High-Precision Double-Sided Fiber Alignment System

System with 6 Degrees of Freedom for Aligning Fibers and Optical Components

F-712.HA2

- Integrated scan routines for fiber optic alignment
- Ideal for applications in silicon photonics
- Extensive software package
- Direct detection of the optical signal
- Position sensors for high accuracy and operational reliability
- Automatic alignment of several fibers in <0.5s

Fast and high-precision drives

The basis of the fiber alignment system is a very stiff setup with an H-811 hexapod and an P-616 NanoCube® nanopositioner. The parallel-kinematic design for motion in degrees of freedom ensures high system stiffness. The motorized drives make longer travel ranges possible and at the same time, the NanoCube® nanopositioner ensures fast scanning motion and dynamic compensation of drift effects. Flexure guides and all-ceramic insulated PICMA® actuators guarantee a long lifetime. Because all drives are equipped with position sensors, it is possible for example, to reliably prevent collisions with expensive silicon wafers.

High-performance scan routines

The sophisticated scan routines are integrated directly into the controller. The performance is improved considerably and integration simplified. The system can manage all tasks in the field of fiber alignment. For example, double-sided systems allow simultaneous alignment of the transmitter and receiver.

Extensive software package

The software package supplied in the scope of delivery allows integration of the system into virtually any environment. All common operating systems such as Windows, Linux, and OS X as well as a large number of common programming languages including MATLAB and NI LabVIEW are supported. Thanks to sophisticated program examples and the use of software tools such as PIMikroMove, the time between starting integrating and productive operation is shortened considerably.

High-resolution analog input

The controller receives the optical intensity signal directly via a high-resolution analog input. Complex setups with cameras are not necessary. Various distribution functions are available for determining the maximum intensity.

Application fields

Alignment of optical components, automatic wafer tests, assembling technology in silicon photonics

Specifications

Motion and positioning	F-712.HA2	Unit
Number of active axes	18	
Rough positioning		
Active axes	X, Y, Z, θ_X, θ_Y, θ_Z	
Travel range in X, Y, Z	±6.5, ±16, ±8.5*	mm
Travel range in θ_X, θ_Y, θ_Z	±14.5, ±10, ±10*	°
Minimum incremental motion	0.1	µm
Max. velocity	10	mm/s
Sensor type	Rotary encoder	
Guide	–	
Drive type	Brushless 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**	<5	s
Scanning time of spiraled area scan 100 µm Ø**	<1	s
Scanning time of spiraled area scan 10 µm Ø**	<0.5	s
Scanning time, gradient scan, randomized with ±5 µm (repeatability < 0.01 dB)***	<0.3	s

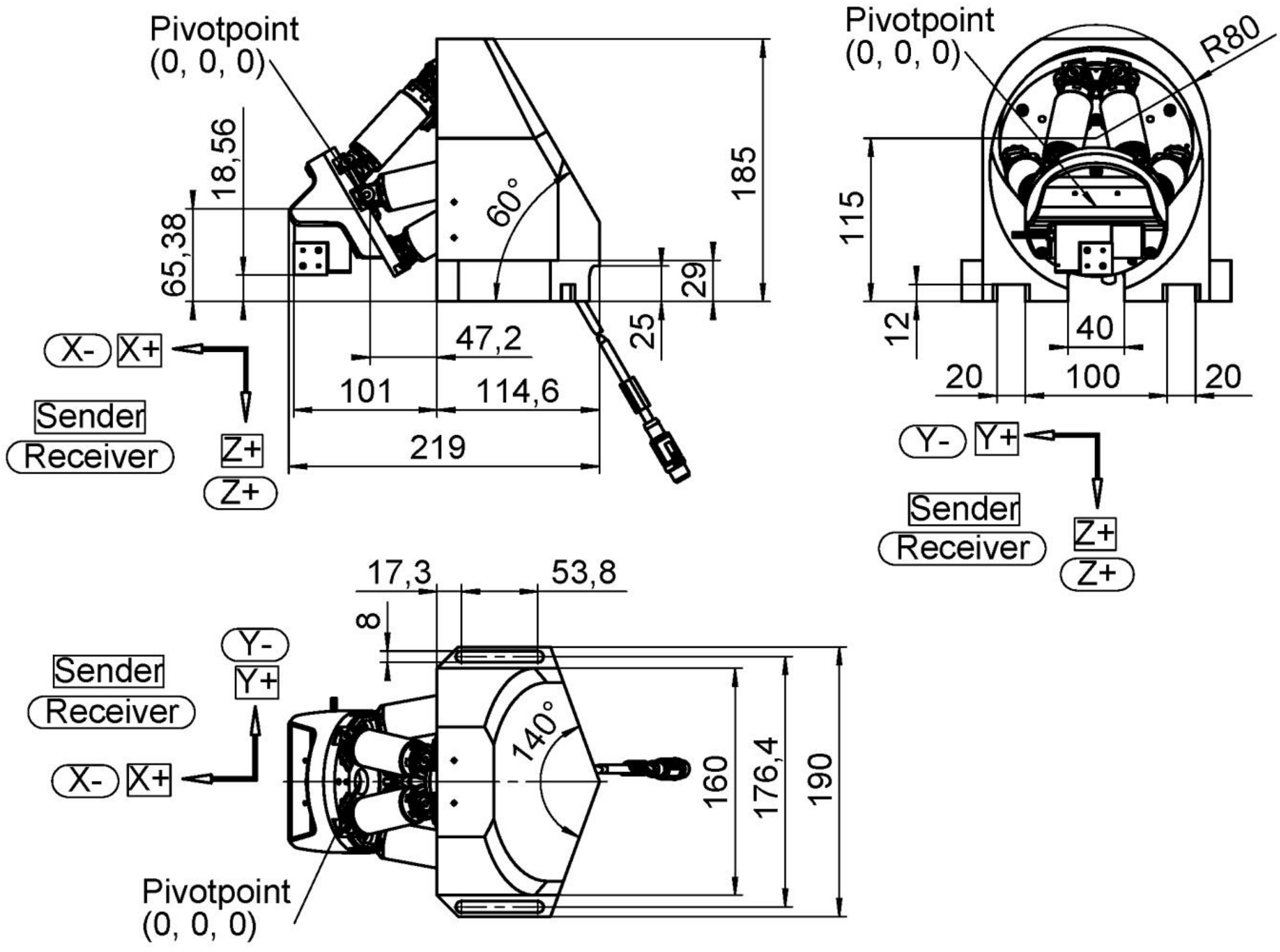
Miscellaneous	F-712.HA2	Unit
Operating temperature range, mechanics	0 to 50	°C
Operating temperature range, controller	5 to 40	°C
Cable length	2	m

	Requirements for the optical power meter	Unit
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

Technical data specified at 20±3 °C.
* The travel ranges of the individual coordinates (X, Y, Z, θ_X, θ_Y, θ_Z) 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 θ_X, θ_Y, θ_Z. 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
Ask about customized versions.

Drawings / Images



F-712.HA, dimensions in mm

Ordering Information

F-712.HA2

Double-sided fiber alignment system with two H-811 hexapods and two NanoCube® Nanopositioners, E-712 digital controller with 4 analog inputs, two C-887 hexapod motion controllers with 2 analog inputs each, firmware routines for extremely fast alignment functions, software package