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# FILM AND DIGITAL TIMES



Leica Portugal Factory Tour



This is the story of a city, a river, a region, wine, craftsmanship, transportation, lenses and cameras. They are all connected.

Porto is the second largest city in Portugal, a 3-hour drive north of Lisbon. Porto is a compact, walkable city that was voted best European destination of 2014. UNESCO declared it a world heritage site in 1996, “The city of Porto, built along the hillsides overlooking the mouth of the Douro river, is an outstanding urban landscape with a 2,000-year history. Its continuous growth, linked to the sea (the Romans gave it the name *Portus*, or *port*), can be seen in the many and varied monuments.”

Seventy miles upstream by boat or car, vineyards cling to the terraced hills of the Douro Valley. After the fall harvest, the grapes are crushed (barefoot) and in springtime the wine is sent downstream to Porto. For centuries, boats called *barcos rabelos* carried the wine for ageing in the famous port houses of Porto. In the 18th century, Portuguese merchants figured out that adding brandy to the local wines would ensure an unspoilable trip two miles downstream to the Atlantic Ocean and then on to the lucrative markets of London..

Porto straddles the Douro River. The medieval neighborhood of Ribeira clammers up hills on the north side. Across the river, linked by the Dom Luis I Bridge, Vila Nova de Gaia is a tangle of tourists staggering along ancient cobblestone streets in search of venerable port wine producers whose storehouses line the shore.

Porto is stunningly photogenic. If you crave a new camera, walk back across the double-decker Luis I Bridge to Portugal’s new Leica Store and Gallery near the main railway station. Here, you can enjoy the gallery’s latest selection of photographs and then choose from Leica’s complete line of cameras and lenses.

But the cameras we’re here to see are 25 miles north in the recently expanded Leica *Aparelhos Opticos de Precisão SA*, Leica Camera’s precision optics subsidiary in Vila Nova de Famalicão. With fine universities, a skilled workforce, gentle climate and pleasant landscapes, the area has long been a center for technology, fine mechanics, optics and electronics. The original Leica factory was established here in 1973. Forty years later, the new 52,000 m<sup>2</sup> (about 10 football fields) facility was opened in March 2013.

At the factory’s inaugural ceremony, Portuguese President Aníbal

António Cavaco Silva said, “We are proud that the company of Leica has such great confidence in the competence of the Portuguese people.”

Dr. Andreas Kaufmann, Chairman of Leica Camera and CW Sondersoptik, replied, “For generations, many families in the region have found a professional home at Leica. With their precision mechanical know-how, our Portuguese colleagues have contributed significantly to the success story of Leica Camera. Construction of the new plant near the old site is a visible sign that Leica has also found a home here and is involved in the future of this region and its people.”

Many of the more than 700 employees have been with the company for 30 to 40 years. The workmanship and quality is as good as Wetzlar. Good infrastructure, easy shipping between Germany and Portugal, and proximity between the two Leica factories make compelling arguments.

Pedro Oliveira, Managing Director of Operations at Leica Portugal explained, “It’s a 3-hour direct flight from Frankfurt (near Leica headquarters in Wetzlar) to Porto. Our time zones are an hour apart—not 12 hours the following day as it would be in Asia. Engineers, designers and production managers can get on the phone and communicate easily. If there’s a problem or a change in specifications, it can be addressed almost immediately.”

In the 1970s, Leica Portugal mostly built sport optics, binoculars and some lenses. Today, the portfolio has expanded to the point where many Leica cameras and lenses are also built here and then shipped to Wetzlar for final assembly and QC. Leica Portugal is where most of the work begins on Leica M and Leica S cameras: crafting raw blocks of aluminum with the latest CNC equipment into camera bodies, meticulously hand polishing the surfaces until they are silky smooth, and inspecting the work every step of the way. This is also where Leica M and S lenses, and the latest Leica Summicron-C 15 mm and 40 mm cine lenses are made: polishing glass, coating, cleaning, edge-blackening, turning the mechanical parts and barrels, assembling, and testing.

But, before visiting the factory, let’s tour Porto and the region—because the history, culture and topography have a lot to do with camera and lens technology.



# Porto



Wine cellars of historic Port wine houses line Vila Nova de Gaia's promenade: Taylors, Sandeman, Calem, Offley, Ramos Pinto, Ferreira...



The picturesque riverfront of Porto's Ribeira district on the North side of the River Douro.



Porto is a city of impressive bridges and intricate engineering. Gustave Eiffel completed the Maria Pia Railroad Bridge in 1877, a decade before the Eiffel Tower. Both structures are made of wrought iron. The bridge was used until 1991 and stands today as a monument.



Dom Luis I Bridge was completed in 1886. The design engineer, Théophile Seyrig, was a former partner of Gustave Eiffel. It was once the longest metal arch bridge in the world. Cars and pedestrians travel the lower level.



The upper level of Dom Luis I Bridge is shared by Metro trains that glide within inches of the pedestrian walkway.



From Porto, the Douro River flows downstream to Foz do Douro and the Atlantic ocean a couple of miles West.



# Porto



JK Rowling roamed here. The Harry Potter author frequented Livraria Lello when she taught English in Porto. It is ranked as 3rd most beautiful bookstore in the world and certainly inspired not only Rowling but also set designers and book lovers who swarm the fantastic spiral staircases and aisles. There's a book trolley on tracks that looks like a Gringotts cart or a rental house lens projector setup.



## Where to Stay and Dine



Pousada Pestana Palácio do Freixo Hotel, an 18th century palace on the banks of the Douro, is a National Monument.



Above: Pedro Lemos Restaurant in nearby Fos do Douro. One Michelin Star. Farm and fish to table. Right: The Yeatman Hotel offers great views from its perch above Vila Nova de Gaia.



# Port Wine



Barcos rabelos once transported Port Wine from the vineyards upriver in the Douro Valley to the wine merchants' cellars in Porto.



It's an uphill walk along narrow, cobblestone streets of Vila Nova de Gaia for a tour and tasting at one of the venerable Port wine houses.



Taylor, Fladgate & Yeatman, established 1692, a family business.

John Fladgate, Baron da Roêda of Portugal, 1809 - 1901.



Port wine is made from grapes upriver in the Douro Valley, picked by hand in September and crushed by foot. Taylor's research recently concluded that, "Although expensive and laborious, treading is still the best way of achieving gentle but complete extraction, producing wines with structure, depth of flavour and balance." The fermenting wine is poured into vats, and then "fortified" with a clear, neutral, young brandy (77% alcohol) at a ratio of about 1:4. As the wine ages, the brandy and wine combine flavors that are subtle and complex. Port matures and ages far longer than most wines. That's the reason Port wine traveled well to England and the world, and why Vintage Port wine can be enjoyed decades later. Sort of like cine lenses: artisanal, artistic, described like fine wines, commanding attention for fine vintages.





# Leica Porto Opening



At the opening of the store and gallery, Andreas Kaufmann said, "It has been a great experience for Leica in Portugal and in terms of our production facility here. Porto is such a beautiful city that the first Leica store in this country had to be here." *Photos above left and below by Gerhard Baier.*



Portugal's first Leica's store and gallery opened in the center of Porto on December 1, 2016. It is located in a historic building at Rua de Sá da Bandeira 48/52. The ornate Excelsior Café once occupied this space in the 1920s, which inspired Leica to create a café-bar between the store and gallery. Like most of the 73 other Leica stores and galleries worldwide, the entire Leica Camera and Sport Optics product line is on display in the 150 sq m facility. Leica Akademie photography workshops and lectures are planned. The gallery opened with "Homage in Black and White to Porto," an exhibition by local photographer Daniel Rodrigues, first-place winner of the World Press Photo Award. The images were all taken with a Leica M Monochrome.



Above: Leica's Excelsior Café. Below: Leica Store.



Above: Leica Gallery. Below: Two blocks away—São Bento Train Station, with Jorge Colaço's tile (azulejo) murals of Portuguese history.





# Leica Portugal Factory Tour



Leica Camera's new Portuguese plant in Vila Nova de Famalicão is a pleasant half-hour drive north of Porto, made especially easy since CW Sonderoptic Managing Director Gerhard Baier was at the wheel. A whimsical Leica M-like gate house greets the visitor. Beyond is the modern factory of Leica Aparelhos Opticos de Precisão SA. It is the size of several football fields. Many Leica cameras, lenses and sport optics are made here. It's one of the most high-tech, impeccable places in the industry, with a highly skilled, enthusiastic workforce. Carlos Mira and Pedro Oliveira are the Managing Directors.

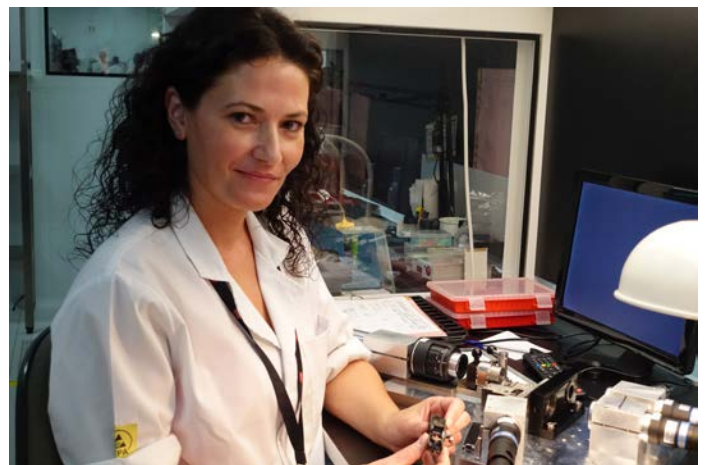
More than 720 people work in the new factory which is about 30% larger than the original one. Inside, the layout and the machines themselves are almost identical to the ones in Wetzlar. State of the art tools and manufacturing techniques ensure quality and productivity. Leica's investment of more than € 23 million was not insignificant and the benefits are already apparent.

Leica COO Markus Limberger shuttles frequently between the two production facilities in Wetzlar and Famalicão. He explained, "Our new, ultra-modern plant in Famalicão shares a crucial and equal role with Wetzlar in Leica's success in the coming decades and will ensure economic stability and continuity in the long term."

Optical manufacturing is not only a science but also an art. As we toured the Famalicão factory, it soon became clear that Leica's investment is ensured by the presence of a very large, highly educated, technically skilled workforce. Labor costs in Portugal are among the lowest in Western Europe and membership in the EU means exchange rates are uniform.



L-R: Gerhard Baier, Carlos Mira, Miguel Reis, Nuno Barros





# Optical Elements

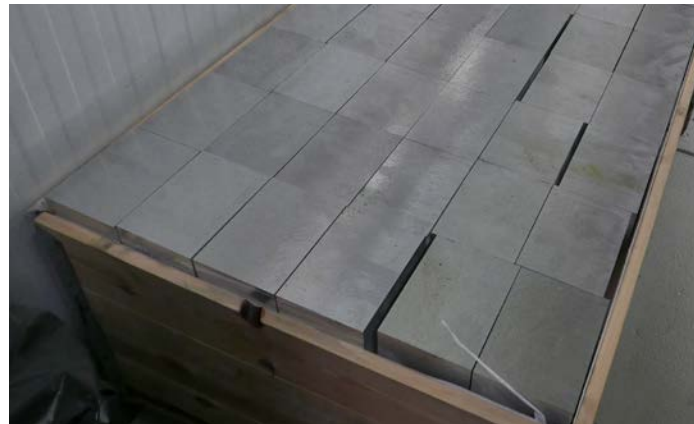


Blocks of glass take shape in the early stages of polishing in a huge machine room, above. Traditional method, below left. Computerized, right.





# Lens Barrels



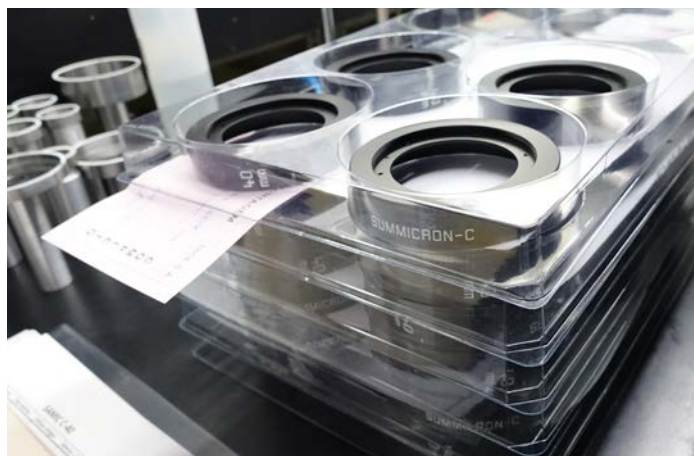
Lens barrels and mechanical sub-assemblies begin life as solid blocks or tubes of aluminum and brass, steel, magnesium and titanium.



CNC machines shape the barrels and mechanical assemblies.



The lens barrels are anodized in-house.

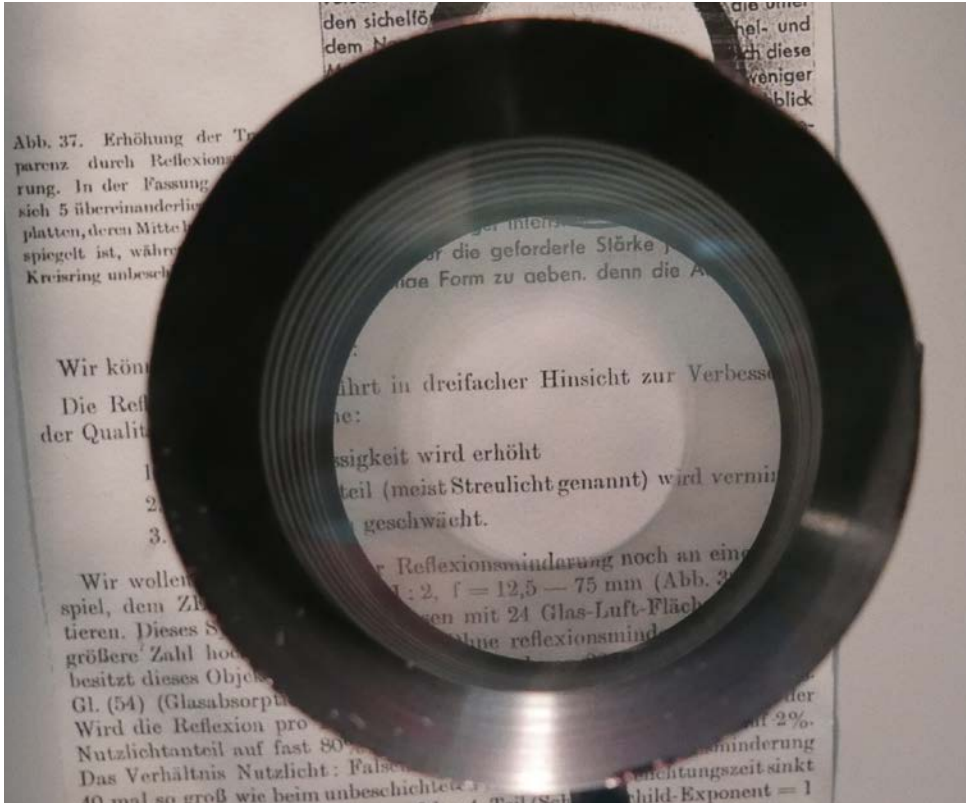


Gerhard Baier and a cart of Summicron-C mechanical assemblies

40 mm Summicron-C lens front barrel section.



# Anti-Reflection Coating and Edge Prep



Comparison of anti-reflection coating in center and an uncoated periphery. The coated area of the lens is sharper and about 10% brighter. Uncoated area is milky and softer.



AR Coatings are made of magnesium, titanium, silver and other exotic ingredients.



Optical elements are cleaned prior to coating.



Machines vaporize and deposit the metals onto the glass elements.



Edges are treated with a special matte black paint to further reduce reflections—and then loaded into trays in preparation for assembly.

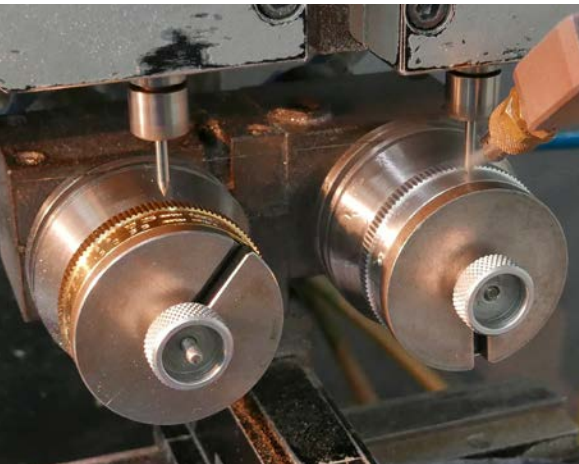


# Optical Assembly





## Finishing Focus and Iris



Engraving focus scale.



Preparing focus and iris rings.



Iris assembly.



Finishing sunshade.



Adding color to focus scale.



The engraved numbers and letters are filled with paint and then the excess is wiped clean, leaving color only in the recessed areas.



Leica 28 mm f/5.6 Summaron-M "pancake" lens.



Leica Summicron-M 50 mm f/2 lenses in chrome and black.



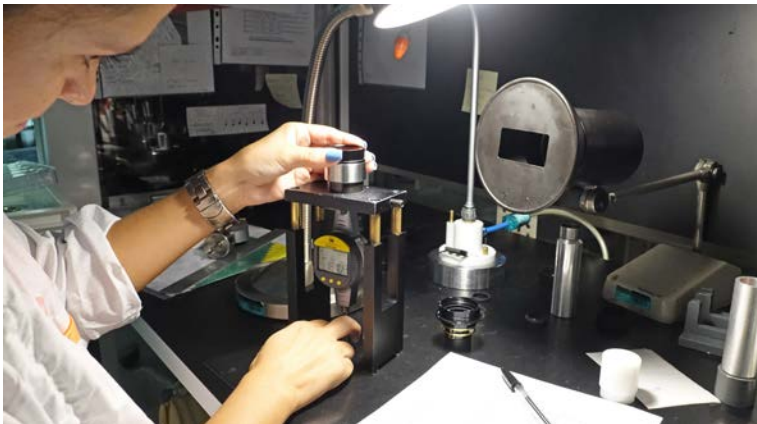
# Lens Measurement and QC



Measuring MTF.



Checking 50 mm lens.



Checking mechanical tolerances.



Checking lens parameters.



# Electronics



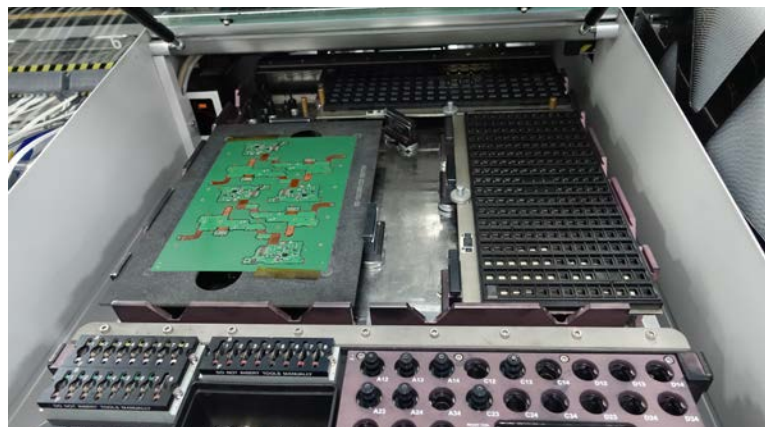
Leica Portugal makes their own circuit boards and electronic assemblies.



SMT Quattro Peak soldering machine.



Checking circuit boards digitally.



Soldering a sub-assembly manually.



Checking circuit boards visually with stereo microscope.

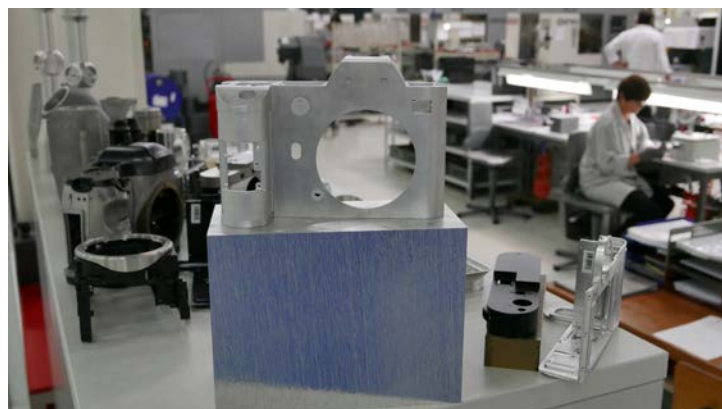




# Building Leica Cameras



Like lenses, many cameras also begin with a solid block of metal



Here's a Leica SL body before and after being milled in a CNC machine



5-axis CNC milling machines.



Precision laser measurement of Leica SL body with robotic arm.





# Let's Build a Leica M



M bodies are milled from brass, magnesium alloy, aluminum, etc.



Leica M cameras are finished by hand—with meticulous attention to detail, polishing and smoothing edges.



Above: Front body housing. Below: camera assembly.



Above: Top cover. Below: Leica M front housing and mount.

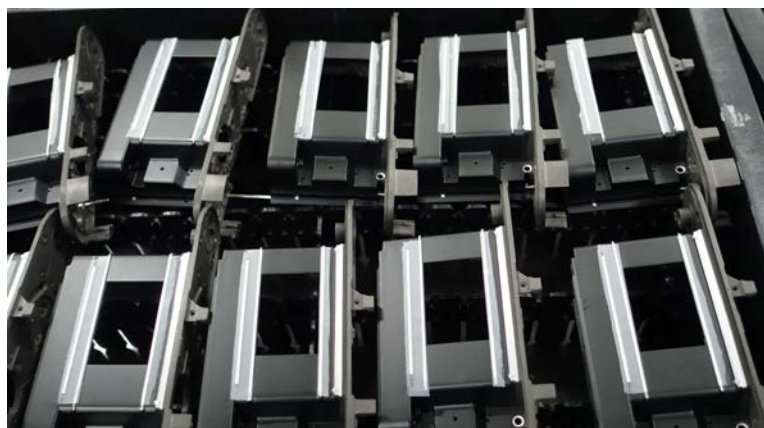




# Analog Leicas



Sprocket rollers.



Film gate of Leica M-A (Typ 127).



Shutter.



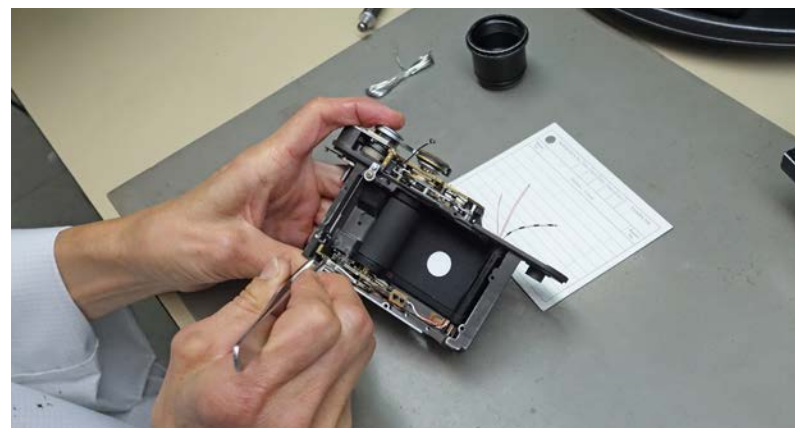
Tools used to build analog Leicas.

Leica Portugal continues the tradition of crafting analog Leica cameras: M7, M-P and M-A.

M7 was introduced in 2002 with an electronic shutter. M-P came in 2003 with mechanical exposure control, improved viewfinder, no logo on front. M-A (Typ 127) arrived in 2014 as a totally mechanical camera—no light meter.



Mechanical shutter assembly of Leica M-A.

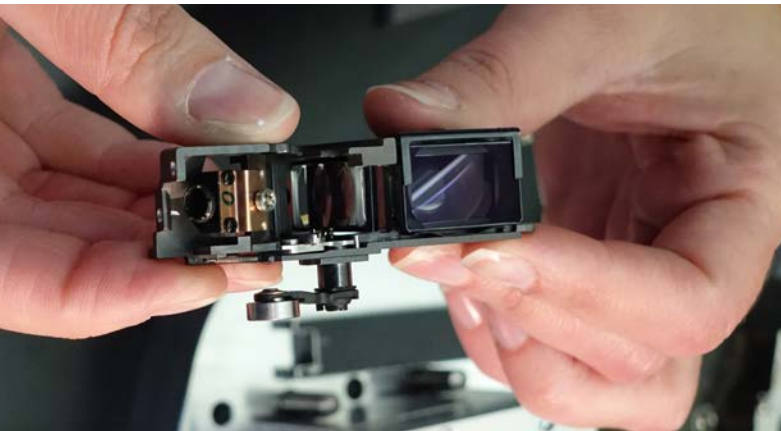


Assembling Leica M-A.

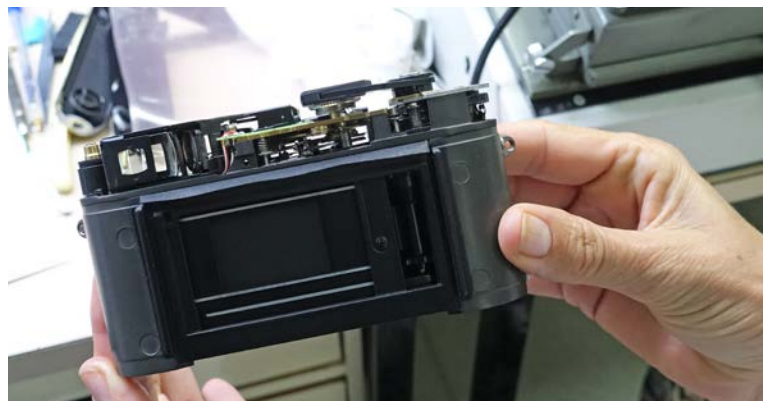




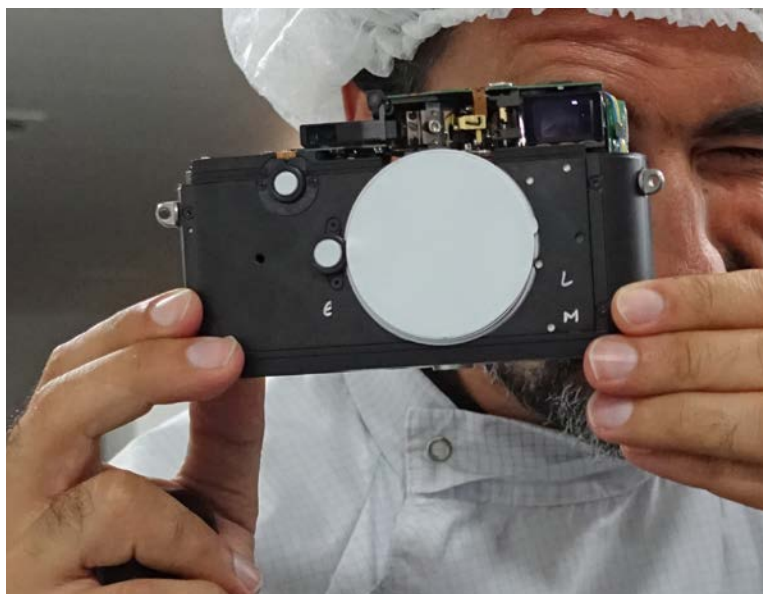
# Leica M Assembly and Adjustment



Above: M's rangefinder. Below: Testing accuracy of rangefinder.

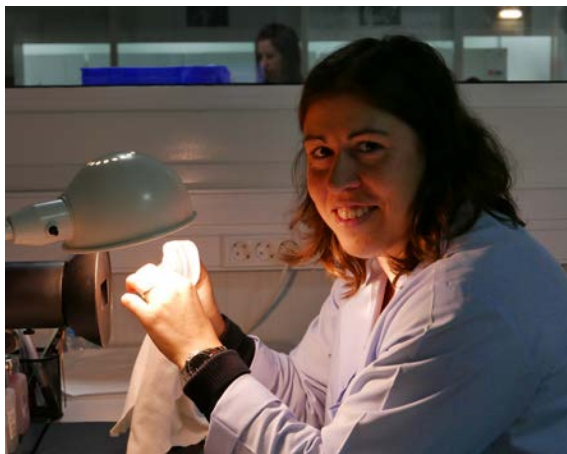


Above: brass top cover of new Leica M10. Right: checking rangefinder of M10.





# Leica Portugal "Gallery"







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