



TRANSPORT FIBER HANDLING AND CLEANING

Revision 1.0

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INTRODUCTION

The Necsel lasers can be mated to a variety of fiber configurations. Each laser typically has an industry standard SMA-905 fiber connector that allows for easy connection to individual fiber optic break-out legs that are combined into a common output ferrule at the other end. The output fiber arrangement may be in a variety of formats, but an example of one in a 16:9 rectangle format inside a round ferrule is shown in Figure B-12.



FIBER HANDLING

TIPS AND TRICKS

A dirty or damaged fiber can cause reduction in output power or permanent damage to the device. Each fiber end is highly polished with anti-reflection coatings to allow for maximum transmission of the visible light. Optics and optic coatings can be chipped, scratched, or smudged easily. Follow these simple guidelines when handling or cleaning the fiber ends:

- Keep fiber connector covered with the protective cap when not in use.
- Do not allow the end of the fiber optic cable to contact any surface, including your hands.
- When handling the fiber bundle, make sure that the end of fiber bundle does not get exposed to high temperatures; this may cause burn spots or potentially catastrophic damage to the fiber. This may also result from back-reflections when the lasers are turned on.
- When using an SMA connector, make sure that the connector does not rotate while it is being inserted into the bulkhead mount, this may cause damage to the fiber.
- Do not clean the fiber if there is no visible contamination.
- The end of the fiber optic cable constitutes an optical surface.
- Wear finger cots, or powder free surgical gloves, while handling fiber optic cables.
- Only fresh (dry) spectroscopic grade Methanol should be used as a cleaning solvent.
- Do not use Acetone as a cleaning solvent on the fiber optical surfaces. It will dissolve the epoxy resin which supports the fiber, and permanently destroy the optical transport fiber.

FIBER OPTIC CLEANING

INTRODUCTION

Before performing the cleaning procedure, inspect the fiber optic surface with a fiberscope or magnifier to determine if the fiber end needs cleaning. Only perform the cleaning procedure if the fiber optic surface shows imperfections, otherwise the procedure may introduce dust, dirt, or potentially induce damage to the fiber optic. It is also recommended to screw on a fiber cap over the output of the laser to prevent any dust particles from entering – these will normally be shipped with the fiber.

The “Drop and Drag” method is the least abrasive cleaning method and should always be used first to remove imperfections or smudges on the fiber optic surface. If the Drop and Drag method will not remove particulates or smudges, then the fiber optic surface should be cleaned with a cleanroom swab. The cleanroom swab is most effective; however, a folded lens tissue with a hemostat may be used as an alternative to the cleanroom swab.

The following materials are required to perform this procedure: (see Figure B-1.)

- › Lens cleaning tissue.
- › Cleanroom-quality swabs.
- › Lens tissue and a hemostat may be used as an alternative to the swabs.
- › Fresh spectroscopic-grade Methanol in drip or eye-dropper bottle.
- › Fiber microscope (fiberscope) or magnifier lens is recommended.
- › Latex (or equivalent) non-powdered, non-coated gloves or finger cots.



Figure B-1. Optical Cleaning Supplies

Important: Do not use Acetone! Acetone will dissolve adhesives used in the manufacture of the fiber optic bundle and will destroy the fiber optic cable. Always wear latex gloves or finger cots (or the equivalent) while performing any of the following procedures. Fingerprints, dust, condensation, and oils from bare hands can damage the fiber optic surface.

DROP AND DRAG PROCEDURE

Using a medicine dropper and a new, clean lens tissue, put one drop of Methanol near the center of the lens tissue.
(See figure B-2)

1. Holding the fiber vertically so the fiber surface points up, carefully place the tissue so the optical surface rubs against the underside of the tissue.
2. In a single movement, gently drag the fiber surface against the underside of the wet tissue in a circle, spiraling out, taking care not to go over the same part of the tissue twice. Drag the fiber out from the saturated part of the tissue to the dry parts of the tissue, which dries the fiber optic surface and prevents Methanol residue. (See figure B-3).
3. Re-check the fiber with the fiberscope or magnifier. If the fiber surface looks clean, immediately install the fiber into the laser fiber-coupler, or place a plastic fiber cap over the end for later use.

If the imperfections have not been removed, or if any Methanol residue has been induced, continue with the cleanroom swab procedure below.

Methanol residue can cause burn spots or potentially catastrophic damage to the fiber optic or ferrule output end.



Figure B-2. Methanol Drop on Lens Tissue



Figure B-3. Wet Tissue Drag across Fiber Ferrule

CLEANROOM SWAB PROCEDURE

Using lens tissue and a hemostat may be substituted for the cleanroom swab procedure. Reference the procedure titled **Folded Lens Tissue Procedure** for the alternate method.

1. Using a medicine dropper, put one to two drops of Methanol on the swab.
2. Vigorously shake off excess Methanol from the swab to prevent Methanol residue.

NOTE: Only the synthetic cloth should make contact with the fiber optic surface. Do not allow the plastic applicator to touch the fiber surface.

1. Holding the fiber vertically so the fiber surface points up, carefully place the base of the swab against the fiber optic surface, taking care not to touch the plastic applicator to the fiber optic surface. (see figure B-4)
2. Drag the swab across the fiber optic surface in a single stroke. **Do not** drag the swab back and forth.
3. Repeat Step 2 using the other side of the swab.
4. Re-check the fiber with the fiberscope or magnifier. If the fiber surface looks clean, immediately install the fiber into the laser fiber-coupler, or place a plastic fiber cap over the end for later use.
5. If imperfections remain, repeat the procedure using a new swab.
6. If imperfections still remain, determine whether the fiber optic must be replaced. Contact Necsel service personnel if further guidance is needed.



Figure B-4. Swab w/ Methanol - Drag across Fiber Tip

FOLDED LENS TISSUE PROCEDURE

As an alternative to the cleanroom swab procedure, use the following procedure with lens tissue and a hemostat:

1. With one hand on each end of the lens tissue, fold the tissue lengthwise in half, three times. Do not touch any part of the lens tissue that will make contact with the fiber optic surface.
2. Use a hemostat to fold the tissue in half, widthwise. Do not touch any part of the lens tissue that will be used to clean the fiber optic surface.
3. Attach a hemostat to the lens tissue.
4. Using a medicine dropper, put two drops of Methanol on the lens tissue.
5. Vigorously shake off excess Methanol from the folded tissue to prevent Methanol residue.



Figure B-5. Folded Lens Tissue (Lengthwise)



Figure B-6. Folded Lens Tissue (Widthwise)

Only the lens tissue should make contact with the fiber optic surface. Do not allow the hemostat to touch the fiber surface.

6. Holding the fiber vertically so the lens surface points up, carefully place the base of the wet side of the folded tissue against the fiber optic surface, taking care not to touch the fiber optic with the hemostat.

7. Drag the folded tissue across the fiber optic surface in a single stroke. **Do not** drag the tissue back and forth.
8. Repeat Step 7 using the other side of the folded tissue.
9. Re-check the fiber using the fiberscope. If imperfections remain, repeat the procedure using a new lens tissue. If the fiber surface looks clean, immediately install the fiber into the laser fiber-coupler, or place a plastic protective fiber cap over the end for later use.



Figure B-7. Hemostat Holding Lens Tissue



Figure B-8. Folded Lens Tissue w/ Methanol

If the power output is acceptable, then the fiber can be used with little concern for damaging the assembly. However, if the power output is lower than it should be or not up to acceptable standards, the fiber must be considered damaged and must not be used. Similarly, if any burn marks are noted on the fiber ferrule, do not use it.



Figure B-9. Wet Folded Tissue Drag



Figure B-10. Fiber Protective Cap Replace

The following figures C-11 and C-12 are examples of good clean fiber tips. Both ends have broadband anti-reflection coatings in the visible from 400nm – 700nm.



Figure B-11. Fiber SMA Tip



Figure B-12. 27-Fiber Output Array Ferrule