directional pad to select Format Storage and then press the Center button to get



– Push the Center button and then the left arrow to select Yes;



– Push the Center button to start the formatting of the SD card.

This takes a few seconds and at the end returns to the Format SD Card menu.

– Shut down the camera


The previous sequence of actions to navigate the menus of the M11 is traditionally denoted as "ON → MENU →  → Main Menu → ④ → Format Storage → Format SD Card → Yes → OFF". The selection of the next step by pressing arrows △, ▷, ▽, ◁, the central button, or MENU (to directly get from

① to ④ instead of scrolling down through several pages with ▽) is left implicit. ON, MENU, and OFF are also omitted for brevity.

2.3 Mounting a lens

The Leica M-mount allows many different lenses to be mounted on the M11 camera body.

- First remove the rear cap of the lens by turning it anti-clockwise (here a NOCTILUX-M 1:0.95/50 ASPH) to see the M-mount.

- Then remove the camera cap (lens cover) by maintaining the Lens/cap release button pressed down and then turning the cap left.

– Then mount the lens (a SUMMARON-M 1:5.6/28mm in the example)

(by aligning the two red buttons on the camera and the lens and then turning the lens clockwise until hearing a click).

To unmounted, maintain the lens release button in the front of the camera pushed down and then turn the lens anti-clockwise. Put back the caps on the lens and the camera.

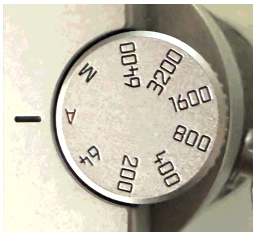
3 The First Photo With a Leica M11

– Set the ISO dial to A (automatic),

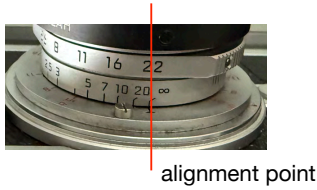


Lift the dial, turn it to put the A in front of the little index, and push back the dial down.

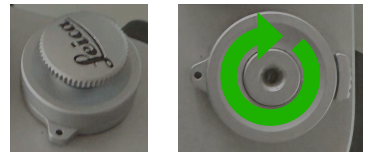
– Turn the shutter speed to A (automatic);



– Turn the aperture on the lens to its maximum (16 or 22), and turn the distance on the lens to ∞;



– Turn the camera on,



by turning the main switch clockwise.

– Get the lens cap off, if any.

– Look to a landscape or a distant subject on the screen (this may require to press the shutter button half-way if the camera got in standby mode).

The red lines show objects in focus (see section 18.3.2). The settings of the camera will remain the same as long as

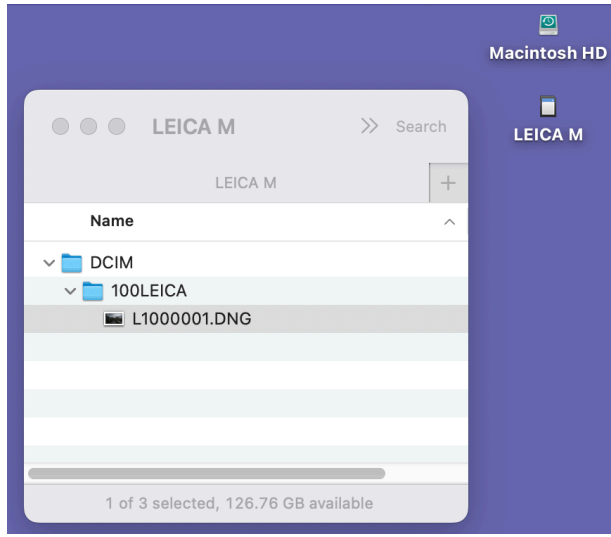
the shutter button is pressed halfway. Release and press halfway again if another view is preferred.

- When satisfied with the screen view, press the shutter button down fully to take the photo. A very recognizable sound produced by the mechanical shutter should be audible.

- Look at your photo on the camera screen.

The screen will go black after 30s, push the shutter button halfway to reactivate.

- Transfer the photo
  - to a computer by removing the battery, then ejecting the SD card, and finally inserting it in your computer slot or a SD card reader.

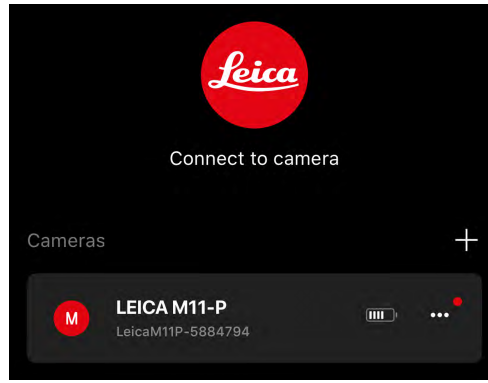


Opening the file L1000001.DNG with Adobe Acrobat Reader, Preview, or Graphic Converter on MacOS will show the photo enlarged on the computer screen.

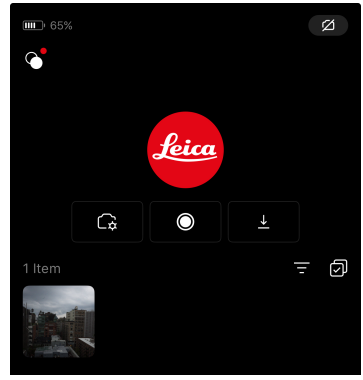
  - to an iPhone using the Leica FOTOS app.
    - First pair the iPhone with the camera by opening the Leica FOTOS app on the iPhone,

selecting Pairing in the Leica FOTOS camera menu, and following the instructions (you might have to re-activate the camera by pushing the shutter button halfway).

- Once the iPhone and camera are paired, open the Leica FOTOS app,



click on LEICA M11-P to connect to the camera (which must be on and active, half-press the shutter button if not) to get the photo

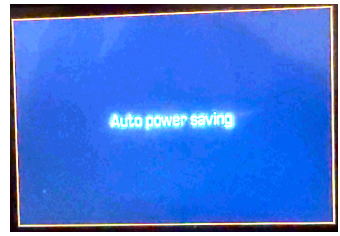


click (or double-click) on the photo to enlarge it and ⍐ to send it electronically (which may require to turn the camera off to allow the iPhone to chose the destination).

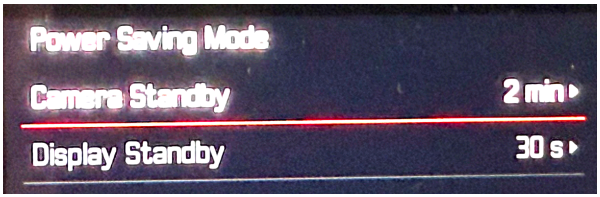
Read what follows to understand what you need to know for your next photos!

4 Silent Deactivation of the Camera and Reactivation

When the camera is on, it automatically goes to inactive mode with a dark screen after some time. This saves energy for the battery. Pressing the shutter button halfway or switching the main switch off and on again will reactivate the camera, as shown by a red Status LED (light-emitting diode) and a visible screen. The silent deactivation time



is 2 min by default and can be chosen by the photographer with MENU → Main Menu → ④ → Camera Settings → Power Saving Modes → Camera Standbys to get



Then the desired Camera Standbys time can be turned Off or chosen between 30 s and 60 min.

Similarly the display deactivates after 30 s, which can also be modified by MENU → → Main Menu → ④ → Camera Settings → Power Saving Modes → Display Standby to be Off or between 30s and 5 min.

Pressing the shutter button halfway or switching the main switch off and on again will reactivate the camera and screen.

5 Light

Photography is the art of fixing visible light on a support. We see and the camera records light that reflects on objects.

Light propagates in straight line beams (think to the straight rays of the sun visible through a cloud), of course except for reflexion on a mirror and refraction, for example through a liquid.

Light has an intensity giving an impression of brightness or brilliance (in absence of clouds, the light of the moon is less intense that the light of the sun at sunrise or sunset, which is itself less intense that the light of the sun at noon).

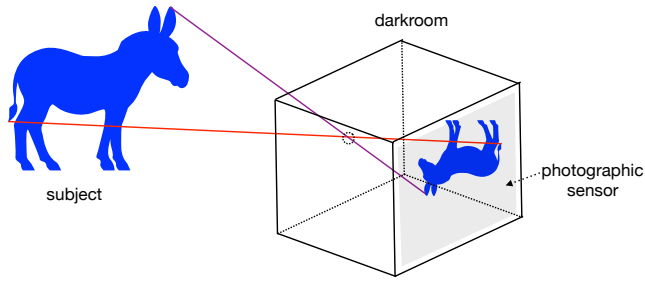
Light is also a quantity (the quantity of light received from the moon for a long time is the same as the quantity of light received from the sun during a very brief instant).

Light can be polarized by reflection on metal or water which alter how the light is transmitted and seen (for example polarization of light allows the glare-reducing effect of polarized sunglasses. Polarizers in photography annihilate light polarization, see section 37).

More scientific details in en.wikipedia.org/wiki/Light, en.wikipedia.org/wiki/Polarization_(waves), or [14].

6 Darkroom

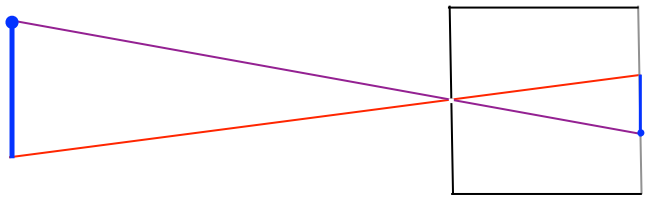
The darkroom has been known for centuries and is at the origin of photography. A darkroom is a box with a small pinhole in one face and a photographic sensor on the opposite face. This sensor was originally made of frosted glass or thin paper. The light beams going through the tiny pinhole reach the photographic sensor. Of course if the light outside the box is intense one sees nothing on the photographic sensor. But if the photographic sensor is seen in the dark (by looking at the photographic sensor while covered by a black cover), one can see an inverted image of the subject (flipped horizontally and vertically).



This is because a ray of light from the top left of the subject goes through the pinhole and arrives at the bottom right of

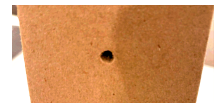
the photographic sensor. The same way, a ray of light from the bottom right of the subject goes through the pinhole and arrives at the top left of the photographic sensor.

Instead of reasoning in three dimensions, one can use a simpler representation of the darkroom in two dimensions, valid in the two horizontal and vertical planes, as follows.



Originally artists painted directly over the frosted glass or thin paper serving as photographic sensor to reproduce the subject. Nowadays some artists like Arnulf Rainer and Philippe Cognée, use a similar idea and paint over photographies.

Here is an improvised darkroom made of a cardboard carton with a pinhole in it and a sensor made of plant-based plastic frosted with a mirror fine sandpaper of grit size 1000. The photo of the sensor under a black sheet shows that the luminous cone is inverted.

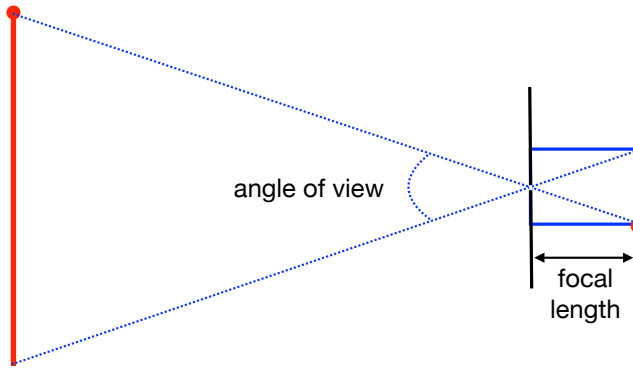


The history of photography is a long search of (sometimes dangerous) chemicals able to capture the light on the photographic sensor of the darkroom and then fix it using a developer and then a fixer, to be able to see the photo in plain light without further modifications by exposition of the photo to light.

7 Focal Length

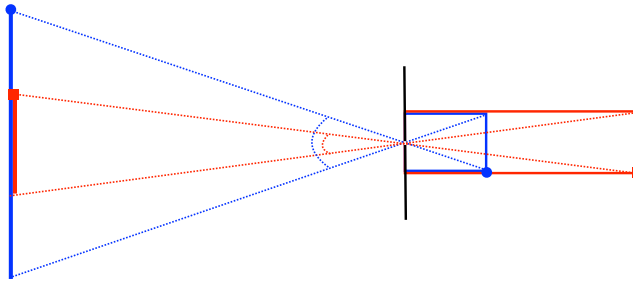
The darkroom also allows us to understand why a camera like the M11 has several lenses (objectives) of different "focal lenghts" 18 mm, 21 mm, 28 mm, 35 mm, 50 mm, 75 mm, 90 mm, and 135 mm, some with adjustable focal lengths 16-18-21 mm and the older 28-35-50 mm. Other companies also produce M-mount lenses such as Voigtländer (10 mm, 15 mm, 40mm) and Zeiss (15 mm).

The focal length is the depth of the darkroom. It determines the angle of view and the magnification of a lens.



8 Comparing Lenses with Different Focal Lengths

Different focal lengths correspond to different depths of the darkroom box.



The two darkrooms, blue and red, have exactly the same photographic sensor size in their back but different depths, that is, focal lengths. The blue darkroom has a small focal length and records a large part of the subject (in blue). The red darkroom has a large focal length and records a small part of the subject (in red).

Notice that because the photographic sensors of the two darkrooms are of the same size, the red darkroom with large focal length has a smaller angle of view and can record more details of the visible subject part thanks to a larger magnification. On the contrary, the blue darkroom with smaller focal length has a larger angle of view but can record less details of the subject because of the smaller magnification.

When choosing a lens, its focal length determines which part of the subject will be captured (as determined by the angle of view). This part of the subject recorded by the camera is called the "frame".

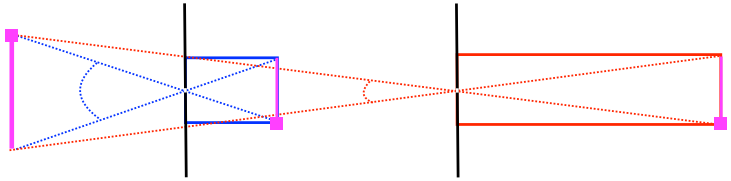
Spatial telescopes have huge focal lengths such as 131.4 meters for the James Webb Space Telescope (JWST). Photo lenses have much shorter focal lenses, typically between 10mm and 800mm,

9 Most Common Focal Lengths of Lenses

The most common Leica M lenses have focal lenses of 28, 35, or 50 mm. The 28 mm, with large angle of view (approximately 75 degrees horizontally), is typically used for a landscape, the 35 mm with a smaller angle of view (54 degrees) is better fitted for a group of persons, while the 50 mm with even smaller angle of view (47 degrees) will be used for an individual (although, obviously, these lenses can be used in all circumstances but produce different photos).

To take a picture of a subject of a given size with a lens of smaller angle of view, one can get farther from the subject. Symmetrically, to take a picture of a subject of a given size

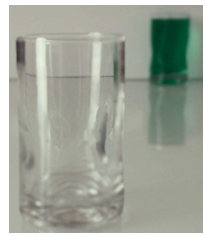
with a lens of larger angle of view, one can get closer from the subject.



In both cases the subject will be captured with exactly the same size on the photographic sensor.

But the pictures will be different! For example[1],

28mm



50mm

120mm

The background appears farther for lenses of small focal lengths and closer with lenses of larger focal lengths, the 50mm being very similar to the human eye.

10 Perspective Distorsion

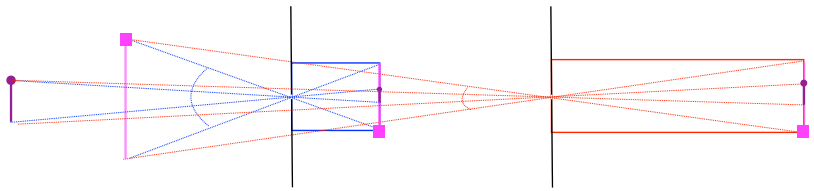
The background in these pictures looks quite different because of the different perspective distorsions, that is, what

[1]The pictures have been taken with the Leica LUX app on an iPhone, there is no Leica 120mm M-mount lens.

is in front and behind the subject is different on the three pictures.

For example with a 28 mm, what is behind the subject looks very far since it will be small. With 50 mm what is behind the subject will be larger and look similar to what we see with human eyes. With the 120mm focal length, the background is larger so looks closer.

This perspective distorsion becomes clear on the following schema.



The subject (in magenta) appears to be of the same size on the photographic sensor of both cameras. But the brown object in a distance behind the subject is smaller on the photographic sensor of the blue camera with short focal length and larger on the photographic sensor of the red camera with longer focal length.

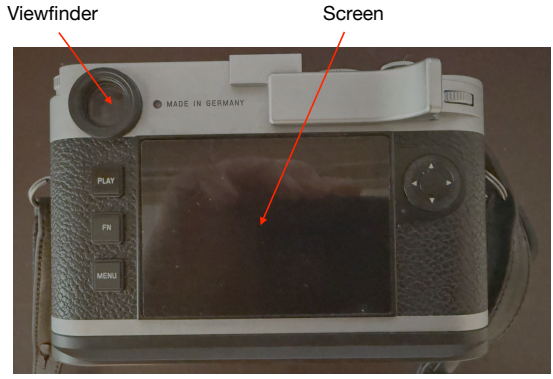
The further is an object, the smaller it looks like. Therefore, in the picture of the blue camera the brown object will look farther (since it is smaller) and it will look closer on the red camera (since it is larger).

It follows that the three 28 mm, 35 mm, and 50 mm lenses can all be used to take pictures of the subject at a given size (provided enough space is available for the photographer to move farther or closer to the subject) but, unless there is no distant background, the three pictures will look quite different.

11 Viewfinder and Screen

In darkrooms the inverted picture appears directly on the translucent sensor. In Leica M cameras, the picture can be seen through the viewfinder or on the screen (called LCD panel) for recent cameras (since the M8 but not for the M11-D which has no screen). At the time of film photography, the photographer could not immediately see the result and had to wait a few days until development of the photographic film in an amateur darkroom or a specialized commercial laboratory.

The viewfinder and LCD liquid crystal screen both allow the photographer to anticipate what will appear in the pictures taken by the camera.



(the camera is off on this picture). The screen shows the subject as seen through the lens (plus other informations to be discussed later). The viewfinder shows a different view of the subject (putting a hand or a cap in front of the lens blackens the screen but leaves the viewfinder unchanged). This is because the image in the viewfinder comes from the

viewfinder window in front of the camera (see figure 2). If

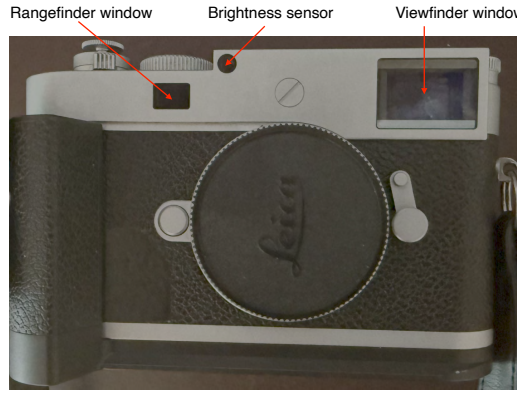
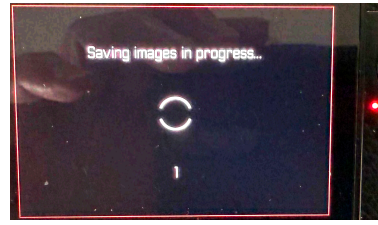


Figure 2: Front of the Leica M11-P camera (with no lens)

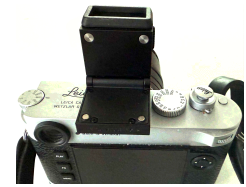
the camera is equipped with a lens, putting an hand on the viewfinder window blackens it but leaves the screen unchanged. This shows that the viewfinder and screen are independent.

In particular if a cap is forgotten on the lens, this is not visible through the viewfinder, but the black photo will be visible on the screen, maybe after a few dozens of seconds of processing by the camera software to denoise the black photo.



An electronic viewfinder (called Leica Visoflex 2) can be mounted on the accessory shoe of the Leica M11 cameras. It exactly reproduces the screen but can be oriented in three different positions to provide an eye-level alternative for the screen.



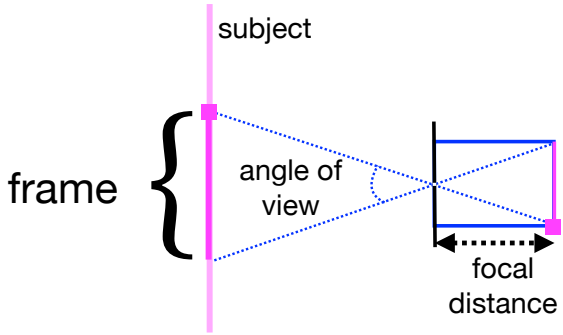


(The former Leica electronic viewfinders other than the Visoflex 2 are incompatible and should not be mounted and used on the M11.)

Finally, note that observing the sun through the viewfinder can damage the eyes.

12 Frame

The frame is the part of the subject reflected on the electronic image sensor. Only this frame part of the subject will appear on the photo.



The frame depends on the focal length of the lens. This frame can be viewed as a rectangle in the Leica M11 viewfinder when the lens is mounted. The frame also appears exactly on the digital screen.

Moving the Frame selector lever

Frame selector lever

(on the right of the lens when facing the camera) will show six different possibilities. Other ones can be seen using external viewfinders to be fixed on the accessory shoe.

When fixing the lens, the current frame is shown in the viewfinder. Moving the Frame selector lever shows two other possible frames, either 35 mm + 135 mm, 28 mm + 90 mm, or 50 mm + 75 mm. These two frames are represented as two rectangles, as follows.

(By the way, the little white rectangle in the middle, shows what is seen through the rangefinder window (see figure 2) in superposition of what is seen through the viewfinder window. This is used for manual focussing, as explained later in section 18.2.)

If the frame produced by a lens is not satisfactory, moving the frame selector will show which lens provides the desired frame.

For other focal lenses, external viewfinders, to be mounted on the accessory shoe, provide the corresponding frame. Here are a few examples.

M11-P with 18mm lens and viewfinder:

M11-P with 21mm lens and viewfinder:

M11-P with 16/18/21mm lens and universal wide-angle viewfinder:

(the lens is equipped with a 67mm UV filter (see section 34) with an 49-67mm adapter since a smaller one creates vignetting (see section 32) at 16mm).

These external viewfinders are for framing only. Focussing must still be done with the camera viewfinder (or using the screen or the electronic viewfinder reproducing this screen introduced at the end of section 11).

13 Camera

A camera is a darkroom with a photographic sensor capturing light like a metal plaque covered by silver salts darkening with light. The darkroom photographic sensor was originally prepared by the photographer in the dark and then covered to be protected from light. The pinhole of the darkroom is closed, the photographic sensor is introduced in the back of the darkroom and uncovered. It is now sensitive

to light. The photographer then opens the pinhole for long enough for the photographic sensor to capture enough light. This time is called the "exposure time". In the early days of photography it was hours, later seconds, and nowadays can be fractions of milliseconds.

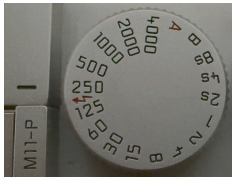
The first Leica cameras used photographic films, nowadays electronic image sensors.

14 Exposure Time (or Shutter Speed)

Originally, the exposure time was very long, a few hours, since the photographic sensor was not very sensitive to light. Photography was for immobile subjects only, such as landscapes. A person traversing the landscape would not appear on the photo since it did not produce a large enough

quantity of light to impress the photographic sensor. Over time, sensitivity of photographic sensors improved and it became possible to take pictures of persons, provided they did not move for a few dozen of seconds. Photographers used supports of the head and body to prevent movements so that the photographed persons often looked tense, rigid, and cramped!

On the Leica M11, the exposure time (or shutter speed) can be chosen thanks to the shutter speed dial on top right of the camera.



The shutter speed dial can be turned and set to be 1/4000 s (second), 1/2000 s, 1/1000 s, 1/500 s, 1/250 s, a red lightning ↜ (1/180 s) for photos taken with a flash, 1/125 s, 1/60 s, 1/30 s, 1/15 s, 1/8 s, 1/4 s, 1/2 s, 1 s, 2s, 4s, or 8s, each time doubling the exposure time. There is also a B meaning that the exposure takes place as long as the shutter button remains pressed down. Finally the A means that the exposure time will be automatically chosen by the camera light sensors and software.

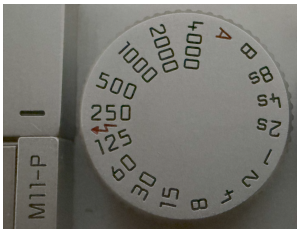
If a photo is too dark, with not enough light captured, a solution is to increase the exposure time. However, beyond 1/250 s, the photographer will possibly slightly move the camera and the photo will be blurry. A solution is to use a monopod, a tripod or minipod,

and even a mechanical shutter release cable to avoid any movement of the camera on the tripod when pressing the trigger.

The shutter release cable has a wheel to block it in down position for the B long exposure time.

15 Shutter Speed

The shutter is the physical device on the camera that opens and closes to control the exposure time of the sensor as determined by the shutter speed dial on top right of the camera (that can be moved by half increments).



The faster (respectively slower) is the shutter speed the smaller (resp. larger) is the exposition time so less (resp. more) light touches the camera sensor.

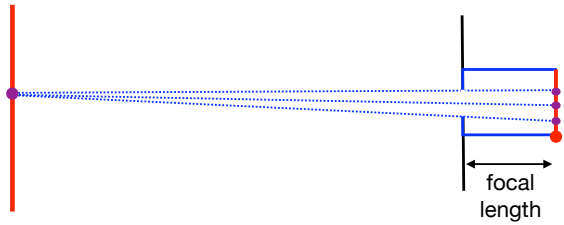
The exposure time is a time measured in seconds. Calling it shutter speed is somewhat a confusing misunderstanding, since a speed is measured in meters per second (or fractions of these). But obviously, the faster the shutter moves (in m/s), the shorter the exposure time (in s).

The shutter can be seen in closed position on a camera with no lense.

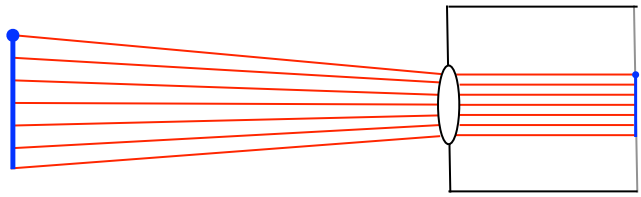
The mechanical shutter consists of light metal blades moving very quickly (in up to 1/4000 s). The shutter is very fragile on should not be touched or blown on (with one's breath or a rubber dust blower ball). The M11 has also an electronic shutter to control the light exposure of the sensor electronically allowing exposure times up to 1/16000 s. Electronic shutter are not perfect so that the M11 offers, by default, an hybrid mode, using the mechanical shutter up to 1/4000 s exposure time and the electronic shutter beyond.

16 Lenses

An obvious solution for a darkroom to capture more light is to have a larger hole. But then a point of the subject will send light rays to different points of the photographic sensor so that the photo will be blurry.



To allow a larger hole in a darkroom without blurring the photographic sensor, photographers invented lenses (that they also call objectives or glasses). Ideally, a lens would project exactly the subject in reduced size on the photographic sensor.



In practice it is impossible to achieve this ideal goal and lenses have a much more complicated design, always with some limitations.

There are usually several lenses in the lens[2] and some mechanism to move them within the lens for focussing, as well as a mechanism to determine the aperture to modify the size of the hole through which the light beams reach the photographic sensor.

[2]In french the lenses inside the lens are "lentilles" inside the "objectif" without ambiguity. Photographic objective is rarely used by photographers in English.

17 Aperture

Lenses may have different apertures with large holes having small numbers while small holes have large numbers like f / 0.95, f / 1.4, f / 2, f / 2.8, f / 4, f / 5.6, f / 8, f / 11, f / 16, f / 22. Small f numbers correspond to large apertures through which a large quantity of light goes through while large f numbers correspond to small apertures through which a small quantity of light goes through. The desired aperture is chosen by turning the focus ring marked with these f numbers. Looking through the lens clearly shows the various apertures (which exact size depends on the lens)

(SUMMICRON-M 1:2/28 ASPH lens with UV filter and no hood nor rear cap at apertures f / 16, f / 11, f / 8, f / 5.6, f / 4, f / 2.8 and f / 2). Half increments are also possible but not shown.

A lens with a small f number is called fast because when wide opened it captures a lot of light so that the exposure

time can be small (or shutter speed very fast). The fastest Leica lens is the NOCTILUX-M 1:f/0.95 50mm ASPH (which first appeared in 2008).

18 Focussing

Ideally whatever is the distance of the subject to the lens, the subject should appear sharp on the photo. Unfortunately, this is not possible in practice. Lenses must focussed on the subject for this subject to appear clear, sharp, in focus on the photo.

On Leica M cameras, focussing is manual. A particular case is when the subject is far enough (usually more than 15/20 m), in which case the distance is set to ∞ (infinity, math for very far!).

Taking pictures of landscapes is always easy since focussing is trivially set to ∞! Otherwise, the photographer must be set manually to the distance to the subject.

The focusing distance in photography is measured from the camera's sensor plane to the subject, not from the front of the lens. This sensor plane is about 1/3 in the back of the M11 camera.

18.1 Focussing by Measuring

The focusing distance can be measured by a laser distance meter or rangefinder (0.947 m in our example) and the focus ring turned to be positioned at that distance (1 m in the example), with some tolerance since the measure is often more precise than necessary.

Although most photographers do not use this measuring method, it is very precise when sharp image quality is required.

18.2 Focussing with the Viewfinder

The M11 is a rangefinder camera. This means that a coincidence rangefinder (also telemeter) is incorporated in the M11 and used to determine the distance to a subject. The image taken through the viewfinder must be aligned vertically with the small center rangefinder image taken through the rangefinder window (see figure 2). This alignment is made by turning manually, left or right, the focussing ring (marked in meters (and feet) on the lens). This is possible thanks to a mechanical linkage between the lens and the viewfinder.

Here is an example with an APO-SUMMICRON-M 1:2/90 ASPH lens at an $f/2$ aperture (which require a precise focussing as explained subsequently).

– When the lens and rangefinder images are vertically aligned (because the focussing ring is on 1.3 m in this example), the lens is focussed and the image on the screen and the photo are clear.

– When the lens and rangefinder images are not perfectly aligned vertically (because the focussing ring is on ∞ in this example), the image is blurry.

If the subject has no vertical line, it is usually possible to move the camera to focus on a vertical line somewhere else at the same distance, then maintain the shutter button half-pressed to keep this distance setting, and come back to the subject to take the photo by fully pressing the shutter down.

For very short distances the rangefinder can be imprecise in which case focussing can be done on the screen.

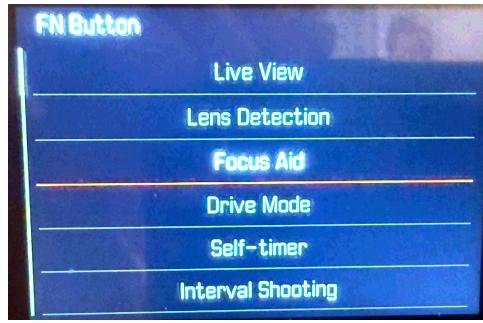
18.3 Focussing with the Screen

It is possible to focus with the screen, turning slowly, left or right, the focussing ring until the image is clear on the

screen. Two settings of the camera do help.

18.3.1 Magnification

- Pressing down the FN (function button, see figure 1) long enough, a menu appears on the screen



  Using up or down arrows of the directional pad, select Focus Aid and then press the Center button to select this option.

- Afterwards, shortly pressing the FN (function button) will magnify the middle of the screen, which is helpful for focussing. Pressing again will go back to the full image on the screen.

18.3.2 Focus peaking

Focus peaking highlights the edges of in focus subject elements in red.

On the first screen the parts of the plant in focus have a red border. On the second screen no part appears in red since the camera focus is incorrect.

19 Depth of Field

For each of its possible apertures and focus distances, a lens has a corresponding depth of field, that is a zone where the photo is clear, sharp, in focus. Subjects outside that this field will appear blurry on the photo (see figure 3). The farther in front or behind the subject, the more blurry the photo will be. Depending on the lens and aperture, the depth of field can be very large or tiny.

Each lens has a different depth of field which depends on the aperture and is engraved on the lens. Lenses with small focal length have the largest depth of field. Here is the depth of field of the SUPER-ELMAR-M 1:3.8/18 ASPH with focal length of 18mm.

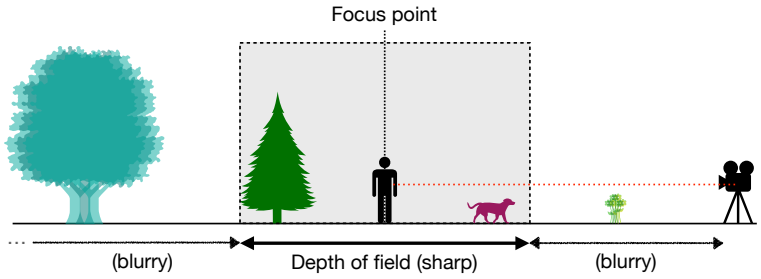


Figure 3: Depth of field

The aperture is set to $f\,/\,8$ and the focus distance to the subject to 5 m (15 feet for the British Imperial System). The depth of field starts at 1.1 m and is sharp up to infinity ∞ (and beyond :). If the aperture is set to 16, then the depth of field for a focus distance of 5m goes from 0.7 m (on the left picture) to ∞ (and beyond on the right picture). This means that, with this lens, choosing an aperture of 16 and a focus distance of 5 m, all pictures will be in focus.

Lenses with large focal length have the smallest depth of field. Here is the depth of field of the APO-TELYT-M 1:3.4/135 of focal length 135mm with focus distance of 5 m.

For the smallest aperture of 22, the depth of field has a minimum of 4.3 and a maximum of 6.3 m, which means that the sharp zone, in gray in figure 3, is only two meter deep. At the maximal aperture of 3.4 the depth of field is very small, a few decimeters. Nevertheless this lens is no problem for photographing objects at a long distance such as the summit of a mountain in a landscape.

Small depths of field have been used in portraiture. For example with an APO-SUMMICRON-M 1:2/90 lens of focal length 90mm at maximum aperture of 2 and a distance to the subject of 1 m

the depth of filed is tiny (and not much larger with aperture 16). Therefore, the subject will be sharp but its background blurry, the farther, the blurriest.

20 24 × 36 mm Film Cameras

The original photography technique (the Daguerreotype named after its inventor Louis Daguerre in 1839) produced only one picture at a time. The invention of the photographic film by George Eastman at Kodak, first in black and white (monochrome) and then in color allowed for several photos to be taken in succession and exactly reproduced on photographic paper as many times as desired (now on printers). The film had perforations and the camera used a film advance lever or knob to advance to the next photo. The photographic films could have different sizes and numbers of photos (so called exposures). The 24x36 mm format, designated as 35 mm, was adopted by the Leica M1 in 1959 and this 2:3 ratio of height:width is still used in the Leica M11 (which, moreover allows for thousands of photos on SD cards).

21 ISO (Sensitivity)

The films had different sensitivities (improperly called "film speed"), the more sensitive films requiring a smaller quantity of light, therefore allowing for faster shutter speeds.

A standardized method of sensitometry was introduced in 1934 and internationalized in the 1974 by the ISO (International Organization for Standardization) to measure film speed.

Popular ISOs are 100, 200 and 400 but one can also find films at ISO 25, 50, 64, 160, 800, 1600 and 3200. A doubling of film sensitivity is represented by a doubling of the numerical film speed value.

A small ISO produces the best quality photos while the quality may degrade at high ISOs with the appearance of noise, such as unwanted grain, dots, and lines.

The ISO sensitivity can be chosen with the ISO dial on top left of the M11. Lift it, select the desired ISO (400 in the example), and push it back down.



The base ISO of the M11 is 60. This is the lowest ISO setting on the M11, which provide the highest image quality with the least amount of noise. The traditional film sensitivities of 100, 200, 400, even 800 are also popular. Beyond 3200/4000 ISO the quality may slightly degrade. When the ISO dial is on A, the ISO is automatically chosen by the camera and can be limited to avoid noise (by MENU →  → Main Menu → M-ISO → ISO 3200, for example)

22 Automatic Mode

As discussed in section 3, the Camera Settings can be chosen automatically by the M11. Just select the ISO A, the shutter speed A, the aperture 8, 16, or 22 according to the ambient luminosity and desired depth of filed, and select the subject distance manually using the screen, knowing that ∞ will always work for landscapes.

23 Manual Settings of the Camera

To take a photo, the manual settings of the M11 are

1. **Lens:** The choice of the lens, which determines the frame, that is the part of the subject appearing on the photo, and the magnification. Otherwise, moving closer or further from the subject is possible but this will affect the perspective, as discussed in section 10;

2. **ISO:** The sensitivity of the sensor measured in ISOs. The lower the better to get better photo quality (64 offering the best quality, 400 is often chosen after good quality film sensitivity).

3. **Aperture:** The aperture of the lens, the smaller the better (that is, the larger f number the better) to allow for a deep depth of field;

4. **Shutter speed:** For the shutter speed, the faster is the better to avoid blurring with hand held cameras;

5. **Focussing:** Finally the manual focussing on the subject.

One can start with a standard choice like (ISO 400, aperture f / 5.6 or f / 8 inside and f / 16 or f / 22 outside, and a shutter speed of 1/250), take the picture, and adjust these settings empirically.

Another solution is to take a first picture in automatic mode, look at the setting chosen by the camera, and adjust if necessary.

Failed pictures cost nothing and are easy to erase by PLAY → MENU → Delete Single → FN (marked with a trash), moving

to other pictures with ◁ and ▷ arrows, and terminating with PLAY (marked ↩).

24 Histogram

When pressing the shutter bottom halfway, the M11 displays a preview of the photo together with other informations in transparent superposition, such as an image histogram[3]

The image histogram represents the number of pixels in the image for each color brightness in the picture, darker colors on the left and lighter colors on the right.

- The image details may be lost due to blown-out highlights. For example, the sky may look white with no cloud visible. In this case, the histogram has a peak on the right;

- On the opposite the image details may be lost due to blacked-out shadows. For example the shadow of a building looks black with nothing visible within the shadow. In this case, the histogram has a peak on the left;

Both phenomena appear on the following picture so that the histogram (appearing superimposed on the screen preview) has two peaks,

[3]If there is no histogram set MENU → Main Menu → ④ → Capture Assistants → Info Profiles → Info Profile 1 → and set Histogram to On. The Grids and Level Gauge (to check the camera horizontality and verticality) may also be useful.

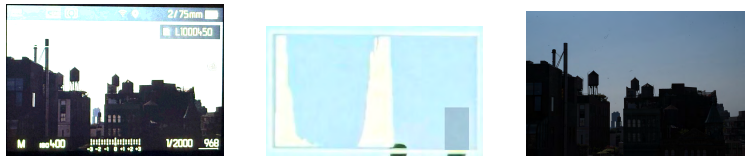


Photo histograms may have different shapes but peaks and biases to the left or right always show an excess in some color brightness, which, in general, is undesirable.

25 Stops: Aperture versus Exposure Time versus ISO

If a photo is too bright (respectively dark), the photographer must decrease (respectively increase) the quantity of light received by the camera. There are three possibilities.

- **Aperture**: decrease (respectively increase) the aperture (that is increase (respectively decrease) the f number);
- **Shutter speed**: decrease (respectively increase) the exposure time, that is, increase (respectively decrease) the shutter speed;
- **ISO**: decrease (respectively increase) the ISO of the photographic sensor.

The ISO modification was listed last since it was not available with film photography, which was a limitation.

The increment or decrement in these cases are called "f-stops" or simply "stops" by photographers. For example stopping down goes down by one stop (for example from 11

to 8) while stopping up goes up by one stop (for example going up from 4 to 5.6).

Most lenses allow to stop the aperture up or down by a half-stop. Some lenses like the Carl Zeiss Distagon 2.6/15 ZM even offer 1/3 stops (that is 19 possibilities between 2.6 and 22).

Cameras and lenses are designed so that an aperture stop, a shutter speed stop, and an ISO stop allow for the same change of the quantity of light received (up by doubling it, down by dividing it by 2).

Assume we have used the lens SUMMILUX 1:1.4/35 ASPH to take the following picture

16/250/200

at aperture 16, speed 250, and ISO 200. If we think that is is too dark (a question of taste), we can make the following corrections (on top is the camera screen and below the photo).

11/250/200

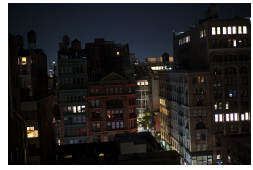
16/125/200

16/250/400

The photos look pretty the same since in each case the change was by 1 stop.

So photographers have to look for a compromise since increasingthe aperture (decreasing the f number) may restrict the depth of field, decreasing the speed may yield blurring, and increasing the ISO may introduce noise.

Moreover the results of the camera and lens settings depend on the lens. Here is an example of two photos taken during the night with the SUMMILUX-M1:1.4/50 ASPH and the NOCTILUX-M 1:0.95/50 ASPH lenses, both at aperture $f/$ 1.4, speed 1/30 s, and iso 3200 focussed at ∞.



SUMMILUX-M1:1.4/50 ASPH

NOCTILUX-M 1:0.95/50 ASPH

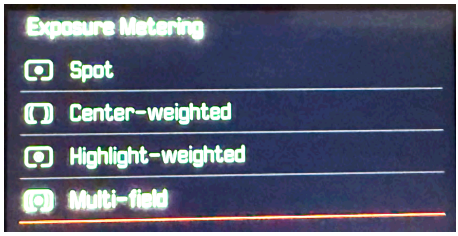
Although the settings are the same, the NOCTILUX-M 1:0.95/50 ASPH photo looks brighter. The lens brightness depends on its aperture (f number), design (number and type of

elements), coating, and handling of optical aberrations (like chromatic and spherical aberrations).

26 Exposure Metering

To decide automatically of the correct setting of the camera for a photo, the M11 determines the exposure, that is the quantity of light per unit area reaching the surface of the electronic image sensor (and then showing its estimation on the screen or viewfinder to help the photographer get the correct exposition as previously explained in section 23).

The M11 let the user choose how the exposure is computed, by MENU → → Main Menu → Exposure Metering showing the following alternatives



- The Multi-field default option determines the exposure by looking at the whole frame;
- The Spot option determines the exposure by looking at a small disk in the middle of the frame.

  This may be useful for example to take a picture of the moon in the dark. With the Multi-field option, most of the picture is dark, which requires a high sensitivity, so that the moon will be very over exposed. But with

the Spot option pointing at the moon, its exposure will be correct, while the rest will remain dark, more precisely under exposed dark, which does not make much difference.

Recall that observing the sun through the viewfinder can damage the eyes.

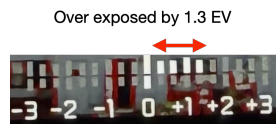
27 EVs (Exposure Values)

An EV (Exposure Value) is a measure of the quantity of light captured by the camera, as defined by given ISO, apertures, and exposer time. The stops as discussed in the previous section 25 correspond to 1 EV.

To indicate whether a photo is overexposed (too much light captured by the sensor) or underexposed (not enough light captured by the sensor)

- A scale in EVs is shown on the screen.

Over exposed



Under exposed

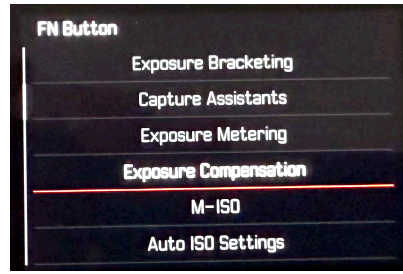
When the exposition is correct, the scale is on 0 EV

- In the viewfinder, an over exposition is indicated by a red left arrow ◀ (showing the direction for the shutter speed button to be turned for correction by decreasing the exposition time), a correct exposition is shown by a red disk ●, and an under exposition is indicated by a red right arrow ▶ (showing the direction for the shutter speed button to be turned for correction by increasing the exposition time).

28 EV Correction

In automatic mode the aperture is chosen by the photographer and the exposition (shutter speed, and ISO) is chosen by the camera software. The camera choice may not be that desired by the photographer. An instruction can be given to the M11 to go brighter (by a positive number of EVs) or darker (by a negative number of EVs). Since this correction may depend on each photo taken, it is useful to make this correction easily accessible, as follows:

- Press down the toothed thumbwheel (on top right of the back of the camera), a menu will appear



and select the Exposure Compensation to assign the exposure compensation selection to the thumbwheel.

– Afterwards, pressing the thumbwheel and turning it left or right will select an exposure compensation measured in thirds of EVs.

This will be added to the exposure selected by the camera or photographer (hence subtracted, that is darker, for negative values).

29 Leica M-mount Lenses designation

The Leica M-mount are designated by a name depending on the maximal aperture of the lens:

- Noctilux: maximal apertures of f / 0.95 or f / 1.0 or f / 1.2 or f / 1.25;
- Summicron: maximal apertures of f / 1.2;
- Summilux: maximal apertures of f / 1.4, f / 1.5 or occasionally f / 1.7;
- Elmarit: maximum aperture of f / 2.8;
- Summaron: maximum aperture of f / 2.8 or f / 3.5 or f/5.6;
- Elmar: maximum aperture of f / 3.8 or f / 4 (Tri-Elmar is for a lens offering three different focal lengths);

This name can be preceded by

- APO: aprochromatic lense enforcing all colors to focus on the sensor at the same distances from a lens;

and the designation can be followed by

- ASPH: aspherical lens to reduce optical abberations.

The name is followed by 1:f/$n.n$ where f / $n.n$ is the maximum aperture (with minimal f number)[4] and then the focal length (in millimeters mm).

[4]The "1:" prefix in Leica M lens designations signifies a division. For example, "1:2/50" represents a ratio indicating the relationship between the lens's focal length and its maximum aperture diameter. So, "1:2/50" signifies a 50mm lens with a maximum aperture diameter that is half of its focal length (50mm / 2 = 25mm). This translates to an aperture of f / 2.

30 Profile

The camera settings (called a profile) can be saved in the camera memory and reused each time the camera is turned on. A simple profile is the following.

- ON → MENU (7 times) → Reset Camera → Yes (and No to all other questions). Restarting the camera, choose the Language, the Time Zone, time, Daylight Saving Time, Date Format, and date.
- Press down the small function button on top-right of the camera

  and choose Live View in the menu. Then, this button can be used to activate/deactivate the screen when the camera is active (otherwise half-press the shutter button).
- Assign Exposure Compensation to the thumbwheel as explained in section 28.
- Assign Focus Aid to the function button FN as explained in section 18.3.
- Limit the maximum ISO as explained in section 21.
- Optionally, show the histogram, grid, and level gauge on the screen as explained in section 24.
- Choose the format and size of digital photos by MENU (3 times) → File Format → JPG. The DNG format is necessary

only for say 2x3 meters photos. Them select JPG Settings → Max JPG Resolution → S-JPG (18 MP) is enough for most family photos.

- To save these settings, MENU (4 times) → User Profile → Manage profiles (well below) → Save as profile → Users 1 → Yes. If the camera is turned OFF and then ON, these settings for User1 will be automatically used.

Before each photo, it remains to use either the automatic mode in section 22 or the manual mode of section 23.

31 Lens Flare

Lens flare and glare is often caused by very bright sources, giving the impression that the photo has been invaded by too much light. The problem is generally solved by slightly reorienting the camera.

Modern lenses are coated to avoid this phenomenon as much as possible by altering the way in which the lens reflects and transmits light. A lens hood can also reduce lens flare.

32 Vignetting

The subject seen in a disk by a lens must be projected to the 2:3 rectangle sensor, which may have undesirable optical effects. One of them is vignetting that is a reduction of an image's brightness on its periphery, often in the corners. Here is a first photo of a white wall taken with the Carl Zeiss DISTAGON 2,8/16 ZM lens, where vignetting is visible. By screwing a filter which is darker in the center in front of the lens (Carl Zeiss Center Filter (-1,5 EV) for the Distagon 2,8/15 ZN), the vignetting is attenuated, on the second photo, at the expense of exposure, which is reduced by the filter.


33 Bokeh

Bokeh is the effect described in section 19, where the depth of field is very small so that the subject is sharp with proper focussing whereas the foreground and background are blurry. Leica M 50mm and 90mm lenses are generally appreciated in portraiture for their smooth bokeh.

In this example, taken with a handheld M11-P equipped with the 2025 re-issue of the SUMMILUX-M 1:/1.4/50 CLASSIC $f/1.4$ lens at 0.7 m and 1/200 with close-focusing with the screen on the yellow spadix of a spathe of *Anthurium*, the

foreground and background are blurry. This lens is known for its smooth creamy bokeh.

34 UV Filters

A UV filter (or UV (ultraviolet) pass filter) is often screwed in front of the lens to protect the glass and its coating. This may harm contrast and sharpness and be at the origin of lens flare (see section 31). An alternative is to use a hood adapted to the lens.

35 ND Filters

ND (neutral-density) filters can be used to reduce the quantity of light entering the lens (without changes in color rendition), for example to extend the exposure time. Variable neutral-density filters have several positions allowing to modify the quantity of light blocked.

Here is an example of overexposed photo together with the correction with the 5 positions of the variable ND filter.

An exposition correction using the ISO, shutter speed, and aperture is usually preferable, except for exceptional situations.

36 ND Graduated Filters

A graduated neutral-density (ND) filter can be used to reduce the quantity of light entering part of the lens, typically half of it, with a gradual transition from one half to the other.

It can be used to darken a bright sky so that both the sky and subject can be properly exposed.

without ND Grad filter

with ND Grad filter

37 Circular Polarizer

A circular polarizer can be mounted in front of the lens to reduce light polarization (for the 16/18/21mm lens below).

A filter adapter may be necessary to adjust to the lens size.

By slowly turning the mobile part of the circular polarizer right or left, polarization will be attenuated (but not if the sun is in front or behind) or even completely suppressed (if the sun is at 90 degrees).

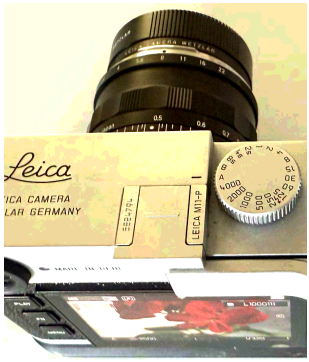
Polarized light

Reduction of polarization with a circular filter

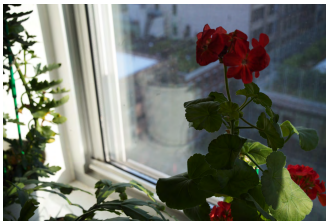
38 Macro Photography

The M11 offers two possibilities for Macro photography:

– The magnifying glass Leica ELPRO E52 can be screwed in front of some lenses (in the following example a Voigtländer NORTON 40mm F 1.2)



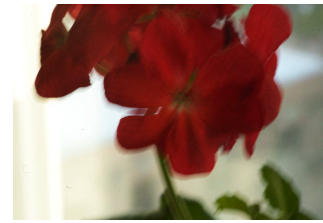
Focussing must be with the screen (with the FN (function) button to magnify the screen)[5] The magnifying effect of the Leica ELPRO E52 is seen by comparing the following two pictures



– The Leica Macro-Adapter-M, here mounted on a Leica MACRO-ELMAR-M 1:4/90 lens (which must be extended by turning and pulling the front of the lens before using) extends the focal length of M-lenses, which has a magnifying effect, as explained in section 10.

[5]If the camera settings have been changed, maintain the FN (function) button pressed down until a menu appears and select Focus Aid.

Again focussing must be through the screen.



Notice that computer applications such as Darktable, GIMP, GraphicConverter, Lightroom, Luminar Neo, or Preview on MacOS and their counterparts on Linux and Windows can be used to select part of a image, but this reduces the resolution, which is not the case with macro photography.

39 Cleaning the Sensor

If dust reaches the sensor it will appear on photos. The sensor can be cleaned but this is a very delicate operation better done by a specialist at a Leica store, as found at URL (universal resource locator) leica-camera.com.

40 Conclusion

We have explained the basic use of the Leica M11. The Leica M11 instruction manual is indispensable to explore the numerous other possibilities offered by the Leica M11.

Numerous books are available to explain the historical [11, 15], technical [1], and artistic aspects [2, 3, 4, 5, 7, 6, 8, 9, 10, 12, 13] of photography. Magazines, like LFI and Modern Photography, review contemporary photography.

Going to photography museums (such as the The contemporary museum of photography, art & culture in New York, the Photography centre in London, the Maison européenne de la photographie, or the Fondation Henri Cartier-Bresson in Paris), as well as visiting temporary expositions (in particular in Leica stores), can also be an inexhaustible source of endless inspiration. Happy photo shooting!

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