High-Energy Pulsed Laser Coupler

Introduction

Laser Coupler

Auxiliary Coupling-Minitor

The fiber-coupling technology for high-energy pulsed lasers is a critical process that enables efficient transmission of high-power, high-peak-power nanosecond pulses through optical fibers. This process requires precise matching of optical parameters to the laser specifications, along with fine-tuned alignment of components. This product integrates and packages these components into a unified module, significantly enhancing coupling effeciency and stability. It is compatible with a wide range of laser application scenarios espically for nanosecond lasers—transforming them from bulky, stationary equipment into flexible and compact processing tools.

Key Features and Advantages

- High efficiency:The system achieves a laser coupling efficiency of up to 80% under typical operating parameters.
- Flexibility:The system "liberates" the laser from fixed, stationary equipment. With delivery through flexible optical fibers, the output port can move freely and easy to integrate into complex systems.
- Reliability:The integrated packaging enhances resistance to vibration and dust. With an optional auxiliary coupling-monitor, it enables real-time observation of the fiber-end coupling condition to improve safety and stability.
- Simplified Design:No user-adjustments are required. The system is easy to operate and to maintain.
- Integrated and Modularized:Standard fiber interfaces allow the laser to function as a module, facilitating upgrades and expansion of the system.

Specification Table

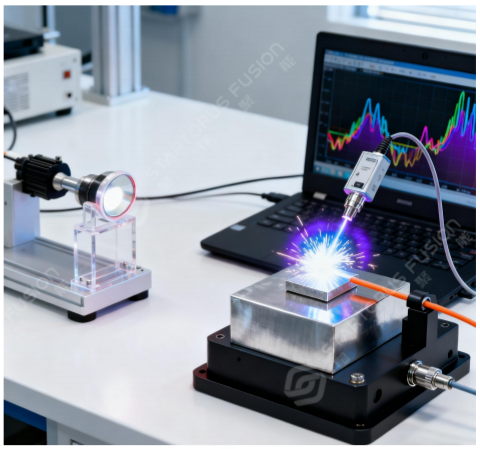
Category	Parameter	Typical Value
Core Energy / Power	Maximum Single-Pulse Energy	50 mJ @1.2 mm Fiber Diameter
	Peak Power Density	30 GW/cm^2
	Coupling Efficiency	80%
Fiber Parameters	Fiber Interface	D80, SMA905 (D80 recommanded)
	Fiber Diameter	1.2 mm
	Fiber Type	Multimode Fiber
	Numerical Aperture	> 0.22
Laser Parameters	Laser Wavelength	800– 1550 nm
	Pulse Width	> 10 ns @50 mJ
	Repetition Rate	< 20 Hz
Other	Interface Monitor	Optional Auxiliary Coupling-Monitor

Typical Application

1.Laser-Induced Breakdown Spectroscopy (LIBS):

● **Applications:**

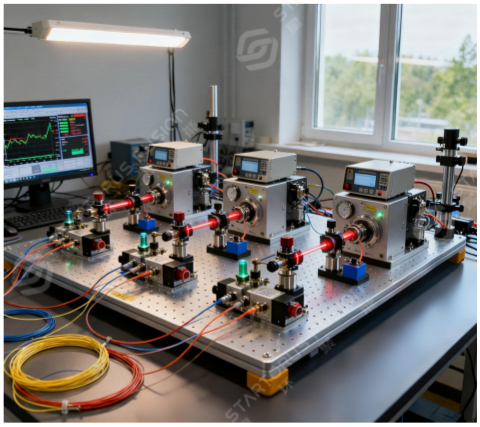
Employed for elemental composition analysis (e.g., in the Curiosity Mars Rover), environmental monitoring, and more.



● **Advantages:**

By utilizing an optical fiber to deliver the laser pulse to the sample, and another to collect the plasma spectroscopic signal, the structure of LIBS system is greatly simplified, which allows the system to operate effectively in harsh or remote environments (such as space, deep-sea, or industrial field sites).

2.Pump-Probe Measurements:



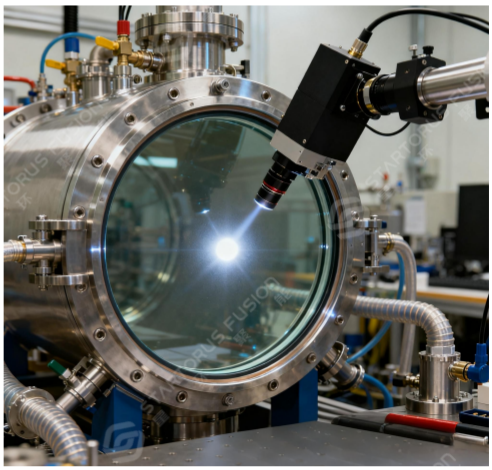
● Applications:

Investigating ultrafast physical and chemical processes.

● Advantages:

Optical fibers can be utilized to precisely control the optical path length and stability of the pump and probe beams, thereby streamlining the platform.

3.Laser Cleaning:



● Applications:

Used for non-destructive and in-situ cleaning to remove contaminants such as rust, paint, films, and grease from the surfaces of materials like metal and glass.

● Advantages:

Transmit the laser to a cleaning head mounted on a handheld device or a robot arm end-effector by optical fiber provides exceptional operational flexibility. This enables real-time, non-destructive, in -situ cleaning of complex structures like glass windows in high-vacuum environments.