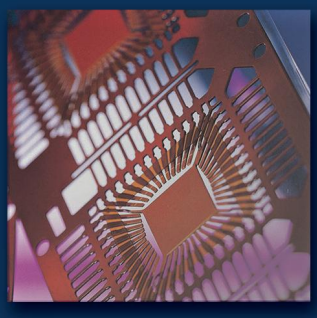
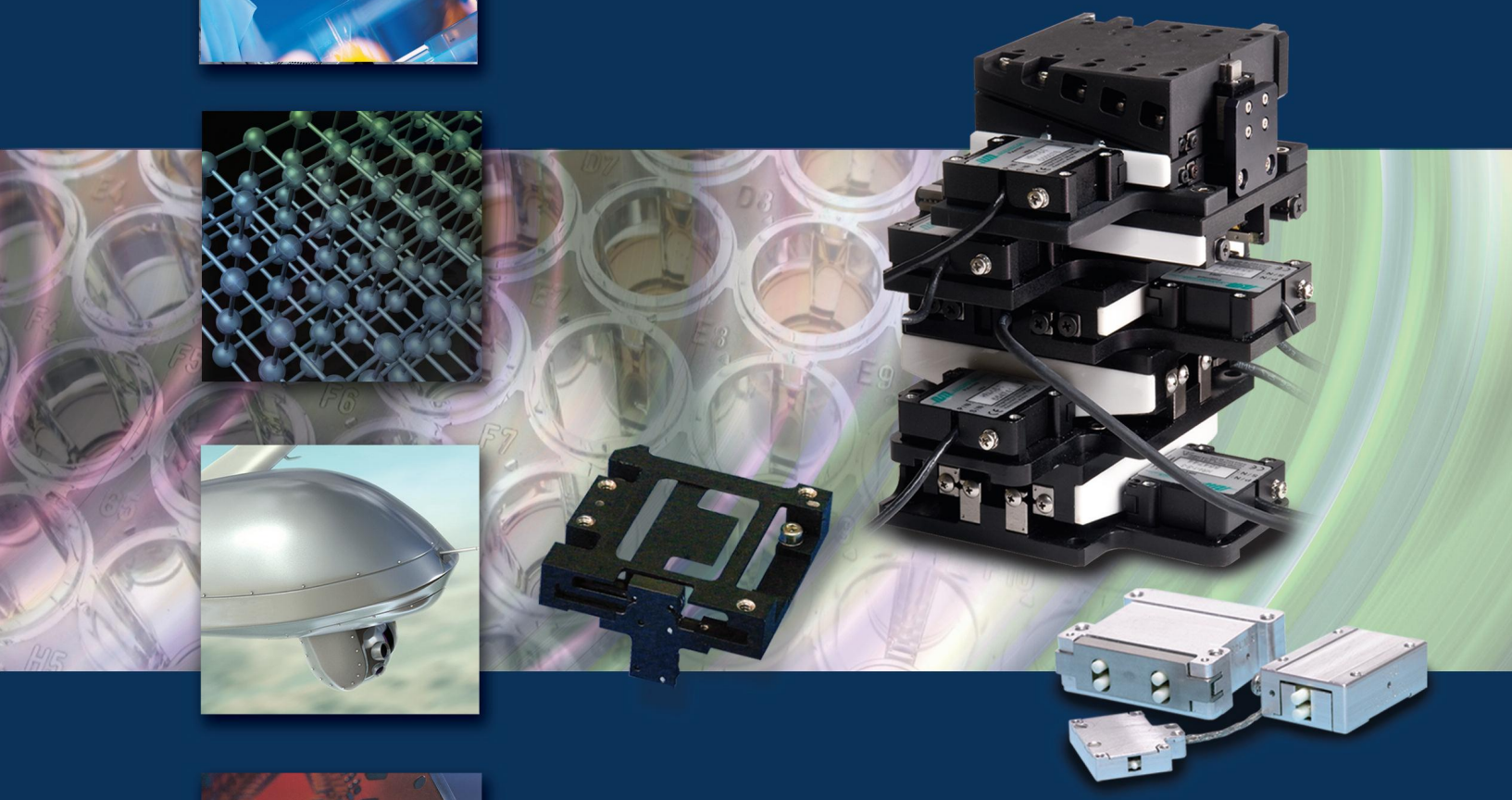
NANOMOTION

A Johnson Electric Company





超声波压电陶瓷电机
运动控制解决方案

苏州钧信自动控制有限公司

Suzhou Servo Dynamics Co.,Ltd

苏州钧信产品系列

ACS
总线控制器

OMRON
驱控一体机

YASKAWA
MP总线控制

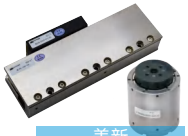
高创
驱动器

控制系统

ABB
伺服电机

TRINAMIC
驱动模块

MAXON
直流电机



美新
直线电机

YASKAWA
伺服电机

COPLEY
驱动器

SMAC
音圈电机

PHYTRON
真空电机

NANOMOTION
超声波压电陶瓷电机

电机驱动

THK
导轨丝杆

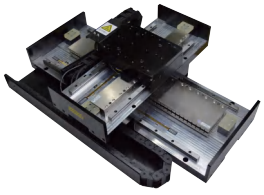
HARMONIC
谐波减速机

APEX
行星减速机

赛劲
齿轮齿条

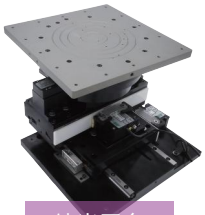
机械传动

Motion Control
Solution
精密运动 系统集成



双轴平台

龙门双驱



纳米平台

气浮平台

精密机台

RENISHAW
雷尼绍光栅尺

RENISHAW
比对仪

RENISHAW
激光干涉仪

智能相机

反馈测量

Based on the principles of ultrasonic standing waves in piezoelectricity, Nanomotion introduces its most advanced series of electronic motors, operating similarly to DC servo motors with the high resolution and dynamic performance of piezo actuators.

Nanomotion... *A Breakthrough Technology*

By pressing the ceramic finger tip against a ceramic strip a driving force is exerted on a linear or rotary stage, creating motion.

The simultaneous excitation of the longitudinal extension and transverse bending modes creates two dimensional acoustic waves resulting in a small elliptical path at the finger tip.

When the driving voltage is not applied, the compression of the finger tip to the ceramic maintains holding torque on the motion device. Unlike other braking devices, there is no position shift or hysteresis in the Nanomotion motor.

As the leading manufacturer of piezo-electric motors for precision motion control applications, Nanomotion's product line ranges from single element motors for actuation, to larger motors for driving typical stages.Nanomotion motors operate with no intrinsic magnetic fields and no moving parts. The motors provide unlimited travel in a compact package, with the ability to achieve unmatched precision for linear or rotary motion.

Nanomotion's motors have been successfully applied in diverse applications, from using our standard housed motors for motion control positioning in industrial automation to simply applying a piezoelectric element embedded in consumer products. Regardless of the packaging, Nanomotion brings a unique drive solution to any motion requirement.

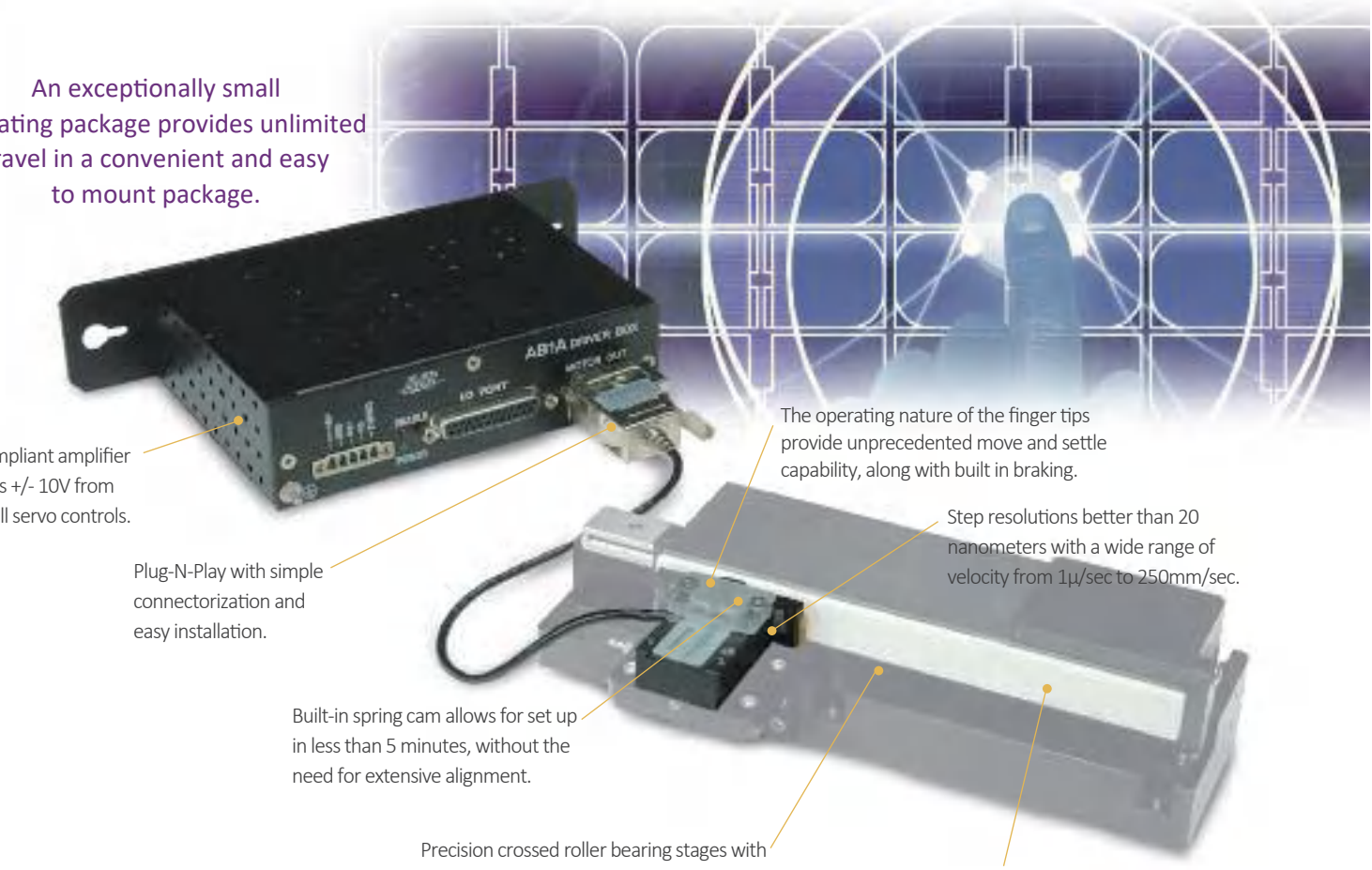
Nanomotion's unique motor & stage technology makes it well suited to applications in:

Medical Instruments and Devices:
Microscopy
Chromatography
Analytical Instrumentation
Focus Modules for Endoscopes
Efficient Pump Drives

Security:
Shutter and Aperture Control
Auto Focus Mechanisms
Image Stabilization

Semiconductor:
Photo Lithography Process
Wafer Inspection
Thin Film Measurement Tools
Scanning Electron & Ion Beam Microscopes
Atomic Force Microscopes

An exceptionally small operating package provides unlimited travel in a convenient and easy to mount package.



CE Compliant amplifier accepts +/- 10V from most all servo controls.

Plug-N-Play with simple connectorization and easy installation.

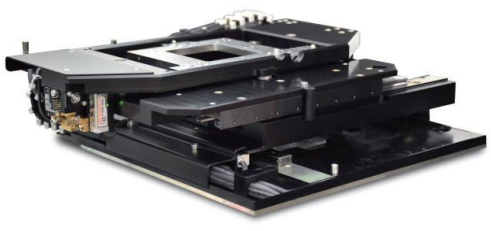
The operating nature of the finger tips provide unprecedented move and settle capability, along with built in braking.

Step resolutions better than 20 nanometers with a wide range of velocity from 1µ/sec to 250mm/sec.

Built-in spring cam allows for set up in less than 5 minutes, without the need for extensive alignment.

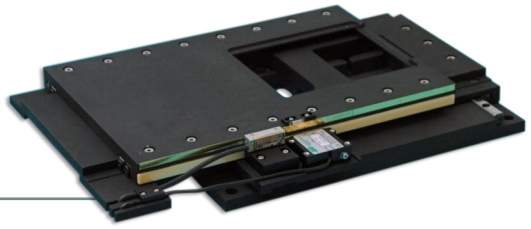
Precision crossed roller bearing stages with integral linear encoders provide a wide range of travel and performance levels.

Alumina running surface mounts to most standard slide mechanisms and is easily applied with double sided tape.



Nanomotion motors and FB stages are available in a wide range of configurations and are compatible with all standard servo controls.

Nanomotion Motors, Stages and Modules For The BioMedical Markets



Medical Instruments & Device Applications

Microscope and Chromatograph applications benefit greatly from the size and motion performance that Nanomotion systems offer. Compact, open frame stages provide for thru-stage light transmission with the ability to incorporate a back light.

The ability to manage a variable amount of slides improves throughput and handling. Stages with positioning resolution from 10nm to 100nm offer rapid move and settle capability beyond that of conventional drives. Imaging on-the-fly applications benefit from the ability to achieve exceptional velocity control at different speeds.

Non-magnetic Motors:

- MRI Applications

Standard Motors:

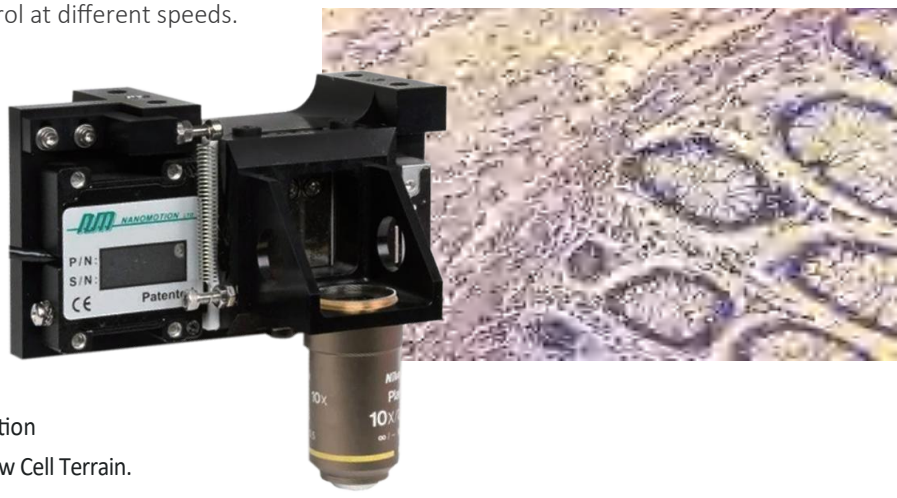
- Microscope Stages
- Auto Focus Axes
- High Throughput Screening
- Clean Room Assembly Applications

Standard Motors:

- Laser & Mass Spectrometer Applications

Precision Stages for Bio and Pharma Markets:

- Linear Stages for Auto Focus In Cell Analysis
- Linear and Rotary Stages for Sample Manipulation



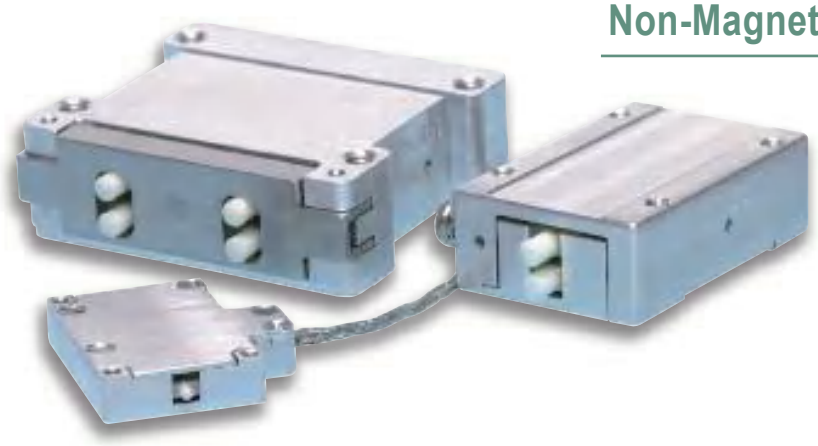
Z Axis Auto Focus stages optimize the ability for rapid step-repeat operation for maintaining focus to follow Cell Terrain.

Proteomics and Drug Development

High speed multi-axis systems use Nanomotion ceramic servo motors to provide the utmost in speed and performance, while maintaining an exceptionally small machine footprint.

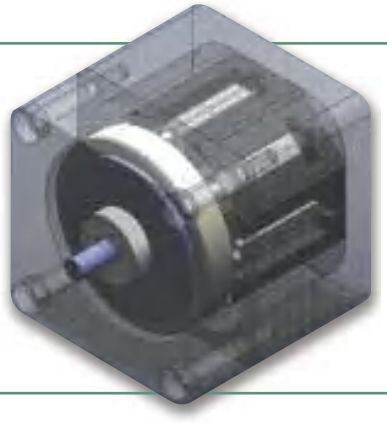
Whether controlling the position of the dispensing head or actuating a series of syringes, Nanomotion provides compact, light weight motors that can operate in a lab environment.

Non-Magnetic Motors for MRI



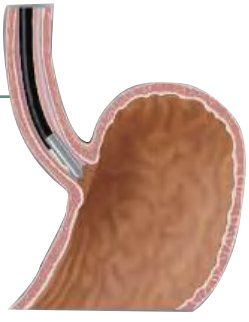
Nanomotion's – N motors are suitable to operation in a 1.5T to 3T MRI environment. These motors have no magnetic materials and no intrinsic magnetic field. Non-magnetic motors are supported by MRI compatible amplifiers that can be tuned to specific MRI frequencies to eliminate artifacts during imaging. MRI robots & manipulators use –N motors to position while the MRI is on, yielding high static holding and no power consumption at rest.

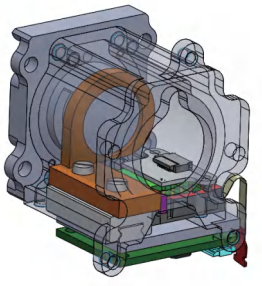
Nanomotion has configured 'traditional' rotary motors, based on its ultrasonic piezo technology to offer a common mounting, with motor shaft. These motors, ranging from 15mm OD to 70mm OD can be configured for a wide range of speed and torque requirements in standard and non-magnetic configurations.



Modules

Miniature modules, utilizing Nanomotion's Edge motor and ASIC building blocks are ideally suited to auto focus devices adapted to endoscopes and a wide variety of surgical tools. Low voltage motors can provide motion at the tip of an endoscope, functioning in a 3.6mm diameter, to provide exceptional image quality as well as tool manipulation.





Nanomotion Motors and Modules For The Security Markets

Standard Motors:

- Shutter & Aperture Control
- Auto Focus & Zoom
- Optical Image Stabilization

Modules:

- Edge Actuator
- NUC Shutters
- Pan & Tilt Gimbals

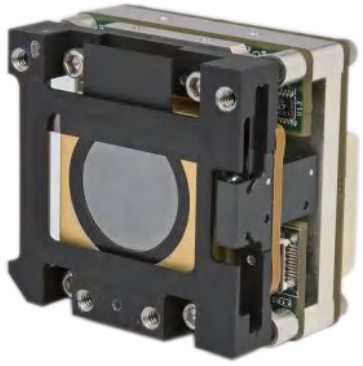
Test Data for Security Market:

- Wide Operating Temperature -40˚C to 70˚C
- Thermal Shock Test Data
- Operation Under Vibration
- Impact Shock Testing

Shutter & Aperture Control

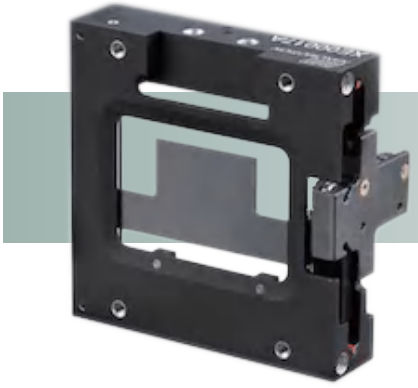
Nanomotion's low voltage motors are particularly well suited flight and battery operated devices in the Security Markets. Non-Uniformity Correction (NUC) Shutters and Variable Apertures benefit from the Edge motor, weighing 0.55g and supported by an ASIC that can operate at wide temperature ranges.

Low voltage motors are supported by a 5mm square ASIC that serves as a dual axis motor drive and control. The ASIC can be configured into a custom electronics to meet specific application requirements.



Nanomotion's high speed shutters can operate open loop, between limit switches or closed loop with a miniature position sensor. Shutters are configured with a total weight of less than 10g and a moving mass of 1.5g,with move times at 100msec or less.

Nanomotion's low voltage motors are ideal for flight and battery operated devices.



Optical Image Stabilization

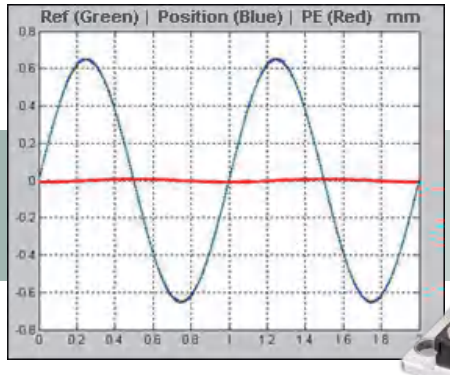
Pan and tilt mechanisms for camera control and image stabilization in cameras, binoculars and other optical devices benefit from rapid response of Nanomotion's ultrasonic standing wave motor technology.

Stabilizing a binocular can be achieved with a small pan and tilt mechanism that moves a roof prism inside an eye piece.

The Nanomotion advantage is in the ability to miniaturize such a device with exceptional low mass and stabilize both high frequency/low amplitude and low frequency/high amplitude motions.

Image stabilization in camera can be achieved by shifting the image sensor in two axes, based on the input of a gyro. This allows for small rapid movements to stabilize image acquisition in a camera.

Shown to the right, the stabilization of the red line, with a disturbance of 2Hz, at an amplitude of 0.65mm.



Nanomotion Motors and FB Stages For The Semiconductor Market

Standard Motors:

- Clean Room Applications

Vacuum and Non-Magnetic Motors

- E-Beam and Ion Beam Applications

Vacuum Compatible Motors:

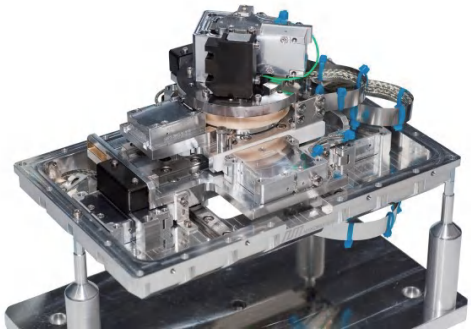
- High Vacuum and UHV Applications

Standard and Vacuum Compatible FB Stages:

- Precision Linear and Rotary Stages for Clean Room and Vacuum Environments
- Custom Stage Designs for Open Frame and Small Footprints
- Well-suited To Use in E-Beam and Ion Beam Chambers

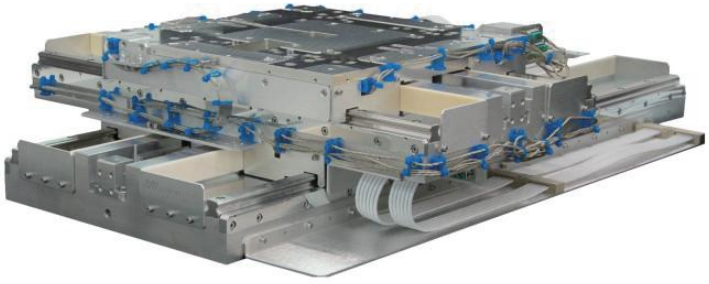
XYZT UHV Stage for Laser / Ion Beam Micromachining of Semicon Devices

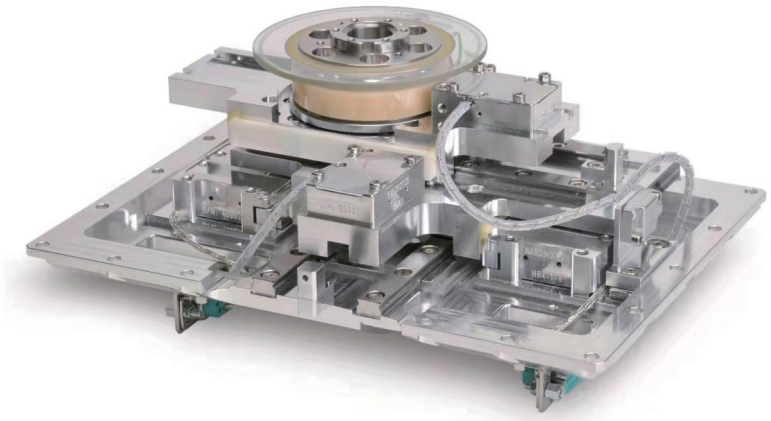
This 4 axis motion system provides X/Y/Z and Theta motion for laser or Ion Beam machining of semiconductor chips or MEMs devices.The stage construction is UHV compatible to 10-10 Torr and has non-magnetic motors.



Each linear axis uses 50nm resolution linear encoders and the theta axis positions to 1 arc second. This stage can operate up to 200mm/sec.

Nanomotion manufactures a wide variety of vacuum and UHV motors for Semiconductor applications. Our vacuum motors,for environments up to 10-7 Torr are also available in non-magnetic configurations. These motors have no magnetic materials and no intrinsic magnetic field, and are ideal for E-Beam and Ion Beam applications, where magnetic motion can disturb the direction of the beam. Nanomotion's UHV motors are inherently non-magnetic and compatible to 10-10 Torr.





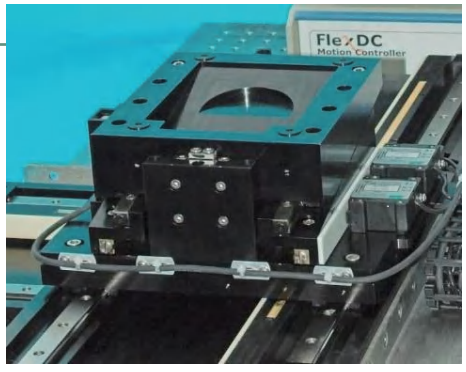
High Vacuum Multi Axis Stage

An XY-Theta stage providing 55mm travel in X and Y at 20nm resolution and a continuous rotary axis operating at 3 arc second resolution provides high performance motion and position stability in Ion beam microscopy.

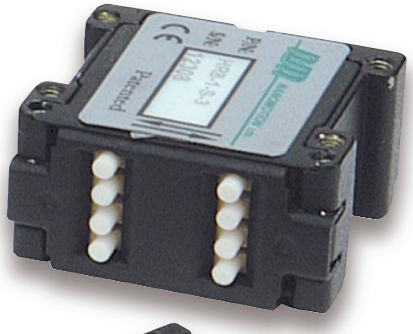
Wafer Metrology Stage

XYZ stage provides travel to position 300mm wafers for inspection process. The XY stage provides travel of 360mm x 480mm with a vertical Z Wedge stage providing up to 25mm travel. Z stage can support a wafer chuck and position sample relative to the process tool. Stages can operate from 10nm to 100nm position resolution.

Wafer Metrology Stage providing Z-XY-Theta motion. A 25mm Z Wedge stage carries XY and Theta for small area inspection of semiconductor materials. Stages can operate from 10nm to 100nm position resolution.



Nanomootion's HR Series motors range in size from a single element(providing 0.4kg of force) to an eight element motor(providing 3.2kg of force). The HR series is capable of driving both linear and rotary stages. The HR series motors have a wide dynamic range of speed， from several microns per second to 250mm/sec and can easily mount to traditional low friction stages or other devices. The unique operating characteristics of the HR Series motors provide inherent braking and the ability to eliminate servo dither when in a static position.



CE Approved

Features

- Unlimited travel
- Wide dynamic velocity range- from 1µ/sec to 250mm/sec
- Excellent move & settle
- Step resolutions to 10nm
- No intrinsic magnetic field
- No external magnetic field sensitivity(for non-magnetic version)
- Vacuum versions available

Motor Performance Specifications

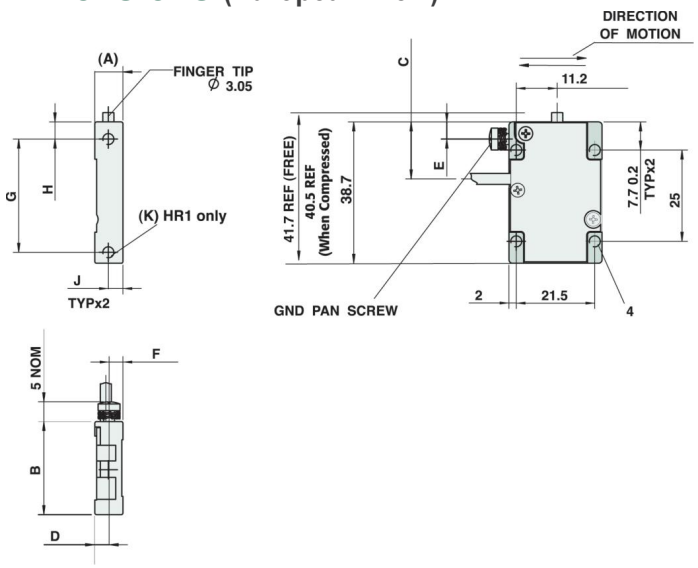
	max velocity (mm/sec)	dynamic stall force (N)	static hold force (N)	static stiffness (N/µ)	preload on stage (N)	Kf force constant (N/volt commanded)
HR1	**250**	**4**	**3.5**	**1**	**18**	**0.75**
HR2	**250**	**8**	**7**	**1.8**	**36**	**1.5**
HR4	**250**	**16**	**14**	**2.8**	**72**	**3**
HR8	**250**	**32**	**28**	**3.5**	**144**	**6**

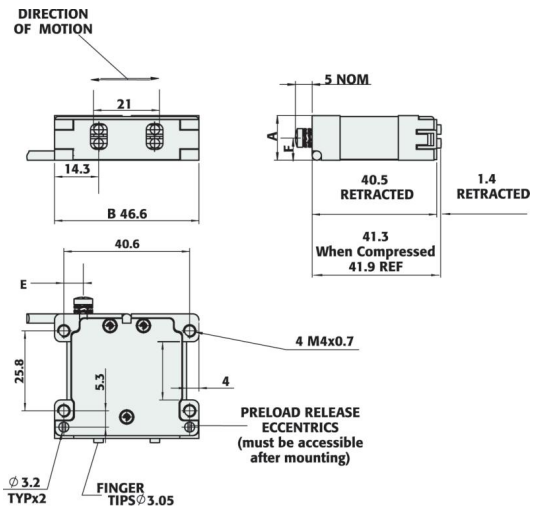
Note: All motor performance data is based on using Nanomotion ceramic motors and amplifiers.
All dimensions in mm

Environmental

Operating Temperature:	0 to 50˚C
Storage:	-20˚C to +70˚C
Humidity:	0 to 80%,non condensing
-V Vacuum Motors:	to 10-7 torr after bake out
-U Ultra-high Vacuum Motors:	to 10-10 torr after bake out
Max Bake Out Temperature:	120˚C for -V motors,140˚C for -U motors

Dimensions (European View)





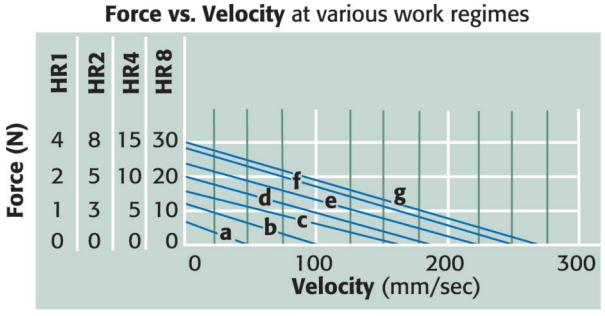
	A motor height	B motor width	C cable exit	D	E gnd screw	F gnd screw	G side mtg	H side mtg	J side mtg	K screw type	motor weight (grams)
HR1-1-S	8	25.7	15.6	4.7	4.7	3.8	31	4.7	4	M3x0.5	30
HR1-1-V	8	25.7	15.6	4.7	4.7	3.8	31	4.7	4	M3x0.5	20
HR1-1-U	7.7	25.5	NA	NA	4	4	NA	NA	NA	NA	20
HR2-1-S	12.7	25.7	15.6	9.7	4.7	6	NA	NA	NA	NA	60
HR2-1-V	12.7	25.7	15.6	9.7	4.7	6	NA	NA	NA	NA	40
HR2-1-U	12.7	25.5	NA	NA	4	6	NA	NA	NA	NA	40
							Terminal Mtg for U motors				
HR4-1-S	14.4	46.6	Bottom Back	9.3	7.2	NA	NA	NA	NA	73	
HR4-1-V	14.4	46.6	Left or Right	9.3	7.2	NA	NA	NA	NA	73	
HR4-1-U	14.9	46.6	NA	NA	NA	NA	NA	NA	6	NA	73
HR8-1-S	23.3	46.6	Bottom Back	9	12	NA	NA	NA	NA	170	
HR8-1-V	23.3	46.6	Left or Right	9	12	NA	NA	NA	NA	120	
HR8-1-U	23.8	46.6	NA	NA	NA	NA	NA	NA	12	NA	120

Note: All dimensions in mm
-S motors are Standard
-V motors are Vacuum Rated to 10-7 Torr(use VN for Vacuum & Non-Magnetic)
-U motors are Vacuum Rated to 10-10 Torr and are Non-Magnetic
-N motors are Non-Magnetic, for MRI environments

Envelope of Performance

curve	25℃ duty cycle	25℃ max.continuous operation time	50℃ duty cycle	50℃ max.continuous operation time	Vacuum duty cycle	Vacuum max.continuous operation time
a	100%	–	100%	–	100%	–
b	100%	–	100%	–	44%	184
c	100%	–	92%	137	26%	107
d	100%	–	62%	93	17%	72
e	78%	67 seconds	47%	70	13%	55
f	56%	67 seconds	33%	50	9%	39
g	50%	67 seconds	30%	45	8%	35

Force vs. Velocity at various work regimes



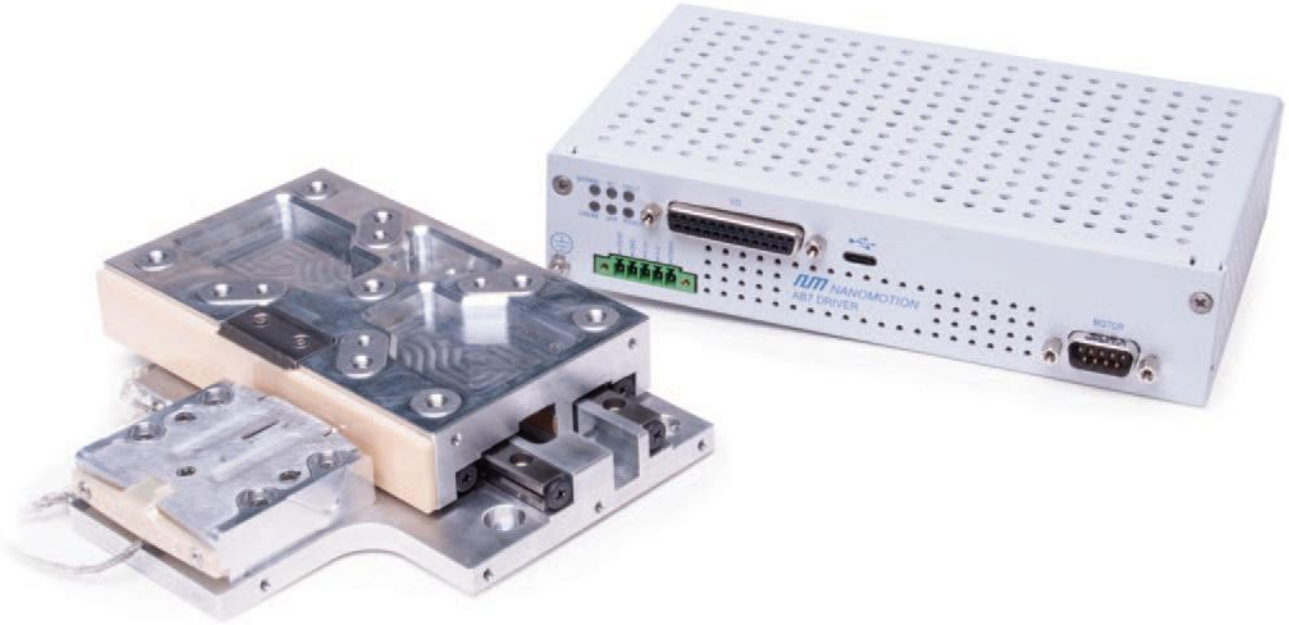
SE Motor

The SE motor family expands Nanomotion's motor product line, capable of addressing the nextgeneration of motion requirements in semiconductor, metrology, and microscopy applications. Based on a more efficient piezo core and enhanced motor structure, the SE motor doubles the velocity of conventional piezo motors, provides the same force, while consuming half the power. The SE motor design provides three times the stiffness, optimizing settling time, extending operating life and increasing duty cycles.

The SE motor product line utilizes a new motor material (higher efficiency) and structure to support applications with operation up to 500mm/sec. Additionally, the internal structure provides an increase in stiffness, in the direction of motion, that is 3 times greater than the HR motor generation. As a result, the motor is capable of significantly higher duty cycles in vacuum applications. Additionally, with higher stiffness, the settling time is much less, resulting in higher throughput and less wear.

Pan & Tilt Gimbals

- High stiffness and efficiency to support a significant increase in duty cycle and position stability
- Unlimited linear and rotary motion
- Wide dynamic velocity range
- Zero backlash and high stiffness
- Position stability with zero power consumption
- Silent operation
- Standard and vacuum versions
- Supports multiple motors for E16, E24, and E32 configurations



SE8-1-X-3

ORDERING INFORMATION

Part Numbers:

SE8-1-S-3 Standard Motor

SE8-1-V-3 Vacuum Motor

SE8-1-VN-3 Vac/Non-magnetic Motor

RELATED PRODUCTS

Part Number:

AB07-SE-EXX Driver for SE

XCD-SE-EXX Driver/Control Board

SE8 Motor

Application Recommendations

The SE8 motor provides a maximum force of 32N and a maximum velocity of 500mm/sec. To support applications with higher moving mass, Nanomotion can support applications with 2, 3, or 4, SE8 motors in parallel on one axis. The SE8 has a non-energized stiffness of 8.5N/µm to support faster settling times and position stability at the nm level. SE motor is well suited for:

- High force, high speed applications
- High Vacuum applications
- Sub-nm positioning accuracy
- High throughput

Product Description

The SE8 motor can easily adapt to numerous bearing structures to provide a high resolution motion control for a wide range of applications. The high stiffness and efficiency of the SE motor family is supporting increased duty cycle operation and estimated life of 20k hours under normal operating conditions.

SE8 Motor Features:

- Wide Dynamic velocity range
- Zero Backlash and high stiffness
- Holds position at power off
- Increased duty cycle, particularly for vacuum applications
- Negligible EMI

SE8-1-X-3

TECHNICAL SPECIFICATIONS
Mechanical
Weight/Mass: 185g

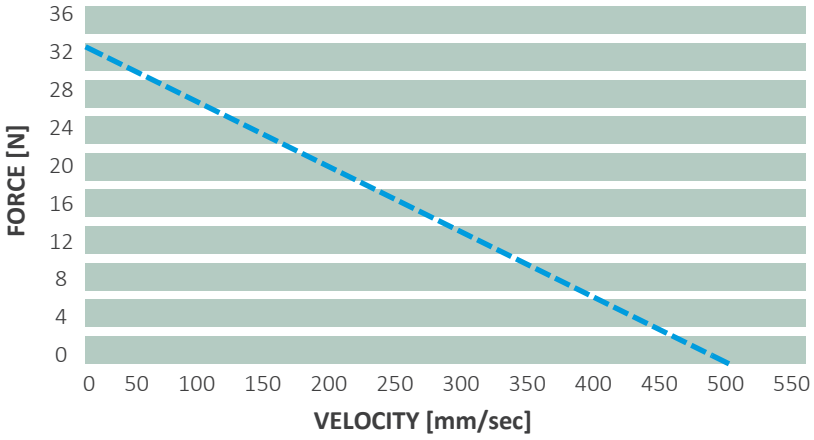
DYNAMIC
Driving Force (max): 32N
Velocity (max): 500mm/sec

ENVIRONMENTAL
Operation Temperature:
0˚C - 50˚C

ELECTRICAL
Motor Voltage (RMS): 280V
Motor Power (max): 40W

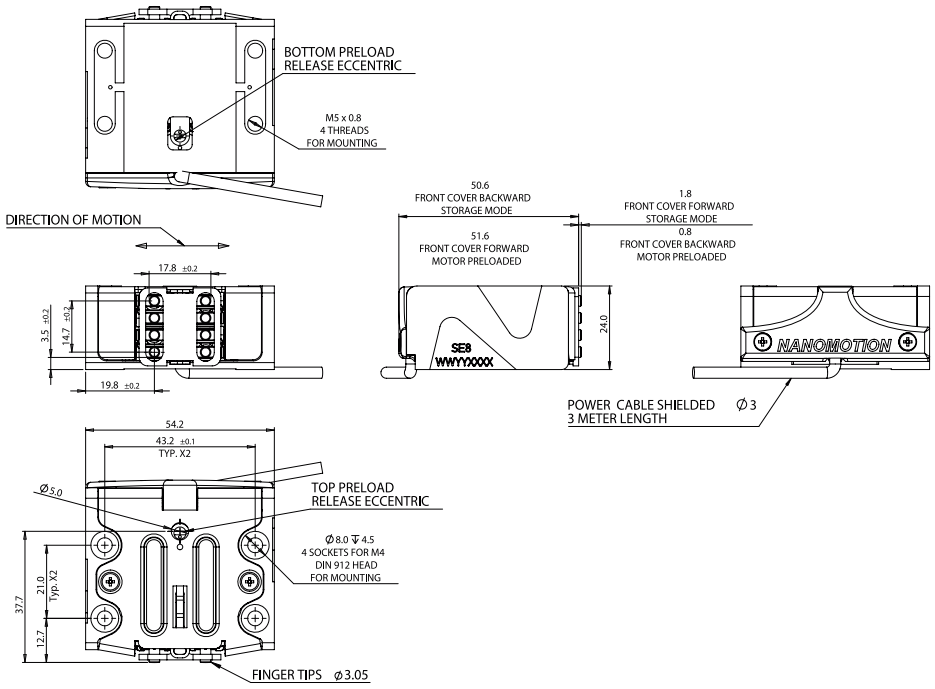
SE8 Motor

FORCE/VELOCITY CHARACTERISTICS

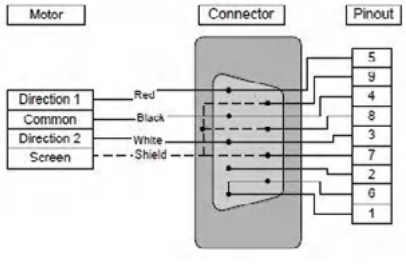


MECHANICAL DRAWINGS AND INTERFACE

All Dimensions are Shown in Metric



ELECTRICAL INTERFACE



SE4-1-X-3

ORDERING INFORMATION

Part Numbers:

SE4-1-S-3 Standard Motor

SE4-1-V-3 Vacuum Motor

SE4-1-VN-3 Vac/Non-magnetic Motor

RELATED PRODUCTS

Part Number:

AB07-SE-EXX Driver for SE

XCD-SE-EXX Driver/Control Board

SE4 Motor

Application Recommendations

The SE4 motor provides a maximum force of 16N and a maximum velocity of 500mm/sec. To support applications with higher moving mass, Nanomotion can support applications with 2 or 4 SE4 motors in parallel on one axis. The SE4 has a non-energized stiffness of 4.5N/µm to support faster settling times and position stability at the 1nm level. SE motor is well suited for:

- High force, high speed applications
- High Vacuum applications
- Sub-nm positioning accuracy
- High throughput

Product Description

The SE4 motor can easily adapt to numerous bearing structures to provide a high resolution motion control for a wide range of applications. The high stiffness and efficiency of the SE motor family is supporting increased duty cycle operation and estimated life of 20k hours under normal operating conditions.

SE4 Motor Features:

- Wide Dynamic velocity range
- Zero Backlash and high stiffness
- Holds position at power off
- Increased duty cycle, particularly for vacuum applications
- Negligible EMI

SE4-1-X-3

TECHNICAL SPECIFICATIONS
Mechanical
Weight/Mass: 123g

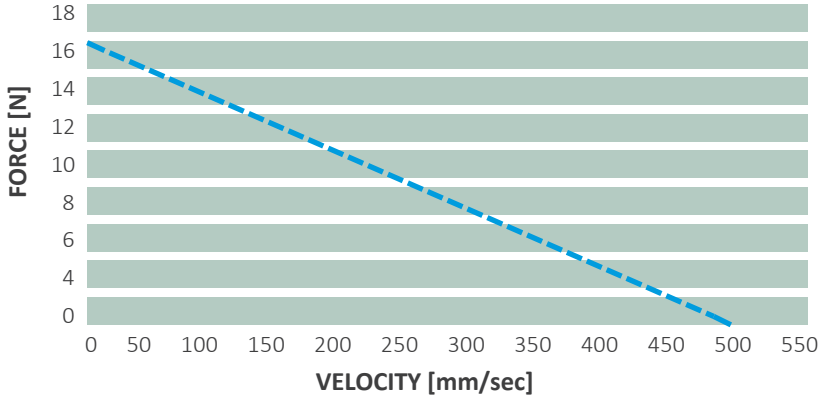
DYNAMIC
Driving Force (max): 16N
Velocity (max): 500mm/sec

ENVIRONMENTAL
Operation Temperature:
0˚C - 50˚C

ELECTRICAL
Motor Voltage (RMS): 280V
Motor Power (max): 20W

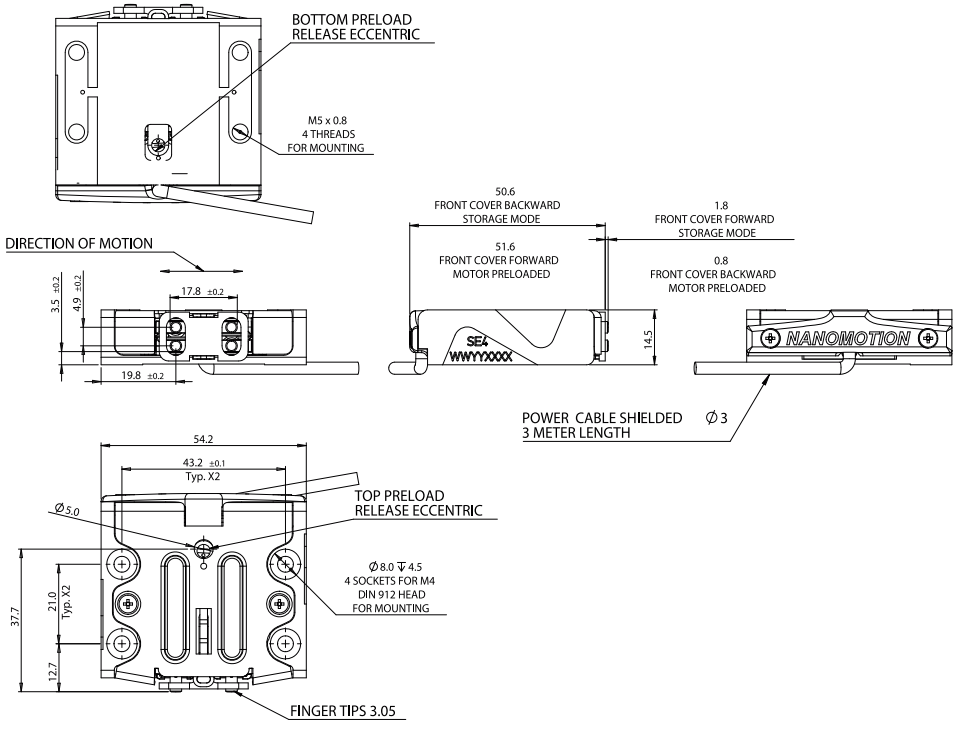
SE4 Motor

FORCE/VELOCITY CHARACTERISTICS

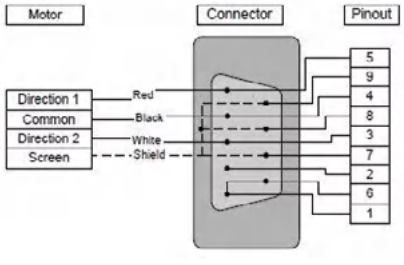


MECHANICAL DRAWINGS AND INTERFACE

All Dimensions are Shown in Metric



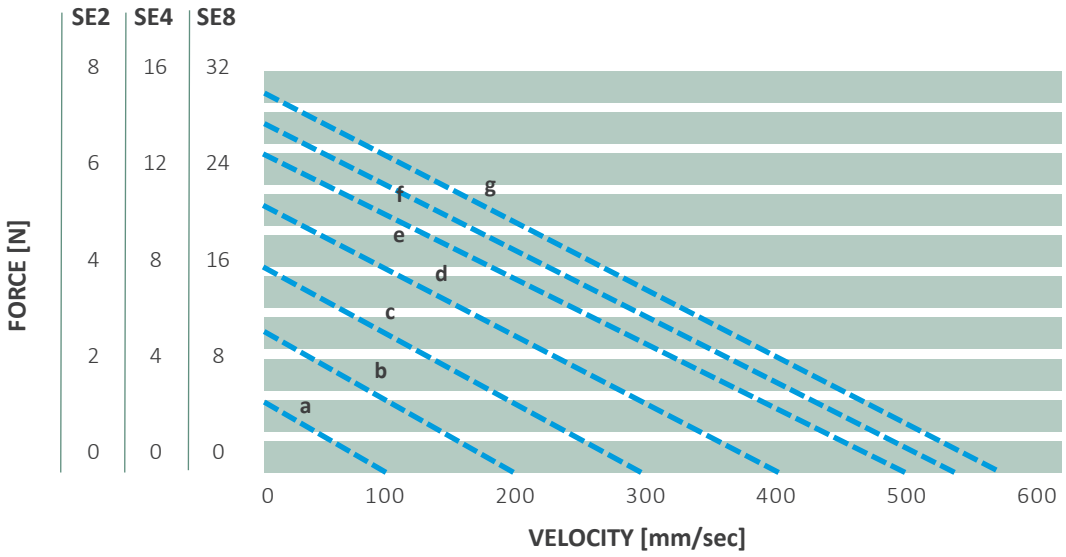
ELECTRICAL INTERFACE



SE Motor Envelope of Performance

The graph depicts the motor force vs velocity at various work regimes, do be defined by the application requirements. The chart defines the maximum duty cycle and continuous based on the specific curve defined by the application requirements.

FORCE/VELOCITY CHARACTERISTICS



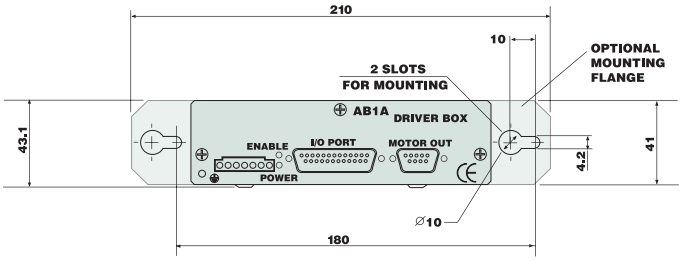
Curve	Air 25˚C		Air 50˚C		Vacuum	
	Duty Cycle (%)	Maximal Continuous Operation Time (sec.)	Duty Cycle (%)	Maximal Continuous Operation Time (sec.)	Duty Cycle (%)	Maximal Continuous Operation Time (sec.)
a	100	∞	100	∞	100	∞
b	100	∞	100	∞	44	184
c	100	∞	92	137	26	107
d	100	∞	62	93	17	72
e	78	87	47	70	13	55
f	56	62	33	50	9	39
g	50	56	30	45	8	35

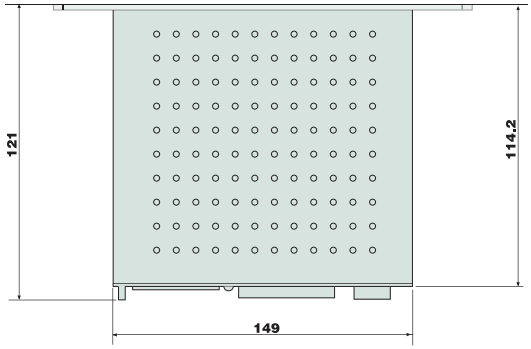
The AB1A amplifier is a single axis digital driver that can run one or multiple Nanomotion motors in parallel. While operating in a closed loop servo system, the driver works as a velocity amplifier, receiving a +/- 10 volt analog command from the controller. The controller signal translates into AC voltage at 39.6 kHz to run the motor. In an open loop mode the amplifier can receive a signal from an external joystick, providing motion in a continuous or stepping mode.

Features

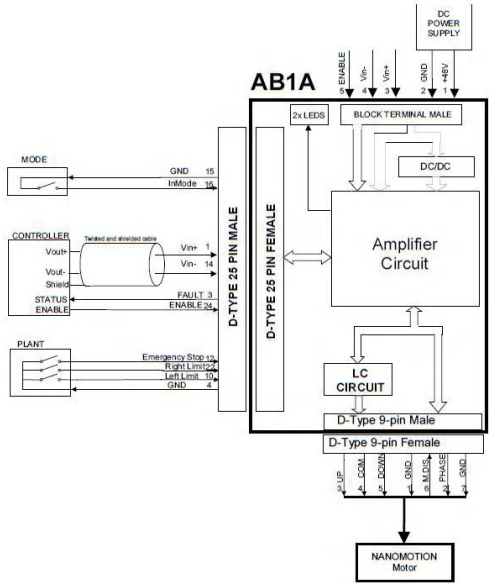
- Digital drive handles up to 32 elements
- +/- 10V input from servo control
- 2 optically isolated limits
- Available in Eurocard 3µ format
- Joystick input for open loop operation
- Card interface is 48 pin 3 row connector

Amplifier Specifications





Driving Capability:	up to 32 elements (4 HR8 motors)
Analog Control Input	
Input Voltage Range:	+/-10V
Input Impedance:	10 KΩ
Input Low Pass Filter:	2.7 KHz
Input Sampling Resolution:	10 bits



Environmental

Operating temperature:	0 to 50˚C
Storage Temperature:	-40˚C to +70˚C
Humidity:	0 to 80%

Electrical

Power Input:	+48Vdc±5%
Max Motor Output:	270 to 280Vrms
Power Consumption w/o Load:	+48Vdc/0.125A
Power Consumption with Max Load:	+48Vdc/6.5Amax

The AB4 amplifier offers the same performance as the AB1A, in a reduced package. The AB4 operates off of 12Vdc supply input and can drive up to 4 HR motor elements total, either (1) 4 element HR motor, or multiple HR motors totaling 4 elements.

The AB4 is the smallest standard motor amplifier and is provided with a 26-pin rear connector (26 pin, two row header). This connector provides access to all functionality (motor,power inputs, limits, and I/O functions), making it easy to integrate. Additional motor and power inputs are available with standard connections on the front.

Features

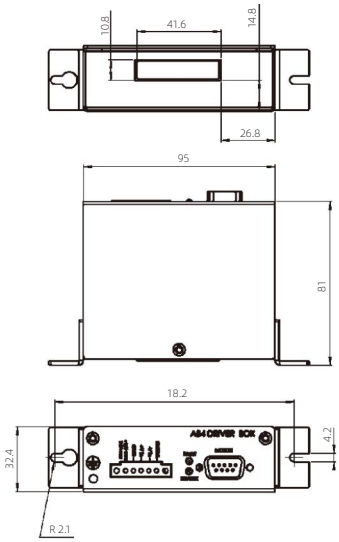
- Exceptionally compact mounting
- 12Vdc supply input
- Drives up to 4 HR motor elements
- Cable length up to 20m
- Over current and over voltage protection

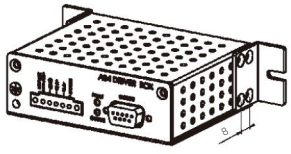
Environmental

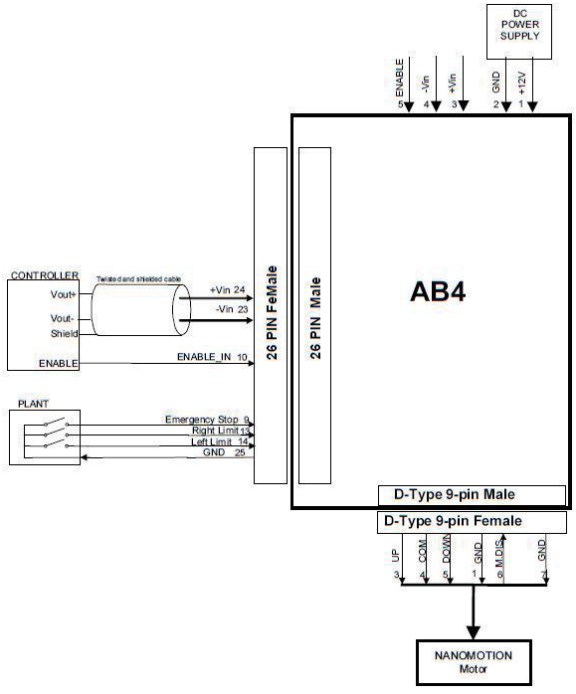
Operating Temperature:	0 to 50˚C
Storage:	-40˚C to +70˚C
Humidity:	up to 80%, non condensing

Electrical

Power Supply Input:	+12 Vdc ±5% (stabilized)
Max Motor Output Voltage:	280 Vrms
Power Consumption without Load:	+12 Vdc/300 mA
Power Consumption with Max Load:	+12 Vdc/3.5 A







Nanomotion's AB7 driver is a single axis amplifier box to support up to 32 motor elements in parallel (4 x SE8). Each driver has an internal personality board based on the motor type and number of motor elements.

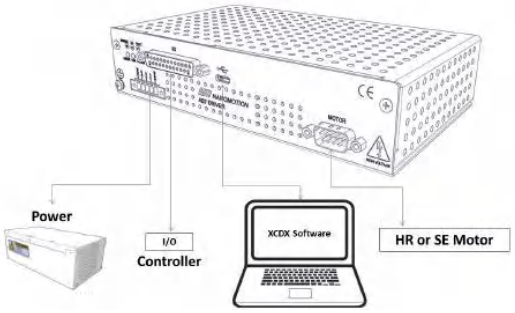
The AB7 has been developed to support the new family of SE motors as well as HR motors, combining a range of operations that were previously supported by different drivers. Included in the diver is a user selectable operation for AC mode (AB1A), DC mode (AB2), Linear Mode (AB5) and UHR Mode (used in both AB1A & AB5). These modes are combined with a motor voltage resolution of 1/8000 noise at full command, which is a 10x improvement over previous drivers, supporting slow speed, constant velocity and high precision applications.

Features

- Compatible with any servo controller
- comprehensive operation mode:

√ AC mode (AB1A),
√ DC mode (AB2),
√ Linear Mode (AB5)
√ UHR Mode (used in both AB1A & AB5)

- support the new family of SE motors as well as HR motors
- Drives up to 32 motor elements in parallel (4 x SE8)
- Support USB (Type-C) interface
- 24 V DC supply input

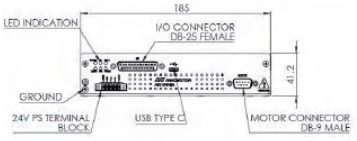


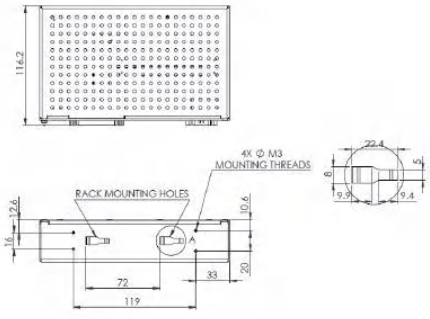
Environmental

Operating Temperature:	0 to 50˚C
Storage:	-40˚C to +70˚C
Humidity:	up to 80%, non condensing

Electrical

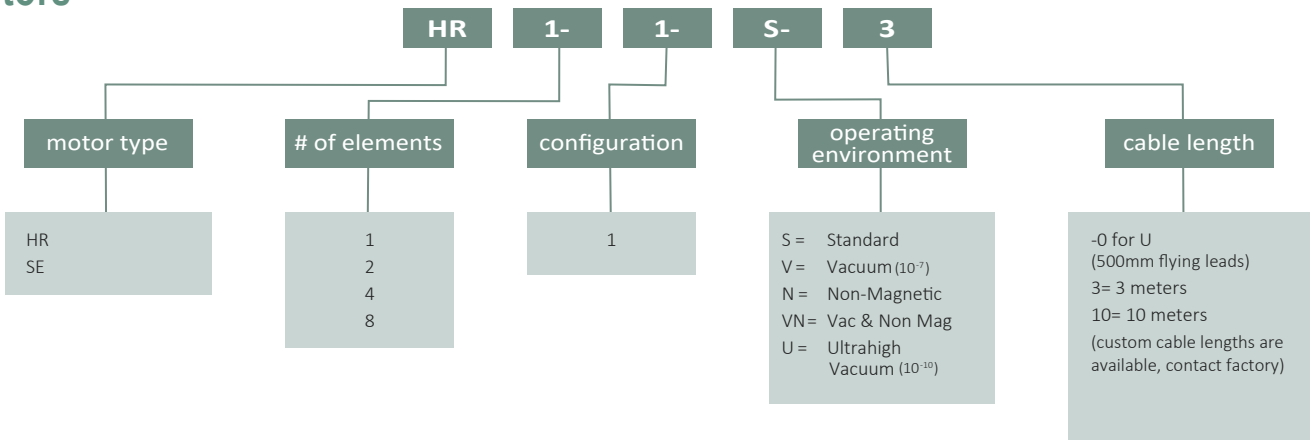
Input Power:	24V±5%
Maximum Current(at full command):	E2: 1 amp E4: 1.5 amps E8: 3 amps
	E16: 6 amps E32: 12 amps
Input Signal:	±10V 14 bit Command Resolution



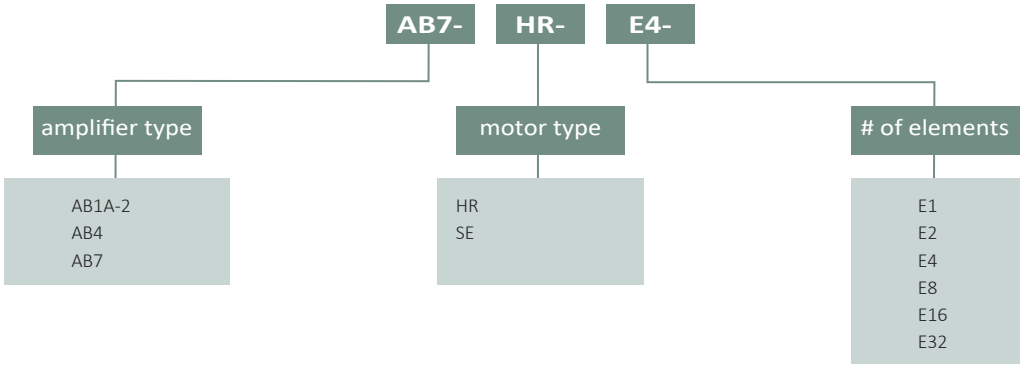


Ordering Guide

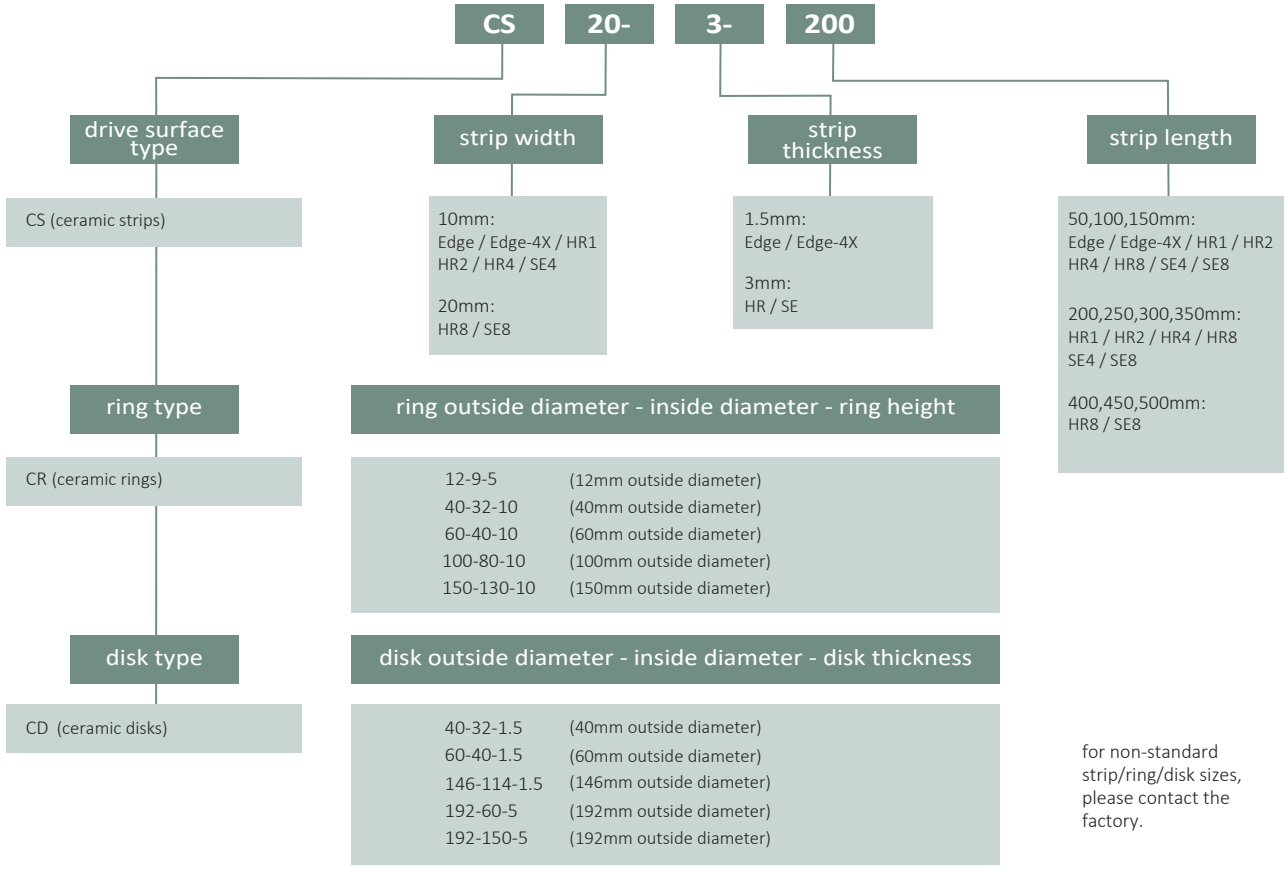
Motors



Amplifiers



Ceramics



for non-standard strip/ring/disk sizes, please contact the factory.

Standard Stages for Motion Control Applications

FB Stage Catalog

NANOMOTION

A Johnson Electric Company

Nanomotion designs and manufactures advanced motion systems, sub-systems modules and piezo motor/drive components.

The FB Series of standard stages are driven by Nanomotion's ultrasonic standing wave piezo motors, providing closed loop, servo motion with an optical encoder. The standard stages provide single and multi-axis motion performance for a wide range of applications in Semiconductor, Biomedical, and Instrumentation markets.

These compact stage configurations are provided in both standard atmospheric configurations as well as vacuum versions that can support clean operation to ISO Class 3 cleanliness. The modular design allows for easy mounting of axes, to each other, along with the use of standard angle brackets for Z mounting. All axes utilize precision crossed roller bearings with anti-migration and optical encoders for precision positioning requirements.

For applications not suitable to standard stage configurations, please feel free to contact Nanomotion's team of application engineers to learn about our custom stage capabilities.

PRODUCT FEATURES

- Precision standard stages for atmosphere and vacuum
- Linear stages for with travel up to 200mm travel
- Rotary stages for continuous motion
- Z-Wedge stage for pure vertical motion
- Goniometric stages for tip/tilt about a common pivot

Customized Solutions Give OEMs Unlimited Possibilities.

FBS050/020/050 Linear Stage

Mechanical Design Characteristics

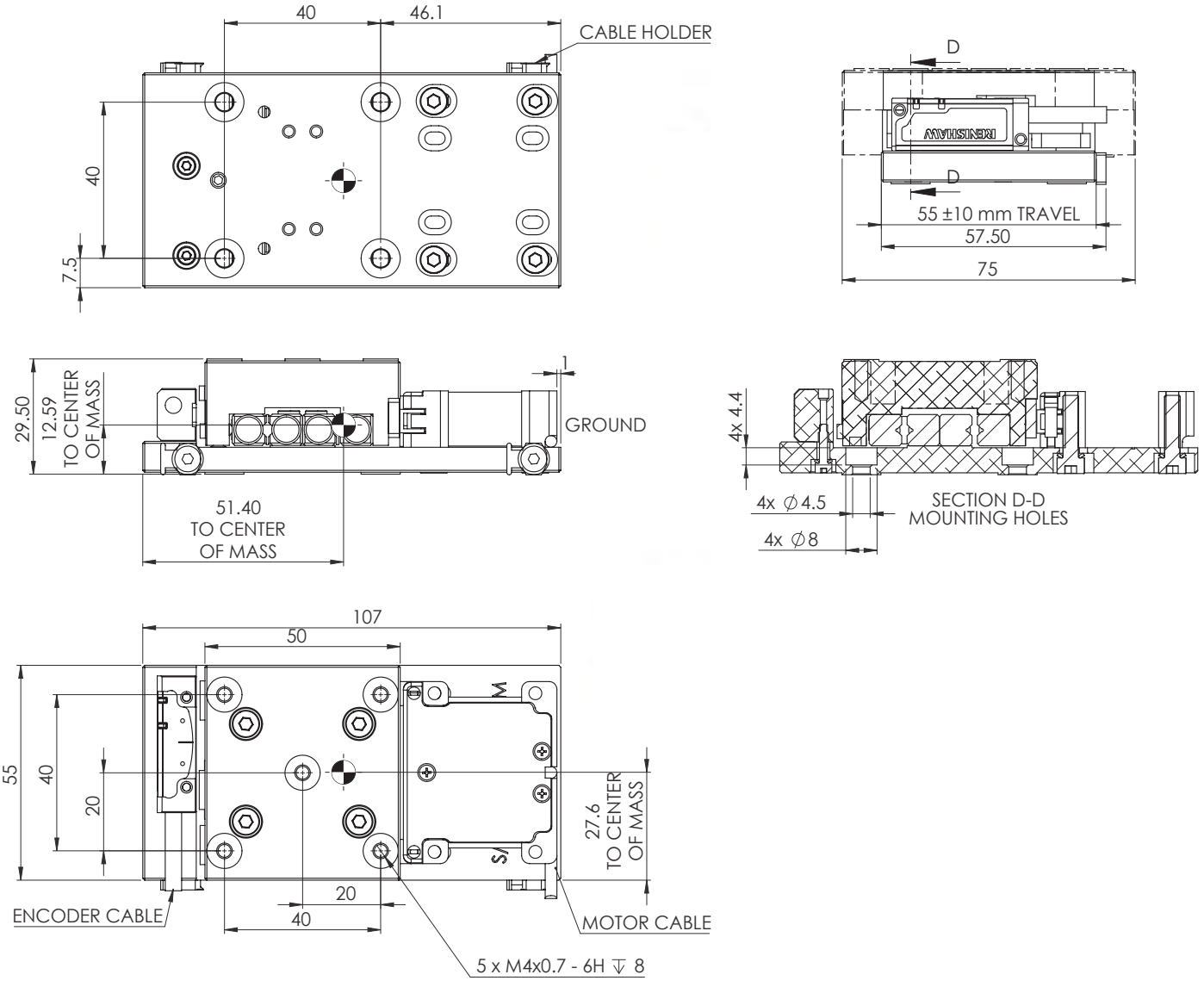
MODEL	FBS050020	FBS050050
Stage Plate Material	Aluminum — Black Anodized	
Motor	HR4 Piezo, ultrasonic standing wave	
Bearing Type	Precision crossed rollers with anti-migration device	
Encoder	Linear optical encoder with gold tape scale	
Cable Lengths (m)	3m	
MTBF (hours)	30,000	
Stage Mass (g)	405g	550g
Carriage Moving Mass (g)	158g	230g
RoSH	Compliant	
Vacuum Compatible Options	High Vacuum (to 10^{-7} Torr) / UHV (to 10^{-10} Torr) available	

Performance Specifications

MODEL		FBS050020		FBS050050
Travel Range (mm)		20mm		50mm
Encoder Resolution	Standard		100nm	
	Optional		10nm	
Bi-directional Repeatability	Standard		1µm	
	Optional		100nm	
Absolute Accuracy	Standard	5µm		10µm
(Error mapping available)	Optional	2.5µm		7µm
Minimum Incremental	AC Mode		100nm	
Move Convergence	UHR Mode		5nm	
	DC Mode		<1nm	
Maximum Velocity		200mm/sec		200mm/sec
Straightness & Flatness		±4µm		±4µm
Pitch & Yaw		±40µrad		±40µrad
Load Capacity - Horizontal		1.8kg		1.8kg
Load Capacity - Vertical		0.4kg		0.3kg
Dynamic Stall Force		16N		16N
Motor Stiffness		1.7N/µ		1.7N/µ
Holding Force without Power			14N	

MECHANICAL DRAWINGS | FBS0500020

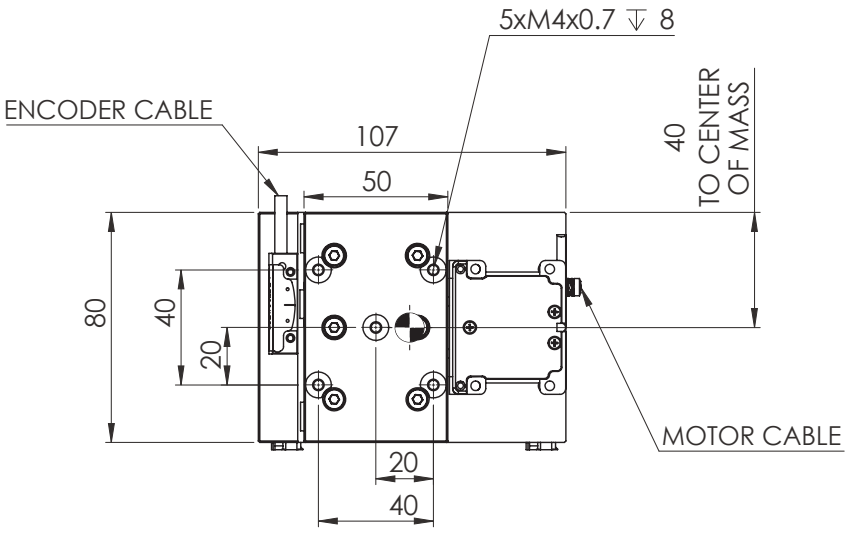
European View Dimensions are Metric

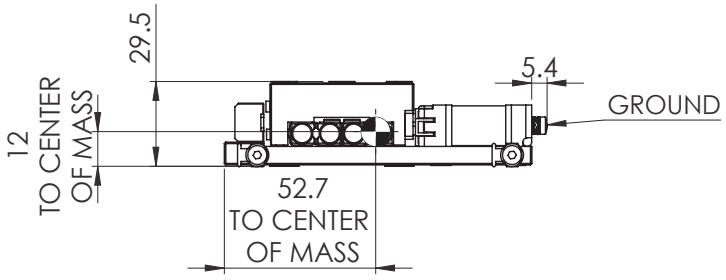


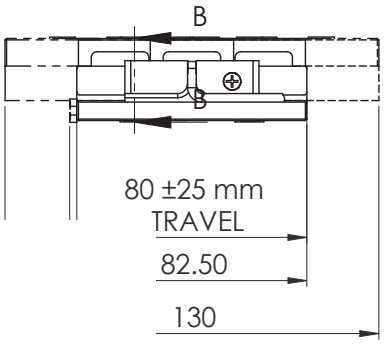
MECHANICAL DRAWINGS

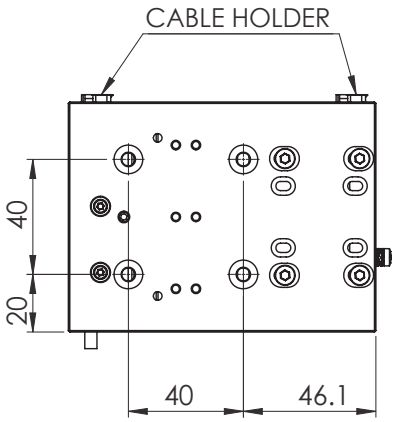
FBS0500050

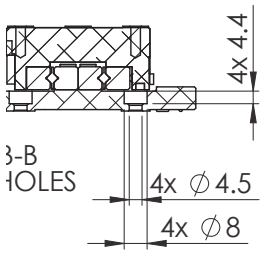
European View Dimensions are Metric



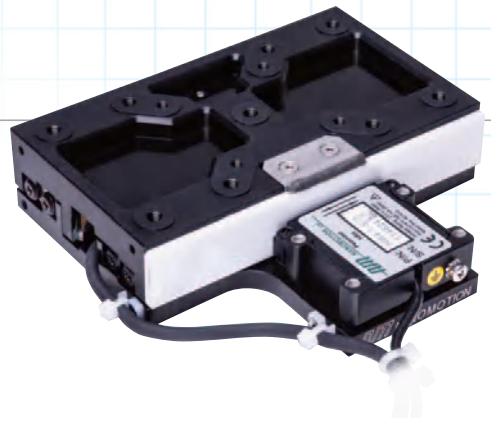








FBS075/040/060/100 Linear Stage



MECHANICAL DESIGN CHARACTERISTICS

MODEL	FBS075040	FBS075060	FBS075100
Stage Plate Material	Aluminum — Black Anodized		
Motor	HR8 Piezo, ultrasonic standing wave		
Bearing Type	Precision crossed rollers with anti-migration device		
Encoder	Linear optical encoder with gold tape scale		
Cable Lengths (m)	3m		
MTBF (hours)	30,000		
Stage Mass (g)	727g	918g	1062g
Carriage Moving Mass (g)	284g	447g	445g
RoSH	Compliant		
Vacuum Compatible Options	High Vacuum (to 10^{-7} Torr) / UHV (to 10^{-10} Torr) available		

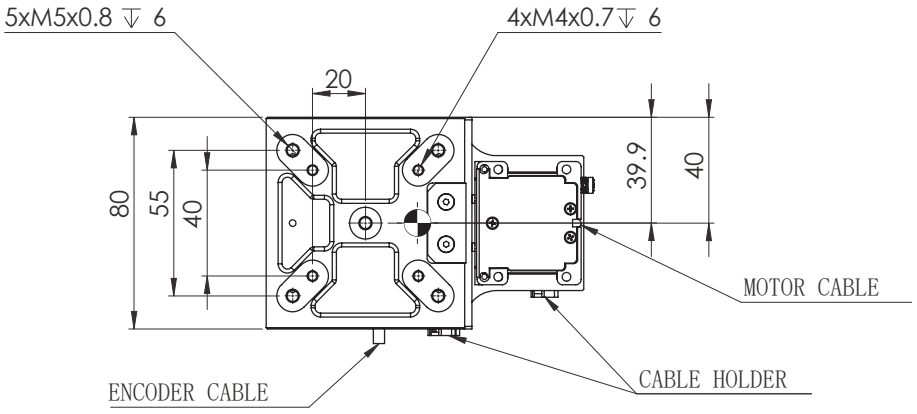
PERFORMANCE SPECIFICATIONS

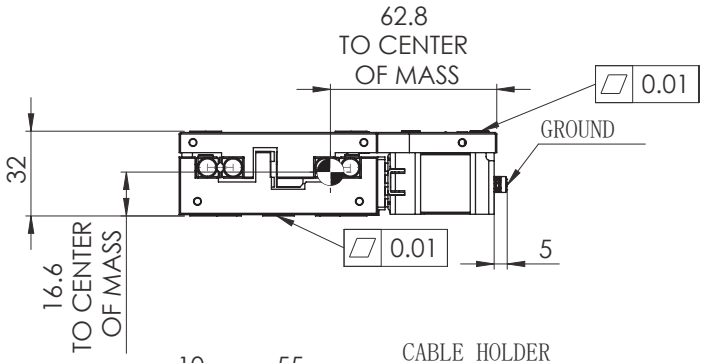
MODEL		FBS075040	FBS075060	FBS075100
Travel Range (mm)		40mm	60mm	100mm
Encoder Resolution	Standard		100nm	
	Optional		10nm	
Bi-directional Repeatability	Standard		1µm	
	Optional		100nm	
Absolute Accuracy	Standard	6µm	8µm	10µm
(Error mapping available)	Optional	3µm	4µm	5µm
Minimum Incremental	AC Mode		100nm	
Move Convergence	UHR Mode		5nm	
	DC Mode		<1nm	
Maximum Velocity		200mm/sec	250mm/sec	250mm/sec
Straightness & Flatness		±4µm	±5µm	±5µm
Pitch & Yaw		±40µrad	±60µrad	±60µrad
Load Capacity - Horizontal		3.0kg	3.0kg	3.0kg
Load Capacity - Vertical		0.8kg	0.65kg	0.65kg
Dynamic Stall Force			32N	
Motor Stiffness			3N/µm	
Holding Force without Power			28N	

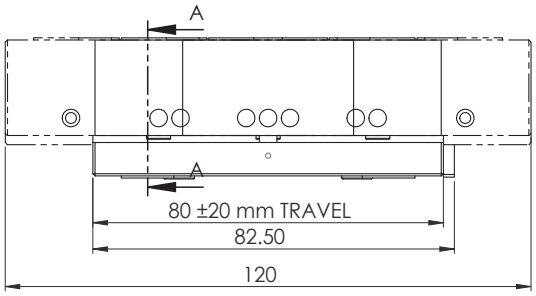
MECHANICAL DRAWINGS

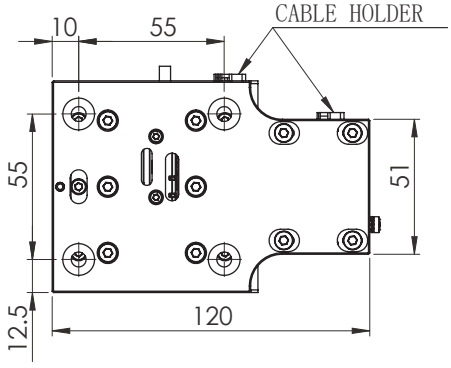
FBS075040

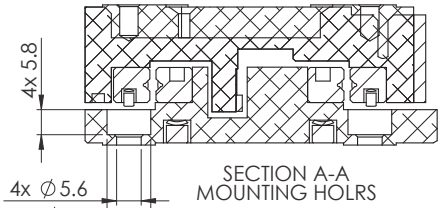
European View Dimensions are Metric







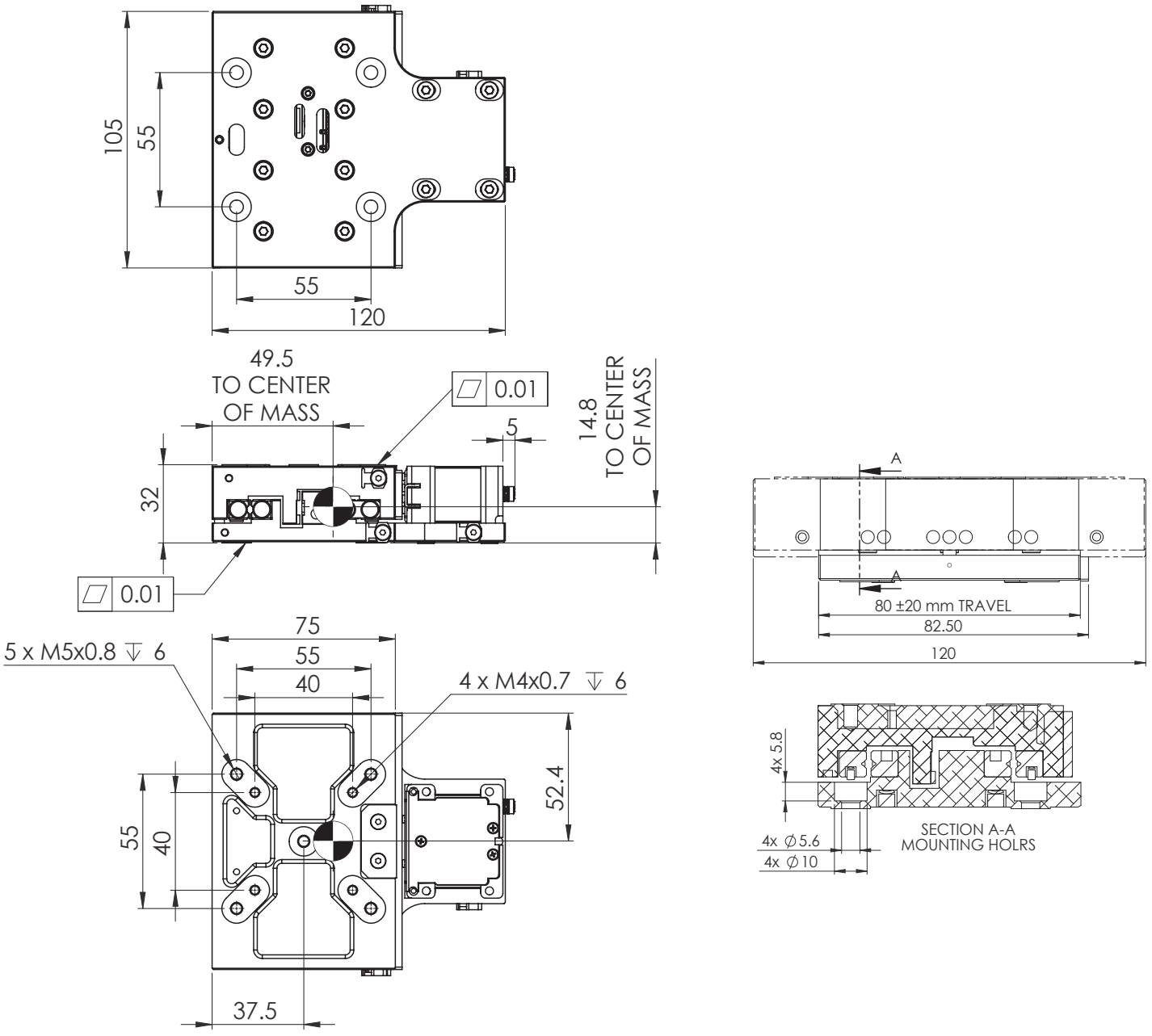




MECHANICAL DRAWINGS

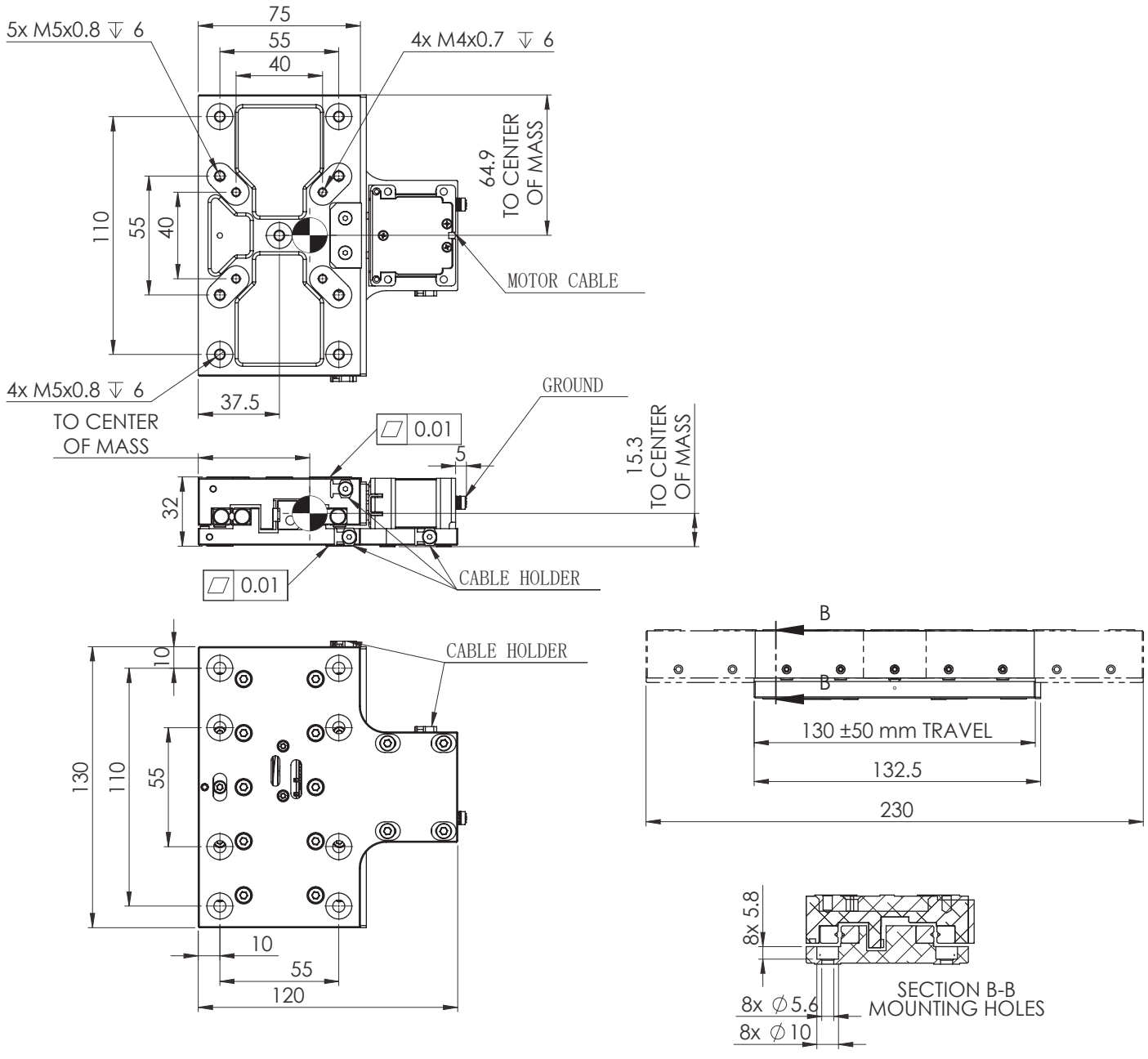
FBS075060

European View Dimensions are Metric



MECHANICAL DRAWINGS | FBS075100

European View Dimensions are Metric



FBS100100

Linear Stage

Mechanical Design Characteristics

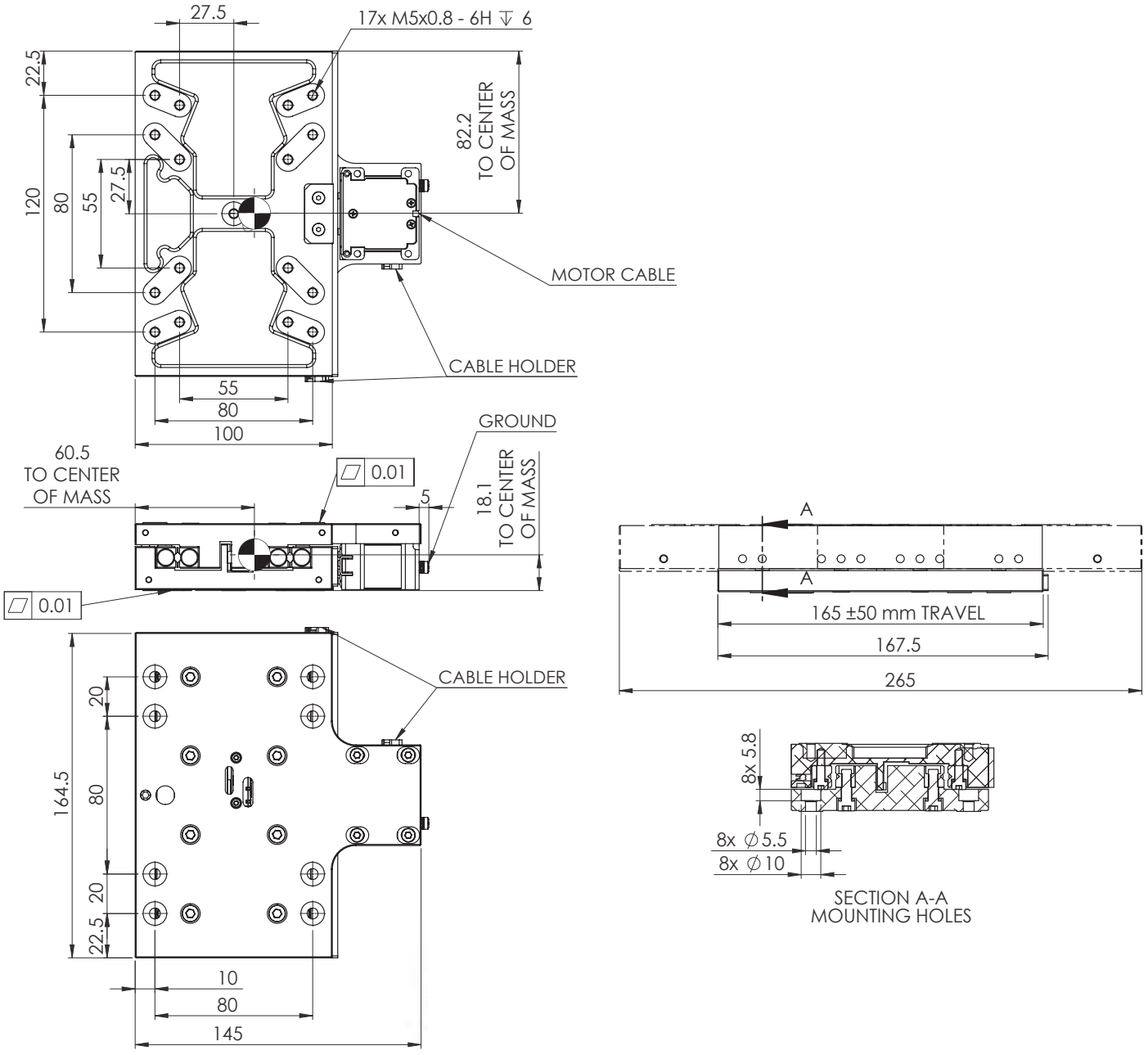
MODEL	FBS100100
Stage Plate Material	Aluminum — Black Anodized
Motor	HR8 Piezo, ultrasonic standing wave
Bearing Type	Precision crossed rollers with anti-migration device
Encoder	Linear optical encoder with gold tape scale
Cable Lengths (m)	3m
MTBF (hours)	30,000
Stage Mass(g)	1811g
Carriage Moving Mass(g)	710g
RoSH	Compliant
Vacuum Compatible Options	High Vacuum (to 10^{-7} Torr) / UHV (to 10^{-10} Torr) available

Performance Specifications

MODEL		FBS100100
Travel Range (mm)		100mm
Encoder Resolution	Standard	100nm
	Optional	10nm
Bi-directional Repeatability	Standard	1µm
	Optional	100nm
Absolute Accuracy	Standard	10µm
(Error mapping available)	Optional	7µm
Minimum Incremental	AC Mode	100nm
Move Convergence	UHR Mode	5nm
	DC Mode	<1nm
Maximum Velocity		250mm/sec
Straightness & Flatness		±4µmm
Pitch & Yaw		±50µrad
Load Capacity - Horizontal		2.7kg
Load Capacity - Vertical		0.4kg
Dynamic Stall Force		32N
Motor Stiffness		3N/µ
Holding Force without Power		28N

MECHANICAL DRAWINGS | FBS100100

European View Dimensions are Metric



FBS150/150/200 Linear Stage

Mechanical Design Characteristics

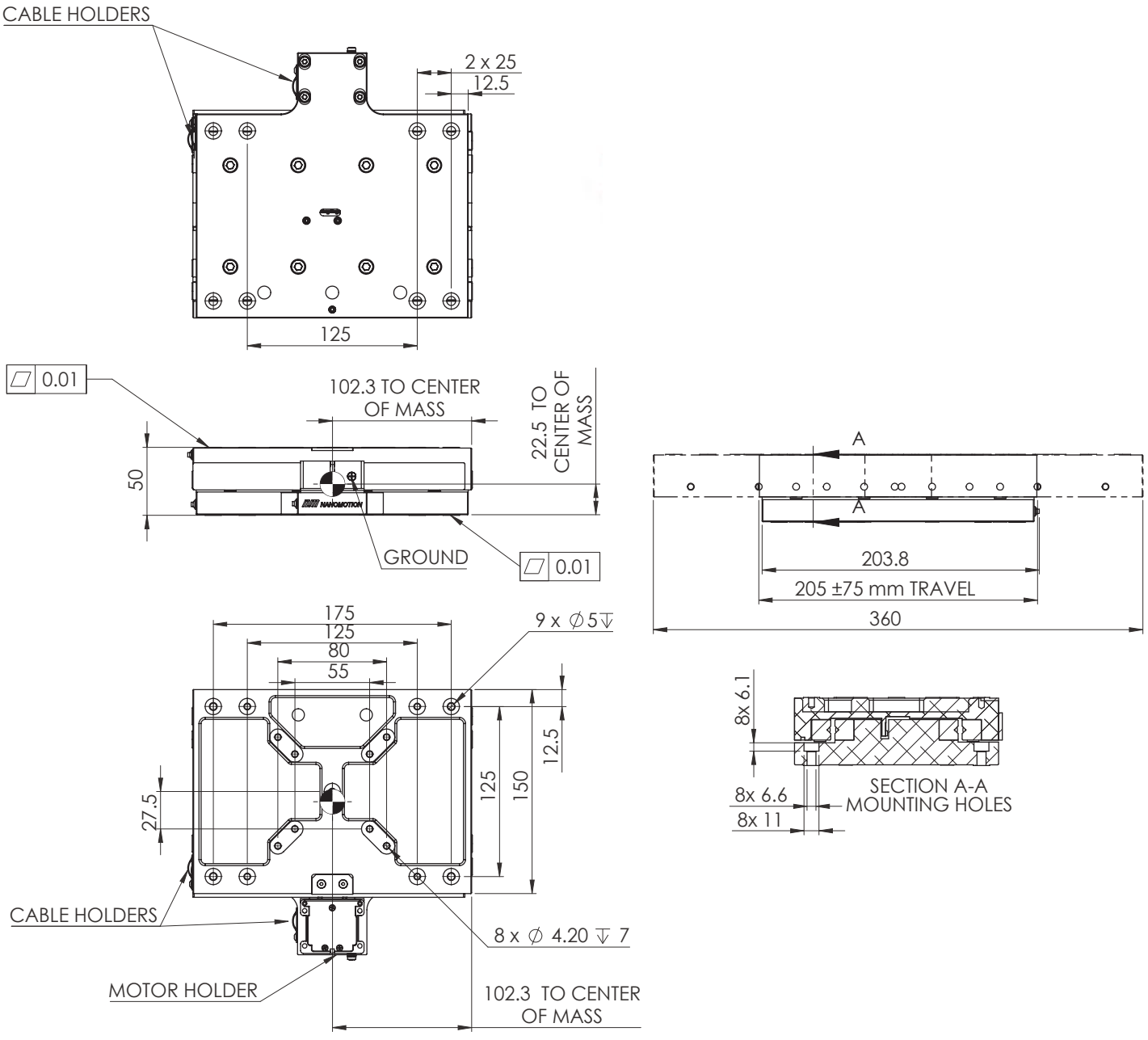
MODEL	FBS150150	FBS150200
Stage Plate Material	Aluminum — Black Anodized	
Motor	HR8 Piezo, ultrasonic standing wave	
Bearing Type	Precision crossed rollers with anti-migration device	
Encoder	Linear optical encoder with gold tape scale	
Cable Lengths (m)	3m	
MTBF (hours)	30,000	
Stage Mass (g)	4399g	5435g
Carriage Moving Mass (g)	1677g	2054g
RoSH	Compliant	
Vacuum Compatible Options	High Vacuum (to 10^{-7} Torr) / UHV (to 10^{-10} Torr) available	

Performance Specifications

MODEL		FBS150150		FBS150200
Travel Range (mm)		150mm		200mm
Encoder Resolution	Standard		100nm	
	Optional		10nm	
Bi-directional Repeatability	Standard		1µm	
	Optional		100nm	
Absolute Accuracy	Standard	12µm		15µm
(Error mapping available)	Optional	7µm		8µm
Minimum Incremental	AC Mode		100nm	
Move Convergence	UHR Mode		5nm	
	DC Mode		<1nm	
Maximum Velocity		200mm/sec		200mm/sec
Straightness & Flatness		±5µm		±5µm
Pitch & Yaw		±50µrad		±50µrad
Load Capacity - Horizontal		1.8kg		1.47kg
Load Capacity - Vertical		NA		NA
Dynamic Stall Force		30N		30N
Motor Stiffness		3N/µm		3N/µm
Holding Force without Power			28N	

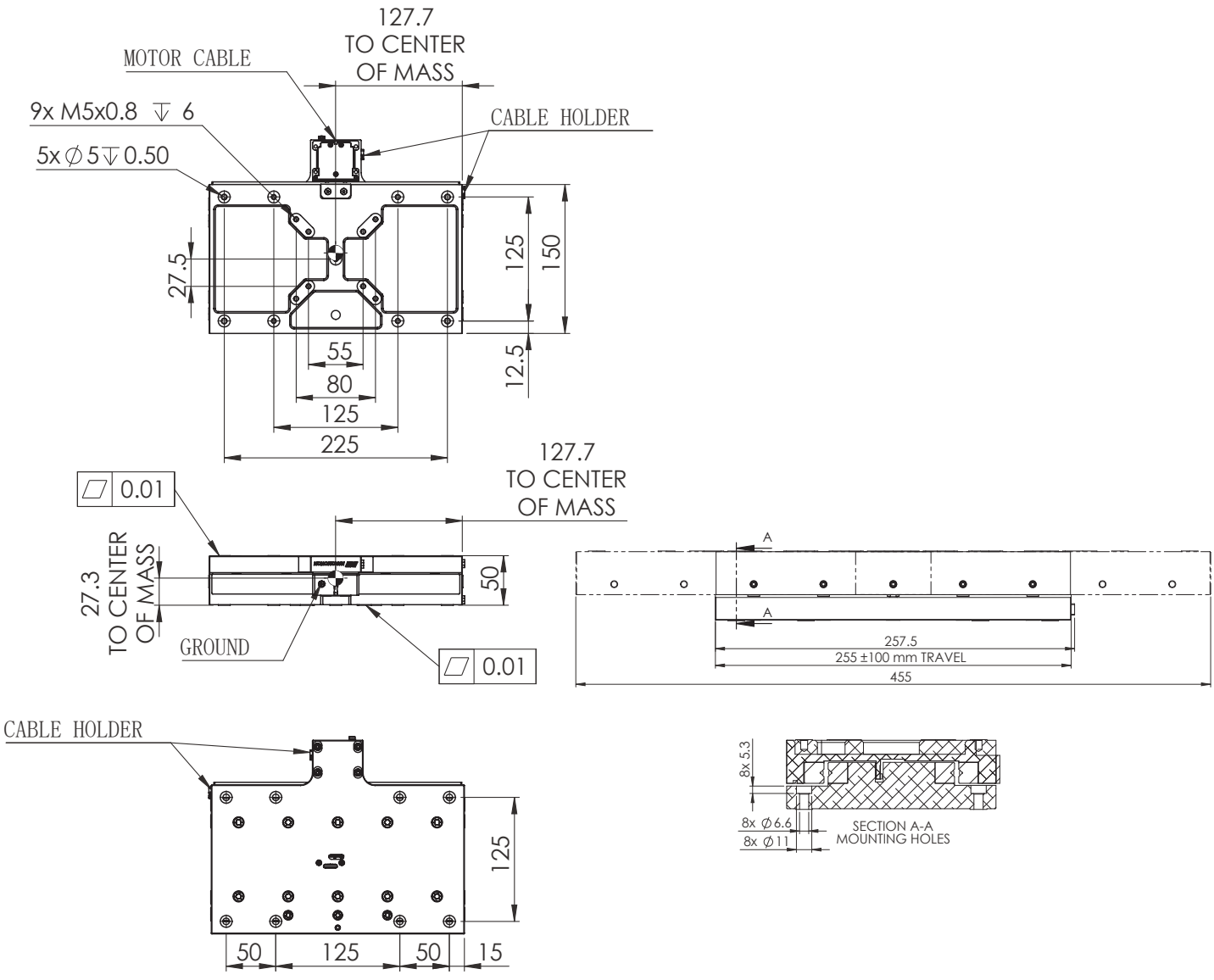
MECHANICAL DRAWINGS | FBS150150

European View Dimensions are Metric

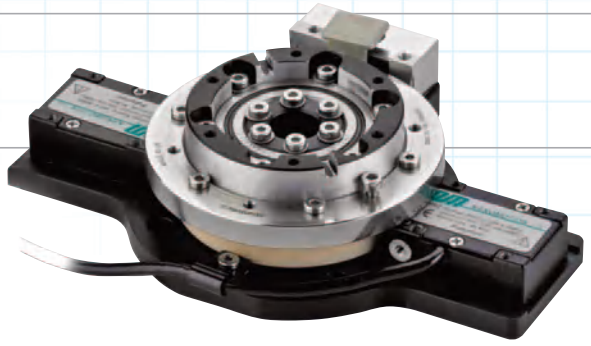


MECHANICAL DRAWINGS | FBS150200

European View Dimensions are Metric



FBS060-360 Rotary Stage



Mechanical Design Characteristics

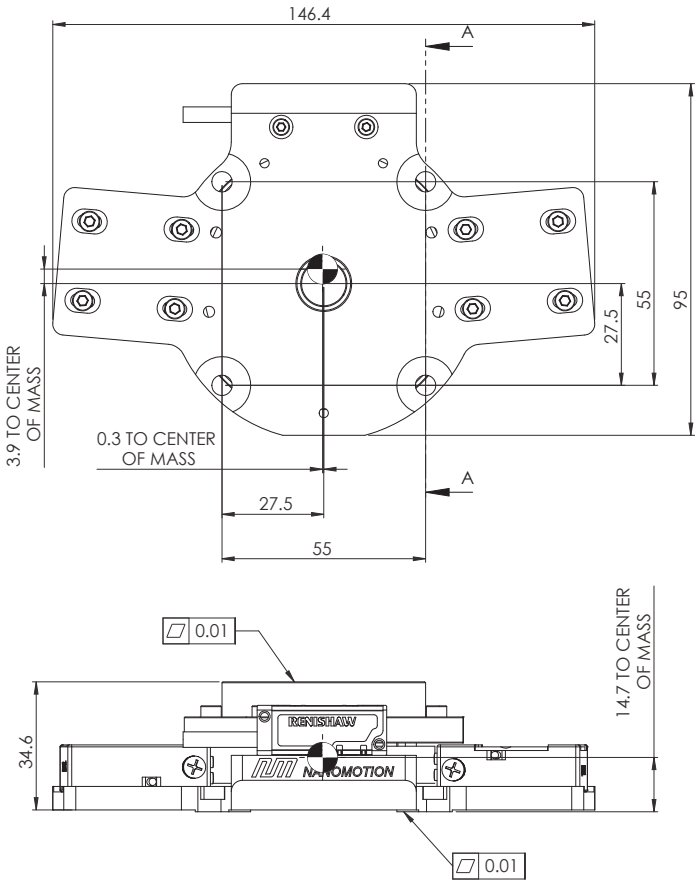
MODEL	FRS060-360
Stage Plate Material	Aluminum — Black Anodized
Motor	2 x HR2 Piezo, ultrasonic standing wave
Bearing Type	Precision crossed roller rotary bearing
Encoder	Linear optical encoder with metal ring
Cable Lengths (m)	3m
MTBF (hours)	30,000
Stage Mass (g)	581g
Moving Mass (g)	268g
Moving Inertia	0.102 gr-m^2
RoSH	Compliant
Vacuum Compatible Options	High Vacuum (to 10^{-7} Torr) / UHV (to 10^{-10} Torr) available

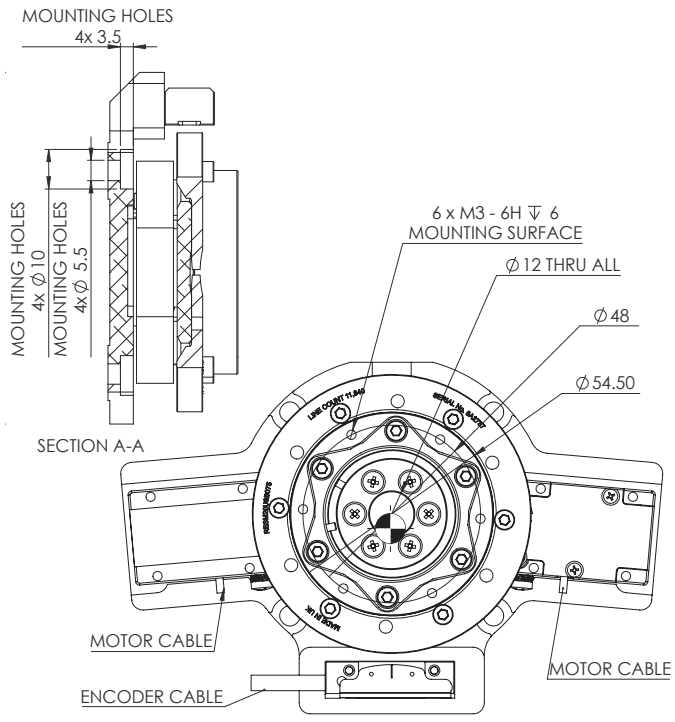
Performance Specifications

MODEL		FRS060360
Travel Range (mm)		n x 360
Encoder Resolution	Standard	5 arc sec.
	Optional	0.5 arc sec.
Bi-directional Repeatability	Standard	50 arc sec.
	Optional	5 arc sec.
Accuracy	Standard (arc sec.)	10 arc sec.
	Optional (arc sec.)	5 arc sec.
Maximum Velocity		8.3 rad/sec
Flatness		±5µm
Load Inertia Capacity		0.0035kg.m^2
Load Capacity - Moment		2kg
Dynamic Stall Force		0.96Nm
Stage Stiffness		0.0032 Nm/µrad
Holding Force without Power		0.86Nm

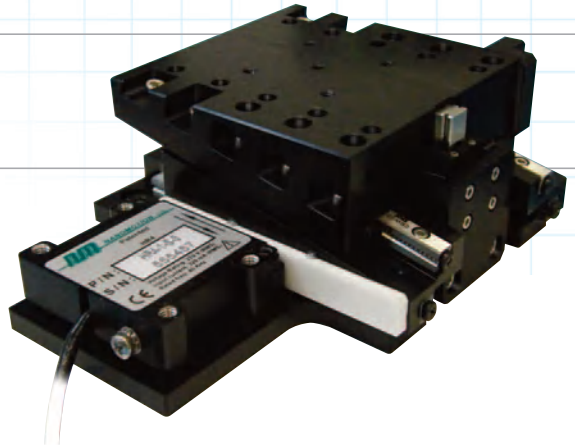
MECHANICAL DRAWINGS | FRS060-360

European View Dimensions are Metric





FZS0850100 Z Wedge Stage



Mechanical Design Characteristics

MODEL	FZS085010
Stage Plate Material	Aluminum — Black Anodized
Motor	HR8 Piezo, ultrasonic standing wave
Bearing Type	Precision crossed rollers with anti-migration device
Encoder	Linear optical encoder with gold tape scale
Cable Lengths (m)	3m
MTBF (hours)	30,000
Stage Mass (g)	1300g
Carriage Moving Mass (g)	310g
RoSH	Compliant
Vacuum Compatible Options	High Vacuum (to 10^{-7} Torr) / UHV (to 10^{-10} Torr) available

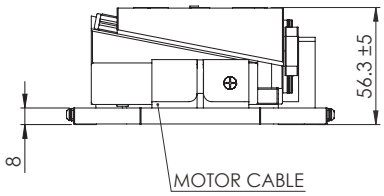
Performance Specifications

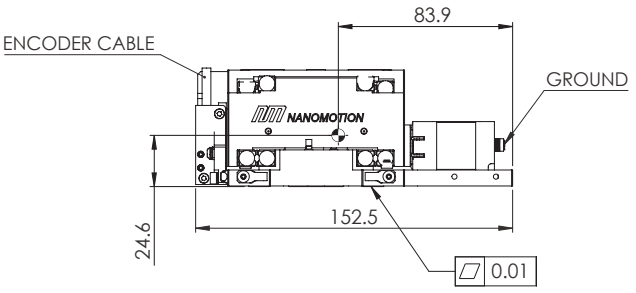
MODEL		FZS085010
Travel Range (mm)		10mm
Encoder Resolution	Standard	10nm
Bi-directional Repeatability	Standard	0.1µm
Accuracy	Standard	3µm
Minimum Incremental	AC Mode	100nm
Move Convergence	UHR Mode	5nm
(encoder & control dependant)	DC Mode	<1nm
Maximum Velocity (vertical)		50mm/sec
Straightness & Flatness		±2µm
Pitch & Yaw		±30µrad
Load Capacity		5kg
Dynamic Stall Force (N)		160N
Motor Stiffness (N/µ)		57N/µm
Holding Force without Power		150N

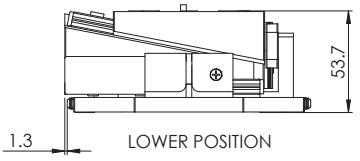
MECHANICAL DRAWINGS

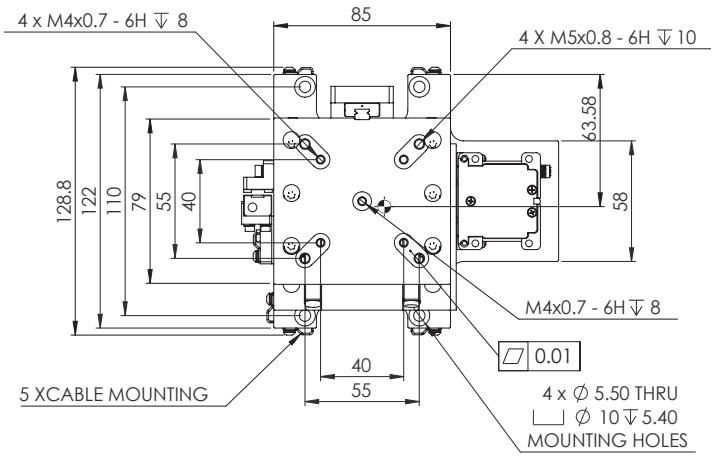
FZS0850100

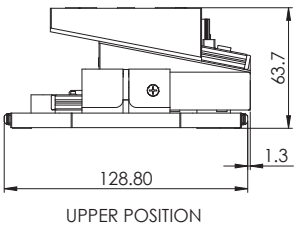
European View Dimensions are Metric











FB Series Wiring Configuration

Motor Wiring: 9 Pin D-type Female Connector

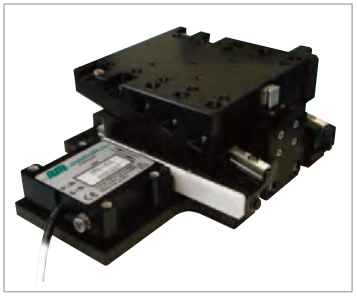
PIN	FUNCTION	DESCRIPTION
1	GND	System Ground
2	N.C.	With AB1A Driver — Phase
3	Motor - Up	White Wire — High Voltage Input
4	Motor - Common	Black Wire — High Voltage input for AB1A
		GND for AB5, AB2, AB4, XCD Controller/Driver
5	Motor-Down	Red Wire — High Voltage input
6	Motor Connected	Short Pin 6 to Pin 1 — Enables Driver
	Safety Input	Open on Pin 6 — Disables Driver
7	GND	System Ground — Connected to Connector Hood
8	N.C.	Not Connected
9	N.C.	Not Connected

Encoder Wiring: 15 Pin D-type Male Connector

PIN	FUNCTION	DESCRIPTION
7,9	5v	Power
2,9	0v	Power
14	A+	Incremental Signals
6	A-	Incremental Signals
13	B+	Incremental Signals
5	B-	Incremental Signals
12	Z+/Q-	Reference Mark/Index
4	Z-/Q+	Reference Mark/Index
15	Shield	Inner Shield
Case	Shield	Outer Shield
1,3	N.C.	Not Connected
10,11	N.C.	Not Connected

Product Features

- Linear stages for 20mm to 200mm travel.
- Rotary Stage for continues motion
- Z-Wedge stage for 10mm travel
- Nanomotion's direct drive piezo motor with zero backlash and no hysteresis.
- Integrated 100nm (0.1µm) optical encoder.



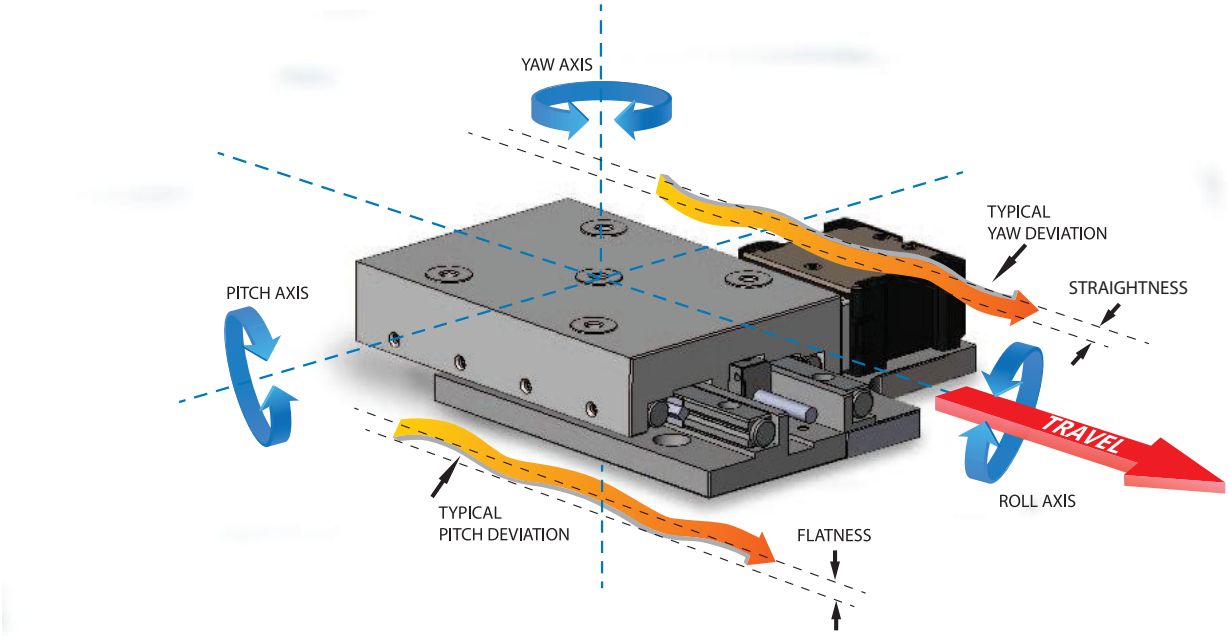
Product Description

The FB Series of alignment stages are driven by Nanomotion's ultrasonic standing wave piezo motors, providing linear, rotary and vertical motion.

The FB Series of stages provide single and multi -axis motion performance for a wide range of applications in optical alignment,semiconductor, biomedical, and the analytical instrumentation markets. These compact stages are provided in both atmosphere and vacuum configurations and can support clean room operation to Class 10.

The FB Series is a modular design that allows for easy mounting for multi-axis applications. All FB Series stages are designed with precision optical encoders and precision crossed roller bearings, with the linear axes having an anti-migration device.

Motion Accuracy



This illustration depicts the various elements that contribute to error. A given axis has linear er-rors, in the form of straightness & flatness and angular errors in the form of pitch, yaw & roll.

A linear axis has six degrees of freedom that can create potential errors in motion. There are 3 degrees of linear errors, considering the linear displacement(travel),Straightness of motion,& Flatness of motion. There are 3 degrees of angular error, which consist of Pitch, Yaw, and Roll.

1. The movement in the direction of translation, which is the actual motion displacement. This accuracy is governed by the precision of the feedback device and the ability of the motor /servo system to control the displacement of motion.

2. Straightness & Flatness are linear errors related to deviations in motion in a vertical plane or left/right plane.

3. Pitch & Yaw are angular errors that result in inclination(pitch) or twisting(yaw) of the moving surface, about the direction of travel.

4. Roll is an angular error that results in the tilting of the moving surface, off to the side,of the direction of motion.

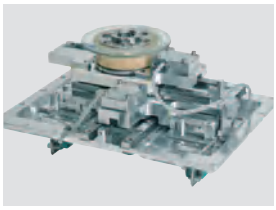
Nanomotion's FB Linear Series uses precision crossed roller bearings, yielding high stiffness, low friction and minimizing the linear and angular errors. The mounting surfaces for the bearings are precision machined aluminum, designed to reflect the bearing accuracy.

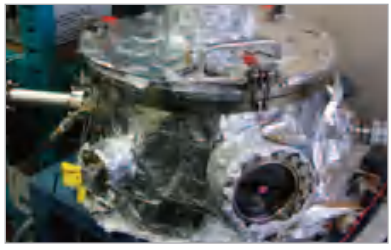
FB Series

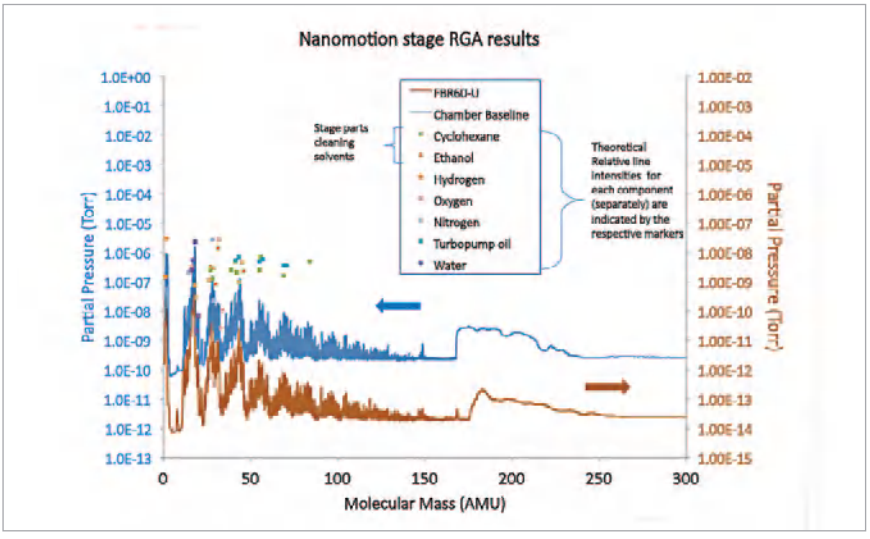
Vacuum & Ultra High Vacuum Compatibility & Cleanliness

Nanomotion's infrastructure includes:

- Cleaning and baking equipment
- Residual Gas Analysis Equipment
- Cleanroom for assembly and testing
- Vacuum chambers for testing
- Particle counting







Nanomotion supports all vacuum/UHV applications with well established infrastructure for RGA analysis and performance testing in vacuum. Our cleanroom supports the assembly and testing of ultra-clean stages.

Nanomotion Motors & Stages are available in:
-V version for high vacuum (10^{-7} Torr)
-U version for Ultra High Vacuum (10^{-10} Torr)

Linear, rotary, tilt, and Z-wedge stages are configure specifically for vacuum / UHV environments, assembled and tested in a cleanroom, then packaged in dry air or nitrogen. Single and multi-axis assemblies are available to meet the most demanding motion requirements.

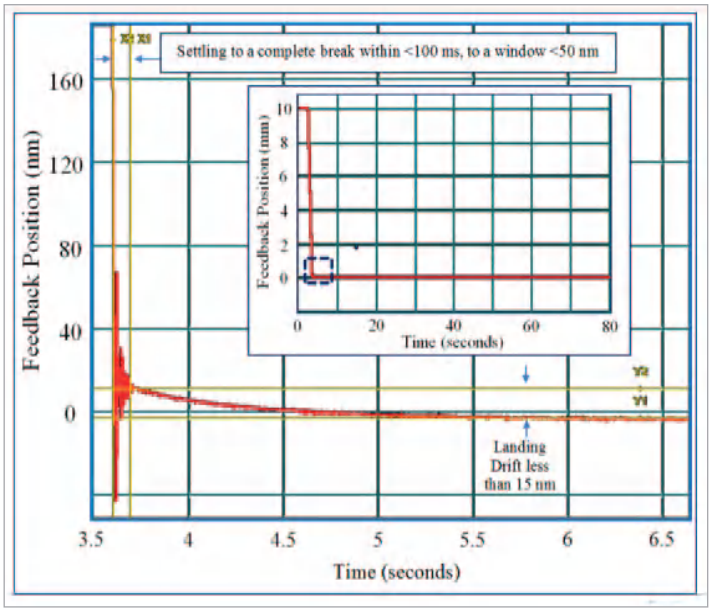
Nanomotion's motors and stages are available in vacuum and UHV compatible configurations, leveraging extensive research on materials, adhesives, and lubricants, providing high performance motion control. Motion systems are specifically designed and manufactured to meet the most stringent performance along with vacuum compatibility and cleanliness.

Move and Settle Motion Profiles & Braking

The ability to step and settle to a stable position is essential to many motion applications. Nanomotion's piezo stages have:

- zero backlash
- zero hysteresis
- no internal motor inertia
- faster response than traditional motor technology

The ability to accelerate an axis with Nanomotion's piezo motor technology is greatly enhanced as the inertia only comes from the moving load. Aside from an ultrasonic standing wave, there are no moving parts internal to the motor. The ability to stop (brake) and hold position with stability is also enhanced by the inherent friction of the ceramic tip working on a ceramic drive surface. These characteristics allow for optimum move and settle, along with the ultimate in position stability.

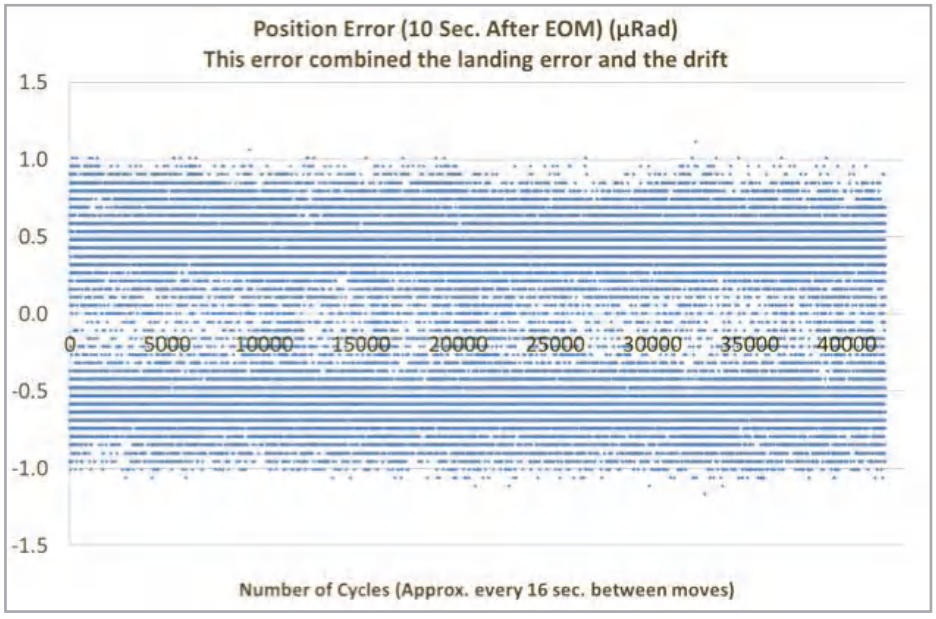


The motion profile reflects the position and velocity profile, reaching position stability at the end of the move command, settling to +/- 1 encoder count. The drift (position stability) is measured at <5nm per minute.

The ability to make more than 20 moves in 1 second, averaging 50msec, for move and settle, is demonstrated over 25 million cycles.

The motion profile below reflects the position and velocity profile, reaching position stability at the end of the move command, settling to +/- 1 encoder count. The drift (position stability) is measured at <5nm per minute.

Position Repeatability and Accuracy In The Direction of Motion



The graph above represents a test, simulating 5 years of operation service, moving 90°, 180°, 270°, 360° and back to home.

Accuracy in our normal servo mode (AC) is to 1µRad

Accuracy in our high resolution mode (DC) is to 0.1µRad

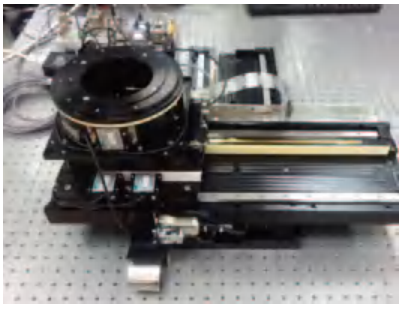
Position repeatability is to +/- 1 µRad

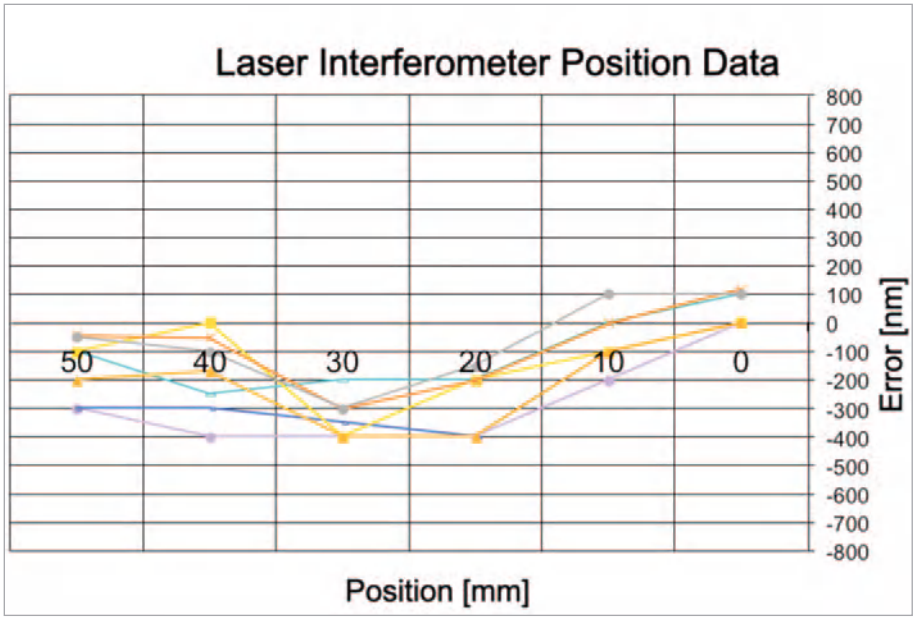
Position Repeatability and Accuracy In The Direction of Motion

There are many design and component factors that impact the ability to achieve position repeatability and accuracy.

All Nanomotion motion systems are closed loop with a position sensor. The position sensors vary in the available resolution and the absolute accuracy. In addition to the position sensors, design considerations that impact the systems stiffness, materials (thermal expansion) and bearing selection are all key factors in determining the precision of motion.

Nanomotion has extensive experience is system configurations ranging from 0.5nm resolution to 1µm resolution. Ultimately the position resolution will be a key factor in determining the position repeatability, as most systems will be repeatable to < 5 encoder counts. Actual errors in the position sensor can be factored out based on measurements with a laser interferometer or auto collimator, yielding standard accuracy in the sub-micron level and achievable accuracy in nanometer level.





Nanomotion utilizes metrology tools such as laser interferometry and auto collimators to validate all aspects of motion performance.

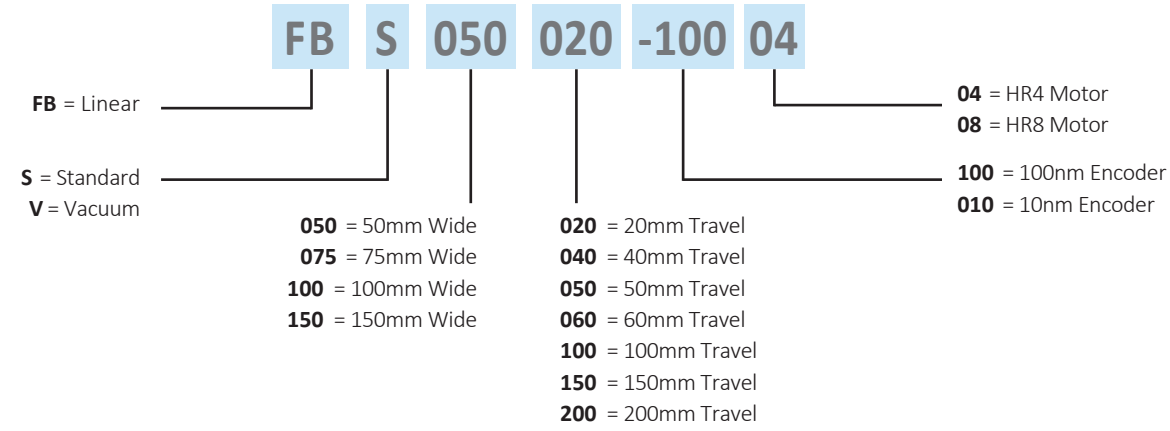
The long travel stage to the right and the graph below reflect an absolute position accuracy of 12 microns over 306mm.The position repeatability is 2 microns with a 0.1µm resolution encoder.

Increasing the encoder resolution can improve position repeatability.

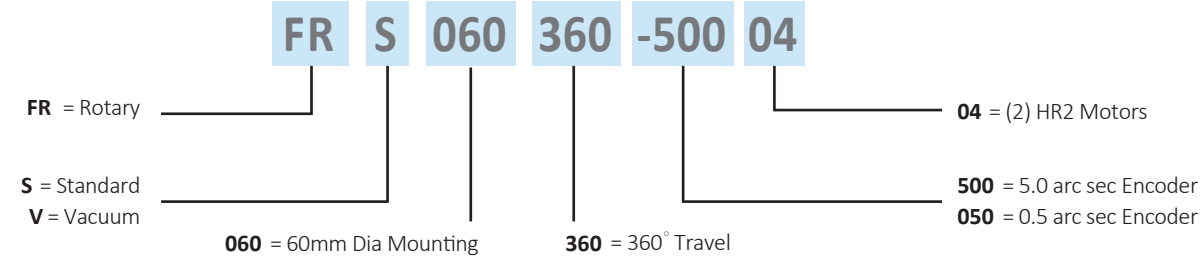
Laser error mapping can improve position accuracy by adding correction points.

How To Order

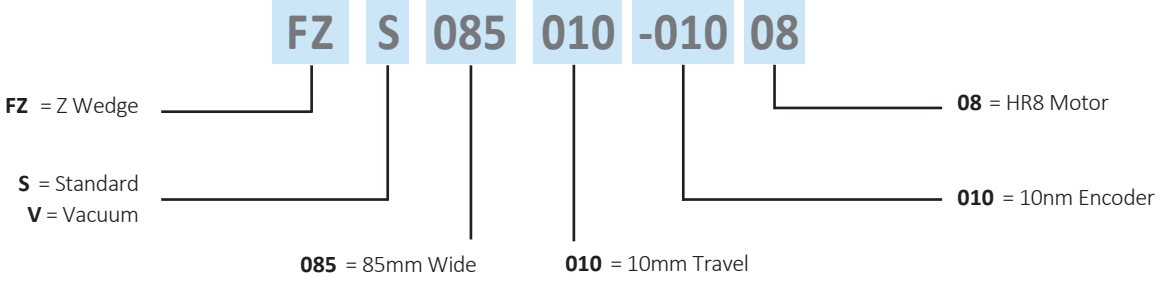
FBS050020-10004



FRS060360-50004



FZS085010-01008



NANOMOTION

A Johnson Electric Company

Motion Modules for Optronic Applications

NANOMOTION
A Johnson Electric Company

EM1-S-O

EDGE Motor

ORDERING INFORMATION

Part Number: EM1-S-0
EDGE Standard Motor

Part Number: EM1-V-0
EDGE-Vacuum Rated Motor

RELATED PRODUCTS/ ACCESSORIES

Part Number: ASIC-1E-00
ASIC Edge X 1 Driver component Open Loop

Part Number: ASIC-1E-BD-00
ASIC Edge X 1
Driver Board Open Loop

Part Number: EDGE150001-01
ASIC -1e-00 Motherboard

Part Number: ASIC-E2-00
ASIC Edge X 2 Dual Axis Controller/Driver

Part Number: ASIC-E2-BD-00
ASIC Edge X 2 Dual Axis Controller/Driver Board closed Loop

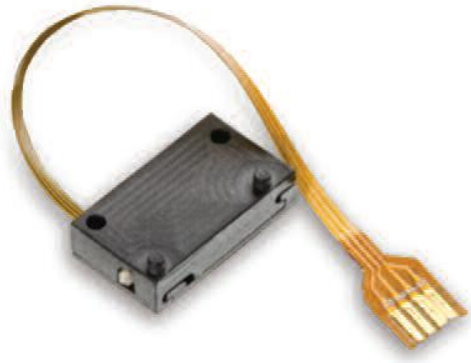
Part Number: XCD-EDGE-BD-00
XCD Edge controller/Driver Board

Part Number: XCDE150100-00
XCD-EDGE-BD-00 Motherboard

Position Repeatability and Accuracy

The EDGE motor is well suitable for a large range of applications, excelling in those where weight, form factor and power consumption are of prominence, such as:

- NUC Shutters
- Shutter & Aperture control components
- Filter changer components
- Auto Focus Modules
- Unattended Ground Sensor Modules
- Optical image Stabilization Modules
- Mirrors Positioning

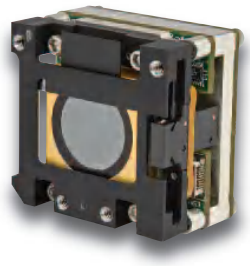


Product Description

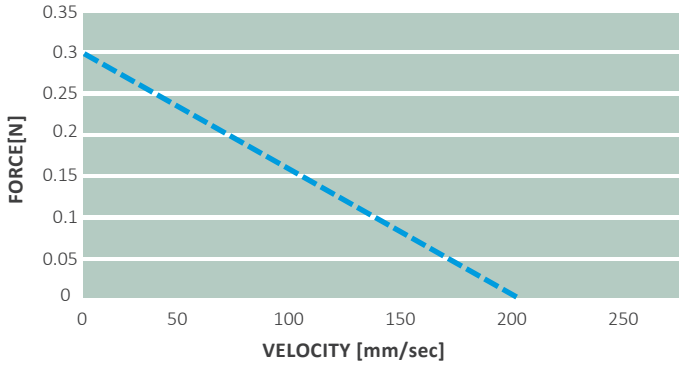
Nanomotion's Edge motor is the smallest industrial motor of its kind available in the marketplace today. Providing unlimited linear or rotary motion, the Edge motor offers extensive opportunities in applications that suit a wide range of industries. The Edge motor works with a uniquely designed, compact ASIC-based driver, and can be operated with any servo controller.The Edge can be easily integrated into most bearing structures, and is ideal for mass production opportunities.

Edge Motor Key Features:

- Extremely small dimensions
- Excellent move and settle characteristics
- Mil-rated
- ASIC drive and control
- Wide dynamic velocity range
- High resolution
- Zero backlash
- Holds position at power off
- Silent operation
- Negligible EMI



VELOCITY/LOAD CHARACTERISTICS



TECHNICAL SPECIFICATIONS

Mechanical
Weight/Mass: 0.55 gr
Dimensions: 13.5 x 7.6 x 3.15 mm

DYNAMIC

Driving Force (max): 0.32N
Velocity (max): 200 mm/sec

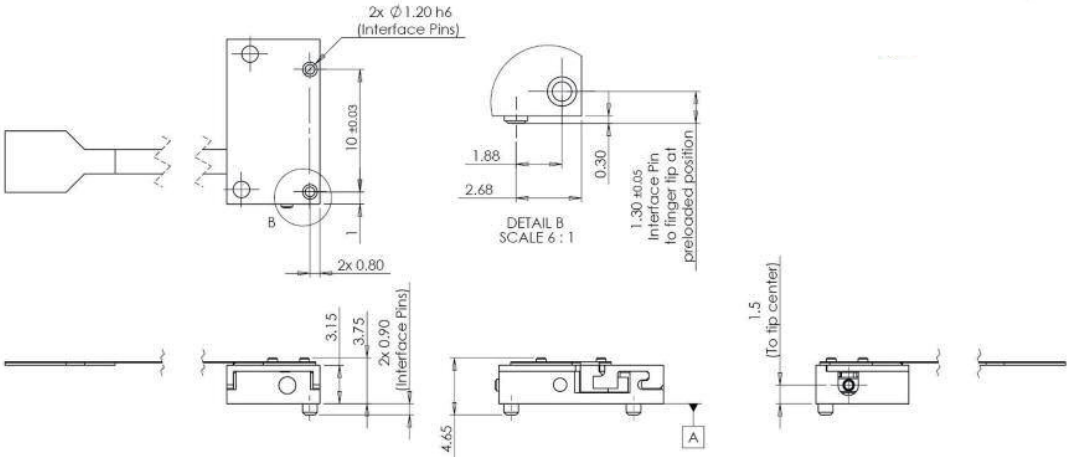
ENVIRONMENTAL

Operation Temperature:
-40 °C ÷ 80 °C
Vibrations: 10 g rms
Shock: 350 g

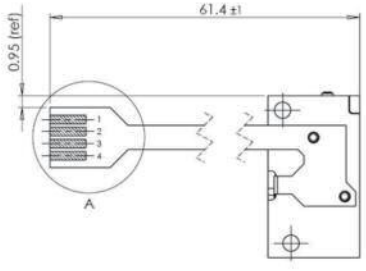
ELECTRICAL

Motor Voltage (max):
8.5 ÷ 11 V AC
Motor Current (max):
130 mA AC

MECHANICAL DRAWINGS AND INTERFACE



ELECTRICAL INTERFACE



pin number	pin name	description
1	P_1	NM MOTOR PHASE 1
2	P_2	NM MOTOR PHASE 2
3,4	COM	NM MOTOR COMMON

NANOMOTION
A Johnson Electric Company

EM4X-S-1-O

EDGE-4X Motor

ORDERING INFORMATION

Part Number: EM4X-S-1-0
EDGE-4X Standard Motor

Part Number: EM4X-V-1-0
EDGE-4X Vacuum Rated Motor

RELATED PRODUCTS/ ACCESSORIES

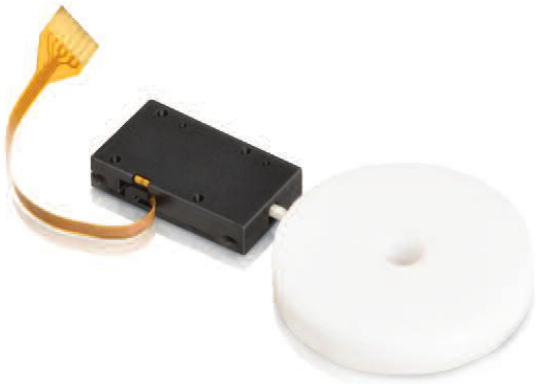
Part Number: XCD-E4X-BD1-01
Controller/Driver for 1 EDGE-4X motor

Part Number: XCD-E4X-BD2-01
Controller/Driver for 2 EDGE-4X motors in parallel

Application Recommendations

The EDGE-4X motor expands the Nanomotion's product line of low voltage piezo motors, bringing 4 times the force of the Edge motor. The EDGE-4X provides up to 1.3N force with unlimited travel for linear or rotary applications. Continuing to optimize size, weight and power, the EDGE-4X is well suited to:

- Auto Focus & Zoom Requirements
- Pan & Tilt Gimbal Drive
- Optical Image Stabilization Modules

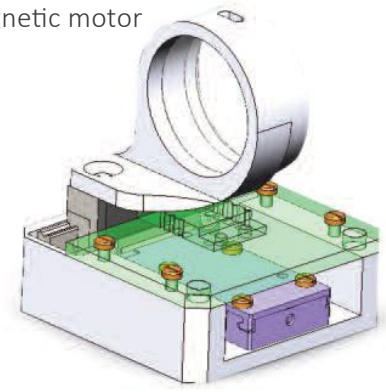


Product Description

The EDGE-4X motor offers a small footprint for unlimited linear and rotary motion. The EDGE-4X provides 1.3N max force and is capable of achieving 200mm/sec maximum velocity.The EDGE-4X can easily adapt to numerous bearing structures to provide high resolution motion control for a wide range of applications in defense optronics, semiconductor and medical markets.

EDGE-4X Moto Features:

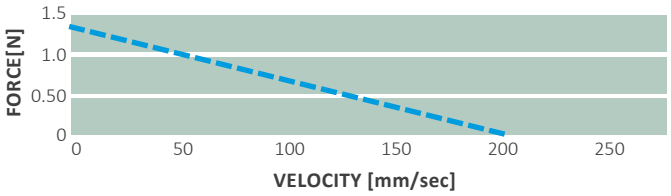
- Small operating footprint
- Wide dynamic velocity range
- Zero backlash
- Holds position at power off
- Silent operation
- Negligible EMI
- Non-magnetic motor



EDGE-4X Motor

VELOCITY/LOAD CHARACTERISTICS

Load/Speed Characteristics



TECHNICAL SPECIFICATIONS

Mechanical
Weight/Mass: 2.2g
Dimensions: 22.8 x 12.4 x 4.3 mm

DYNAMIC

Driving Force (max): 1.3N
Velocity (max): 200mm/sec

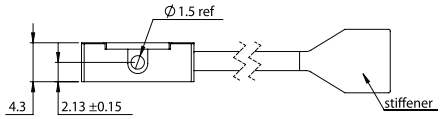
ENVIRONMENTAL

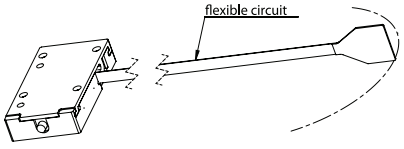
Operation Temperature:
-40℃ to 80℃
Vibrations: 10g rms
Shock: 350g, 0.8ms half sine

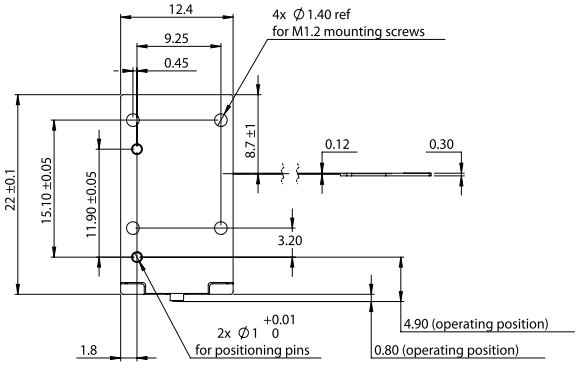
ELECTRICAL

Motor Voltage (max): 14VAC
Motor Current (max): 250mA AC
*5V DC Drive Circuitry Available

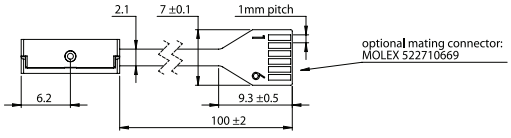
MECHANICAL DRAWINGS AND INTERFACE







ELECTRICAL INTERFACE



pin number	pin name	description
1	NTC OUT TERMI NAL RESI STOR	
2	NTC OUT TERMI NAL RESI STOR	
3	P2	NM MOTOR
4	P1	NM MOTOR
5	COM	NM MOTOR COMMON

NANOMOTION
A Johnson Electric Company

RS08B

Rotary Shutter

Product Features

- Silent operation – undetectable
- Best SWaP Performance
  - Mass: 2g
  - Embedded drive & control in shutter body
- Holding and braking without power consumption
- Compliant for shock, vibration, and temperature applications
- OEM blade & cable/connector configurations available

Optronic Systems

- Thermal Imaging Shutter (NUC)
- Laser Shutter
- Filter Changer

ORDERING INFORMATION

Shutter Part Numbering

RS08B	Travel	XXX	-00
		OAA (Standard) OKA (No Blade)	
	35°		
	45°		
	55°		
	70°		
	90°		
	120°		

ORDERING EXAMPLE

RS08B	055	OAA	-00

RS08B with 55 deg travel, standard blade

EVALUATION KIT PART NUMBERING

RS08B	-EVAL	Travel

RS08B -EVAL 55

Product Description

The RS08B is the next generation rotary shutter from Nanomotion, utilizing a silent motor drive, in an 8mm x 20mm package. The RS08B is designed to operate from a 3.3v battery and supports a wide range of angular travel up to 120°.

The RS08B has an internal, magnetic absolute position sensor, allowing full travel between soft stops, after calibration. The connector in the base of the shutter provides flexibility for users to configure various cable lengths and mating connections to a device.

Shutter blades can be configured based on specific requirements, incorporating the physical hard stop into the blade. This allows for the entire shutter body to be self-contained as a stand-alone unit.

MECHANICAL DRAWINGS AND INTERFACE

TECHNICAL SPECIFICATIONS

Mechanical

- Weight: <3g (based on standard blade)
- Dimensions: 8mm x 20mm Long

Performance ⌀

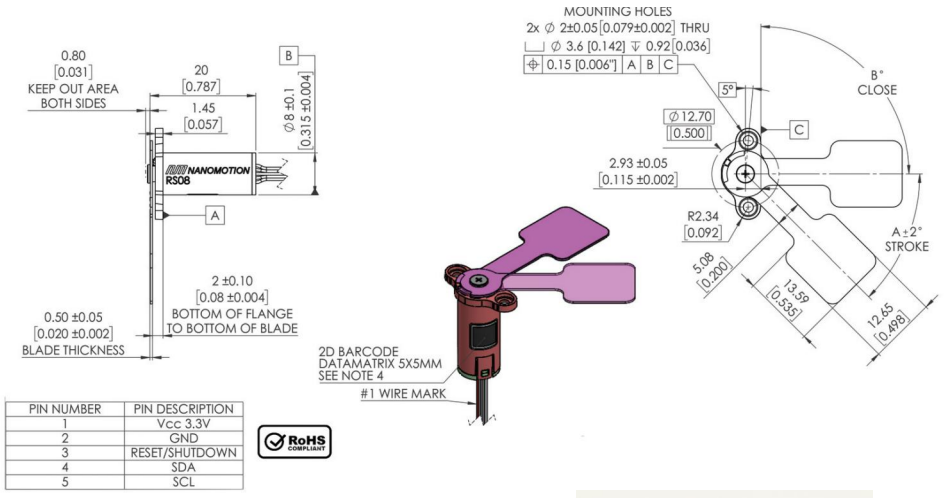
- Drive Mode: Closed Loop
  - Position and Velocity Control
- Stroke Angles: selectable to 120˚
- Operating Temperature: -40˚C to 70˚C

ELECTRICAL

- Drive Voltage: 3.3V
- Max Power Consumption: 800mW
- Typical Power Consumption: 400mW
- Idle (on): 10mW

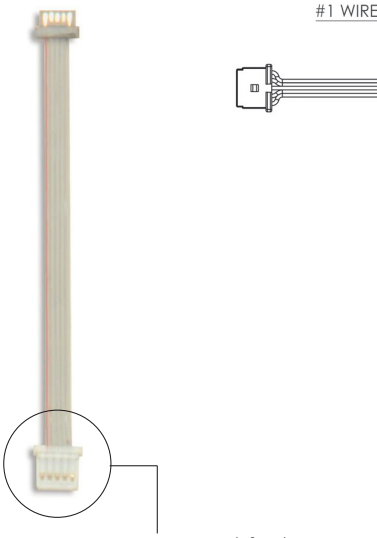
Communication

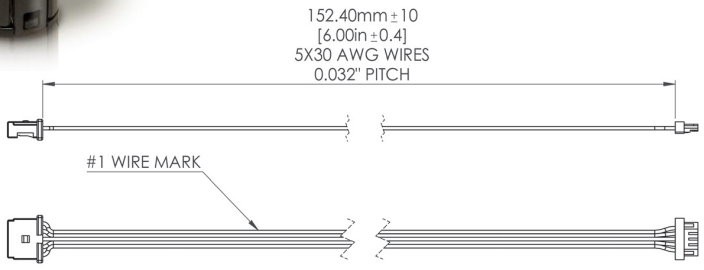
- IIC



PIN NUMBER	PIN DESCRIPTION
1	Vcc 3.3V
2	GND
3	RESET/SHUTDOWN
4	SDA
5	SCL

RoHS COMPLIANT





Customer defined connector
can be supplied

#	Hirose P/N	Description
1	DF52-5S-0.8H	RECEPTACLE
2	DF52-5P-0.8C	PLUG CONNECTOR
3	DF52-2832 PCF	CRIMP CONTACT

NANOMOTION
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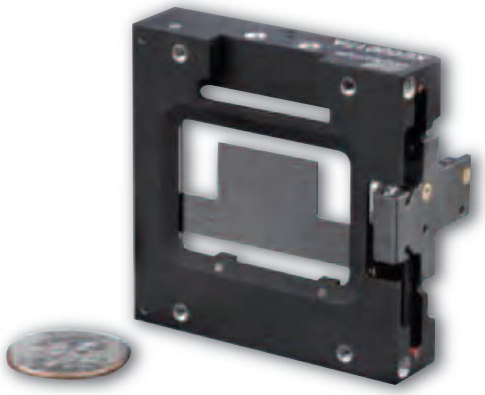
S787 NUC Shutter

Application Recommendations

- NUC Shutters for thermal sensors



ORDERING INFORMATION

Part Number: S787ARSHTR-00

RELATED PRODUCTS/ ACCESSORIES

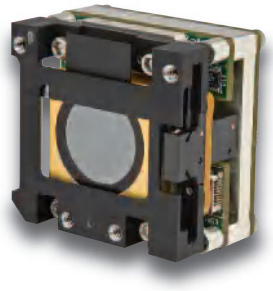
Part Number: ASIC-1E-01

ASIC Drive/Control Component for S787 Shutter

Product Description

Nanomotion's S787 series of NUC shutter is designed to meet the most challenging operating conditions of infrared imaging systems. The S787 shutter operates linearly with a direct drive EDGE motor, providing the lightest weight configuration while maintaining the closest proximity to the FPA.

The S787 series is provided with a 17 mm x 15mm leaf that is capable of moving 15mm in 100mseconds.The moving blade is supported by the Edge – Actuator bearing structure on one side and an outboard shaft bearing to eliminate any blade deflection and vibration Standard configurations utilize Nanomotion's Edge motor with a miniature position sensor, integral to the shutter assembly, for closed loop operation. The shutter is supported by our ASIC that closes the position loop and serves as a drive & control.



Example of S787 NUC Shutter

TECHNICAL SPECIFICATIONS

Mechanical
Weight: 15 gr
Dimensions:
Aperture area: 14.7 x 17.0 mm
Moving mass of 1.5 gr
Back working distance: 2.2 mm

PERFORMANCE

Driving Force (max): 1.3N
Velocity (max): 200mm/sec

ENVIRONMENTAL

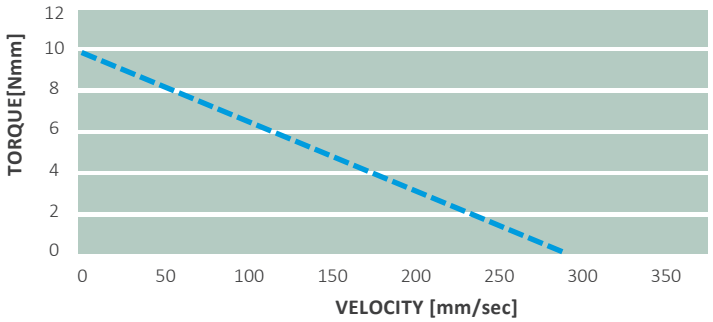
Operation Temperature:
-40℃ to 80℃
Vibrations: 10g rms
Shock: 350g, 0.8ms half sine

ELECTRICAL

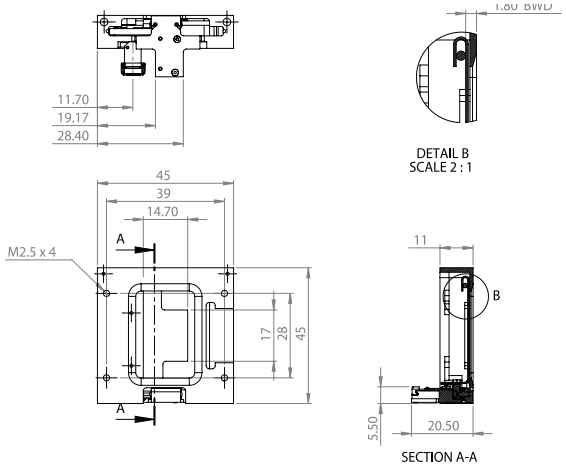
Motor Voltage (max): 14VAC
Motor Current (max): 250mA AC
*5V DC Drive Circuitry Available

VELOCITY/LOAD CHARACTERISTICS

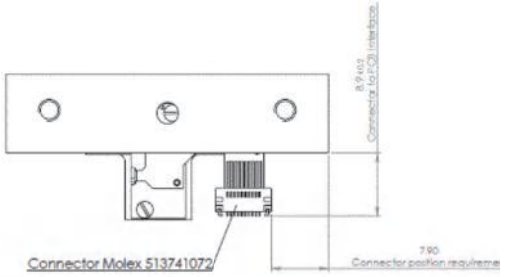
Load/Speed Characteristics

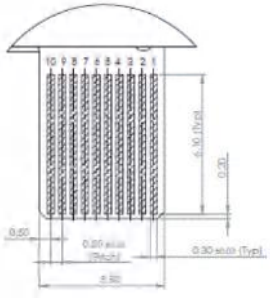


MECHANICAL DRAWINGS AND INTERFACE



ELECTRICAL INTERFACE





pin number	pin name	description
1	NC	DISCONNECTED
2	SC_1	PR1 COLLECTOR
3	GND	GROUND
4	SA_1	PR1 ANODE LED
5	COM	NM MOTOR COMMON
6	P_2	MN MOTOR PHASE 2
7	P_1	NM MOTOR PHASE 1
8	SA 2	PR2 ANODE LED
9	GND	GROUND
10	SC_2	PR2 COLLECTOR

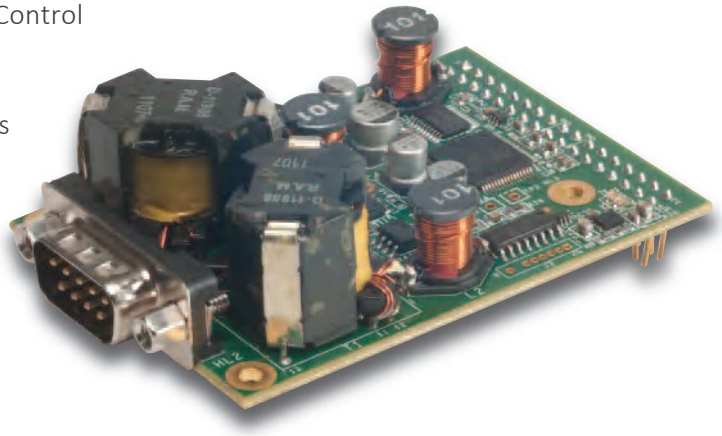
NANOMOTION
A Johnson Electric Company

XCD-HRx-BD-01

Drive and Control

Application Recommendations

- Auto Focus/Zoom Modules
- Shutter & Aperture Control
- Filter Changers
- Pan and Tilt Modules
- OEM stages



ORDERING INFORMATION

Part Number: XCD-HR1-BD-01
XCD-HR2-BD-01
XCD-HR4-BD-01

RELATED PRODUCTS/ ACCESSORIES

Part Number: HR1-1, HR2-1, HR4-1 Motors

Part Number: XCDH150100-00 XCD HR Motherboard Assembly

Product Description

Nanomotion's XCD – Drive & Control redefines the art of miniaturized drive and control electronics with the smallest hardware for operating piezo ceramic servo motors. The XCD provides complete servo control for the OEM market, coupled with the power stage and drive electronics on one board. XCD will have an OEM specific, motherboard for connecting to the motor, position sensor, power and communication.

The XCD for ST/HR motors is provided as a single axis board which can drive the ST, HR1,HR2,or HR4 motor.The XCD can operate in the 'AB5' mode with brake on/off, or in the more traditional AB1A mode.The XCD for ST/HR motors accepts a differential quadrature encoder signal and is programmed via an IIC interface and the Nano-Commander user software.

TECHNICAL SPECIFICATIONS

Mechanical
Dimensions: 52mm x 72mm x 26.4mm

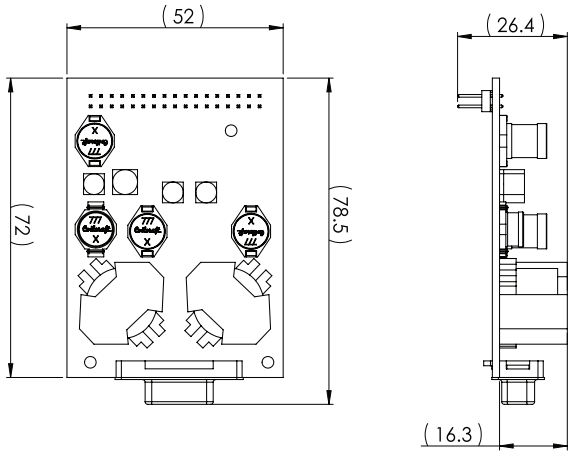
PERFORMANCE

- Motors supported: HR1, HR2, HR4
- Drive mode : AB5 , AB1
- Support AQB sensor (Differential Single ended 5V)
- Communication: SPI slave, Uart (LVTTL)
- Safety : Limit switches , motor interlock, Emergency
- 2 x input TTL (5v/3.3v)
- 2 x output LVTTL (3.3v)
- 3 x Analog input: NTC , Joystick , Potentiometer (Ain range: 0V to 3.3V)
- 2 x Analog out (pwm)

ELECTRICAL

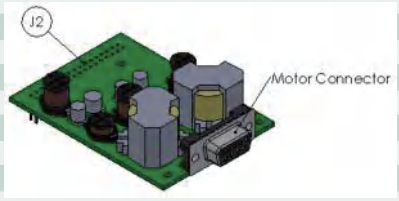
Drive voltage: 12V
Power consumption: 13W

MECHANICAL DRAWINGS AND INTERFACE



ELECTRICAL INTERFACE

pin number	Main Connector		Motor Connector	
	pin name	pin description	pin name	pin description
1	+12v	12vdc power input	gnd	system ground
2	+12v	12vdc power input	n. c.	not connected
3	spi_clk	spiclock	motor _up	high voltage
out put				
4	spi_en	spienable	motor _common	high voltage
out put				
5	miso	master in slave out	motor _down	high voltage
out put				
6	mosi	master out slavein	motor _connected	input
7	rxd	rs232 receive	shield	inner shield
8	txd	rs232 transmit	n. c.	not connected
9	gnd	system ground	n. c.	not connected
10	gnd	system ground		
11	sda	i2c serial data		
12	scl	i2c serial clock		
13	gpi01	general purpose digital input 1		
14	gpi02	n/a		
15	gpi03	general purpose digital output 3		
16	gpi04	general purpose digital output 4		
17	an1	analog input 1		
18	an2	analog input 2		
19	anlg_out 1	analog input 1		
20	an3	analoo input 3		
21	anlg_ou2	analog 0uput 2		
22	emer gency	emergency stop		
23	+5v	5vdc power out		
24	pwm_out	keep alive		
25	a+	incremental signals		
26	limit _sw_left	limit switch left		
27	a-	encoder incremental signals		
28	limit _sw_right	limit switch right		
29	b+	encoder incremental signals		
30	index+	encoder reference mark/positive signal		
31	b-	incremental signals		
32	index-	encoder reference mark/negative signal		

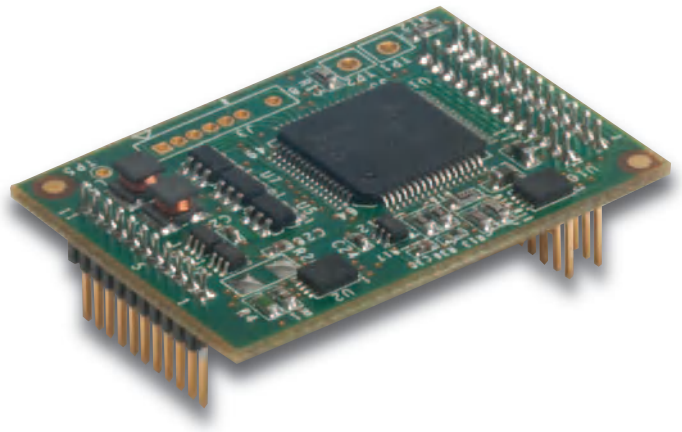


NANOMOTION
A Johnson Electric Company

XCD-EDGE-BD-03 Drive and Control

Application Recommendations

- Auto Focus/Zoom Modules
- Shutter & Aperture Control
- Filter Changers
- Pan and Tilt Modules



ORDERING INFORMATION

Part Number: XCD-EDGE-BD-03
Drive and Control

RELATED PRODUCTS/ ACCESSORIES

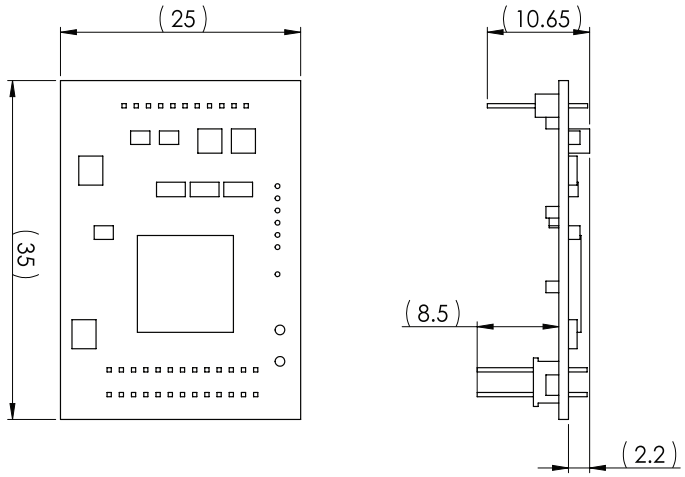
Part Number: EM1-S-0
EM1-V-0
EDGE motor
Part Number: XCDE150100-00
XCD EDGE Motherboard Assembly

Product Description

Nanomotion's XCD – Drive & Control redefines the art of miniaturized drive and control electronics with the smallest hardware for operating piezo ceramic servo motors. The XCD provides complete servo control for the OEM market, coupled with the power stage and drive electronics on one board. XCD will have an OEM specific, motherboard for connecting to the motor, position sensor, power and communication.

The XCD for the Edge motor is provided as a single axis board which can operate in the 'AB5' mode with brake on/off, or in the more traditional AB1A mode. The XCD for the Edge motors accepts a single ended encoder signal and is programmed via an IIC interface and the NanoCommander user software.

MECHANICAL DRAWINGS AND INTERFACE



TECHNICAL SPECIFICATIONS

Dimensions:
35.0 x 25.0 x 10.65 mm
Motors supported : EDGE
Input Power: 5 V
Drive Mode AB5
(brake on/off) or AB1A mode
Communication IIC
Operating Temperature:
-40 to 85 ℃

ELECTRICAL

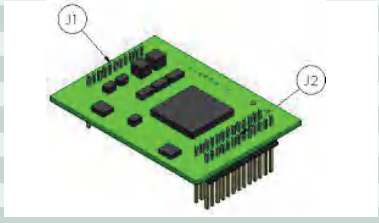
Power Consumption:
500 mW (max)

ELECTRICAL INTERFACE

J2 Main Connector

pin number	pin name	pin description
1	+5v	5vdc pc:mer input
2	+5v	5vdc pc:mer input
3	spi clk	spiclock
4	spi en	spienable
5	miso	master in slave out
6	mosi	master out slavein
7	n.c.	nc(conected
8	n.c.	not conected
9	rxd	rs232 receive
10	txd	rs232 transmit
11	sda	12c serial data
12	scl	12c serial clock
13	gpi01	ppw
14	gpi02	n/a
15	gpi03	general purpose digital output 3
16	gpi04	general purpose digital output 4
17	an2	analog input 1
18	an1	analog input 2
19	emergency	emeroencv stop
20	an3	analoo input 3
21	anlg out2	analog 0uput 2
22	anlg out1	analog 0uput 1
23	n.c.	n/a
24	pwm out	keep alive
25	gnd	system ground
26	gnd	svstem oround

+5v	5vdc power out
a	encoder incremental signals
b	encoder incremental signals
index	encoder reference mark
gnd	system ground
urn it sw right	limit switch right
lim sw len	limit switch len
gnd	svstem ground
p1	mc(or phase 1
com	mc(or common
p2	mc(or phase 2



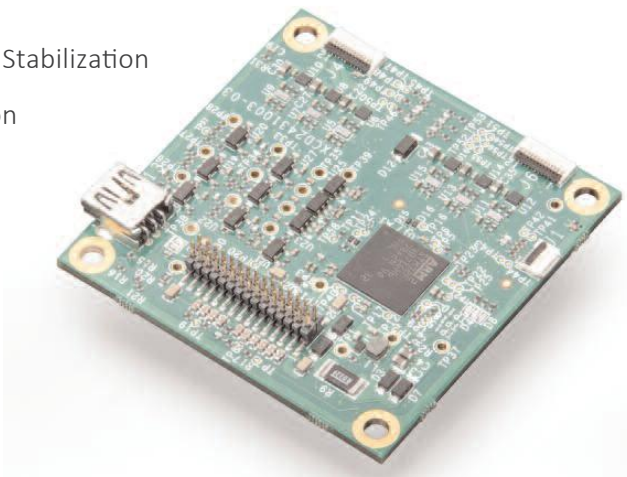
NANOMOTION
A Johnson Electric Company

XCD2

Dual Axis Drive and Control

Application Recommendations

- Auto Focus/Zoom Modules
- Pan & Tilt Gimbal with Gyro Stabilization
- Beam Steering & Stabilization
- Target Acquisition Devices



ORDERING INFORMATION

Part Number: XCD2150003-02
(main board)

RELATED PRODUCTS/ ACCESSORIES

Communication Host Adaptor Boards:
XCD215002A-00
RS232/485 HOST adapter
XCD215002B-00
General HOST adapter
XCD2150002C-00
USB to UART/SPI/I2C adapter

Motor Adaptor Boards:
XCD215002A-00
RS232/485 HOST adapter

Encoder Interface Boards
- A Quad B
- BiSS encoder

Product Description

XCD2 Multi axis amplifier & control board is a dual axis OEM amplifier and control board designed for applications using the Edge & Edge -4X motors. The board level product serves as a dual axis controller and can support a mixture of motor configurations, with multiple Edge motors or multiple Edge-4X motors per axis.

The XCD2 also supports Nanomotion's gyro input for dual axis stabilization. The XCD2 is programmed via IIC and can support quadrature (incremental) encoder input as well as BiSS (absolute) encoder input.

The XCD2 supports 2 axes of motion in the AB1 or AB5 mode of operation. It is an advanced 32 -bit ARM 168MHz floating point processor with a configurable servo rate, up to 20KHz.

Communications via UART, I2C, SPI and USB are supported, along with an embedded gyro interface using the SPI port.

Advanced I/Os with (8)GPIO, (16) ADC and (2) DACs, with configurable parameters.

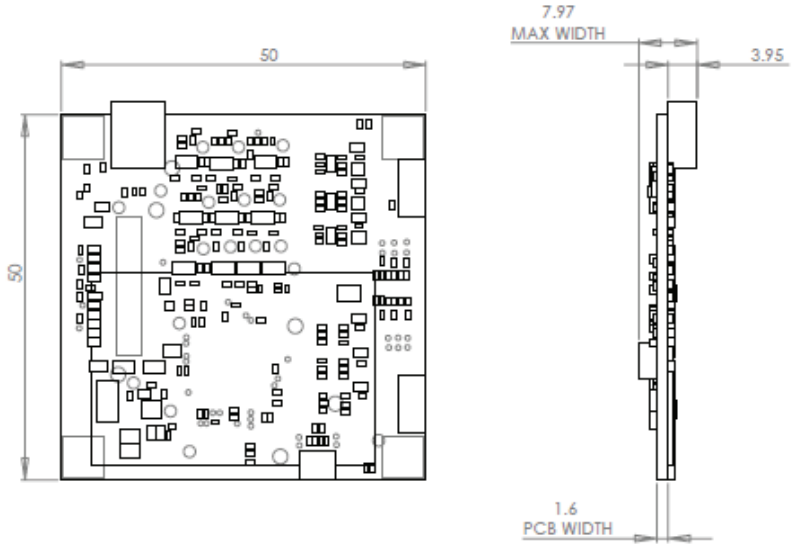
MECHANICAL DRAWINGS AND INTERFACE (Dimensions in mm)

TECHNICAL SPECIFICATIONS

Mechanical
Dimensions: 50mm x 50mm

PERFORMANCE

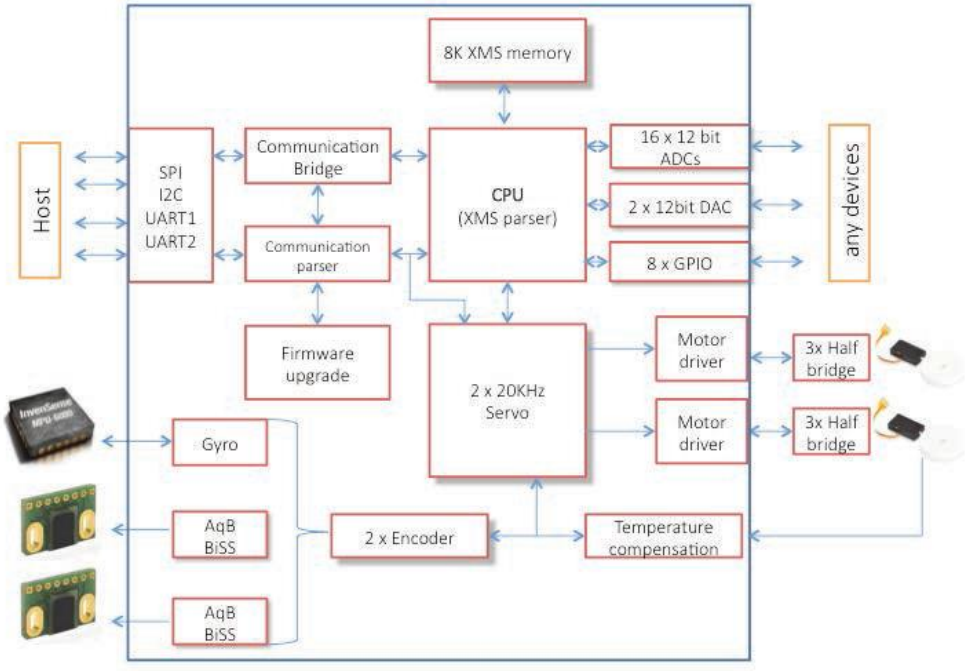
- Motors Supported: 1, 2, 3, or 4 Edge Motors per axis
- 1 or 2 Edge-4X Motors per axis
- Drive mode : AB1 or AB5 (Brake on/off)
- Communication: IIC, UART, SPI and USB
- Operating Temperature: -40˚C to 70˚C



POWER CONSUMPTION

Input: 5V 5% tolerance
CPU: 100mA
Edge-4X: 300mA per motor
Edge: 100mA per motor
Inputs & Outputs are 3.3V

BLOCK DIAGRAM

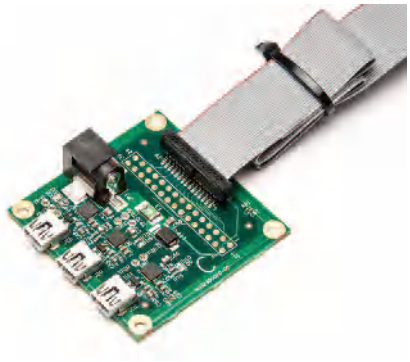


POWER STAGE & CONNECTION OPTIONS

The XCD2 drive/control board offers a variety of options to connect:

- Host Adapter Board
- Motor power stage
- Incremental or Absolute Encoders
- Gyro (Nanomotion defined)

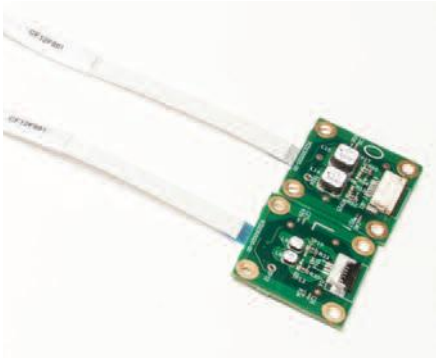
HOST ADAPTER BOARD



The host adaptor board provides an easy way to connect to the XCD2 main board. A standard header connector has pin to pin connection to HOST connector and has the same signals as the small HOST connector. In additional the board has a power jack connector to supply 5V.

Three boards are available:

- A – RS232 and RS485 communication interfaces
- B – Contains pin to pin connection between the HOST connector and a 100mill header
- C – I2C, SPI and UART communication interfaces

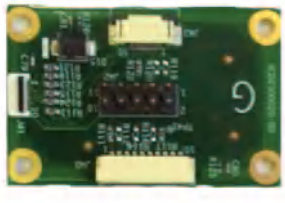


MOTOR POWER STAGE

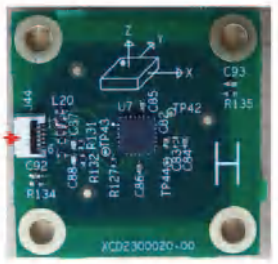
The XCD2 is designed to work with Nanomotion's Edge and Edge-4X motors. The controller can support two axes with any configuration of 1 through 4 Edge motors and 1 to 2 Edge-4X motors.
Each power stage board is available with standard flat ribbon cables and connectors.

ENCODER INTERFACE

The XCD2 supports either an incremental, A-quad-B encoder or an absolution, BiSS encoder. Both connection boards are available.



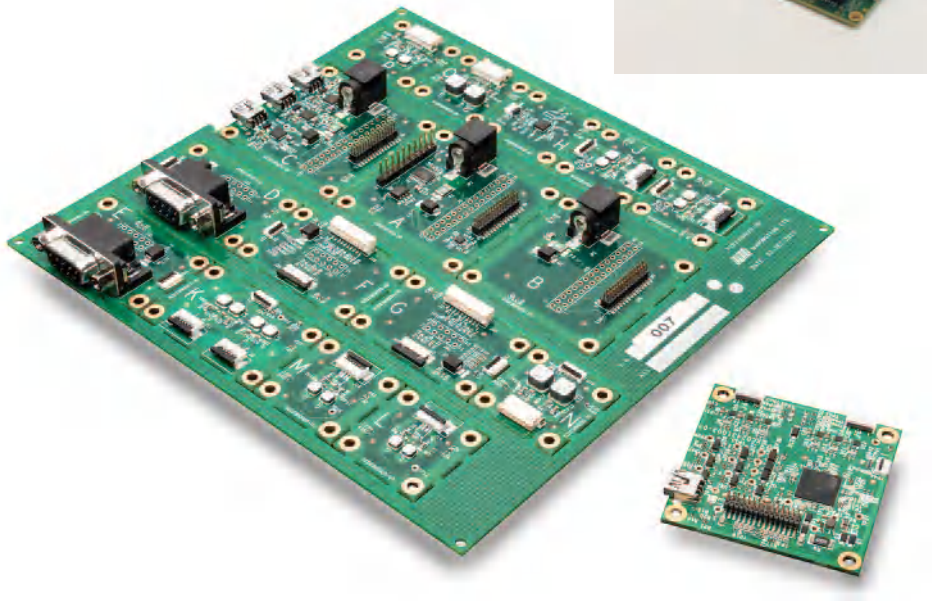
GYRO INTERFACE



The embedded gyro interface uses the SPI port and provides (8) stabilized presets allowing for easy transition between modes (encoder + gyro).
The gyro interface only supports the InvenSense MPU-6000 gyro.

BLOCK DIAGRAM

For application development, Nanomotion offers a variety of development kits that consist of both motor/mechanical axes and the various board configurations. Nanomotion can also supply a single XCD2 board, providing all of the component options, in a 'snap-off' board configuration, allowing flexibility to change between power stage, encoder choices and communications.
Most applications ultimately lead to the integration of our XCD2 chip or power stage being integrated into customer electronics, to save space. However, all applications can be supported through the use of various evaluation boards and even custom production board based on specific requirements.



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Servo Dynamics

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