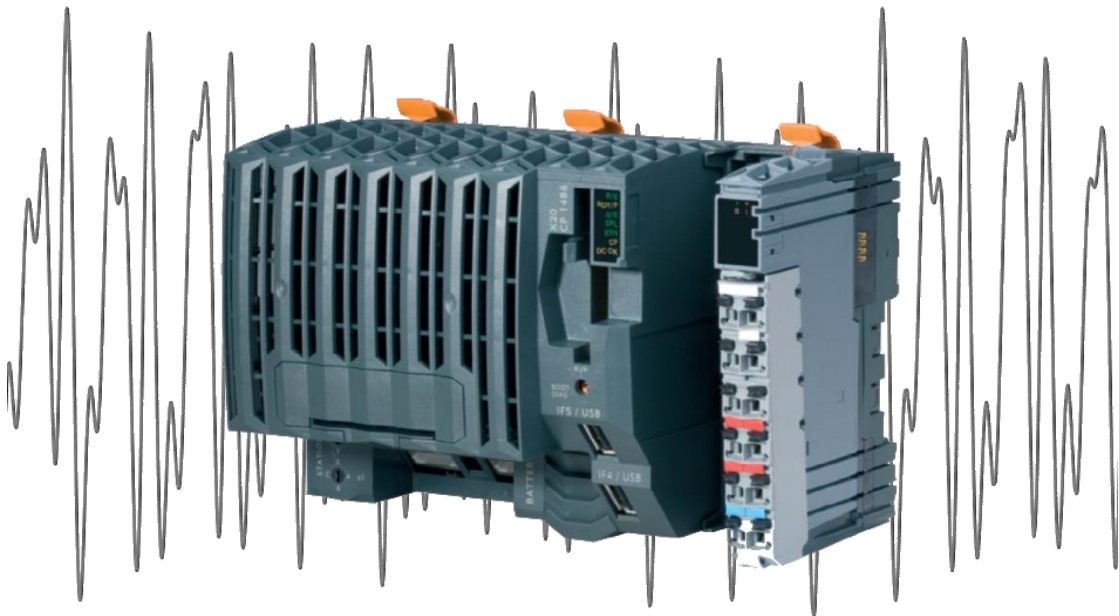# VibroUnit-FFT

## for reliable vibration analyses

**The dream of every vibration diagnostician and every operating engineer is to know the history of vibration characteristic values, i.e. their temporal development! Now this dream has moved within reach:**



**The innovative VibroUnit-FFT condition monitoring module ensures that frequency-selective vibration values are permanently determined, saved and transmitted via bus to the control system or SCADA system in order to facilitate a cost-efficient monitoring and recording of vibration values.**

- The characteristic values determined by the **VibroUnit-FFT** allow targeted monitoring of typical machine faults, both internal and in the downstream control system, such as imbalance, alignment errors, gear tooth errors and bearing damage.

- The characteristic values determined by the **VibroUnit-FFT** help to provide the key information required for a reliable vibration analysis. Without adequate information, even an experienced vibration expert is unable to reach a solid conclusion.

- Thanks to the digital preservation in the control system or SCADA system, the temporal development of the applicable vibration components can be observed and evaluated in correlation with the relevant machine and process data. This enables a fast and reliable diagnosis, often without having to consult an expert!

- Only by monitoring the frequency-selectively determined characteristic values can potential faults be detected in time, which allows scheduling of repair standstills.

## Usual Standard

When it comes to plain bearing mounted turbo machinery, in addition to the bearing points, it is also standard to measure, indicate and monitor, up to 2 MAX limit values, the peak-to-peak value of the shaft vibration with the aid of eddy current sensors. A vibration expert is usually only consulted after the alarm value is exceeded.

Provided that the machine is still operational, the expert compiles frequency spectrums of the individual vibration signals with the aid of a mobile diagnostic device. He then draws conclusions on the probable cause of vibration based on the intensity of the individual frequency components (1x, 2x, 3x and 4x).

Without being able to draw on comparative data relevant to a respective diagnosis, the reliability of the actual diagnosis is not particularly high.

In order to be able to increase the reliability of the vibration diagnoses, a prudent operator ensures that his rotating equipment is checked at regular intervals. Frequency-selective values are determined and saved with the aid of a mobile analyzer.

Predictive maintenance based on permanently determined frequency-selective vibration characteristic values has hardly been put into practice up to now, which is due to higher costs.
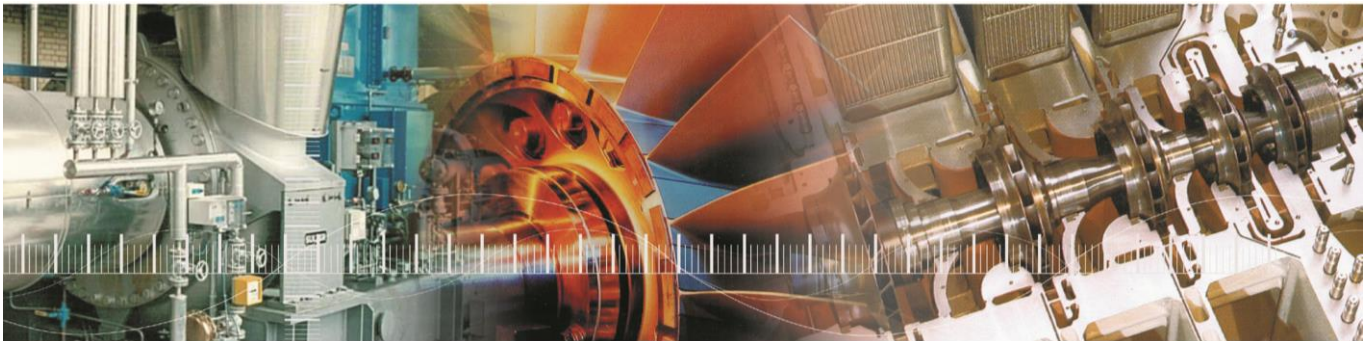


*Every turbo machine vibrates; therefore, monitoring vibrations as a basis for the assessment of machine conditions has become an established practice.*

## The Next Generation of Continuous Condition Monitoring

**VibroUnit-FFT,** the innovative condition monitoring module from **kmo turbo**, breaks new ground by establishing a basis that now makes comprehensive frequency-selective 24/7 online monitoring economically viable.

**VibroUnit-FFT** is installed parallel to an existing vibration measurement system, no matter whether the existing system is a monitor or a transmitter. This is a modular system that can be expanded up to 16 channels.

The raw vibration signals (buffered out) from oscillators, transmitters or monitors are sampled and analyzed. **VibroUnit-FFT** permanently calculates a frequency spectrum and determines characteristic values from up to 8 predefined frequency bands per channel. These characteristic values are entered into an internal ring memory.

The data can be forwarded to the existing control system or SCADA system via Ethernet or Profibus

in order to facilitate indication, monitoring, correlation with the process data and external archiving. This opens up completely new possibilities:

- Up to now, the control system or monitoring system has only monitored the sum signal of the vibration. **VibroUnit-FFT** now also enables individual and intelligent monitoring of frequency-selective characteristic values.

- **VibroUnit-FFT** not only analyzes the rotary frequency components, but also the typical frequencies that develop due to faulty assembly, alignment errors, lubrication or cooling problems, gearing damage, bearing instability, clearance excitation, local rubbing (hot-spot) or due to foundation vibration.

- The development of individual vibration components can, in conjunction with relevant machine data, be analyzed for diagnostic purposes.

## Diagnosis-Relevant Frequencies

Up to 8 frequency bands can be freely defined per channel. When monitoring variable speed rotors, the predefined frequency bands are automatically adjusted to suit the respective speed.

Recommended and factory-set values:

Band 1:   rotary frequency
Band 2:   2x rotary frequency
Band 3:   3x rotary frequency
Band 4:   4x rotary frequency
Band 5:   35-55% of rotary frequency
          (bearing instability)
Band 6:   known resonance frequency ±5%

Examples of further revealing frequencies:

- Frequency of parallel running rotors

- Frequency of the drive motor

- Frequency of the pump drive

- Frequency of adjacent units

- …
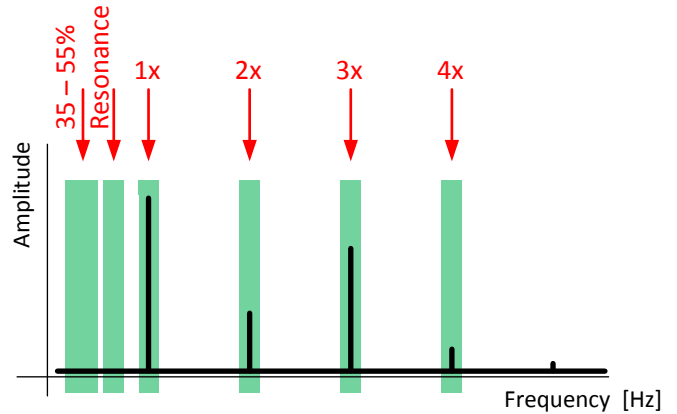


## Installation and Commissioning

Minimal wiring effort required: ICA staff connects a cable from the **VibroUnit-FFT** to the buffered out (raw signal) of the oscillator or the monitor and connects the module via bus with the control system.

The basis configuration is limited to entering a single value, namely the operating speed, via an intuitively operable input mask.
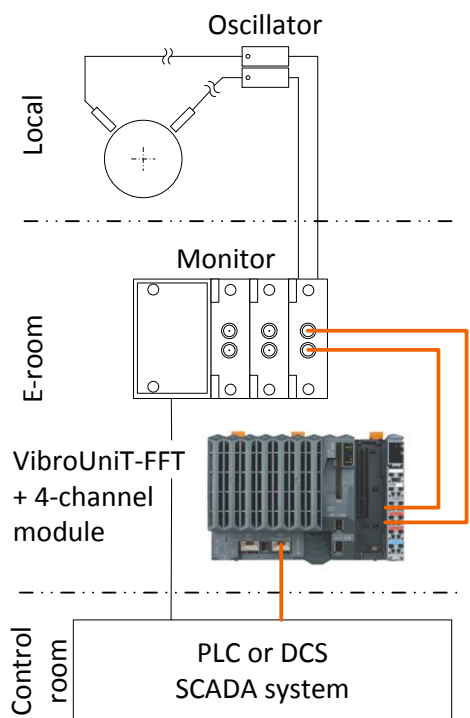


**VibroUnit-FFT** *with 4-channel module*
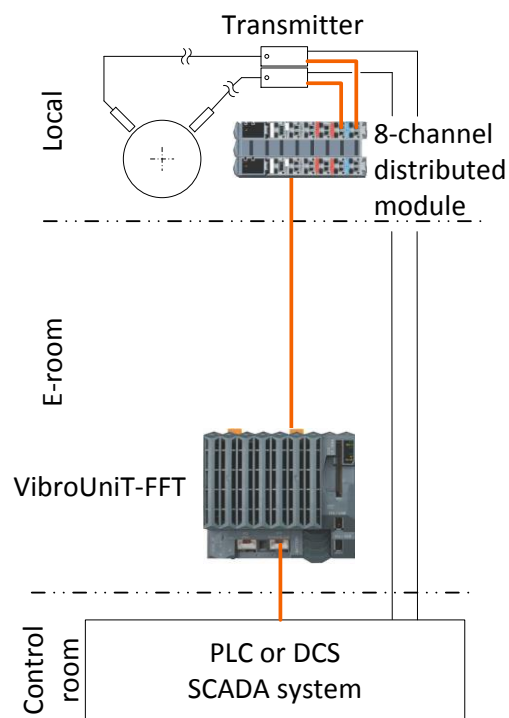


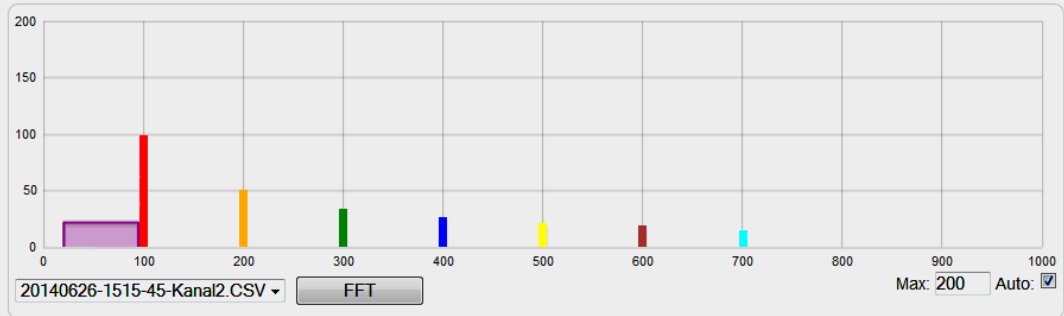**VibroUnit-FFT** *with 8-channel module (remote)*

# VibroUnit FFT

**kmo** turbo

20140626-1515-45-Kanal2.CSV ▾ | FFT

Max: 200 | Auto: ☑

Name: SS Y | Driving Speed: Fest ▾ | Rotation: 6000 rpm

**Band 1** Driving Speed ▾ | Value: 98 µm
Name: 1x
f center: 100 Hz | f width: 4 Hz ☑

**Band 2** 2x ▾ | Value: 49 µm
Name: 2x
f center: 200 Hz | f width: 4 Hz ☑

**Band 3** 3x ▾ | Value: 33 µm
Name: 3x
f center: 300 Hz | f width: 4 Hz ☑

**Band 4** 4x ▾ | Value: 25 µm
Name: 4x
f center: 400 Hz | f width: 4 Hz ☑

**Band 5** Subharmonic ▾ | Value: 22 µm
Name: 20% - 80%
f center: 58 Hz | f width: 75 Hz ☑

**Band 6** free ▾ | Value: 20 µm
Name: 5x
f center: 500 Hz | f width: 4 Hz ☑

**Band 7** free ▾ | Value: 17 µm
Name: 6x
f center: 600 Hz | f width: 4 Hz ☑

**Band 8** free ▾ | Value: 14 µm
Name: 7x
f center: 700 Hz | f width: 4 Hz ☑

Write | Read

*Clearly arranged parameterization and indication*

*14.11*

## Technical data

| | |
|---|---|
| Processor: | Intel Atom |
| Memory: | 2 GB MMC |
| Operating voltage: | 24 V DC |
| Interfaces: | 2 x Ethernet, RS485 (optional), 2 x USB |
| Bus protocols: | Modbus-TCP, Profibus (optional) |
| Configuration: | via web interface |
| Certifications: | CE, cULus, GOST-R |
| Potential isolation: | channel - bus |
| Number of channels: | modular: max. 16 (4 channels per entry card) |
| Definable bands: | 8 per channel, analysis: RMS (route) + peak-to-peak |
| Permissible input signal: | ±10 V AC (buffered out of an eddy current measurement) |
| Sampling frequency: | 51.5625 kHz |
| Frequency range: | 2 kHz |
| Frequency resolution: | 0.63 Hz |
| Customizing: | The module can be expanded upon by adding control and regulating tasks if required. |