

FA95e and FA130e Series

Direct-Drive, Multi-Axis Photonics Alignment System

3- to 6-axis photonics alignment

High resolution (2 nm), repeatability (100 nm), and accuracy (300 nm)

Anti-creep crossed-roller bearings

Noncontact direct-drive linear motors

Direct-drive rotary and goniometer options

Raster, spiral, or power peaking algorithms

Interface to industry-standard power meters



Introduction

Aerotech's enhanced FiberAlign™ FAe series is the latest high-performance photonics aligning system incorporating best-in-class drive and state-of-the-art axis control technology. It builds on the success of the original FiberAlign systems while improving accuracies and shrinking step sizes. The modular design permits the selection of the number of axes, travel distance, and load capacity to exactly fit the application, all while maintaining high-speed, resolution, and accuracy.

Automated Production

As alignment accuracies, the quest for higher yields, and device volumes increase, the need for a precise, reliable, and repeatable motion system becomes increasingly important. Due to the rapidly changing nature of components and manufacturing processes, flexibility in system configuration becomes a must. Aerotech's FAe series responds to and satisfies all of these requirements. With the selection of robust system components and decades of precision motion experience, high-volume production in a 24/7 manufacturing environment has become a reality.

Advanced Drive Technology

Only noncontact direct-drive technology offers the robust, accurate, high-speed, and high-resolution positioning necessary for mass production of precision devices. Aerotech's state-of-the-art drive technology offers industry-leading resolution combined with travels up to 160 mm and

positioning speeds up to 200 mm/s. Utilizing ultra-quiet linear drives and advanced control technology, Aerotech's FAe series offers the best position repeatability, accuracy, and in-position stability to meet the motion system requirement of higher yields.

Fast Vision Alignment and Power Scanning Algorithms

A comprehensive software toolkit provides easy access to commonly used functions. Alignment functions such as hill climbing from a power meter input, and raster, square, or circular spiral scans are easily implemented via standard functions. In addition to the automated tools, both joystick and on-screen jog control are available for manual operations.

FA95e or FA130e – Which is Right for You?

To satisfy the ongoing positioning and processing needs of the photonics manufacturing industry, Aerotech offers both the FA95e and FA130e. Both basic three-axis models can be extended with additional axes to satisfy the requirement to control motion in six axes: X, Y, Z, T (yaw), P (pitch), R (roll).

FA95e represents the more compact version (one-third of the volume of FA130e) and is ideal where space is limited. Additional axes can be attached to provide high-resolution, high-accuracy rotary motion.

Yaw rotary motion is provided by Aerotech's ANT95-R direct-drive, high-resolution rotary actuators, while pitch

FA95e Series SPECIFICATIONS

and roll motion are provided by Aerotech's advanced ANT-20G series direct-drive, high-resolution goniometers. The rotary devices offer a 20 degree angular range with industry-leading step resolution of 0.01 arc-seconds.

The FA130e is similar in construction to the FA95e but offers a larger travel and larger load carrying capability in a

slightly larger envelope. Travel for the X and Y axes are selectable up to 160 millimeters.

The FA130e also accepts the ANT95-R rotary actuator and the ANT-20G goniometers, providing up to six axes of motion control.

| Mechanical Specifications | | | FA95e-25XY-25Z | FA95e-25XY-50Z | FA95e-50XY-25Z | FA95e-50XY-50Z |
|--|------------|------|--------------------------------------|-----------------|-----------------|-----------------|
| Number of Axes | | | 25 x 25 x 25 mm | 25 x 25 x 50 mm | 50 x 50 x 25 mm | 50 x 50 x 50 mm |
| Accuracy ⁽¹⁾ | XY | Std | ±2.5 µm | | | |
| | | Plus | ±250 nm | | | |
| | Z | Std | ±4 µm | | | |
| | | Plus | ±300 nm | | | |
| Resolution (Minimum Incremental Motion) ⁽¹⁾ | | | 2 nm | | | |
| Repeatability (Bidirectional) ⁽¹⁾ | | | ±100 nm | | | |
| Orthogonality | XY | Std | 10 arc-sec | | | |
| | | Plus | 3 arc-sec | | | |
| | Z to XY | Std | 10 arc-sec | | | |
| | | Plus | 10 arc-sec | | | |
| Maximum Speed ⁽²⁾ | | | 200 mm/s | | | |
| In-Position Stability ⁽²⁾ | | | <2 nm | | | |
| Maximum Force (Continuous) | XY | | 7.75 N | 7.75 N | 9.5 N | 9.5 N |
| | Z | | 7.75 N | 9.5 N | 7.75 N | 9.5 N |
| Load Capacity | | | 3.0 kg | 3.0 kg | 5.0 kg | 5.0 kg |
| Moving Mass | XY (Lower) | | 3.0 kg | 3.7 kg | 4.0 kg | 4.6 kg |
| | XY (Upper) | | 2.4 kg | 3.0 kg | 2.7 kg | 3.3 kg |
| | Z | | 0.46 kg | 0.46 kg | 0.52 kg | 0.52 kg |
| Stage Mass | | | 3.7 kg | 4.3 kg | 5.1 kg | 5.7 kg |
| Material | | | Aluminum body, Black Hardcoat Finish | | | |
| MTBF (Mean Time Between Failure) | | | 20,000 hrs | | | |

Notes:

- Values listed are per axis.
- Requires the selection of an appropriate amplifier with sufficient voltage and current.
- In-position stability listing is 3 sigma value.
- Z-axis counterbalance air supply must be clean, dry, and filtered to 0.25 µm or better. Nitrogen at 99.9% purity is recommended. Supply pressure is determined by the amount of payload to the stage.
- PLUS requires the use of an Aerotech controller.

| Electrical Specifications | FA95e-XY-Z |
|---------------------------|-----------------------------|
| Drive System | Brushless Linear Servomotor |
| Feedback | Noncontact Linear Encoder |
| Maximum Bus Voltage | ±40 VDC |
| Limit Switches | 5 V, Normally-closed |
| Home Switch | Near center of travel |

Note: To ensure the achievement and repeatability of specifications over an extended period of time, environmental temperature must be controlled to within 0.25°C/24 hours. If this is not possible, alternate products are available. Please consult Aerotech.

FA130e Series SPECIFICATIONS

| Mechanical Specifications | | | FA130e-60XY-35Z | FA130e-60XY-60Z | FA130e-110XY-35Z | FA130e-110XY-60Z |
|--|------------|------|--------------------------------------|-----------------|-------------------|-------------------|
| Number of Axes | | | 60 x 60 x 35 mm | 60 x 60 x 60 mm | 110 x 110 x 35 mm | 110 x 110 x 60 mm |
| Accuracy ⁽¹⁾ | XY | Std | ±2.5 µm | ±2.5 µm | ±4.0 µm | ±4.0 µm |
| | | Plus | ±250 nm | ±250 nm | ±300 nm | ±300 nm |
| | Z | Std | ±3 µm | | | |
| | | Plus | ±300 nm | | | |
| Resolution (Minimum Incremental Motion) ⁽¹⁾ | | | 2 nm | | | |
| Repeatability (Bidirectional) ⁽¹⁾ | | | ±100 nm | | | |
| Orthogonality | XY | Std | 10 arc-sec | | | |
| | | Plus | 3 arc-sec | | | |
| | Z to XY | Std | 10 arc-sec | | | |
| | | Plus | 10 arc-sec | | | |
| Maximum Speed ⁽²⁾ | | | 200 mm/s | | | |
| In-Position Stability ⁽³⁾ | | | <2 nm | | | |
| Maximum Force (Continuous) | XY | | 23 N | | | |
| | Z | | 23 N | | | |
| Load Capacity | | | 8.0 kg | | | |
| Moving Mass | XY (Lower) | | 8.5 kg | 9.4 kg | 10.0 kg | 10.9 kg |
| | XY (Upper) | | 5.8 kg | 6.7 kg | 6.4 kg | 7.3 kg |
| | Z | | 1.2 kg | 1.4 kg | 1.2 kg | 1.4 kg |
| Stage Mass | | | 9.8 kg | 10.7 kg | 11.7 kg | 12.6 kg |
| Material | | | Aluminum body, Black Hardcoat Finish | | | |
| MTBF (Mean Time Between Failure) | | | 20,000 hrs | | | |

Notes:

- Values listed are per axis.
- Requires the selection of an appropriate amplifier with sufficient voltage and current.
- In-position stability listing is 3 sigma value.
- Z-axis counterbalance air supply must be clean, dry, and filtered to 0.25 µm or better. Nitrogen at 99.9% purity is recommended. Supply pressure is determined by the amount of payload to the stage.
- PLUS requires the use of an Aerotech controller.

| Electrical Specifications | FA130e-XY-Z |
|---------------------------|-----------------------------|
| Drive System | Brushless Linear Servomotor |
| Feedback | Noncontact Linear Encoder |
| Maximum Bus Voltage | ±40 VDC |
| Limit Switches | 5 V, Normally-closed |
| Home Switch | Near center of travel |

Note: To ensure the achievement and repeatability of specifications over an extended period of time, environmental temperature must be controlled to within 0.25°C/24 hours. If this is not possible, alternate products are available. Please consult Aerotech.

FA130e Series SPECIFICATIONS

| Mechanical Specifications | | | FA130e-160XY-35Z | FA130e-160XY-60Z |
|--|------------|------|--------------------------------------|-------------------|
| Number of Axes | | | 160 x 160 x 35 mm | 160 x 160 x 60 mm |
| Accuracy ⁽¹⁾ | XY | Std | ±5.0 µm | ±5.0 µm |
| | | Plus | ±300 nm | |
| | Z | Std | ±3 µm | |
| | | Plus | ±300 nm | |
| Resolution (Minimum Incremental Motion) ⁽¹⁾ | | | 2 nm | |
| Repeatability (Bidirectional) ⁽¹⁾ | | | ±100 nm | |
| Orthogonality | XY | Std | 10 arc-sec | |
| | | Plus | 3 arc-sec | |
| | Z to XY | Std | 10 arc-sec | |
| | | Plus | 10 arc-sec | |
| Maximum Speed ⁽²⁾ | | | 200 mm/s | |
| In-Position Stability ⁽³⁾ | | | <2 nm | |
| Maximum Force (Continuous) | XY | | 23 N | |
| | Z | | 23 N | |
| Load Capacity | | | 8.0 kg | |
| Moving Mass | XY (Lower) | | 11.2 kg | 12.1 kg |
| | XY (Upper) | | 6.7 kg | 7.6 kg |
| | Z | | 1.2 kg | 1.4 kg |
| Stage Mass | | | 13.2 kg | 14.1 kg |
| Material | | | Aluminum body, Black Hardcoat Finish | |
| MTBF (Mean Time Between Failure) | | | 20,000 hrs | |

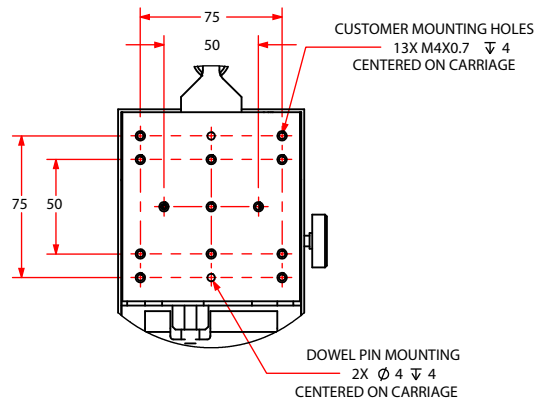
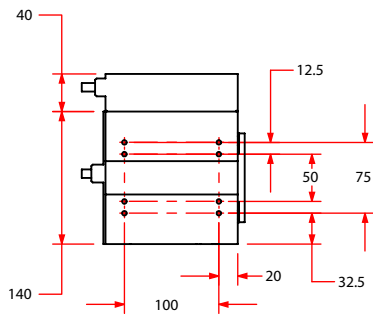
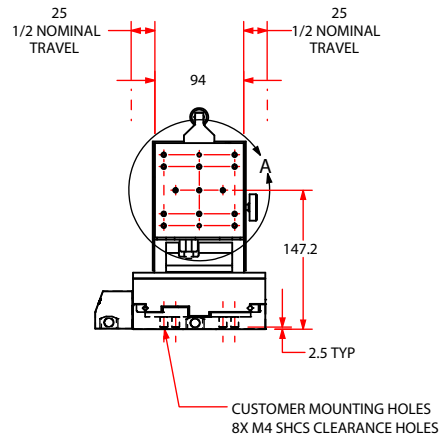
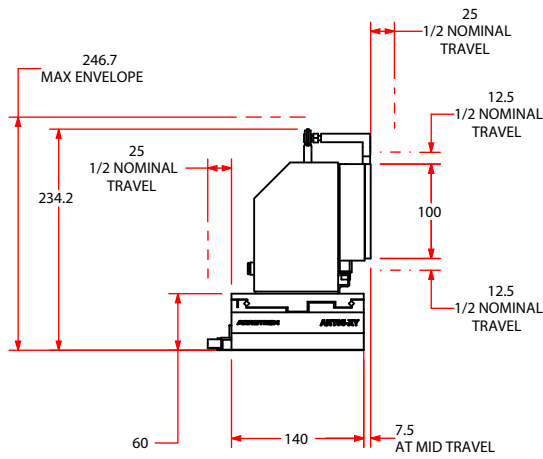
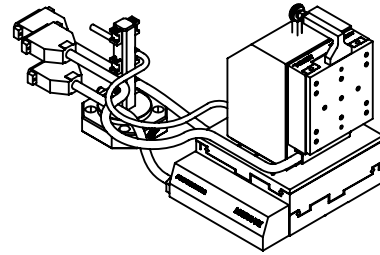
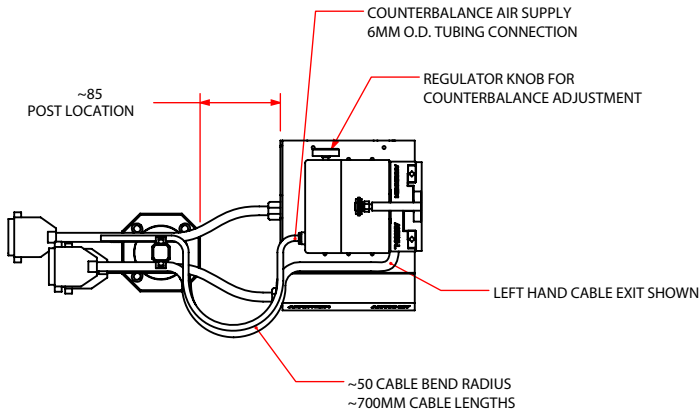
Notes:

1. Values listed are per axis.
2. Requires the selection of an appropriate amplifier with sufficient voltage and current.
3. In-position stability listing is 3 sigma value.
4. Z-axis counterbalance air supply must be clean, dry, and filtered to 0.25 µm or better. Nitrogen at 99.9% purity is recommended. Supply pressure is determined by the amount of payload to the stage.
5. -PLUS requires the use of an Aerotech controller.

Note: To ensure the achievement and repeatability of specifications over an extended period of time, environmental temperature must be controlled to within 0.25°C/24 hours. If this is not possible, alternate products are available. Please consult Aerotech.

FA95e Series DIMENSIONS

FA95e



DETAIL A
SCALE 1 : 4

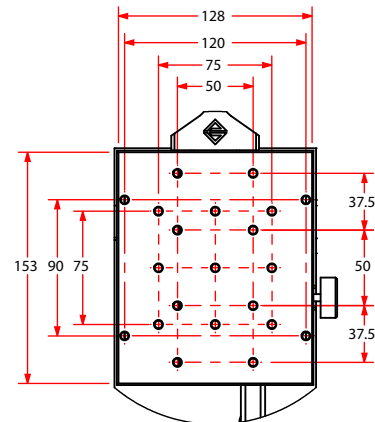
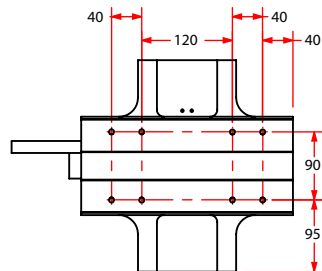
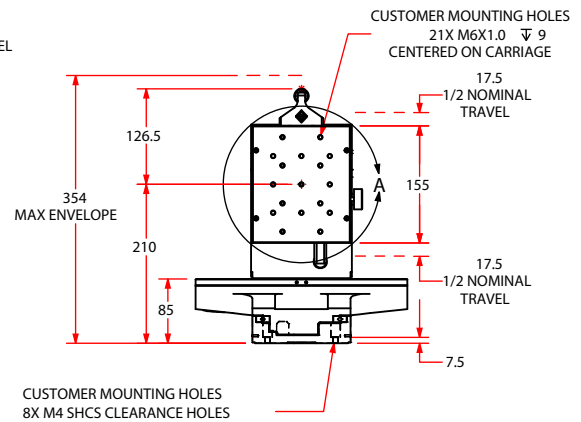
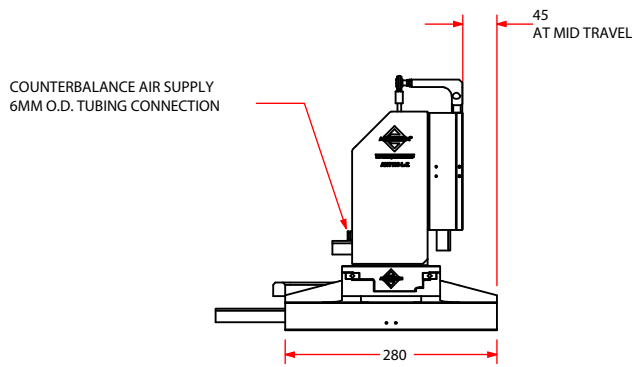
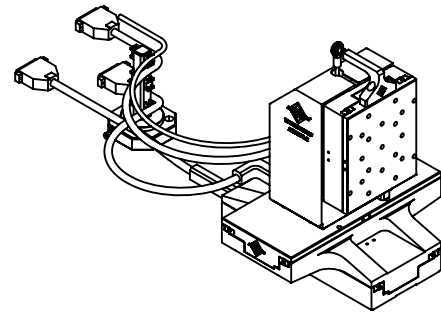
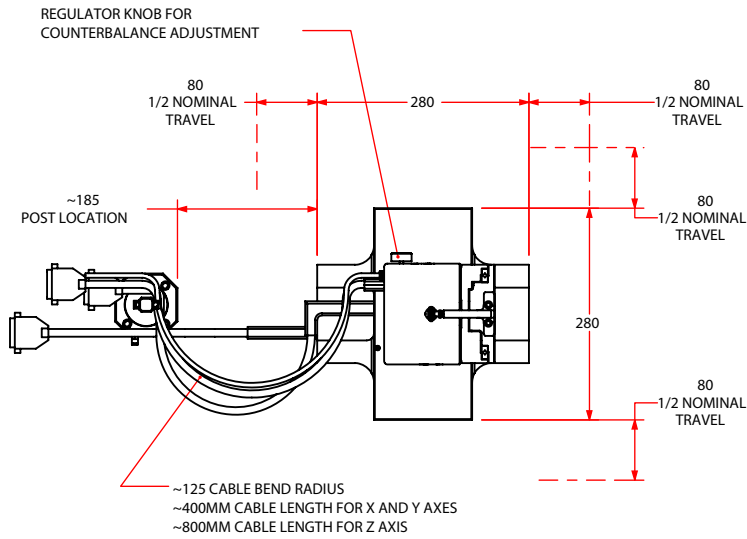
DIMENSIONS: MILLIMETERS

FA95e-50XY-25Z SHOWN

OTHER TRAVELS AVAILABLE. SEE SPECIFICATIONS AND ORDERING INFORMATION.

FA130e Series DIMENSIONS

FA130e



DIMENSIONS: MILLIMETERS

DETAIL A
SCALE 1 : 5

FA130e-160XY-35Z SHOWN

OTHER TRAVELS AVAILABLE. SEE SPECIFICATIONS AND ORDERING INFORMATION.

FA95e Series ORDERING INFORMATION

Ordering Example

| FA95e | -25XY | -25Z | -RH | -T | -A | -PLUS |
|--------|----------------|--------|-------------------|----------------------|------------------|----------------|
| Series | XY Axis | Z Axis | Z-Axis Cable Exit | Optional Rotary Axes | Axis Orientation | Accuracy Grade |
| FA95e | -25XY -50XY | -25Z | -RH -LH | -T -P -R | -A -B -C | -PLUS |

FA95e Direct-Drive, Multi-Axis Photonics Alignment System

FA95e Proprietary direct-drive motor technology, linear-encoder-based fiber translator; XYZ axes aligned to 10 arc-sec orthogonal

XY Axis

-25XY 25 mm x 25 mm XY travel
 -50XY 50 mm x 50 mm XY travel

Z Axis

-25Z 25 mm Z travel

Z-Axis Cable Exit

-RH Z-axis right-hand cable exit
 -LH Z-axis left-hand cable exit

Optional rotary axes

The axis orientation is X,Y,Z working from the bottom to the top axis. X is bottom axis, Y is middle axis, and Z is the top (vertical) axis.

-T Single rotary-axis oriented as yaw; rotation about Y-axis (ANT95-20-R)
 -P Single goniometer rotary-axis oriented as pitch; rotation about Y-axis (ANT-20G)
 -R Single goniometer rotary-axis oriented as roll; rotation about X-axis (ANT-20G)

Note: Other axis combinations available upon request.

Axis Orientation

The letters in the axis orientation correspond to the standard XYZ configurations detailed in Aerotech's multi-axis assembly specification. The letter indicates the orientation of the vertical axis (Z) relative to the bottom axis (X).

-A XY cable exits in the rear; vertical axis tabletop parallel to middle-axis (Y) facing to the front
 -B XY cable exits in the rear; vertical axis tabletop parallel to bottom-axis (X) facing to the left
 -C XY cable exits in the rear; vertical axis tabletop parallel to bottom-axis (X) facing to the right

Optional Accuracy Grade

-PLUS High-accuracy version

FA130e Series ORDERING INFORMATION

Ordering Example

| FA130e | -60XY | -35Z | -T | -A | -PLUS |
|--------|---------------------------|--------------|----------------------|------------------|----------------|
| Series | XY Axis | Z Axis | Optional Rotary Axes | Axis Orientation | Accuracy Grade |
| FA130e | -60XY -110XY -160XY | -35Z -60Z | -T -P -R | -A -B -C | -PLUS |

FA130e Direct-Drive, Multi-Axis Photonics Alignment System

FA130e Proprietary direct-drive motor technology, linear-encoder-based fiber translator; XYZ axes aligned to 10 arc-sec orthogonal

XY Axis

| | |
|--------|---------------------------|
| -60XY | 60 mm x 60 mm XY travel |
| -110XY | 110 mm x 100 mm XY travel |
| -160XY | 160 mm x 160 mm XY travel |

Z Axis

| | |
|------|----------------|
| -35Z | 35 mm Z travel |
| -60Z | 60 mm Z travel |

Optional Rotary Axes

The axis orientation is X,Y,Z working from the bottom to the top axis. X is bottom axis, Y is middle axis, and Z is the top (vertical) axis.

| | |
|----|--|
| -T | Single rotary-axis oriented as yaw; rotation about Y-axis (ANT95-20-R) |
| -P | Single goniometer rotary-axis oriented as pitch; rotation about Y-axis (ANT-20G) |
| -R | Single goniometer rotary-axis oriented as roll; rotation about X-axis (ANT-20G) |

Note: Other axis combinations available upon request.

Axis Orientation

The letters in the axis orientation correspond to the standard XYZ configurations detailed in Aerotech's multi-axis assembly specification. The letter indicates the orientation of the vertical axis (Z) relative to the bottom axis (X).

| | |
|----|--|
| -A | XY cable exits in the rear; vertical axis tabletop parallel to middle-axis (Y) facing to the front |
| -B | XY cable exits in the rear; vertical axis tabletop parallel to bottom-axis (X) facing to the left |
| -C | XY cable exits in the rear; vertical axis tabletop parallel to bottom-axis (X) facing to the right |

Optional Accuracy Grade

| | |
|-------|-----------------------|
| -PLUS | High-accuracy version |
|-------|-----------------------|