The combination fully meets the requirements of the International Society of Explosive Engineers, ISEE 2017 for ground vibration and blast overpressure monitoring.

Operation of the unit can be either standalone or as part of a Sentinel System with all the benefits this provides.

For mining staff and noise and vibration consultants who measuring the impact of blasts around mines, the blast overpressure microphone, when used with the VMT, provides a durable and robust solution that, unlike many other industry-standard solutions, continues to meet the ISEE requirements even after being used for a long time in the field. In addition, the VMT with this microphone is a complete, robust and reliable blast monitoring solution that is easy to operate.

BACKGROUND

Whenever an explosive is detonated, transient airborne pressure waves are generated. As these waves pass a given position, the pressure of the air rises very rapidly to a value above the atmospheric or ambient pressure. It then falls more slowly to a value below atmospheric before returning to the ambient value after a series of oscillations. The maximum pressure above atmospheric is known as the peak air overpressure.

These pressure waves will comprise of energy over a wide frequency range. Energy above 20 Hz is perceptible to the human ear as sound while below 20 Hz is inaudible; however it can be sensed in the form of concussion. The sound and concussion together is known as air overpressure which is measured in terms of Pascal (Pa), decibels (dB re 20 µPa), or pounds per square inch (psi) over the required frequency range.

Since both high and low frequencies are involved, there is no frequency weighting network applied to the measurement. All frequency components, both audible and inaudible, can cause a structure to vibrate in a way which can be confused with the effects of ground vibrations.

High blast overpressure can cause damage in structures (e.g. windows as well as structural damage) as well as being a source of community nuisance. As a result, blasting can only take place under specific weather conditions to consider effect on propagation and are subject to compliance limits.
Adding a blast overpressure microphone to the VMT to provide simultaneous ground vibration and noise monitoring enables blast monitoring around mines.

Blast measurement is different from ambient noise measurement as it covers high levels at low frequencies. As a result, the overpressure microphone does not require, or cover, the wide frequency response of general noise monitoring.

This microphone, provided as an accessory to the VMT, supplies an industry standard solution for blast overpressure monitoring. As the unit complies with RoHS 2 regulations, it can be deployed globally.

In addition to the advantages of our Vibration Monitoring Terminal VMT, there are a number of smaller, but potentially important, differences to other solutions:

- The microphone uses a stainless-steel diaphragm that has superior stability and does not corrode in harsh environments unlike Mylar or plastic membranes which absorb moisture and thus change their sensitivity
- At high temperatures, plastic membranes stretch affecting sensitivity and do not recover even when returning to normal temperatures. This does not happen with this microphone

- The windscreens used are hydrophobic and UV-protected so they won't deteriorate outdoors
- The microphone preamplifier is conformal-coated providing superior humidity protection
- Each microphone capsule is heated to 250 °C for 4 hours after manufacture to release manufacturing stresses ensuring long term stability in the field
- A wider dynamic range than the minimum ISEE requirements ensures that no blast overpressure data is missed
- The general VMT and Sentinel benefits

A Y-cable connects the blast microphone and geophone to the same input socket without strain, preventing risk of damage to the equipment.

Like the rest of the VMT, the robust, shielded cable is optimized for outdoor use protecting against dust, water, electromagnetic interference and UV-radiation.

A standard 3 m microphone cable is included, sufficient for the vast majority of situations with 1.5 m microphone heights (using the optional tripod) while enabling suitable location of both the analyzer and the geophone with its standard 2 m cable. Significantly longer cables can be supported and extension cables are available at standards lengths.

When used with the VMT, blast overpressure data is added to vibration events in stand-alone and alerts in Sentinel.

If you have an older Type 3680 Vibration Monitoring Terminal, you can get it upgraded at an authorized service center in order for it to accept the signal from the blast microphone.

For more information concerning the functionality of our Vibration Monitoring Terminal Type 3680, please see the Product Data sheet - BP2556
MEASUREMENT

Measurement is compliant with ISEE standard performance specifications for blasting seismographs 2017 and covers a wide range of levels, sufficient for capturing blast noise, and meets IEC 61672 class 1 accuracy over that ISEE frequency range.

It is capable of being mounted on a tripod or permanently on a mast and includes a windscreen and anti-bird spikes for unattended deployment and longer-term use.

STAND-ALONE USE

When used with the microphone, the VMT’s vibration event report includes:

- Maximum unweighted Peak pressure level recorded during the vibration alert
- Time of the maximum pressure relative to the start of the vibration event in accordance with industry standards
- Shows the air overpressure signal throughout the event as it does the vibration signals. This reduces the data storage and optimizes the time a user needs to look at data as the blast overpressure is only reported at the time of a vibration event.

Data outputs are available in CSV, XLSX and PDF depending on whether you need speedy response (CSV) or more attractive presentation.

The report indicates if a microphone overload occurs at any point throughout the alert measurement thus ensuring system integrity.

The microphone can be calibrated in the field using a standard calibrator and the calibration data is stored to ensure professional reporting and responses to data integrity questions.

It is also possible to output LZpeak (Pa) and Microphone Overload status in 1 s intervals, and to export air overpressure WAV files for post-processing.

When not required, the blast overpressure microphone data input can be deactivated in the VMT, thus hiding blast overpressure data when not relevant.

USING THE VMT WITH SENTINEL

Setting up the VMT with the blast overpressure microphone is seamless. Simply indicate on the VMT that blast microphone data is to be used and the data is transferred to Sentinel. Vibration data can be seen as shown on the right.

Sentinel’s detailed vibration alert report includes the blast overpressure level and the time of the level together with the vibration data. For more information, see the Sentinel product data sheet BP 2389.
MICROPHONE CONFIGURATION

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black UV Resistant Cable</td>
<td>![Image of Black UV Resistant Cable]</td>
</tr>
<tr>
<td>Microphone Capsule</td>
<td>![Image of Microphone Capsule]</td>
</tr>
<tr>
<td>O-Ring Sealed Connector</td>
<td>![Image of O-Ring Sealed Connector]</td>
</tr>
<tr>
<td>3 meters</td>
<td>![Image of 3 meters]</td>
</tr>
<tr>
<td>Windscreen</td>
<td>![Image of Windscreen]</td>
</tr>
<tr>
<td>Preamplifier</td>
<td>![Image of Preamplifier]</td>
</tr>
</tbody>
</table>

SPECIFICATIONS - BLAST OVERPRESSURE MICROPHONE

**AU--8381**
- **Sensor**: ½” microphone with stainless steel diaphragm
- **Microphone Noise Floor**: 75 dB (112 mPa)
- **Microphone Maximum Input**: 160 dB peak SPL (2000 Pa)
- **Microphone Frequency Range**: 2 Hz to 250 Hz (-3 dB)
- **Accuracy**: ISEE compliant

Other features:
- Windscreen
- Anti-bird spikes
- 3 m microphone cable
- Field calibration with acoustic calibrator

**ENVIRONMENTAL**
-- Connectors are water- and dust-proof to IP 66

**With 3680 VMT**

---

**VIBRATION EVENTS**
- Enables max blast overpressure data to be added to vibration events

**VIBRATION CLIMATE**
- Enables blast overpressure data to be added to 1 second logged data

**EXPORT**
- Event blast overpressure signal in WAV format

**With 3680 VMT and Sentinel**

---

**VIBRATION ALERTS**
- Enables max blast overpressure data to be added to vibration alerts
### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Type AU--8381 - Blast Overpressure Microphone</th>
<th>Accessories and Components Available Separately</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes the following</td>
<td>AU-UA-0041 1.5 m Tripod with Microphone Capsule</td>
</tr>
<tr>
<td>AU-MM-8381 Blast Overpressure Microphone Capsule</td>
<td>Type AU--3680 VMT</td>
</tr>
<tr>
<td>AU-ZC-0001 Blast Overpressure Preamplifier</td>
<td>Type AU--4231 Sound Level Calibrator</td>
</tr>
<tr>
<td>AU-UA-0001 Blast Overpressure Windscreen</td>
<td>Type AU--7871 Sentinel, Web-based subscription service for continuous, real-time monitoring and compliance management</td>
</tr>
<tr>
<td>AU-UA-0003 Blast Overpressure microphone bird spikes</td>
<td></td>
</tr>
<tr>
<td>AU-AO-0001-030 Blast Overpressure Microphone Cable</td>
<td></td>
</tr>
<tr>
<td>AU-UA-0008 Blast Overpressure Microphone and Geophone Y-Cable</td>
<td>Microphone extension cables are also available.</td>
</tr>
</tbody>
</table>

Accessories and Components Available Separately

- AU-UA-0041: 1.5 m Tripod with Microphone Adaptors
- Type AU--3680: VMT
- Type AU--4231: Sound Level Calibrator
- Type AU--7871: Sentinel, Web-based subscription service for continuous, real-time monitoring and compliance management

Microphone extension cables are also available.

#### Services

- AU--4450-MOD: 4450 Blast Overpressure Hardware Upgrade, done at service center

Contact your EMS Brüel & Kjær sales representative for more information.

---

Although reasonable care has been taken to ensure the information in this document is accurate, nothing herein can be construed to imply representation or warranty as to its accuracy, currency or completeness, nor is it intended to form the basis of any contract. Content is subject to change without notice – contact EMS Brüel & Kjær for the latest version of this document.