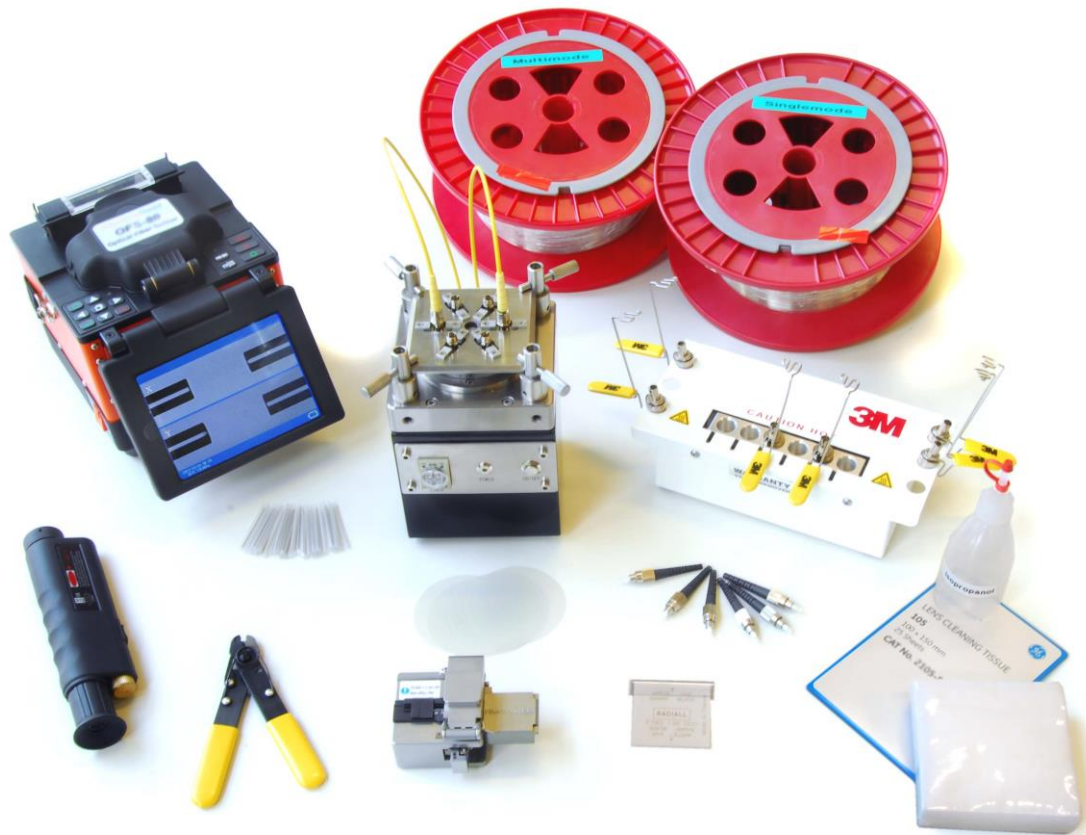


Workshop Glass Fiber Optics, Fiber Connectors and Fiber Splices (CA-1450)



Aim of the Workshop

Data transfer via glass fibers enables the handling of large data transfer rates. However, the installation of glass fiber networks is demanding, therefore preparation and handling of glass fibers and equipment should be trained well. Within this workshop the trainee will learn to prepare glass fibers, equip glass fibers with connectors, and join bare glass fiber ends by fusion splicing.

Fiber Preparation and Connector Installation

Stripping by removing the plastic cladding of the glass fiber is done by a pair of Miller pliers. Now the fiber is equipped with a fiber connector using the hot melt technique: an oven heats up the connector containing a hot-melt glue. The fiber tip is placed in the connector aperture. After cooling down the connector, the fiber is rigidly linked to the connector. The connector surface has to be grinded and polished with a polishing machine.

A fiber inspection microscope is used to control the quality of the connector surface.

Fiber Fusion Splicing

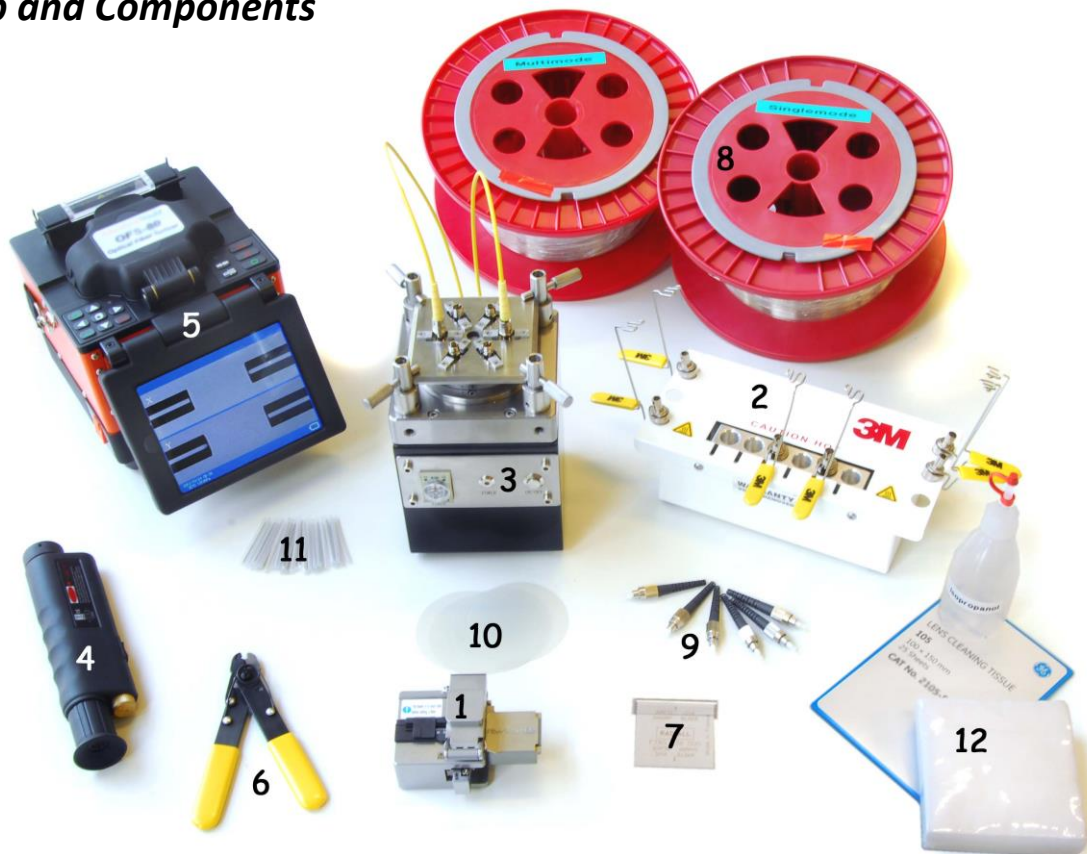
In a next step joining of two bare fibers by arc splicing is trained. Arc fusion splicing is a kind of welding with both fiber ends exposed to an electrical arc. For an optimal result the fiber tips have to be cleaved with a high precision cleaver to get a fiber tip of a plane surface and of high optical quality. The fiber has to be ideally positioned which is performed by the splicer machine automatically. The fiber position can be controlled by build-in vision control system. After the fusion process the quality and damping of the splice is tested by the splicer machine. Finally, a splice protection sleeve is affixed to the splice.

A basic version with a fiber lock manual unit and with a manually polishing option for connectors are offered (CA-1451).

Educational Objectives of Investigation

- Fiber Stripping
- Fiber Breaking
- Fiber Connector Installation
- Connector Polishing
- Fiber Fusion Splicing
- Splice Protection Sleeve
- Inspection Microscope
- Hot Melt Oven

Setup and Components



- 1 High precision fiber cleaver
- 2 Holt melt cementing oven for fiber connectors with rack for heat dissipation
- 3 Grinding and polishing machine for fiber connectors (CA-1450)
/ manual polishing unit (CA-1451)
- 4 Inspection microscope for fiber connectors
- 5 Automatic arc splicing unit (CA-1450) / manual fiber lock unit (CA-1451)
- 6 Miller stripper for fiber coating removal
- 7 Ceramic blade for fiber cutting
- 8 Single- and multimode bare fiber on spool (1000 m each)
- 9 Set of single- and multimode fiber connectors (ST type)
- 10 Set of fiber connector grinding and polishing discs
- 11 Set of splice protection sleeves (CA-1450) / Fiber lock connection sleeves (CA-1451)
- 12 Optics cleaning kit
- 13 Green laser module 1mW in housing with fiber socket for tests (not shown)

Ordering Information

For ordering the Workshop Glass Fiber Optics (CA-1450)
use ordering number: 490091450

For ordering the Workshop Glass Fiber Optics Basics (CA-1451)
use ordering number: 490091451

Fiber Preparation and Handling

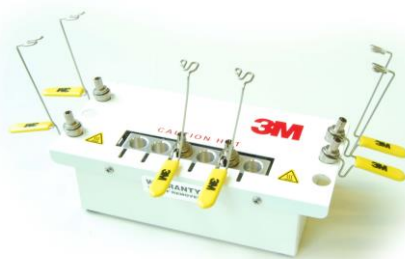
In the following list the sequence of fiber preparation procedures is given.

- **Stripping of glass fibers**



For mounting of a connector to a bare fiber end, the protection coating of the fiber has to be removed. The correct handling of a Miller Stripper is trained in this step, and leads to a bare fiber without coating which can be inserted in a fiber connector.

- **Assembling of fiber connectors**



In a hot melt oven a fiber connector is heated up until the glue in the duct of the connector is molten. The fiber tip is now inserted in the connector. Special holders for the fiber and fiber connector allow heating up and cooling down of the connector. When leaving the connector cooling down the glue becomes solid and the fiber is rigidly fixed to the connector.

- **Grinding and polishing of fiber connectors**



In a next step the connector is grinded and polished. For this task a polishing machine is used. The projecting fiber end is cut off with the ceramics blade. The connector is mounted on the polishing machine. In a first step it is grinded and in a second step polished by suited lapping films.

In case of the Basic Version CA-1451 a manual polishing disc with polishing films are provided.

- **Optical inspection of fiber connector surface**



An inspection microscope allows the supervision of the polishing process. The connector ferrule is polished until the fiber is free of scratches and distortions.

- **Single and multimode fibers**



For the performance of connector assembling and fiber splicing tests the kit provides two fiber spools with 1000 m of singlemode and multimode fiber, respectively.

- **Cleaving of glass fibers**



For splicing two fibers, the fiber coating has to be stripped off by the fiber stripper, as mentioned above. Further, the two bare ends of the fibers have to be cleaved by a precision cleaver provided in the kit. After cleaving the fiber ends show a smooth, flat surface.

- **Splicing of glass fibers**



By a splicing machine the two bare fiber ends are arc fused. The two fiber ends are aligned by the splicing machine automatically. On the monitor screen of the splicing machine the alignment and splicing process can be followed. In a last step a splice protection sleeve is slid over the splice and heated until the sleeve shrinks and builds a firm protection against bending and tension.

In case of the Basic Version CA-1451 a manual fiber lock unit with fiber lock sleeves are provided.

- **Green laser module in housing**



A 1 mW laser light source mounted in a housing and connected to a fiber socket is provided for tests of the assembled fiber connectors and spliced fiber ends. By the laser light, distortions at the connectors or splices can be visualized.