DEVELOPMENT PROCEDURE FOR ULTIMATE U08M PLATES exposed with continuous laser

The proposed development method is easy to implement and uses development products (developer and bleach) optimized for these plates.

Material required:

- One light tight box to hold the plate to be exposed
- 3 cans of products: developer (concentrated), bleach (ready to be used) and drying water (distilled or de-mineralized water with a few drops of Photoflo added)
– A processing tray: 8x8cm for 6.1x6.1cm plates; 12x15cm for 10.2x12.7cm plates and 32x42cm for 30x40cm plates. Flat bottom tray to limit the quantity of developer, and white color to visualize the process are preferred.
- A 5ml syringe or similar and a 100ml graduated cylinder (for 4x5" plates). Proportional equipment for larger plates
- Clean running water
- A LED allowing you to work in safelight
  Green LED for red sensitive plates
  Red LED for blue and green sensitive plates

Your plate should only be taken out under safelight until the end of the revelation. You can turn the light on after the rinse following the development

Optional: lint-free paper towels + electric hair dryer for those who cannot wait for natural drying.

❶ Exposure:

Switch on your laser at least **30 minutes** before the exposure, for temperature stabilization.

After removing the holographic plate from the refrigerator and its protective packaging (in a dark room) – transfer it into a light tight box for transport and let it adjust to room temperature (at least 30 minutes prior to exposure). The plate is then ready for exposure.

Put the plate onto the to-be recorded object, gelatin side next to the object.

How to know which side is the "gelatin side"? Blow onto the plate and watch it through safe light.

- If steam appears on the plate, you have blown onto the glass side.
- If nothing happens, you have blown onto the gelatin side. Remember which side it is and let the plate re-adjust to room temperature (about 30 minutes) so that the temperature of the gelatin gets uniform again. You can also take another plate and keep this one for the next exposure.

For the power output of your laser, you must adjust the exposure time for an exposure of 100µJ/cm^2. If you do not have a power meter, estimate or call our technical support for help. Please be ready with the laser characteristics and description of your bench when calling.

In order to expose your object, open the shutter for the correct exposure time.

Calculation of exposure time:

For a HeNe 1mW laser projecting a beam with a 8cm diameter, the exposure time is approximatively 8 seconds.

For a more powerful laser or a different diameter, make a pro-rata calculation.

Typical exposure times for **Ultimate 08M** in Denisyuk holography (the range depends on the

optics used):

- Laser He-Ne (25mW) – 30 x 40cm plate: 9 sec.
- Laser He-Ne (10 mW) – 10.2x12.7cm plate: 2 sec.
- Laser He-Ne (5 mW) – 6.1x6.1cm plate: 1,5 sec.

❷ Development:

The developer is non-toxic and optimized for Ultimate plates.

It comes in cans of 120ml (or 550ml) concentrated – you will need to dilute with water (1:10), only the quantity that you need, when ready to use. Keep unused developer in the original white bottle which prevents oxidation. This way, it can be kept for at least a year.

The kit provides enough developer for 40 of the 6.6x6.1cm plates or 24 of the 10.2x12.7cm plates:

6.6x6.1cm plate: mix 3ml of developer with 30ml of water in a small tray (approx. 8x8cm);

10.2x12.7cm plate: 5ml of developer mixed with 50ml of water (approx. 12x15cm tray).

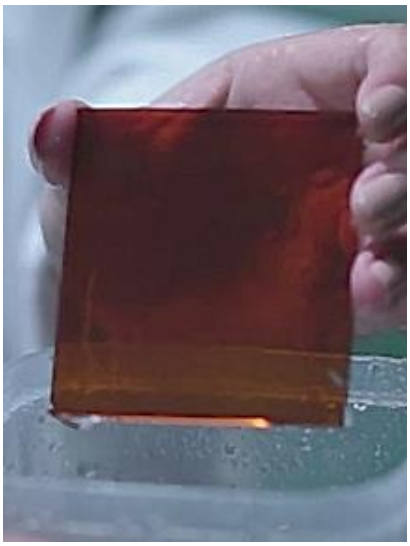
For repetitive work, it is best to use new developer for each plate. Measure the water temperature before mixing – it must be equal or greater than 20° C (68° F) for the developer to function properly.

Development time: 6 minutes at 20°-25°C under safelight

(If your room is at a temperature higher than 25°C, you'll be able to shorten the development time, for example, from 6 to 4 minutes.)

Put your plate in the tray, after pouring the diluted developer, gelatin side up. The developer effect will start to be visible a few seconds after the plate is covered with the mixed developer and will be complete after 6 minutes. During the development, move the tray continuously so there will be no smudge on the gelatin.

After development, the Ultimate 08M plates will have a pale red/orange color.



Example of Ultimate 08M plate after development. Exposure: 100 µJ/cm² with a He-Ne Laser

This color is explained by the very small grain size (MIE diffusion), much smaller than competitive holographic materials which are more similar to the photographic films.

We can restate another way: it is normal for this material not to reach any black density like other holographic or photographic material. **There is no need, or reason, to develop further than the required 6 minutes.**

The U08M material provides a wide latitude in exposure. Only very over-exposed plates will not give transparent holograms.

❷ Rinse: **Rinse under running water (the temperature doesn’t matter) for 30 seconds in the tray, allowing water to overflow into a sink.**

❸ Bleach:

The bleach is non-toxic. It comes as a powder to be diluted one time in a liter of water. It can handle at least one hundred 10.2x12.7cm holographic plates. It is considered “dead" when it does not bleach a plate in less than 10 minutes. Even weakened, it gives the same quality of holograms. It conserves well when stored at room temperature – for up to a year.

Pour the plate into the developing tray containing the bleach and agitate continuously until you get good transparency (3 or 4 minutes at 20°C (68°F)).

Wash the plate under running water (the temperature doesn’t matter) for 1 minute.

For maximum transparency, if you need it, bleach again for 30 seconds more. Then rinse again.

Denisyuk Hologram observed by transmission via halogen spot, after bleach but before drying.

When the hologram is successful, this image will be very strong.

❸ Second Rinse: **Rinse under running water for 2 minutes (the temperature doesn’t matter)**

Notes:

If the plate is opaque, it has been overexposed and you’ll have to decrease the exposure time for the next plate.

If the plate is extremely transparent and if you can't see the hologram shine, it has been underexposed. You will have to increase the exposure time for the next plate.

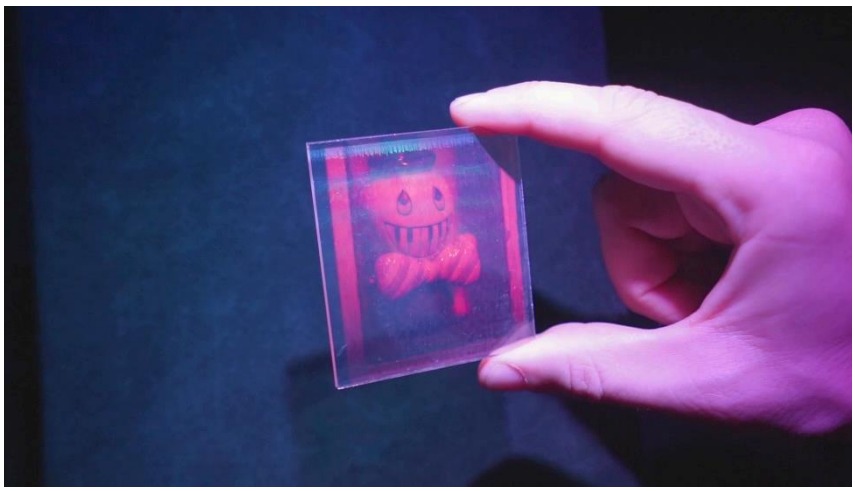
❹ Drying: use a demineralized or distilled water solution with some drops of Photoflo added.

Alternative 1 (no contact): vertical natural drying, no contact with the emulsion.

1: Soak 1 minute in this solution.
2: Remove the plate gently and allow to dry vertically for 15-20 minutes.

Alternative 2 (faster but with a small risk of scratching the plate)
Care is required to avoid scratching the plate.
1: Soak 1 minute in this solution.
2: Wipe the gelatin side of the plate very gently, with paper towel folded in 4, until the surface is dry. Rotate the plate 90 degrees each time until the entire plate is wiped (to eliminate streaking).
3: Now finish with a hair dryer (at moderate heat and not too close). The holographic image will quickly appear.

Final result:

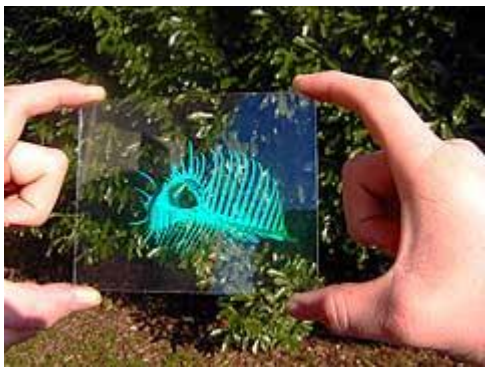


Hologram on Ultimate 08M plate
Exposed with He-Ne Laser - Reconstructed in white light (halogen)

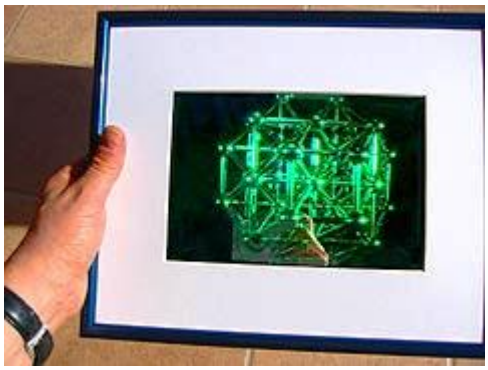
Criteria for judging the quality of the hologram:

- If the hologram is bright but the plate is milky white / opaque: over-exposure
  ➔ Decrease the exposure time
- If the hologram is dim and the plate is transparent: under-exposure (or movement)
  ➔ Increase the exposure time
- If the hologram is bright and the plate is transparent: **perfect exposure**

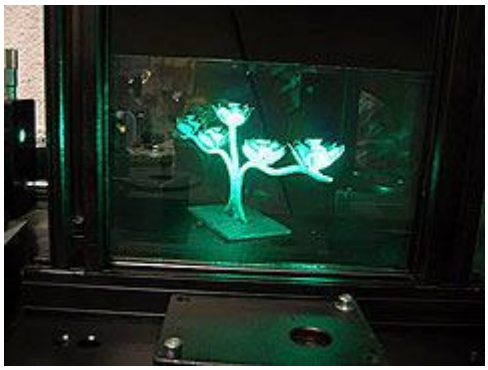
❺ Examples of holograms created by our clients with Ultimate 08:



Ultimate 08, laser 532nm, hologram H2



Ultimate 08, laser 532nm, hologram Denisyuk



Ultimate 08, laser 532nm, transmission hologram H1

Do not hesitate to share your results and observations with us!