Vernier

2021 UNIVERSITY CATALOG

INTERNATIONAL EDITION

Celebrating 40 years

Engage the Scientists and Engineers of Tomorrow

Celebrating 40 years

Vernier Software started in 1981 as a two-person, part-time company run by a physics teacher and a social worker. Today we have 110 employees, and we sell in over 150 countries. We are proud to celebrate our 40th year in 2021!

Last year in this catalog letter, we made a comment about "living in interesting times." We were just talking about the complications of tariffs on our pricing. Now, in 2021, we are all really living through interesting times! With all the disruption of our business, we are pleased to say that we have been able to retain all of our employees (while working mostly from home). We have changed the way we do a lot of things, but like you, we are adapting.

When schools shut down in March, we quickly posted free experiment data so instructors would have something to share with students as they improvised ways to teach science remotely. And we literally pivoted—with Pivot Interactives—one of the best and most popular products for remote learning.

We now have a great collection of software tools for teaching science remotely, and they all work on Chromebooks, as well as computers and tablets. Our new Vernier Graphical Analysis Pro app includes data from many of the experiments in our lab books with videos taken of the procedure during data collection. With the Vernier Video Analysis app, students can take videos with their cell phones and analyze their motion data. If you have not tried out these programs, please do. All are available for a free 30-day trial.

And as we do every year, we have introduced some new Go Direct sensors. This year we added the Go Direct Weather System, Go Direct Thermocouple, Go Direct Static Charge, and Go Direct Platinum-Cell Conductivity.

And finally, we are excited to celebrate our 40th year with the introduction of LabQuest 3! It is a major upgrade to our LabQuest line of handheld data-collection tools with a large screen and advanced touch-screen abilities.

Stay positive and test negative!

John Wheeler
CEO
jwheeler@vernier.com

Dave and Christine Vernier
Co-Presidents
dvernier@vernier.com and cvernier@vernier.com

Why Vernier? Endless Possibilities.

Our durable hardware and quality software are designed and priced for hands-on student use whether learning remotely or in the laboratory. We have ready-to-go experiments and resources in a wide variety of subjects, including

BIOLOGY · CHEMISTRY · PHYSICS · ENGINEERING
AGRICULTURAL SCIENCE · ENVIRONMENTAL SCIENCE · PHYSIOLOGY

Our sensors and data-collection technology are so versatile that you can use them in nearly any science or engineering course.

Contents

What's New?

Vernier Graphical Analysis Pro

Meet Our Newly Enhanced App:
Vernier Graphical Analysis™ Pro

We reimagined our award-winning Vernier Graphical Analysis™ app to meet the needs of today's educators. The Pro version features the ability for you and your students to perform live experiments and share the data over the internet in real time. Whether learning happens remotely or in person, your students can experience real experiments and think critically as they analyze and graph data.

As always, our solutions are supported by resources to help you teach. This app comes with dozens of experiment videos that include sample data and provides interactive graphing capabilities. Sign up for a free 30-day trial today!

Learn more at vernier.com/graphical-analysis-pro

Remote Learning Solutions

As the COVID-19 pandemic continues to disrupt education systems around the world, we want you to know we're here for you. We've worked hard to ensure you have the best resources to keep your students engaged with science as they learn remotely.

Learn more at
vernier.com/college-rls

LabQuest 3

LabQuest 3 is a powerful, advanced, easy-to-navigate, and versatile data-logging solution for STEM students.

The all-new LabQuest® 3 is a standalone data-collection platform that students can use to collect, analyze, and interact with data efficiently. With its new touch-screen abilities, students can navigate the platform with ease, and because of its wireless capabilities, students can collect data anywhere.

Learn more at vernier.com/labq3

Sensors

Go Direct Static Charge

Perform quantitative measurements of static charges with enhanced accuracy and performance. Learn more at vernier.com/gdx-q

Go Direct Thermocouple

Collect reliable data during experiments that involve extreme temperatures. Learn more at vernier.com/gdx-tc

Go Direct Platinum-Cell Conductivity

Measure conductivity with greater accuracy and chemical compatibility. Learn more at vernier.com/gdx-conpt

Go Direct Weather System

Easily monitor a wide variety of environmental factors with just one sensor. Learn more at vernier.com/gdx-wtva

I have been using Vernier sensors and interfaces for over 20 years, both at the high school level at an international school and at a Canadian college. The equipment is robust and easy to use. Having access to this equipment has transformed the kinds of investigations available to the students.

—Dr. Carl Doige, Okanagan College

Join these institutions, and hundreds of others, already using Vernier technology:

Arizona State University

Baltimore City Community College

Benedictine University

California State University—Fullerton

Cameron University

Canisius College

Charles University

Colorado School of Mines

Cornell University

Cuyahoga Community College

Delft University of Technology

Dickinson College

ETH Zurich

Georgia Tech

Harvard University

Haskell Indian Nations University

Immaculata University

Lehigh University

Lund University

Massachusetts Institute of Technology

McGill University

Miami University

Michigan Technological University

Mississippi State University

National University of Colombia

National University of Singapore

Oregon State University

Princeton University

Queensborough Community College

Quinnipiac University

Saint Mary's University

Stanford University

Stephen F. Austin State University

Sungkyunkwan University

TEC Monterrey

Texas A&M

The Ohio State University

University of Arizona

University of British Columbia

University of California—Berkeley

University of Cambridge

University of Chicago

University of Hong Kong

University of Kansas

University of Minnesota—Minneapolis

University of Nebraska—Lincoln

University of Pennsylvania

University of Puerto Rico

University of Sydney

University of Tennessee—Chattanooga

University of Toronto

University of Washington

University of Wisconsin—Madison

Vincennes University

Virginia Commonwealth University

Wake Technical Community College

West Virginia Wesleyan College

Yale University

Biology

vernier.com/biology

Why Vernier?

Vernier biology solutions help students form a deep understanding of key scientific concepts. Whether you are introducing your students to enzymes or exploring primary productivity, our probeware and ready-to-go experiments are the right fit for your laboratory.

Quality

Durable hardware for lab and field use

Affordable

Designed for education and educational budgets

Versatile

Supports a variety of devices and experiments

> **Your great products and superb support of them have been a major part of my labs and are very much appreciated.**
>
> *David Willey*
> *University of Pittsburgh*

A Guide to Vernier Data Collection

We're here to support you as an educator as you incorporate data-collection technology into your instruction. See how our products provide you with affordable laboratory solutions designed for student success.

Our Guarantee: Most of our products are protected by a 5-year limited warranty. And after five years? We'll make every attempt to repair your equipment.

GDX What You Need to Get Started with Go Direct Sensors

Go Direct Sensor

These versatile sensors connect to your device via Bluetooth® wireless technology or USB.

Device

Go Direct® sensors connect to a wide variety of commonly used devices, including Chromebooks, computers, tablets, smartphones, and LabQuest 3.

Software

Vernier Graphical Analysis™ Pro
Vernier Spectral Analysis®

Lab Book

Our popular, award-winning lab books provide hundreds of well-tested, customizable experiments. Our lab books come with a generous site license—purchase once and share files across your department.

LQ What You Need to Get Started with LabQuest 3

Sensor

Go Direct Sensor
These versatile sensors connect to LabQuest® 3 via Bluetooth wireless technology or USB.

LabQuest Sensor
LabQuest sensors connect directly to LabQuest 3 sensor ports (BTA/BTD).

LabQuest 3

LabQuest 3 serves as a standalone data-collection platform that works with all Vernier sensors.

Software

LabQuest App

Lab Book

Our popular, award-winning lab books provide hundreds of well-tested, customizable experiments. Our lab books come with a generous site license—purchase once and share files across your department.

Software

Vernier Spectral Analysis GDX LQ

Spectral Analysis supports our family of spectrometers on computers, Chromebooks, and compatible mobile devices. Use it to generate full spectra, create standard curves, and conduct kinetics experiments.

LabQuest App LQ

LabQuest 3 has built-in software that gives your students real-time graphing capabilities in a handheld device. It's powerful, yet beautifully simple.

NEW

Vernier Graphical Analysis Pro GDX LQ

We are enhancing our award-winning Vernier Graphical Analysis™ app with advanced features that support remote learning and more advanced analysis of experiment data.

Free Trial for Educators

Try out Graphical Analysis Pro for free for 30 days. Access the sample experiments and enhanced analysis tools to use it with your students.
Get a free trial and learn about site license options at vernier.com/graphical-analysis-pro

Partnership with LabArchives

Vernier Software & Technology has partnered with LabArchives to bring high-quality biology content to instructors through the Lab Builder library. Because all content is structured and standardized, instructors can arrange, customize, and add content to their courses with ease.

vernier.com/lab-archives

Why Vernier?

Our durable hardware and quality software are designed for hands-on student use. Give your students the opportunity to gain practical, relevant data-collection and analysis experience that they can use wherever they go next.

General Biology

Go Direct CO_2 Gas

This sensor measures gaseous carbon dioxide concentration levels, air temperature, and relative humidity. With built-in temperature compensation and humidity protection, this sensor is ideal for measuring fermentation, respiration, and photosynthesis.

GDX-CO2

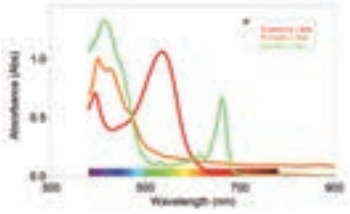
vernier.com/gdx-co2

Go Direct SpectroVis® Plus

Use this spectrophotometer to collect a full-wavelength spectrum (absorbance, percent transmittance, fluorescence, or intensity), study absorbance *vs.* concentration (create standard curves), or monitor enzyme activity (enzyme kinetics).

GDX-SVISPL

vernier.com/gdx-svispl



Vernier Spectral Analysis
FREE DOWNLOAD
Learn more on page 7.

Go Direct Tris-Compatible Flat pH

Use this sensor to measure the pH of solutions. It features a sealed, gel-filled, double-junction electrode, making it compatible with Tris buffers and solutions containing proteins or sulfides.

GDX-FPH
vernier.com/gdx-fph

Go Direct Optical Dissolved Oxygen

Use this sensor to measure dissolved oxygen, water temperature, and atmospheric pressure. It's ideal for experiments in biology, ecology, and environmental science.

GDX-ODO
vernier.com/gdx-odo

Biology with Vernier

This book includes 31 experiments for fundamental concepts in biology. The instructor information section included for each experiment contains reagent preparation information, sample data, and tips for successful completion.

Topics

- Cell respiration
- Membrane diffusion
- Osmosis
- Photosynthesis and transpiration
- Human physiology

vernier.com/bwv

Download only
BWV-E

Printed book + download
BWV

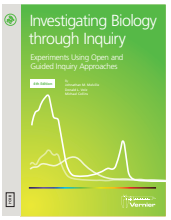
Investigating Biology through Inquiry

This book includes 22 investigations for many fundamental concepts in biology. Each investigation includes a preliminary activity, instructor information, sample researchable questions, and sample data.

Topics

- Cell and molecular biology
- Organismal biology
- Ecology
- Evolution

vernier.com/bio-i



Download only
BIO-I-E

Printed book + download
BIO-I

Biology Go Direct Starter Package

Learn more at vernier.com/gdp-bio-st

This package includes four sensors, which all work with our free Vernier Graphical Analysis app, as well as Graphical Analysis Pro and LabQuest 3.

- Go Direct Temperature
- Go Wireless® Heart Rate
- Go Direct Gas Pressure
- Go Direct CO_2 Gas

GDP-BIO-ST

Human Physiology

Go Direct EKG

Use Go Direct® EKG to record electrical activity of the heart or skeletal muscles.

GDX-EKG **vernier.com/gdx-ekg**

Go Direct Hand Dynamometer

Measure grip and pinch strength, and perform muscle fatigue studies.

GDX-HD **vernier.com/gdx-hd**

Go Direct Respiration Belt

Use this sensor to measure human respiration rate and study breathing patterns.

GDX-RB

vernier.com/gdx-rb

Go Direct Spirometer

This multi-channel sensor can be used to measure tidal volume, vital capacity, flow rate, air pressure, and respiration rate.

GDX-SPR

vernier.com/gdx-spr

Go Direct O_2 Gas

Use this sensor to measure gaseous oxygen concentration levels and air temperature.

GDX-O2

vernier.com/gdx-o2

Go Direct Blood Pressure

This affordable, non-invasive sensor is designed to easily measure human blood pressure.

GDX-BP **vernier.com/gdx-bp**

Human Physiology Experiments: Volume 1

This book contains 14 experiments that encourage students to investigate the physiology of the cardiac, muscular, respiratory, vascular, and nervous systems using Go Direct sensors.

vernier.com/hsb-hp

Download only
HSB-HP-E

Printed book + download
HSB-HP

Human Physiology Experiments: Volume 2

An expansion of our *Human Physiology Experiments: Volume 1* lab book, the setup for these experiments is minimal—students are collecting data within minutes.

vernier.com/alb-hp2

Download only
ALB-HP2-E

Printed book + download
ALB-HP2-E

Human Physiology Go Direct Standard Package

This package includes 11 products that all work with our free Vernier Graphical Analysis™ app, as well as Graphical Analysis Pro and LabQuest® 3.

- Go Direct EKG
- Go Direct Force and Acceleration
- Go Direct Surface Temperature
- Go Direct Hand Dynamometer
- Go Direct Respiration Belt
- Go Direct O_2 Gas
- Go Direct Blood Pressure
- Go Direct Spirometer
- Go Wireless® Heart Rate
- Reflex Hammer Accessory Kit
- BioChamber 250

GDP-HP-DX

Learn more at vernier.com/gdp-hp-dx

Starter package also available

BIOLOGY

Biotechnology

Spectrometers

Go Direct SpectroVis® Plus

Use this spectrophotometer to collect a full-wavelength spectrum (absorbance, percent transmittance, fluorescence, or intensity), study absorbance *vs.* concentration (create standard curves), or monitor enzymatic activity (enzyme kinetics).

GDX-SVISPL

vernier.com/gdx-svispl

Vernier UV-VIS Spectrophotometer

This ultraviolet and visible light spectrophotometer is used to measure the absorbance spectra of various chemical and biochemical compounds such as DNA, proteins, and NADH.

VSP-UV

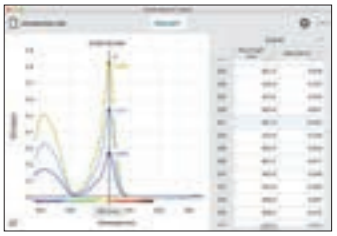
vernier.com/vsp-uv

Vernier Fluorescence/ UV-VIS Spectrophotometer

This spectrophotometer measures the fluorescence and absorbance spectra of ultraviolet and visible samples such as quinine sulfate, fluorescein, rhodamine, and DAPI.

VSP-FUV

vernier.com/vsp-fuv



Vernier Spectral Analysis®

Our free Spectral Analysis app makes it easy to incorporate spectroscopy into your general biology and biotechnology experiments. Using the app, students can collect a full spectrum and explore topics such as plant pigments, enzyme kinetics, and Beer's law (standard curves).

FREE DOWNLOAD **vernier.com/spectral-analysis**

Go Direct Tris-Compatible Flat pH

This pH sensor features a sealed, gel-filled, double-junction electrode, making it compatible with Tris buffers and solutions containing proteins or sulfides.

GDX-FPH

vernier.com/gdx-fph

BlueView™ Transilluminator

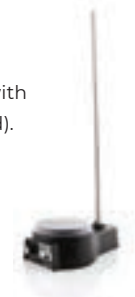
This transilluminator uses super bright blue LEDs to illuminate electrophoresis gels stained with fluorescent dyes (e.g., SYBR® Safe). This combination is a safer alternative to ethidium bromide and a UV transilluminator.

BLUE-VIEW **vernier.com/blue-view**

Stir Station

This combination stir plate/ring stand can be used with AC power (included) or four C batteries (not included).

STIR **vernier.com/stir**



OHAUS Scout Balances

Collect mass data from OHAUS Scout® balances using Logger *Pro*® 3 software or LabQuest 3. (OHAUS Scout USB Cable is required and not included.)

vernier.com/ohaus

Vernier and Bio-Rad Laboratories

Bio-Rad® combines high-quality supplies, equipment, and curricula with outstanding customer service and technical support—things we believe are important to teachers. Vernier and Bio-Rad enhance classroom experiences with joint experiments and curricula for biotechnology.

Download free sample experiments at vernier.com/bio-rad-kits

Environmental Science

Go Direct Optical Dissolved Oxygen

Use this sensor to measure dissolved oxygen, water temperature, and atmospheric pressure. It is ideal for experiments in environmental science.

GDX-ODO

vernier.com/gdx-odo

Go Direct Conductivity

Use this sensor to measure total dissolved solids (TDS) in aquatic samples or the salinity of soil samples.

GDX-CON

vernier.com/gdx-con

Go Direct Temperature

This rugged probe measures the temperature of a variety of substances including air, soil, and water.

Range: –40 to 125°C

GDX-TMP

vernier.com/gdx-tmp

Go Direct Tris-Compatible Flat pH

The flat glass shape of this pH sensor is more durable and easier to clean than the traditional pH bulb shape, making it the best choice for environmental science.

GDX-FPH

vernier.com/gdx-fph

Go Direct Nitrate Ion-Selective Electrode

Use this sensor to measure nitrate concentration in water samples from water sources throughout your watershed.

GDX-NO3

vernier.com/gdx-no3

Go Direct Energy

Simpler to use than a multimeter, Go Direct® Energy measures the voltage and current output of a renewable energy system. Connect a source, such as a small wind turbine or solar panel, and our Vernier Graphical Analysis™ or Graphical Analysis Pro app displays voltage, current, power, and energy output.

GDX-NRG

vernier.com/gdx-nrg

NEW LabQuest 3

LabQuest 3 is a powerful, advanced, easy-to-navigate, and versatile data-logging solution for STEM students.

The all-new LabQuest® 3 is a standalone data-collection platform that students can use to collect, analyze, and interact with data efficiently. With its new touch-screen abilities, students can navigate the platform with ease, and because of its wireless capabilities, students can collect data anywhere.

LABQ3

vernier.com/labq3

LabQuest App

LabQuest 3 has built-in software that gives your students real-time graphing capabilities in a handheld device. It's powerful, yet beautifully simple.

NEW Go Direct Weather System

Easily monitor a wide variety of environmental factors with just one sensor. Go Direct Weather System includes an affordable, wireless handheld sensor that measures ambient temperature, humidity, wind speed, wind chill, dew point, barometric pressure, and more. The included Go Direct Weather Vane accessory is required to report wind direction. Mounting Go Direct Weather System on a tripod is recommended (tripod not included).

GDX-WTVA

vernier.com/gdx-wtva

Go Direct Sensor Clamp

Prevent accidental drops during field investigations with the Go Direct Sensor Clamp.

GDX-CLAMP

vernier.com/gdx-clamp

Renewable Energy with Vernier

The *Renewable Energy with Vernier* lab book features 26 experiments in wind and solar energy. The book contains a combination of explorations, classic experiments, inquiry investigations, engineering projects, and more.

vernier.com/rev

Download only
REV-E

Printed book + download
REV

Investigating Environmental Science through Inquiry

This book contains 34 inquiry-based environmental science investigations.* Topics include Earth systems and resources, the living world, global change and population, energy resources and consumption, and pollution.

vernier.com/esi

Download only
ESI-E

Printed book + download
ESI

Water Quality with Vernier

With the 18 tests in *Water Quality with Vernier*,* students investigate the water quality of a body of water by testing pH, total dissolved solids, dissolved oxygen, BOD, and more.

vernier.com/wqv

Download only
WQV-E

Printed book + download
WQV

** Instructions for Vernier Graphical Analysis app are not yet available.*

Biology Products

Go Direct Sensors

Product	Order Code
Go Direct® Blood Pressure	GDX-BP
Go Direct CO_2 Gas	GDX-CO2
Go Direct Colorimeter	GDX-COL
Go Direct Conductivity	GDX-CON
Go Direct EKG	GDX-EKG
Go Direct Ethanol Vapor	GDX-ETOH
Go Direct Energy	GDX-NRG
Go Direct Force and Acceleration	GDX-FOR
Go Direct Gas Pressure	GDX-GP
Go Direct Hand Dynamometer	GDX-HD
Heart Rate Monitors	
Go Wireless Exercise Heart Rate	GW-EHR
Go Wireless® Heart Rate	GW-HR
Ion-Selective Electrodes	
Go Direct Ammonium Ion-Selective Electrode	GDX-NH4
Go Direct Nitrate Ion-Selective Electrode	GDX-NO3
Go Direct Light and Color	GDX-LC
Go Direct O_2 Gas	GDX-O2
Go Direct Optical Dissolved Oxygen	GDX-ODO
pH Sensors	
Go Direct pH	GDX-PH
Go Direct Tris-Compatible Flat pH	GDX-FPH
Go Direct Respiration Belt	GDX-RB
Spectrophotometers	
Go Direct SpectroVis® Plus	GDX-SVISPL
Vernier Fluorescence/UV-VIS Spectrophotometer	VSP-FUV
Vernier UV-VIS Spectrophotometer	VSP-UV
Go Direct Spirometer	GDX-SPR
Temperature Probes	
Go Direct Surface Temperature	GDX-ST
Go Direct Temperature	GDX-TMP
Go Direct Wide-Range Temperature	GDX-WRT
Go Direct Weather	GDX-WTHR
Go Direct Weather System	GDX-WTVA

LabQuest Sensors

Product	Order Code
PAR Sensor	PAR-BTA
Relative Humidity Sensor	RH-BTA
Salinity Sensor	SAL-BTA
Soil Moisture Sensor	SMS-BTA
Turbidity Sensor	TRB-BTA

Accessories and Lab Equipment

Product	Order Code
BioChamber 250	BC-250
BioChamber 2000	BC-2000
BlueView Transilluminator	BLUE-VIEW
Disposable Bacteria Filters (pkg. of 10)	SPR-FIL10
Disposable Mouth Pieces (pkg. of 30)	SPR-MP30
EKG Electrodes (pkg. of 100)	ELEC
Go Direct Charge Station	GDX-CRG
Go Direct Sensor Clamp	GDX-CLAMP
Nose Clip (pkg. of 10)	SPR-NOSE10
OHAUS® Balances	vernier.com/ohaus
Primary Productivity Kit	PPK
Reflex Hammer Accessory Kit	RFX-ACC
Stir Station	STIR
Water Depth Sampler	WDS
Water Quality Bottles	WQ-BOT

Lab Books*

Product	Order Code
Biology with Vernier	BWV
Investigating Biology through Inquiry	BIO-I
Advanced Biology with Vernier	BIO-A
Human Physiology Experiments: Volume 1	HSB-HP
Human Physiology Experiments: Volume 2	ALB-HP2
Investigating Environmental Science through Inquiry	ESI
Renewable Energy with Vernier	REV
Water Quality with Vernier	WQV

** Includes printed book and download; also available as a download only*

See all our products for biology at vernier.com/biology

Chemistry

vernier.com/chemistry

Why Vernier?

When you teach with Vernier, you're teaching with a complete chemistry solution. From titrations to spectroscopy, our sensors and instrumentation are backed by powerful analytical software, college-level experiments, and unparalleled support.

Quality

Durable hardware for lab and field use

Affordable

Designed for education and educational budgets

Versatile

Supports a variety of devices and experiments

> **The use of these technologies helps to build students' proficiency using instrumentation while providing them with hands-on experience that will better prepare them for careers in the chemistry field.**

Seth Barrett, Ph.D.
Muskingum University

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Device

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Software

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Vernier Spectral Analysis®
Vernier Instrumental Analysis™

Lab Book

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LabQuest App

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Software

Vernier Spectral Analysis

Vernier Spectral Analysis supports our family of spectrometers. Use it to generate full spectra, conduct Beer's law investigations, and investigate kinetics.

Vernier Instrumental Analysis

Vernier Instrumental Analysis is used for more advanced instrumentation such as Go Direct Mini GC,™ Go Direct Polarimeter, and Go Direct Cyclic Voltammetry System.

Logger *Pro* 3

Logger *Pro* 3 is our data-collection and analysis software for LabQuest sensors and spectrometers on Windows® and macOS® computers.

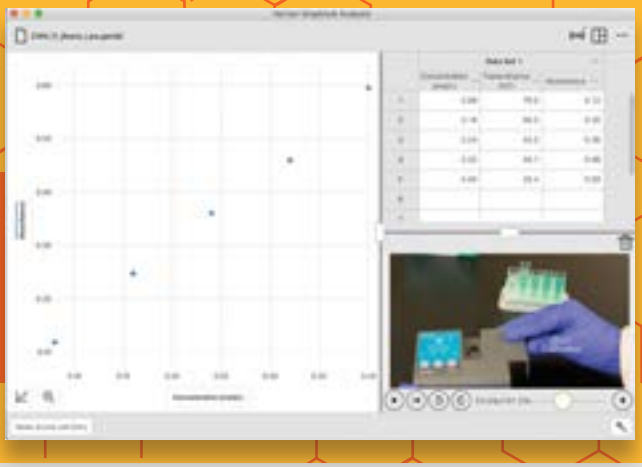
NEW

Vernier Graphical Analysis Pro

We are enhancing our award-winning Vernier Graphical Analysis app with advanced features that support remote learning and more advanced analysis of experiment data.

Free Trial for Educators

Try out Graphical Analysis Pro for free for 30 days. Access the sample experiments and enhanced analysis tools to use it with your students.
Get a free trial and learn about site license options at vernier.com/graphical-analysis-pro



Partnership with LabArchives

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vernier.com/lab-archives

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General Chemistry

Go Direct Temperature

Use this rugged temperature probe for investigating endothermic and exothermic reactions, determining the physical properties of water, and investigating intermolecular forces.

Range: –40 to 125°C

GDX-TMP

vernier.com/gdx-tmp

Go Direct pH

Go Direct pH is an important and versatile sensor for your laboratory. Conduct acid-base titrations, monitor pH changes during chemical reactions, and investigate buffers. The wireless connection makes it easier to do field-based studies such as testing the pH of surface water.

GDX-PH

vernier.com/gdx-ph

Go Direct Gas Pressure

Explore gas laws and the Clausius-Clapeyron equation with this sensor that measures the absolute pressure of a gas.

GDX-GP

vernier.com/gdx-gp

Go Direct SpectroVis® Plus

With a range of 380 to 950 nm, students can use this spectrophotometer to easily collect a full-wavelength spectrum, study absorbance *vs.* concentration, or monitor rates of reaction. Collect and analyze data using Vernier Spectral Analysis, LabQuest App, or Logger *Pro*® 3.

GDX-SVISPL

vernier.com/gdx-svispl

Go Direct Drop Counter

As an alternative to using a buret, the drop counter precisely records the number of drops of titrant added during a titration and then automatically converts it to volume.

GDX-DC

vernier.com/gdx-dc

Stir Station

This combination stir plate/ring stand can be used with AC power (included) or four C batteries (not included).

STIR

vernier.com/stir

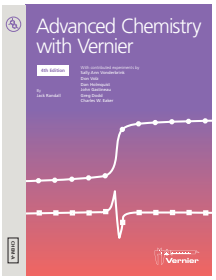
Advanced Chemistry with Vernier

This book contains 35 ready-to-use student experiments that support general chemistry. Instructor notes with sample data are also included.

Topics

- Gas laws
- Titrations
- Spectroscopy
- Electrochemistry

vernier.com/chem-a



Download only
CHEM-A-E

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CHEM-A

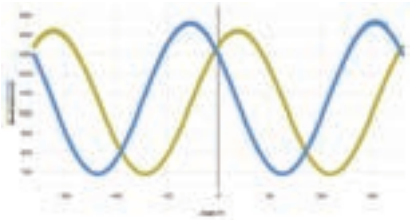
Biochemistry

Go Direct Polarimeter

The concept of chirality can be difficult for students to visualize. Go Direct® Polarimeter provides a visual representation of this concept by measuring the optical rotation of optical isomers such as sugars, amino acids, and proteins.

GDX-POL

vernier.com/gdx-pol



Reaction kinetics of sucrose

Vernier Fluorescence/ UV-VIS Spectrophotometer

The Fluorescence/UV-VIS Spectrophotometer measures the fluorescence and absorbance spectra of samples such as quinine sulfate, fluorescein, rhodamine, and DAPI.

VSP-FUV

vernier.com/vsp-fuv

Wavelength Range

- 220 to 850 nm

Light Sources

- Visible: LED-boosted tungsten
- UV: Deuterium
- Fluorescence: exchangeable LEDs for excitation at 375 nm, 450 nm, and 525 nm (additional wavelengths sold separately)

Go Direct Tris-Compatible Flat pH

Go Direct Tris-Compatible Flat pH is a double-junction electrode for measuring pH in Tris buffers and solutions containing proteins or sulfides. The flat glass shape makes it easy to clean and useful for measuring the pH of semisolids such as soil slurries and certain foods.

GDX-FPH

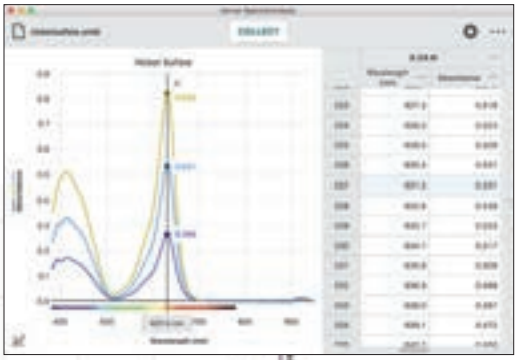
vernier.com/gdx-fph

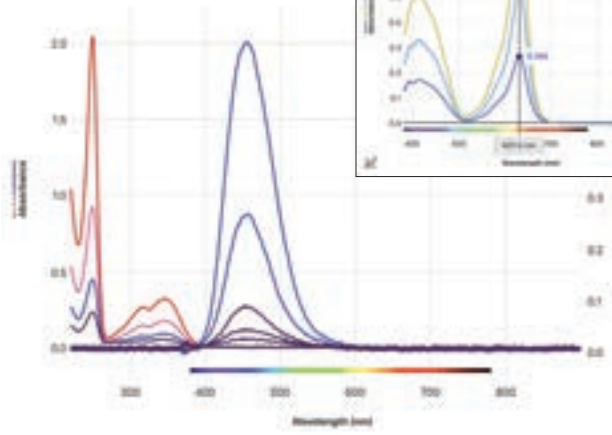
Vernier Spectral Analysis

Our free Vernier Spectral Analysis® app makes it easy to incorporate spectroscopy into your chemistry experiments. Using the app, students can collect a full spectrum and explore topics such as Beer's law, kinetics, and fluorescence.

The user-friendly software includes analysis features such as curve fitting and data interpolation.

vernier.com/spectral-analysis





Organic Chemistry

Go Direct Melt Station

Go Direct Melt Station accurately measures melting temperatures of a solid (up to 260°C), and the real-time graphing provides a unique perspective of the melting process.

GDX-MLT

vernier.com/gdx-mlt

Go Direct Wide-Range Temperature

Go Direct Wide-Range Temperature is designed to be used as you would use a thermometer for experiments such as the recrystallization of benzoic acid, simple and fractional distillations, determination of boiling points, the synthesis and analysis of aspirin and other organic compounds, and more.

Range: –20 to 330°C

GDX-WRT

vernier.com/gdx-wrt

Go Direct Mini GC

With the easy-to-use Go Direct Mini GC™ and the free Vernier Instrumental Analysis app, students can separate, analyze, and identify substances contained in a volatile liquid or gaseous sample. This portable gas chromatograph detects polar and nonpolar compounds allowing for a wide range of experiments. Sample experiments include fractional distillation and Fischer esterification.

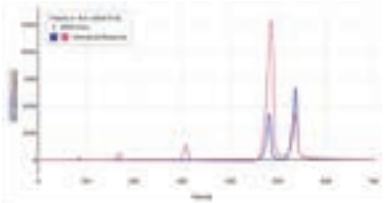
GDX-GC

vernier.com/gdx-gc

Vernier Instrumental Analysis

With our free Vernier Instrumental Analysis™ app, students can collect and analyze data from our Go Direct Mini GC, Go Direct Polarimeter, and Go Direct Cyclic Voltammetry System (page 16) using computers, Chromebooks, or compatible mobile devices.

vernier.com/instrumental-analysis



Vernier UV-VIS Spectrophotometer

The Vernier UV-VIS Spectrophotometer generates a full spectrum, Beer's law graph, and kinetics traces of ultraviolet and visible-absorbing samples such as aspirin, DNA, proteins, and NADH.

VSP-UV

vernier.com/vsp-uv

Wavelength Range

- 220 to 850 nm

Light Sources

- Visible: LED-boosted tungsten
- UV: Deuterium

Free Software

Vernier Spectral Analysis

See page 14.

UPDATED

Organic Chemistry with Vernier

Organic Chemistry with Vernier contains 26 experiments that represent a broad range of topics and techniques taught in most college organic chemistry lab courses. The experiments in this book build upon prior knowledge, laboratory techniques, and skills students have learned in general chemistry courses.

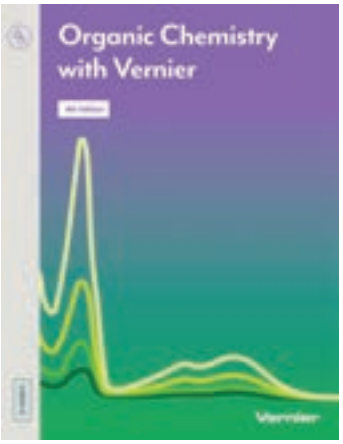
Topics

- Distillation
- Chromatography
- Synthesis
- Polarimetry

vernier.com/chem-o

Download only
CHEM-O-E

Printed book + download
CHEM-O



Analytical Chemistry

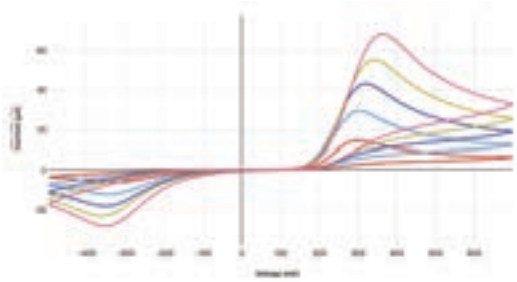
Go Direct Cyclic Voltammetry System

Give your students hands-on experience with electrochemically active reactions using this affordable potentiostat and disposable screen-printed electrodes.

Easily incorporate electrochemistry into your curriculum using our e-book, *Electrochemistry Experiments with the Go Direct Cyclic Voltammetry System,* available for free with your purchase.

GDX-CVS

vernier.com/gdx-cvs



Determining acetaminophen concentration in children's liquid Tylenol®

Free Software

Vernier Instrumental Analysis™

See page 14.

Go Direct Polarimeter

The concept of chirality can be difficult for students to visualize. Go Direct® Polarimeter provides a visual representation of this concept by measuring the optical rotation of optical isomers such as sugars, amino acids, and proteins.

GDX-POL

vernier.com/gdx-pol

Vernier UV-VIS Spectrophotometer

The Vernier UV-VIS Spectrophotometer generates a full spectrum, Beer's law graph, and kinetics traces of ultraviolet and visible-absorbing samples such as aspirin, DNA, proteins, and NADH.

VSP-UV

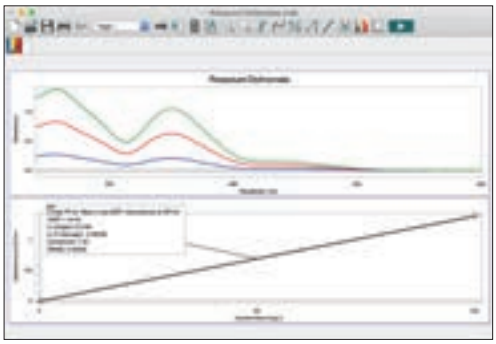
Wavelength Range

- 220 to 850 nm

Light Sources

- Visible: LED-boosted tungsten
- UV: Deuterium

vernier.com/vsp-uv



Examining the absorbance spectrum of potassium dichromate using the Vernier UV-VIS Spectrophotometer and Logger Pro®

Recommended Accessory

Vernier Spectrophotometer Optical Fiber

Analyze emissions spectra of gas discharge tubes or flame tests with this optical fiber.

VSP-FIBER **vernier.com/vsp-fiber**

Free Software

Vernier Spectral Analysis®

See page 14.

Go Direct pH

Use this general-purpose pH sensor to monitor the pH of aqueous solutions.

GDX-PH

vernier.com/gdx-ph

Go Direct ORP

Measure the ability of a solution to act as an oxidizing or reducing agent.

GDX-ORP

vernier.com/gdx-orp

Go Direct Drop Counter

This sensor precisely records the number of drops of titrant added during a titration and then automatically converts it to volume.

GDX-DC

vernier.com/gdx-dc

Physical Chemistry

Vernier Fluorescence/ UV-VIS Spectrophotometer

The Fluorescence/UV-VIS Spectrophotometer measures the fluorescence and absorbance spectra of ultraviolet and visible samples such as quinine sulfate, fluorescein, rhodamine, and DAPI.

VSP-FUV

Wavelength Range

- 220 to 850 nm

Light Sources

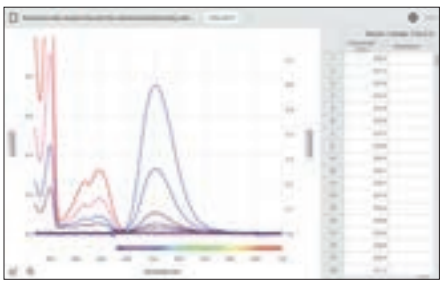
- Visible: LED-boosted tungsten
- UV: Deuterium
- Fluorescence: exchangeable LEDs for excitation at 375 nm, 450 nm, and 525 nm (additional wavelengths sold separately)

Free experiment downloads available at vernier.com/vsp-fuv

Free Software

Vernier Spectral Analysis

See page 14.



Absorbance and fluorescence spectra of quinine sulfate at varying concentrations

IMPROVED Vernier Flash Photolysis Spectrometer

The Vernier Flash Photolysis Spectrometer is perfect for students to explore the fundamental principles of photochemical reactions. This spectrometer now includes 13 detection filters for measuring the absorption and emission changes of a photoexcited sample with microsecond resolution. Excitation filters (2) are also included.

VSP-FP

Wavelength Range

- 450 to 750 nm

Light Sources

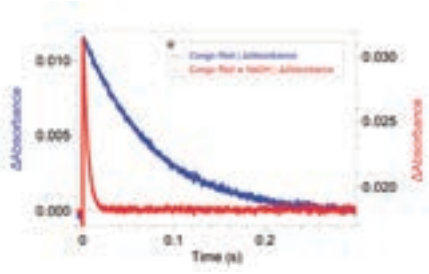
- Xenon flashlamp (pump) white LED (probe)
- 13 exchangeable filters for detection wavelength
- 2 exchangeable colored glass filters for excitation wavelength

Free experiment downloads available at vernier.com/vsp-fp

Free Software

Collect data with the free all-inclusive Flash Photolysis Spectrometer Software.*

**Available for Windows® only*



Fast photocatalysis of Congo Red

Go Direct Mini GC

Teach students chromatography with an affordable, portable gas chromatograph that detects polar and nonpolar compounds. With the easy-to-use Go Direct Mini GC™ and the free Vernier Instrumental Analysis app, students can separate, analyze, and identify substances contained in a volatile liquid or gaseous sample. Go Direct Mini GC uses Bluetooth® wireless technology or USB to connect to your device.

Included with Go Direct Mini GC is our *Chromatography Experiments with the Go Direct Mini GC* e-book. This lab manual includes student instructions and instructor notes.

GDX-GC

vernier.com/gdx-gc

Free Download

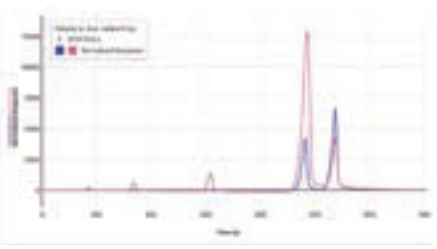
***Chromatography Experiments with the Go Direct Mini GC* e-book**

Free with purchase of Go Direct Mini GC

Free Software

Vernier Instrumental Analysis

See page 15.



Separating a mixture of alkanes, esters, and cyclic hydrocarbons

Chemistry Products

Go Direct Sensors

Sensor	Order Code
Go Direct® Colorimeter	GDX-COL
Conductivity Probes	
Go Direct Conductivity	GDX-CON
Go Direct Platinum-Cell Conductivity	GDX-CONPT
Current Probes	
Go Direct Constant Current System	GDX-CCS
Go Direct Current	GDX-CUR
Go Direct Drop Counter	GDX-DC
Go Direct Electrode Amplifier	GDX-EA
Go Direct Gas Pressure	GDX-GP
Go Direct Melt Station	GDX-MLT
Go Direct ORP	GDX-ORP
pH Sensors	
Go Direct Glass-Body pH	GDX-GPH
Go Direct pH	GDX-PH
Go Direct Tris-Compatible Flat pH	GDX-FPH
Go Direct Radiation Monitor	GDX-RAD
Go Direct SpectroVis® Plus	GDX-SVISPL
Temperature Probes	
Go Direct Surface Temperature	GDX-ST
Go Direct Temperature	GDX-TMP
Go Direct Thermocouple	GDX-TC
Go Direct Wide-Range Temperature	GDX-WRT
Go Direct Voltage	GDX-VOLT

LabQuest Sensors

Sensor	Order Code
Colorimeter	COL-BTA
Conductivity Probes	
Conductivity Probe	CON-BTA
Platinum-Cell Conductivity Probe	CONPT-BTA
Current Probes	
Constant Current System	CCS-BTA
Current Probe	DCP-BTA
Drop Counter	VDC-BTD
Electrode Amplifier	EA-BTA
Gas Pressure Sensors	
Gas Pressure Sensor	GPS-BTA
Pressure Sensor 400	PS400-BTA
Instrumentation Amplifier	INA-BTA
Melt Station	MLT-BTA
ORP Sensor	ORP-BTA
pH Sensors	
Glass-Body pH Electrode BNC (requires Electrode Amplifier)	GPH-BNC
pH Sensor	PH-BTA
Tris-Compatible Flat pH Sensor	FPH-BTA
Polarimeter (Chemical)	CHEM-POL
Radiation Monitor	VRM-BTD
Temperature Probes	
Stainless Steel Temperature Probe	TMP-BTA
Surface Temperature Sensor	STS-BTA
Thermocouple	TCA-BTA
Wide-Range Temperature Probe	WRT-BTA
Voltage Probes	
Differential Voltage Probe	DVP-BTA
Voltage Probe	VP-BTA

Instrumentation

Instrument	Order Code
Go Direct Mini GC™	GDX-GC
Go Direct Cyclic Voltammetry System	GDX-CVS
Go Direct Polarimeter	GDX-POL

Spectrometers

Spectrometer	Order Code
Go Direct SpectroVis® Plus	GDX-SVISPL
Vernier Emissions Spectrometer	VSP-EM
Vernier Flash Photolysis Spectrometer	VSP-FP
Vernier Fluorescence/UV-VIS Spectrophotometer	VSP-FUV
Vernier Spectrometer (Ocean Optics dba Ocean Insight)	V-SPEC
Vernier UV-VIS Spectrophotometer	VSP-UV

Lab Equipment

Equipment	Order Code
Electrode Support	ESUP
OHAUS® Balances	vernier.com/ohaus
Stir Station	STIR
Cuvette Rack	CUV-RACK
Go Direct Charge Station	GDX-CRG

Lab Books*

Equipment	Order Code
Advanced Chemistry with Vernier	CHEM-A
Chemistry with Vernier	CWV
Food Chemistry Experiments	HSB-FOOD
Investigating Chemistry through Inquiry	CHEM-I
Organic Chemistry with Vernier	CHEM-O

** Includes printed book and download; also available as a download only*

See all our products for chemistry online at vernier.com/chemistry

Physics

vernier.com/physics

Why Vernier?

Vernier started when one educator, Dave Vernier, decided to build solutions to bring physics to life for his students. Today, our complete physics solution is still powered by the desire to inspire students and foster learning and is backed by powerful software and unparalleled support.

Quality

Durable hardware lasts for years of use

Affordable

Designed for education and educational budgets

Versatile

Supports a variety of devices and experiments

> **I really find your hardware, and especially Logger *Pro*, extremely helpful in my teaching. Couldn't do it without your stuff.**
>
> *Barbara Hughey*
> *Massachusetts Institute of Technology*

A Guide to Vernier Data Collection

We're here to support you as an educator as you incorporate data-collection technology into your instruction. See how our products provide you with affordable laboratory solutions designed for student success.

Our Guarantee: Most of our products are protected by a 5-year limited warranty. And after five years? We'll make every attempt to repair your equipment.

What You Need to Get Started with Go Direct Sensors

Go Direct Sensor

These versatile sensors connect to your device via Bluetooth® wireless technology or USB.

Device

Go Direct® sensors connect to a wide variety of commonly used devices, including Chromebooks, computers, smartphones, tablets, and LabQuest 3.

Software

Vernier Graphical Analysis™ Pro
Vernier Spectral Analysis®
Vernier Video Analysis™

Lab Book

Our popular, award-winning lab books provide hundreds of well-tested, customizable experiments. Our lab books come with a generous site license—purchase once and share files across your department.

What You Need to Get Started with LabQuest Sensors

LabQuest Sensor

LabQuest® sensors share data with your device via a wired connection (BTA/BTD) to an interface from the LabQuest family.

Interface

An interface sends information from the sensor to the data-collection and analysis software. The LabQuest family includes LabQuest 3, LabQuest Stream,® and LabQuest Mini.

Device

LabQuest sensors connect to computers, Chromebooks, and compatible mobile devices through a LabQuest interface.

Software

Vernier Graphical Analysis Pro
Logger *Pro*® 3

Lab Book

Our popular, award-winning lab books provide hundreds of well-tested, customizable experiments. Our lab books come with a generous site license—purchase once and share files across your department.

Software

Vernier Spectral Analysis

Spectral Analysis supports our family of spectrometers. The user-friendly interface walks students through the data-collection process and includes analysis features such as curve fitting and data interpolation.

Vernier Video Analysis

Students can use their smartphone or tablet in the laboratory or out in the field to record motion. They can then import the video into Video Analysis on any device to mark the object in motion, set the scale, and create graphs of the motion.

Logger *Pro* 3

Logger *Pro* 3 is our data-collection and analysis software for LabQuest sensors and spectrometers on Windows® and macOS® computers.

NEW

Vernier Graphical Analysis Pro

We are enhancing our award-winning Vernier Graphical Analysis app with advanced features that support remote learning and more advanced analysis of experiment data.

Free Trial for Educators

Try out Graphical Analysis Pro for free for 30 days. Access the sample experiments and enhanced analysis tools to use it with your students.
Get a free trial and learn about site license options at vernier.com/graphical-analysis-pro

Why Vernier?

Our durable hardware and quality software are designed for hands-on student use. Give your students the opportunity to gain practical, relevant data-collection and analysis experience that they can use wherever they go next.

Mechanics

Dynamics Cart and Track System with Go Direct Sensor Cart

GDX

The Dynamics Cart and Track System with Go Direct Sensor Cart includes essential laboratory equipment for teaching dynamics and kinematics. With our Go Direct Sensor Cart, students can explore force, position, velocity, and acceleration directly on their device using Bluetooth wireless technology. There are no wires to create drag, and no additional equipment is required! Each cart features built-in sensors that simplify experiment setup and make this system the best choice for studying dynamics and kinematics.

with 1.2 m Track DTS-GDX
with 2.2 m Track DTS-GDX-LONG

vernier.com/dts-gdx

Additional Cart and Track options are available at vernier.com/dynamics

Go Direct Photogate

GDX

This double-gate sensor includes two photogates built into the arms of the sensor. It accurately measures velocity and acceleration.

GDX-VPG

vernier.com/gdx-vpg

Go Direct Force and Acceleration

GDX

Measure forces as small as ±0.1 N and up to ±50 N with this sensor that couples a 3-axis accelerometer with a stable and accurate force sensor. It also includes a 3-axis gyroscope for experiments involving rotation.

GDX-FOR

vernier.com/gdx-for

Go Direct Centripetal Force Apparatus

GDX

When combined with Go Direct Force and Acceleration (not included), the Centripetal Force Apparatus makes an ideal tool to explore rotational dynamics.

GDX-CFA

vernier.com/gdx-cfa

Moment of Inertia Accessory Kit

GDX LQ

With the Moment of Inertia Accessory Kit, students can explore inertia in a broader context. The kit expands the capabilities of the Vernier Centripetal Force Apparatus when investigating moments of inertia of different geometries.

CFA-MIK

vernier.com/cfa-mik

Go Direct Motion

GDX

Use ultrasound to measure the position, velocity, and acceleration of moving objects.

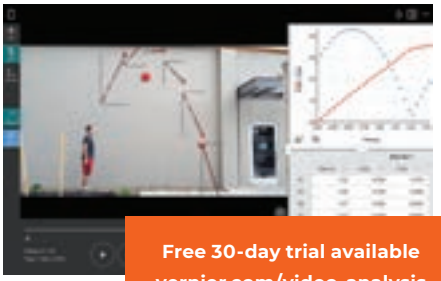
GDX-MD

vernier.com/gdx-md

Vernier Video Analysis App

Students can use their smartphones and tablets in the laboratory or out in the field to capture motion. Once the video is inserted into the app, students set the scale and mark points within the video to track the object in motion. Vernier Video Analysis™ generates accurate and visually rich graphs and a data table reflecting the recorded motion.

Video Analysis is a browser-based app that works on Windows,® macOS,® Android,™ Chrome OS,™ iOS, and iPadOS.®



Free 30-day trial available
vernier.com/video-analysis

Vernier Video Analysis: Motion and Sports

This e-book features 12 investigations in which students use Vernier Video Analysis to explore velocity, acceleration, and sports activities.
Download only: HSB-VVAMS-E vernier.com/hsb-vvams-e

Waves and Sound

Go Direct Sound

GDX

This is really two sensors in one—measure sound level in decibels, or capture and evaluate sound waveforms.

GDX-SND

vernier.com/gdx-snd

Power Amplifier

Drive devices such as speakers, lamps, and small DC motors.

PAMP

vernier.com/pamp

Power Amplifier Accessory Speaker

Study mechanical waves on strings and springs.

PAAS-PAMP

vernier.com/paas-pamp

Thermodynamics

Go Direct Gas Pressure

GDX

This sensor measures the absolute pressure of a gas.

GDX-GP

vernier.com/gdx-gp

Go Direct Temperature

GDX

Go Direct® Temperature is a durable, stainless steel temperature sensor for use in liquids or air.

Range: –40 to 125°C

GDX-TMP

vernier.com/gdx-tmp

Go Direct Surface Temperature

GDX

An exposed temperature sensor makes this an ideal choice for situations where low thermal mass and extremely rapid response are needed. Use in air and water only.

Range: –25 to 125°C

GDX-ST

vernier.com/gdx-st

Electricity and Magnetism

Go Direct Voltage

GDX

This sensor combines a wide input voltage range and high precision, making it an excellent choice for investigations of both AC/DC circuits and electromagnetism.

Ranges: ±20 V and ±1 V

GDX-VOLT

vernier.com/gdx-volt

Go Direct Current

GDX

Measure electric currents in circuits with this versatile sensor.

Ranges: ±1 A and ±0.1 A

GDX-CUR

vernier.com/gdx-cur

Go Direct Static Charge

GDX

With Go Direct Static Charge, students can easily perform quantitative measurements of static charges. Designed with ease of use in mind, this wireless sensor ensures enhanced accuracy and performance.

Range: ±100 nC

GDX-Q

vernier.com/gdx-q

Go Direct 3-Axis Magnetic Field

GDX

Determine the magnitude and direction of a magnetic field at any point in space with this 3-axis sensor.

Ranges: ±5 mT and ±130 mT

GDX-3MG

vernier.com/gdx-3mg

Electrostatics Kit

When using the Electrostatics Kit with Go Direct Static Charge, students can conduct a range of experiments in electrostatics.

ESK-CRG

vernier.com/esk-crg

High-Voltage Electrostatics Kit

Use this kit to investigate the distribution of charge on a sphere, transfer of charge on contact between two spheres, and charging by induction.

HVEK-CRG

vernier.com/hvek-crg

Extech® Digital Power Supply

This power supply provides constant current or constant voltage for physics activities that require DC power.

EXPS

vernier.com/exps

Vernier Circuit Board 2

Use this convenient platform to study basic series and parallel circuits as well as RLC circuits. Many components for experimentation are provided, and additional components can be added to expand the capability of this useful board.

VCB2

vernier.com/vcb2

Electrostatic High-Voltage Genecon

A great addition to the High Voltage Electrostatics Kit, the Electrostatic High-Voltage Genecon generates both positive and negative charges and reliably creates charge differences in high humidity.

HVEK-GEN

vernier.com/hvek-gen

Light and Optics

Light Sensors

Go Direct® Light and Color

GDX

This sensor combines visible light, UV, and RGB sensors to measure source emission, transmittance, and reflection of light in the visible light to ultraviolet electromagnetic spectrum.

GDX-LC

vernier.com/gdx-lc

Light Sensor*

LQ

Investigate polarizers, reflectivity, and solar energy with this sensor that approximates the human eye in spectral response. It's great for inverse square law experiments.

LS-BTA vernier.com/ls-bta

LQ

Diffraction Apparatus‡

Use the Diffraction Apparatus* to map light intensity *vs.* position for various slit geometries.

DAK vernier.com/dak

Green Diffraction Laser *(optional)*

Add this laser to your Diffraction Apparatus to study the effect of wavelength on a diffraction pattern.

GDL-DAK vernier.com/gdl-dak

Optics Expansion Kit

Use the Optics Expansion Kit‡ with your dynamics track to conduct optics experiments, such as image formation with lenses and light intensity *vs.* distance. You can even use the kit to build a basic telescope.

Kit includes

- 3 lenses (100 mm converging lens, 200 mm converging lens, –150 mm diverging lens)
- Screen
- Combination luminous and point light source
- Light sensor holder
- Aperture screen
- Power supply

The Optics Expansion Kit is used in experiments in our *Physics with Vernier* and *Advanced Physics with Vernier—Beyond Mechanics* lab books.

OEK

vernier.com/oek

See website for replacement parts.

Accessories

Color Mixer Kit‡

CM-OEK vernier.com/cm-oek

Mirror Set

M-OEK vernier.com/m-oek

Polarizer/Analyzer Set

PAK-OEK vernier.com/pak-oek

** Requires an interface such as LabQuest 3 or LabQuest Mini*

‡ Requires a Combination 1.2 m Track/Optics Bench (TRACK,)

Modern Physics

Radiation Monitors

Our radiation monitors detect alpha, beta, gamma, and X-ray radiation. They can be used to explore radiation statistics, measure the rate of nuclear decay, monitor radon progeny, and investigate the effects of shielding. The sensors include both LED and audible indicators.

Go Direct Radiation Monitor

GDX

GDX-RAD

vernier.com/gdx-rad

Vernier Radiation Monitor*

LQ

VRM-BTD

vernier.com/vrm-btd

Vernier Emissions Spectrometer

The Vernier Emissions Spectrometer gives precise measurements over a range of 350–900 nm. Use it with or without the Vernier Emissions Fiber (not included) to examine spectra of light bulbs, spectrum tubes, or the sun.

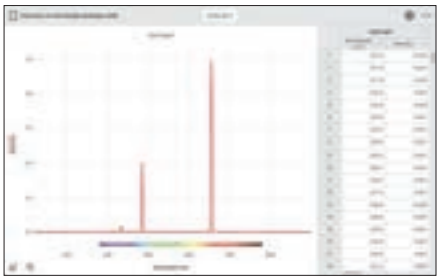
VSP-EM

vernier.com/vsp-em

Vernier Emissions Fiber

VSP-EM-FIBER

vernier.com/vsp-em-fiber



Vernier Spectral Analysis App

Our free Vernier Spectral Analysis® app with our Emissions Spectrometer makes it easy to analyze spectra. Students can quickly locate peaks or compare spectra from different sources.

vernier.com/spectral-analysis

Spectrum Tube Power Supplies

Single

This power supply features an ultra-safe design for electrifying spectrum tubes.

ST-SPS

vernier.com/st-sps

Carousel

This power supply holds up to eight gas spectrum tubes.

ST-CAR

vernier.com/st-car

Spectrum Tubes

Spectrum Tubes are permanently enclosed in protective plastic carriers, with no exposed high voltage.

Hydrogen	ST-H
Nitrogen	ST-N
Helium	ST-HE
Neon	ST-NE
Carbon Dioxide	ST-CO2
Air	ST-AIR
Argon	ST-AR

Spectrum Tubes carry a warranty of 2 years or 100 hours, whichever comes first (hydrogen tube: two years or 40 hours, whichever comes first).

vernier.com/spectrum-tubes

Additional Physics Products

Mechanics

Product	Order Code
Go Direct® Acceleration	GDX-ACC
3-Axis Accelerometer	3D-BTA
25-g Accelerometer	ACC-BTA
Bumper and Launcher Kit	BLK
Centripetal Force Apparatus	CFA
Dual-Range Force Sensor	DFS-BTA
Dynamics Cart and Track System	DTS
Dynamics Cart and Track System with Motion Encoder	DTS-EC
Eddy Current Brake	DTS-ECB
Encoder Fan Cart	CART-FEC
Fan Cart	CART-F
Force Plate	FP-BTA
Friction Pad DTS	DTS-PAD
Independence of Motion	IOM-VPL
Go Direct Sensor Cart Accessory Kit	GDX-CART-AK
Low-g Accelerometer	LGA-BTA
Motion Detector	MD-BTD
Photogate	VPG-BTD
Go Direct Projectile Launcher	GDX-PL
Vernier Projectile Launcher	VPL
Projectile Stop	PS-VPL
Pulley Bracket	B-SPA
Go Direct Rotary Motion	GDX-RMS
Rotary Motion Sensor	RMV-BTD
Rotational Motion Accessory Kit	AK-RMV
Time of Flight Pad	TOF-VPL
Ultra Pulley Attachment	SPA

Waves and Sound

Product	Order Code
Microphone	MCA-BTA
Sound Level Sensor	SLS-BTA

Thermodynamics

Product	Order Code
Gas Pressure Sensor	GPS-BTA
Stainless Steel Temperature Probe	TMP-BTA
Surface Temperature Sensor	STS-BTA

Electricity and Magnetism

Product	Order Code
Magnetic Field Sensor	MG-BTA
Power Amplifier	PAMP
Differential Voltage Probe	DVP-BTA
Current Probe	DCP-BTA
Instrumentation Amplifier	INA-BTA
Optional Breadboard Kit for the Vernier Circuit Board 2	VCB2-OBBK
Extech® Digital DC Power Supply	EXPS
Charge Sensor	CRG-BTA

Light and Optics

Product	Order Code
Polarizer/Analyzer Set for Optics Expansion Kit	PAK-OEK
Combination 1.2 m Track/Optics Bench	TRACK
Combination 2.2 m Track/Optics Bench	TRACK-LONG
Green Diffraction Laser	GDL-DAK

Lab Books

Product	Order Code
Physics with Vernier	PWV*
Advanced Physics with Vernier—Mechanics	PHYS-AM*
Advanced Physics with Vernier—Beyond Mechanics	PHYS-ABM*
Physics Explorations and Projects	PEP*
Vernier Video Analysis: Motion and Sports	HSB-VVAMS-E

** Includes printed book and download; also available as a download only*

This is just a sample of our physics solutions. To see the full suite of Vernier physics products, please visit vernier.com/physics

Engineering

vernier.com/engineering

Why Vernier?

Vernier engineering solutions harness the power of analytical software and the precision of high-quality sensors to help students sharpen their design skills and prepare to enter the workforce. As with all of our solutions, our engineering technology is backed by unparalleled support.

Quality

Durable hardware for lab and field use

Affordable

Designed for education and educational budgets

Versatile

Supports a variety of devices and experiments

> **Our projects are about more than just supporting the need for engineering education in local classrooms. Vernier products help deepen our students' learning through experiential, hands-on community engagement.**
>
> *Maija A. Benitz, Ph.D.*
> *Roger Williams University*

A Guide to Vernier Data Collection

We're here to support you as an educator as you incorporate data-collection technology into your instruction. See how our products provide you with affordable laboratory solutions designed for student success.

Our Guarantee: Most of our products are protected by a 5-year limited warranty. And after five years? We'll make every attempt to repair your equipment.

GDX What You Need to Get Started with Go Direct Sensors

Go Direct® sensors connect directly (no interface required) to your computer, Chromebook,™ or compatible mobile device via USB or Bluetooth® wireless technology. Collect and analyze data with Vernier Graphical Analysis™ Pro app, LabVIEW,™ Python,® or JavaScript.™

A Go Direct sensor

B Computer, Chromebook, tablet, smartphone

C Software

- Vernier Graphical Analysis Pro
- National Instruments LabVIEW
- Python
- JavaScript

LQ What You Need to Get Started with LabQuest Sensors

LabQuest® sensors have a cable with a plug that makes it easy to connect and disconnect to an interface without any additional wiring. Use LabQuest sensors with a Vernier interface, Arduino,® NI ELVIS, NI myDAQ, or your own DAQ hardware. If using a non-Vernier interface, these sensors require a +5.0 volt supply voltage and output a 0 to 5 volt signal. Most sensors have a simple, linear calibration.

A LabQuest sensor

B Interface (LabQuest, DAQ, or Arduino)

C Computer, Chromebook, tablet, smartphone

D Software

- Vernier Graphical Analysis Pro
- Logger *Pro*® 3
- National Instruments LabVIEW
- Arduino IDE

NEW

Vernier Graphical Analysis Pro

We are enhancing our award-winning Vernier Graphical Analysis app with advanced features supporting remote learning and more advanced analysis of experiment data.

GDX LQ

Free Trial for Educators

Try out Graphical Analysis Pro for free for 30 days. Access the sample experiments and enhanced analysis tools to use it with your students.

Get a free trial and learn about site license options at vernier.com/graphical-analysis-pro

Why Vernier?

Our durable hardware and quality software are designed for hands-on student use. Give your students the opportunity to gain practical, relevant data-collection and analysis experience that they can use wherever they go next.

Introduction to Engineering

Go Direct Energy

Go Direct Energy measures voltage and current as well as displays power and energy output of scale model wind turbines and solar panels, so students can quantitatively evaluate the effects of their design changes. It connects via Bluetooth wireless technology or USB to your device.

GDX-NRG

vernier.com/gdx-nrg

Vernier Variable Load

Use the Vernier Variable Load in conjunction with Go Direct Energy to provide a range of resistive loads for projects such as engineering wind turbines or investigating solar panels. Students can adjust the potentiometer to provide resistances between 6 and 255 Ω to determine the optimal load on a system.

VES-VL

vernier.com/ves-vl

Advanced Wind Experiment Kit

Use this kit as a fast and easy way to introduce the engineering aspects of wind turbine technology. Investigate different blade designs, gear ratios, and generators.

KW-AWX

vernier.com/kw-awx

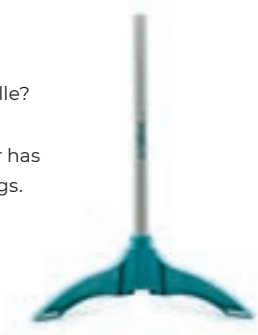
See all our products for engineering at vernier.com/engineering

Wind Turbine Design

Tower and Base Set

Do you need a tower for your turbine nacelle? This is the same tower that comes in the Advanced Wind Experiment Kit. The tower has a diameter that fits inside 1-inch PVC fittings.

KW-TBS vernier.com/kw-tbs



Basic Turbine Building Parts

The Basic Turbine Building Parts kit includes three hubs, a wind turbine generator, and 25 dowels, all in one package.

KW-BTPART
vernier.com/kw-btpart

Wind Turbine Generator with Wires

This is the primary generator for wind turbine experiments because it runs smoothly and provides high power output at a relatively low RPM.

KW-GEN
vernier.com/kw-gen

Hub (3 Pack)

With these 12-hole crimping hubs, made from recycled plastic, students can turn a DC generator into a wind turbine.

KW-WTH3
vernier.com/kw-wth3

Nacelle

Build a complete turbine by making your own tower and base with PVC pipe (from a hardware store) or use the Tower and Base Set. You will also need a generator and a way to affix the turbine blades.

KW-NAC
vernier.com/kw-nac

simpleGEN

Students can use the easy-to-build AC generator of the simpleGEN to explore the basics of electrical generator design.

KW-SGEN
vernier.com/kw-sgen

Gear Set

The small 8-tooth gear fits on 2 mm driveshafts that are found on many DC generators. The gears have a keying feature and can be changed quickly and easily using the included hex locks. The hex locks secure to our hex driveshaft, which is included in the Drivetrain Set (KW-DS).

Gear sizes: 64 teeth, 32 teeth, 16 teeth, 8 teeth

KW-GEAR
vernier.com/kw-gear

Balsa Blade Sheets

Balsa wood is very light weight and stiff, making it perfect for wind turbine blade design.

Balsa Blade Sheets (10 Sheets) KW-BBS10
Balsa Blade Sheets (100 Sheets) KW-BBS100
vernier.com/kw-bbs10

See all our products for engineering at vernier.com/engineering

Measurement and Instrumentation

Biomedical Engineering with Go Direct Sensors GDX

With wireless options and multiple on-board sensors, Go Direct sensors are perfect for analyzing and studying physiological functions.

Go Direct EKG

Go Direct® EKG has five channels:
EKG, heart rate, EMG, EMG rectified, and voltage.

GDX-EKG

vernier.com/gdx-ekg

Go Direct O_2 Gas

This sensor measures gaseous oxygen concentration levels and air temperature.

GDX-O2

vernier.com/gdx-o2

Go Direct Blood Pressure

Go Direct Blood Pressure has seven channels: cuff pressure, mean arterial pressure, systolic pressure, diastolic pressure, pulse rate, oscillations, and envelope.

GDX-BP

vernier.com/gdx-bp

Go Direct Temperature

This rugged, general purpose sensor has a temperature range of –40 to 125°C.

GDX-TMP

vernier.com/gdx-tmp

Go Direct Spirometer

Go Direct Spirometer has six channels:
flow rate, volume, adjusted volume, cycle volume, respiration rate, and differential pressure.

GDX-SPR

vernier.com/gdx-spr

Go Direct Surface Temperature

With a range of –25 to 125°C, this sensor is designed for use in situations in which low thermal mass or flexibility is required, such as on human skin.

GDX-ST

vernier.com/gdx-st

Go Direct Hand Dynamometer

Go Direct Hand Dynamometer has seven channels:
force, x-axis acceleration, y-axis acceleration, z-axis acceleration, x-axis gyro, y-axis gyro, and z-axis gyro.

GDX-HD

vernier.com/gdx-hd

Go Direct Respiration Belt

Go Direct Respiration Belt has four channels:
force, respiration rate, steps, and step rate.

GDX-RB

vernier.com/gdx-rb

Go Direct CO_2 Gas

Go Direct CO_2 Gas has three channels:
CO_2 gas, temperature, and relative humidity.

GDX-CO2

vernier.com/gdx-co2

Go Direct Acceleration

This 3-axis acceleration sensor has two acceleration ranges (±157 m/s² and ±1960 m/s²) plus an altimeter and a 3-axis gyroscope.

GDX-ACC

vernier.com/gdx-acc

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Arduino with LabQuest Sensors

LQ

Help students build coding skills and foster creative critical thinking with our complete packages for Arduino,® Vernier LabQuest® sensors, and engaging coding projects.

Vernier Coding with Arduino—Analog Sensor Package

The package has everything needed for students to use Vernier sensors with Arduino microcontrollers, including the *Vernier Coding Activities with Arduino: Analog Sensors* e-book at no additional cost.

VCA-AS-PKG **vernier.com/vca-as-pkg**

SparkFun RedBoard with Cable

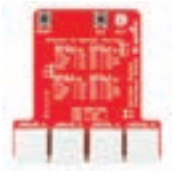
This Arduino-compatible board makes it easy to take sensor measurements when used with the Vernier Arduino Interface Shield.

ARD-RED **vernier.com/ard-red**

Vernier Ardunio Interface Shield

Conveniently connect the SparkFun® RedBoard or Arduino Uno to Vernier LabQuest sensors with the Vernier Arduino Interface Shield.

BT-ARD **vernier.com/bt-ard**



Motion Detector

The Motion Detector uses ultrasound to measure position of objects.
Range: 0.15 to 6 m
Resolution: 1 mm

MD-BTD **vernier.com/md-btd**

Surface Temperature Sensor

Measure temperature where low thermal mass or flexibility is required.
Range: –25 to 125°C

STS-BTA **vernier.com/sts-bta**

Digital Control Unit

Use the digital output lines of an interface to control DC electrical devices.

DCU-BTD **vernier.com/dcu-btd**

pH Sensor

This is a general-purpose pH sensor.
Range: pH 0 to 14
Accuracy: ±0.2 pH units

PH-BTA **vernier.com/ph-bta**

Gas Pressure Sensor

Use the Gas Pressure Sensor to monitor pressure changes of a gas.

GPS-BTA **vernier.com/gps-bta**

Anemometer

This is an impeller-type anemometer for measuring wind speed.
Range: 0.5 to 30 m/s (1 to 67 mph)

ANM-BTA **vernier.com/anm-bta**

Read the online guide and see all our products for Arduino at vernier.com/arduino

Outreach

Use proven outreach tools to enhance your STEM community engagement projects. Foster an interest in engineering through coding, robotics, renewable energy exploration, and structural design and material science.

Wind Energy

Incorporate hands-on activities into your community engagement projects by challenging students to design and test wind turbines. Wind experiment kits, such as the KidWind MINI Wind Turbine with Blade Design (KW-MWTBD), are available for every level.

National Instruments LabVIEW and Vernier

Introduce your students to NI LabVIEW™ software, a programming language used throughout the engineering disciplines. We have sample LabVIEW programs (VIs) for LabQuest Mini, myDAQ, Go Direct sensors, and other Vernier hardware.

With LabQuest Sensors LQ

LabQuest Mini

LabQuest Mini is a powerful, affordable, and easy to use sensor interface for data acquisition with more than 75 Vernier LabQuest sensors.

LQ-MINI

vernier.com/lq-mini

myDAQ Adapter

The myDAQ Adapter can be used to perform data acquisition with more than 75 Vernier LabQuest sensors and the NI myDAQ interface (sold separately). It is designed for use with NI LabVIEW software.

BT-MDAQ

vernier.com/bt-mdaq

Analog Protoboard Adapter

Use these adapters to connect Vernier LabQuest sensors to a non-Vernier interface, such as NI ELVIS. The connector fits into a standard prototyping board.

BTA-ELV **vernier.com/bta-elv**

With Go Direct Sensors GDX

Integrate over 50 wireless sensors into your LabVIEW project to acquire data or control your NI DAQ hardware.

Go Direct Acceleration		GDX-ACC	vernier.com/gdx-acc	GDX-MD	vernier.com/gdx-md
Go Direct Force and Acceleration		GDX-FOR	vernier.com/gdx-for	GDX-LC	vernier.com/gdx-lc
Go Direct Rotary Motion		GDX-RMS	vernier.com/gdx-rms	GDX-WTHR	vernier.com/gdx-wthr



See all our products for NI LabVIEW at vernier.com/ni-labview

Bridge Building

Go Direct® Structures & Materials Tester

Use our new Go Direct Structures & Materials Tester to evaluate the strength of model bridges and engineered structures by measuring the applied load. Utilizing both load and displacement, students can evaluate the properties of materials.

GDX-VSMT

vernier.com/gdx-vsmt

Benefits

- The force and displacement sensors connect via Bluetooth® wireless technology or via USB.
- Uses our free Graphical Analysis™ 4 app to collect and analyze data
- Exact force and displacement for bends and breaks
- Accurate positioning for center and off-center loading
- Easy loading for different sizes and shapes
- Includes free *Materials Testing: Beams to Bridges* e-book

Engineering Products

Wind Turbine Design

Product	Order Code
Advanced Wind Experiment Kit	KW-AWX
Balsa Blade Sheets (10 Sheets)	KW-BBS10
Basic Turbine Building Parts	KW-BTPART
Drivetrain Set	KW-DS
Gear Set	KW-GEAR
Go Direct® Energy	GDX-NRG
Hub (3 Pack)	KW-WTH3
Nacelle	KW-NAC
Tower and Base Set	KW-TBS
Vernier Variable Load	VES-VL
Wind Turbine Generator with Wires	KW-GEN

Engineering with Arduino

Product	Order Code
Anemometer	ANM-BTA
Digital Control Unit	DCU-BTD
Gas Pressure Sensor	GPS-BTA
Motion Detector	MD-BTD
pH Sensor	PH-BTA
SparkFun® RedBoard with Cable	ARD-RED
Surface Temperature Sensor	STS-BTA
Vernier Arduino® Interface Shield	BT-ARD
Vernier Coding Activities with Arduino: Analog Sensors lab book	VCA-AS-E

LabQuest Sensors

Product	Order Code
Barometer	BAR-BTA
Gas Pressure Sensor	GPS-BTA
Light Sensor	LS-BTA
Magnetic Field Sensor	MG-BTA
Microphone	MCA-BTA
Soil Moisture Sensor	SMS-BTA
Stainless Steel Temperature Probe	TMP-BTA

Learn more about over 80 LabQuest sensors at vernier.com/labquest

Biomedical Engineering

Product	Order Code
Go Direct Acceleration	GDX-ACC
Go Direct Blood Pressure	GDX-BP
Go Direct CO_2 Gas	GDX-CO2
Go Direct EKG	GDX-EKG
Go Direct Hand Dynamometer	GDX-HD
Go Direct O_2 Gas	GDX-O2
Go Direct Respiration Belt	GDX-RB
Go Direct Spirometer	GDX-SPR
Go Direct Surface Temperature	GDX-ST
Go Direct Temperature	GDX-TMP

NI LabVIEW and Vernier

Product	Order Code
Analog Protoboard Adapter	BTA-ELV
myDAQ Adapter	BT-MDAQ
LabQuest® Mini	LQ-MINI

Outreach

Product	Order Code
Go Direct Structures & Materials Tester	GDX-VSMT
KidWind MINI Wind Turbine with Blade Design	KW-MWTBD

Go Direct Sensors

Product	Order Code
Go Direct Acceleration	GDX-ACC
Go Direct Force and Acceleration	GDX-FOR
Go Direct Light and Color	GDX-LC
Go Direct Motion	GDX-MD
Go Direct Rotary Motion	GDX-RMS

Learn more about over 50 Go Direct sensors at vernier.com/go-direct

See all of our engineering products online at vernier.com/engineering

Index

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Fax: +1-503-277-2440

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Celebrating 40 years