# Vention Linear Axis Setup

This \*How-to-Guide\* covers the setup of motors and sensors on a Vention Linear axis.

## Background

Vention linear axes equipped with the MachineMotion controller provide a true motion control platform. This allows precise & accurate motion to be performed.

For motion control to be possible, a position reference must exist. This is what homing refers to, the action of finding the position reference of an axis. This position reference is also called \*home\* or \*zero\*.

End-stop sensors are used to perform homing operations. In order for the homing to be properly done, end-stop sensors must be placed in the appropriate location and connected to the right port on the MachineMotion controller. Installation of end-stop sensors also depends on how the motor is installed on the linear axis.

## Motors

### Rotation Direction

By convention, the motors have a positive and a negative rotation direction. This is an important consideration when installing the motor on a linear axis. When sending motion commands to the controller (for example a relative move of +200mm), it is important that the axis moves in the desired direction.

The rotation direction convention is shown in \*Figure 1\* and \*Figure 2\*:

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/881/large/positive\_motor\_direction.png?1548034463" width="25%" height="25%"></p>

\*\*\*Figure 1: Motor Positive Rotation Direction (Front Shaft Perspective)\*\*\*

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/882/large/negative\_motor\_direction.png?1548034476" width="25%" height="25%"></p>

\*\*\*Figure 2: Motor Negative Rotation Direction (Front Shaft Perspective)\*\*\*

### Linear Axis Direction

In order to satisfy the application requirements, positive rotation of the motor shaft should result in linear motion in the desired direction. \*Figures 3 to 6\* show how the linear axis move depending on where the motor is installed.

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/885/large/positive\_axis\_direction\_quadrant\_3.png?1548034507" width="60%" height="60%"></p>

\*\*\*Figure 3: Motor Placement #1\*\*\*

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/884/large/positive\_axis\_direction\_quadrant\_2.png?1548034505" width="60%" height="60%"></p>

\*\*\*Figure 4: Motor Placement #2\*\*\*

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/883/large/positive\_axis\_direction\_quadrant\_1.png?1548034504" width="60%" height="60%"></p>

\*\*\*Figure 5: Motor Placement #3\*\*\*

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/886/large/positive\_axis\_direction\_quadrant\_4.png?1548034508" width="60%" height="60%"></p>

\*\*\*Figure 6: Motor Placement #4\*\*\*

## End-Stop sensors

Linear axes require the use of end-stop sensors, for two main reasons:

- Perform homing operations (placing the axis in a known position, called home or zero)

- Disable motion in the event of an over or under travel event.

Inductive sensors are the preffered option for end-stop sensing since they are non-contact and less subject to environmental interference.

- M18 Inductive Proximity Sensor (Sn = 10 mm): [CE-SN-004-0001](https://www.vention.io/parts/244)

### Connections

#### Home Sensor (also called under-travel sensor)

The home sensor should be connected to the SENSORxA on the MachineMotion controller. For axis 1, the home sensor should be connected to SENSOR1A, for axis 2 SENSOR2A and for axis 3 SENSOR3A.

#### Over-Travel Sensor

The over-travel sensor should be connected to the SENSORxB on the MachineMotion controller. For axis 1, the home sensor should be connected to SENSOR1B, for axis 2 SENSOR2B and for axis 3 SENSOR3B.

### Position

#### Home / Under-Travel Sensor

When moving the axis in the negative direction, the gantry should be moving towards SENSOR1A (home / under-travel sensor).

#### Over-Travel Sensor

When moving the axis in the positive direction, the gantry should be moving towards SENSOR1B (over-travel sensor).

The image below details how to connect and position the end-stop sensors for a specific motor position. Important points:

- The \*home\* sensor is positioned such that a negative motion moves towards it

- The \*home\* sensor is connected to port SENSOR1A

- The \*over-travel\* sensor is positioned such that a positive motion moves towards it

- The \*over-travel\* sensor is connected to port SENSOR1B

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/888/large/sensor\_connection\_example.png?1548034531" width="60%" height="60%"></p>

\*\*\*Figure 7: End-stop Connections Example for a Specific Motor Connection\*\*\*

## Direction Reversal

It is posible that for design reasons, the motor has to be placed at a specific place on the linear axis (due to space or mechnical constraints). This could result in an undesired positive motion direction of the linear axis. For this reason, there is a also a software command that permits reversing the direction of a given axis. The basic Vention Apps offer this feature:

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/887/large/control\_center\_reverse\_axis.png?1548034530" width="50%" height="50%"></p>

\*\*\*Figure 8: Basic 1-Axis Linear Motion App showing the location of the reverse axis feature\*\*\*

\*\*++This configuration reverses the motor default rotation direction, but also reverses the position of the home and over-travel sensors.++\*\*

Going back to the example of \*Figure 7\*, reversing the axis results in the following configuration.

- The \*home\* sensor is positioned such that a negative motion moves towards it

- The \*home\* sensor is connected to port SENSOR1B

- The \*over-travel\* sensor is positioned such that a positive motion moves towards it

- The \*over-travel\* sensor is connected to port SENSOR1A

<p style="text-align:center;" ><img src="https://s3.amazonaws.com/ventioncms/vention\_images/images/000/000/889/large/sensor\_connection\_example\_reverse\_direction.png?1548034533" width="60%" height="60%"></p>

\*\*\*Figure 9: End-stop Connections Example for a Specific Motor Connection using software axis reversal\*\*\*