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[3]			<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:
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.

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

Recommended Controller		FA95e-XY-Z
Multi-Axis	A3200	Npaq-MXR Npaq-MR-MXR NDrive ML-MXH
	Ensemble	Epaq-MXH Epaq-MR-MXH Ensemble ML-MXH
Single Axis	Soloist	Soloist ML-MXH

Notes:
1. Linear amplifiers are required to achieve the listed specifications. Other options are available.

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:
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.

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.

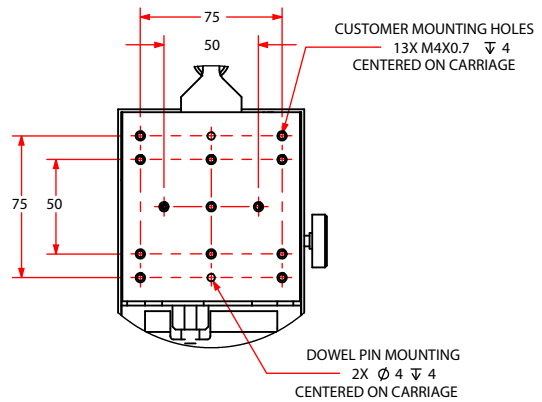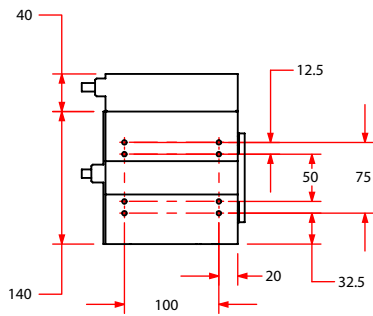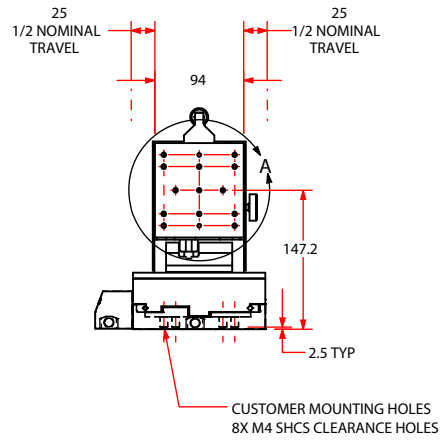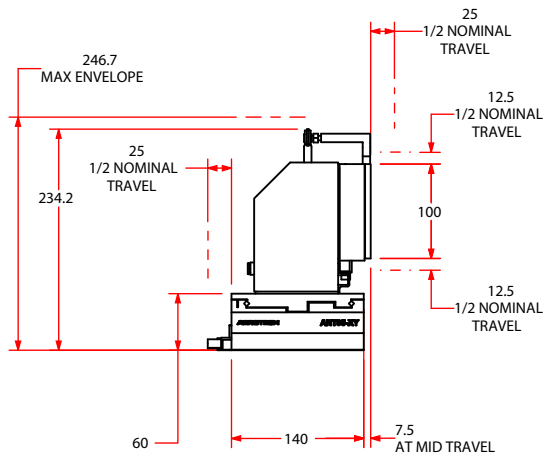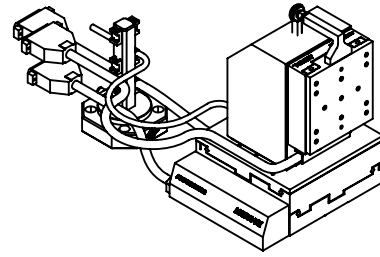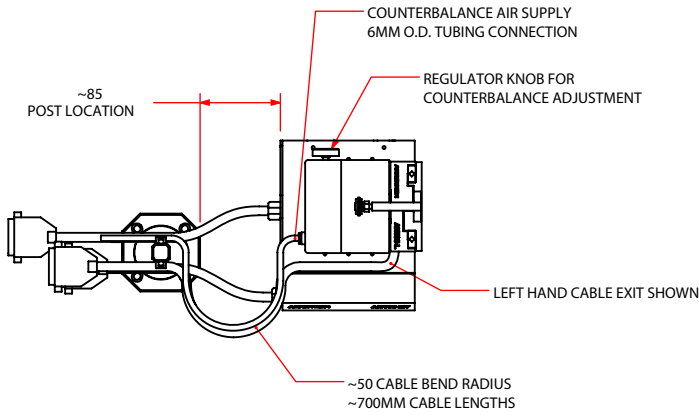| Recommended Controller		FA130e-XY-Z
Multi-Axis	A3200	Npaq-MXR Npaq-MR-MXR NDrive ML-MXH
	Ensemble	Epaq-MXH Epaq-MR-MXH Ensemble ML-MXH
Single Axis	Soloist	Soloist ML-MXH

Notes:
1. Linear amplifiers are required to achieve the listed specifications. Other options are available.

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.
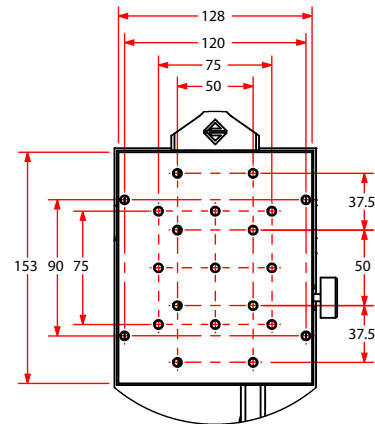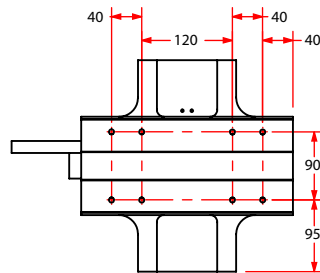
FA95e Series DIMENSIONS

FA95e

COUNTERBALANCE AIR SUPPLY
6MM O.D. TUBING CONNECTION

REGULATOR KNOB FOR
COUNTERBALANCE ADJUSTMENT

~85
POST LOCATION

LEFT HAND CABLE EXIT SHOWN

~50 CABLE BEND RADIUS
~700MM CABLE LENGTHS

25
1/2 NOMINAL
TRAVEL

12.5
1/2 NOMINAL
TRAVEL

246.7
MAX ENVELOPE

25
1/2 NOMINAL
TRAVEL

234.2

100

12.5
1/2 NOMINAL
TRAVEL

60

140

7.5
AT MID TRAVEL

25
1/2 NOMINAL
TRAVEL

25
1/2 NOMINAL
TRAVEL

94

147.2

2.5 TYP

CUSTOMER MOUNTING HOLES
8X M4 SHCS CLEARANCE HOLES

40

12.5

50   75

20

32.5

140

100

75

50

CUSTOMER MOUNTING HOLES
13X M4X0.7 ▽ 4
CENTERED ON CARRIAGE

75   50

DOWEL PIN MOUNTING
2X ⌀ 4 ▽ 4
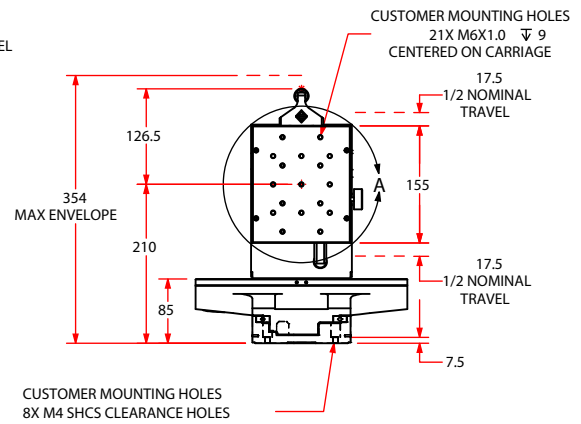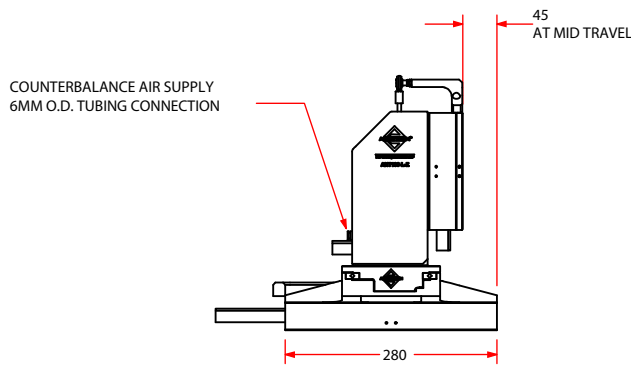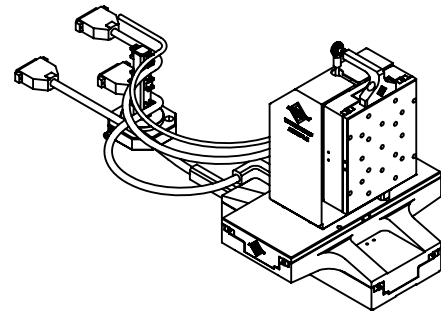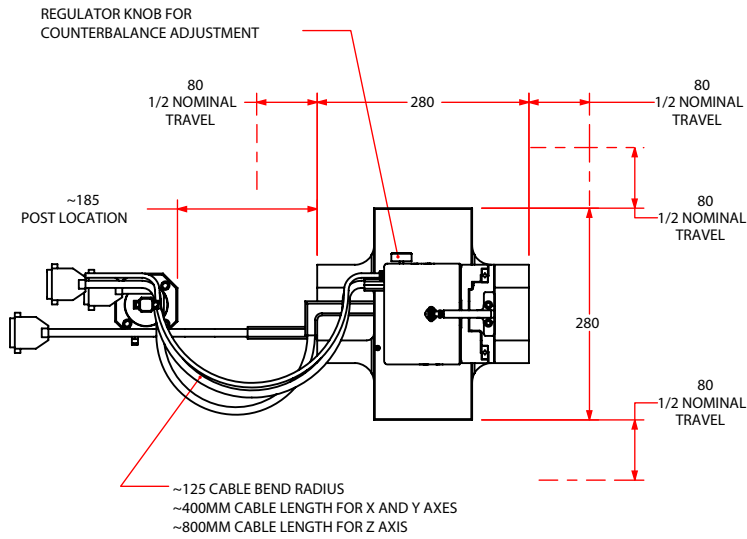CENTERED ON CARRIAGE

DETAIL A
SCALE 1 : 4

DIMENSIONS: MILLIMETERS

FA95e-50XY-25Z SHOWN
OTHER TRAVELS AVAILABLE. SEE SPECIFICATIONS AND ORDERING INFORMATION.

FA130e Series DIMENSIONS

FA130e

REGULATOR KNOB FOR
COUNTERBALANCE ADJUSTMENT

80
1/2 NOMINAL
TRAVEL

280

80
1/2 NOMINAL
TRAVEL

80
1/2 NOMINAL
TRAVEL

~185
POST LOCATION

280

80
1/2 NOMINAL
TRAVEL

~125 CABLE BEND RADIUS
~400MM CABLE LENGTH FOR X AND Y AXES
~800MM CABLE LENGTH FOR Z AXIS

45
AT MID TRAVEL

COUNTERBALANCE AIR SUPPLY
6MM O.D. TUBING CONNECTION

CUSTOMER MOUNTING HOLES
21X M6X1.0 ⤓ 9
CENTERED ON CARRIAGE

17.5
1/2 NOMINAL
TRAVEL

126.5

354
MAX ENVELOPE

155

210

A

85

17.5
1/2 NOMINAL
TRAVEL

280

7.5

CUSTOMER MOUNTING HOLES
8X M4 SHCS CLEARANCE HOLES

40

40

120

40

90

95

128

120

75

50

153 90 75

37.5

50

37.5

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

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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