

X-ASR Series User's Manual

Motorized XY microscope stages with built-in controllers



Zaber's products are not intended for use in any critical medical, aviation, or military applications or situations where a product's use or failure could cause personal injury, death, or damage to property. Zaber disclaims any and all liability for injury or other damages resulting from the use of our products.

Zaber's motion control devices are precision instruments and must be handled with care. In particular, moving parts must be treated with care. Avoid axial loads in excess of the rated thrust load, axial and radial impact, dust and other contaminants and damage to the drive components. These will reduce the performance of the device below stated specifications.

Zaber's motion control devices are precision instruments and must be handled with care. In particular, moving parts must be treated with care. Avoid axial loads in excess of the rated thrust load, axial and radial impact, dust and other contaminants and damage to the lead screw thread. These will reduce the performance of the device below stated specifications.

Noise Emissions

The A-weighted emission sound pressure level (SPL) of this device does not exceed 70 dB(A) during intended use.

The A-weighted emission sound pressure level (SPL) of this device may reach up to 79 dB(A) if the stage is stalled.

- Fixed width type indicates communication to and from a device. The ↵ symbol indicates a carriage return, which can be achieved by pressing enter when using a terminal program.

We recommend using [Zaber Console](#) to communicate with the device(s). For other software options, see the [Software](#) page. Please refer to the [Protocol Manual](#) for more detailed information on the available commands.

Initial Set-up



- Daisy chain all integrated devices and controllers together using the RS-232 "Prev" and "Next" connectors (see [Daisy-Chaining Devices](#) for more details).
- Next, supply power to one or more devices. Many products share power through the daisy-chain cables. The green power indicator on each should light up.
- Turn the knob to move a positioner. Most positioners will only move in one direction until they reach a home sensor at one limit of travel. Then they will move in both directions over full travel.
- Download and install [Zaber Console](#). Start Zaber Console.
- Select the communications port the first controller is connected to. For instructions on how to find the available communication ports on your system, please refer to: [Appendix A - Available Communications Ports](#).
- If multiple devices are detected, Zaber Console may prompt you to **renumber** them. The first device in the chain (closest to the computer) will become Device 1, the next will become Device 2, and so on.

Initialization

Every time the device is powered up or reset, you should return the positioner to the home position. This is achieved by sending the **home** command to the individual device or all devices. Until this is done, most positioners will only allow motion in one direction, towards the sensor.

If it is not possible in your application to home the positioner after every power-up, see the [tools parking](#) command. Parking allows the device to be turned off and then used at a later time without first having to home the axes.

Using the Device

Several commonly used ASCII commands are shown below. For a full list of available commands, please refer to the [Protocol Manual](#).

| Command | Description |
|---------------------------|--|
| /1 1 get pos ↵ | Query the current position of Device #1 Axis #1. |
| /1 1 move abs 10000 ↵ | Move Device #1, Axis #1 to position 10000 microsteps. |
| /2 1 move rel -12800 ↵ | Move Device #2, Axis #1 in the negative direction by 12800 microsteps. |
| /1 stop ↵ | Decelerate and stop ALL axes on Device 1. An axis number of 0 or no axis number implies all axes on the device, or the device itself. |
| /move vel 153600 ↵ | Move ALL devices and ALL axes in the positive direction at the speed 153600. A device address of 0 or no device address implies all devices in the chain. |

Modifying Device Settings

Here are some examples if you would like to customize particular device or axis settings. Refer to the [Protocol Manual](#) for detailed descriptions of each setting.

| Command | Description |
|-----------------------------|--|
| /1 set maxspeed 100000 ↵ | Set the speed of all axes on the device. |
| /1 get maxspeed ↵ | Query the maximum speed of all axes on the device. |
| /1 system restore ↵ | Restore all the settings of Device 1 to the default. |

Firmware Updates

In order to allow access to new features and bug fixes, this Zaber device can be updated remotely through Zaber Console. Follow instructions here to update: www.zaber.com/FirmwareUpdate

Connectors

All images are shown looking into the device.

Power

| Pin | Description |
|-----|--|
| 1 | 24 - 48 V |
| 2 | GND (Note: Zaber's power supplies ground this pin to AC Earth) |

Note: To prevent damage to the device due to static buildup, the device should be properly grounded. The power supplies Zaber provides for X-Series devices are non-isolated and thus ground the device chassis to Earth via the negative terminal of the power supply. If for any reason you are using an isolated power supply, please ensure your device is grounded by connecting the negative terminal of the power connector to AC Earth.

RS-232 Communications

| Pin | Previous | Next |
|-----|-----------------|-----------------|
| 1 | Power (max 4 A) | Power (max 4 A) |
| 2 | Ground | Ground |
| 3 | Receive | Transmit |
| 4 | Transmit | Receive |

Default Settings

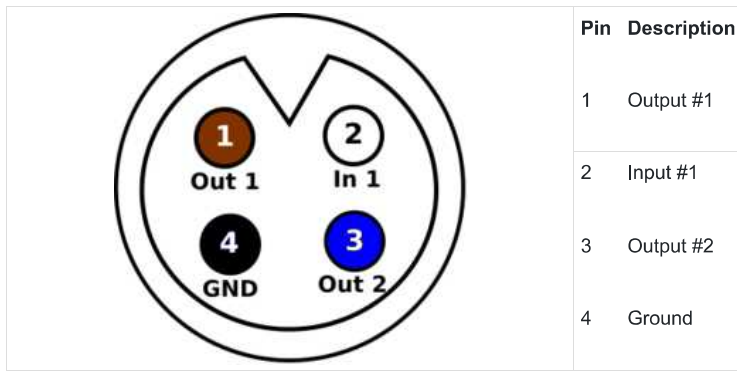
- Baud rate: 115200
- Protocol: Zaber ASCII

Specifications

- Supported Protocols: Zaber ASCII
- Supported baud rates: 9600, 19200, 38400, 57600, 115200
- Bits: 8
- Parity: None
- Stop Bits: 1

- Flow Control: None

D12 IO pinout



Note: See [I/O Usage and Examples](#) for additional information.

Indicators

Green (Device) - Power

- On: Controller is operational.
- Blinking twice per second: The power supply voltage or controller temperature is out of range.

Red (Device) - System Error

- On/blinking: An error has occurred. Please contact [Zaber Technical Support](#).

Yellow (Device) - Communication

- On: Data is being transferred.
- Blinking twice per second: Packet corruption has occurred for ASCII commands sent with a checksum.

Yellow (Axis) - Axis Status

- On: Axis is moving.
- Blinking: Axis is under manual control via the knob (in Velocity mode). The blinking rate is proportional to movement speed.

Blue (Axis) - Warning/Error

- Blinking twice per second: Driver is disabled due to over-temperature, out-of-range voltage or other driver fault; or due to user request. See [Fx Warning Flags](#).
Note: This may occur for a few seconds on power-up as device initializes.
- Fading in and out slowly: The axis is parked. See the [tools parking](#) command.

The X-ASR can be connected to a computer as follows:

- Plug the M8 to USB adaptor ([X-USBDC](#)) into one of your computer's USB ports, then attach the device to the adaptor. You may need to use a cable extension to reach your computer. There is no need to power down or reboot the computer.
- Connect the power plug of your power supply to the power connector of the device. The green LED should light up indicating the device has power.
- Additional devices can simply be daisy-chained to the first. See [Daisy-Chaining Devices](#) below.
- Install software from the [Software](#) page. For the initial setup, using [Zaber Console](#) is recommended.



As a simple first test, try entering:

```
/renumber↵  
/1 home↵  
/1 move rel 10000↵
```

The parameter of 10000 in the move command above specifies 10000 microsteps. To see the microstep size (default resolution) for the positioner and how it translates to displacement, first go to the [product overview](#) page, find your product, click through to the product's webpage, and click on the "Series Specs" tab. The microstep size (default resolution) will be shown in the list of product specs either in the "Group Specifications" section or the "Comparison" section.

Daisy-Chaining Devices

Multiple devices can be connected together in a chain through the Prev and Next connectors. This allows any number of devices to be controlled from a single connection to a computer, reducing cabling demands. In addition, X-Series devices carry power through the daisy chain, so in most cases a power supply only needs to be connected to one device in the chain. Whenever a device is added or removed from a chain, a **renumber** command should be sent to prevent device-address conflicts.



To daisy-chain X-Series devices with A-Series devices:

- Ensure all devices are set to the same baud rate and the A-Series devices are using the ASCII communication protocol before connecting them.
- Connect any X-Series devices at the start of the chain (closest to the computer). This configuration will reduce the number of adaptor cables required.
- Connect a **T-XDC** (or **S-XDC** for daisy-chaining an A-MCB2) adaptor cable to the Next port of the last X-Series device in the chain, and to the Prev port of the A-Series device.
- Power supplied to an X-Series device will not be transmitted to any A-Series devices in the chain.
- Contact [Zaber Technical Support](#) for assistance selecting connecting cables when daisy-chaining multiple series.

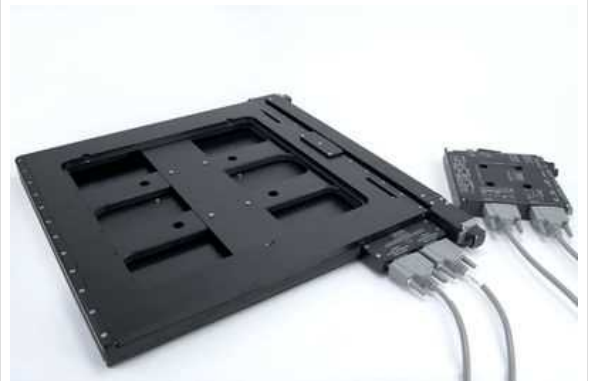
Shipping Plate Removal

The (X-)ASR205B205B and (X-)ASR305B305B stages are fitted with sheet metal plates to prevent shock loads from the stage during shipping. Follow the instructions below to remove the shipping plates.

Instructions

1. Connect the stage to a controller.

(X-)ASR305B305B



2. Remove the 8 M3 screws securing the shipping plates to the base and mid-plates as shown.



3. With these screws removed, use the controller to move the upper-axis in order to gain access to the screws on the underside of the top-plate as shown.



4. Remove the two screws holding the upper-axis shipping plate to the underside of the top plate. Move the upper-axis in the opposite direction in order to access and remove the two screws under the opposite side of the top-plate. Slide the upper-axis shipping plate out and set it aside.



5. Repeat the same procedure for the lower-axis shipping plate. Move the lower-axis to gain access to the 4 screws holding the lower-axis shipping plate to the underside of the mid-plate. When all 4 screws are removed, remove the plate. The stage is now ready to be installed and used.



Mounting

The (X-)ASR050B050B and (X-)ASR100B120B stages are mounted using adaptor plates. The (X-)ASR205B205B and (X-)ASR305B305B mount directly to compatible microscopes and use adaptor plates only for breadboard mounting. The following adaptor plates are currently available:

| (X-)ASR100B120B | (X-)ASR050B050B | (X-)ASR205B205B / (X-)ASR305B305B |
|---|---|---|
| AP110 - for mounting to standard M6 or 1/4"-20 breadboards. | AP137 - for mounting to standard M6 or 1/4"-20 breadboards. | AP160 - for mounting to standard M6 or 1/4"-20 breadboards. |
| AP111 - for mounting to Leica, Zeiss and Olympus microscopes. | | |
| AP114 - for mounting to Nikon inverted microscopes. | | |
| AP125 - for mounting to Olympus BX upright microscopes. | | |
| AP131 - for mounting to Olympus IX inverted microscopes. | | |

For more details about these adaptor plates, please see our [accessory page](#).

The adaptor plates are attached to the (X-)ASR using 2 or 3 M3 screws per plate. To install the adaptors, align them as shown in the pictures below and tighten the M3 screws. The stage will need to be plugged into the controller so that you are able to move the lower axis and gain access to the screw holes.

| Instructions | (X-)ASR100B120B |
|---|--|
| 1. Position the lower axis such that you have access to the adaptor plate mounting screw holes. |  <p>ADAPTOR PLATE MOUNTING SCREW HOLES</p> |
| 2. Place an adaptor plate underneath the (X-)ASR base. |  <p>ADAPTOR PLATE</p> |
| 3. Install and tighten the M3 screws. |  <p>M3 SCREWS</p> |

The (X-)ASR205B205B and (X-)ASR305B305B stages mount directly to the following microscopes:

- Olympus MX61
- Nikon L200N
- Nikon L300N

Custom adaptor plates are available upon request. Please contact Zaber technical support at 1-888-276-8033 or contact@zaber.com for more information.

Most of the information you will need to operate the stage using the X-MCC controller can be found in the [X-MCC User Manual](#). The sections below provide some additional information that is specific to the (X-)ASR stages.

(X-)ASR Inserts

The different (X-)ASR stages accept the following size inserts:

| Stage | Insert size |
|-----------------|--------------|
| (X-)ASR050B050B | 82 x 82 mm |
| (X-)ASR100B120B | 160 x 110 mm |
| (X-)ASR205B205B | 219 x 219 mm |
| (X-)ASR305B305B | 300 x 300 mm |

The following inserts are currently available:

| (X-)ASR050B050B | (X-)ASR100B120B | (X-)ASR205B205B | (X-)ASR305B305B |
|---|---|--|--|
| AM141 - for holding 30-60mm petri dishes | AM108 - for holding various petri dishes or microscope slides | AM152 - solid aluminum insert | AM153 - solid aluminum insert |
| AM142 - for holding 1" x 3" microscope slides | AM109 - for holding various multiwell plates | AM154 - M6 x 50 mm breadboard | AM155 - M6 x 50 mm breadboard |
| AM143 - M6 x 25 mm breadboard | AM126 - M6 x 25 mm breadboard | AM156 - rotating 125/150/200 mm wafer holder AM161 - borosilicate glass | AM157 - rotating 150/200/300 mm wafer holder AM162 - borosilicate glass |

For more details about these inserts, please see our [accessory page](#).

Installation and Removal - (X-)ASR050B050B and (X-)ASR100B120B

On the (X-)ASR050B050B and (X-)ASR100B120B, the inserts are held in place by a spring clip in one corner of the aperture. To install an insert, place the one corner up against the spring first. While holding this corner down, push the insert towards the spring clip and snap the opposing corner into place. Removal is the reverse of this procedure.

For most applications, the spring clip should provide sufficient force to hold the insert in place, while still allowing quick changes between inserts. For applications requiring more secure mounting, custom inserts can be provided that can be secured to the (X-)ASR using 4 M2 screws.

| Instructions | (X-)ASR100B120B |
|--|---|
| 1. To install an insert, first position the corner next to the spring clip as shown. |  |
| 2. While holding down the corner next to the spring clip, push the opposite corner down. |  |

Installation and Removal - (X-)ASR205B205B and (X-)ASR305B305B

On the (X-)ASR205B205B and (X-)ASR305B305B, the inserts are held in place by 3 M4 flat head screws. The screws mate with 3 matching chamfers on the insert to kinematically constrain it. Some inserts also allow for mounting using 16 or 24 M3 screws around the perimeter of the insert. The perimeter screws will secure the insert against high loads, but may compromise the flatness of the stage. It is only recommended that these screws be used when the necessary to prevent the insert from shifting under high loads.

| Instructions | (X-)ASR305B305B |
|---|--|
| 1. To install an insert, first line up the 3 insert chamfers with the 3 screw pockets in the (X-)ASR top plate. |  |

2. Screw the 3 M4 x 8 flat head screws into the holes in the top plate as shown. Tighten the screws evenly until the insert is held securely.



3. If required, the insert can be leveled using the 3 M4 set screws adjacent to the flat head screws. Before adjusting the set screws, loosen the flat head screws.



Setting Home and Away Sensors

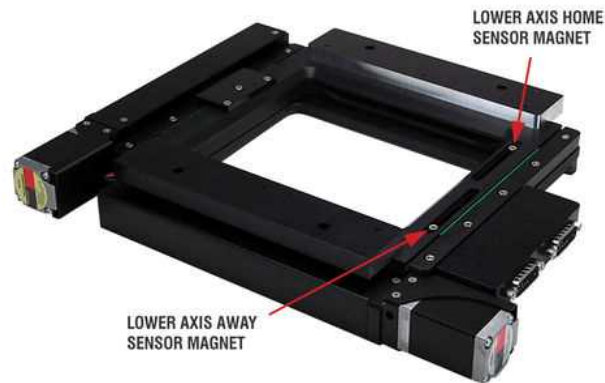
The (X-)ASR provides adjustable travel limits for each axis. A home sensor sets the 0 position of each axis and an away sensor determines the maximum travel range. As long as the "limit_auto-detect" setting is enabled, each stage will not be able to move past these limits.

Limit adjustment is performed by moving the magnets which trigger the sensor. The limit switch magnets are attached to the bottoms of the limit adjustment screws shown in the pictures below.

⚠ Important: If adjusting the magnets outwards, make adjustments in small increments. Exceeding the nominal factory set travel range by more than 3 mm can cause the device to become stuck at one end of travel.

| | (X-)ASR100B120B |
|---------------------------------|---|
| Upper axis limit switch magnets | <p>UPPER AXIS HOME SENSOR MAGNET</p> <p>UPPER AXIS AWAY SENSOR MAGNET</p> |

Lower axis limit switch magnets



To adjust the limits, loosen the screws by about 1/2 turn, slide the screw to the desired location and re-tighten. Make sure that the green hall sensor PCB (visible through the magnet adjustment slots) always stays in between the limit screws.



When adjusting the limit switch magnets, ensure that the green sensor PCB remains in between two magnets.

In addition to the regular software options available for all Zaber devices, the X-ASR is supported by Micro-Manager open source microscopy software. Micro-manager can be downloaded for free from the [Micro-Manager website](#).

Most X-Series motion control products have an integrated, depressible knob with 20 detents per revolution, allowing axes to be controlled without the use of a computer. There are two manual movement modes available: Velocity and Displacement. Switch between these modes by holding down the knob for 1 second or by configuring the `knob.mode` setting.

On power-up, many axes will only travel towards the motor from their start-up positions until the home position is reached. Once the axis has been homed, the full range of travel becomes available.

Velocity Mode

Turn the knob clockwise to move the axis in the positive direction (extend) or counter-clockwise for negative direction (retract). Each detent of the knob increases the speed of the carriage.

There are 16 speeds in each direction. The velocity profile and maximum speed can be configured via the `knob.speedprofile` and `knob.maxspeed` settings. The axis stops and resets the knob upon arriving at the end of travel.

Displacement Mode

Turn the knob clockwise to move the axis in the positive direction (extend), counter-clockwise for negative direction (retract). Each detent of the knob moves the axis a fixed number of microsteps, specified by the `knob.distance` setting. If `knob.distance` is set to 0, each detent of the knob will move to the next index position, similar to `move index` movements. The axis moves at the speed specified by the `maxspeed` setting, or the slower of `maxspeed` and `limit.approach.maxspeed` if the axis has not been homed. If there are fewer than `knob.distance` microsteps to the end of travel and another move is requested, the axis will move to the end of travel and then stop.

Summary of knob functionality

- Turning the knob:
Moves the axis in the direction of knob turn.

- Pressing the knob:
Decelerates and stops the axis (identical to a `stop` command).
Instantly stops the axis, if the axis is already decelerating.

Warning: Stopping instantly may result in damage to the product and reduced lifespan. Use sparingly if the axis is under heavy load.

- Pressing and holding the knob for 1 second:
Toggles between Velocity Mode and Displacement Mode.

This section describes the behaviour of the axis trajectory when a movement command is issued.

Software Position Limits

The travel range of the axis is limited by the Minimum Position and Maximum Position settings. The factory settings for the axis are configured to match the physical travel range. If a customized range is desired, it can be changed by configuring the `limit.min` and `limit.max` settings to appropriate values. For the Current Position, query `pos`.

Minimum Position

When the Current Position is less than the Minimum Position value, the axis cannot move in the negative direction (towards the motor).

Maximum Position

When the Current Position is greater than the Maximum Position value, the axis cannot move in the positive direction (towards the motor).

Movement Speed

The movement speed of the axis depends on axis status and various speed settings. If the axis has not been initialized by the `home` command or by moving towards the home end of the axis, movement speed will be constrained to fail-safe values. The home status of the axis can be determined by reading the `limit.home.triggered` setting.

Movement speed of the axis is specified below:

`move vel`

The axis will move at the specified speed regardless of home status.

Knob movement in Velocity Mode

The axis will move at the specified speed regardless of home status.

The speed is specified by the `knob.speedprofile` and `knob.maxspeed` settings.

Other movement commands - when the axis has not been homed

The axis will move at the slower of the `maxspeed` and `limit.approach.maxspeed` settings.

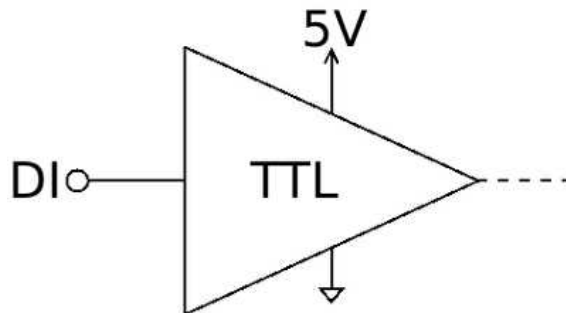
Other movement commands - when the axis has been homed

The axis will move at the speed specified by the `maxspeed` setting.

The X-ASR features one digital input and two digital outputs that operate on a +5 V supply and are TTL compatible. The input and output capabilities of the X-ASR can also be used with `triggers` to perform actions based on the current value of the I/O channel.

Digital Inputs

The input will draw up to 1 mA during operation.



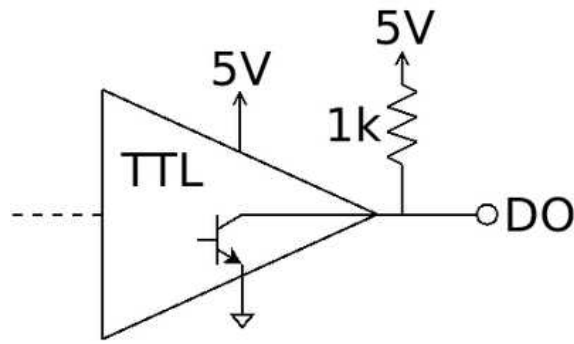
Reading the input is accomplished by sending the unit an `io get di` command, as shown below.

```
/1 io get di 1\r\n@01 0 OK IDLE -- 0
```

This command queries the input on the device, in this case input 1, which is low.

Digital Outputs

The digital outputs use an open collector buffer with a pre-installed 1 kΩ pull up resistor to +5 V. Each output can sink up to 20 mA.



The digital outputs are set through the `io set do` command, as shown below.

```
/1 io set do 2 1↵
@01 0 OK IDLE -- 0
/1 io set do 1 0↵
@01 0 OK IDLE -- 0
```

The first command sets the second digital output high (5 V). The second command sets the first digital output low (0 V).

The following sections contain tips for troubleshooting common problems. If the device is unable to communicate, and it is operating erratically, a manual factory reset can be performed on most devices using the following steps. Note that this will reset most settings.

- Power Off the device
- Push and hold the knob for the first Axis (if applicable)
- Power On the device
- Continue to hold the knob in (for ~5 seconds) until one or more LEDs are fading or the blue LED is lit, then release.

The device has been returned to its factory defaults and can be configured as per the steps in [Initial Setup](#).

Front Panel Indicators

Green LED on.

The device is powered on and is operating normally.

Green LED flashes slowly.

The operating conditions of the device are outside of the recommended range.

This will occur when the supply voltage is either over or under the recommended range or the controller temperature has exceeded the set limit. Check the following:

- The input voltage is within the operational range of the device. This can be read from the device with the `get system.voltage` command.
- The device temperature is within range. This can be read from the device with the `get system.temperature` command.

Green LED off.

The device is not powered.

Check the supply connections and power adaptor for correct operation.

Red LED on or flashing.

A critical error has occurred.

Please contact [Zaber Technical Support](#).

Yellow LED always off or flashes but no reply.

There are communication errors.

Please see the [Communication Errors](#) section below.

Blue (or Green for Firmware versions <7.15) LED Fades In and Out.

The axis is parked.

Issue a `tools parking unpark` command, or `home` the axis.

Blue LED blinking twice per second. Axis does not move.

Driver may be disabled due to over-temperature, out-of-range voltage or other driver fault; or due to user request.

See [Fx Warning Flags](#).

Once the issue has been resolved, send `driver enable`.

Manual Control

Turning the knob either way results in no movement.

The knob may have been disabled.

Check that the `knob.enable` setting is correct.

Restore the default parameters through the `system restore` command.

The axis won't cover the full range of travel.

The axis hasn't been homed.

Turn the knob anti-clockwise until the axis reaches the fully retracted position. The axis will home and the full range of travel available.

Unexpected Behaviour**The axis doesn't respond to a move command.**

The axis may need to be homed before use.

Send the **home** command.

The axis is moving on its own and running against the ends of travel.

The position encoder has de-synchronized.

Reset the device by power cycling it or sending the **system reset** command, then re-initialize it with the **home** command.

The axis is moving very slowly. It used to move faster.

The speed settings may have been changed inadvertently.

Send a **system restore** command.

The axis makes louder than normal noise during travel and is frequently slipping.

This condition happens if the thrust needed is more than the thrust available from the axis.

Check the following:

- The force on the axis is less than the maximum thrust.
- The voltage matches the specified voltage. Read the voltage using the **get system.voltage** command. Voltage less than the specified voltage for the device will reduce the positioner's maximum thrust.

Test the following:

- Try a slower target velocity. Stepper motors produce more thrust when moving slowly.
- Try a lower acceleration and deceleration.
- Clean the screw and lightly re-grease it with a grease that does not degrade plastics.

The axis has repeatability errors smaller than 4 full steps.

If steps aren't being skipped, friction or loose parts may still cause some variation when returning to a position.

Please contact **Zaber Technical Support**.

The axis doesn't cover the full range of travel, or runs into the end.

A setting might have been inadvertently changed.

- **home** the axis to see if this corrects the behaviour.
- Send a **system restore** command.

The positioner's motor unexpectedly shuts off. An Fx warning flag is present.

The motor over-temperature protection switch has been tripped. This sensor will trip if the positioner's maximum continuous thrust specification is exceeded for too long. To prevent this condition from occurring again, reduce the average force that the motor outputs by reducing acceleration, reducing the load, or lowering the duty cycle.

Send a **driver enable** command. The axis does not require homing.

Communication Errors**There is no communication with the device; the Yellow LED does not come on or flash.**

There are several things that should be checked:

- Make sure the correct serial port is selected. Try selecting other serial ports in the software.
- Check the baud rate, hand shaking, parity, stop bit, etc. when configuring the serial communications software. The required settings are listed in the **RS-232 Communications** section above.
- Make sure there are no bent pins in the ends of all the data cables
- Make sure the device is powered. The Green LED should be on.
- If the computer is a laptop running on batteries, try plugging in the power. Some laptops disable the serial ports when running on batteries.
- Make sure a null modem adaptor or cable is not being used.
- Make sure the correct adaptors(if any) are being used. Refer to the pinouts in the **RS-232 Communications** section above.
- If the problem was encountered when trying to control the device with custom software, try using one of the demo programs from the Zaber website to verify that the hardware is functioning properly.

Two or more devices both respond to commands sent to device 1.

Most devices are shipped with their device number set as 1. If you connect the devices through Zaber Console, you will be prompted to renumber them. If you aren't able to install and open Zaber Console, send the **renumber** command in the software you are using to set all of the device numbers to different values.

The Yellow LED comes on briefly when sending a command, but the axis does not move and does not reply.

Check baud rate, hand shaking, parity, stop bit, etc. are set as per the **RS-232 Communications** defaults.

The device numbers may not be what is expected, issue a **renumber** command. Make sure that the computer does not transmit anything else while the devices renumber.

If the problem is encountered when trying to control the device with custom software:

- Use a demo program from the Zaber website to verify that the hardware is functioning properly.
- Make sure that the receiving part of the code or commercial package is correct.
- Check the serial port settings are correct.
- Check connectors for bent or broken pins.

Slipping and Stalling

The axis makes noise but does not move.

The axis is stalling.

Try removing all external loads. If the axis now extends and retracts normally, the problem is excessive load. Try to reduce the load and ensure the load is less than the maximum thrust. A higher thrust or torque can be achieved by lowering the speed of the axis using the **maxspeed** setting.

If an axis is stalling with no external load at default speed and acceleration settings then it requires servicing.

For Zaber's policies on warranty and repair, please refer to the [Ordering Policies](#).

Standard products

Standard products are any part numbers that do not contain the suffix ENG followed by a 4 digit number. Most, but not all, standard products are listed for sale on our website. All standard Zaber products are backed by a one-month satisfaction guarantee. If you are not satisfied with your purchase, we will refund your payment minus any shipping charges. Goods must be in brand new saleable condition with no marks. Zaber products are guaranteed for one year. During this period Zaber will repair any products with faults due to manufacturing defects, free of charge.

Custom products

Custom products are any part numbers containing the suffix ENG followed by a 4 digit number. Each of these products has been designed for a custom application for a particular customer. Custom products are guaranteed for one year, unless explicitly stated otherwise. During this period Zaber will repair any products with faults due to manufacturing defects, free of charge.

How to return products

Customers with devices in need of return or repair should contact Zaber to obtain an RMA form which must be filled out and sent back to us to receive an RMA number. The RMA form contains instructions for packing and returning the device. The specified RMA number must be included on the shipment to ensure timely processing.

If you would like to receive our periodic email newsletter including product updates and promotions, please sign up online at www.zaber.com (news section). Newsletters typically include a promotional offer worth at least \$100.

Contact Zaber Technologies Inc by any of the following methods:

| | |
|--------------|--|
| Phone | 1-604-569-3780 (direct) 1-888-276-8033 (toll free in North America) |
| Fax | 1-604-648-8033 |
| Mail | #2 - 605 West Kent Ave. N., Vancouver, British Columbia, Canada, V6P 6T7 |
| Web | www.zaber.com |
| Email | Please visit our website for up to date email contact information. |

The original instructions for this product are available at <https://www.zaber.com/manuals/X-ASR>.

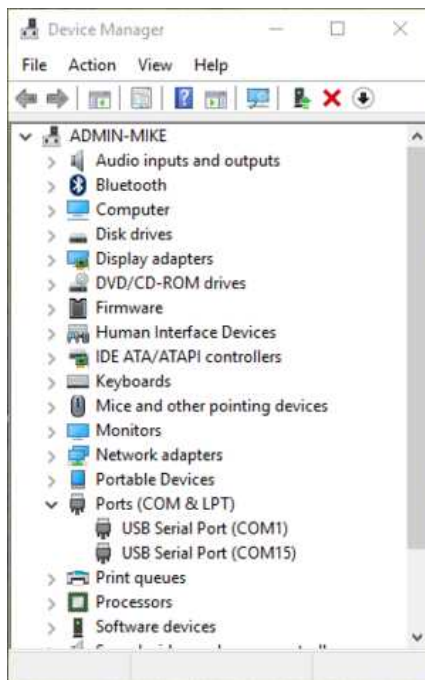
Finding Installed Serial Ports

Windows

- Open Search or Run from the Start Menu or Taskbar, type "Device Manager" and press enter.



- Expand the Ports (COM & LPT) category.



- In this example there are two serial ports available (COM1 and COM15), which are both USB adaptors.

Linux

▪ Finding devices

- Open a terminal and execute the following command:

```
dmesg | grep -E ttyU?S
```

- The response will be similar to the following:

```
[ 2.029214] serial8250: ttyS0 at I/O 0x3f8 (irq = 4) is a 16550A
[ 2.432572] 00:07: ttyS0 at I/O 0x3f8 (irq = 4) is a 16550A
[ 2.468149] 0000:00:03.3: ttyS4 at I/O 0xec98 (irq = 17) is a 16550A
[ 13.514432] usb 7-2: FTDI USB Serial Device converter now attached to ttyUSB0
```

- This shows that there are 3 serial ports available: ttyS0, ttyS4 and ttyUSB0 (a USB adaptor)

▪ Checking port permissions

- Using the ports found above, execute the following command

```
ls -l /dev/tty{S0, S4, USB0}
```

- The permissions, given below, show that a user has to be root or a member of the dialout group to be able to access these devices

```
crw-rw---- 1 root dialout 4, 64 Oct 31 06:44 /dev/ttyS0
crw-rw---- 1 root dialout 4, 68 Oct 31 06:45 /dev/ttyS4
crw-rw---- 1 root dialout 188, 0 Oct 31 07:58 /dev/ttyUSB0
```

▪ Checking group membership

```
groups
```

- The output will be similar to the following:

```
adm cdrom sudo dip plugdev users lpadmin sambashare
```

Notice that dialout is not in the list

- A user can be added to the dialout group with the following command

```
sudo adduser $USER dialout
```

- Group membership will not take effect until the next logon.

OSX

▪ Finding devices

- Open a terminal and execute the following command:

```
ls /dev/cu.*serial*
```

- The response will be similar to the following:

```
/dev/cu.usbserial-FTB3QAET
/dev/cu.usbserial-FTEJJ1YW
```

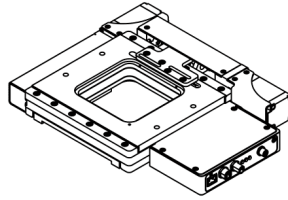
- This shows that there are two serial ports available, both of which happen to be USB adaptors.

- There may be other devices that match this query, such as keyboards or some web cameras. To determine which one corresponds to your USB serial cable, try repeating the command with and without the cable connected to the computer, to see which one appears and disappears.

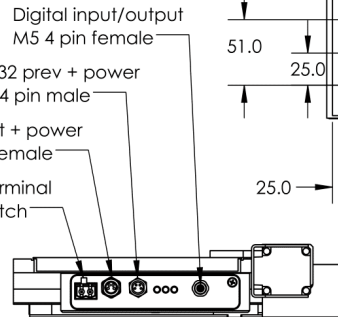
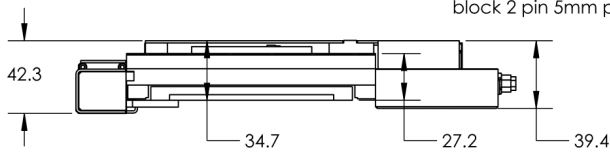
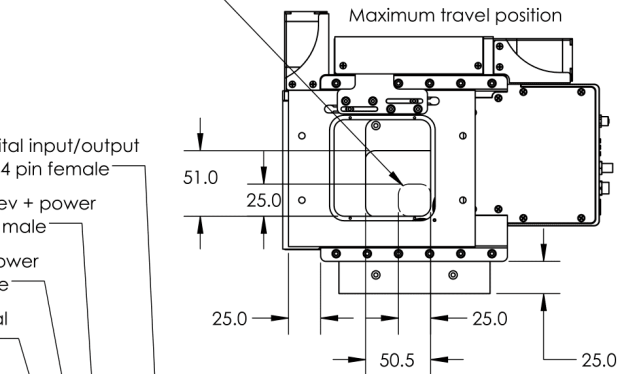
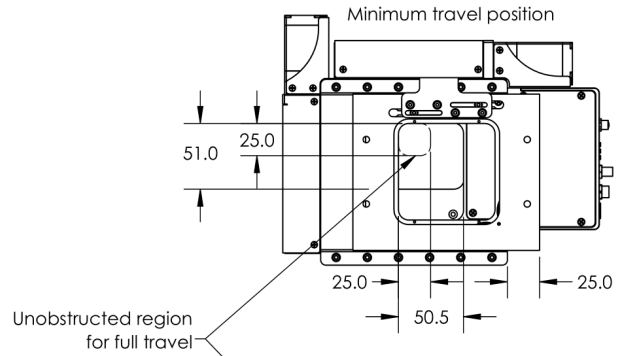
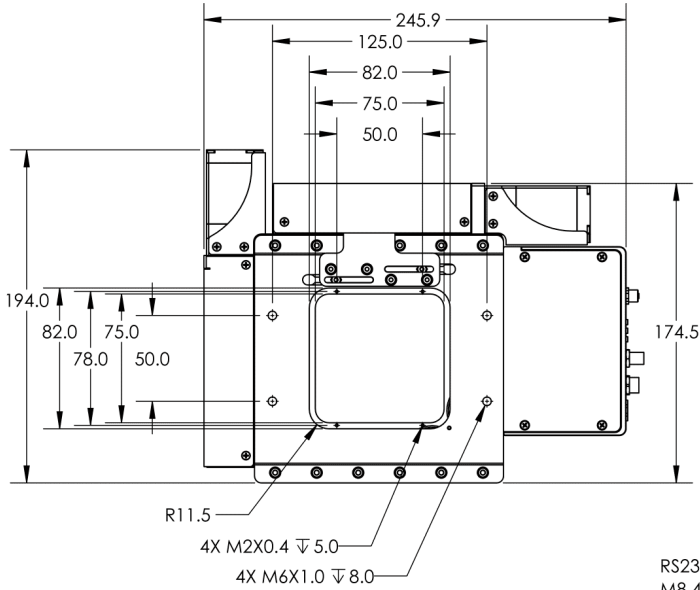
ZABER

X-ASR050B050B-SD12 Motorized XY Microscope Stage

dimensions in mm



Adaptor plates required for most applications
See related products page for details at www.zaber.com

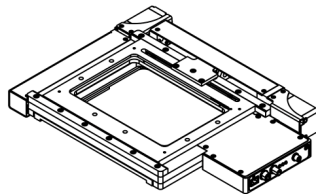


DWG 3521 R01

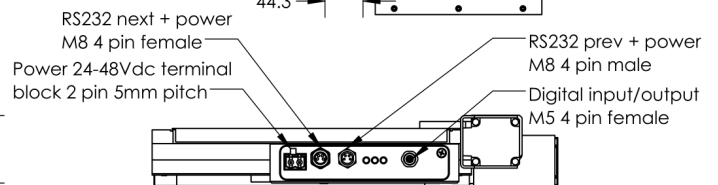
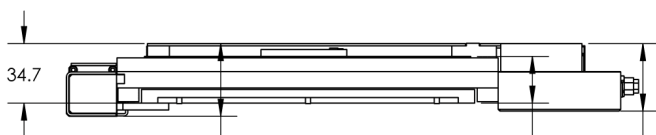
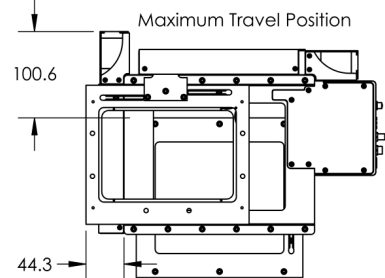
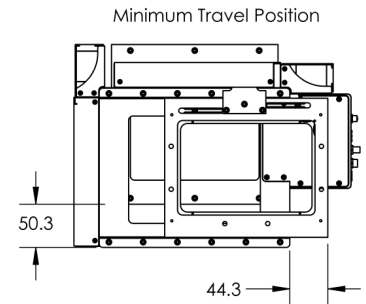
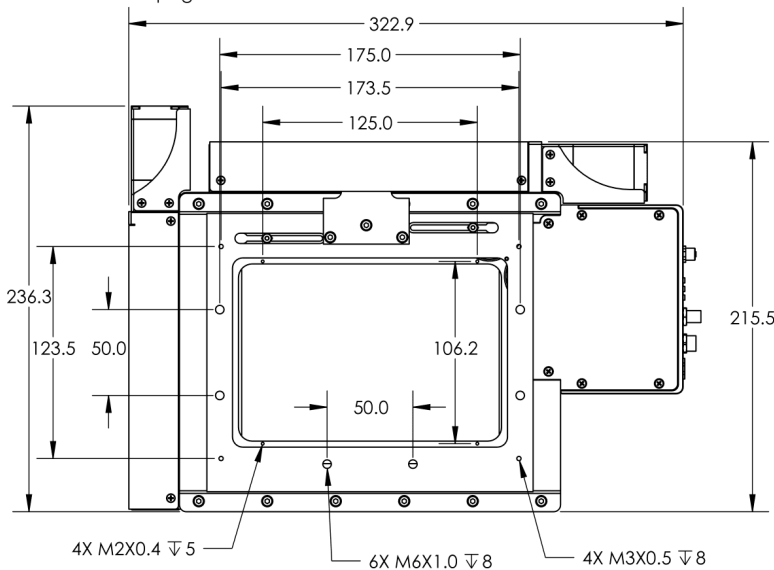
ZABER

X-ASR100B120B-SD12 Motorized XY Microscope Stage

dimensions in mm



Adaptor plates required for mounting in most applications.
See accessories page for details at www.zaber.com.



42.3

27.2

39.3

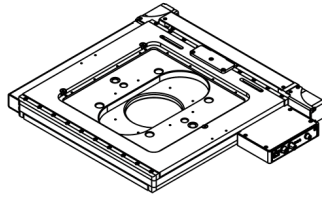
DWG 3523 R01

ZABER

X-ASR205B205B-SD12

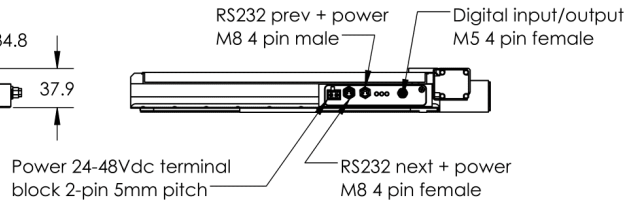
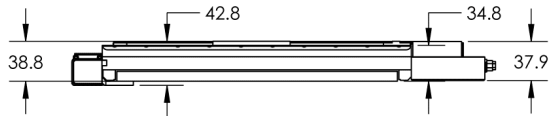
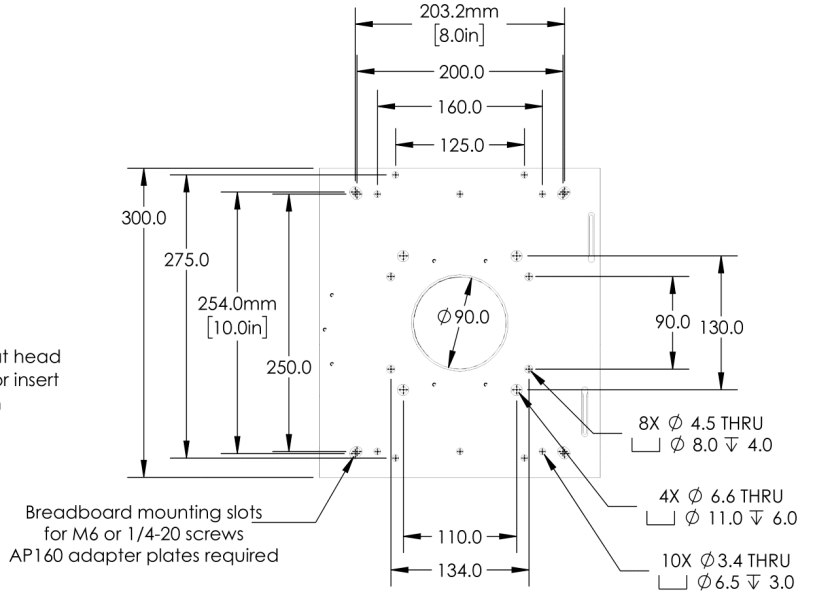
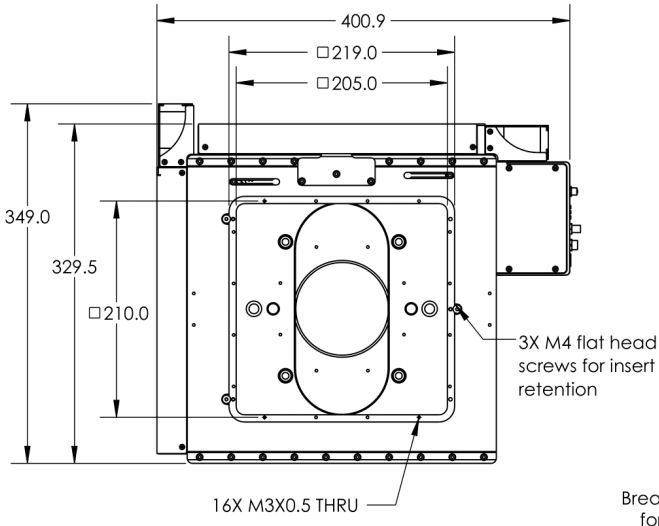
Motorized XY Microscope Stage

dimensions in mm



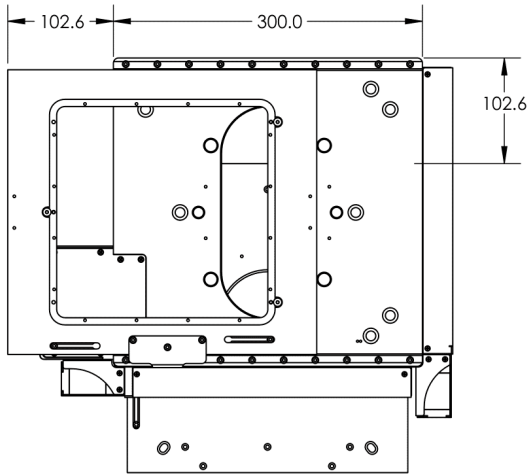
Adaptor plates required for breadboard mounting.
See accessories page for details at www.zaber.com

Base-plate mounting features

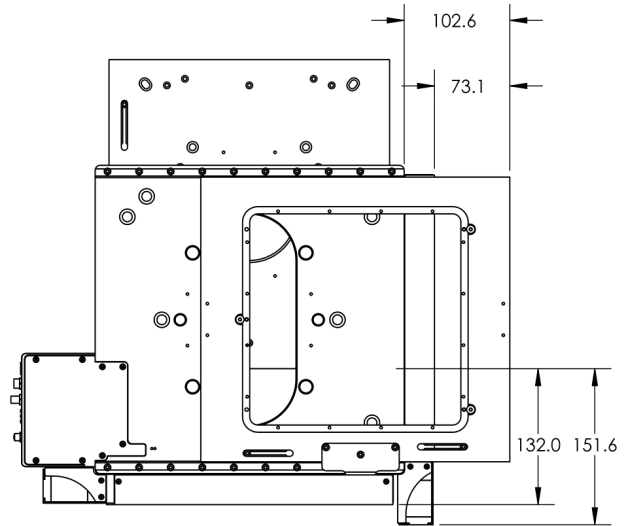


DWG 3524 R01

MINIMUM TRAVEL POSITION



MAXIMUM TRAVEL POSITION

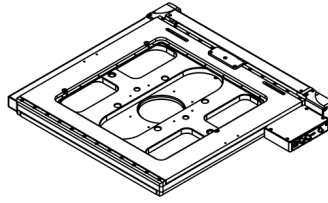


ZABER

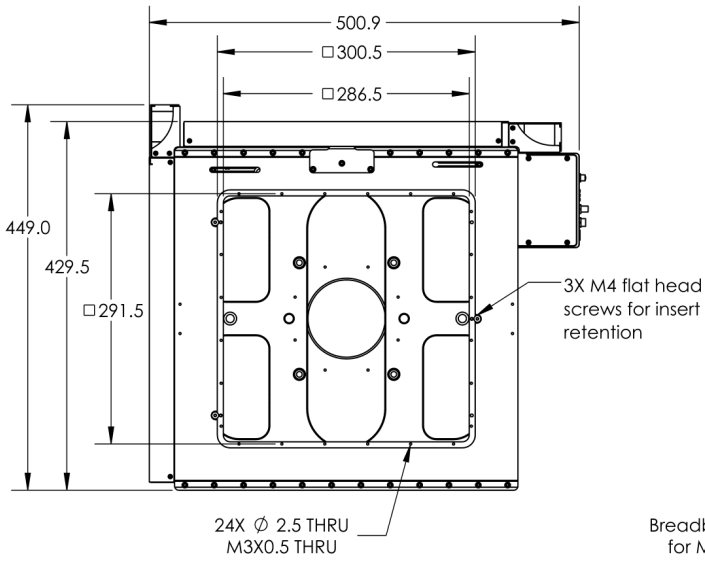
X-ASR305B305B-SD12

Motorized XY Microscope Stage

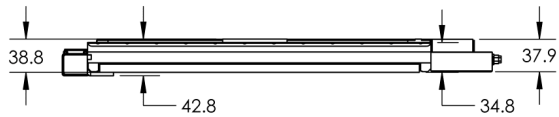
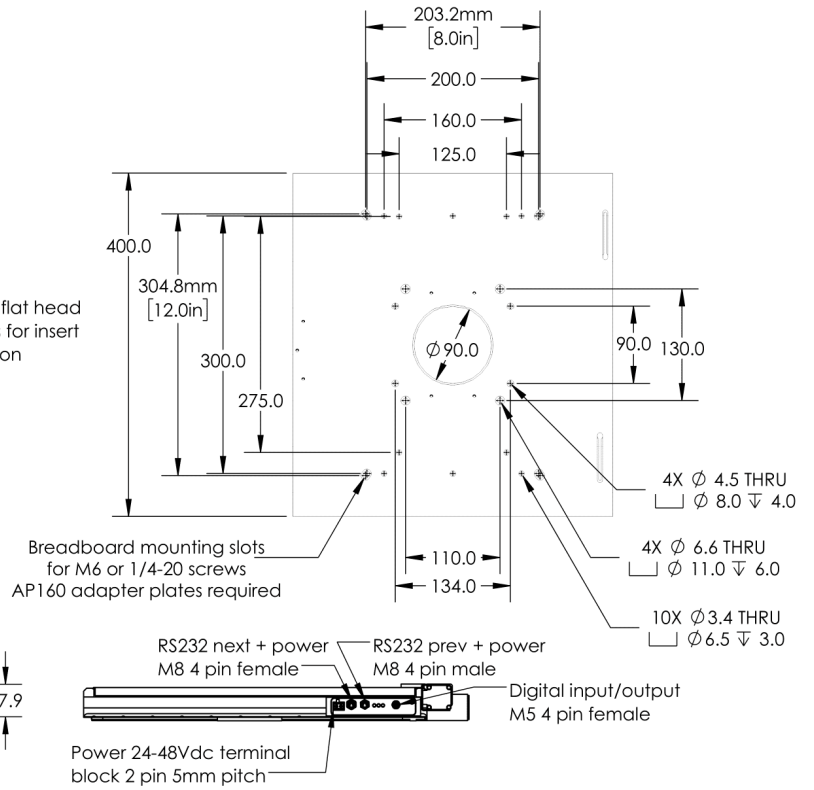
dimensions in mm

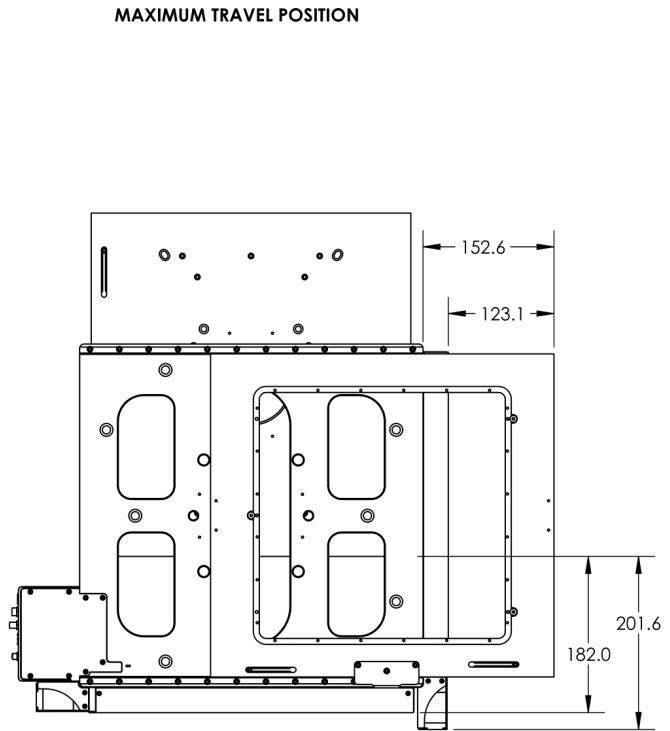
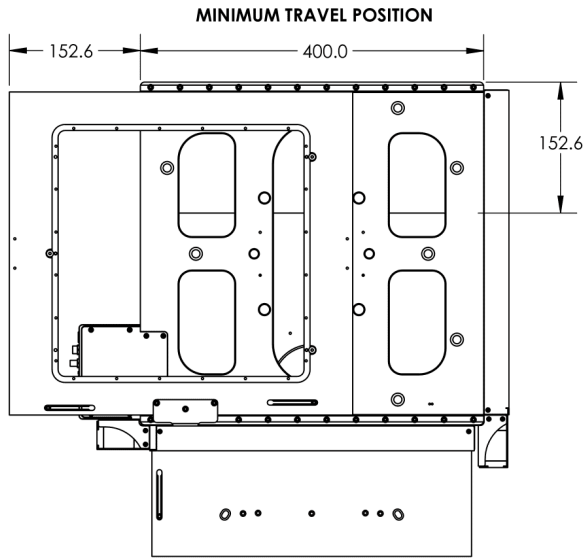


Adaptor plates required for breadboard mounting.
See accessories page for details at www.zaber.com



Base-plate mounting features





DWG 3528 R01

| Specification | Value | Alternate Unit |
|-------------------------------------|-------------------------------|----------------|
| Microstep Size (Default Resolution) | 0.15625 μm | |
| Built-in Controller | Yes | |
| Minimum Speed | 0.000095 mm/s | 0.000004"/s |
| Speed Resolution | 0.000095 mm/s | 0.000004"/s |
| Peak Thrust | 95 N | 21.3 lb |
| Maximum Continuous Thrust | 95 N | 21.3 lb |
| Communication Interface | RS-232, USB 2.0 | |
| Communication Protocol | Zaber ASCII (Default), RS-232 | |
| Guide Type | Crossed roller bearing | |
| Maximum Current Draw | 2600 mA | |
| Power Supply | 24-48 VDC | |
| Linear Motion Per Motor Rev | 2.00 mm | 0.079" |
| Motor Steps Per Rev | 200 | |
| Motor Type | Stepper (2 phase) | |
| Motor Rated Current | 1500 mA/phase | |
| Motor Winding Resistance | 2.05 ohms/phase | |
| Inductance | 1 mH/phase | |
| Default Resolution | 1/64 of a step | |
| Data Cable Connection | Locking 4-pin M8 | |
| Mechanical Drive System | Precision lead screw | |

| Specification | Value | Alternate Unit |
|-----------------------------|--|----------------|
| Limit or Home Sensing | Magnetic, adjustable home and away sensors | |
| Manual Control | No | |
| Axes of Motion | 2 | |
| LED Indicators | Yes | |
| Mounting Interface | Separate mounting adaptors available | |
| Operating Temperature Range | 0 to 50 °C | |
| Vacuum Compatible | No | |
| RoHS Compliant | Yes | |
| Digital Input | 1 | |
| Digital Output | 2 | |

Comparison

| Part Number | Lower Travel Range | Upper Travel Range | Accuracy (unidirectional) | Repeatability |
|--------------------|--------------------|--------------------|---------------------------|----------------------|
| X-ASR050B050B-SD12 | 50 mm (1.969") | 50 mm (1.969") | 12 µm (0.000472") | < 2 µm (< 0.000079") |
| X-ASR100B120B-SD12 | 100 mm (3.937") | 120 mm (4.724") | 40 µm (0.001575") | < 2 µm (< 0.000079") |
| X-ASR205B205B-SD12 | 205 mm (8.071") | 205 mm (8.071") | 50 µm (0.001968") | < 2 µm (< 0.000079") |
| X-ASR305B305B-SD12 | 305 mm (12.008") | 305 mm (12.008") | 80 µm (0.003150") | |

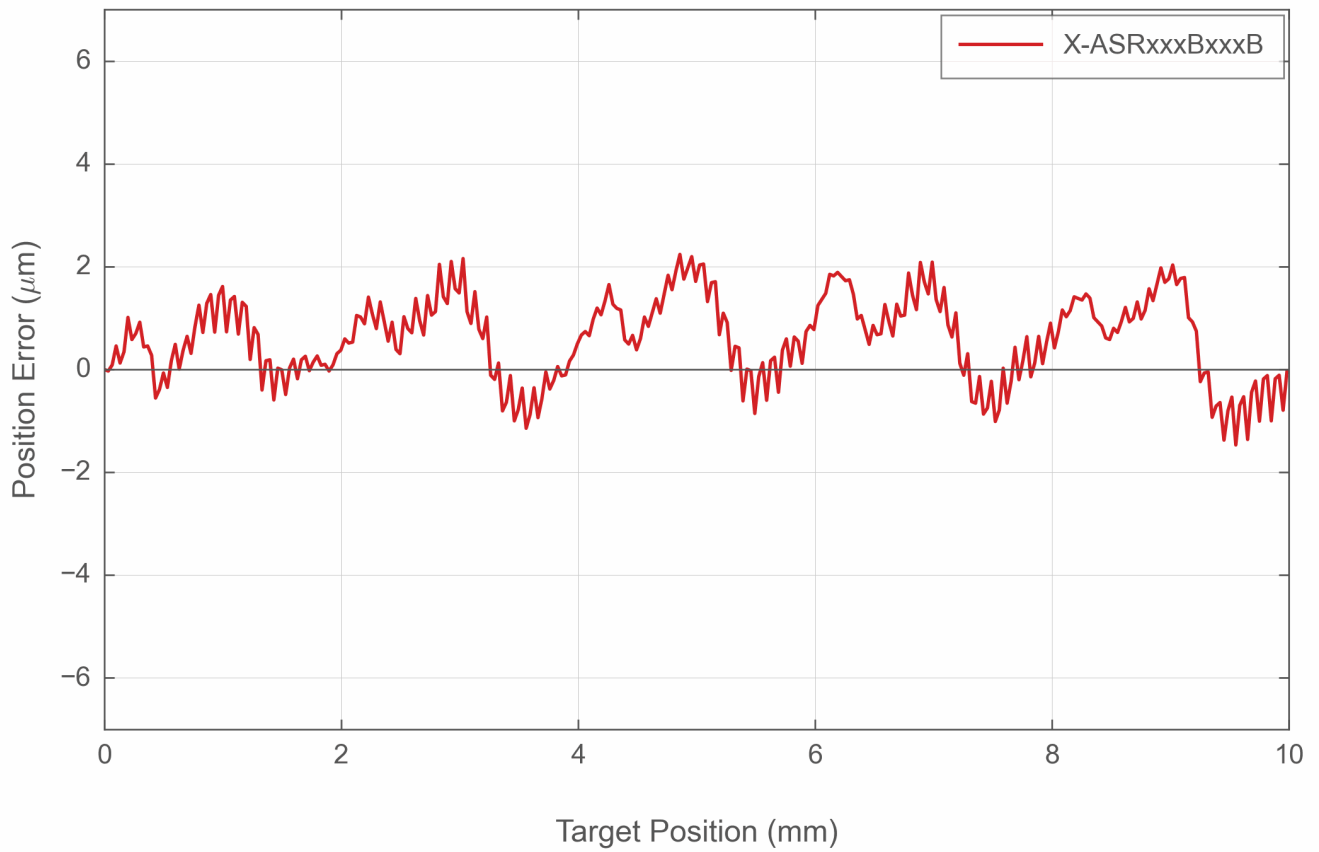
| Part Number | Flatness | Backlash | Maximum Speed | Maximum Centered Load |
|--------------------|-----------------|-----------------------|--------------------|-----------------------|
| X-ASR050B050B-SD12 | 8 µm (0.0003") | < 4 µm (< 0.000157") | 85 mm/s (3.346"/s) | 200 N (44.9 lb) |
| X-ASR100B120B-SD12 | 15 µm (0.0006") | < 4 µm (< 0.000157") | 85 mm/s (3.346"/s) | 100 N (22.4 lb) |
| X-ASR205B205B-SD12 | 25 µm (0.0010") | < 10 µm (< 0.000394") | 85 mm/s (3.346"/s) | 100 N (22.4 lb) |
| X-ASR305B305B-SD12 | 50 µm (0.0020") | < 10 µm (< 0.000394") | 65 mm/s (2.559"/s) | 100 N (22.4 lb) |

| Part Number | Pitch | Roll | Yaw | CE Compliant |
|--------------------|--------------------|---------------------|---------------------|--------------|
| X-ASR050B050B-SD12 | 0.02° (0.349 mrad) | 0.02° (0.349 mrad) | 0.005° (0.087 mrad) | Yes |
| X-ASR100B120B-SD12 | 0.02° (0.349 mrad) | 0.02° (0.349 mrad) | 0.005° (0.087 mrad) | Yes |
| X-ASR205B205B-SD12 | 0.02° (0.349 mrad) | 0.01° (0.174 mrad) | 0.01° (0.174 mrad) | Yes |
| X-ASR305B305B-SD12 | 0.04° (0.698 mrad) | 0.015° (0.262 mrad) | 0.015° (0.262 mrad) | |

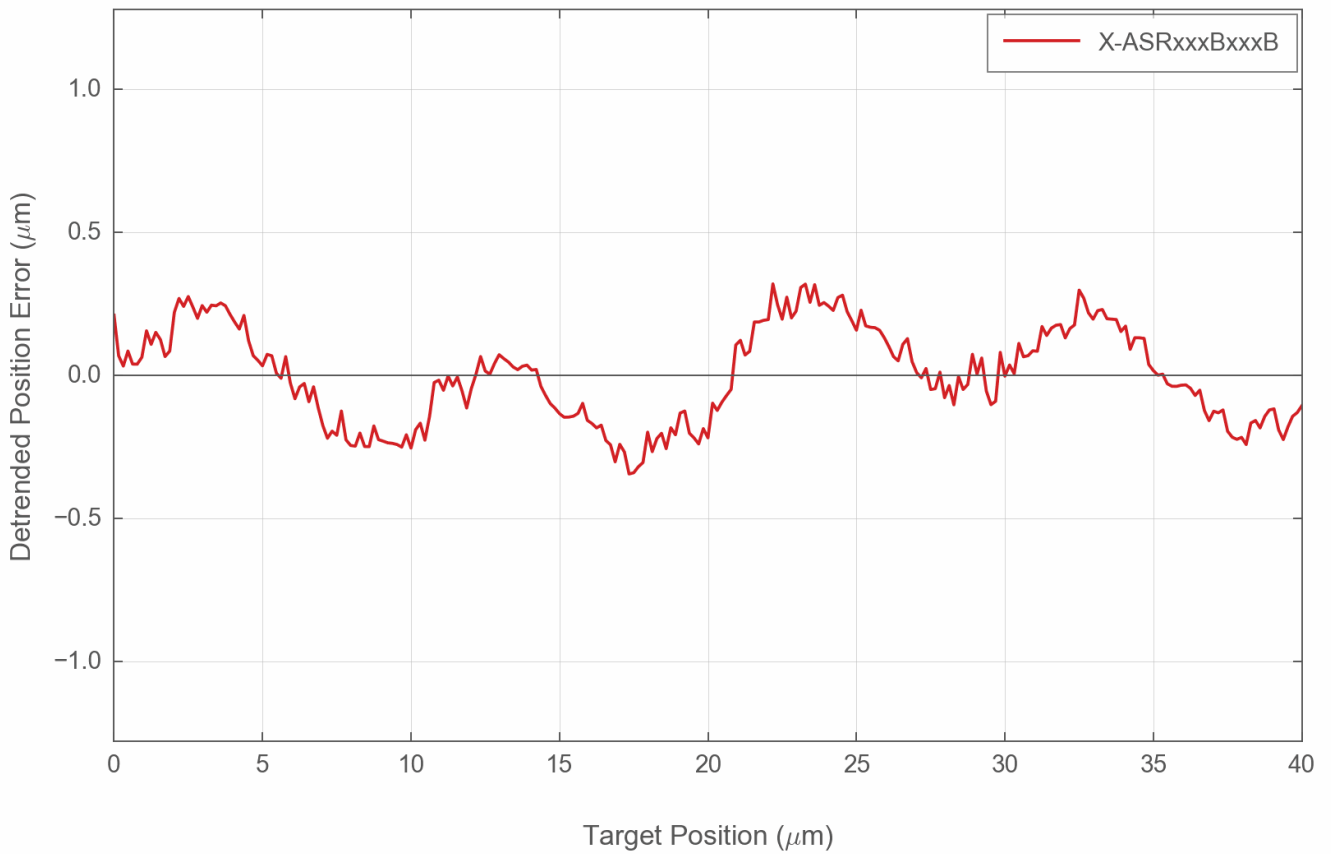
| Part Number | Weight |
|--------------------|----------------------|
| X-ASR050B050B-SD12 | 2.10 kg (4.630 lb) |
| X-ASR100B120B-SD12 | 3.30 kg (7.275 lb) |
| X-ASR205B205B-SD12 | 6.90 kg (15.212 lb) |
| X-ASR305B305B-SD12 | 10.60 kg (23.369 lb) |

Charts and Notes

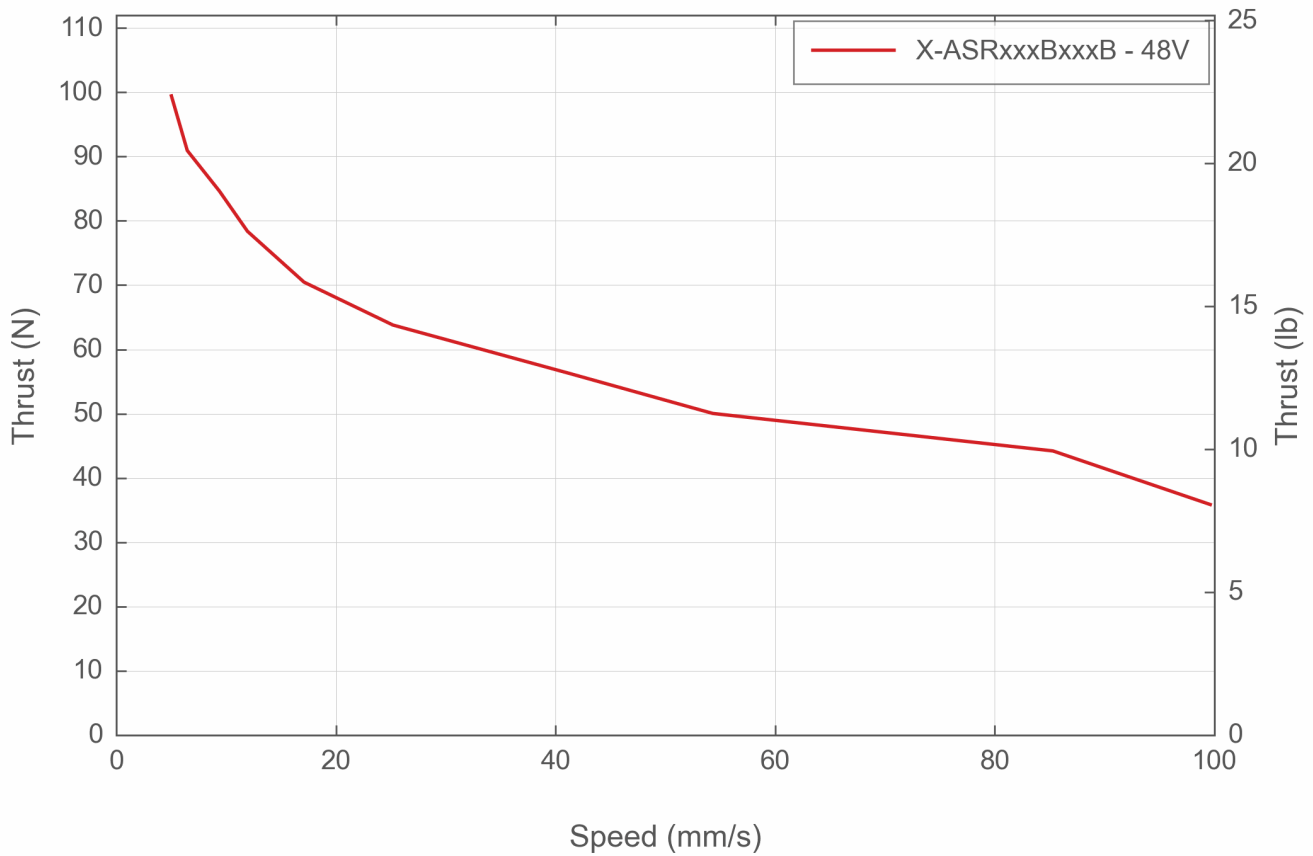
Typical Accuracy



Typical Microstepping Accuracy



Thrust Speed Performance



This product uses the FreeRTOS kernel. FreeRTOS is © 2022 Amazon.com, Inc. or its affiliates and is governed by the following license:

All rights reserved.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.

IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

This product uses the LZ4 compression library. LZ4 is © 2011–2016 Yann Collet and is governed by the following license:

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.