SKF Laser Vibrometer

MSL-7000 Series

General description

Measuring equipment employed in production environments requires a compact and robust design suitable for the challenges met in harsh industrial areas. The SKF Laser Vibrometer combines a robust, integrated, single-box design with the clear advantages of non-contact, laser-based vibration measurement.

With a special focus on reliable measurement results, the SKF Laser Vibrometer produces optimal results on every measurement surface, regardless of environmental conditions. These outstanding properties make it the first choice for process-integrated acoustic quality inspection.

The vibrometer is non-contact, wear-free and does not require servo-mechanisms or noise protection for performing measurements.

Condition monitoring

The SKF Laser Vibrometer completes SKF's assortment of vibration sensors with a high-end contactless velocity proportional sensor, which can be used in combination with condition monitoring products such as SKF Microlog for advanced measurements and monitoring.

The sensor enables service engineers additional capabilities for field monitoring, such as measurements in areas difficult to reach, in hazardous zones and on hot or on rotating parts. Even measurement through glass is possible.

Quality control

The SKF Laser Vibrometer measures structure-borne noise reliably and without contact. The acquired data provide valuable information on manufacturing quality and compliance with a product's acoustic emission limits. Direct integration of the vibrometer into a production line creates a real-time quality control system that enables FAIL decisions on the basis of structure-borne vibration. The sensor allows easy integration into the manufacturing line and supports flexible resetting of manufacturing batches.

Features

- Measurements on rotating components
- Especially useful for slow-moving applications
- Measurement through glass/windows
- Distance up to 3 m *(9.9 ft.)*, more distance depends on the reflection of the measuring object
- Contact-less, reliable and free from wear
- Flexible use, many applications
- Mobile/stationary
- Simple to install and operate
- Easy to integrate into test setups and existing control systems
- Robust and compact single-box design
- High linearity of signal
- Reduced impact from surface features due to DESPEC technology
- Acoustic measurement range up to 22 kHz frequency response
- Eye safe, visible, low power laser (Class II)

Introduction to Laser-Doppler vibrometry

If a light beam is reflected by a moving object, the frequency of the light is shifted proportional to its velocity, a phenomenon referred to as the Doppler Shift. Through this process, the velocity information becomes coded in the frequency of the light and is subsequently used by the Laser-Doppler vibrometry to measure the vibration. A precision interferometer and digital decoding electronics transform the frequency shift into a voltage signal that can be processed by standard data acquisition systems. A significant property of this technology is that the velocity information is independent of the intensity of the reflected light; hence, this robust measuring principle works well for objects with low reflectivity surfaces.

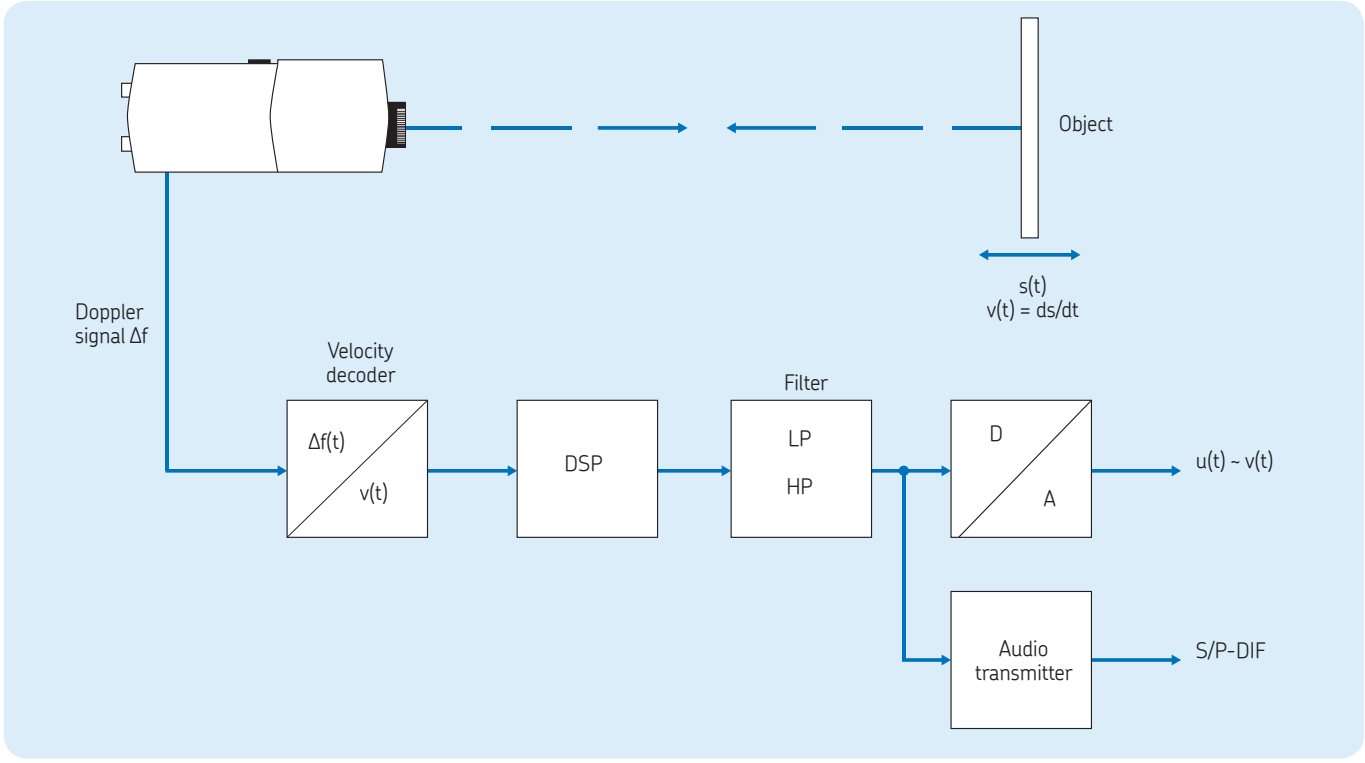
Variants

The MSL-7000 Series comprises three variants:

- MSL-7000 A: Vibration sensor for end-of-line noise and vibration testing. It can be connected to measuring electronics with digital input (S/P-DIF). Optionally the sensor can be connected to electronics with analogue input , therefore the adapter box MSL-P 7000 needs to be ordered.
- MSL-7000 B: Vibration sensor for condition monitoring under special conditions. Designed to be used in combination with SKF Microlog. This version includes a robust carrying case. Optionally a battery pack can be ordered for field measurement (operating time approx. 4–5 hours).
- MSL-7000 C: This version includes an additional measurement adapter box and the FPM noise testing software (FPM = Finger Print Method), which can be connected to a Laptop for vibration analysis. The FPM software is an advanced vibration analysis software for detailed root cause analysis (RCA) of bearing vibrations.

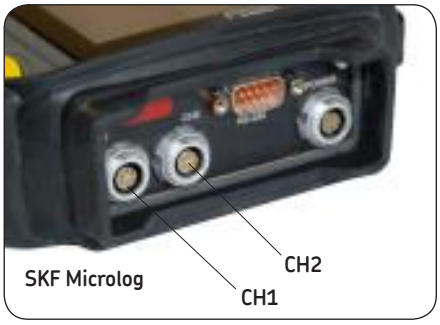
Calibration

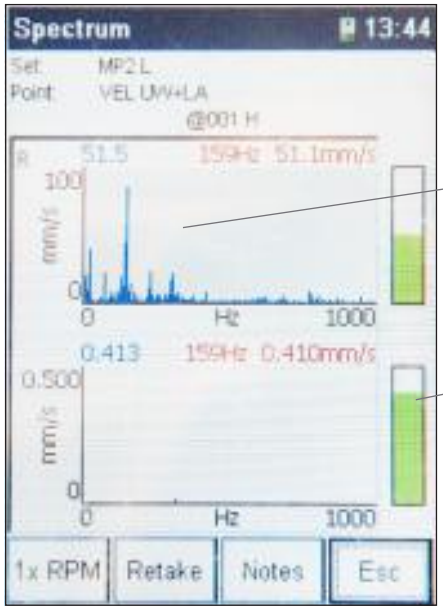
For high-accurate measurements, it is recommended to calibrate the SKF Laser Vibrometer and the SKF Microlog with SKF's calibration exciter MSL-C 7000. The exciter creates a fixed frequency of 159,2 Hz and 10 mm/s (RMS) amplitude.



SKF Laser Vibrometer connected to a SKF Microlog

[1)] Items not part of the SKF Laser Vibrometer kit.





Channel 1: Frequency spectrum of the laser signal

Channel 2: Laser beam signal reflection; the value should be a maximum – adjust using focusing ring

Example: Measurement with SKF Microlog

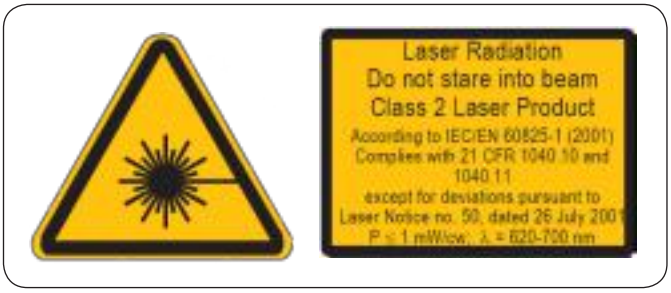
MSL-7000 B version for use with SKF Microlog

Technical specifications

- Operating temperature: 5 to 40 °C *(40 to 105 °F)*
- Storage temperature: –10 to +65 °C *(15 to 150 °F)*
- Relative humidity: Maximum 80%, non-condensing
- Protection rating: IP 64
- Decoder type: DSP velocity decoder, three measurement ranges
- Velocity ranges:
  - ±20 mm/s
  - ±100 mm/s
  - ±500 mm/s
- Scaling factor:
  - 200 mV/mm/s
  - 40 mV/mm/s
  - 8 mV/mm/s
- Velocity resolution[1)]:
  - < 0,02 (µm/s)/√Hz
  - < 0,20 (µm/s)/√Hz
  - < 0,10 (µm/s)/√Hz
- Frequency range:
  - 0 to 22 kHz (digital output)
  - 0,5 Hz to 22 kHz (analog output)
- Filters:
  - Digital low pass filter 1 kHz / 5 kHz / 22 kHz (–1 dB), roll-off > 120 dB/dec (analog and digital output)
  - Analog high pass filter 100 Hz (–3 dB) / off, roll-off about 60 dB/dec (analog output only)
  - DESPEC filter for optimization of signals measured on rough surfaces, effective up to 5 kHz
- Outputs analog: ±4 V, 24 bit DAC
- Outputs digital: S/P-DIF (Sony/Philips Digital Audio Interface) 24 bit, 48 kHz (L channel = filtered, R channel = unfiltered)

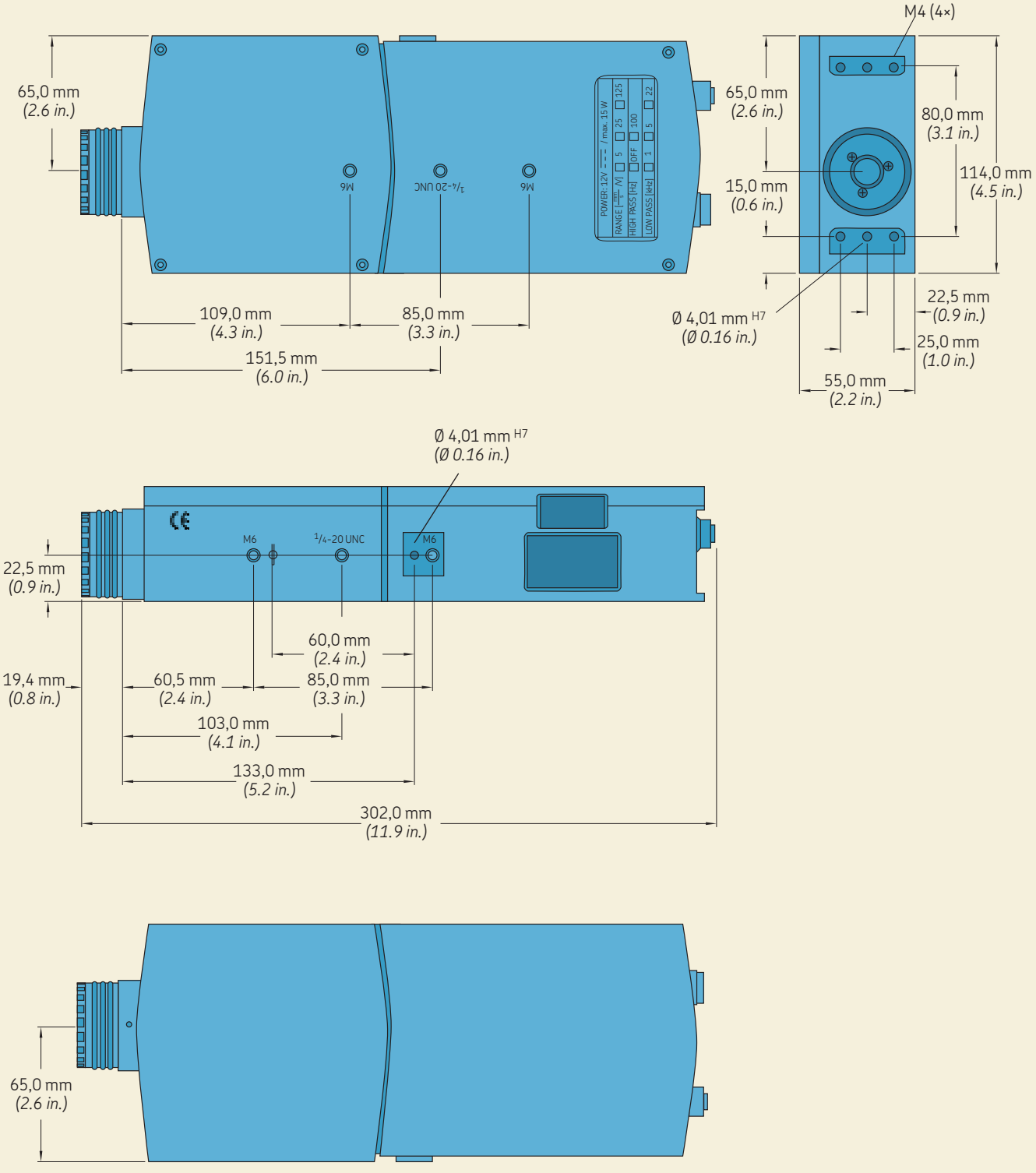
[1)] The resolution is defined as the signal amplitude (RMS) at which the signal-to-noise ratio is 0 dB in a 1 Hz spectral bandwidth (RBW), measured on 3M Scotchlite tape.

- Connectors:
  - Industrial connector for voltage supply, optical signal level and velocity output
  - Triax connector for S/P-DIF digital output
- Optical system, variable focus lens (vf): 90 mm to 3 m stand-off distance; more distance depends on the reflection of the measuring object
- Laser safety: < 1 mW output power, laser safety Class II, visible 632,8 nm laser



- Dimensions: See next page
- Weight: Approximately 2,6 kg *(5.7 lb.)*
- Power requirements: 11,0 to 14,5 V DC, maximum 15 W
- Recommended calibration exciter: Type MSL-C 7000
- Service interval: After non-stop operation for 15 000 to 20 000 hours, service from SKF is recommended. After this time, the intensity of the laser beam may decrease; there will be no influence on the measuring result.

Dimensions


65,0 mm
(2.6 in.)
M6
1/4-20 UNC
M6
POWER: 12V ⎓ / max. 15 W
RANGE [m/s² / V] 5 25 125
HIGH PASS [Hz] OFF 100
LOW PASS [kHz] 1 5 22
109,0 mm
(4.3 in.)
85,0 mm
(3.3 in.)
151,5 mm
(6.0 in.)
M4 (4×)
65,0 mm
(2.6 in.)
80,0 mm
(3.1 in.)
114,0 mm
(4.5 in.)
15,0 mm
(0.6 in.)
Ø 4,01 mm H7
(Ø 0.16 in.)
22,5 mm
(0.9 in.)
25,0 mm
(1.0 in.)
55,0 mm
(2.2 in.)
Ø 4,01 mm H7
(Ø 0.16 in.)
M6
1/4-20 UNC
M6
22,5 mm
(0.9 in.)
60,0 mm
(2.4 in.)
19,4 mm
(0.8 in.)
60,5 mm
(2.4 in.)
85,0 mm
(3.3 in.)
103,0 mm
(4.1 in.)
133,0 mm
(5.2 in.)
302,0 mm
(11.9 in.)
65,0 mm
(2.6 in.)

Ordering information

The SKF Laser Vibrometer is available as a stand-alone product or as part of two kits, description as follows:

SKF Laser Vibrometer [MSL-7000 A] includes:

- SKF Laser vibrometer [MSL-7000]
- Power supply [MSL-S 7000]
- RS-232 interface cable [MSL-I 7000]
- S/P-DIF digital cable [MSL-D 7000]
- Vibrotec software
- Allen key
- User manual

SKF Laser Vibrometer [MSL-7000]

Power supply [MSL-S 7000]

RS-232 interface cable [MSL-I 7000]

S/P-DIF digital cable [MSL-D 7000]

Vibrotec software

Allen key

SKF Laser Vibrometer MSL-7000 user manual

SKF Laser Vibrometer kit [MSL-7000 B] includes the following additional components to MSL-7000 A:

- Carrying case
- RS-232 USB adapter [MSL-A 7000]
- Adapter box [MSL-P 7000]

Carrying case

RS-232 USB adapter [MSL-A 7000]

Adapter box [MSL-P 7000]

SKF Laser Vibrometer kit [MSL-7000 C] includes the following additional components to MSL-7000 B:

- Measuring adapter box including USB cable [MSL-M 7000]
- FPM noise testing software with dongle
- FPM software user manual

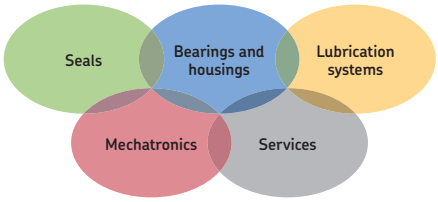
Measuring adapter box including USB cable [MSL-M 7000]

FPM noise testing software with dongle

FPM software user manual

Accessories

- Calibration exciter [MSL-C 7000]
- Battery pack [MSL-B 7000]
- Adapter box [MSL-P 7000]



The Power of Knowledge Engineering
Combining products, people, and application-specific knowledge, SKF delivers innovative solutions to equipment manufacturers and production facilities in every major industry worldwide. Having expertise in multiple competence areas supports SKF Life Cycle Management, a proven approach to improving equipment reliability, optimizing operational and energy efficiency and reducing total cost of ownership.

These competence areas include bearings and units, seals, lubrication systems, mechatronics, and a wide range of services, from 3-D computer modelling to cloud-based condition monitoring and asset management services.

SKF's global footprint provides SKF customers with uniform quality standards and worldwide product availability. Our local presence provides direct access to the experience, knowledge and ingenuity of SKF people.

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PUB CM/P8 12922 EN · September 2013