ENGINEERING MEASUREMENT SYSTEMS FLEET MANAGEMENT ENERGY

VISPIRON HIGH ENGINEERING

MEASUREMENT SYSTEMS

ROTEC
SINGLE FLANK TESTING

The quality of a power train – and thus that of a gearbox – is more and more dependent on the noise emitted by the package. Hence testing methods such as noise or single flank testing gain in importance. The traditional single flank testing, per definition done at low revolutions (approx. 20 rpm) and with a small load, is considered a useful tool for judging a gear‘s quality. Biggest advantage of this testing method is its numerical comparability throughout the world, as all results are non-dependent on any external factors.

SINGLE FLANK TESTING

The ideal case is for a pair of gears to uniformly transmit the circular motion. The working variation is the difference in position between where a tooth should be and where it actually is due to the probable lack of quality.

MEASUREMENT OF WORKING VARIATION

Usually two high-resolution incremental encoders are fitted to the axles of the two gears to be tested. The ROTEC system measures the intervals between the encoders‘ lines on both gear and drive. Optaining the angular position of pinion and gear, the working variation can be determined. A high resolution is ensured by the measurement system‘s fast clock for all data acquisition channels. Evaluating every single line given by the encoder allows for exact reproduction of the meshing.

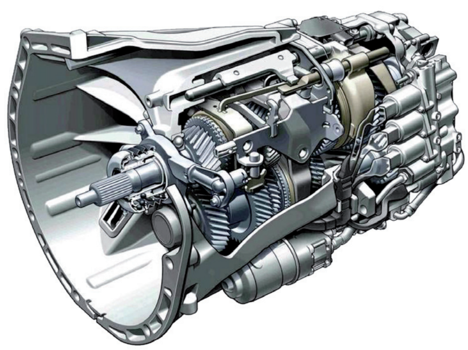
Calculating the angular deviation between the two encoders results in a curve for the total error (single flank deviation). Not only does it show the meshing, the excentricity of the shafts can also be seen. Distinguishing is possible between a short wave component repeating once per tooth and a long wave component showing once per revolution. The first of the two is caused by variation of the tooth geometry (crowning, etc...) and by an irregular tooth surface whereas the latter results from a varying concentricity of the two shafts. Additional non-tooth-dependent factors, a borehole for example, might also be of importance. Data should ideally be recorded for at least one complete over-rolling of the two wheels. With the help of averaging routines, the ROTEC software can differentiate between pinion and gear. The long wave portion of the total error curve is isolated using a low pass filter with a cut-off order set at 1/3 of the tooth mesh. Subtracting this new curve from the original one leaves behind the short wave component.

RELATED VALUES

Apart from analysing the working variation, the ROTEC system can also acquire and calculate values such as angular acceleration of gear and pinion, structure-borne noise of the bearings or the emitted airborne sound. Synchronous acquisition of all channels is guaranteed. Since order analysis of all data is possible, accurate correlation between, for example, noise levels and tooth meshing may be made.

DIN CHARACTERISTIC VALUES

- F‘i total error
- f‘l long wave component
- f‘k short wave component
- f‘max maximum value of tooth-to-tooth error
- f‘mit average value of tooth-to-tooth error



VISPIRON ROTEC GmbH
Frankfurter Ring 224 • D-80807 München • ✆ +49 (0)89 / 323 651 0 • 🖷 +49 (0)89 / 323 651 56 • vispiron.de • rotec@vispiron.de

ENGINEERING MEASUREMENT SYSTEMS FLEET MANAGEMENT ENERGY

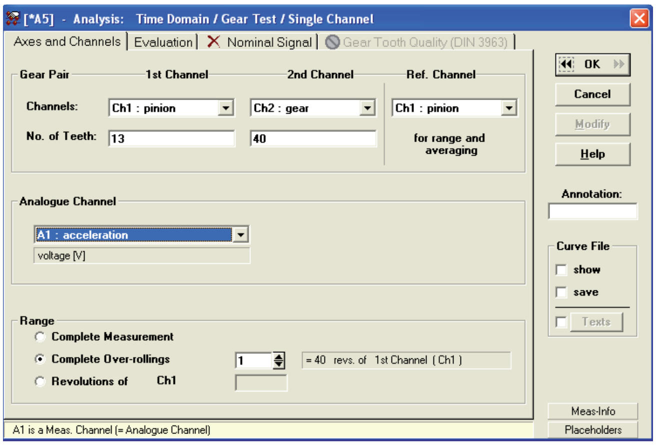
VISPIRON HIGH ENGINEERING

MEASUREMENT SYSTEMS

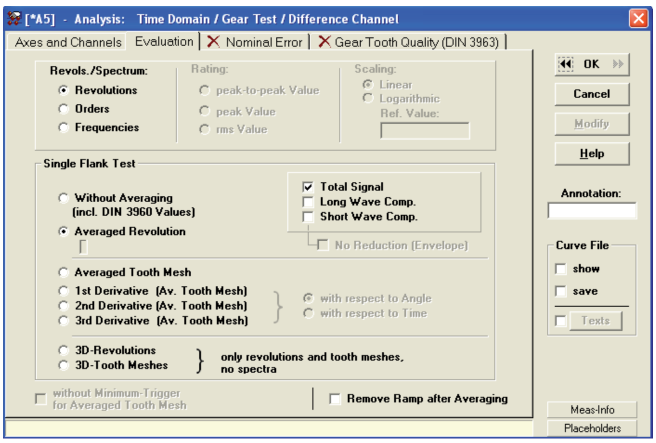
ROTEC SINGLE FLANK TESTING

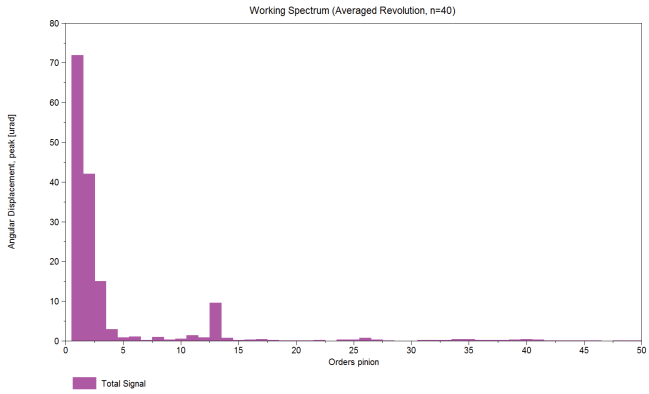
APPLICATION EXAMPLE – BEVEL GEARS

pinion / gear:	13 / 40 teeth
rotational direction:	drive
load:	20 Nm
drive shaft speed:	60 Upm
rotary encoders:	18.000 lines each

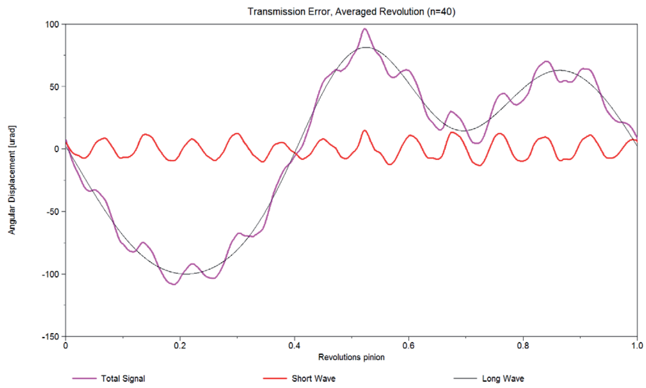


User-friendly software environment





The spectrum of the total transmission error includes the tooth-meshing order, its harmonics and side bands.



The transmission error curves show the deviation between the actual position of the driven wheel and the position it would occupy if the gearset were perfectly conjugate.

VISPIRON ROTEC GmbH
Frankfurter Ring 224 • D-80807 München • ✆ +49 (0)89 / 323 651 0 • 🖷 +49 (0)89 / 323 651 56 • vispiron.de • rotec@vispiron.de