Vibration Monitoring Terminal Type 3680
Simple and effective vibration monitoring

When you need to reduce the risk of structural damage to nearby buildings, assess human response to vibration or monitor background vibration levels to ensure sensitive equipment operates correctly, you need a robust device on which you can rely.

Brüel & Kjær's Vibration Monitoring Terminal Type 3680 (VMT) achieves it all reliably and with the minimum of effort.

Uses and Features

Uses

Construction and mining
- Fast alerting on triaxial PPV measurements
- Alerts trigger SMS, email or local control of external devices

Road and rail planning
- Continuous monitoring of vibration levels
- Background surveys prior to construction, or routine assessment during operation

Ambient monitoring at hospitals/manufacturing
- Alerts if background levels prevent accurate operation of imaging equipment

Features

Complete solution
- Vibration metrics for a wide range of applications
- Continuous uninterrupted measurement
- Immediate and fast data transfer if thresholds exceeded; generating alerts within a second
- Mains powered or 12-hour operation with integrated backup battery
- Continuous operation on solar power (optional) subject to panel size and local conditions

Easy to operate
- Three status LEDs confirm correct operation or diagnose problems on-site
- Seamless operation with Sentinel: Switch on the unit and it automatically connects and configures itself. The built-in GPS locates the measurement position
- For stand-alone use, a free smartphone app enables set-up, remote display and operation anywhere, as well as data transfer to standard applications like Microsoft® Excel®

Brüel & Kjær

The Vibration Monitoring Terminal (VMT)

Brüel & Kjær's Vibration Monitoring Terminal Type 3680 continually measures ground vibration in three axes, providing vibration metrics for a wide range of applications including monitoring structural damage to nearby buildings, assessing human response to vibration, or monitoring background vibration levels to ensure sensitive equipment operates correctly.

The robust, reliable device is housed in a rugged aluminium enclosure, water- and dustproof to IP 67, and can operate in temperatures from −20 to +55 °C, making it suitable for the harsh environments it will be used in. And, it can be used on its own as a stand-alone meter or as part of a Sentinel compliance monitoring system.

It continuously measures without interruption across three axes in compliance with ISEE (2 to 250 Hz), DIN 45669−1 (1 to 315 Hz) and DIN 45669−1 (1 to 80 Hz). The system's 0.2 to 300 mm/s dynamic range ensures full coverage of vibration velocity levels.

The VMT is a self-contained unit including sensor conditioning, processing, storage, GPS and wireless communication. All suitable antennas are included, so you simply need to insert a SIM card into the easily accessible but well-protected slot, to connect to a 2G/3G/4G/LTE cellular network. Three status LEDs confirm correct operation and the status of the battery, communications and data logging, and help diagnose problems on-site in an intuitive manner. To confirm data validity, a sensor check can be made. In addition, the VMT has a heartbeat function to ensure stable operation and, if that fails, its self-healing function ensures continued operation with minimal manual intervention.

The VMT logs data at 1-second intervals, creates periodic climate reports at intervals of between 1 and 60 minutes, and identifies vibration alerts based on user-configurable trigger levels. Vibration alerts are generated within seconds of them occurring. Hourly instrument status reports are available and include the status of the battery, sensor check, count of measurements, and wireless and GPS signal strengths.

The unit is typically powered via a mains connection. Alternatively, it can be operated for up to 12 hours with its integrated and robust LiFePO4 battery – or connect it to solar panels for continuous operation.[*] To make remote operation cost-effective and easy, the VMT is self-starting, also when power is interrupted, so you do not have to visit the location to turn it on.

VMT Type 3680 comes complete with ground spikes and a wall-mounting fitting for the geophone to ensure that correct and valid data is being collected. A connector security cover is included to hide the display lights from view and to help protect the front panel from damage and physical interference.

Optional accredited calibrations of the geophone, both initial and regular, are available if your legislation requires this for traceable reporting.

Stand-alone Operation

For stand-alone use, a free smartphone app, VMT Manager, enables set-up, remote display and operation anywhere, as well as data transfer to standard applications like Microsoft® Excel®. The VMT Manager app is available on iOS and Android mobile devices.

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* Actual operation time are subject to panel size and local weather conditions.

Fig. 1
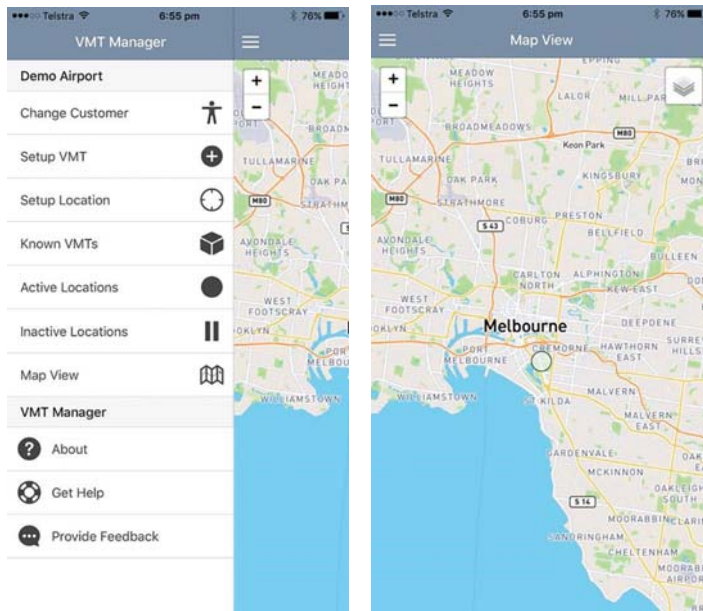*Example views of the VMT Manager app on iPhone® – selecting an active location*

Fig. 2
Vibration alerts are generated within seconds of them occurring and sent by SMS

The communications set-up of the VMT is done using BLE (Bluetooth Low Energy). Other set-up including location, measurement indices and trigger levels for alerts is done via the cloud using WiFi or the cellular network. This can be done in a browser on your smartphone.

It is also possible to set up when these trigger levels are active. The VMT's built-in GPS locates its measurement position but you can overwrite this in the event of poor GPS satellite coverage.

Used in stand-alone mode, the VMT has additional measurement functionality in addition to that supported by Sentinel. This includes the broadband vibration acceleration level Vrms dB in logged data, overall VdB and maximum VdB in each axis in alerts, and in periodic reports (climate).

Fig. 3
Left: Live data on a smartphone
*Right: Sample data sent by email*
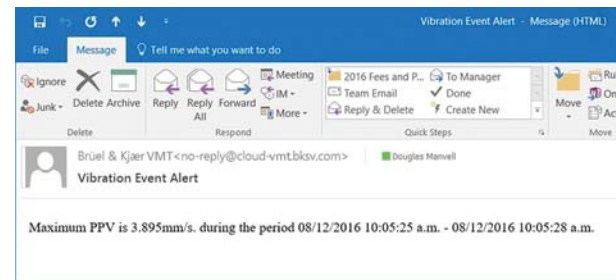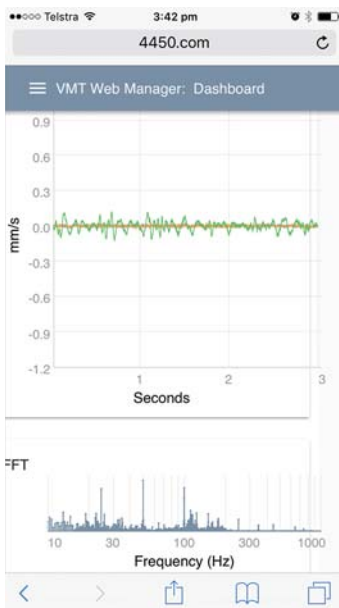
Live data can be viewed in a browser via a cloud service either from the smartphone or any PC. For reporting and further analysis, data can be selected in the app and sent to an email directly from the VMT.

The unit has enough memory for storing at least a full year (365 days) of all vibration measurements, alerts and data.

The VMT operates seamlessly with Brüel & Kjær's Sentinel solution, simply switch the unit on and it automatically connects and configures itself. When used with Sentinel, all control of the VMT is done remotely including set-up, remote display, operation and reporting.

Fig. 4
Sentinel display showing live and historical data
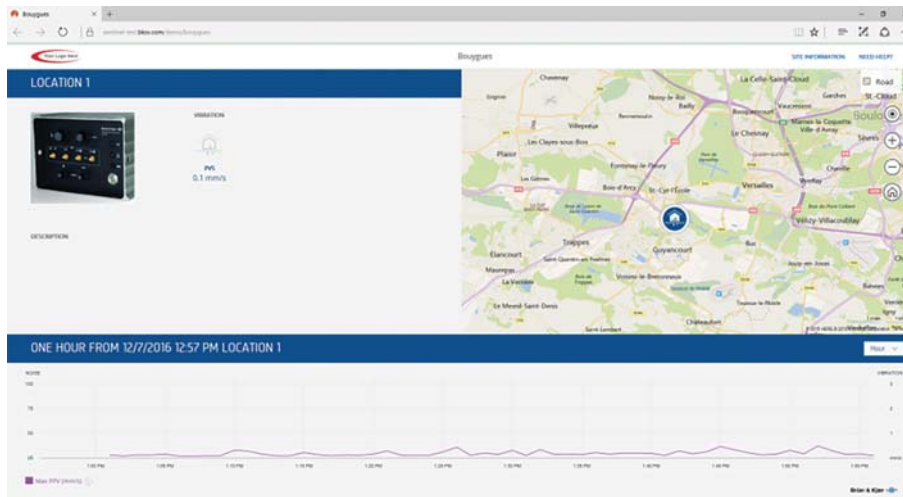
Vibration alerts are generated within seconds of them occurring and visualized and disseminated by Sentinel. The VMT can be set up with different alert trigger levels for different times of the day, and the reports contain sufficient detail for reporting and cause investigation.

Sentinel shows live vibration velocity data updated every minute. To confirm data validity, a sensor check is made daily.

For more information, see the Sentinel product data sheet BP 2389.

Compliance with Standards

CE ⚠ ♻ ⌧	The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People's Republic of China WEEE mark indicates compliance with the EU WEEE Directive
Safety	EN/IEC 60950−1: Safety requirements for information technology equipment ANS/UL 60950−1: Safety requirements for information technology equipment
EMC Emission	EN 61326−1 (2013): Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements EN 301489: EMC standard for radio equipment and services: • EN 301489−1: V1.9.2 (2011−09): Common technical requirements • EN 301489−17: V2.2.1 (2012−09): Specific conditions for broadband data transmission systems • EN 301489−24: V1.5.1 (2010−10): Specific conditions for IMT-2000 CDMA Direct Spread (UTRA and E-UTRA) for mobile and portable (UE) radio and ancillary equipment CISPR 22: Information technology equipment – Radio disturbance characteristics of information technology equipment. Class B Limits CISPR 25: Vehicles, boats and internal combustion engines – Radio disturbance characteristics – Limits and methods of measurement for the protection of on-board receivers EN 55022: Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement. Class B equipment, device and apparatus FCC Rules, Part 15: Complies with the limits for a Class B digital device Canadian ICES−003: Information technology equipment (including digital apparatus) — Limits and methods of measurement
EMC Immunity	EN 61000−4−3: A2 (2010): Electromagnetic compatibility (EMC). Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test EN 61326−1 (2013): Electrical equipment for measurement, control and laboratory use – EMC requirements **Note:** The above is only guaranteed using accessories listed in this document
Temperature	IEC 60068−2−1 & IEC 60068−2−2: Environmental Testing. Cold and Dry Heat Operating Temperature: −20 to +55 °C (−4 to 131°F) Storage Temperature: −40 to +60 °C (−40 to 140 °F)
Mechanical	Non-operating: IEC 60068−2−6: Vibration: 0.15 mm, 20 m/s^2, 10 – 500 Hz IEC 60068−2−27: Shock: 500 m/s^2 IEC 60068−2−29: Bump: 1000 bumps at 150 m/s^2
Enclosure	IEC 60529: Protection provided by enclosures: IP 67

Specifications – Vibration Monitoring Terminal Type 3680

Sensor

Triaxial geophone

Processing and Analysis

Signal processing with sensor in compliance with ISEE (2 to 250 Hz), DIN 45669−1 (1 to 315 Hz) and DIN 45669−1 (1 to 80 Hz)
Supported Measurement Standards: ISO 4866, DIN 4150, BS−7385, DIN 45669−1
Signal Recording: 3-channel in FLAC format
Dynamic Range: 0.2 up to 312 mm/s
Accuracy: ±5% or 0.5 mm/s between 1 and 125 Hz
Resolution: 0.008 mm/s
Sampling Rate: 24 bit up to 8 kHz
Peak Particle Velocity: 0.13 to 312 mm/s and zero-crossing frequencies
Other features:
• Sensor check
• Companion smartphone app for set-up and data download
• Heartbeat and self-healing operation
• File formats: Proprietary Sentinel streaming protocol or Microsoft® Excel®
• Compatible with Brüel & Kjær Sentinel monitoring service

VIBRATION EVENTS
• Triggered from defined vibration level
• Maximum PPV in each axis, zero-crossing frequencies and time of maximum
• Overall VdB and maximum VdB in each axis[*]
• Vibration waveform in each axis between 1 to 10 seconds with pre-trigger
• Alerts via SMS or email and local auxiliary control

VIBRATION CLIMATE
• Triggered configurable from 1 to 60 minutes
• Maximum PPV in each axis, zero-crossing frequencies
• Overall VdB, maximum VdB in each axis[*]
• Time of maximum level
• 5 percentiles from L1 to L99

STATUS REPORTS
Every hour, including battery, sensor check, count of measurements, wireless and GPS signal strength

COMMUNICATIONS
• Bluetooth® Low Energy (BLE): for communications set-up with the accompanying app

- Wi-Fi®
- 2G/3G/4G/LTE wireless with SIM card
- Real-time display
- Data transfer with simultaneous, uninterrupted measurement and storage

STORAGE
- 365 days of all vibration measurements, alerts and data
- Diagnostics, battery-life, temperature, wireless signal strength, uptime, unit health

Display
- Battery OK
- Communications OK
- Logging OK

Connections
- Geophone
- Auxiliary control, for example, external light or siren
- External 4G antenna

- External GPS antenna
- Mains power

Physical
Size: 140 × 200 × 480 mm (5.5 × 7.9 × 18.9″)
Weight: 8.98 kg (19.8 lb)

ENVIRONMENTAL
Water- and dust-proof to IP 67
12-hour battery backup with full operation with integrated LiFePO4 battery
Recommended to store at room temperature
Mains Power: 90 – 264 VAC
Operating Temp. (ambient): * Subject to operating conditions:
- With Battery: −20 to +55 °C (−4 to +131 °F)
- With Power Supply Plugged In: −20 to +40 °C (−4 to +104 °C)

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* All temperatures indicated in shade

Ordering Information

Type 3680-A   Vibration Monitoring Terminal (Europe)
Type 3680-B   Vibration Montoring Terminal (Americas)
Type 3680-C   Vibration Monitoring Terminal (Asia-Pacific)

Type 3680 includes the following:
- Type 4450-A/B/C: Vibration Analyzer (according to terminal variant)
- Type 8380: Triaxial Geophone
- KE-0014: Accessory Bag with Shoulder Strap
- FB-0737: Mounting Plate, for geophone
- UA-0006: Geophone Ground Spikes, set of 3
- DB-0009: Handle, Security Cap
- UL-1066: Dual-band Antenna (WiFi, 2.4 to 5.85 GHz), set of 3
- UL-1065: GPS Antenna
- DK-1769: Lock with cable
- DP-0127: Dust Cap for antenna connectors
- 3 × YI-0073: Geophone Stud Nut
- Power Supply

ACCESSORIES AND COMPONENTS AVAILABLE SEPARATELY

Type 7871	Sentinel, Web-based subscription service for continuous, real-time monitoring and compliance management
ZG-0876	Power Supply for EU, 90 – 264 VAC, IP 67, SB107-DK3A (M) to JP-0304, 16 VDC / 4A
ZG-0878	Power Supply for US, 90 – 264 VAC, IP 67, NEMA 5-15 (M) to JP-0304, 16VDC / 4A
ZG-0875	Power Supply for AU, 90 – 264 VAC, IP 67, SAA-3 (M) to JP-0304, 16VDC / 4A
ZG-0877	Power Supply for GB, 90 – 264 VAC, IP 67, BS 1363A (M) to JP-0304, 16VDC / 4A

Solar panels are also available. Contact your Brüel & Kjær sales representative for more information.

SERVICES

8380-CAI	Accredited Initial Calibration of geophone
8380-CAF	Annual Accredited Calibration of geophone

Brüel & Kjær