We have solutions

MIVA® Offline

MIVA® 5100 Vibration checker and Data Collector

VIKON Vibrationskonsult AB

VIKON offers cost-effective solutions for Condition Monitoring and Rotor Balancing on all types of rotating machinery. Our products and Services can be used for Quality Control, Condition Based Maintenance and for Balancing of rigid and flexible shafts.

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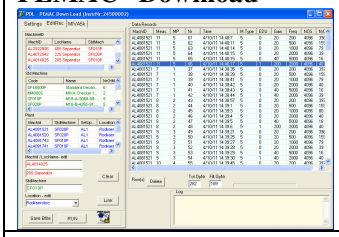
About MIVA® Equipment

Standalone Operation 	**MIVA® 5100** is a hand held vibration instrument and data collector designed for quick and easy check-up of machine condition. The LCD display on the instrument front shows vibration severity and bearing condition values continuously and guides the operator through the data collection. A replaceable 512 MB memory module (MMC) in the instrument can store time series data from a large number of measurements. Data can be downloaded to a PC and analyzed with PEMAC® [1] and ROBAL® [2] Software
Field Casing 	**MIVA® 5100 Field Casing** has room for vibration sensors, speed sensors and cables. It has also room for accessories such as speed sensors and studs for installation of the sensors (see below).
PEMAC® Download 	**PEMAC® Download** is the software used for downloading and analysis of data collected with MIVA® 5100. This software has a special module for downloading data from MIVA® 5100. Evaluation is done with the same PEMAC Software that is used in MIVA® Online, i.e. the VIKON system for online condition monitoring. Hence, what we learn in MIVA® Offline is also applicable to MIVA® Online and vice versa.
Mounting studs 	**Mounting studs** are extremely important when using MIVA® 5100 in a predictive maintenance program. If you do not use adequate studs you may risk many false alarms. Ensure you have the best equipment available. Mounting pads are available for cementing and for screwing onto the machine.
USB-2-RS485 Adapter 	**USB-2-RS485 Adapter** connects the USB port on the PC to the MIVA® Network via a standard LAN cable. Several MIVA® 5100 can be connected to the network. The one closest to the PC is the Master. All others are Slaves. Speed sensors connected to the Master synchronizes data collection with the Slaves thus providing simultaneous data collection and synchronization with one or two independent rotating shafts.

[1] PEMAC® Condition Monitoring software
[2] ROBAL® Rotor Balancing software

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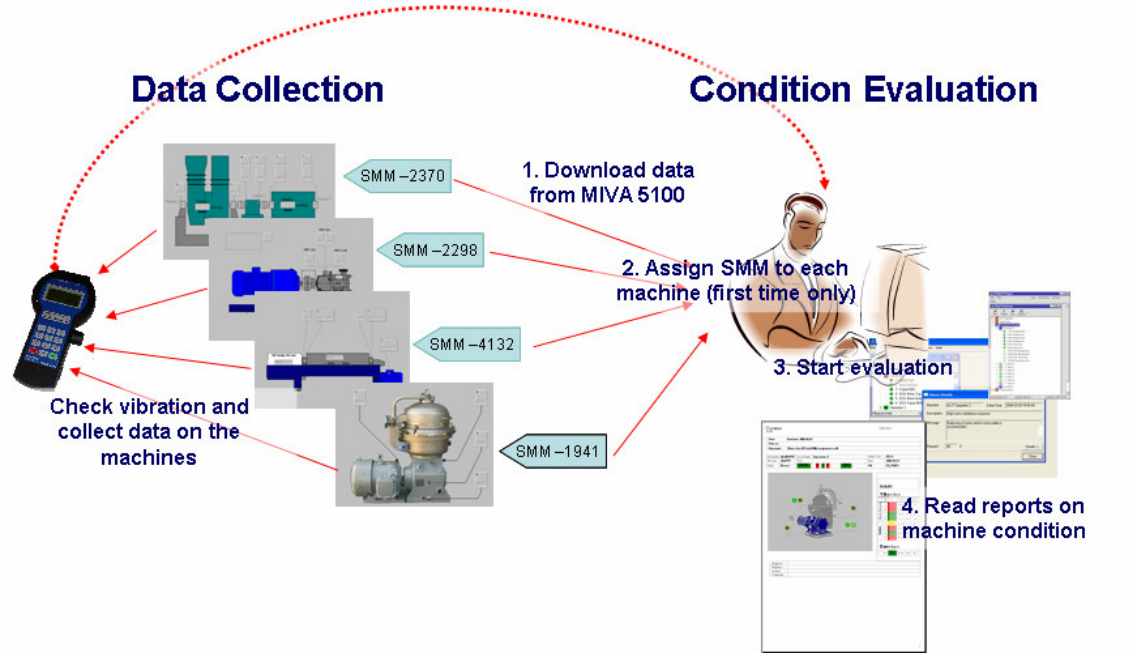
MIVA® Offline

MIVA® Offline is a complete system for machine condition monitoring based on the handheld MIVA® 5100 Data collector and the PEMAC® Condition Monitoring software.
The picture below illustrates how it can be used.



At the machine park

MIVA® 5100 is easy to operate in the standalone mode. Just walk to the machine and follow steps below.

1 Enter number of measuring points
2 Enter machine identity (e.g. serial or tag number)
3 Place sensor on a measuring location
4 Turn knob to select the point from menu
5 Press knob to measure on selected point

Repeat steps 3 – 5 for all points on the machine. Data is stored on a multi-media-card (MMC) and can be analyzed later on.

At the office

Connect MIVA® 5100 to the PC where PEMAC® Download is installed and download data. If it is the first time you download data from a machine you must first register the machine and assign a standard machine module (SMM) to the machine. If the machine has already been registered you may start evaluation right away.

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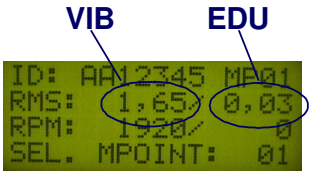
MIVA® 5100 Vibration checker and data collector

MIVA® 5100 is a tool for measuring vibration severity according to ISO Standards and utilizing vibration enveloping technology to identify severity of bearing and other machine problems. It is also a data collector able to store vibration time records from a large number of machines for later analysis. When you start MIVA® 5100 you can choose if you just want to check vibration (monitoring mode) or if you want to collect and store data from defined points on the machine (Standalone mode).

Vibration check

The overall vibration velocity (**VIB**) is a common measurement parameter for determining rotational and structural problems. Enveloping (**EDU**) measures vibration associated with e.g. bearing problems and gear mesh.

Values for **VIB** and **EDU** are continuously displayed on the LCD panel when using the monitoring mode. Just move the sensor to a point of interest, wait until readings are stable and you can read the actual values (see below). The frequency range used for the measurement is programmable. For example, if you want to check vibration according to ISO Standards you must use the 1000 Hz range for VIB.



Data collection

The standalone mode is used for data collection. When you enter this mode you must first specify the number of points on the machine and then enter a unique id number (e.g. the machine serial number). When this is done you can place the sensor on a point, select the corresponding point number and press the measure button to start data collection. Measured values are displayed on the LCD when data collection is complete. You then move to the next point until you have data from all points on the machine. Now you can continue to collect data from other machines at the plant and store it all on the MMC.

Note that when you collect data for condition monitoring it is important that you prepare the measuring locations properly. Use special mounting blocks to avoid measurement errors due to improper fit of the sensor to the machine.

The data memory is a replaceable 512 MB MMC, which can hold complete vibration and enveloping signals for hundreds of measurements. After you have completed all the measurements data is safely stored on the memory card, even when you turn off the MIVA® 5100 or pull out the memory card.

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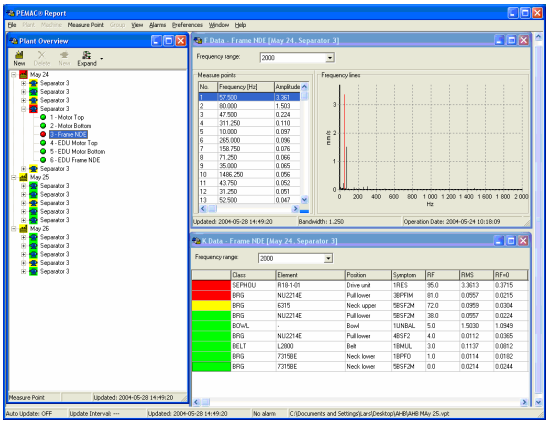
Machine Condition Monitoring

The PEMAC® Download software (PDL) is included in the MIVA® 5100 Offline system. It allows you to download and evaluate data under provision a standard machine module (SMM) has been assigned to each machine.

Standard Machine Module



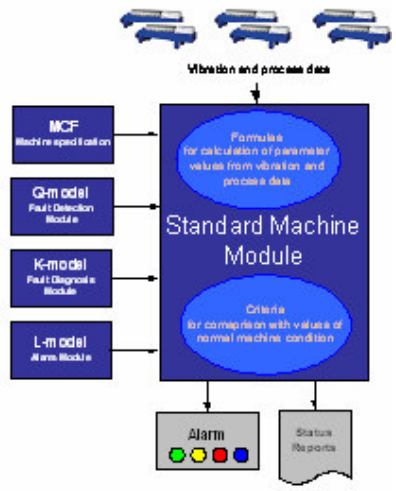
SMM is a software module allowing the MIVA® Offline system to automatically evaluate and diagnose machine condition. SMM can be developed for single machines, for a specific machine design or for a class of machines.

Machine status and status of machine components such as rotating shafts, bearings, gears etc is defined by comparing measured parameter values to the corresponding values of normal machine condition (criteria). The SMM defines both formulas for calculation of parameter values and criteria for a normal machine to compare with.

Machine status is presented in green, yellow, red and blue for quick overview of the severity. Proposed maintenance actions can be presented in clear text.

Green	- Normal
Yellow	- Satisfactory condition
Red	- Unsatisfactory condition
Blue	- Unacceptable condition

Criteria for recognizing a fault can be calculated from monitoring data. As more data becomes available the reliability of alarm and fault source identification will steadily improve. This is the purpose of the SMM. Every single machine using the SMM will benefit from this.



VIKON is offering services for development of SMM. This can be done in the background without interfering with the monitoring program. Data is uploaded and new improved versions of the SMM are downloaded via Internet.

Parameter Values and Data Models

Mathematical and logical models are used by the SMM to define status of the machine and its components.

The Q-model and the K-model are specifically developed for the vibration analysis. The L-model is a logical model combining parameter values from the Q and the K models to identify and diagnose faults. A well tuned SMM can display Clear Text Messages stating severity of a fault, fault type and recommended maintenance actions.

The Q-model is used for analysis of discrepancy in vibration condition of the actual machine and the Standard Machine. Unacceptable discrepancy is interpreted as a change in machine condition and generates an alarm. The result of Q-model analysis is a report stating actual alarm status and highlighting parameter values causing the alarm. Details are shown in a report.

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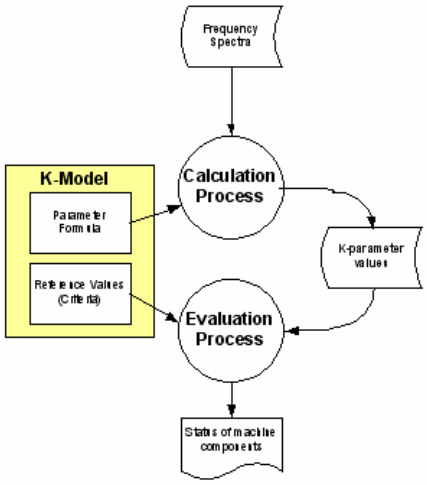
The vibration source and the measured parameter values are related to each other as shown in the following table. Note that V stands for vibration velocity and G for acceleration. Both dimensions are important for reliable fault detection.

Main source	Q-parameter	Comments
Rotating forces	TOTG PERG TOTV[1)] PERV	Monitors the total velocity amplitude (V) and the total acceleration amplitude (G) in a specified frequency range and the parts of them that is caused by periodic vibration. Typical sources are unbalance and gear mesh problems. The value PERV is also measured for the signal envelope EDU.
Shocks	CREST KURT SKEW	Sensitive to transients in the vibration signal. Typical sources are defective bearings, defective gears, looseness etc.
Friction forces	SPI1 SPI2 SPI3 SPI4	Estimates the noise carpet energy in a vibration signal. Typical examples of carpet energy sources are: Defective bearings, rub, poor gear condition, inappropriate lubrication.

[1)] ISO Standards use TOTV (mm/s rms) in the 1000 Hz range to define vibration severity.

Description of the K-model

The K-model is used for identification of symptoms in vibration spectra, which can be related to defective machine components. The difference between symptoms found in the actual machine and corresponding symptoms found in the Standard Machine yields accurate diagnosis of defective machine components.



The model contains formulas for calculation of a large number of K-parameter values. Each parameter describes a pattern in the vibration spectra, which is generated under normal conditions or when a fault has occurred. The spectral power of this pattern is the value of the K-parameter. The K-model also contains reference values (criteria) for each K-parameter value.

The first step in the analysis is to calculate frequency components related to faults defined by the Standard Machine and to match these patterns with the pattern of measured frequency components. The spectral power of matching frequencies is then calculated to define the actual K-parameter value. This value is evaluated with statistical methods to determine discrepancy from the SMM.

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SMM for a Class of machines

When starting a condition monitoring program it is usually not possible to find values of the Q-parameters other than TOTV (velocity rms amplitude) in the 1000 Hz range. VIKON may have SMM for certain machine types and in this case reference values may be defined for all parameters. However, when nothing is known about the machine, except the machine class to which it belongs, it is still possible to get a good reference by using the ISO 2373 standard.

The following shows severity ranges and examples of their applications to different classes of machines according to ISO 2372.

Classes of machines as defined by ISO 2372			
Class I – Individual parts of engines and machines, integrally connected with the complete machine in its normal operating condition. (Production electrical motors of up to 15 kW are typical examples of machines in this category.)	**Class II –** Medium-sized machines (typically, electric motors with 15 to 75 kW output) without special foundations, rigidly mounted engines, or machines on special foundations (up to 300 kW).	**Class III –** Large prime movers and other large machines with rotating masses mounted on rigid and heavy foundations which are relatively stiff in the direction of vibration measurement.	**Class IV –** Large prime movers and other large machines with rotating masses mounted on foundations which are relatively soft in the direction of vibration measurement (for example, turbo-generator sets, especially those with light weight substructures

Vibration Severity mm/s rms	Small Machines	Medium Machines	Large Machines	
	Class I	Class II	Rigid Support Class III	Flexible Support Class IV
0.28				
0.45				
0.71				
1.12				
1.8				
2.8				
4.5				
7.1				
11.2				
18				
28				
45				
71				

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Above diagram shows vibration severity ranges and examples of their applications to different classes of machines according to ISO 2372. Colored areas for unacceptable, unsatisfactory and acceptable vibration are recommendations only. Colours may be interpreted the following way.

Green - Normal condition
Yellow - Satisfactory condition
Red - Unsatisfactory condition
Blue - Unacceptable condition

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