

Laser Doppler Vibrometer

LV-1800

Dynamic & High-Resolution



ONO SOKKI



Integrated sensor and camera

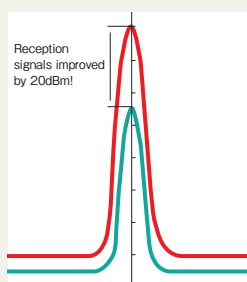
The LV-1800 has an integrated design of a sensor and a high sensitivity digital camera*¹. Without degradation of the detection sensitivity, you can check targets and the parts irradiated by laser beams on a Windows® based PC*². Additionally, by combining the objective lens (LV-0151A) and the illumination unit (LV-0185), amplitude of MEMS (Micro Electro Mechanical Systems) and micro objects can be detected.



*1. LV-0181 Built-in positioning camera, LV-0185 Illumination unit: options *2. Windows®7/10

Greatly increased detection ability

Newly designed interference optical system has achieved improvement of the detection sensitivity by +20 dBm compared to the conventional model. Restrictions of targets and detecting environment have been dramatically eased to facilitate sensor installation and setup.



Detectable various targets with 4 velocity ranges

Detectable velocity amplitude range is $0.05 \mu\text{m/s}^*$ to 10 m/s . The LV-1800 can detect behaviors of various targets from high velocity amplitude of ultrasonic tools and piezoelectric devices to small amplitude generated by thin films, MEMS, and ceramic capacitors.



*Minimum resolution: at maximum modulation when the LV-0800 (Minute velocity range board) is installed.

Vibrometer using Non-contact Laser Doppler Method

Dynamic & High-Resolution

LV-1800



Quick confirmation of the focal position and the detection status

SIGNAL LEVEL indicator which shows the detection status, and distance scale used for a guideline of the laser's focal position are equipped with the sensor part.

It enables quick and reliable setup, and checking of the detection status at hand.



Excellent ease of use with a small and light-weight sensor

The sensor is separated from the laser light source. Without any restrictions on installation, laser beams can be irradiated in all directions. Furthermore, using a wide variety of options provided, and amplitude in the deep position or narrow parts can be detected.



Easy storage and transporting

The main body has a sensor storage and a cable clamp for winding cable (3 m). The optional storage trunk (LV-0350) can store major options such as the magnet stand and the illumination unit as well as the main body. You can organize quickly, and transport safely.



Noise-free design without cooling fan

LV-1800 is subjected to countermeasure for self-vibration by means of fan-less natural air cooling. It prevents the transmission of vibration noise from the main body and the sensor to the detection target, so that the analyses of minute velocity amplitude and displacement will not be affected.

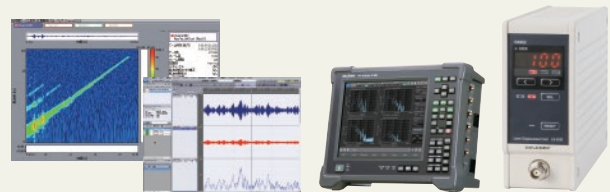
Class 2 laser beams for any sites

The laser beams of the LV-1800 conform to Class 2 safety standard. It employs a visible light laser of 1mW or less. The LV-1800 has been designed, tested and conformed according to the following safety standards, so it can be used at global sites. Conforming standards:

- JIS C 6802
- IEC 60825-1:2007
- FDA (CDRH) 21CFR 1040.10 and 1040.11 except for deviations in accordance with the requirement of Laser Notice No.50
- CE Marking (Low Voltage Directive, EN61010-1) (EMC Directive, EN61326-1)
- FCC (Part 15B)
- CANADA EMI regulations (ICES-003)

Wide range of options provide utmost solutions

LV-1800 and its options, which have been developed based on an abundance of experiences at measurement sites, support detection in various cases. Furthermore, Ono Sokki's waveform analysis unit and its software provide utmost solution by visualizing behavior and characteristics of a target.



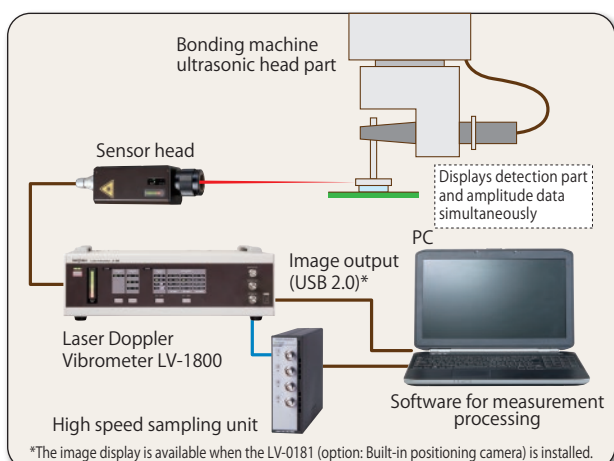
Laser Doppler vibrometer with No load and Non-contact

LV-1800 is a vibrometer that detects amplitude velocity by using the Doppler shift of laser beams without load, without contact. Wide range of targets difficult to detect by contact type detectors can be measured, such as target with high speed, high frequency, transparent, thin film, microscopic objects.

Applications

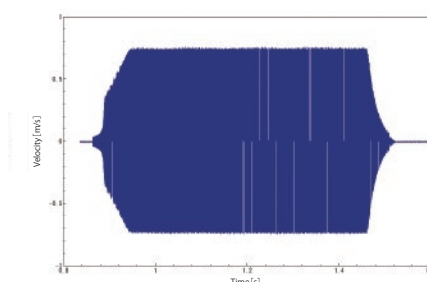
- Vibration and resonance point measurement of component mounting substrates
- Vibration measurement of inverters, capacitors, reactors of EV/HEV.
- Measurement through glass
- Vibration measurement of transparent or thin film
- Resonance point measurement of optical pickup such as CD, DVD, or BD.
- Evaluation of component parts including HDD
- Evaluation of microphones and receivers included in cell phones.
- Amplitude measurement of ultrasonic welding machine and wire bonding tools
- Measurement of piezoelectric elements, MEMS etc.
- Behavior measurement of ultrasonic motors

Vibration measurement of ultrasonic tools

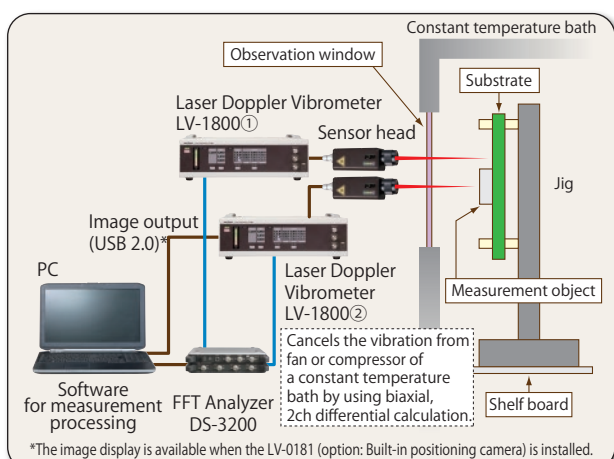


This application can measure the amplitude of objects vibrating at high speeds, such as ultrasonic welders and bonding machine tools, at frequencies above 20 kHz.

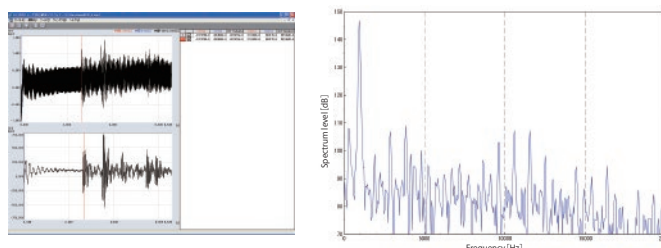
Using the amplitude values and frequency analysis, you can check welding quality or determine maintenance timing of equipment.



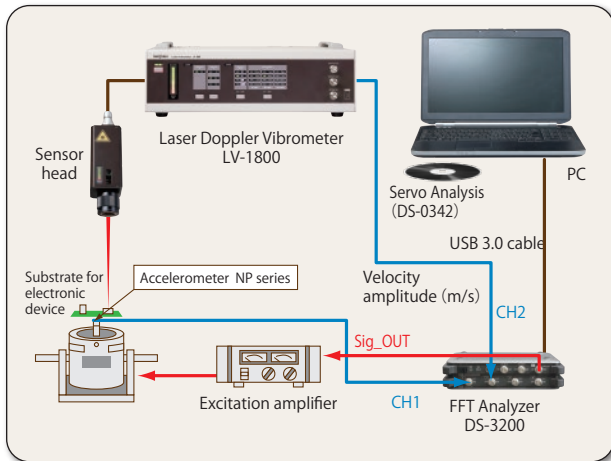
Measurement through a glass



The LV-1800 does not detect transparent objects not located at focal position. Using this characteristic, this system can detect vibration of an object inside a vacuum chamber or a constant temperature bath by irradiating laser through a glass.

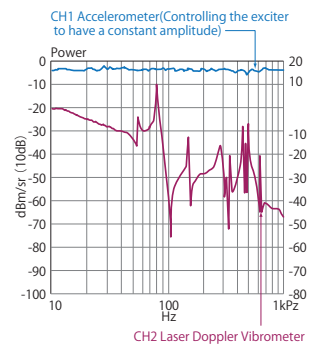


Measurement of components mounted on a substrate

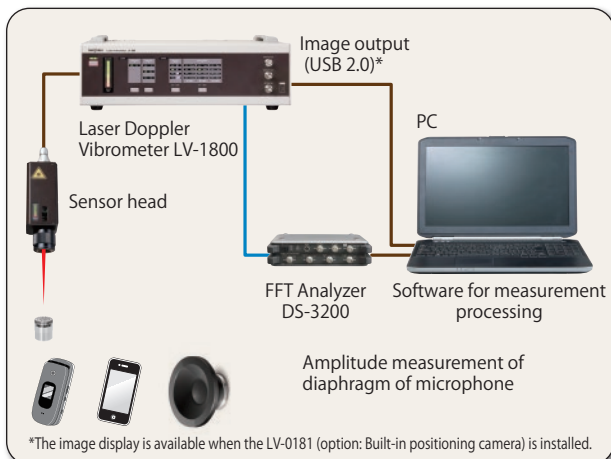


As LV-1800 Laser Doppler Vibrometer has high spatial resolution, it can detect the amplitude of electronic components mounted on substrates in pin point when vibration testing.

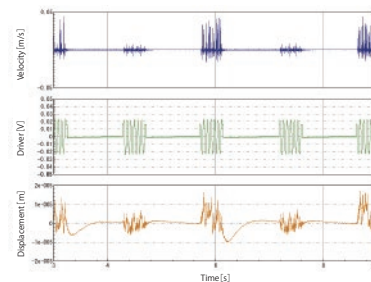
This system is useful to see the status of targets when unexpected overload is applied. For example, you can see the status of parts in a case when overload is applied to the target with larger amplitude more than the specified acceleration owing to the variety of each part mass and substrate vibration mode.



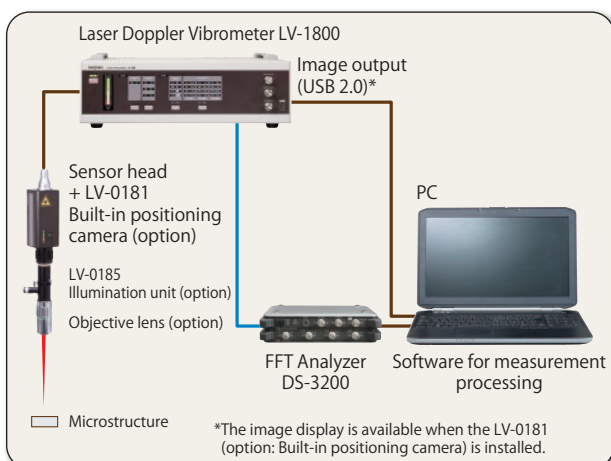
Measurement of thin film vibration



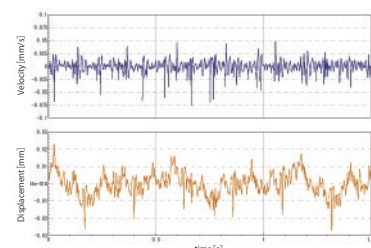
LV-1800, that features non-contact and no-load detection, is the most suitable device for amplitude measurement of thin film, such as a diaphragm of cell phone microphone, a corn paper of receiver or speaker, and a transparent film like a liquid crystal display film.



Measurement of microstructures

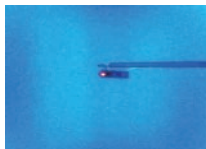
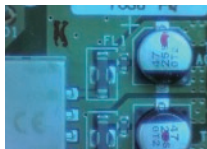
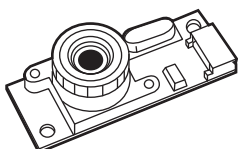


LV-1800 has high spatial resolution by mounting the LV-0150A optional objective lens having micro spot diameter up to $\phi 3 \mu\text{m}$ (standard spot diameter: $\phi 20 \mu\text{m}$). You can detect the amplitude of microstructures, such as MEMS (Micro Electro Mechanical Systems) with this system.



LV-0181 Built-in positioning camera

The LV-0181 is a high sensitivity digital camera to position the sensor head while checking the image of an object. (A camera module is built in the sensor head). The coaxial and confocal camera, in which the focal point of the laser beams and the focus of images are common, displays the images of detected parts on Windows® based PC through USB 2.0 output. The LV-0181 makes it possible to check small measuring objects and also irradiate laser beams speedily. By combining the LV-0151A (objective lens) and the LV-0185 (illumination unit), amplitude of micro objects such as MEMS can be measured.



■ Specification of the LV-0181

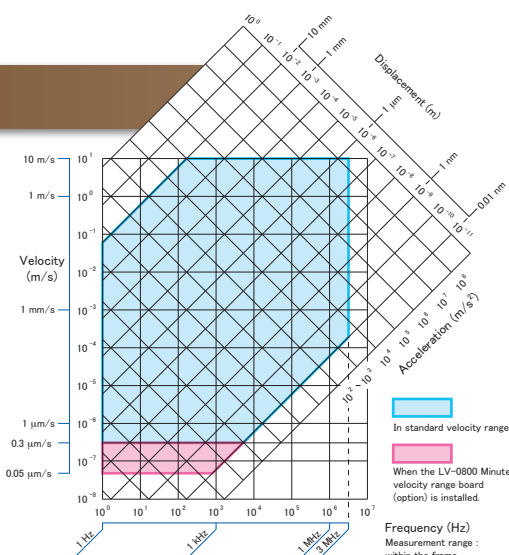
| | |
|-----------------------|---|
| Connector type | USB 2.0 (Main unit side : mini-B type) |
| Imaging element | CMOS color sensor 1/4-inch |
| Number of pixels | 300,000 pixels or more |
| Image size | VGA (640 x 480) |
| Frame rate | 30 frames / second |
| Range of shooting | 10 x 7.5 mm or more (measurement distance 100 mm or more) |
| Function | Exposure / gain / white balance (automatic) |
| Operating environment | Windows® 7 (SP1 or later)/10 Display True Color 24 bit or more |
| Camera focus | Confocal with laser spot |
| Accessory | LV-0181 Camera Monitor software CD-ROM USB cable (CF-0703) 1.5 m |

LV-0800 Minute velocity range board

The LV-0800 is a minute velocity range board to be installed to the LV-1800. It enables measurements of those which are hard to be detected in standard measurement ranges such as amplitudes of ceramic capacitors, propagation of ultrasonic waves. By adding the LV-0800, it covers the detection of 0.05 $\mu\text{m/s}$ to 10 m/s velocity amplitudes with 4 ranges.

■ Specification of the LV-0800

| | |
|--------------------|---|
| Velocity range | 0.001 (m/s) / V (0.01 m/s _{0-p} (MAX)) |
| Minimum resolution | 0.05 $\mu\text{m/s}$ * at maximum modulation |
| Frequency range | 0.3 to 200 kHz ($f_c = -3$ dB) |



LV-0112 Displacement output board/LV-0111 Acceleration output board

When the LV-0112/0111 is built in the LV-1800, it converts the detected velocity (m/s) into displacement (m) or acceleration (m/s²). Signal is output from an optional connector, and the velocity signal and the displacement/acceleration signal can be obtained simultaneously. Either one of the LV-0112 or the LV-0111 can be installed in the LV-1800.

■ Specification of the LV-0112

| Setup range of the LV-1800 | Frequency range / Displacement range | | |
|----------------------------|--------------------------------------|---------------------|--------------------|
| | 1 Hz to 20 kHz | 10 Hz to 50 kHz | 1 kHz to 200 kHz |
| 1.0 (m/s) / V | 100 mm/V | 1 mm/V | 10 $\mu\text{m/V}$ |
| 0.1 (m/s) / V | 10 mm/V | 100 $\mu\text{m/V}$ | 1 $\mu\text{m/V}$ |
| 0.01 (m/s) / V | 1 mm/V | 10 $\mu\text{m/V}$ | 100 nm/V |
| 0.001 (m/s) / V | 0.1 mm/V | 1 $\mu\text{m/V}$ | 10 nm/V |

■ Specification of the LV-0111

| Setup range of the LV-1800 | Frequency range / Acceleration range | | |
|----------------------------|---|---|---|
| | 1 Hz to 2 kHz | 1 Hz to 20 kHz | 100 Hz to 400 kHz |
| 1.0 (m/s) / V | 10 ³ (m/s ²) / V | 10 ⁵ (m/s ²) / V | 10 ⁷ (m/s ²) / V |
| 0.1 (m/s) / V | 10 ² (m/s ²) / V | 10 ⁴ (m/s ²) / V | 10 ⁶ (m/s ²) / V |
| 0.01 (m/s) / V | 10 ¹ (m/s ²) / V | 10 ³ (m/s ²) / V | 10 ⁵ (m/s ²) / V |

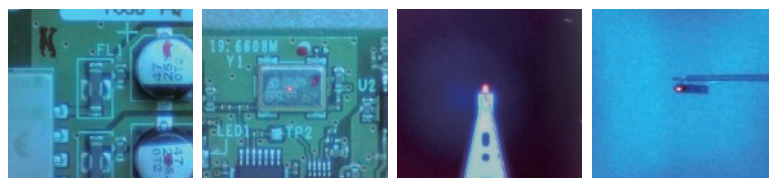
■ Common specification

| | |
|----------------------------|---|
| Signal source | Internally receives the velocity signal from the LV-1800 |
| Output form | Analog voltage |
| Output voltage | ± 10 V (MAX) *Minimum input impedance: 100 k Ω or more |
| DC offset | 20 mV or less |
| Maximum amplitude | Ten times of an each setup range (0-p) |
| Amplitude conversion error | ± 5 % or less |
| Amplitude output polarity | + voltage when moving closer to a sensor side. |

LV-0185 Illumination unit



The LV-0185 is an option which illuminates a target coaxially with laser beams. The White LED and the laser beam illuminate the detecting part in the same working distance, and sharpens the images of the LV-0181. Mounting an objective lens is more effective to focus the light. It facilitates laser irradiation to a minute detecting part and a rear side where light is difficult to be illuminated.



■ Specification of the LV-0185

| | |
|---------------------------|---|
| Applicable objective lens | LV-0150A (5x) / LV-0151A (10x) |
| | LV-0152A (20x) |
| Irradiation method | Coaxial epi-illumination |
| Light emitting part | Cold-light illumination by white LED |
| Cable length | 1.5 m (when the dedicated extension cable in used.) |

| Control | Variable adjustment |
|-----------------------------|--|
| Operating temperature range | 0 to 40 °C (with no condensation) |
| Operating humidity range | 30 to 80 % RH (with no condensation) |
| Input voltage | 100 V AC to 240 V AC, 50/60 Hz |
| Consumption voltage (VA) | 3.5 VA when 100 V AC, 9.0 VA when 240 V AC |
| Cooling method | Natural air cooling (fan-less cooling) |

Measurement system for vibrating micro object







<Basic configuration : example>

- Laser Doppler Vibrometer LV-1800
- Built-in positioning camera LV-0181
- Objective lens
 - LV-0150A
 - LV-0151A
 - LV-0152A
- Illumination unit LV-0185
- Large size magnet stand LV-0030
- Fine-positioning XY stage LV-0015
- Fine-positioning Z stage LV-0016

* A PC is required to display the image.



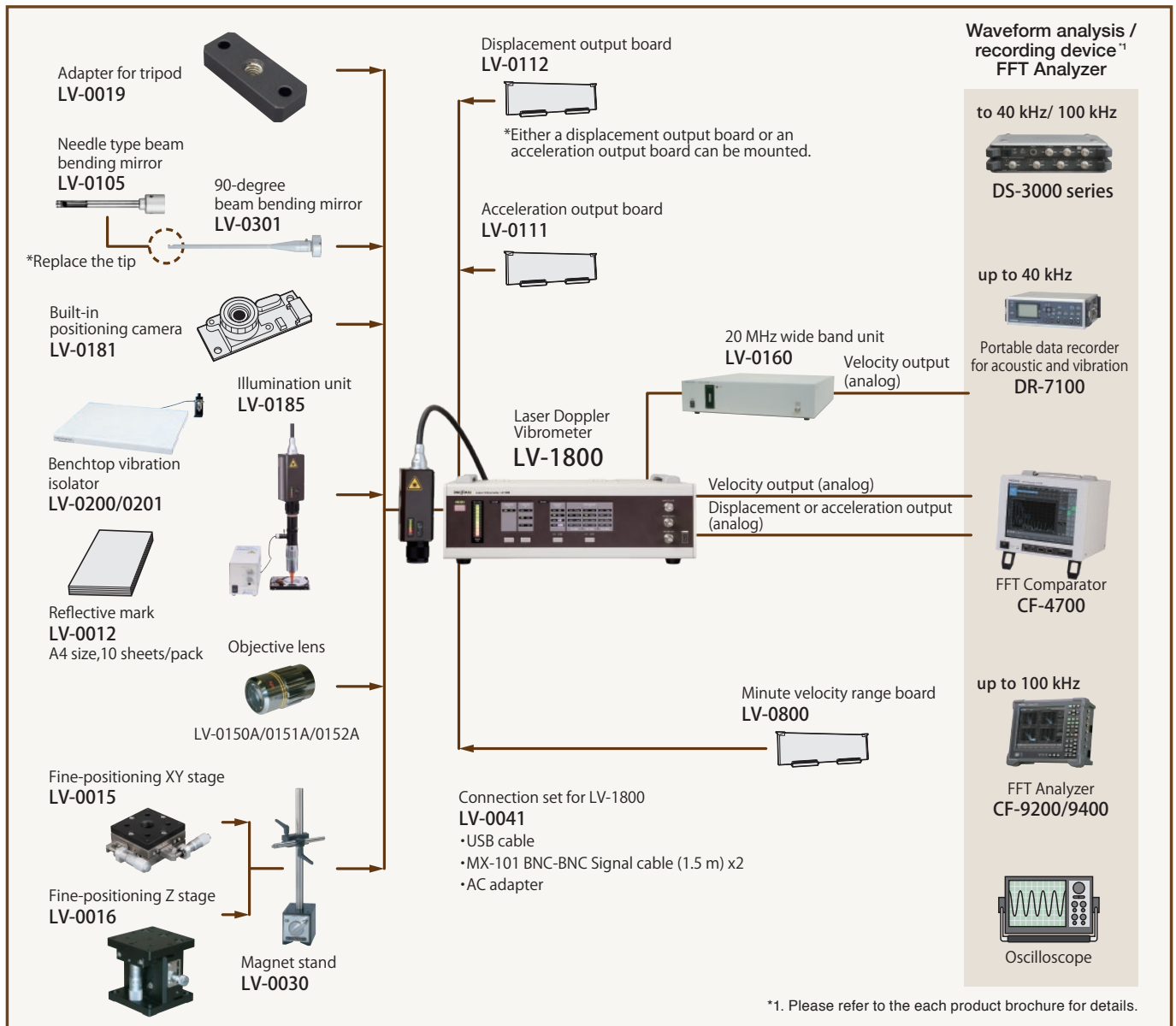
Installing the LV-0181 (Built-in positioning camera), the LV-0185 (Illumination unit) and an objective lens to the LV-1800 enables micro spotting of laser beams and image observation by epi-illumination. It makes laser positioning to microstructures and detection of multipoint parts possible.

| Objective lens | Specification | The image of the LV-0181 |
|--|---|---|
| LV-0150A  | Magnification: 5x WD: 36.1 mm Spot diameter: $\phi 4 \mu\text{m}$ or less * A conversion adapter is provided as standard. |  |
| LV-0151A  | Magnification: 10x WD: 38.9 mm Spot diameter: $\phi 3 \mu\text{m}$ or less * A conversion adapter is provided as standard. |  |
| LV-0152A  | Magnification: 20x WD: 22.5 mm Spot diameter: $\phi 2.5 \mu\text{m}$ or less * A conversion adapter is provided as standard. |  |

* Objective scale: 100 μm / scale

* Please contact us for 20 or more magnification of objective lens.

System configuration

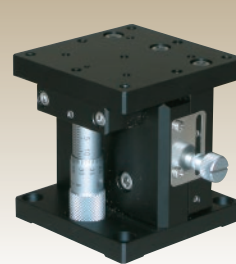


LV-0030 Magnet stand



The magnet stand is used for sensor positioning. Laser can be irradiated with high angular flexibility with cross clamp. Using it together with the LV-0015 or LV-0016 fine-positioning stage enables fine adjustment of the detecting position.

LV-0016 Fine-positioning Z stage



The Z stage enables fine alignment of the sensor up/down position. Using it together with the LV-0030 magnet stand, you can easily perform focusing of laser beams and image, and fine adjustment.

Stage surface: 60 x 60 mm
Movable range: 0 to 10 mm

* An adapter plate is required separately when attaching only LV-0016 to LV-0030.

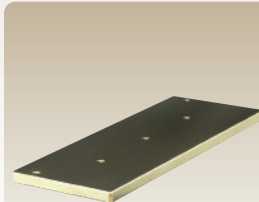
LV-0015 Fine-positioning XY stage



The XY stage enables precise alignment of the sensor position. Using it together with the LV-0030 magnet stand, fine adjustment in X and Y directions can be performed. Using as a standalone unit, positioning of samples can be performed.

Stage surface: 60 x 60 mm
Movable range: ± 5 mm

LV-0018A Steel plate



You can use this plate as a base on the LV-0030 magnet stand by mounting on the LV-0017A tripod. Fixing the LV-0015/0016 fine-positioning stage directly with screws prevents the stage and sensor from falling.

LV-0017A Tripod



Use this tripod to mount a sensor or a stand in a location without surface plate. It comes with the LV-0019 camera screw adapter (for direct mounting of a sensor to the tripod) and the LV-0018A steel plate.

LV-0301 90-degree beam bending mirror



Attaching the mirror to the LV-1800 lens enables the laser beams path to bend by 90- degree and rotated 360- degree, so that it can be aimed at small crevices such as behind the chassis.

Tip of the rod diameter : $\phi=10$ mm

LV-0150A/0151A/0152A Objective lens



*Image: LV-0151A

The laser spot diameter can be narrowed to $20\mu\text{m}$ or less by attaching the objective lens to the tip of the LV-1800. Three types of lens are available according to the spot diameter or magnification. Please refer to P.7 for details.

* A conversion adapter for attachment is provided as standard.

* Please contact us for the other magnifications.

LV-0105 Needle type beam bending mirror



This mirror has $\phi 4$ mm of rod tip diameter, useful for the guide of detection at narrower space. Used by attaching to the tip of the 90-degree beam bending mirror LV-0301.

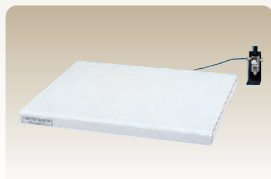
Tip of the rod diameter: $\phi=4$ mm

*The LV-0301 is required for the use of the LV-0105.

LV-0200 Benchtop vibration isolator (auto-leveling type)

Isolates the sensor from background vibration transmitted from the floor to improve S/N ratio.

A regulator with filter is provided as standard. The top plate is made with SUS on which the LV-0030 can be mounted.



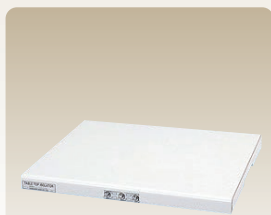
Outer dimensions : 500 x 600 x 56 mm
Maximum load weight : 120 kg
Weight : approx. 29 kg
Leveling mechanism : Operated using 0.3 to 0.7 MPa pressurized air or nitrogen gas.

LV-0019 Camera screw adapter



The adapter for mounting the sensor of the LV-1800 to the platform of the tripod LV-0017A (1/4-inch screw).

LV-0201 Benchtop vibration isolator (manual-leveling type)



This benchtop vibration isolator does not require compressed air and can be installed anywhere. It isolates the sensor from background vibration transmitted from the floor to improve S/N ratio. The top plate is made with SUS on which the LV-0030 can be mounted.

Outer dimensions : 500 x 600 x 56 mm
Maximum load weight : 120 kg
Weight : approx. 29 kg
Leveling mechanism : Hand pump

LV-0350 Storage trunk



This storage trunk can store the LV-1800 main unit and other optional products together.

<Products containable>

- LV-1800 x 1
- LV-0030 (+LV-0015/0016) x 1
- Objective lens x 2
- LV-0185 x 1
- LV-0018A x 1

*Utility space is provided.

LV-0160 20 MHz wide band unit

<made to order>



By connecting this unit to the LV-1800, detection of high velocity amplitudes up to 20 MHz is available.

<Usage> High frequency measurement such as ceramic capacitor, piezoelectric device or crystal oscillator

Measurement velocity range : 2 mm/s to 5 m/s
Velocity range : 2 (m/s)/V
Frequency range : 1 Hz to 20 MHz
Velocity output signal : ± 2.5 V (at 100 k Ω or more of input impedance)
Output impedance : 75 Ω

Power supply : 100 V to 240 V AC (50/60 Hz), 40 VA MAX
Operating temperature range : 0 to +40 $^{\circ}\text{C}$
Outer dimensions : 420(W) x 500(D) x 99(H) mm (not including protruded section)
Weight : approx. 7 kg

*The modification is required to use the LV-0160 with the LV-1800. Please contact your nearest distributor for more details.

Specification of the LV-1800

| 1. Detection unit | | | |
|---|---|--|--|
| Detection demodulation system | | Velocity demodulation using optical heterodyne detection | |
| Laser beam | Light source | He-Ne laser (approx. 633 nm wavelength) | |
| | Emission output | 1 mW or less | |
| | Laser safety class | Conforming to Laser Class 2 *Please refer to "3. Conforming standard" for more details. | |
| | Minimum laser spot diameter | Approx. 20 μm or less (ϕ=1/e ² when the focusing position is 100 mm.) Approx. 3 μm or less (When the LV-0151A is mounted) WD=approx. 38.9 mm | |
| Standard lens | Variable-focus lens | 100 mm to 10 m (∞) | |
| | Distance scale | 100 mm to 10 m (∞) *With the coherence length mark | |
| | Size of attachment | M22 x 0.5/Depth 5.5 mm | |
| Built-in positioning camera LV-0181 (option) | Installing method | Built-in sensor (Can be installed after delivery. Please contact your nearest distributor for more details.) | |
| | Interface | USB 2.0 *output from the conversion section USB mini-B connector | |
| | Imaging element | CMOS color 1/4-inch | |
| | Number of pixels | More than 300,000 pixels | |
| | Image size | VGA (640 x 480) | |
| | Frame rate | 30 frames/second | |
| | Minimum imaging range | 10 x 7.5 mm (TYP) WD=100 mm (at minimal length) | |
| | | 2.1 x 1.6 mm (TYP) When the LV-0151A objective lens is mounted. | |
| | Imaging position | An erect image when you see the indicator panel of the sensor head.(rotatable) | |
| | Exposure | Automatic | |
| | White balance | Automatic | |
| | Gain | Automatic | |
| | Operating environment | Windows® 7 / 10 / Display True Color 24 bit or more | |
| Camera focus | Adjusted by an objective lens, confocal with laser spot | | |
| Sensor suspension | Screw for sensor suspension | Backside x1 | M8 depth 8 mm *exclusive for LV-0030 magnet stand. |
| | | Side x1 | |
| | | Side x2 | M4 depth 5 mm |
| | Tripod setup | Use the LV-0019 camera screw adapter (option) | |
| Demodulation sensitivity monitor | Signal level indicator | 10-segment LED array display *Works with the signal level indicator on the conversion unit. | |
| | ERROR indicator | LED display (red) | |
| Signal cable | Cable length | 3 m | The cable is wound up on the cable clamp. (rear panel of the conversion unit) |
| | Diameter | ϕ=10.5 mm | |
| | Coating | Oil-resistant coating | |
| | Minimum bend radius | R=40 mm or more | |
| Outer dimensions | W | 53 mm | Not including the protruded section |
| | H | 52.5 mm | |
| | D | 152.5 mm | |
| Weight | | Approx. 750 g (When the LV-0181 is installed. Not including the cable.) | |

| 2. Conversion unit | | | |
|----------------------------------|-----------------------------|---|---|
| Detection velocity | Frequency range | 0.3 to 3 MHz ($f_c=-3$ dB) *common to each velocity range 0.001 (m/s)/V (option): 0.3 to 200 kHz ($f_c=-3$ dB) | |
| | Maximum detection velocity | 10 m/s o-p (20 m/s p-p) | |
| | Minimum velocity resolution | 0.3 $\mu\text{m/s}$ or less (when at 0.01 (m/s)/V) 0.05 $\mu\text{m/s}$ or less (when the LV-0800 is installed.) | |
| | Output | ± 10 V (20 V p-p) *input impedance: 100 k Ω or more | |
| | | Polarity of output voltage | + voltage when moving closer to a sensor side |
| | | DC offset | 20 mV or less |
| | | Output impedance | 50 Ω |
| | | Minimum input impedance | 100 k Ω or more |
| | | Connector type | BNC (C02) |
| | | | |
| Velocity range | 1.0 (m/s)/V | 10 m/s o-p (20 m/s p-p) | |
| | 0.1 (m/s)/V | 1 m/s o-p (2 m/s p-p) | |
| | 0.01 (m/s)/V | 0.1 m/s o-p (0.2 m/s p-p) | |
| | 0.001 (m/s)/V (option) | 0.01 m/s o-p (0.02 m/s p-p) *Please refer to P6 "LV-0800 Minute velocity range board" for more details. | |
| | Over indicator | Light up of red LED when the detected velocity exceeds +5 % of upper limit. | |
| Demodulation sensitivity monitor | Signal level indicator | 20-segment LED array display/Works with the signal level indicator on the detection unit. | |
| | MONITOR output | 0 to 10 V | |
| | | Output impedance | 50 Ω |
| | | Minimum input impedance | 100 k Ω or more |
| | | Connector type | BNC (C02) |
| | ERROR indicator | Light up of red LED | |
| High-pass filter (HPF) | 100 Hz | $f_c=-3$ dB | |
| | OFF (0.3 Hz) | | |

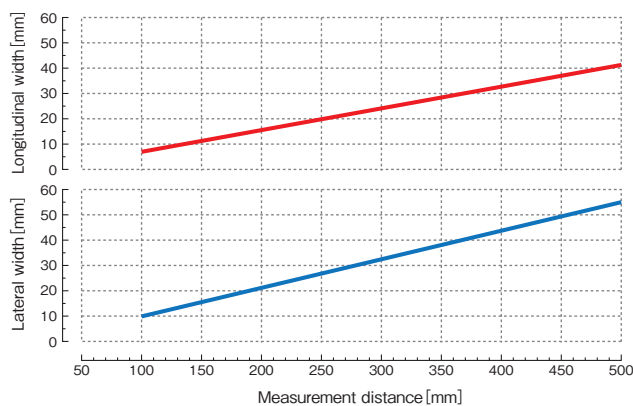
2. Conversion unit

| | | | | |
|--|----------------------------------|---|---|---|
| Low-pass filter (LPF) | | 50 kHz | | fc=−3 dB * Not selectable when used at 0.001 (m /s) / V range |
| | | 100 kHz | | |
| | | 1 MHz* | | |
| | | OFF (3 MHz) | | |
| Image output for positioning (option) | Image output | Digital | | |
| | Standard | USB 2.0 | | |
| | Display | Light up of white LED *When the LV-0180 is installed. | | |
| | Connector type | USB mini-B type | | |
| Control of laser irradiation | ON/OFF | Operated by the laser control switch on front panel. Function of power-on laser irradiation can be specified at the time of order. | | |
| | Laser beam irradiation indicator | Light up of green LED when laser beam is irradiated. | | |
| | Mechanical shutter | Contact input | The laser beam irradiation is stopped at contact open. | |
| | | Connector type | Receptacle : RM12BRB-2S Plug : RM12BPE-2PH (short-circuited) | |
| Storage device | Storage of detection unit | Stored in the conversion unit | | |
| | Storage of cable | Wound up on the cable clamp (rear panel of the conversion unit) | | |
| Outer dimensions | W | 410 mm | Not including protruded section | |
| | H | 120 mm | | |
| | D | 324 mm | | |
| Weight | | Approx. 8.1 kg (including the sensor and the cable) | | |
| Operating temperature range | | 0 to 40 °C | | |
| Operating humidity range | | 30 to 80 % RH (with no condensation) | | |
| Storage temperature range | | −10 to +50 °C | | |
| Input voltage | | 100 to 240 V AC | | |
| | | 50/60 Hz | | |
| Power consumption | | 60 VA | | |
| Cooling method | | Natural air cooling (non-vibration cooling) | | |

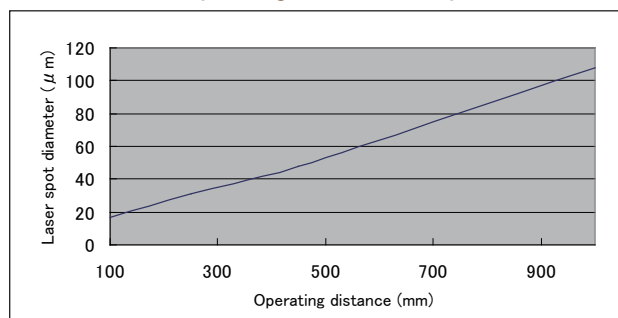
3. Conforming standard

| | | |
|---|-----------------------|--------------------------------|
| IEC60825-1:2007 | | |
| FDA (CDRH) 21CFR 1040.10 and 1040.11 except for deviations in accordance with the requirement of Laser Notice No.50 | | |
| CE marking | Low Voltage Directive | EN61010-1:2010 |
| | EMC Directive | EN61326-1:2006 Class A Table 2 |
| FCC (Part 15B) | | |
| CANADA EMI Standard (ICES-003) | | |
| JIS C 6802 class 2 | | |

■ Imaging range taken by the LV-0181 Built-in positioning camera



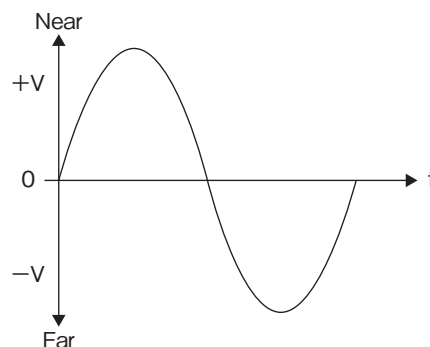
■ Relation between operating distance and spot diameter



4. Accessory

| Product name | No. of pcs. | Remarks |
|-----------------------|-------------|---|
| AC Power cable | 1 | |
| Safety lock connector | 1 | After short-circuit processing |
| Output signal cable | 2 | MX-101 BNC-BNC 1.5 m |
| Lens cap | 1 | Attached to the lens tip |
| Reflection mark | 1 | LV-0012 A4-size |
| Backup fuse | 1 | Built-in AC inlet of a main unit, T3.15 A 250 VAC |
| Instruction manual | 1 | |

■ Target amplitude: Polarity of output voltage

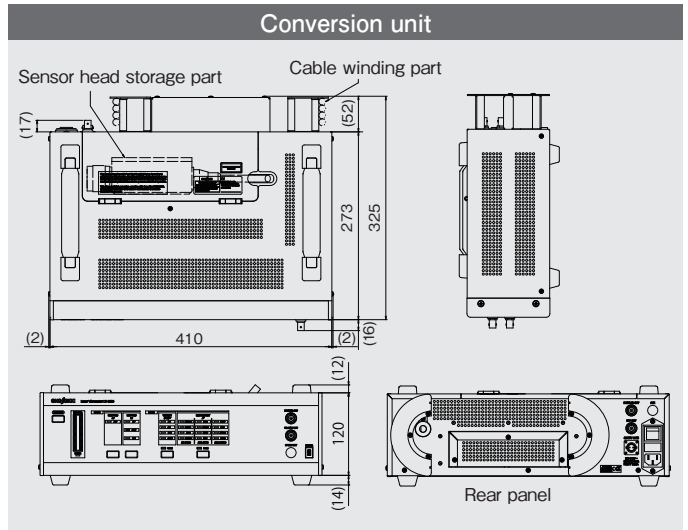
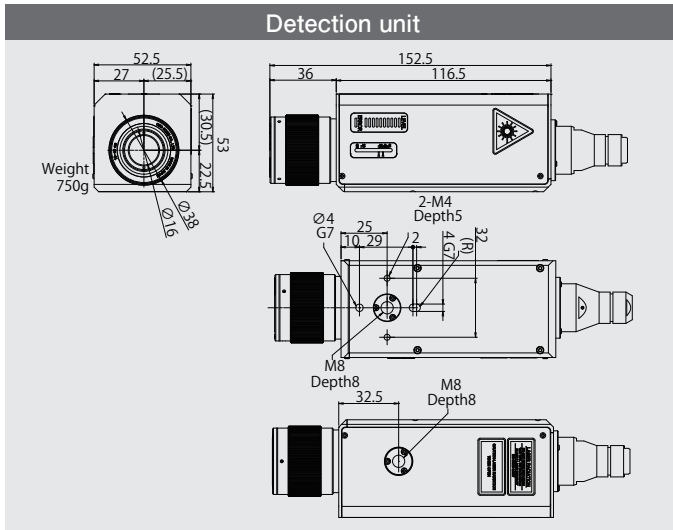


Evaluation condition of resolution/dynamic range

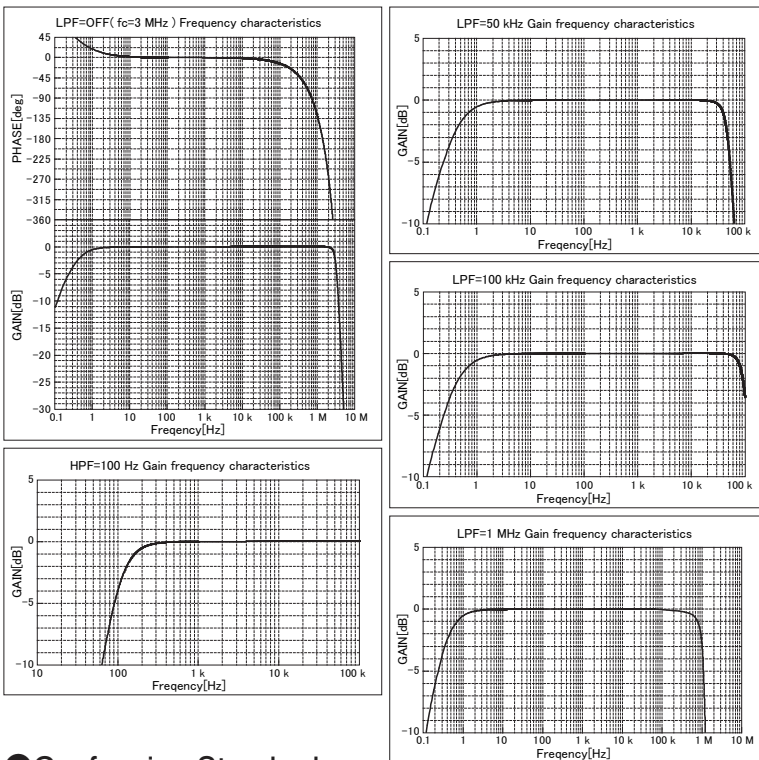
- LPF: 100 kHz ON
- At maximum demodulation using a corner cube
- Power spectrum observation by FFT Analyzer
- 1 kHz range 1 kHz, 2048 lines, averaging of 256 times

*Please refer to the above graph for the each filter characteristics.

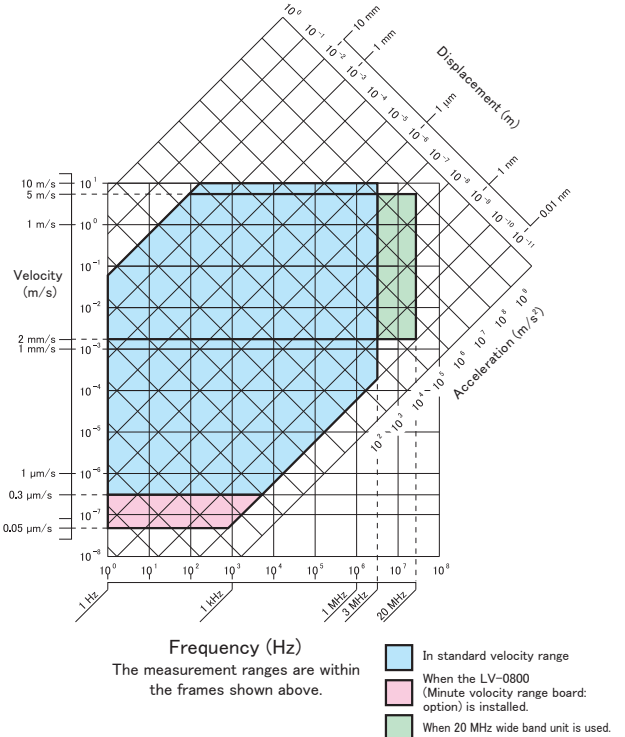
●LV-1800 Outer dimensions (unit: mm)



●LV-1800 Frequency characteristics graph



●Measurement range



●Conforming Standard

The LV-1800 model has been designed and tested in accordance with the following standards.
 JIS C 6802 (Laser Product Radiation Safety Standards)
 IEC 60825-1: 2007
 FDA (CDRH) 21CFR 1040.10 and 1040.11 except for deviations in accordance with the requirement of Laser Notice No.50
 CE Marking (Low Voltage Directive, EN61010-1)
 (EMC Directive, EN61326-1)
 FCC (Part 15B)
 CANADA EMI regulations (ICES-003)

●Description and warning label



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 VOC free ink was used to print this report.

CAT. NO. 1654-03E Printed in Japan 195(LI) 0.5K