9 ACCELEROMETER SPECS YOU PROBABLY DON'T CHECK – AND WHEN YOU SHOULD!

VIB202: UNDERSTANDING ACCELEROMETER SPECIFICATIONS

CASE MATERIAL

WHEN TO CHECK: **AGGRESSIVE APPLICATIONS, HARSH OR WET ENVIRONMENTS**

- In harsh and wet environments, look for: 316L stainless steel
  - Unspecified stainless steel
- In deep and sea water environments, look for: titanium to avoid galvanic corrosion
- Avoid, except for laboratory environments: aluminum

SEALING

WHEN TO CHECK: **ALWAYS, ESPECIALLY UNDERWATER APPLICATIONS**

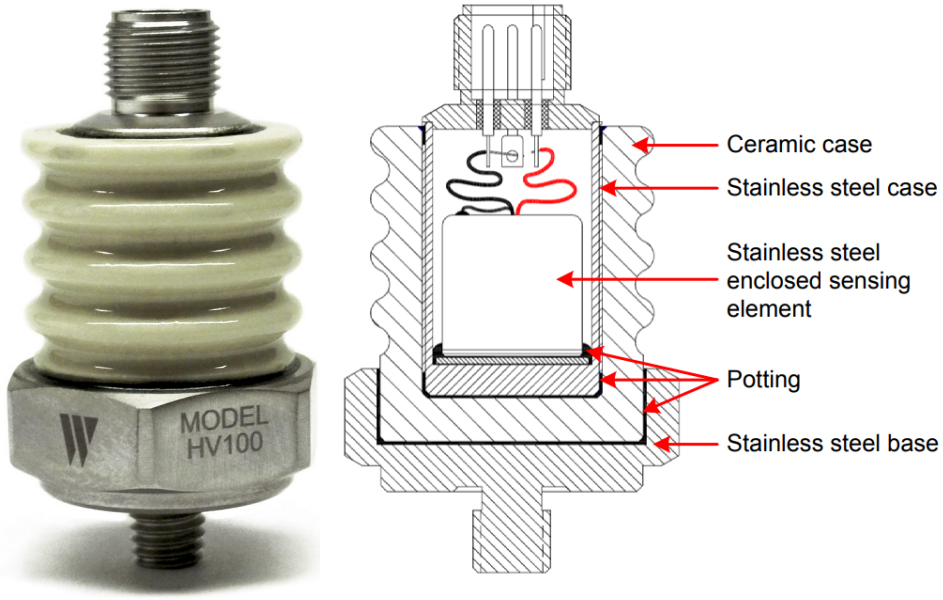
- Sealing ensures long term reliability for sensitive internal electronics
- Look for: true hermetic sealing with helium leak testing
  - May have to ask the manufacturer
- Avoid “IP68” and “epoxy sealed”

Leakage rate (cc/sec)	**Example**	**Time for 1cc to leak (at 1 atm.)**	**Suitable test method**
10^{-4}	Poorly built accelerometers	2.78 hours	Bubble test
10^{-6}	Beverage cans	11.57 days	Helium leak test
10^{-7}	Vacuum process systems	3.86 months	Helium leak test
10^{-8}	Wilcoxon industrial sensor	3.22 years	Helium leak test
10^{-9}	Pace maker	32 years	Helium leak test

ELECTROMAGNETIC SENSITIVITY

WHEN TO CHECK: **ELECTRICAL INTERFERENCE IS PRESENT**

- When EMI is present, look for: <100 µg/gauss
  - Contact the manufacturer if not specified or listed generically as “CE”
- For high-EMI and EFT applications, look for: electrical isolation between the sensor and the machine being monitored and electrical insulation of the accelerometer’s case and connector
- Cables with braided shields offer up to 95% shielding of signal carrying conductors



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CALIBRATION DATA OF DELIVERED SENSOR

WHEN TO CHECK: **ALWAYS ENTER THIS INTO INSTRUMENTATION**

Example #1

- Guaranteed sensitivity:
  100 mV/g ±5%
- Actual sensitivity:
  96 mV/g
- Sensor output:
  2900 mV
- Measured acceleration:
  30.2 g

Example #2

- Typical sensitivity:
  100 mV/g ±10%
- Actual sensitivity:
  87 mV/g
- Sensor output:
  2900 mV
- Measured acceleration:
  33.3 g
- Reported acceleration without calibration data:
  29 g

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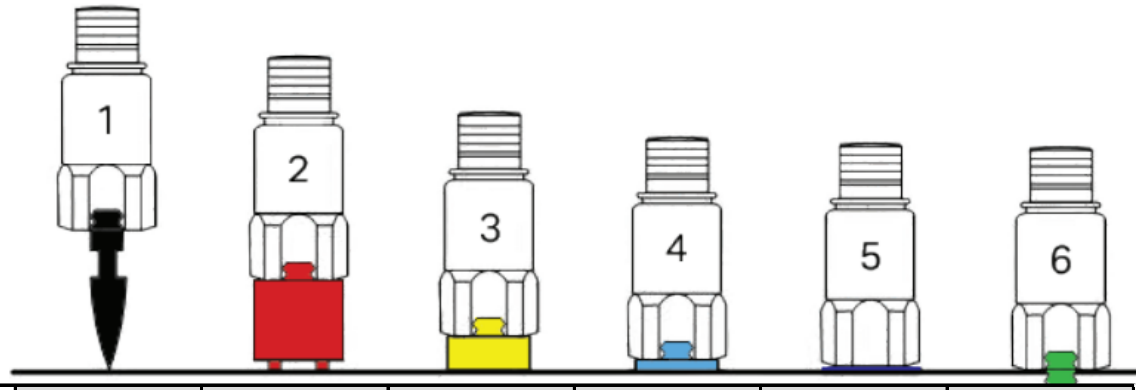
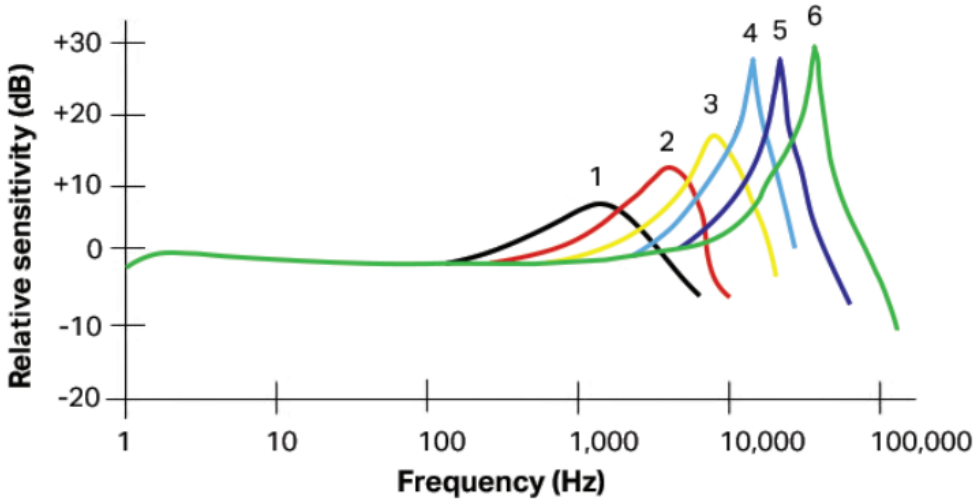
BEYOND THE SPECS: MOUNTED FREQUENCY RANGE

WHEN TO CHECK: **ALWAYS**

MOUNTING METHOD CAN LIMIT THE HIGH FREQUENCY RESPONSE OF THE SENSOR



	Probe tip	Curved surface magnet	Flat magnet	Cement mounting pad	Adhesive	Stud
Frequency range (Hz)	500 - 1,000	2,000 - 5,000	5,000 - 7,000	10,000 - 15,000	10,000 - 15,000	Sensor max
	Acceptable		Good	Best		



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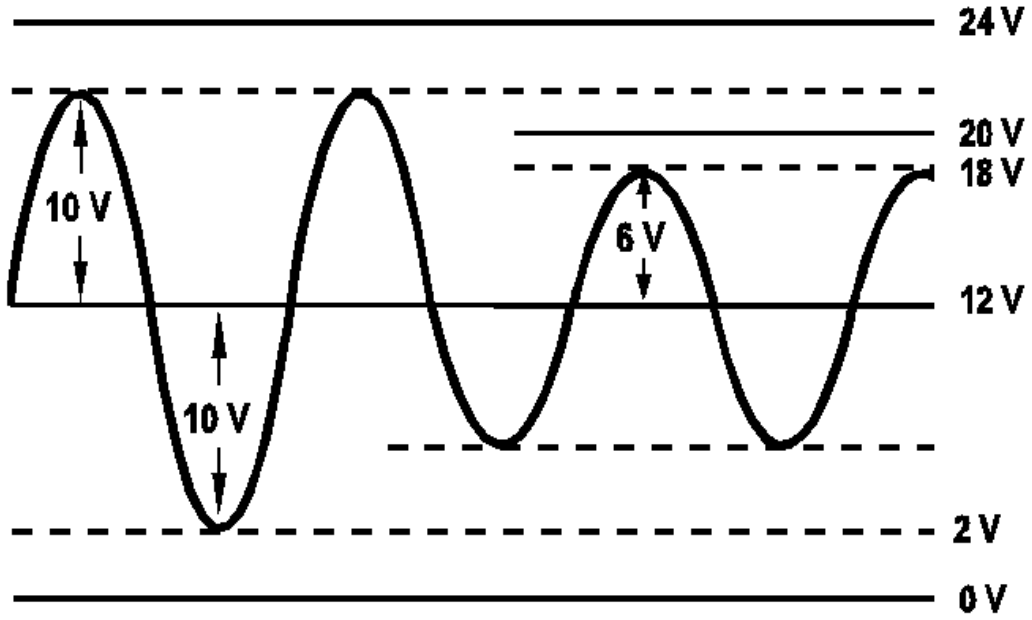
ACCELERATION RANGE AND VOLTAGE SUPPLY

WHEN TO CHECK: **LIMITED POWER SOURCE APPLICATIONS**

Acceleration range, VDC > 25 V	80 g peak
Power requirement:	
Voltage source	18 - 30 VDC

- 50g v 80g – output voltage
- 5V output v 8V output (100mV/g x 5 V → 50g)
- Vibration limit and shock limit compared to accel range



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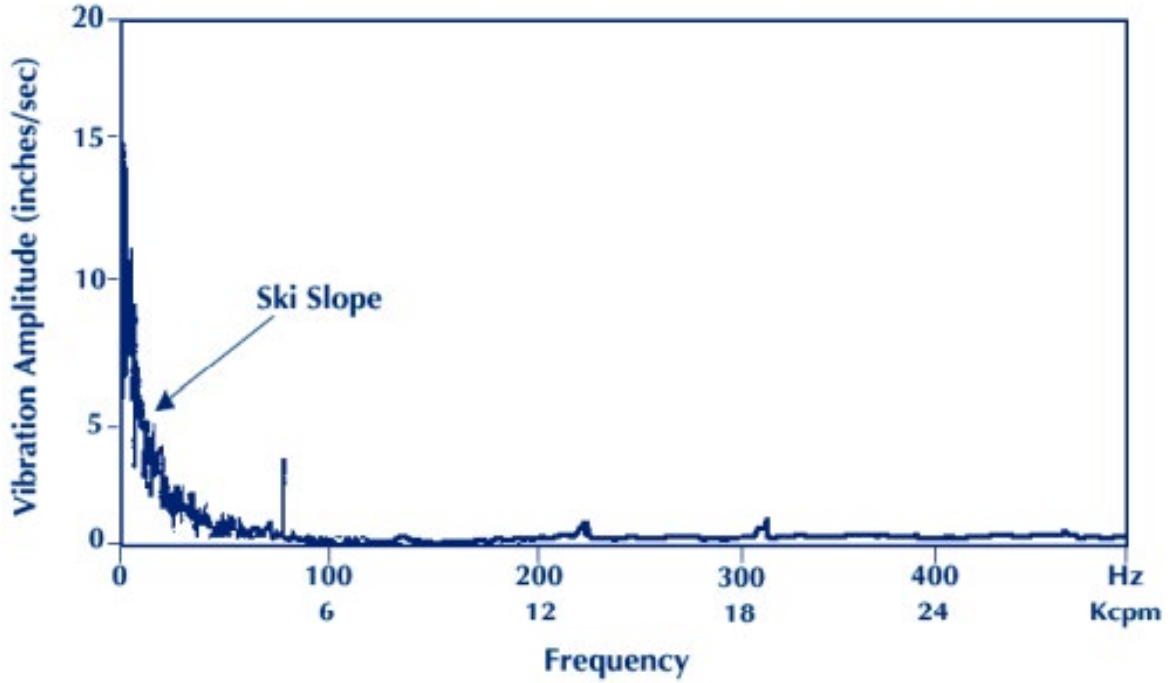
TURN ON AND SETTLING TIME

WHEN TO CHECK: **WALK-AROUND DATA COLLECTION**

- Sensor output is impacted by
  - Powering on in permanent installations
  - Magnetic mounting with a handheld vibration meter
- Sensor overload
  - When the total vibration limit is exceeded, ski slopes and clipping may occur
- For permanent installations, vibration junction boxes can help ensure reliable data
- Look for: short turn on times and settling times speed data collection

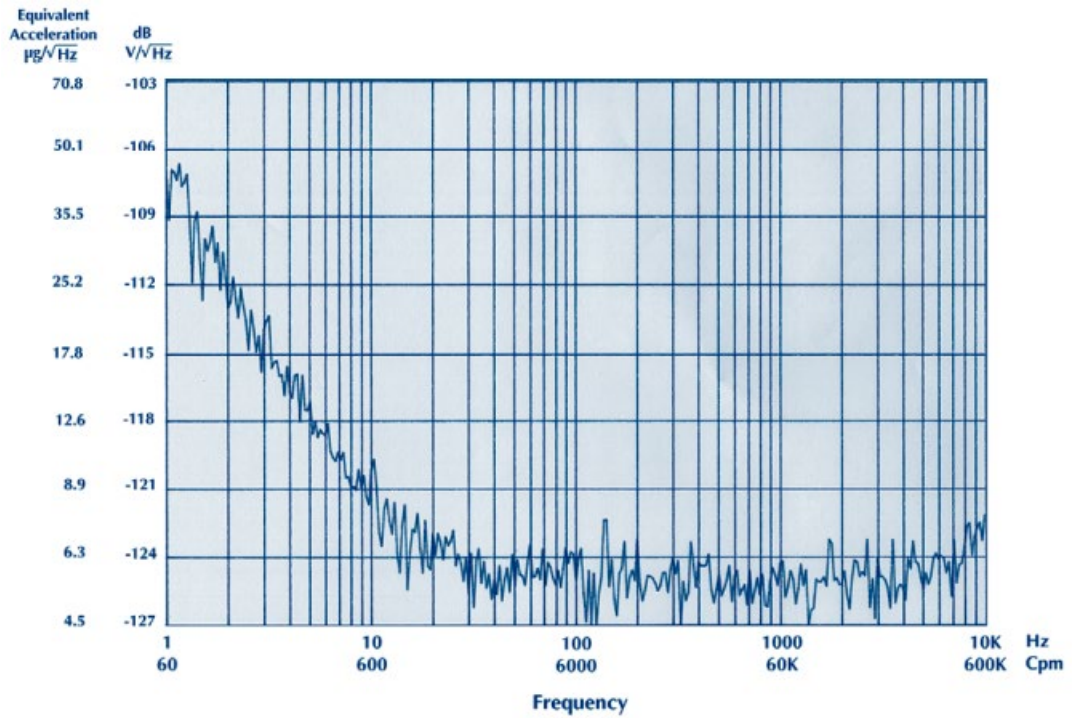


SPECTRAL NOISE

WHEN TO CHECK: **THE FREQUENCY OF INTEREST IS BELOW 10 KHZ, MOST INDUSTRIAL CONDITION MONITORING APPLICATIONS**

Electrical noise, equiv. g:		
Broadband	**2.5 Hz to 25 kHz**	700 µg
Spectral	**10 Hz**	10 µg/√Hz
	100 Hz	5 µg/√Hz
	1,000 Hz	5 µg/√Hz

- Broadband is important but does not isolate the frequency range of interest
  - Specification range may vary by manufacturer
- Look for: spectral noise at <u>your</u> frequency range of interest



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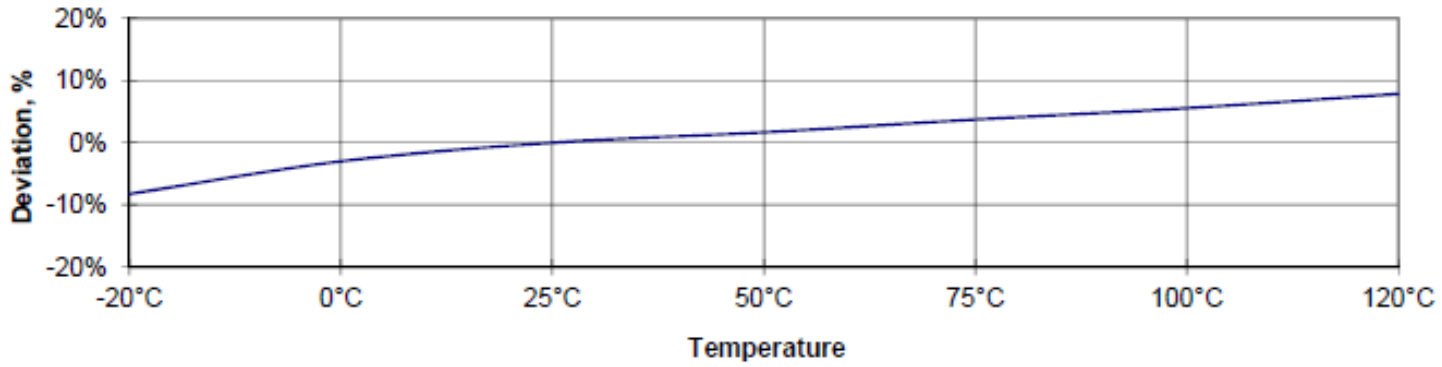
TEMPERATURE RESPONSE

WHEN TO CHECK: **APPLICATIONS OUTSIDE OF ROOM TEMPERATURE (25ºC)**

- Different from operating temperature range
- Indicates the expected change in nominal sensitivity across the operating temperature range
- Important to know and factor into the overall accelerometer output



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REVIEW

- **Case material**: look for 316L stainless steel for rugged applications
- **Sealing**: true hermeticity with helium leak testing for the longest sensor life
- **Electromagnetic sensitivity**: ensure protection of your data and your sensor
- **Calibration data**: enter this into your instrumentation
- **Mounted frequency response**: mounting techniques may degrade the usable frequency range
- **Acceleration range and power supply**: confirm the deployed sensor has enough power to perform
- **Turn on and settling time**: don't take data before the sensor is ready
- **Spectral noise**: spectral noise data confirms suitably low for your application
- **Temperature response**: account for changes in sensitivity in hot and cold environments
- **BONUS Piezoelectric stabilization**: prevent measurement drift as the sensor ages

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THANK YOU!

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