

VSR-E Series User's Manual

Vertical lift stages with built-in motor encoders



~~Minimum Velocity Mode~~ Disclaimer

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 warranty of fitness for a particular purpose. The user of this product agrees to [Zaber's general terms and conditions of sale](#).

Precautions

Zaber's autodetect peripheral axes are designed to be used effortlessly with Zaber's line of autodetect controllers. The VSR-E includes onboard memory that allows Zaber's controllers to autodetect the model and set reasonable parameters. See the [Protocol Manual](#) for more information on how to modify the settings. Damage to the axis 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

- Fixed width type indicates communication to and from a device. The μ 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

AutoDetect

Your VSR-E peripheral is equipped with AutoDetect, a feature that allows a Zaber controller to automatically configure its settings for the peripheral when it is connected.

 **Important:** The controller should always be powered down before disconnecting or connecting your VSR-E peripheral.

To connect the peripheral to a controller:

- Power off the controller.
- Connect the VSR-E peripheral.
- Power on the controller.
- The controller will activate the peripheral shortly after it is powered on.

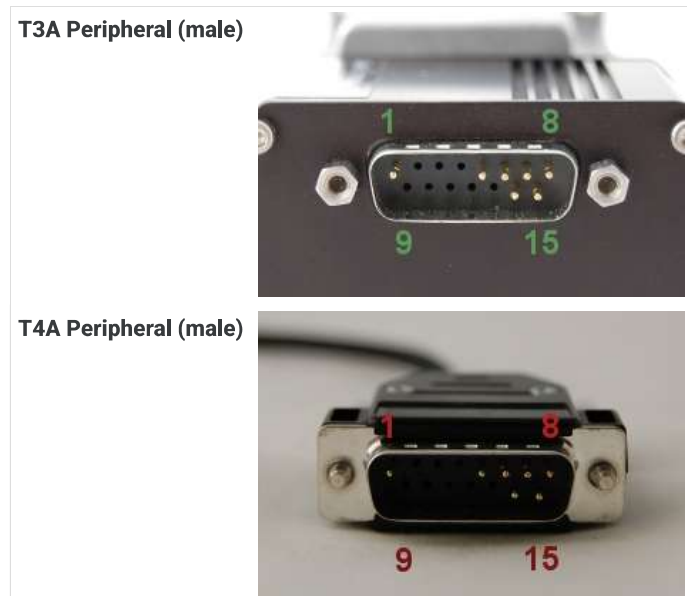
See the Zaber controller user manual for more details on peripheral activation and control.

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)



Pin #	Function
1	+5V for Limits & Encoder
2	AutoDetect Data
3	N.C.
4	Away Sensor
5	Home Sensor
6	Ground
7	Motor B1
8	Motor A1
9	AutoDetect 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 encoders and hall sensor limit switches.** Damage to the device due to incorrect wiring is not covered by warranty.

Motors & Encoders

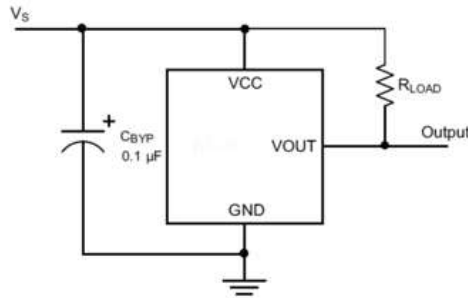
For motor and encoder information see the [VSR-E product page](#)

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:
 - 5 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 10 k Ω and for the bypass capacitor is 0.1 μ F to 1 μ F. The larger the capacitance, the better the noise filtering but the slower the response time.

Installation

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

Trajectory Control and Behaviour

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 \(T:106\)](#) and [limit.max \(T:44\)](#) settings to appropriate values. For the Current Position, query [pos \(T:60\)](#).

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

When the Current Position is greater than the Maximum Position value, the axis cannot move in the positive direction (away from 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 \(T:1\)](#) 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 \(T:53:103\)](#) setting.

Movement speed of the axis is specified below:

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

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

The speed is specified by the [knob.speedprofile \(T:112\)](#) and [knob.maxspeed \(T:111\)](#) settings.

The axis will move at the slower of the [maxspeed \(T:42\)](#) and [limit.approach.maxspeed \(T:41\)](#) settings.

The axis will move at the speed specified by the [maxspeed \(T:42\)](#) setting.

Warranty and Repair

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

If you would like to receive our periodic email newsletter including product updates and promotions.

Contact Information

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.

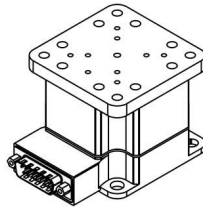
The original instructions for this product are available at <https://www.zaber.com/manuals/VSR-E>.

Appendix A: Default Settings

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

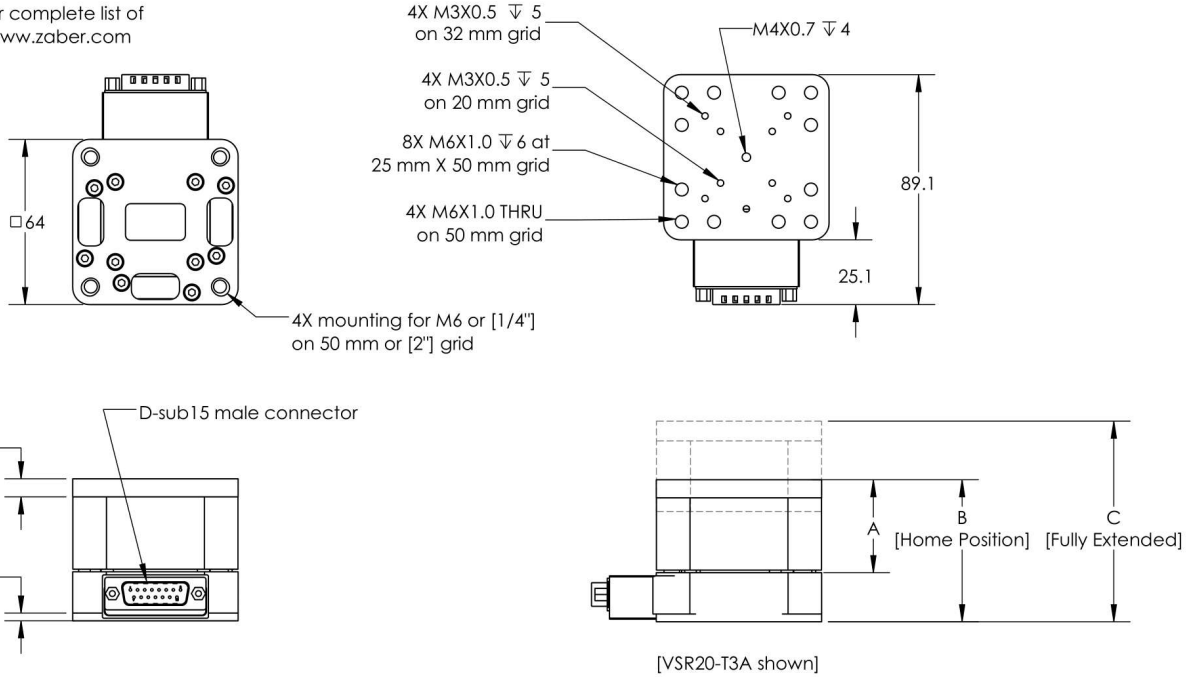
Product Drawing

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



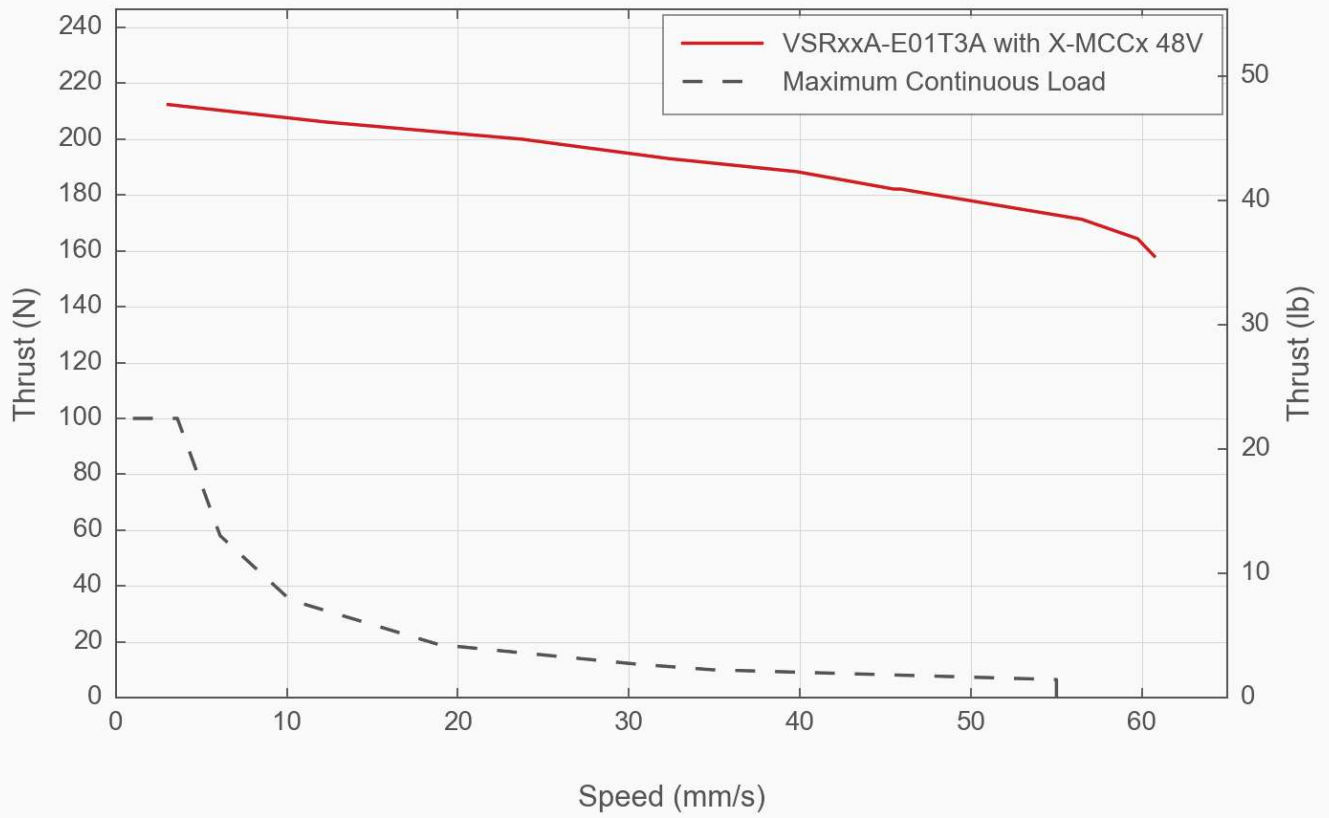
DWG 1088 R02

Specifications

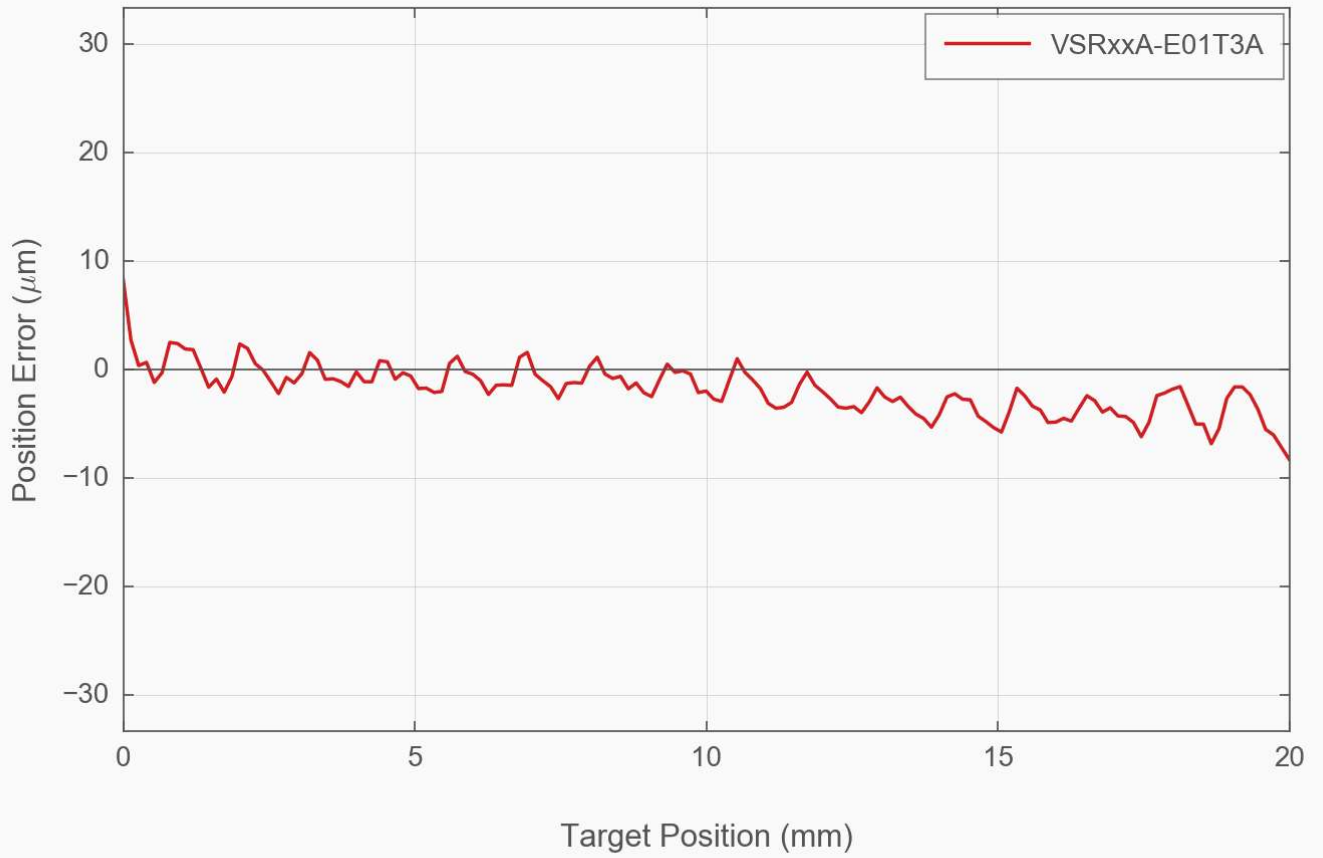
Specification	Value	Alternate Unit
Microstep Size (Default Resolution)	0.09525 μ m	
Built-in Controller	No	
Recommended Controller	MCC (48 V) Recommended	
AutoDetect	Yes	
Travel Range	20 mm	0.787"
Accuracy (unidirectional)	50 μ m	0.001968"
Loaded Accuracy (10 N)	35 μ m	0.001378"
Repeatability	< 1 μ m	< 0.000039"
Loaded Backlash (10 N)	< 10 μ m	< 0.000394"
Backlash	< 35 μ m	< 0.001378"
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

Specification	Value	Alternate Unit
Maximum Centered Load	100 N	22.4 lb
Maximum Moment (Pitch)	300 N·cm	424.8 oz·in
Maximum Moment (Roll)	300 N·cm	424.8 oz·in
Maximum Moment (Yaw)	300 N·cm	424.8 oz·in
Horizontal Runout	< 30 μm	< 0.001181"
Pitch	0.12°	2.094 mrad
Roll	0.12°	2.094 mrad
Yaw	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	
Guide Type	Ball Bearing	
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	
CE Compliant	Yes	
Vacuum Compatible	No	
Weight	0.57 kg	1.257 lb

Thrust Speed Performance



Typical Accuracy



Product Change Notices

Click [here](#) to view the current product change notices and subscribe to future change notifications.