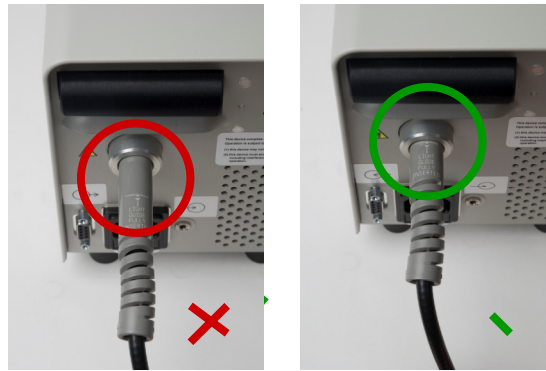


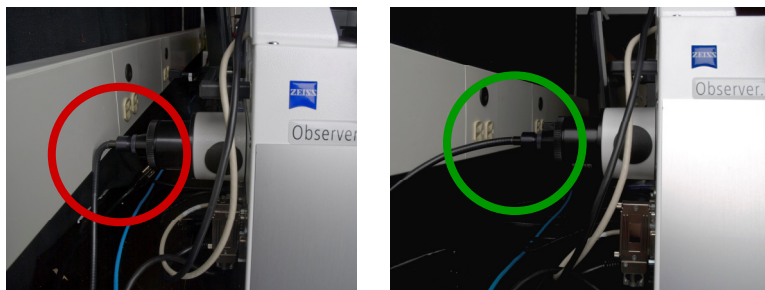
# Liquid Light Guides

## Proper handling and installation of liquid light guides

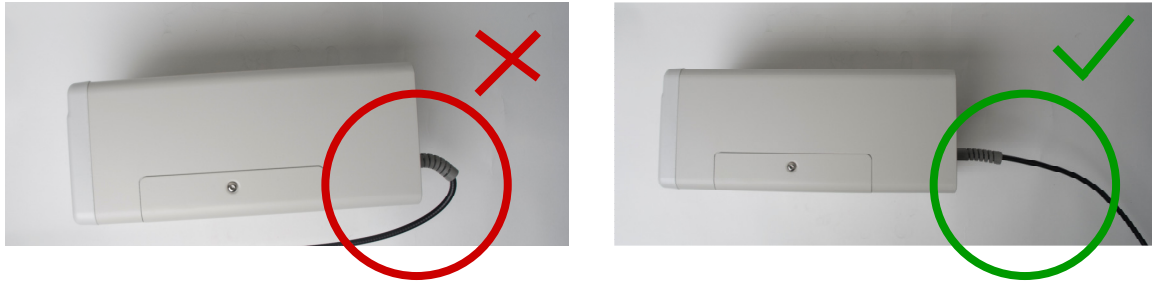
1. Liquid light guides have a typical life of 4000 hours of operation when handled properly and installed in a well maintained X-Cite 120. The formation of bubbles is one of the most common reasons for a light guide to degrade prematurely and result in a sudden reduction in illumination intensity. Bubbles can form without warning, and if they occur within the first 1500 to 2000 hours of use, is it typically due to overheating and/or mechanical stress to the light guide. Below are some simple tips to avoid overheating and stressing the light guide.
2. Always fully insert the light guide in to the X-Cite unit (i.e. up to the white line); this ensures contact with a heat sink to conduct heat away from the light guide.



3. Always allow adequate clearance at the rear of the X-Cite unit and microscope to prevent excessive bending and/or crushing of the light guide against walls. Minimum bend radius to prevent immediate damage to the LLG is 40mm, however, a bend radius of at least 75mm is recommended for a light guide while "in use". Sharper bends can cause heat to build up and cause problems longer term.



4. Always place the X-Cite unit close enough to the microscope so that there is some slack in the light guide and no sharp bends.

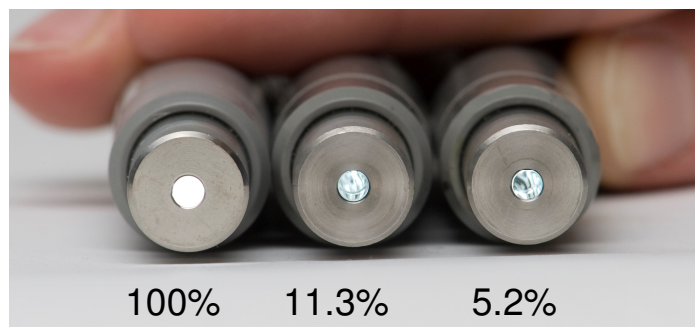


5. Never leave an endcap on the output end of the light guide when the other end is connected to the X-Cite unit; if the unit is turned on in this condition, the cap will overheat, melt and/or permanently discolor the quartz end of the light guide.
6. Do not expose the light guide to extreme temperatures (above 35°C, below -5°C) for extended periods of time during use, transport or storage; this may cause degradation of the seals and allow air bubbles to form in the liquid.

### What does a bubble look like?

Depending on the size and location in the light guide, a bubble may or may not be obvious. To check for bubbles:

1. Disconnect the LLG from the X-Cite and microscope adapter.
2. Hold one end towards a bright window or overhead room light - DO NOT use an X-Cite or any other focused light source for this test!
3. Look at the quartz at the other end of the LLG
  - a. Bubble-free: quartz end will appear as a bright, solid circle; you may also be able to see a thin circular outline at the quartz/liquid interface.
  - b. Bubbles at/near the quartz end: appear as dark spots, as small as 0.5mm in diameter or even as larger more defined spheres.
  - c. Bubbles in the middle of the light guide: may not be well-defined spots, but will appear as dark shadows
  - d. In extreme cases, where the bubble is blocking the entire diameter of the light guide, no light will come through, even when pointing the distal end at a light source.



- e. Appearance and % output of light guides with bubbles relative to an LLG without bubbles (100%).

### **Can a bubbled light guide recover?**

Yes, light guides with small bubbles can sometimes recover. Disconnect the light guide from the X-Cite unit, and leave the light guide undisturbed on a shelf for 1-2 weeks. For this to be effective, it is important to catch the bubble when it is small.

### **When should light guides be replaced?**

It is usually time to replace a light guide when:

- Illumination is low and replacing the lamp does not improve brightness
- Dark or uneven areas become visible in the field of view (a bubble is blocking part of the light)
- A section of the light guide becomes noticeably warmer than the rest of the guide (a bubble is blocking transmission of light, forcing the light guide to absorb the energy)
- It is 2-3 years old, OR has been in use for 4000-6000 hours (2-3 lamp changes)