SiPH Upgrade | 200 and 300 mm Automated Probe Systems

The Dedicated Solution for Silicon Photonics Device Characterisation

FEATURES / BENEFITS

Dedicated for silicon photonics on-wafer test

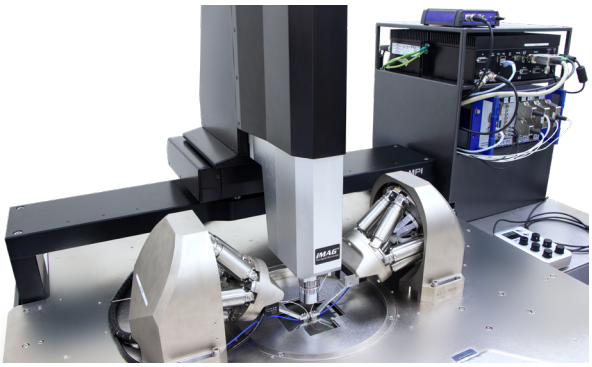
- Including various options of high-precision fiber alignment systems for ultra-fast scanning routines
- Multiple measurement capabilities for O-O, O-E, E-O and E-E device configuration
- Integrated Z-sensing for detecting the fiber to wafer contact point
- Crash protection when using two optical fiber arms
- Temperature capability from -50 °C to 200 °C
- Optional dark box for testing in light tight environment

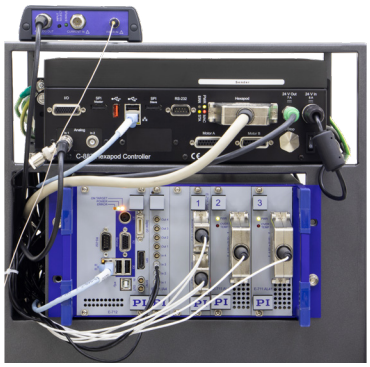
System compatibility

- 200 mm: TS2000-IFE and TS2000-SE
- 300 mm: TS3000, TS3000-SE, TS3500 and TS3500-SE

INTEGRATED RACK FOR OPTICAL ALIGNMENT ELECTRONICS

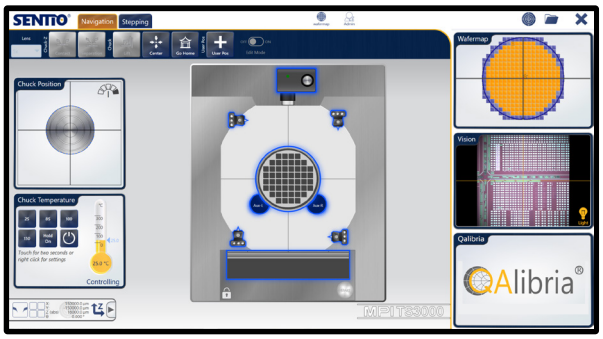
The SiPH optical alignment system requires appropriate electronic components. To avoid consuming additional floor space, an extra electronic rack has been integrated inside the probe systems foot print. It is located right above the optional chiller for the thermal chuck system and consists all the drivers for positioning, distance control and optical detection.
The photonics alignment system is designed for single fiber and and multichannel arrays. Its modular design allows the use of up to 6-axis fiber positioning stages.





SOFTWARE

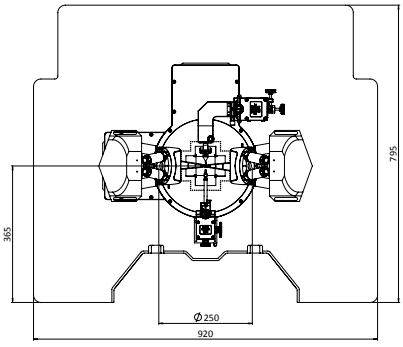
Necessary optical alignment stages, such as the hexapod, are fully integrated into the SENTIO® probe station control software. Those are operated just like any other automated positioner including its additional alignment features. And not only integrated in the multi touch software, even the hardware control panel supports the SiPH positioner type.
For easy test executive integration of the SiPH functionality MPI is providing free sample scripts. Those are covering all necessary operation required for automated testing. Additionally, optical measurement equipment, can be embedded to trigger the actual measurement such as IL or PDL measurements.

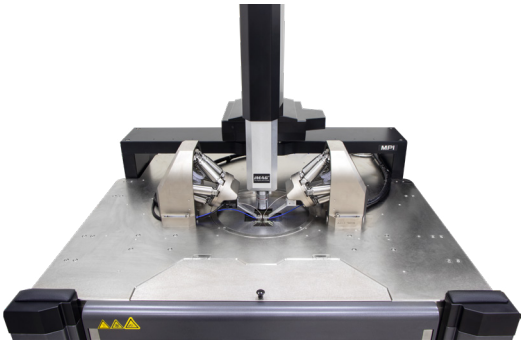


PROBE PLATEN

Specifications

Material	Nickel plated steel
Stability	Optimized for advanced optical measurement requirement
Platen cooling	Fully integrated CDA cooling
Configuration	Optical alignment positioner with probe card or MicroPositioners
RF MicroPositioner mounting	Magnetic with guided rail
DC MicroPositioner mounting	Magnetic
Optical positioner mounting	Bolt down



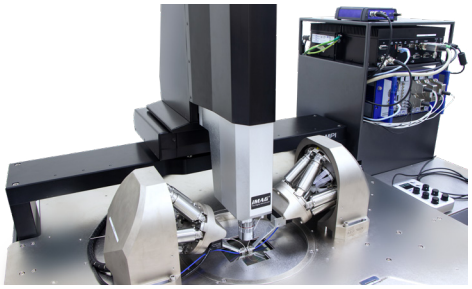


Example based on TS3000, or TS3500 probe platen

FAST MULTICHANNEL PHOTONIC ALIGNMENT SYSTEM[1]

System with 6 Degrees of Freedom for Ultra-Fast Scan Routines

- Integrated scan routines for fiber optic alignment
- Extensive software package
- Direct detection of the optical signal
- Position sensors for high accuracy and operational reliability
- Automatic alignment and coupling optimization
- Suitable for single fiber and fiber arrays
- Simplified setup with 3-axis stage for single fiber applications
- Optional optical power meter



Specifications

Six-axis coarse positioning	
Active axes	X, Y, Z, θX, θY, θZ
Travel range in X, Y, Z	±6.5, ±16, ±8.5 mm*
Travel range in θX, θY, θZ	±14.5, ±10, ±10°*
Minimum incremental motion	0.1 µm
Max. velocity	10 mm/s
Sensor type	Rotary encoder
Drive type	Brushless DC motor
Three-axis coarse positioning	
Alternatively to the six-axis coarse positioning the MPI PMP60 can be used	
Fine positioning	
Active axes	X, Y, Z
Closed-loop travel in X, Y, Z	100 µm
Min. incremental motion, closed-loop	2.5 nm
Linearity error, for the entire travel range**	2 %
Repeatability (bidirectional) 10% travel range	2 nm
Sensor type	Incremental
Drive type	PICMA®
Alignment	
Alignment time area scan 100 µm x 100 µm***	<1 s
Alignment time gradient search, randomized with ±5 µm****	<0.3 s
Repeatability (fiber to fiber)	0.02 dB
Fiber output power measurement	
Wavelength range	700 to 1800 nm
Minimum input power	50 nW
Maximum input power	40 mW
Miscellaneous	
Operating temperature range, mechanics	0 to 50 °C
Operating temperature range, controller	5 to 40 °C
Cable length	2 m

Requirements for the photometer used

Output signal	Analog output, ideally converted from linear to logarithmic
Output voltage range, max.	-5 to 5 V
Bandwidth, min.	1 kHz
Noise level, max.	-60 dBm

** The travel ranges of the individual coordinates (X, Y, Z, θX, θY, θZ) are interdependent. The data for each axis in this table shows its maximum travel range, where all other axes and the pivot point are at the reference position. See the dimensional drawings for the default coordinate system and pivot point coordinates of the hexapod. Changing the pivot point will reduce the travel range in θX, θY, θZ. Changing the orientation of the coordinate system (e.g., when the optical axis is to be the Z axis), will change the travel range in X, Y, and Z.*
*** without polynomial linearization*
**** typical time span for scanning the entire area and moving to the highest intensity*
***** reaching the global maximum after first light has been found*

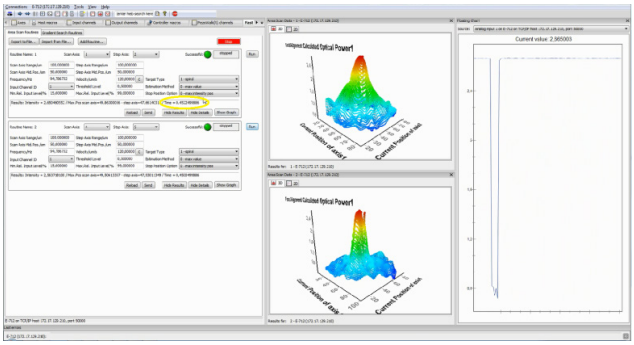
[1]All these texts, images and drawings are courtesy of Physik Instrumente (PI) GmbH & Co. KG., © 2017

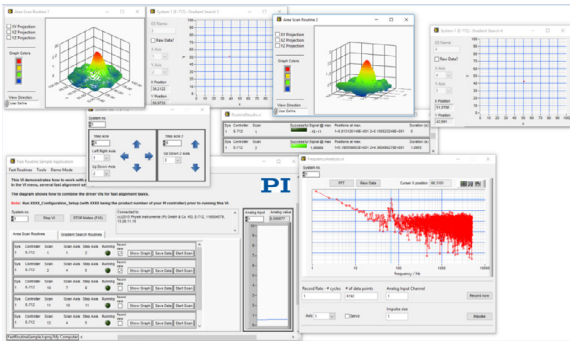
Comprehensive Software Package and Development Tool-Kits

Software emulation allows application programs to be developed and pretested without having all components on site. Simulation tools also avoid collisions e.g., to prevent the moving platform from approaching positions where the platform or the mounted load would collide with the surroundings. The free choice of the pivot point and coordinate systems for definition of work- and tool-space can be done by a simple software command to enable scanning in inclined planes. Mobile apps allow wireless monitoring and control.

User-friendly application development libraries and sample applications for easy, fast, and flexible implementation
- Libraries for C++, C#, VB.net, etc.
- Python
- LabVIEW
- MatLab

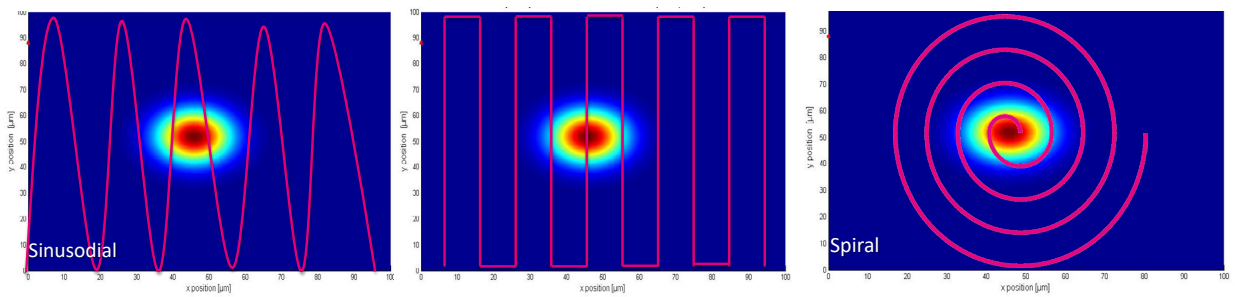
Available for Windows, Linux and OS X deployment. Universal Command Set (GCS) simplifies commissioning and programming. Supports PI controllers' built-in, ultrafast, and vibration-free scan/align algorithms. PIMikroMove® GUI for Windows provides quick access to motion and scanning across all PI products regardless of drive technology, controller type, number of axes etc. Includes softwarebased scan and align routines which work with all PI motion controllers.





Alignment Routines

- Gradient Search, define with FDG and start with one command FRS #
- Gradient of signal steers movement
- New approach with fastest results
- Run simultanously on any channels, in- and output as well
- Tracking functionality



Digital Motion Controller

Modular control system for up to 6 axis for highest precision:

- Real-time operating system for excellent trajectory control
- Highly stable 20-bit D/A converter
- 20 kHz servo update rate
- Flexible interfaces: Ethernet TCP/IP, RS-232, USB
- Supports capacitance sensors or lensed fibers for automatic Z sensing

Specifications

Function	Modular digital controller for multi-axis piezo nanopositioning systems
Axes	6
Processor	PC-based, real-time operating system
Sampling rate, servo control	20 kHz
Sensor	
Servo characteristics	P-I, two notch filters
Sensor type	Capacitive
Sensor channels	6
Sensor resolution	18 bits
External synchronization	Yes
Amplifier	
Amplifier channels	8
Output voltage	–30 to 135 V
Peak output power per channel	25 W
Average output power per channel	8 W
Current limitation	Short-circuit-proof
Resolution DAC	20-bit
Overheat protection	Output voltage switch-off at 75 °C
Interfaces and operation	
Interface / communication	Ethernet, USB, RS-232, SPI
Piezo / sensor connection	Sub-D Mix 25W3
Analog inputs	LEMO: 4 × ±10 V differential; bandwidth: max. 25 kHz; resolution: 18 bit; max. impedance: 250 Ohm
Analog outputs	LEMO: 4 × ±10 V differential; bandwidth: max. 25 kHz; resolution: 16 bit
Digital input/output	MDR20: 8 × TTL
Command set	PI General Command Set (GCS)
User software	PIMikroMove
Application programming interfaces	API for C / C++ / C# / VB.NET / MATLAB / Python, drivers for NI LabVIEW
Supported functions	Wave generator, trigger I/O, macros
Indicators	LEDs for OnTarget, Error, Power, Over Temp
Linearization	4th order polynomials, DDL option (Dynamic Digital Linearization)
Miscellaneous	
Operating temperature range	5 to 40 °C
Mass	5.96 kg
Dimensions	9.5” chassis, 236 mm × 132 mm × 296 mm + handles (47 mm length)
Max. power consumption	225 W
Operating voltage	100 to 240 VAC, 50 to 60 Hz

Z DISTANCE SENSING

For precise fiber positioning a distance sensor is integrated into the probe arm. The sensor supports an easy and safe setup when fiber and DUT are brought into close proximity.

Specifications

Sensor Type	Capacitive
Measurement range	1000 µm
Resolution	40 nm
Interface	Ethernet for easy access via browser
Analog output	0 to 10 Volt for direct connection to alignment system and probe system hardware
Quantity	1 or 2, depending on configuration for single or dual setup

OPTICAL POWER METER

Specifications

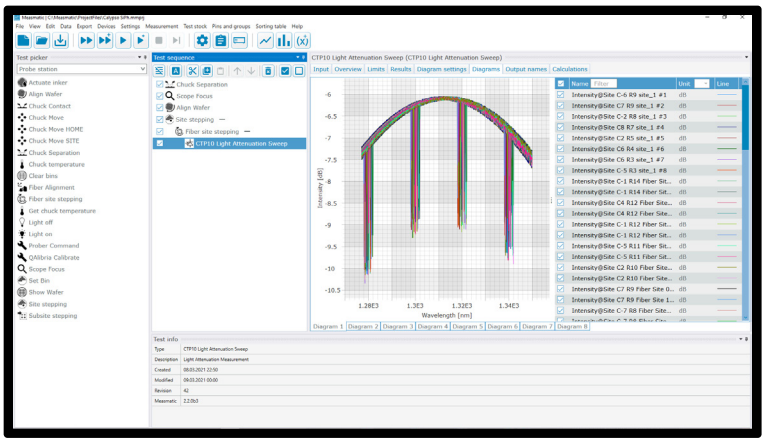
Optical input	
Wavelength range	400 to 1550 nm
Connectors	FC/PC, FC/APC
Polarization dependence	None
Minimum input power at 1550 nm	85 nW
Maximum input power at 1550 nm	85 mW
Average noise at 1550 nm	<10 nW
Current input	
Connectors	BNC
Minimum input current	0
Maximum input current	1 mA
Average noise	<120 pA
Output	
Connectors	BNC
Output signal	Analog, logarithmic
Voltage range	-5 to 5 V
Bandwidth (3dB)	20 kHz
Logarithmic increase	1 V/10 dB
Output voltage at 85 mW, 1550 nm	≈ +5 V
Output voltage at 85 nW, 1550 nm	≈ -1.2 V
Output voltage at 1 mA input current	+5 V
Miscellaneous	
Operating voltage	12 to 24 V
Power consumption	2.4 W
Overall mass	0.6 kg
Relative humidity	20 to 70 %
Operating temperature range	5 to 40 °C
Storage temperature range	-10 to 50 °C
Requirements for customer supplied optical power meter	
Output signal	Analog, ideally logarithmic
Voltage range	Maximum -5 to 5 V
Bandwidth	Minimum 1 kHz
Noise level	Minimum -60 dBm

MEASMATIC - THE UNIVERSAL TEST SEQUENCER

The Measmatic software provides a unique environment for automating silicon photonics measurements. With built-in SENTIO connectivity, all automated MPI probe stations including the SiPH alignment positioner are natively supported. A variety of device drivers are integrated for optical and electrical device measurements. The flexible architecture of the software allows the use of instruments from different manufacturers. Any instrument with a GPIB, Ethernet or RS232 interface can be supported. The graphical user interface and functionality are customizable with built-in Python and Lua scripting functions.

The test library contains predefined sequences for the characterization of silicon photonic devices. User-specific test routines including conditions and loop steps can be defined.

A variety of mathematical functions are used to extract parameters and visualize the acquired data. Data export is in a table format or can be customized in Python scripts.



Direct contact:
Asia region: ast-asia@mpi-corporation.com
EMEA region: ast-europe@mpi-corporation.com
America region: ast-americas@mpi-corporation.com

MPI global presence: for your local support, please find the right contact here:
www.mpi-corporation.com/ast/support/local-support-worldwide

MPI Global Presence