



CAT-I

# ISO 18436 Category I

## Basic Vibration Analyst Training & Certification

### Public Courses and Online Training

Learn vibration analysis from the world's leading provider of training & certification. At Mobius Institute, we offer the most understandable and interesting training available. Our Crystal Clear™ training methodology is unique; using hundreds of 3D animations and software simulations that make complex concepts easier to understand. We offer ISO 18436 Category I to IV training via public venue courses as well as online through the Mobius Institute website.

Mobius Institute is ISO/IEC 17024 and ISO 18436-1 accredited, meaning that you are assured that your certification meets the highest global standards, and our training teaches you everything you need to know according to the ISO 18436 standard for vibration analyst training. There is no more highly regarded training & certification available.



# CAT-I Course Overview



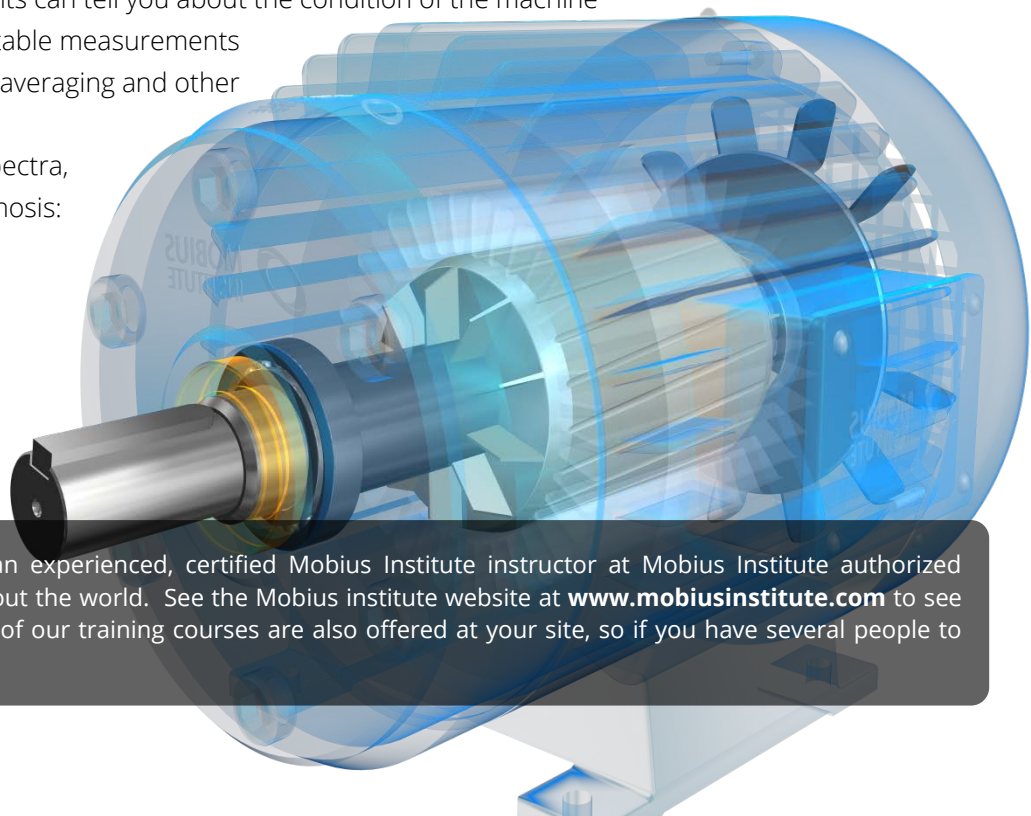
The Mobius Institute Category I course is the ideal starting place for new vibration analysts, people collecting vibration data, and those who want a better understanding of vibration analysis and condition monitoring. If you are ready to get started in vibration analysis and condition monitoring, this course is for you.

You will come away with a solid understanding of why we monitor the condition of rotating machinery (and other critical assets), the importance of improved reliability, and how vibration can be successfully measured and analyzed to provide an early warning of a wide range of fault conditions. You won't come away as an expert; that's what our more advanced courses are for.

Mobius makes learning about vibration analysis unique. We use 3D animations, Flash simulations, and numerous software simulators that completely demystify vibration analysis. While vibration training courses have traditionally been very theoretical, difficult to understand (and boring), you will be captivated by the Mobius training methods, and you will enjoy our practical approach. You will take away skills that you can immediately apply to your job, and you will truly understand what you are doing. When senior vibration analysts attend our classes they often say "if only I could have learned this way when I got started". You have the opportunity to do just that.

You will come away from the course with a solid understanding of:

- The benefits of performing condition monitoring and improving reliability
- The condition monitoring technologies: acoustic emission, infrared analysis (thermography), oil analysis, wear particle analysis, motor testing
- How machines work – via supplementary self-study using the "Equipment Knowledge" section
- How vibration measurements can tell you about the condition of the machine
- How to collect good, repeatable measurements
- What the Fmax, resolution, averaging and other analyzer settings mean
- How to analyze vibration spectra, and the basics of fault diagnosis: unbalance, misalignment, looseness, rolling element bearings faults, resonance, and other conditions
- An introduction to setting alarm limits



Our public courses are conducted by an experienced, certified Mobius Institute instructor at Mobius Institute authorized training centers in 50 countries throughout the world. See the Mobius institute website at [www.mobiusinstitute.com](http://www.mobiusinstitute.com) to see the courses scheduled in your area. All of our training courses are also offered at your site, so if you have several people to train, we can come to your location.

# CAT-I Course **Description**

**Duration:** 3 ½ days Cat I / Level I

**Format:** Live course or via online learning

**Optional:** ½ day Review & certification examination, 2 hours, 70% passing grade

**Compliance:** ISO 18436 Category I – Vibration Analyst, ASNT SNT-TC-1A Recommended Practice

**Public Course Pre-Study:** Registered students are given access to the online version of the course via the Mobius Institute Learning Zone before the class and for six months after course completion to assist them with converting the course information into practice

**Online Learning:** Registered students are given access to the Mobius Institute Learning Management System for a period of 6 months to provide ample time to learn the material and prepare for the optional certification examination

**Certification Prerequisite:** Prior experience is not required for attending the training course, but 6 months of experience is required for certification.

**Outcome:** You will come away from this course with a very good understanding of vibration analysis fundamentals, you will understand how to take good measurements, and you will be ready to begin analyzing vibration spectra.

## **Category I - Candidate Profile:**

- You are relatively new to vibration analysis
- You are or will be collecting vibration data
- You are or will be analyzing vibration data
- You look forward to the opportunity to develop your skills in the field of machine condition & vibration analysis
- You are seeking to become certified to international standards (ISO-18436) by an accredited certification body
- You want to become more valuable to your employer

## Topics covered:

- Maintenance practices
- Condition monitoring
- Principles of vibration
- Introduction to vibration measurement
- An introduction to the time waveform
- An introduction to the spectrum
- An introduction to forcing frequencies
- Explaining the different vibration units
- A brief introduction to phase
- Data acquisition
- A quick review of data acquisition
- How do we measure vibration?
- Where to place the sensor on the machine
- Understanding axial, radial, vertical, and horizontal readings
- A quick introduction to mounting the accelerometer and surface preparation
- Naming conventions
- What are “routes” and how do you create them?
- Signal processing
- A quick tour of your analyzer
- Spectral averaging
- Vibration analysis
- The spectrum analysis process
- What is resonance – a quick introduction
- Diagnosing common fault conditions
- Setting alarm limits

The purchase of the **public course** includes six months of access to the Mobius Learning Zone (an excellent web resource to prepare for the course, and to follow up after the course), a course manual, quick-reference guide, Mobius mouse pad with fault diagnostic reminders and pen. Examinations for certification are offered as an option at the end of the course.

The purchase of the **online learning course** includes six months access to the Mobius Learning Management System (LMS) where you are provided the complete course content, carefully explained and demonstrated on-screen. Optionally, you can order a hard copy training manual, and become certified by taking the optional certification examination through invigilation.



## CAT-I Certification

All Mobius certified analysts receive personalized logos with their certification number and name for their own professional use. Mobius Institute also maintains a listing of all certified analysts on our website and provides each analyst with a certification confirmation webpage.

For more information about Mobius Institute's accreditation, and the recognition of your certification by the ISO 18436 standard, please visit [www.mobiusinstitute.com/certification](http://www.mobiusinstitute.com/certification).

## Get started today

Go to our website to learn more about our public and online learning courses, view the public course schedule for your area. Don't hesitate to mail your questions to [learn@mobiusinstitute.com](mailto:learn@mobiusinstitute.com) or contact an authorized training center in your region.

**MOBIUS INSTITUTE**  
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## Online Learning & Classroom Course

The Vibration Analysis Cat I course is intended for personnel who are new to vibration monitoring and analysis, and for personnel who have limited vibration analysis experience. The course focuses on periodic, single channel data collection and analysis for condition based maintenance programs. A foundation is established for in-depth understanding of spectrum and waveform relationships. This is the ideal starting place for new vibration analysts, people collecting vibration data, and those who want a better understanding of vibration analysis and condition monitoring. You will come away from this course with a very good understanding of the fundamentals; you will understand how to take good measurements (and understand the importance of repeatability); and you will be ready to begin analyzing vibration spectra.

### Detailed topic list:

#### Maintenance Practices

- What is breakdown maintenance and when should it be employed?
- What is preventive (calendar based) maintenance, and what are its major flaws?
- What is predictive (condition based) maintenance, and what are its benefits?
- What is proactive (reliability centered) maintenance, and what are its benefits?

#### Condition monitoring

- Acoustic emission (ultrasound):
  - What is acoustic emission?
  - What can it tell you about rotating machinery?
  - How do you detect leaks and electrical faults?
  - How can it be used to detect bearing faults?
- Thermography
  - What is thermography?
  - How can it be used to detect faults in mechanical and electrical equipment?
  - What is emissivity, and how does it affect the accuracy of the measurements?
  - What are the key qualities of thermal imaging cameras?
- Oil analysis
  - How can it be used to check if the machine has a fault condition,
  - How can you test if the lubricant is “fit for purpose”?
  - What do viscosity, cleanliness, particle count, and other tests tell you?
- Wear particle analysis:
  - How are the tests performed?
  - How can you learn about the nature of wear?

- How can you determine which components are wearing?
- How does it differ from conventional oil analysis?

#### Motor testing

- What are the most common types of faults?
- What can motor current analysis tell you?
- What other test types tell you about the condition of the rotor, stator, and insulation?

#### Vibration analysis

- Quick introduction to vibration analysis
- Spectrum versus overall level readings
- Walk-around versus on-line monitoring versus protection systems

#### Principles of vibration

- Introduction to vibration measurement
  - A quick introduction to the accelerometer and displacement probes
  - A quick introduction to the vibration waveform (via live displays)
- An introduction to the time waveform
  - What is the time waveform?
  - How does it change with higher and lower frequency
  - What is frequency and period?
  - How does it change with amplitude
  - What are rms, peak and peak-peak?
  - What happens when the vibration includes multiple frequencies and amplitudes?
- An introduction to the spectrum
  - What is the spectrum, and what does “FFT” mean
  - How can a spectrum be used to separate each source of vibration into a graph that highlights the different frequencies of vibration

- An introduction to forcing frequencies
  - Using units of orders instead of Hz or CPM.
  - Calculating forcing frequencies
  - Identifying shaft speed
  - Blade and vane passing frequencies, bearing frequencies, gear mesh frequencies, and more
  - Gear and belt driven machines (multiple shafts with different turning speeds)
- Explaining the different vibration units
  - What is the difference between acceleration, velocity and displacement?
  - When would you use each type of unit?
  - How to convert between each type of unit?
- A brief introduction to phase
  - What is phase (in-phase, out of phase, phase angle)?
  - Why is it important in vibration analysis?
  - How is it measured with a single-channel analyzer, two-channel analyzer, and strobe?
- The importance of selecting the correct Fmax and lines of resolution?
- Spectral averaging
  - What does averaging do, and why is it important?

## Vibration analysis

- The spectrum analysis process
  - Four steps to success
  - The ISO standard
- What is resonance – a quick introduction
  - How does it affect your machines and your measurements
- Diagnosing common fault conditions
  - Unbalance
  - Misalignment
  - Looseness
  - Rolling element bearing wear
  - Common electric motor faults
  - Common pump, fan and compressor faults
  - Common belt drive and gearbox faults

## Data acquisition

- A quick review of data acquisition
- How do we measure vibration?
  - The non-contact eddy current displacement probe
  - The velocity probe
  - The accelerometer
- Where to place the sensor on the machine
- Understanding axial, radial, vertical, and horizontal readings
  - Do you really need to measure in three axes?
  - What does one axis tell you that another will not?
- A quick introduction to mounting the accelerometer and surface preparation
  - Comparing handheld probes, magnetic mounts, and quick connect mounts
  - The 3D animations will highlight the important differences
  - What do you do if you cannot access the desired measurement point?
- Naming conventions
  - Where is position “1” on the machine?
  - What does “MNDE” mean?
- What are “routes” and how do you create them?
  - Downloading, following, and uploading routes
  - Why should you record your field observations when you are in the field (and why should you listen to the vibration during data collection)?
  - Recognizing bad data (and deciding what you should do if you get bad data)

## Setting alarm limits

- The ISO standard for setting alarms
  - How to use them
  - Their limitations
- Band alarms
  - How they can be used to warn you of changes in vibration level
  - How they can aid your analysis process
  - Their limitations
- Envelope alarms
  - How they can be used to warn you of changes in vibration level
  - Their limitations

## Signal processing

- A quick tour of your analyzer
  - Fmax and lines of resolution (LOR)