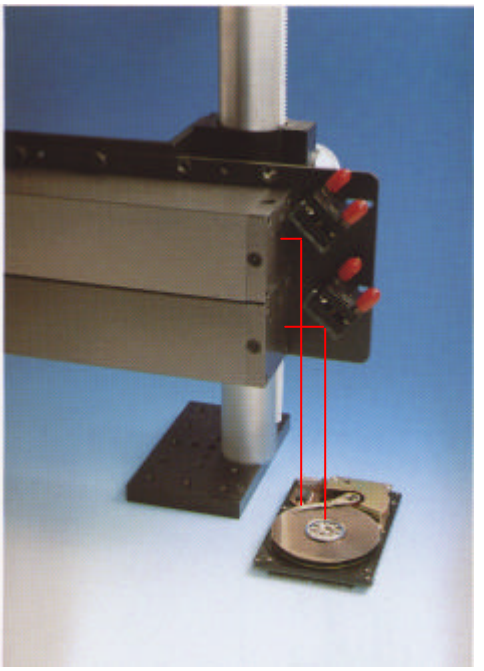
Laser Doppler Displacement Meter



Optodyne's VS-5020 Vibration Sensor is a non-contact, highly sensitive means of measuring displacement, velocity, and acceleration. Performing as a storage oscilloscope for mechanical vibration, theVS-5020 meets precision engineering requirements of microelectronic, aerospace, automotive, and R&D applications. A two-axis system, the VS-5020 provides measurement accuracy of 1 ppm, resolution to 0.001 micron, speed up to 5 m/sec, and frequencyresponse from dc to 400 kHz. The extremely high signal-to-noise ratio of this two-axis system permits the user to measure simultaneously both target and background phenomena, while maintaining the integrity of each measurement. Digital square waves and/or analog voltage output are available for feedback or data acquisition and monitoring.

Non-Contact High Sensitivity, High Accuracy Vibration and Position Sensor Model VS-5020

Major Features and Benefits

- Compact and light-weight
- Non-contact and high sensitivity
- Simple setup and operation
- Variable standoff (few mm to few meters)
- Small beam spot diameter
  - (10-100 micrometers)
- 2 channels for differential or orthogonal measurement
- High resolution, high repeatability, high data rate, and high signal-to-noise ratio
- No calibration factor, no interference, no minimum velocity, no non-linear effects, and no range switch
- Computer data storage and processing

Major Applications

- Non-intrusive dynamic measurement for disk drives, heads and VCM.
- Measurement and analysis of complex motions for printer heads, disk drives and stepper motors, XY-tables, and bearings.
- Measurement of settling time and dynamic properties of slides, ball screws, stages and spindles.
- Calibration of transducers, accelerometers, probes and shakes.
- Engine valve displacement and Diesel engine injection needle positioning.

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Specifications

Modular in design, the VS-5020 may be configured to handle a wide variety of measurement applications. Because the system is immune to electromagnetic interference, it is useful in many electronic environments where vibration measurement has traditionally been difficult to obtain. The VS-5020 operates on polished surfaces of almost any material - metallic, non-metallic, composite, plastic, glass or ceramic.
The system's software will analyze the collected data, or the data may be transported to other analyzers such as FFT's.

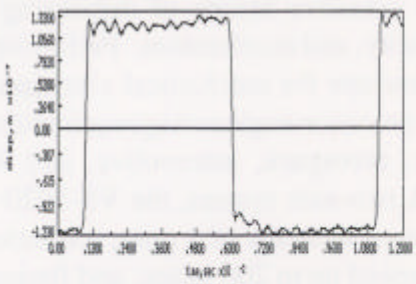


Fig. 1. Motion of the magnetic head of a small hard disk drive

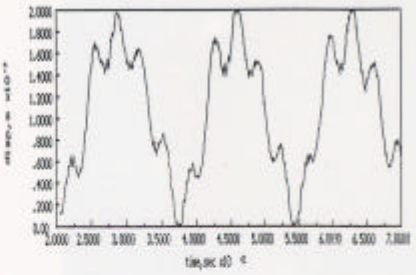


Fig. 2. Typical spindle runout of a hard disk drive at 3600 rpm

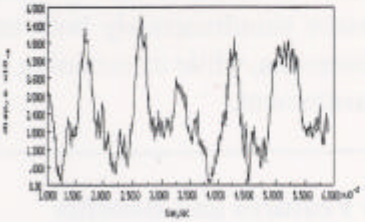


Fig. 3. Typical magnetic head flight height variation

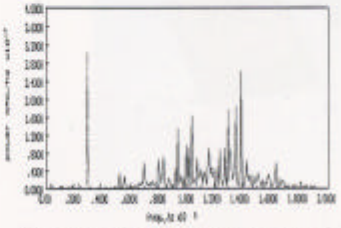


Fig.4. The power spectra density of figure 3

SYSTEM DESCRIPTION

Major elements of the VS-5020 include two LDDM™ laser head assemblies, steering mirrors, a processor module, IBM-compatible 386 computer, software, carrying case, and accessories.

Model VS-5020 Specifications

Sensitivity:
Displacement resolution: 2.5 nm

Min. return light: 1 microwatt

Beam diameter: 5 mm
(with lens) (10 to 100 urn)

Data rate: 6.25 to 800 K data/sec

Record size: 64K points/record
or 128 kbyte/record

Target Surface: Reflectivity > 4 %
Surface finish, polished to 0.02 –0.04 micron

Surfaceflatness, 0.2 micron over beam spot

Ranges:
Displacement: 2.5 nm to 5 m

Velocity: 0 - 5 m/s
Acceleration:. 0 - 100,000 g

Number of Channels: 2

Trigger Mode: Pre or Post-trigger

Output interface: Up and down pulses (TTL)
Analog Phase (0-2.5 V)

Analog output: 0-10 V with D/A board

Power: 90-230 VAC, 50-60 Hz

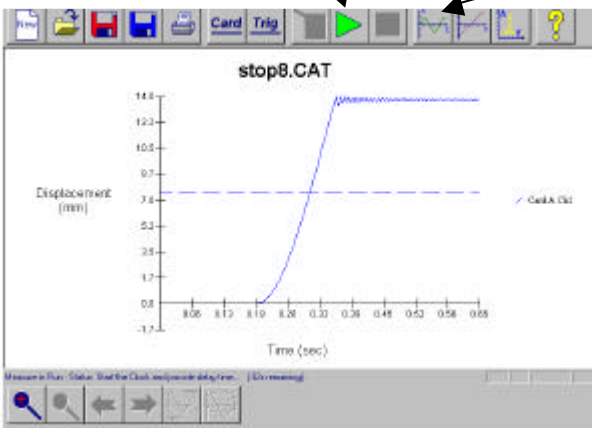
WinCatch Program: example of use:

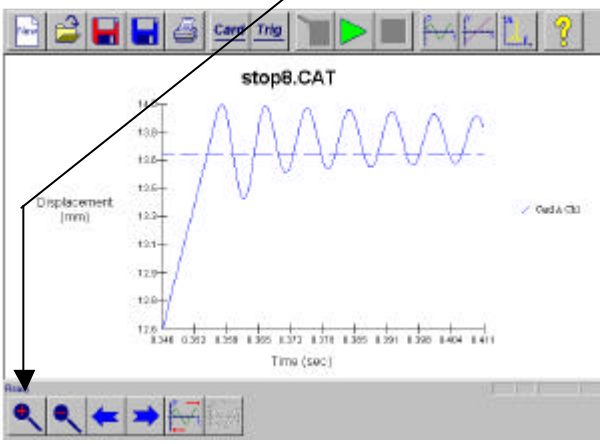
We have a linear stage that moves and stops; Take data samples at 100KHz

Click and Take a measurement

Click and see the DISPLACEMENT

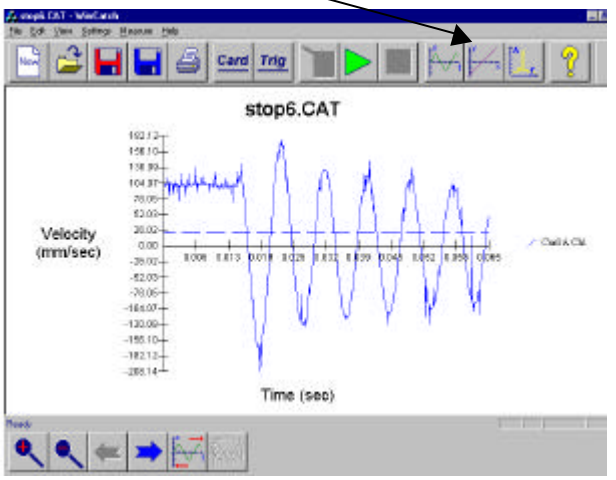
Click and Look for details with the ZOOM (up to 1000 X)

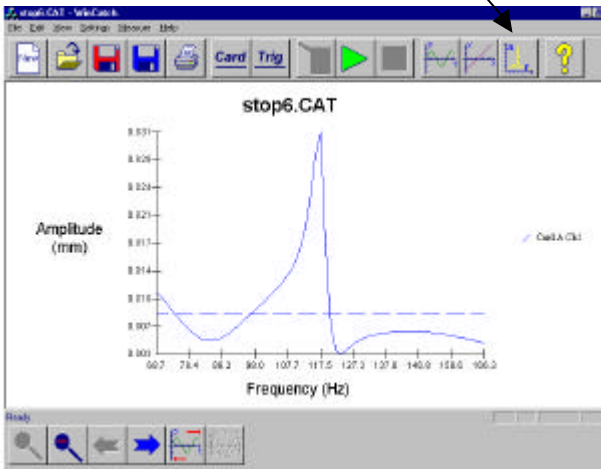




Click to See VELOCITY (or acceleration)

and Click again to look at the FREQENCY domain





OPTODYNE, INC

VIBRATION SENSOR SERIES

(Mini-Descriptions)

The following is a list of the different OPTODYNE Vibration Sensors. These instruments are designed to detect the small increments of linear displacement that occur in vibrating structures or materials. These instruments are useful in a wide variety of applications, such .as hard disk assemblies, microelectronics processing and inspection equipment, material and component analysis and machine design. For more detailed information, please call or FAX your local Optodyne Representative or our factory directly.

VS-5010

The VS-5010 is a single axis vibration sensor designed for the detection of very small displacement increments. It has high sensitivity which allows the operator to reflect from most polished or shiny .surfaces without the addition of any mass to the target. The adjustable mount and steering mirror enables the operator to easily focus on the target. This system contains computer and software.

VS-5020

The VS-5020 is a two axis vibration sensor designed for the detection of very small displacement increments. The two axis capability permits the detection of background vibrations, which then can be compared and separated from the target vibration. Two Laser Head Assemblies, with steering mirrors allow of easy target focusing. Most polished or shiny surfaces will reflect sufficient light. Therefore, the addition of any mass to the target is unnecessary.

The above vibration sensors are fully configured systems, including computer and software. The following vibration sensors are configured without a computer and with no software. An analog output is provided, enabling the operator to connect the sensor to an appropriate instrument for data collection and analysis.

VS-5101

The VS-5101 is a vibration sensor only (no computer or software) that utilizes the L-107 high-speed, high-sensitivity laser head. An analog output signal is provided. A convenient adjustable stand with a steering mirror is provided. One focal lens is supplied with the sensor. Other focal lens can easily be interchanged.

VS-5102

The VS-5102 is a 2 axis (2 laser head) version of the VS-5101. The two laser heads allow the operator to focus on different positions on a target or on different targets.

OPTODYNE, INC.

(LASER VIBRATION SENSOR SERIES)

GENERAL DESCRIPTION:

The VS-5010 is designed to collect, process and plot vibration data for any vibrating surface. Analysis software performs numerical processing of the data to produce plots off displacement velocity, acceleration, power spectra and shock response. The system is capable of detecting vibrations in a frequency range of 0 to 400 KHz, with sampling rates of 6.25K to 800K samples per second, with a storage capacity of up to 64 K data samples (2 bytes per sample). The system's processor collects the data, performs digital conversion and transmits the data to a PC for storage and subsequent analysis and plot generation. The laser sensor has a maximum displacement range of 190 inches, a maximum velocity of 144 inches/sec and resolution of 0.1 microinches. The sensor can receive a usable reflected signal from most specular reflective surfaces, allowing for true non-contact vibration detection. For other surfaces, a variety of lenses can be used to enhance signal return. Both the VS-5010 and. the VS-5101 come with analog output ^3, digital output, and the option of either analog output #1 or analog output #2. The VS-5101 has the same specifications, but only comes with the analog outputs, and includes the same selectable analog outputs, but no digital output.

SPECIFICATIONS:

Sensitivity:

Displacement	2.5 nanometer (0.1 microinch)
Velocity	0.2 micron per second
Acceleration:	0.2 micron per second per second

Range:

Displacement	up to 5 meters
Velocity	up to 5 meters per second
Acceleration	up to 100,000 Gs

Catch Board (5010 only)

Sampling rate	400 Hz to 800 KHz
Data Size	64 x 2 bytes per record
Trigger Mode	pre. Mid, or Post Trigger

Analog Signal #1: (5010 and 5101)

Range	0-12 Volts (0.4 mm)
Resolution	3.4 nm/mV
Velocity	150 mm/ s
Max Frequency	250kHz

Analog Signal #2: (5010 and 5101)

Range	0-12 Volts (2.6mm)
Resolution	217 nm/ mV)
Velocity	610mm/ s
Max Frequency	1 MHz

Analog Signal #3 (5020 and 5102):

Range	0-2.5 Volts (0.6 micron)
Resolution	0.25 nm / mV
Velocity	5 m/s
Max Frequency	400 kHz

power 90-230 VAC, 50-60- Hz

Operating Environment:

Temperature 60 to 90 degrees F.

SYSTEM CONTENTS:

L-107V (Quantity of I):
The LDDM laser head module is a single-aperture compact device containing the Helium Neon laser tube w/ lemo connector, projecting/receiving electro-optics and a signal detector. This device collects the analog data and transmits them to the processor for processing to digital form.

P-211 (Quantity of I):
This single channel processor module contains the electronics for analog signal processing, display conversion and data transmission to the PC. Vibration data is transmitted by a special PC interface card and connector.

D-101 (Quantity of I):
The LED display provides an easy-to-read 10 digit output for the processed data, and is helpful during laser alignment.

R-102 (Quantity of I):
A small, low-mass retroreflector is provided as a target that can be attached to a vibrating surface.

IPC1-400 (Quantity of 1, for VS-5010 only):
The high data rate interface card allows for increased sampling rate, which increases the frequency range of detectable vibrations. Sampling rate is increased to 800K samples/sec.

S-106G (for VS-5010 only):
High speed vibration data collection software is provided.

S-107 (for VS-5010 only):
Vibration data analysis and conversion software is provided. This software also accomplishes plot generation.

LD-47A (Quantity of I):
One 30 mm focal length lens is supplied.

LD-47C (Quantity of I):
One 100 mm focal length lens is supplied.

LD-61 (Quantity of I):
Mounting plate for laser head.

LD-21L (Quantity of I):
The system conies with a 12 foot cable set lemo connector, for connecting the laser head and processor module. A 6 foot power cord for connecting the processor module to line voltage is also included.

IDAC (Quantity of I):
Digital to Analog output (BNC) is provided. (2 outputs per axis)

OPTIONS TO ADD:

The following items may be added to the system.
VS-5010 system. An adjustment will be made in the system price if this is added.
LD-20A (Quantity of I): The customer may choose to purchase a rugged industrial style carrying case.
LD-46: Adjustable mount with 2 steering mirrors
WC-1 Win Catch software

*Prices and Specifications subject to change without notice.

OPTODYNE, INC.

PRODUCT DESCRIPTION

VS-5020
VS-5102
(VIBRATION SENSOR SERIES)

GENERAL DESCRIPTION:

The VS-5020 is designed to collect, process and plot vibration data for any vibrating surface in two axes. Analysis software performs numerical processing of the data to produce plots of displacement, velocity, acceleration, power spectra and shock response. The system is capable of detecting vibrations in a frequency range of 0 to 400 KHz, with sampling rates of 6.25K to 800K samples per second, and can store up to 64 K data samples (2 bytes per sample). The system's processor collects the data, performs digital conversion and transmits the data to a PC for storage and subsequent analysis and plot generation. The laser sensor has a maximum displacement range of 190 inches, a maximum velocity of 144 inches/sec and a resolution of 0.1 microinches. The sensor can receive a usable reflected signal from most specular reflective surfaces, allowing for true non-contact vibration detection. For other surfaces, a focal lens can be used to enhance signal return. The VS-5020 and VS-5102 can monitor both the object and background vibration at the same time. Both the VS-5020 and the VS-5102 come with analog.output #3, and the option of either analog output #1 or analog output #2. The VS-5102 has the same system specifications, but only comes with the analog outputs.

SPECIFICATIONS:

Sensitivity:

Displacement	2.5 nanometer (0.1 microinch)
Velocity	0.2 micron per second
Acceleration:	0.2 micron per second per second

Range:

Displacement	up to 5 meters
Velocity	up to 5 meters per second
Acceleration	up to 100,000 Gs

Catch Board (5010 only)

Sampling rate	400 Hz to 800 KHz
Data Size	64 x 2 bytes per record
Trigger Mode	pre. Mid, or Post Trigger

Analog Signal #1: (5010 and 5101)

Range	0-12 Volts (0.4 mm)
Resolution	3.4 nm/mV
Velocity	150 mm/ s
Max Frequency	250kHz

Analog Signal #2: (5010 and 5101)

Range	0-12 Volts (2.6mm)
Resolution	217 nm/ mV)
Velocity	610mm/ s
Max Frequency	1 MHz

Analog Signal #3 (5020 and 5102):

Range	0-2.5 Volts (0.6 micron)
Resolution	0.25 nm / mV
Velocity	5 m/s
Max Frequency	400 kHz

power 90-230 VAC, 50-60- Hz

Operating Environment:

Temperature	60 to 90 degrees F.
Altitude	0 to 10,000 feet
Humidity	0 to 95 (non-condensing)

SYSTEM CONTENTS:

L-107 (Quantity of 2):
The LDDM laser head module is a single-aperture compact device containing the Helium Neon laser tube, projecting/receiving electro-optics and a signal detector. This device collects the analog data and transmits them to the processor for processing to digital form.

P-202 (Quantity of I):
This dual channel processor module contains the electronics for analog signal processing, display conversion and data transmission to the PCAT. Vibration data is transmitted by a special PC interface card and connector.

D-101 (Quantity of I):
The LED display provides an easy-to-read 10-digit output for the processed data. It is convenient to see from some distance and is helpful during laser alignment.

R-102 (Quantity of 2):
A small, low-mass retroreflector is provided as a target that can be attached to a vibrating surface.

IPC2-400 (Quantity of 1, for VS-5020 only):
The high data rate interface card allows for increased sampling rate, which increases the frequency range of detectable vibrations. Sampling rate is increased to 800K samples/sec.

S-106S (for VS-5020 only):
High speed vibration data collection software is provided.

S-107 (for VS-5020 only):
Vibration data analysis and conversion software is provided. This software also accomplishes plot generation.

LD-47A (Quantity of I):
One 100 mm focal length lens is supplied.

LD-47B (Quantity of I):
One 150 mm focal length lens is supplied.

LD-46 (Quantity of I):
An adjustable mount which holds up to two laser heads is included.

LD-21R (Quantity of 2):
The system comes with a 12 foot cable set for connecting the laser head and processor module. A 6 foot power cord for connecting the processor module to line voltage is also included.

IDAC (Quantity of I):
Digital to Analog output (BNC) is provided. (2 outputs per axis)

OPTIONS TO ADD:

LD-20B (Quantity of 2): The customer may choose to purchase a rugged industrial style carrying/storage.

WC-1 Win Catch software