Fiber and fiber coupler instruction manual

Safety precautions

Appropriate safety measures should always be taken when the laser works. Failure to take proper safety precautions can result in permanent damage to the retina or other serious damage. We suggest that, review standards, legislation and government regulations for operating laser safety measures for all operators or people who may have been exposed to laser radiation. We also strongly recommend that any laser used in the workplace should be used under the guidance of a person who has professional knowledge about laser safety.

All users should be cautious when using a laser instrument. This instruction manual gives a typical example of a 100mW visible laser. Please note special precautions should be taken when using invisible wavelength or high power laser.

Figure 1: Fiber coupler

Figure 2: 532nm laser with fiber coupler

Summarize of fiber coupler

Fiber coupler is optical element that enables the free space laser beam enter to optical fiber effectively. The design is simple: A focusing optical system is used to reduce the beam as much as possible, the fiber input aperture is connected to the focus, make the maximum laser power send to the optical fiber. There are many kind of different fiber and fiber coupler on the market, this manual will focus on introduce fiber and fiber coupler produced by us. Four basic elements of fiber coupler: A fastener connecting the aperture of the laser, the focusing optical system inside the fastener, the fiber interface at the end of fastener and three adjusting screws for positioning.

Cleaning the end of fiber

Note: Wipe the surface of fiber head every time when using fiber.

1. Remove the fiber cap, and wipe the surface of fiber head with a cotton bud dipped in ethanol. Make sure use the fiber after the surface of fiber head is wiped up. Start the laser until the ethanol is volatilized.
2. Do not touch the surface of fiber end, the surface of fiber end do not contact with any other surface. The surface of fiber end need to wipe again if it is contaminated. Minimize times of fiber plugging and unplugging.

Notes for fiber plugging and unplugging

1. It is necessary to first contact the fiber end to the internal coupler at an angle, then turn the fiber to a flat angle to insert the fiber into the coupler, do not insert the fiber end into the coupler directly.

Correct connection mode

Wrong connection mode

2. Please put on fiber cap in time after the fiber removed from coupler to prevent the fiber end from being contaminated.

Notes for fiber operating

1. Fiber was in a coil and tied up before delivery, open the tie before use.
2. Do not stretching force to the fiber to avoid distortion along the fiber axis. The table below is the specification of minimum bending diameter of fiber:

Diameter of fiber(μ m)	Transport and storage(mm)	Operating(mm)
200	50	65
400	110	140
600	220	280

3. Fiber in transit or storage need to tie up and meets the requirement of minimum bending diameter it is necessary measure to prevent damage of fiber.

Correct tie up method

Wrong tie up method

Align of fiber coupler

To maximize the amount of laser enter the fiber the coupler need to be aligned. All the fiber coupler will align by we before shipment, the optimum align position of fiber coupler may change caused by vibration during transport or large temperature difference during operating and storage and so on. If the laser cannot reach the expected output power, it may need to readjustment.

Readjustment the fiber coupler

1. Pull out the fiber from fiber coupler; do not take off the fiber coupler.
2. Turn on the laser, maximum the output power of laser. The output of the laser will highly divergent because of the focusing optical system in the fiber coupler. (Figure 3) Let the laser warm up at least 5 minutes 20 minutes is recommended. Make sure an eclipser in front of the aperture.

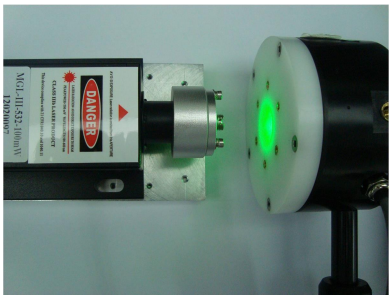

Figure 3: Laser output power of unconnected fiber

3. Use a power meter measure the output power when the fiber is not connected. Make sure the laser output power close to or exceed the power level of laser.

4. Connect the fiber to the fiber coupler. Make sure the fiber cap is taken off when adjusting the fiber. Do not touch the surface of fiber end, the surface of fiber end do not contact with any other surface.

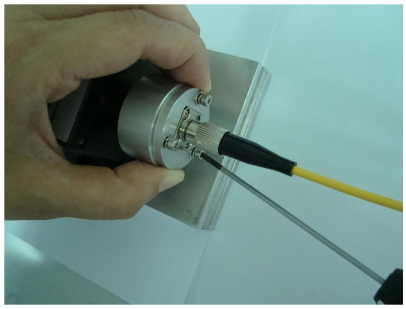

Figure 4: Test laser output power

5. Turn the three adjusting screws on the coupler clockwise or counter clockwise with a screw driver (the three screws should be adjusted together), until laser output from the aperture. At the meantime slide the front end cap of coupler with fingers gently to achieve the maximum output power (Figure 4). The output power maximum when the center of fiber is at the focal point of laser beam. Note: the center of coupler maybe not the most accurate coupling center (Figure 5).

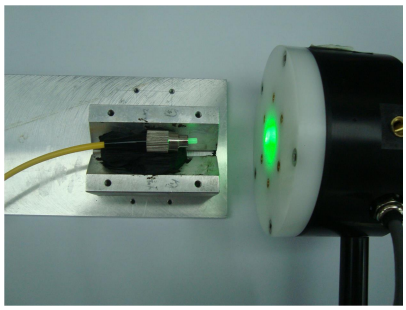

Figure 5: Adjustment complete

6. After the five steps above if the power is not reach the expected range, please follow the method below adjust focusing optical component.

Adjust focusing optical component in the coupler

1. Focusing optical component located on the thread at the center of fiber coupler. Please turn the focusing optical component in coupler. Do not touch optical lens please and no more than half-turn at a time.(Figure 6)

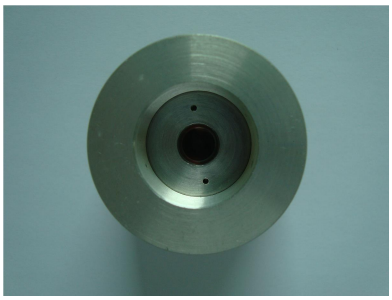

Figure 6: Focusing lens in coupler

2. If you turn to get a slightly less power than the maximum power, the aperture of fiber is close to overlap with the focus of lens.
3. Cleaning lens on fiber coupler with a cotton bud dipped in ethanol. Then connect fiber to the fiber coupler do the above procedure again until get maximum output power.
4. We suggest not use other glue or binder, they may produce invisible gas and cause permanent damage to optical component.

Instructions of fiber align

1. The smaller the fiber core diameter, the harder to align.
2. Gently turn the screw and make sure the screw does not fall off the coupler when you let go.
3. Then first tighten part of screws, fine adjustment, finally find the maximum power position tighten all the three screws.
4. A damaged fiber may produce misalignment. If the problem persists, try replacing the fiber.
5. If customer wants to use free space laser could gently turn off the fiber coupler counter clockwise from alignment part of the laser.
6. Due to the very small size of the laser beam, dust, hair or of other material debris around the beam may cause significant optical changes, so all optical operations should be performed in a clean and dust-free environment.