

# HS-620 Vibration Meter Kit

## Operating Manual

**Hansford Sensors Ltd.**

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The HS-620 Vibration Meter Kit is an ideal low cost entry level vibration monitoring instrument, designed for Maintenance Technicians to use on site, helping to give protection to important plant machinery

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## 1. Overview

The Vibration Meter is a reliable and easy to use hand-held machine condition inspection instrument. It provides vibration measurement, alarm indication and a bearing status check facility. The meter enables plant maintenance technicians to monitor machines, find potential problems in advance of failure, and to ensure machine reliability.

### 1.1 HS-620 Kit Contents

- VBA 20 meter unit with lithium battery fitted
- Hand Held Accelerometer with TNC Connector
- 80cm cable with TNC to BNC connectors
- Magnetic Base
- Vibration Spike
- 2 x Battery Charger (Mains +Car)
- Manual
- Carrying Case

### 1.2 Overall Vibration Mode

The meter can measure vibration velocity in mm/s rms, Acceleration in g peak, and Displacement in  $\mu\text{m}$  peak to peak. When measuring velocity, and on switching to the 'Hold' mode, the meter display will indicate an alarm status according to the machine vibration standard ISO10816-3.

### 1.3 Bearing Status Mode

The meter measures Bg value in g rms and Bv value in mm/s rms which represent the bearing status. The lower frequency machine vibrations are attenuated by a 1kHz high pass filter. In the 'Hold' mode, the meter display indicates the bearing alarm status.

## 2. Operating Instructions



Figure 1. The VBA20

### 2.1 Sensor Connection

Fit the vibration sensor to the machine measurement position via a magnetic base or stud. Connect the sensor cable to the BNC connector on the meter. When a satisfactory sensor connection is made, the sensor fault icon on the LCD display will disappear. Conversely, the sensor fault icon will appear if the meter detects a poor sensor connection.

### 2.2 Power On/Off

Power On - Push **SEL** key only for ½ sec. The meter defaults to the overall vibration velocity range.

Power Off - Push two keys, **SEL + BRG** or **SEL + VIB** for 1 sec.  
The meter will power-off on release of the keys.

The meter will automatically power-off after 3 minutes of no key operation.

## 2.3 Key Functions

**SEL** key- Press **SEL** to switch-on the meter

In the Overall Vibration mode press **SEL** to toggle through the measurement parameter options:-

'Vel' = vibration velocity in mm/s RMS  
'Acc ' = acceleration in g pk  
'Disp' = displacement in  $\mu\text{m}$  pk-pk

In the Overall Vibration Hold mode press **SEL** to toggle through the machine groups.

In the Bearing Status mode press **SEL** to toggle between Bg rms and Bv rms ranges.

In the Bearing Status Hold mode press **SEL** to toggle through the machine speed in rpm.

**VIB** key - Press **VIB** to toggle between Measure and Hold modes. The Hold mode is indicated by an '**H**' in the display.

In the BRG mode Press **VIB** to enter the Overall Vib. mode.

**BRG** key - In the Overall Vib. mode press **BRG** to enter the Bearing Status mode.

In the Bearing Status measurement mode press **BRG** to toggle between this and the Bearing Status Hold mode indicated by an '**H**' on the display.

When the overall velocity reading is in the Hold mode, the meter display indicates the vibration alarm status of the machine according to ISO10816-3 as defined in section 3.

When the BRG velocity or g reading is in the Hold mode the meter display indicates the bearing status according to a rule-of-thumb assessment as defined in section 4.

## 2.4 Overall Vibration Measurement & Assessment

At switch-on the meter defaults to the Velocity measurement mode, with the units 'mm/s rms' indicated at the bottom right of the display.

If required, press **SEL** to select acceleration or displacement. Note that no vibration assessment is available on these ranges.

When the vibration reading has settled, press **VIB** to move to the Hold mode. An '**H**' icon is displayed.

In the velocity range the VBA20 will then indicate either a tick icon for **OK**, a single bell for vibration **alert** or two bells for **danger**.

The meter makes this assessment depending on the vibration level and one of the four the machine group options selected using the **SEL** key. The machine groups are defined in ISO10816-3 and the meter categorizes these as 'ISO1&3-R', 'ISO1&3-F', 'ISO2&4-R', 'ISO2&4-F'. R and F refer to rigid and flexible machine mounting respectively.

A label on the back of the meter gives details of the ISO10816-3 machine groups. The user can refer to this to confirm the appropriate group number for the tested machine. The information attached is as follows in section 2.5.

## 2.5 ISO Machine Groups:

**Group 1** – Large machines rated power above 300KW; Electrical machines with shaft dia. >315mm. Normally **sleeve** bearings, speed 120RPM - 15000RPM.

**Group 2** – Medium size machines rated power 15KW < P<300KW; Electrical machines with shaft 160mm <dia.>315mm. Normally **element** bearings, Speed above 600RPM.

**Group 3** – Pumps with multi-vane impeller and with **separate** driver (centrifugal, mixed flow or axial flow) with rated power above 15KW.

**Group 4** – Pumps with multi-vane impeller and with **integrated** driver (centrifugal, mixed flow or axial flow) with rated power above 15KW.

**Support Class:** **R** = Rigid Mount: **F** = Flexible Mount.

## 2.6 Bearing Status Check

Fix the sensor directly to the bearing housing as close to the bearing as possible. Note that valid high frequency readings are unlikely to be achieved using hand pressure and the spike.

Press the **BRG** key to enter the **Bearing Status** mode.

Press the **SEL** key to select either Bg (g RMS) or Bv (mm/s RMS).

When the bearing status reading has settled, press the **BRG** key to enter the hold mode (**H**). The bearing status reading is then held and the rule-of-thumb alarm status displayed.

Press the **SEL** key to toggle through and select the appropriate speed range of the bearing shaft. (rpm:<500, rpm:<1000, rpm:<2000, rpm:<5000, rpm:<10000) .

The meter will then indicate either a tick icon for **OK**, a single bell for vibration **alert** or two bells for **danger**.

The meter makes the assessment based on the rules-of-thumb defined in section 4

## 2.7 Battery & Charger

The VBA20 is powered by an internal rechargeable Lithium-Ion battery which can operate for 48 hours continuously following full charge. The battery condition is indicated by an icon at the top right of the meter display.

The battery charger supplied requires 3 hours to fully charge the battery. An LED on the charger indicates the charge status, being orange when charging and green when charging is complete.

### 3. The ISO10816-3 Machine Vibration Standard

Industrial machines covered by the ISO10816-3 standard include :-

- Steam turbines with nominal power less than 50MW
- Steam turbines with nominal power above 50MW with speeds less than 1500rpm or above 3600rpm (ie. excludes machines included in ISO10816-2)
- Rotating compressors
- Industry gas turbines with nominal power less than 3MW
- Centrifugal, Mixed flow, or Axial flow pumps
- Electric Generators excluding Hydro-electric or pump stations
- Electrical motors of all types
- Blowers or fans

The standard classifies machine groups as in section 2.5 and defines vibration levels for each group, shown in the chart on page 9, as follows:-

Green – levels expected for a new machine.

Yellow - levels considered as acceptable for long periods.

Amber - levels not acceptable for long periods.

Red – levels likely to cause machine damage.

It further classifies machines as being either rigid or flexible mounted with the flexible mounted machines being allowed higher vibration levels. The meter indicates a tick box for levels in the green and yellow sections and uses the lower limit for the amber sections (one bell) and the red sections (two bells) in its vibration assessment.

Industrial machines with power above 15kW and nominal speeds between 120 -15000 r/min				
Unit	Group 1 and 3		Group 2 and 4	
	Rigid	Flexible	Rigid	Flexible
0-1.4	Green	Green	Green	Green
1.4-2.3	Green	Green	Yellow	Green
2.3-2.8	Yellow	Green	Yellow	Yellow
2.8-3.5	Yellow	Green	Orange	Yellow
3.5-4.5	Yellow	Yellow	Orange	Yellow
4.5-7.1	Orange	Yellow	Red	Orange
7.1-11	Red	Orange	Red	Orange
11--	Red	Red	Red	Red

The machine mountings affect the resonances related to the basic running speed of the machine. Machines with rubber or spring mountings often vibrate at low speeds following start-up, and as the speed increases the vibration level is reduced. Such a machine is considered flexible mounted.

Modern high speed machines having flexible bearing supports can also be considered as flexible mounted even though not mounted on rubber or springs.

A great advantage of using proper vibration measurements and standards is that future maintenance requirements and costs can be assessed reliably on machine commissioning. For example, if levels of 3mm/s RMS, are measured for a new machine, it is likely to require high maintenance activity. The specific requirements of this is individual to the machine design and the advice of the machine manufacturer should be sought.

#### **4. Bearing Status Assessment**

When the rolling elements move inside a bearing, broadband noise and vibration is generated. This increases if the bearing is not properly greased, or overloaded due to misalignment or damaged surfaces.

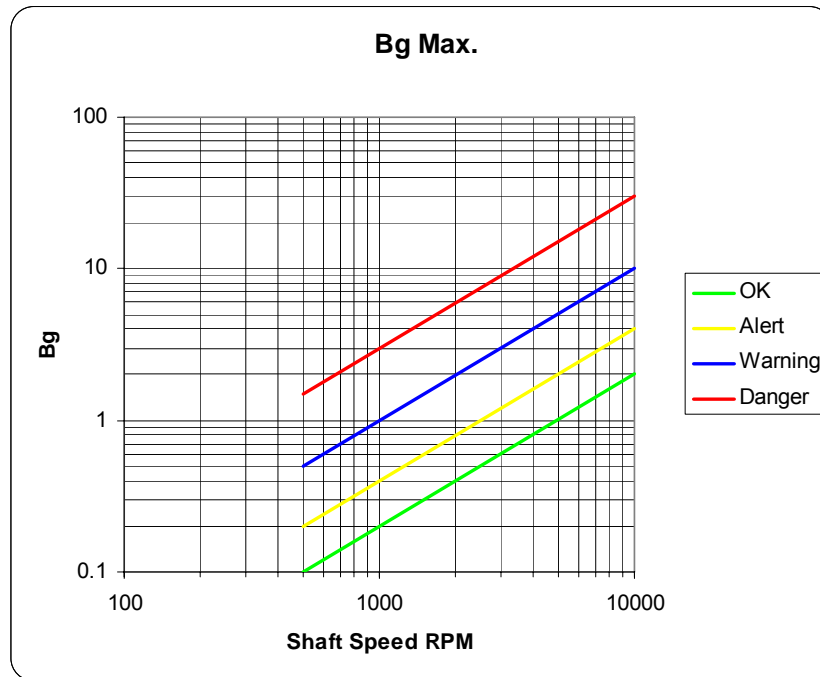
The bearing vibration Bg or Bv measured by the meter is the RMS value of all high frequency vibrations from a bearing between 1kHz and 12KHz.

The vibrations below 1kHz are suppressed in the Bg and Bv reading to eliminate vibrations caused by unbalance or misalignment in the machine. The bearing condition vibration is therefore better defined.

A practical problem arises in gearboxes, and other machines where steel meets steel, in which vibrations are produced in the same frequency range as the bearing vibrations. For this reason bearings should not normally be exchanged on the basis of a high bearing value only. A high bearing condition value is an indication that further analysis is required, and an FFT analyzer will indicate if there are frequencies corresponding to the mathematically calculated bearing frequencies.

##### **4.1 Bg Value**

Bg value is vibration acceleration within 1-12kHz in unit of g RMS. The reason for using acceleration is that it gives higher numbers at higher frequency than velocity measurement. The rule-of-thumb assessment of Bg is shown in the chart on page 11.



#### 4.2 BV Values

Bv measurement is a long established method for detecting bearing faults which gives reliable indication of bearing condition in 80-90% of cases. The rule-of-thumb assessment used in the meter is as follows:-

- $BV \leq 1 \text{ mm/s}$  - Healthy bearing, correctly greased
- $BV = 1-2 \text{ mm/s}$  - Possibly damaged or un-greased bearing
- $BV > 2 \text{ mm/s}$  - Bearing seizure likely

## 5. Specification

- Input** ..... IEPE Accelerometer 100mV/g
- Vibration** ..... Acceleration: 0-20gPk, Frequency Range 5Hz-12kHz  
Velocity:0-200mm/s RMS, Freq. Range 10Hz-1kHz  
Automatic Alarm Check: ISO10816-3.  
Displacement: 0-2000µm Peak-Peak, Freq. Range 5Hz-1kHz
- Bearing:** ..... Bg: 0-20 g RMS Freq. Range 1kHz-12 kHz  
Bv: 0-200 mm/s RMS, Freq. Range 1kHz-12 kHz  
Automatic Alarm Check for BG and BV: Rule-of-thumb
- Accuracy:**..... +/-5%
- Display** ..... Monochromatic LCD, 128x64
- Power** ..... Lithium rechargeable battery, 3.6V 1700 mAh,  
Recharge time 3 hours, >48 hours continuous operation
- Temperature** ..... Operation: -10°C to +50°C; Storage: -20°C to +60°C
- Size** ..... L 115mm x W 70-80mm x T 25mm
- Weight**..... 250 g includes sensor and cable

## 6 . Warranty

All goods are guaranteed against defects in materials and workmanship, subject to specific exclusions, for a period of 36 months from the date of purchase. In the event of failure within 36 months of original purchase, the company will promptly repair or replace the defective components without charge.

Specific exceptions rendering the Warranty void are:-

If repair is attempted by unauthorised persons or agents, or if the product has been used for purposes for which it was not intended and or subjected to abuse or wilful neglect. No liability can be accepted for loss of items or component parts. It is expected that the user takes sufficient precautions to safeguard all guaranteed items.



## CERTIFICATE OF CALIBRATION

We certify that this product has been calibrated in accordance with our manufacturing procedures, using calibrated equipment traceable to UK national standards, to ensure that the product meets the published specifications.

Model No. HS-620      Serial No. \_\_\_\_\_

Calibrated By \_\_\_\_\_      Date of Calibration  
\_\_\_\_\_

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