FAG

FAG Detector III – The solution for monitoring and balancing

Technical Product Information

SCHAEFFLER GROUP
INDUSTRIAL

Principle · Operation

High functionality – Simple handling

The FAG Detector III is a vibration measuring device, data collector and operational balancing device all in one. Together with the PC software Trendline, the device allows improved planning of maintenance and increased machine availability.
The device is functionally powerful, convenient and very easy to use. It is thus ideal as a first step into the world of offline plant monitoring and offers an excellent price/performance ratio.

Areas of application

Machine vibrations are a good indicator of the condition of a machine. Detector III can be used to monitor machine vibrations according to ISO 10816 and the condition of rolling bearings by means of the demodulation detection method.
The raw and demodulated signals stored in the system can be used later for analysis of signals in relation to time and frequency ranges. Misalignment and imbalance can be reliably detected in addition to rolling bearing damage and gear tooth problems.
As further process parameters, the sensor technology can also record the temperature and speed.

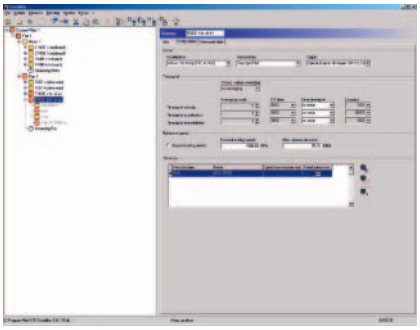
Condition-based maintenance

Condition-based maintenance means: identifying damage at an early stage, defining planned repairs, making optimum use of bearing life, and achieving considerable reductions in costs.
The purchase costs of Detector III can generally be recouped in a very short time.
The device is simple to use and requires no prior knowledge of vibration measurement techniques.
The user can generate individual routes and is then guided systematically from one measurement point to the next. The preplanned “measurement round” can be expanded in situ at any time to include additional measurement points.

Data are measured and stored by simply pressing a key.

Measurement and analysis of machine condition

The FAG Detector III picks up vibration signals at predetermined measurement points and calculates the RMS values for vibration velocity, vibration acceleration and for the demodulation signal.
These characteristic values describe the condition of the machine and component and are presented in greater detail in the table on page 5.
Frequency bands of any width in the range between 0,1 Hz and 20 kHz can be defined and monitored. The FAG Detector III can store up to 1600 measurement points and, in parallel, up to 270 time signals.
After a measurement round, all the recorded data are transferred to the software FAG Trendline for evaluation, analysis and graphic presentation.



With the aid of this software, the user can depict the structure of the machine. Before measurement is carried out, this configuration is then transferred via the RS 232 interface to the FAG Detector III.
The sensor should be positioned as close as possible to the point to be measured. In general, it is attached to the machine by means of the screw-mounted magnetic foot.
On the FAG Detector III, this measurement location is selected in the configuration and measurement is started.

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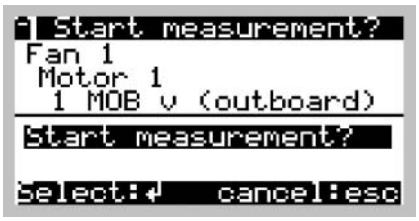
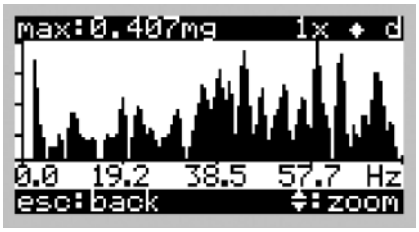
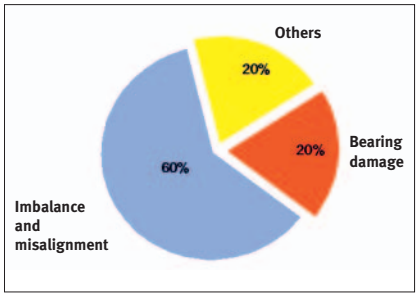




During measurement, the speed should be constant (at least 40 or 600 rpm for ISO 10816).
The device records the sensor signals according to the selected bandwidths and calculates the characteristic values.
For each configuration, the FAG Detector III compares the newly measured characteristic values with the defined limit values for the main alarm for this measurement location. If this threshold value is exceeded, this is displayed immediately on the device.
With the aid of trend analysis, the user can estimate when an alarm will probably occur.
When an alarm is triggered, an alarm report can be automatically generated and printed out. In order to allow comparison of values, they must be recorded under the same conditions. After reference measurement, measurements should be carried out at regular intervals.

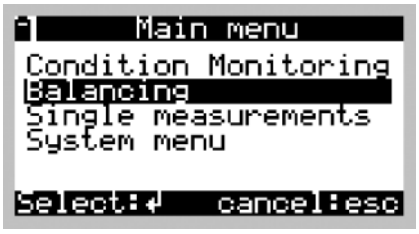
Balancing using Detector III

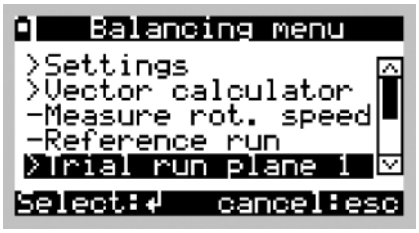
There are many different reasons for unplanned stoppage of machinery. However, a not inconsiderable percentage can be attributed, directly or indirectly, to imbalance or misalignment.

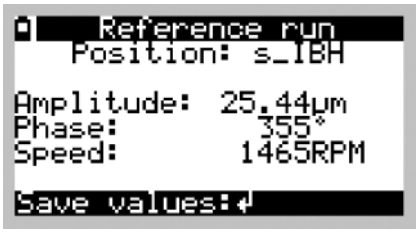


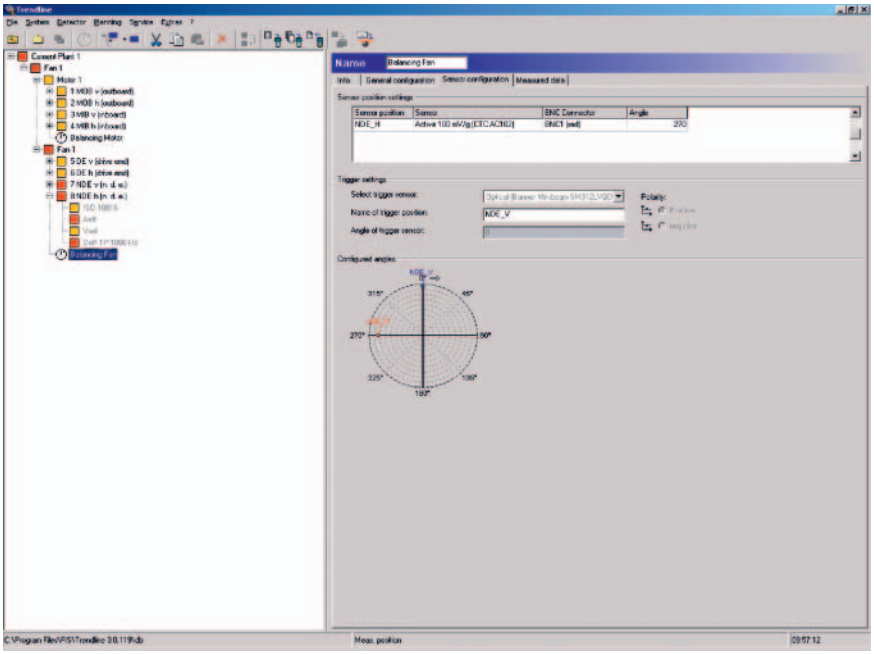
During operation, imbalance can generate considerable vibrations that lead to secondary damage such as premature bearing wear or fatigue fractures.
This results in machine failure and thus unplanned production shutdowns.

The FAG Detector III is a tool that can be used to not only identify but









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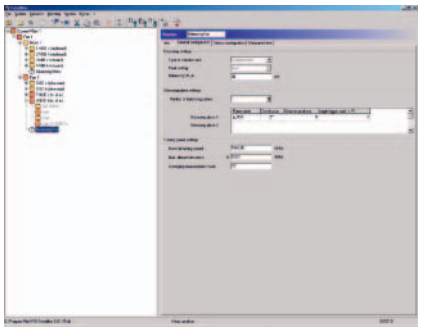
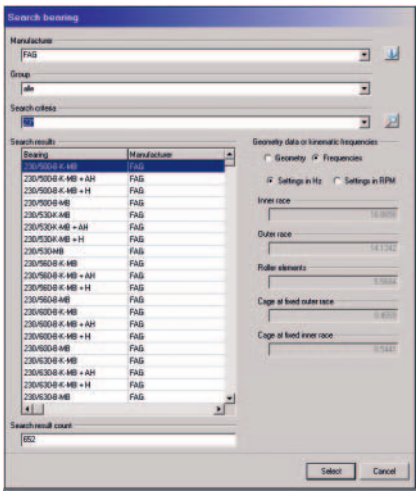
also easily and efficiently eliminate such conditions.
During balancing work, the simple user guide gives effective support. Step by step, the device's software guides the user through the balancing procedure.
The user can generate a configuration for each balancing procedure using the software FAG Trendline. Templates can also be defined that can be adapted in situ to the machine.

The results of the balancing work are transferred to the software FAG Trendline. They can then be displayed in table as well as diagrammatic format.



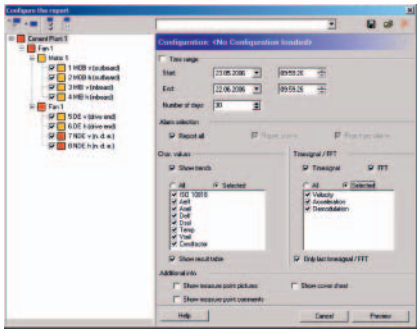
Trendline bearing database

The integrated bearing database (containing approx. 20 000 bearings from various manufacturers) allows considerably simplified and shortened analysis of the measured data. In tandem with the data viewer, the bearing database offers a perfect combination for assessing machine condition. Significant features can be recognised and allocated to the appropriate components at first sight.
Several bearings can be allocated to each measurement point.
This offers the option of checking several bearing defect frequencies efficiently at one measurement point. The bearing database can be expanded individually by each user to include further entries.



Configurable report

A very useful feature of the software, especially for companies using the FAG Detector III in service work, is the expanded report generator. This can be used to prepare a wide range of reports. These can be stored in the software as templates. Specially adapted reports can thus be defined and used when preparing reports for different customers. All the information present in the system can be used for the report, including time signals, trend curves and alarm data.



Features · Ordering designation and scope of delivery

Overview of advantages

- Complete package with excellent price/performance ratio
- Static and dynamic balancing (1 and 2 levels)
- Monitoring functions:
  – ISO 10816
  – general vibration condition
  – rolling bearing condition
  – data collector for up to 1 600 measurement points
  – storage of up to 300 time signals
- Portable, handy, easy to use diagnostic device
- Integrated database with approx. 20 000 entries
- Operation with one hand using 21 keys
- Soft keyboard resistant to dust and spray water
- Headset jack for acoustic noise assessment
- Storage and display of up to 4 measurement values per measurement point for straight-forward condition assessment
- Configurable report generator
- e-mail service
- PC trend/graphics software with database for WIN 2000/XP
- Sensor cable length up to 50 m

Ordering designation and scope of delivery

Ordering designation:
DETECT3-KIT
or
DETECT3.BALANCE-KIT

Scope of delivery:
DETECT3-KIT

- Basic device with rechargeable battery
- Acceleration pickup with magnetic foot
- Temperature sensor
- Battery charger
- PC data cable (serial/USB)
- User manual
- Protective bag with holder for temperature sensor
- PC software Trendline
- Case

DETECT3.BALANCE-KIT

- Acceleration sensor with magnetic foot and sensor cable
- Trigger sensor (optical and inductive)
- Balance
- Magnetic holder for trigger sensor
- Extension for magnetic holder
- Cable for trigger sensor (length 10 m)
- Reflex mark for trigger sensor
- Dongle for activation of balancing function
- Case

Accessories

- Sensor extension cables for lengths of 5 m and 15 m are available on request

Selection of characteristic values

Selection of characteristic values

Possible characteristic values and signal curves for each measurement point	Measurement range/resolution	Frequency range	Display
Characteristic value: vibration velocity to ISO 10816 (VDI 2056) (broadband RMS value for vibration rate) for general assessment of machine condition to ISO 10816	**ISO 10816** 0 to 5,52 m/s[3] at 10 Hz 0 to 55,2 mm/s[3] at 1 kHz	10 Hz to 1 kHz	Detector and PC
Characteristic value: vibration velocity (freely selectable) (RMS value for vibration velocity, e.g. for detection of imbalance and misalignment)	$\mathbf{V_{sel}}$ 0 to 5,52 m/s[3] at 10 Hz 0 to 55,2 mm/s[3] at 1 kHz	Freely selectable up to set TP[1] (max. 20 kHz)	Detector and PC
Characteristic value: acceleration (broadband RMS value for vibration acceleration, e.g. for monitoring of gearboxes)	$\mathbf{A_{eff}}$ 0 to 37 g[3]	2 kHz – up to set TP[1] (max. 20 kHz)	Detector and PC
Characteristic value: acceleration (freely selectable) (e.g. for selective gear tooth monitoring)	$\mathbf{A_{sel}}$ 0 to 37 g[3]	Freely selectable up to set TP[1] (max. 20 kHz)	Detector and PC
Characteristic value: demodulated signal (RMS value of demodulated signal up to 100/1 000 Hz, e.g. for monitoring of rolling bearing condition)	$\mathbf{D_{eff}}$ 0 to 37 g[3]	Freely selectable up to set TP[1] (max. 20 kHz)	Detector and PC
Characteristic value: demodulated signal (freely selectable) (e.g. for selective monitoring of rolling bearing condition)	$\mathbf{D_{sel}}$ 0 to 37 g[3]	Freely selectable up to set TP[1] (max. 20 kHz)	Detector and PC
Time signal of vibration acceleration up to low-pass cut-off frequency, 4 096 or 8 192 values	±50 g[3]	0,1 Hz to 20 kHz[2]	PC
Demodulated time signal up to set low-pass cut-off frequency, 4 096 or 8 192 values	±50 g[3]	0,1 Hz to 20 kHz[2]	PC
Frequency spectrum (Fourier transform) of time signal for vibration velocity up to set low-pass cut-off frequency	±5,52 m/s[3], resolution: TP · 2,56 / number of values[4] (0,0625 Hz to 12,5 Hz)	0,3 Hz to 20 kHz[2]	PC
Frequency spectrum (Fourier transform) of time signal for vibration velocity up to set low-pass cut-off frequency	±50 g[3], resolution: TP · 2,56 / number of values[4] (0,0625 Hz to 12,5 Hz)	0,1 Hz to 20 kHz[2]	PC
Frequency spectrum (Fourier transform) of time signal for demodulated signal or up to set low-pass cut-off frequency	±25 g[3], resolution: TP · 2,56/ number of values[4] (0,0625 Hz to 12,5 Hz)	0,1 Hz to 20 kHz[2]	PC
Measurement point temperature	**Temp** = –20 °C to +550 °C	–	Detector and PC
Crest factor	–	Calculation from time signal for acceleration (up to TP)	Detector and PC
Speed	30 to 10 000 rpm	0,5 Hz to 166 Hz	Detector and PC

[1] TP = low-pass cut-off frequency (200, 500 Hz, 1, 2, 5, 10, 20 kHz)
[2] Lower limit frequency as a function of set low-pass cut-off frequency (lower limit frequency = TP/number of lines · 2,56)
[3] 100 mV/g sensor
[4] Number of values: 4 096 (with 1 600 FFT lines) or 8 192 (with 3 200 FFT lines)

On the PC, the user can specify for each measurement point whether and under what conditions certain time signals are to be stored. Three different time signals can be measured, namely vibration velocity (0,1 Hz to TP, scan rate = 2,56 · TP) vibration acceleration (0,1 Hz to TP, scan rate = 2,56 · TP) and demodulated signal (0 Hz to TP , scan rate = 2,56 · TP).
Detector III can store up to 300 time signals.

Technical data

Device designation	FAG DETECTOR III, DETECT3-KIT
Inputs	2 × BNC jacks (multiplexer) ICP (4,7 mA), steplessly adjustable sensitivity AC/DC ±5V, impedance >100 kΩ 1 × AUX Tachometer input 5 to 24V, <60 000 rpm (rising or falling flank selectable) IR temperature sensor ±5V, impedance >100 kΩ (freely configurable) Battery charger
Outputs	Headset (demodulated signal) RS 232 for data transmission (38,4 kb/s, 57,6 kb/s) AUX: supply for trigger sensor (5 V max. 200 mA, 12 V max. 50 mA)

Vibration measurement

Measurement ranges	Acceleration/vibration velocity 0,1 Hz to TP 0,1 Hz to 200 Hz; 0,1 Hz to 500 Hz; ... Demodulated signal 0 Hz to TP Low-pass cut-off frequencies 200 Hz, 500 Hz, 1 kHz, 2 kHz, 5 kHz, 10 kHz, 20 kHz High-pass (demodulated signal branch) 750 Hz Temperature –20 °C to +550 °C (temperature range as a function of sensor used, freely configurable input)
Characteristic values	A_{eff} (2 kHz to TP), RMS value for vibration acceleration A_{sel} RMS value for vibration acceleration in freely definable frequency range ISO 10816 (10 Hz to 1 kHz), RMS value for vibration velocity V_{sel} RMS value for vibration velocity in freely definable frequency range (frequency band as a function of TP) D_{eff} RMS value for demodulated signal D_{sel} RMS value for demodulated signal in freely definable frequency range: crest factor, speed, temperature
Window function	Hanning
Averaging in frequency range	1–9 (FFT, characteristic values per channel) Linear
Scan rate	max. 51,2 kHz, as a function of TP
A/D converter	16 bit (autoranging) Dynamic range >90 db
Frequency resolution	1 600, 3 200 lines (0,0625 Hz to 12,5 Hz as a function of set TP)

Technical data

Balancing	
	1 or 2 plane balancing Weight positions: Continuous (0 to 359°) or discrete (4 to 99 positions) Removal of weights: yes/no
Balancing measurement type	Acceleration, velocity, travel
Measurement	Peak, peak – peak, RMS
Balance units	g, mm/s, inch/s, µm, mil
Weight units	gr., oz. (up to 99 999,99 gr. or oz.)

General	
Separate measurements	Temperature, speed, headset (demodulated signal)
Keyboard	Soft keyboard with 21 keys
Display	Illuminated graphic display (LCD), 128 × 64 pixels, dimensions 55 mm × 33 mm
Memory	1 600 measurement points plus 270 time signals (maximum 300 time signals)
Power supply	NiMh 2 000 mAh Voltage 6V
Dimensions and mass	230 × 70(53) × 45 (53) mm (L × B × H) approx. 500g (including battery)
Temperature range	0 °C to 50 °C (working temperature) –20 °C to +70 °C (transport and storage temperature)
Operating time	approx. 6 to 8 hours continuous operation (charging time of fully discharged battery approx. 4 hours)
Housing	ABS IP 40
Case	2 compartments, black Nylon, 2 clear film windows, openings with Velcro fastenings, Velcro strip holders for cable and sensor, carry strap
EMC standards	– EN61000-4-2 – EN61000-4-3 – EN61000-4-6
Firmware	Free of charge firmware updates on Internet Available languages: German, English, Finnish, French, Italian, Dutch, Portuguese, Swedish, Slovenian, Spanish and Turkish

Technical data

Software	FAG Trendline (updates on Internet) Suitable for Windows 2000/XP Available in: German, English, French, Portuguese and Spanish – configuration of FAG Detector III via RS 232 interface – bearing database of approx. 20 000 bearings – graphic presentation of measurement values and curve – trend analysis – presentation of time signals and FFT – display of balancing in tabular and diagrammatic format – configurable report generator

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