Compact, High-Speed XYZ Photonics Alignment Systems

Single-Sided and Double-Sided, Fully Automated

F-712.MAx

- Integrated scan/align routines for fibers and photonic devices
- Fast, simultaneous optical performance optimization across multiple device I/Os and degrees of freedom
- Broad and deep software support for rapid process development, including support for popular languages such as C#, Python, LabVIEW, and MATLAB on Windows and Linux
- Automatic alignment in typically < 0.5 s
- Responsive application and product support from PI worldwide

Problem solved

PI's Fast Multichannel Photonics Alignment (FMPA) solutions combine application-optimized, fab-ready, highly dynamic alignment stages with sophisticated controllers that integrate the world's most advanced and effective first-light search, profile, and power optimization alignment algorithms.

Reduction of alignment time by 99 %

This award-winning technology addresses the number one cost driver for photonics test and assembly: the precise alignment required for each element and channel. Legacy alignment technologies date back to the 1980s and can take minutes to complete. PI's fast optical alignment solutions reduce the time required by typically 99 %, routinely completing the task in less than one second. With studies indicating that on the order of 80 % of the cost of a photonic device is consumed in the alignment prior to FMPA, it is easy to see how profound the production economics benefit from reducing that 80 % by 99 %. And with projections of three orders of magnitude escalation in demand for photonic devices in the near future, as new applications and devices emerge, FMPA is a true enabler.

Compact solution for XYZ alignment challenges

This compact solution integrates a high-precision XYZ stage (based on model M-122) for generous travel with an XYZ piezo nanopositioner of extraordinary speed and resolution (based on model P-616). A single controller manages all axes in single-sided and double-sided configurations: F-712.MA1 and F-712.MA2, respectively. Four high-resolution analog inputs provide connectivity to power meters, such as PI's F-712.PM1 high-bandwidth optical power meter, for optimization and profiling, enabling efficient and fast automated fiber alignment. Soft limits are supported to ensure process safety. Starting with these sophisticated platforms, it is easy to configure automated alignment solutions of unprecedented speed that support functionalities such as submicron-sensitive wafer proximity automation.

Application fields

PIC production, photonics alignment, alignment of optical components, lenses, silicon photonics wafer probing, testing, assembly, and packaging of photonics and fiber optics

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Specifications

Motion and positioning	F-712.MA1	F-712.MA2	Unit
Number of active axes	6	12	
Rough positioning			
Active axes	X, Y, Z		
Travel range in X, Y, Z	25, 25, 25		mm
Minimum incremental motion	3		µm
Max. velocity	20		mm/s
Sensor typ2	Rotary encoder		
Guide	Crossed roller guide		
Drive type	DC motor		
Fine positioning			
Active axes	X, Y, Z		
Travel range in X, Y, Z, closed loop	100		µm
Min. incremental motion, open-loop	0.3		nm
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			
Scanning time of spiraled area scan 500 µm Ø**	< 3	< 6	s
Scanning time of spiraled area scan 100 µm Ø*	< 0.3	< 1	s
Scanning time of spiraled area scan 10 µm Ø**	< 0.2	< 0.5	s
Signal optimization with gradient search, randomized with ±5 µm (repeatability < 0.01 dB)***	< 0.3		s

Miscellaneous	F-712.MA1	F-712.MA2	Unit
Operating temperature range, mechanics	-20 to 65		°C
Operating temperature range, controller	5 to 40		°C
Cable length	3		m

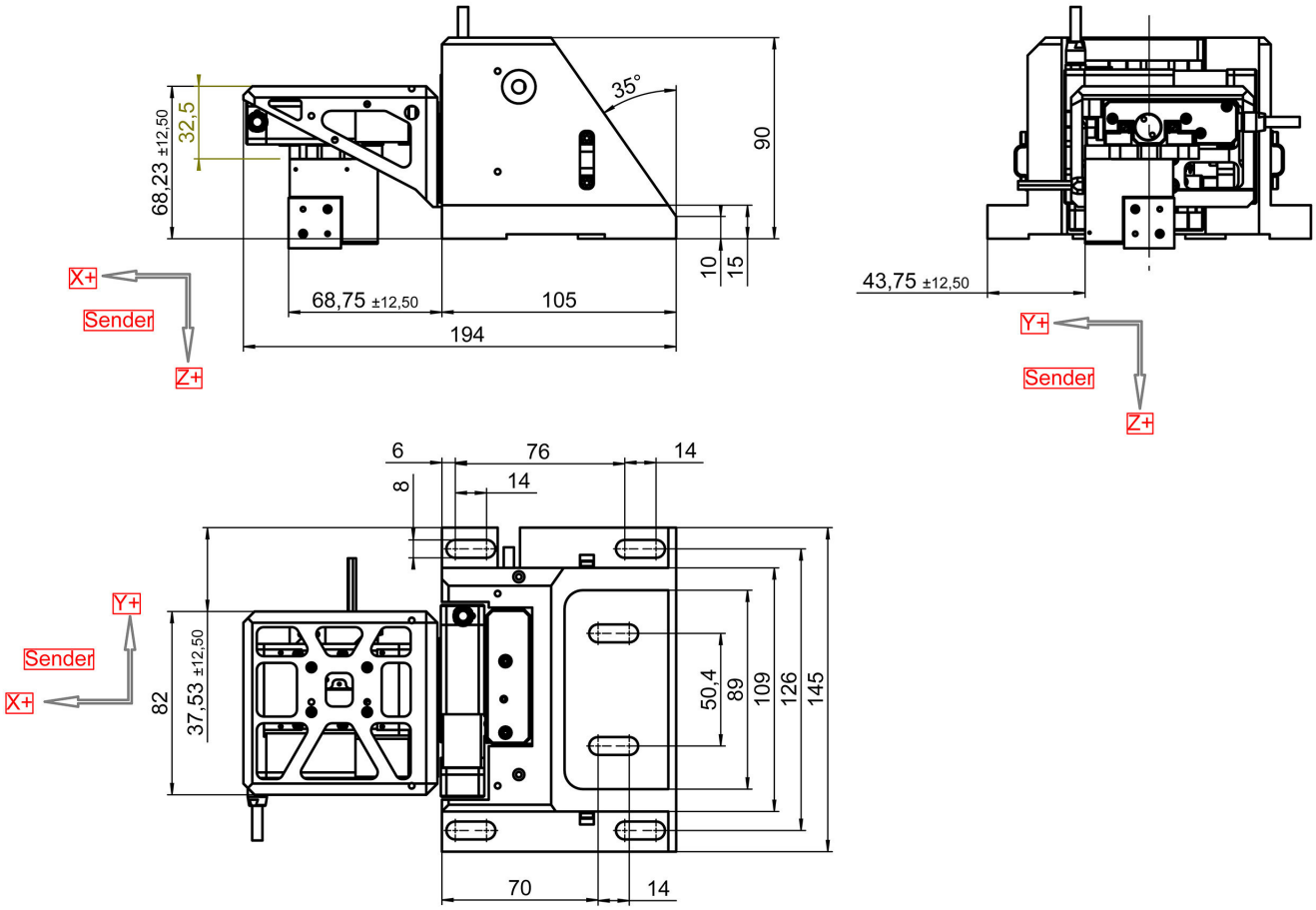
Requirements for the optical power meter		Unit
Output signal	Analog output, ideally converted from linear to logarithmic	
Output voltage range, max.	-5 bis 5	V
Bandwidth, min.	1	kHz
Noise level, max.	-60	dBm

* without polynomial linearization

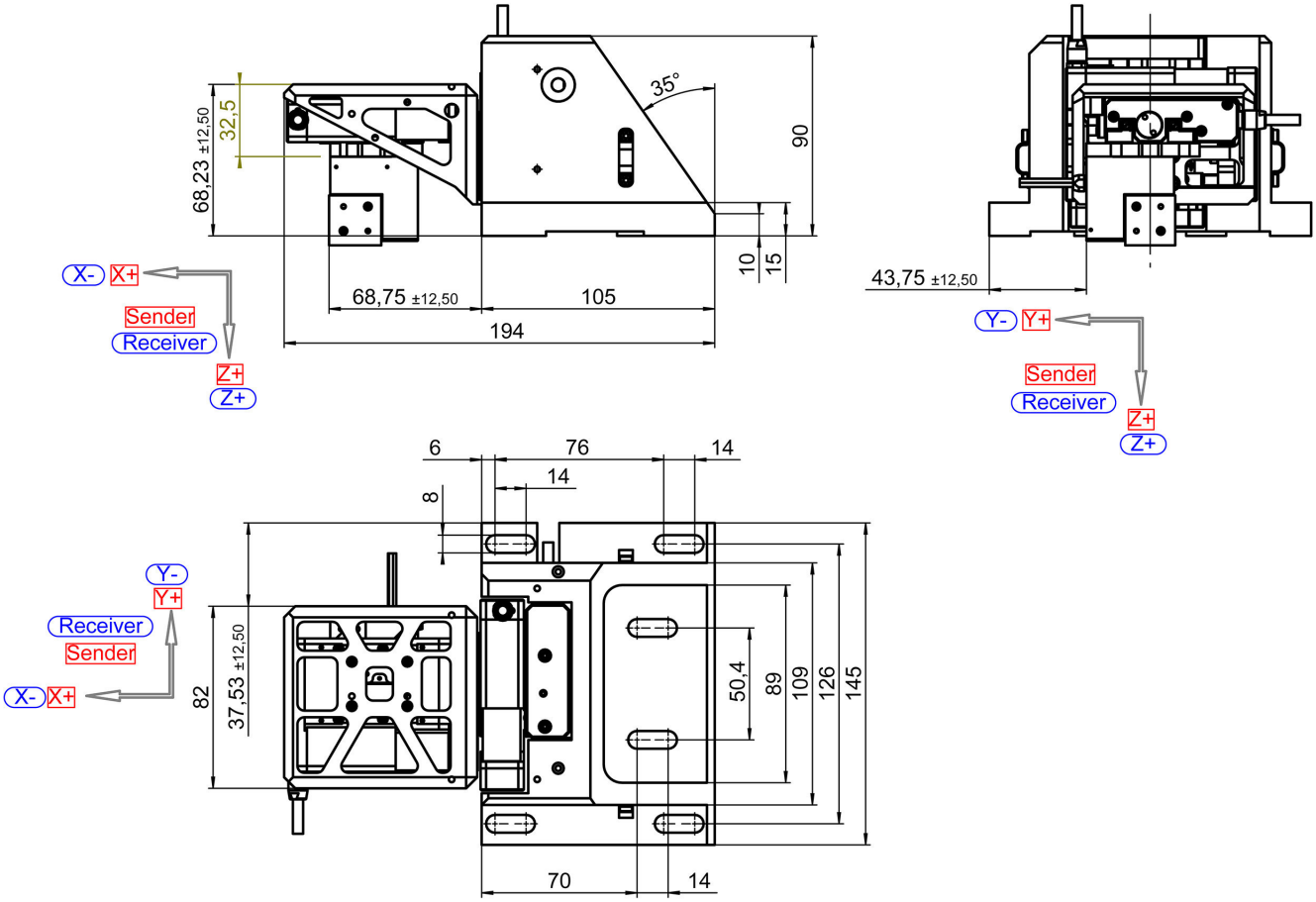
22.08.2024

** typical time span fod scanning the entire area and moving to the highest intensity
*** reaching the global maximum after first light has been found
At PI, technical data is specified at 22 ±3 °C. Unless otherwise stated, the values are for unloaded conditions. Some properties are interdependent. The designation "typ." indicates a statistical average for a property; it does not indicate a guaranteed value for every product supplied. During the final inspection of a product, only selected properties are analyzed, not all. Please note that some product characteristics may deteriorate with increasing operating time.
Ask about customized versions.

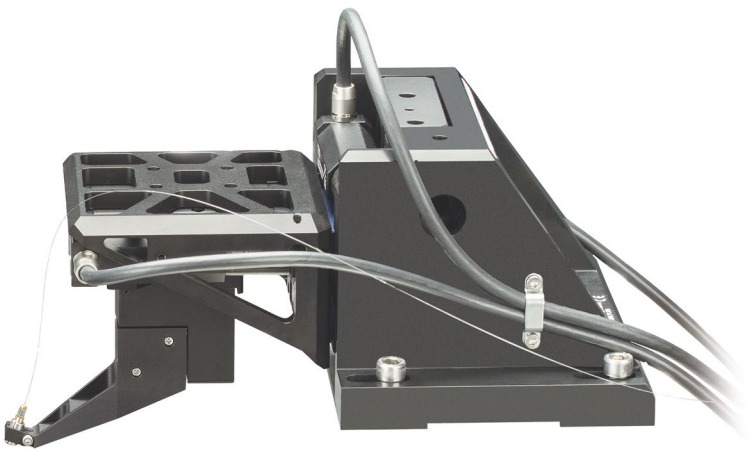
Drawings / Images



F-712.MA1, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.



F-712.MA2, dimensions in mm. Note that a comma is used in the drawings instead of a decimal point.



F-712.MA1

Ordering Information

F-712.MA1
Single-sided photonics alignment system with stacked XYZ linear stages and NanoCube® Nanopositioner, E-712 digital controller with 4 analog inputs, firmware routines for extremely fast alignment functions, software package

F-712.MA2
Double-sided photonics alignment system with stacked XYZ linear stages and two NanoCube® Nanopositioners, E-712 digital controller with 4 analog inputs, firmware routines for extremely fast alignment functions, software package