FAG

FAG ProCheck
State of the art machine monitoring for maximum availability

SCHAEFFLER GROUP
INDUSTRIAL

Advantages · Areas of application

FAG ProCheck

The prevention of unplanned downtime, thereby increasing the availability of machine, represents an increasingly important challenge in the field of maintenance. At the same time, components should be replaced not on a preventive basis but only when a malfunction occurs. In this way, the service life can be used to its optimum and cost savings can be achieved.
Modern systems for condition and process monitoring are able to master this mixture of requirements. FAG ProCheck is a new type of online system that has been developed specially for vibration monitoring and quality assurance. Due to its high functionality and versatility, it can be used to monitor plant and components in all conceivable industry segments.

Advantages of FAG ProCheck

- Early detection and prevention of malfunctions
- Multi-channel measurements and corresponding analyses
- Compact and robust construction (the hardware is developed by National Instruments)
- ATEX certification for use in widely varying industrial sectors
- Intelligent algorithms for analysis of measurement data
- Versatile communication interfaces and connection options
- High reliability and security through use of Flash Disk data storage
- Combination of various monitoring parameters for increased reliability
- Base platform for future expansion

Areas of application

FAG ProCheck was developed for the monitoring of rotating components and can be used in almost all industry segments, such as

- paper
- steel and aluminium
- raw material extraction and processing
- energy production
- oil and gas

This spectrum ranges from applications in which a particularly robust system is required through to use in explosion risk areas.

FAG ProCheck

Gearbox monitoring on a hot rolling line

Online monitoring · Modularity and flexibility

Online monitoring and diagnosis

FAG ProCheck is an intelligent online monitoring system that can operate automatically – without further intervention by the user – to measure, record, analyse and issue alerts on data. Through continuous monitoring, changes in the behaviour of the monitored plant are detected in good time.

The data recorded by the sensor equipment are subjected to initial assessment by FAG ProCheck. If defined alarm thresholds are exceeded, alert warnings are automatically generated and transferred by the system to selected interfaces where they are subjected to further processing.
FAG ProCheck can be configured and adapted either by the customer or by FAG Industrial Services (F'IS). Intelligent algorithms process the data to extract the necessary information on the condition of the machine as an initial aid to the user. This initial assessment is independent of connection to the server PC holding the configuration and analysis software. Due to the networking capability, several FAG ProCheck systems can be combined. All the systems in a network can thus operate independently of a server connection and store their data on a memory device within the instrument (Flash Disk). Depending on the system configuration, these data can be held locally for a period of up to several weeks.

Modularity and flexibility

FAG ProCheck is suitable for the checking of individual machines as well as complete plant. Depending on the variant, the FAG ProCheck has up to 16 sensor channels. By means of additional digital and/or analogue inputs, a wide range of process information can be recorded and evaluated. The user can start his monitoring setup with a minimal installation and expand it at a later stage.
All the FAG ProCheck systems in a network can be managed using a central database. This allows central access to all data.

Various monitoring modules (analogue/digital)

Analysis methods

Analysis methods

In order to obtain authoritative information from the recorded data, FAG ProCheck uses proven analysis methods.
Broadband parameter monitoring is used to detect changes in the overall vibration behaviour of plant at an early stage, together with selective frequency monitoring. With the aid of selective frequency monitoring, changes in the individual components of a machine can be detected and analysed. These changes can be diagnosed and allocated at an early stage on the basis of characteristic patterns in the corresponding signals. The use of the demodulated signal spectrum is of decisive importance here. With the aid of this signal, shock pulses caused by gearbox or rolling bearing problems can be detected and analysed at an early stage.

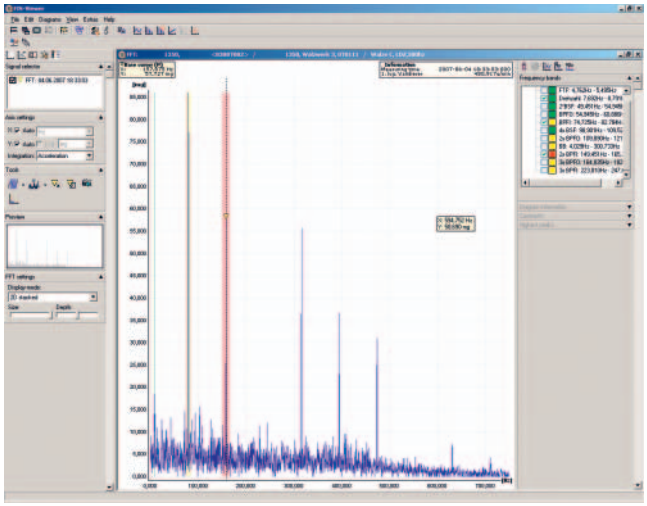
In time-based broadband monitoring, the following parameters are calculated from the original signal:
- RMS
- crest factor
- peak value
- peak-to-peak
- DC value

In selective frequency monitoring, the following parameters are used for analysis:
- ISO 10816
- RMS, broadband or selective
- bearing diagnostic value (LDZ), broadband or selective

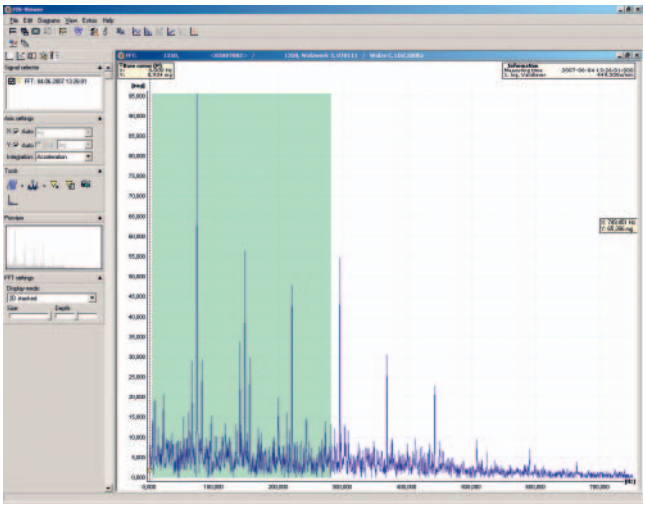
In addition to recording vibration signals, it is also possible to record other process information such as
- temperature
- pressure
- load
- speed
- torque
- oil status/oil quality

and correlate these with the vibration signals.

This correlation allows more authoritative statements to be made on the condition of the machine.



F'IS Viewer: Selective frequency monitoring



F'IS Viewer: Broadband monitoring

Communication · Software

Communication with a higher level system

For communication with a higher level system, various inputs and outputs are available.
Additional signals can be received via digital or analogue inputs and used for triggering or validation of measurements. These signals can thus be used as command variables for dependent signal analysis such as alarm threshold control. These signals can also be used to initiate time-controlled or event-controlled measurement tasks and thus control automation of data logging in certain applications.
On the other hand, information such as alarm status can be transferred to the higher level system and held there for further processing.

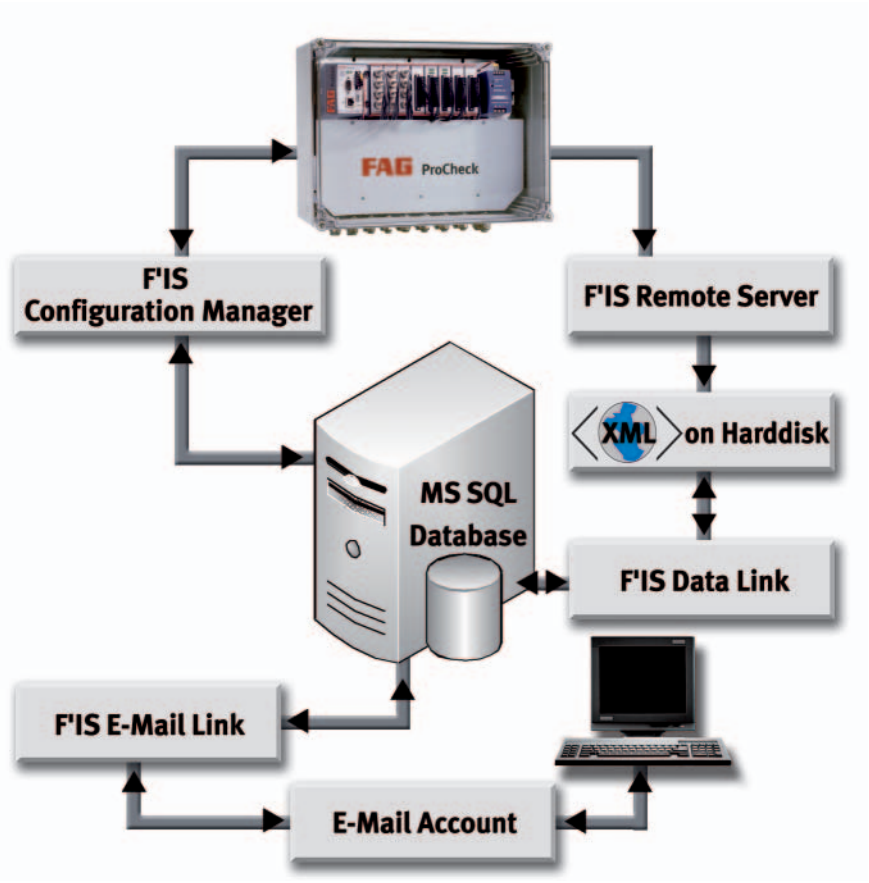
Communication with FAG ProCheck can be carried out via the following channels:

- network (TCP/IP)
- serial
- modem

Software

Successful vibration monitoring of the plant is dependent to a large extent on the software. In addition to simple configuration and use of the software, the various data presentation and analysis options are of decisive importance. In order to fulfil this requirement as well as possible, the software F'IS Administrator for FAG ProCheck is divided into the following components:

- F'IS Configuration Manager
- F'IS Remote Server
- F'IS Data Link
- F'IS E-Mail Link



Date processing and exchange

Software · Functionality

F'IS Configuration Manager

The module is used to configure FAG ProCheck. The following settings are made:

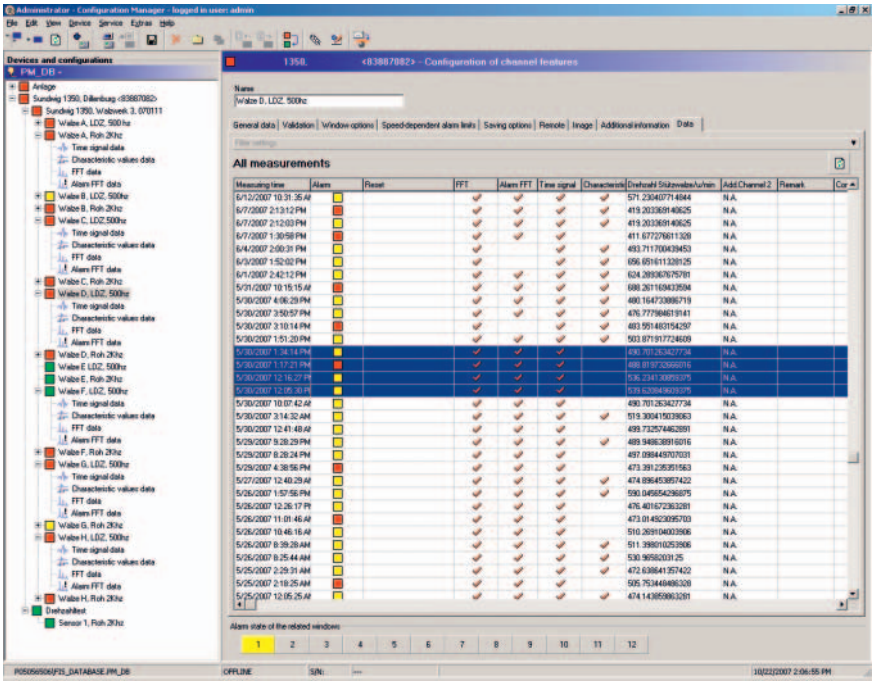
- allocation of physically connected sensors to particular monitoring configurations
- allocation of additional channels (inputs/outputs) to existing configurations
- definition of the frequency bands to be monitored
- definition of the necessary alarm thresholds

F'IS Configuration Manager is the central point for managing the administration of the monitoring systems and database as well as user administration. It can be used to issue a wide variety of access rights in FAG ProCheck.
Furthermore, F'IS Configuration Manager also provides the alarm list for FAG ProCheck in which all status changes such as the sending or modification of configurations are recorded.

The F'IS Viewer is a central visualisation tool that can present the data in diagrammatic form.
In order to offer the user optimum support in viewing and evaluating the data, various analysis methods are used. In addition, the user is supported when using the F'IS Viewer by a large number of cursor and zoom functions such as differential, harmonic, side band cursors etc.

• Trend analysis

Trend analysis is a simple and reliable method for assessing changes in the vibration behaviour of machine. The trends can be based on parameters in broadband monitoring as well as on narrowband parameters of individual components such as a rolling bearing outer ring or a gear tooth set. For example, monitoring of an outer ring may be carried out by bringing together several narrowband frequency bands for overrolling frequency and the harmonics to form one parameter.
Incipient damage or a forthcoming problem becomes apparent in an increase in the trend values for a monitored component or machine.



F'IS Configuration Manager: Alarm list

Software · Functionality

Since the information is obtained at an early stage, the user still has sufficient time to react.

• FFT analysis

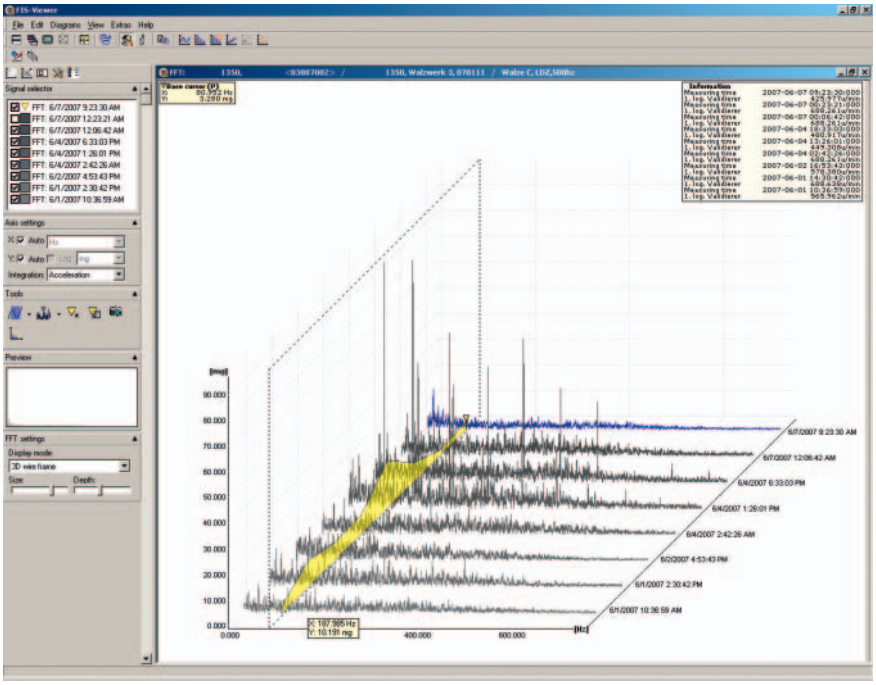
FFT analysis subdivides the recorded signals into their individual frequency portions. It is thus possible to monitor the amplitudes of individual frequencies within narrow bands for specified limit values and trigger an alarm if limit values are exceeded. This subdivision into frequency portions allows very reliable assessment of machine condition. It is possible to precisely allocate the frequencies to particular components such as bearing rings, gear teeth or to phenomena such as misalignment, imbalance etc.

• Waterfall diagram and sonogram

These two presentation methods allow transparent visualisation of time-based spectral changes in the vibration behaviour.
The waterfall diagram is a presentation method in which the individual FFTs are presented behind each other “spatially” to give a three-dimensional image. In the sonogram, the development of the spectrum over time is presented by means of colour.
This gives the user a rapid and simple graphic overview of the development over time of the various frequency portions of the vibration. As a result, the analyses are easily understood even by non-experts in vibration monitoring.

F’IS Remote Server/F’IS Data Link/ F’IS E-Mail Link

F’IS Remote Server is used to transfer data from FAG ProCheck to the software F’IS Administrator. This software module offers the option of transmitting data on a time-controlled or event-controlled basis. The user can select which measurement values (time signals, frequency spectra or trend values) are transferred from FAG ProCheck and stored in the appropriate database by means of F’IS Data Link. This functionality ensures seamless data storage.
In order to provide FAG ProCheck data held in the database to other people, the F’IS E-Mail Link functionality is available. This allows automatic data export by e-mail to be defined. The data can be sent to any number of mailboxes required. At the recipient’s end, all incoming e-mails are checked and, if these contain measurement data, they are automatically transferred to the appropriate database.
For viewing or analysis of data, the modules F’IS E-Mail Link and F’IS Configuration Manager must be installed on the computer.
In its base version, F’IS Administrator is supplied with the freely available SQL Server from Microsoft®. This is limited to a storage capacity of 2 GB and eight parallel users.
With an upgrade to the paid-for SQL Server, these restrictions no longer apply.



F’IS Viewer: Waterfall diagram

Versions and ordering designations

FAG ProCheck versions and ordering designations

	PRO-CHECK-8CH*	PRO-CHECK-8CHEXP**	PRO-CHECK-12CH***	PRO-CHECK-16CH****
IEPE channels	8[1)]	8[1)]	12[1)]	16[1)2)]
Analogue inputs	8	8	8	6
Analogue current outputs	8	4	8	–
Digital outputs	16	–	16	16
Relay outputs	–	4	–	–

[1)] Measurement range: ± 5 V
[2)] Multiplexer

Ordering designations for countries outside Europe:

*	**FIS.PROCHECK.8CH**
**	**FIS.PROCHECK.8CH.EXP**
***	**FIS.PROCHECK.12CH**
****	**FIS.PROCHECK.16CH**

Technical data

Vibration inputs	
Sensor channels	8 channels, 12 channels, 16 channels with multiplexer
Parallel measurement	4 channels rather 2 channels for mulitplexed systems
Sensors	IEPE acceleration sensors
Measurement range	± 5 V
Sensor power supply	2/4 mA (direct/multiplexer) at 24 V

Analogue measurements	
Characteristic values	Time signal, spectrum, demodulated signal, acceleration (RMS), velocity (RMS), displacement (RMS)
Parameters in time range	RMS, peak, peak-to-peak, crest factor, DC value
Parameters in frequency range	ISO 10816, bearing diagnosis value LDZ (broadband/selective), RMS (broadband/selective)

Signal processing	
Lines	max. 25 600
Low passes	5, 10, 20, 50, 100, 200, 500 Hz / 1, 2, 5, 10, 20 kHz
Sampling rate	50 kHz
Dynamics/resolution	120 dB / 24 Bit
FFT averaging	RMS, peak hold
High passes	250, 750, 2 000 Hz

Inputs (analogue or digital)	
Input range	± 10 V
Resolution	12 Bit
Quantity	max. 8
Sampling rate	analogue 50 Hz – 10 kHz, digital 50 kHz

Technical data

Outputs	
Relay outputs	max. 8, sink/source, 60 VDC/250 VAC, 750 mA
Switching outputs	max. 16, 6 V – 30 V, source, 750 mA (24 V)
Current outputs	max. 8, 16 Bit, 0 mA – 20 mA or 4 mA – 20 mA
Memory	
RAM	64 MB
Memory	512 MB (Flash Disk)
Interfaces	
	RS 232 (max. data rate 115 KBit/s)
	Ethernet 10/100 MBit/s (IEEE 802.3)
ATEX approval	
	EEx nC IIC T4, VL Class I, Division 2 (only for National Instruments hardware)
Other information	
Dimensions with housing	400 × 300 × 190 (W×H×D)
Mass	7,5 kg
Protection class	IP 65 (in housing), IP 40 (only for National Instruments hardware)
Operating temperature	–40 °C to +70 °C (only for National Instruments hardware)
Voltage power supply, power consumption	9 V to 35 V, 17 W (only for National Instruments hardware) 18 V to 30 V, max. 48 W (in housing) 115 V to 230 V, max. 50 W (with power pack)
Software	F'IS Administrator (updates on Internet) Compatible with Windows XP Available in: German, English

National Instruments is a trademark of National Instruments.

Everything from a single source – Customised monitoring solutions for everyone

Everything from a single source – Customised monitoring solutions for everyone

FAG Industrial Services (F'IS) is a full service supplier in the field of condition-based maintenance. With the sourcing of high quality FAG products, the customer thus gains access to a range of product-related services (see diagram).
Based on many years' experience, F'IS knows that customers wishing to change to the concept of continuous condition monitoring have differing needs and requirements. Therefore, F'IS has a comprehensive portfolio of products and services containing both standard and customer-specific solutions that are always developed in close partnership with the customer.
The F'IS service portfolio for continuous condition monitoring covers the following areas:

- consultancy
- installation
- initial operation
- system support
- continuous and regular measurement

The customer decides, which of the available services he wishes to use. For example, he can choose whether to have complete monitoring of his plant by F'IS or to have his employees qualified for independent monitoring at their own responsibility through training. Whichever service is selected, the team of F'IS experts is available at any time. If you have any further questions on our services, please contact us direct or visit our website.

Services for FAG ProCheck

Notes

Notes

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