RION

Signal Acquisition and Post-Processing for Detailed Analysis

1. Data Security and Reanalysis

2. Determination of mitigation requirements

3. Evaluation of groundborne noise

4. Checking Compliance with Complex Limits

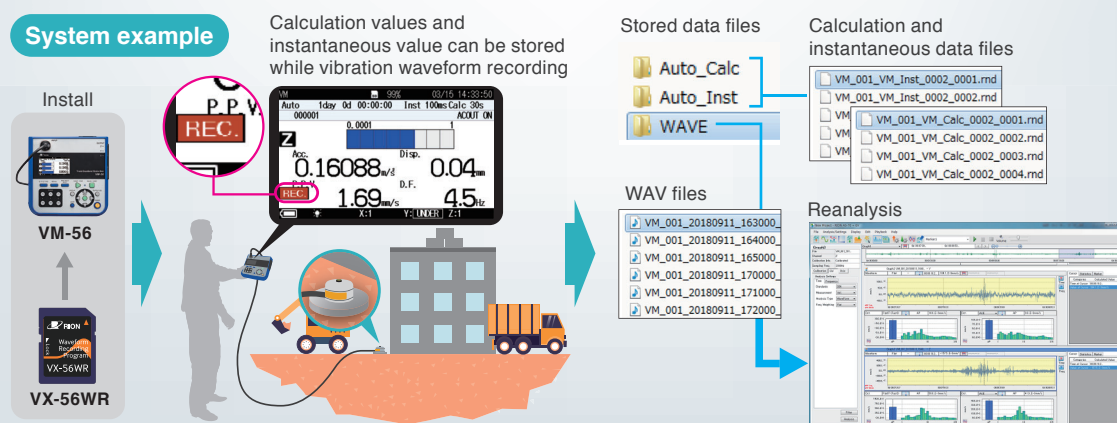5. Simultaneous analysis for Noise and Vibration

The VM-56 Tri-axial Groundborne Vibration Meter can be used with the VX-56WR Waveform Recording Program to simultaneously make measurements and store the raw acceleration signal as a wav file. Detailed analysis of the wav file can be conveniently carried out using AS-70GV post-processing software for PC. AS-70GV reads the calibration and sensitivity data from the VX-56WR wav file automatically so all results are in the correct units. AS-70GV can be used to for octave, third octave and FFT analysis and to calculate the parameters necessary for assessment of human response and the risk of effects on buildings. AS-70GV can also integrate and differentiate signals so analysis can be carried out in terms of acceleration, velocity or displacement. A range of frequency and time weightings can also be applied.

Examples for measurement systems using RION products are shown below.

1. Data Security and Reanalysis

Capturing the raw data for a vibration event ensures that you will be able to obtain all the information you require from it. Having taken a measurement on site you may decide you wish to analyse it in a different way. Some vibration standards advise that, where possible, the raw signal should be stored in addition to the measurement data in order to facilitate further analysis should it prove necessary.
The VM-56 supports SD cards up to 32 GB which can give a total recording time of approximately 20 days (470 hours). It is therefore practical to have the added security of recording all the raw data during most measurement exercises.

Equipment configuration

Product	Model
Tri-axial Groundborne Vibration Meter	VM-56
Tri-axial Accelerometer	PV-83D (Supplied with VM-56. Cable length 1.5 m)
Waveform Recording Program	VX-56WR
DIN plate	VP-54D
L-bracket	VP-54L
SD card（512 MB / 2 GB / 32 GB）	MC-51SD1 / 20SD2 / 32SP3
Waveform Analysis Software for Groundborne Vibration	AS-70GV
Computer	

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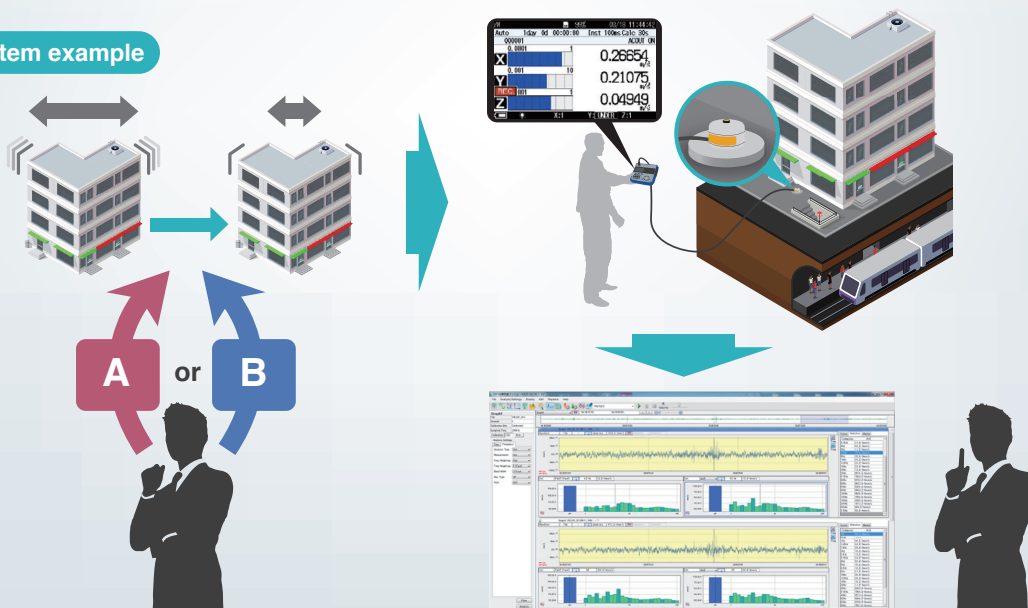5. Simultaneous analysis for Noise and Vibration

2. Determination of mitigation requirements

Frequency analysis of vibration is essential for determining vibration mitigation requirements. Octave or third octave data can be used to specify the requirements for foundations of buildings built (or to be built) above railway tunnels and/or in other situations where the buildings would be subject to substantial levels of structureborne or groundborne vibration. Third octave or octave data can also be used to evaluate the mitigation requirements at source e.g. resilient mountings for railways or machinery.

There is no standard way of expressing the efficacy of vibration isolation products. AS-70GV can be used to evaluate the raw vibration signal in terms of octaves, third octaves, (weighted or unweighted) acceleration and/or velocity. This flexibility enables the analysis to be carried out in terms of the parameters which best suit any individual investigation.

System example

A or B

Equipment configuration

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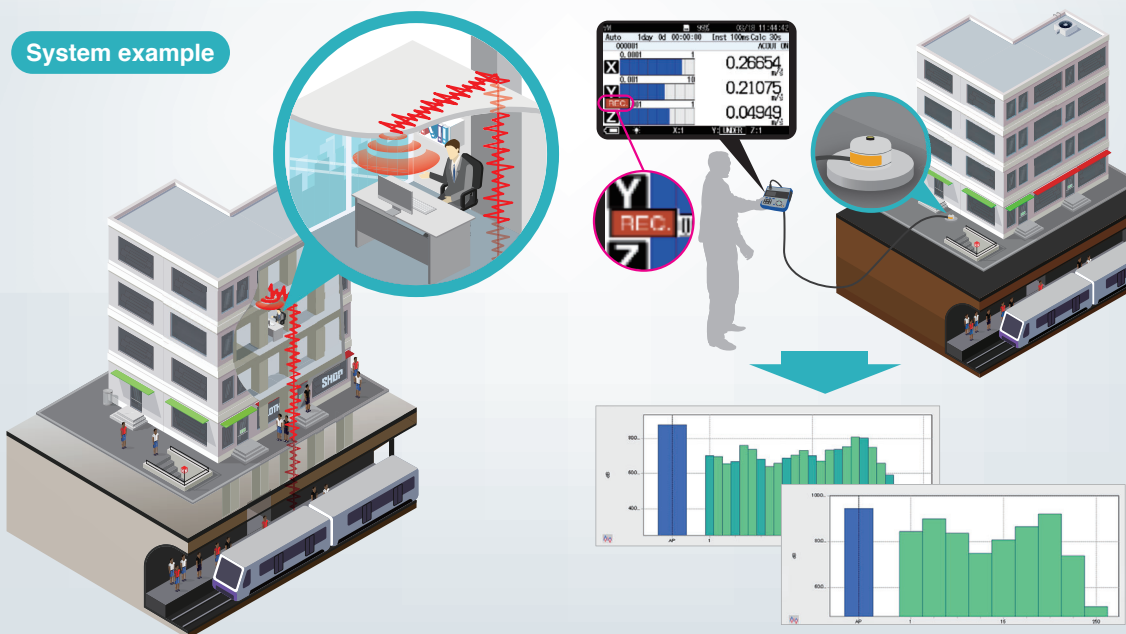# Signal Acquisition and Post-Processing for Detailed Analysis

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3. **Evaluation of groundborne noise**
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5. Simultaneous analysis for Noise and Vibration

3. Evaluation of groundborne noise

Groundborne noise is the rumbling sound heard in buildings above underground railways. It can also be an issue in developments built around and above railway stations. Significant levels of groundborne noise can be generated by relatively low levels of vibration (well below those which can be directly perceived). Groundborne noise levels are predicted and evaluated by applying a factor to the octave or third octave band vibration levels to predict octave/third octave band sound pressure levels. A-weighting is then applied to the octave/third octave groundborne sound pressure levels before logarithmically summing them. The VM-56/VX-56WR combination is ideally suited to recording the vibration signals for this application because of the system's high sensitivity and wide frequency range (up to 315 Hz). Analysis can subsequently be carried out in octave or third octave bands as necessary using AS-70GV.

System example

Equipment configuration

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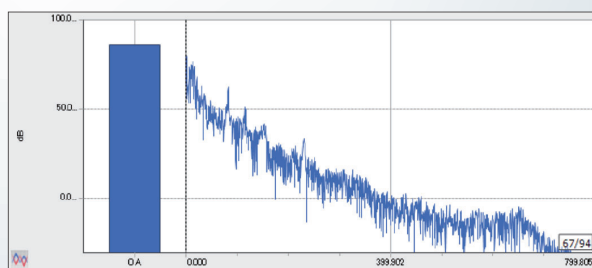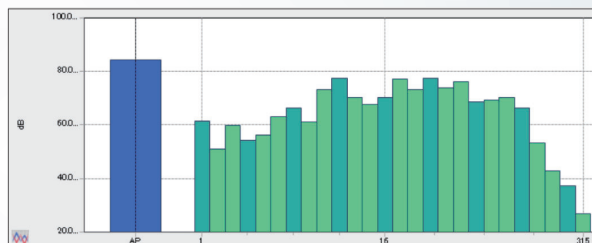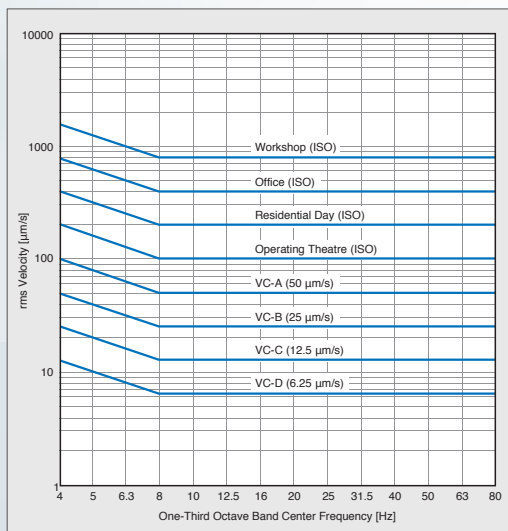4. Checking Compliance with Complex Limits

5. Simultaneous analysis for Noise and Vibration

4. Checking Compliance with Complex Limits

Vibration limits for sensitive equipment or activities requiring precision are often frequency dependent. They could be in octave bands, third octave bands or FFT. Sometimes limits are expressed in terms of velocity and other times they are expressed as acceleration values. There are also sometimes rms vibration limits for steady vibration and peak vibration limits for intermittent vibration.

Recording the raw acceleration signal with the VM-56/VX-56WR and analysing the data using AS-70GV enables comparison of the recorded vibration signal with a wide range of criteria.

Equipment configuration

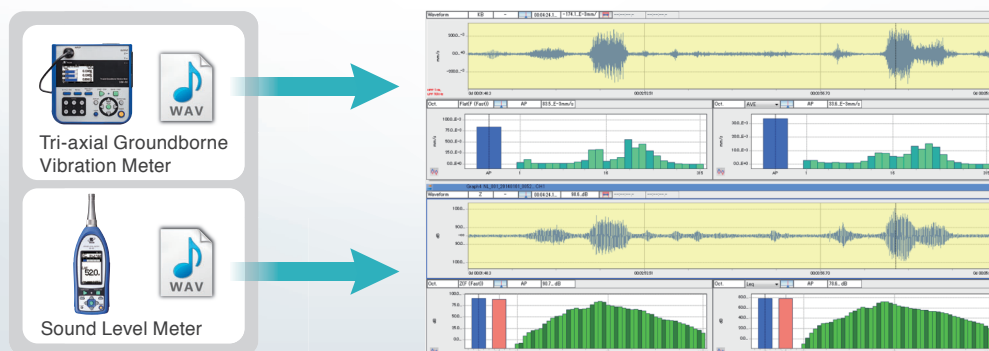| Product	Model
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The Analysis software AS-70GV allows calculations based on WAV files from a sound level meter (Rion NL-52 series) and from VX-56WR simultaneously. Together, a Rion NL-52 with the NX-42WR, a VM-56 plus VX-56WR and AS-70GV, make an extremely powerful system for the simultaneous analysis of sound and vibration.
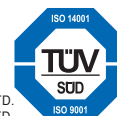
Tri-axial Groundborne Vibration Meter

Sound Level Meter

Equipment configuration

Product	Model
Tri-axial Groundborne Vibration Meter	VM-56
Tri-axial Accelerometer	PV-83D (Supplied with VM-56. Cable length 1.5 m)
Waveform Recording Program	VX-56WR
Sound Level Meter	NL-52
Extended function program	NX-42EX
Waveform Recording Program	NX-42WR
DIN plate	VP-54D
L-bracket	VP-54L
SD card (512 MB / 2 GB / 32 GB)	MC-51SD1 / 20SD2 / 32SP3
Waveform Analysis Software for Groundborne Vibration	AS-70GV
Computer	

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