

# VSR-E Series User's Manual

Vertical lift stage with built-in motor encoders and Auto Detect



## Disclaimer

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Zaber's devices 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.

## Precautions

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Zaber's Auto Detect peripheral devices are designed to be used effortlessly with Zaber's line of Auto Detect controllers. The VSR-E includes onboard memory that allows Zaber's controllers to auto-detect the model and set reasonable parameters. See the [Protocol Manual](#) for more information on how to modify the settings. Damage to the device may result if the settings are not correct. To use your Zaber peripheral with a third-party controller, review the motor, sensor, and encoder specifications and pin-outs carefully.

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.

## Conventions used throughout this document

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- Fixed width type indicates communication to and from a device. The `\r` symbol indicates a carriage return, which can be achieved by pressing enter when using a terminal program.
- An **ASCII command** followed by (T:xx) indicates a legacy T-Series **Binary Protocol** command that achieves the same result. For example,

`move abs 10000 (T:20:10000)` shows that a move abs ASCII command can also be achieved with Binary command number 20.

Not all ASCII commands have an equivalent Binary counterpart.

## Device Overview

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### Connectors

Recommended controller(s) for your VSR-E peripheral are provided in the product specifications. Zaber's controllers and peripherals are designed for ease of use when used together. Optimal settings for each peripheral are automatically detected by Zaber's controllers when the device is connected.

For reference, the pinout for the peripheral cable connectors is shown below:

### Pinout for D-sub 15 Connectors (peripherals)

#### T3A Peripheral (male)



#### T4A Peripheral (male)



| Pin # | Function                 |
|-------|--------------------------|
| 1     | +5V for Limits & Encoder |
| 2     | Auto Detect Data         |
| 3     | <i>reserved</i>          |
| 4     | Away Sensor              |
| 5     | Home Sensor              |
| 6     | Ground                   |
| 7     | Motor B1                 |
| 8     | Motor A1                 |
| 9     | Auto Detect Clock        |
| 10    | Encoder A                |

|    |               |
|----|---------------|
| 11 | Encoder B     |
| 12 | Encoder Index |
| 13 | Ground        |
| 14 | Motor B2      |
| 15 | Motor A2      |

*Not all pins are used for all models*

## Alternate Controllers

The VSR-E can be controlled by any 2-phase stepper motor controller with limit sensor and appropriate encoder input. **We do not recommend using your own controller unless you are familiar with how to control a stepper motor with hall sensor limit switches.** Damage to the stage due to incorrect wiring is not covered by warranty.

### Motors & Encoders

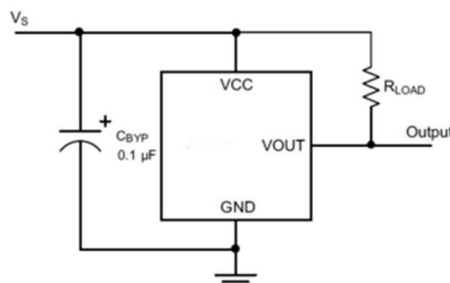
For motor and encoder information see the [VSR-E product page](#)

### Limit Sensors

Hall effect sensors are used in the VSR-E as home sensors. The Hall sensors used are part number A1120LLHLT-T made by Allegro. [Click here for data sheet](#). Your controller should be configured so the stage stops immediately (quick deceleration) when the sensors are triggered.

- PCB wire colour code:
  - 3.6-24 Vdc input - red
  - Home signal - yellow
  - Away signal - white
  - Ground - black

The Hall sensor has an open-collector output. The default output is high impedance when the Hall sensor is not active. When the sensor detects a magnet, the Hall sensor pulls the output low to ground.



If you are not using a Zaber controller, ensure that your controller has a pull-up resistor on the output line of each Hall sensor as shown in the diagram. The bypass capacitor is optional, but may help to eliminate false triggering in noisy environments. The typical value for the pull-up

resistor ( $R_{LOAD}$ ) is 10k and for the bypass capacitor is 0.1uF to 1uF. The larger the capacitance, the better the noise filtering but the slower the response time.

## Installation

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VSR-E stages can be mounted using M6 screws to a standard metric breadboard, or to various Zaber devices.

## Warranty and Repair

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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.

## Email Updates

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

## Contact Information

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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](http://www.zaber.com)

**Email** Please visit our website for up to date email contact information.

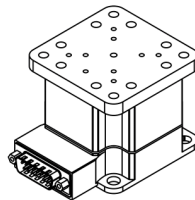
The original instructions for this product are available at <https://www.zaber.com/manuals/VSR-E>.

## Appendix A: Default Settings

Please see [the Zaber Support Page](#) for default settings for this device.

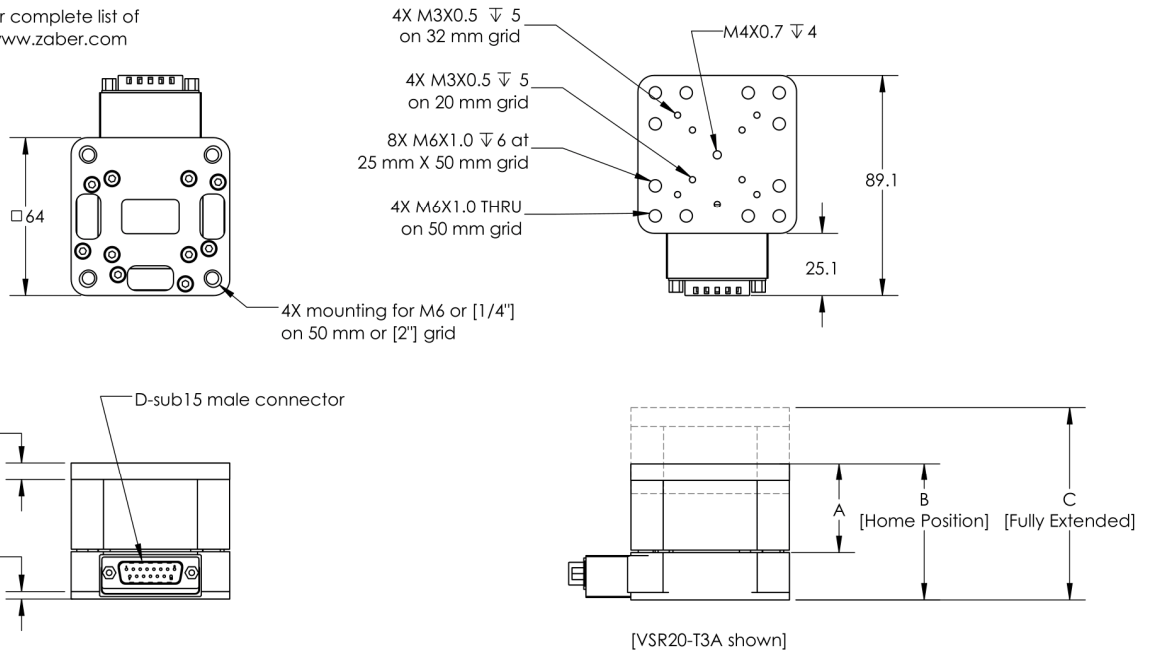
## Product Drawing

**ZABER**  
 VSR Vertical Lift Stage  
 dimensions in mm



| Model Number* | Travel | A    | B    | C     |
|---------------|--------|------|------|-------|
| VSR20-T3A     | 20.0   | 36.0 | 55.0 | 75.0  |
| VSR20-E01T3A  | 20.0   | 54.0 | 73.0 | 93.0  |
| VSR40-T3A     | 40.0   | 66.0 | 85.0 | 125.0 |

\*See product page for complete list of available models at [www.zaber.com](http://www.zaber.com)



DWG 1088 R02

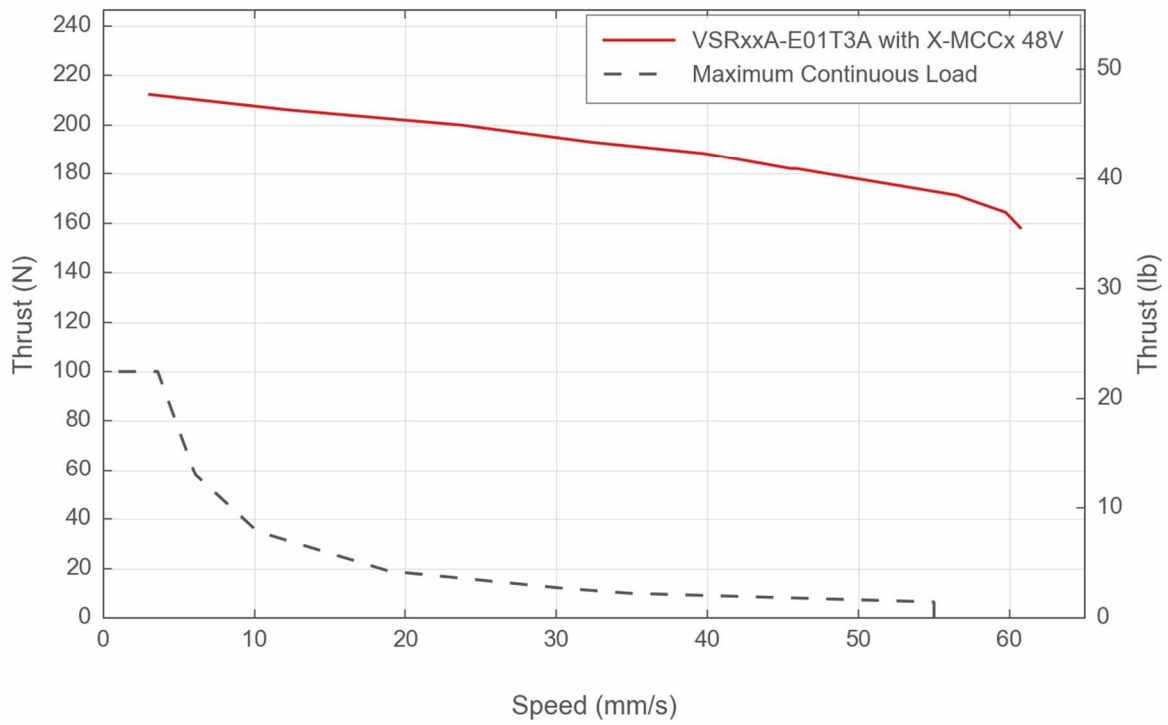
## Specifications

| Specification                       | Value                 | Alternate Unit |
|-------------------------------------|-----------------------|----------------|
| Microstep Size (Default Resolution) | 0.09525 $\mu\text{m}$ |                |
| Built-in Controller                 | No                    |                |

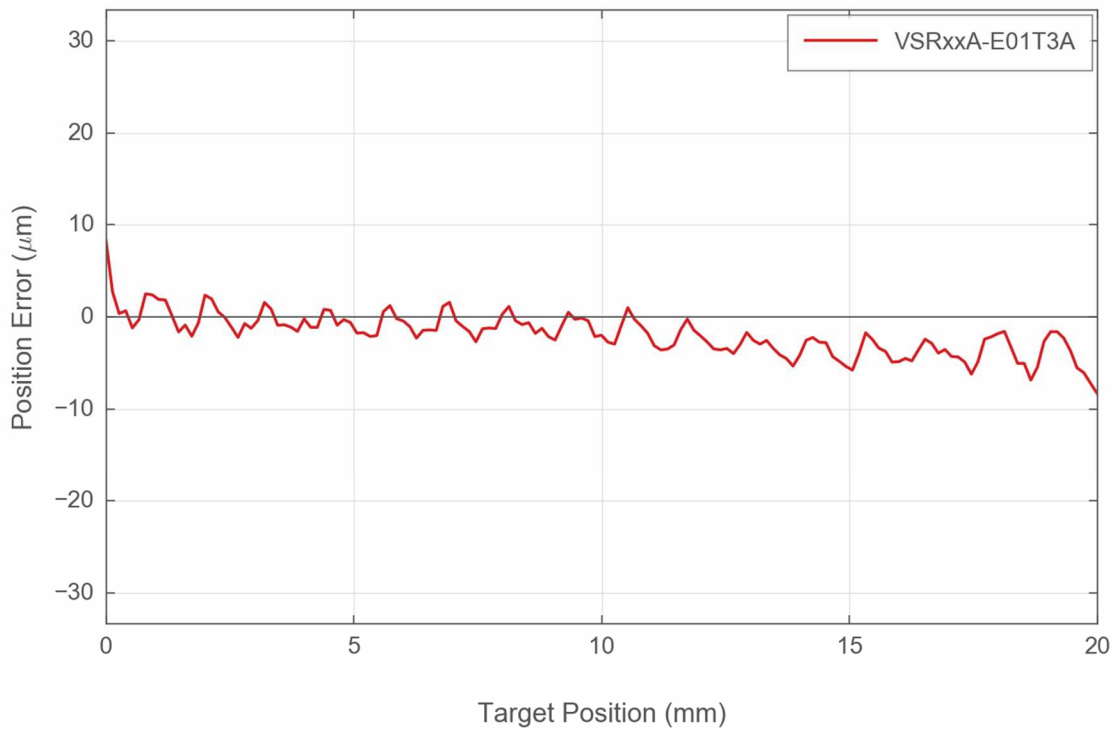
| Specification               | Value                     | Alternate Unit  |
|-----------------------------|---------------------------|-----------------|
| Recommended Controller      | X-MCC (48 V) Recommended  |                 |
| Travel Range                | 20 mm                     | 0.787 "         |
| Accuracy (unidirectional)   | 50 $\mu\text{m}$          | 0.001968 "      |
| Loaded Accuracy (10 N)      | 35 $\mu\text{m}$          | 0.001378 "      |
| Repeatability               | < 1 $\mu\text{m}$         | < 0.000039 "    |
| Backlash                    | < 35 $\mu\text{m}$        | < 0.001378 "    |
| Loaded Backlash (10 N)      | < 10 $\mu\text{m}$        | < 0.000394 "    |
| Maximum Speed               | 55 mm/s                   | 2.165 "/s       |
| Minimum Speed               | 0.000058 mm/s             | 0.000002 "/s    |
| Speed Resolution            | 0.000058 mm/s             | 0.000002 "/s    |
| Encoder Resolution          | 500 CPR                   | 2000 states/rev |
| Encoder Type                | Rotary quadrature encoder |                 |
| Peak Thrust                 | 200 N                     | 44.9 lb         |
| Maximum Continuous Thrust   | 100 N                     | 22.4 lb         |
| Maximum Centered Load       | 100 N                     | 22.4 lb         |
| Maximum Cantilever Load     | 300 N · cm                | 424.8 oz · in   |
| Guide Type                  | Ball Bearing              |                 |
| Horizontal Runout           | < 30 $\mu\text{m}$        | < 0.001181 "    |
| Pitch                       | 0.12 °                    | 2.094 mrad      |
| Roll                        | 0.12 °                    | 2.094 mrad      |
| Linear Motion Per Motor Rev | 1.2192 mm                 | 0.048 "         |
| Motor Steps Per Rev         | 200                       |                 |
| Motor Type                  | Stepper (2 phase)         |                 |
| Motor Rated Current         | 1500 mA/phase             |                 |
| Inductance                  | 2.2 mH/phase              |                 |
| Motor Connection            | D-sub 15                  |                 |
| Default Resolution          | 1/64 of a step            |                 |
| Mechanical Drive System     | Precision Lead Screw      |                 |
| Limit or Home Sensing       | Magnetic home sensor      |                 |
| Axes of Motion              | 1                         |                 |
| Mounting Interface          | M6 and M3 threaded holes  |                 |
| Operating Temperature Range | 0-50 °C                   |                 |
| Vacuum Compatible           | No                        |                 |
| RoHS Compliant              | Yes                       |                 |
| CE Compliant                | Yes                       |                 |
| Weight                      | 0.57 kg                   | 1.257 lb        |

## Charts and Notes

## Thrust Speed Performance



## Typical Accuracy



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

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