Vernier Rotary Motion Sensor
(Order Code RMV-BTD)

The Vernier Rotary Motion Sensor is a bidirectional angle sensor designed to measure rotational or linear position, velocity and acceleration. It is used for a variety of investigations, including measurement of rotational inertia and verification of the conservation of angular momentum.

Additional experiments and innovative uses can be found at **www.vernier.com/rmv-btd**

Note: Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

What's Included
- Rotary Motion Sensor
- Thumb screw
- 3-step pulley and mounting screw
- O-ring

Compatible Software
See **www.vernier.com/manuals/rmv-btd** for a list of software compatible with the Rotary Motion Sensor.

Getting Started
1. Plug the sensor into the interface (LabQuest 3, LabQuest Mini, etc.).
2. Connect the interface to your device.
   - If using USB, connect to the USB port on your computer.
   - If using Bluetooth® wireless technology, click your interface type and then select your device.
3. Prepare for data collection:
   - Vernier Graphical Analysis®: Launch the app, if necessary, and click Sensor Data Collection.
   - LabQuest® App: Choose New from the File menu.

The software will identify the sensor and load a default data-collection setup. You are now ready to collect data.

Need Additional Information?
Visit the following link:

www.vernier.com/start-lq-sensor

Using the Product
Example Experiments
The following examples show various ways to use the Rotary Motion Sensor. Some of these examples use accessory products described below.

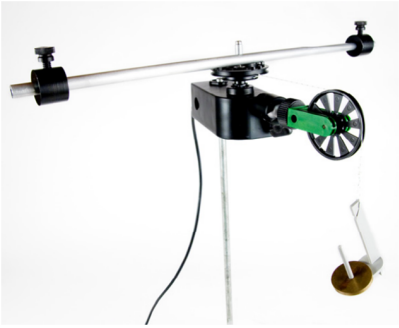
Atwood's Machine
Attach the 3-step pulley to the rotating shaft. Use the thumb screw to attach the Rotary Motion Sensor to a ring stand. Attach each end of the string to a mass and run the string over the pulley. Use the Rotary Motion Sensor to determine the acceleration of the system.

Moment of Inertia of a Disk
(requires Rotational Motion Accessory Kit, see Accessories section)

Attach an Ultra Pulley to the Rotary Motion Sensor. Attach the 3-step pulley to the rotating shaft. Attach the disk to the 3-step pulley. Attach a string to the underside of the hub. Attach the Ultra Pulley to the Rotary Motion Sensor using the Ultra Pulley Swivel Mount. Run the string over the Ultra Pulley and attach a weight to the end of the string. Use the weight to apply a torque to the system while the Rotary Motion Sensor measures the angular acceleration.

Moment of Inertia of Point Masses
(requires Rotational Motion Accessory Kit, see Accessories section)

Use the same set up as described in the previous section. This time attach a rod with two masses to the 3-step pulley. Use the weight to apply a torque to the system while the Rotary Motion Sensor measures the angular acceleration.



Conservation of Angular Momentum
(requires Rotational Motion Accessory Kit, see Accessories section)

Attach the disk to the 3-step pulley. Give the disk a spin. While the system is rotating, drop a second disk onto the first disk. Observe the change in the angular velocity before and after the mass is added to the system.

Motion of a Physical Pendulum
(requires Rotational Motion Accessory Kit, see Accessories section)

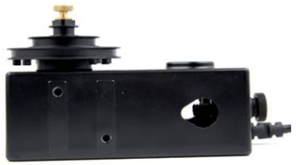
Attach the 3-step pulley to the Rotary Motion Sensor with the small step next to the sensor body. Attach the center of the rod with two masses to the pulley. Position the masses so they are not symmetric. Position the sensor so the face of the pulley is vertical. Start the pendulum swinging, and determine the angular acceleration as a function of the angle.

Configuring the Sensor

The 3-step pulley can be mounted on the rotating shaft in either of two orientations: with the wide side of the pulley near the sensor body, or with the narrow side of the pulley near the sensor body. The easiest way to insert the 3-step pulley on the Rotary Motion Sensor shaft is hold the shaft to prevent rotation as you turn the pulley to align the key to the slot. The o-ring can be slipped over the outer pulley to increase friction when the pulley is in contact with a surface.

The thumb screw can be threaded into the back of the sensor allowing the Rotary Motion Sensor to be attached to a ring stand.

The sensor also has a set of accessory mounting holes which allow it to connect to existing accessories.



Specifications

Resolution	1° or 0.25° [1]
Accuracy	≤ ±1.0% FS
Maximum speed	30 rev/s at 1° resolution 7.5 rev/s at 0.25° resolution
3-step pulley	10 mm, 29 mm and 48 mm groove diameter

Note: High resolution mode is also known as X4 mode. When active, the sensor has a 0.25 degree resolution and a limited maximum measurable rotational velocity.

Care and Maintenance

Do not wrap the cable tightly around the sensor for storage. Repeatedly doing so can irreparably damage the wires and is not covered under warranty.

How the Sensor Works

The Rotary Motion Sensor uses a quadrature optical (incremental type) encoder to measure the amount and direction of rotation. The encoder, which is attached to the rotating sensor shaft, consists of a coded pattern of opaque and transparent sectors. The quadrature encoder produces two pulse output patterns 90° apart in phase. The position of the shaft is determined by counting the pulses. The phase relationship between the output signals determines the direction of rotation.

Troubleshooting

For troubleshooting and FAQs, see **www.vernier.com/til/1439**

Repair Information

If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your Rotary Motion Sensor, contact Vernier Technical Support at support@vernier.com or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

Accessories

Item	Order Code
Rotary Motion Accessory Kit	AK-RMV
Rotary Motion Motor Kit	MK-RMV

Warranty

Warranty information for this product can be found on the Support tab at **www.vernier.com/rmv-btd**

General warranty information can be found at **www.vernier.com/warranty**

Disposal

When disposing of this electronic product, do not treat it as household waste. Its disposal is subject to regulations that vary by country and region. This item should be given to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring that this product is disposed of correctly, you help prevent potential negative consequences on human health or on the environment. The recycling of materials will help to conserve natural resources. For more detailed information about recycling this product, contact your local city office or your disposal service.

The symbol, shown here, indicates that this product must not be disposed of in a standard waste container.

Vernier Science Education
13979 SW Millikan Way • Beaverton, OR 97005-2886
Toll Free (888) 837-6437 • (503) 277-2299 • Fax (503) 277-2440
info@vernier.com • www.vernier.com

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