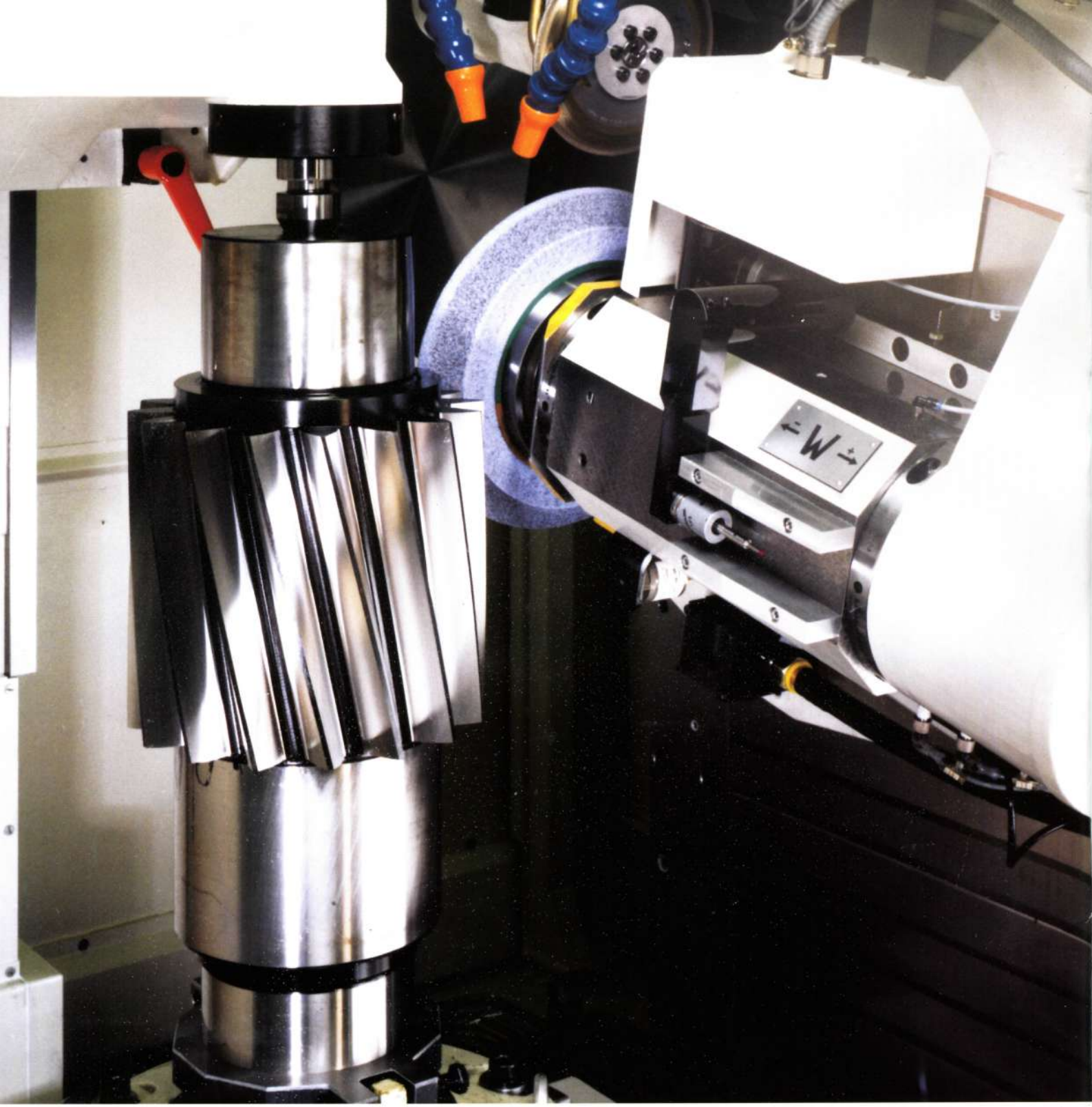

Leitz
SOLUTIONS
Gears
precisely
the best



How do you optimize your production process?

We all know that time is money. Poor quality costs us twice – the time spent making the product, and the time spent correcting the problem, not to mention the cost of scrap. The difference between economic success and failure hinges on knowing how to prevent the root cause of quality problems.

Production processes need to be constantly optimized in order to produce more units in less time – without compromising quality.

We can help you accelerate production processes and identify potential quality issues.

Our own commitment to the highest levels of quality and performance enables LEITZ CMMs to be the standard in Gear Metrology.

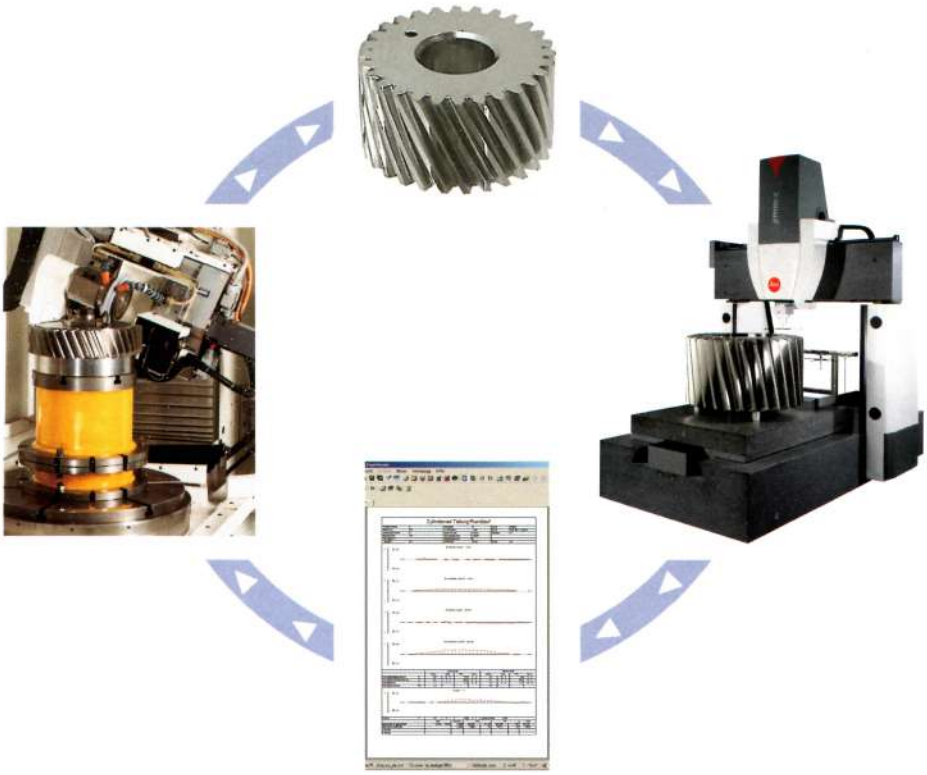
Optimize Processes – Requirements and Solutions

Optimizing production processes requires solutions built on performance and quality.

- **Hexagon Metrology – Symbol of worldwide competency:**
  - Our knowledge
  - Our experience
  - Our innovation
  - Our responsibility
  - Our quality
  - For Your Solutions

- **Providing solutions to your individual needs**

- **Measurement of all types of gears and gear tooling.**
  - Cylindrical gears
  - Bevel gears
  - Worms and worm wheels
  - Gear cutting tools



Cylindrical Gear

Bevel Gear

Worms

Gear Cutting Tools

Can coordinate measuring machines measure all sizes of gears?

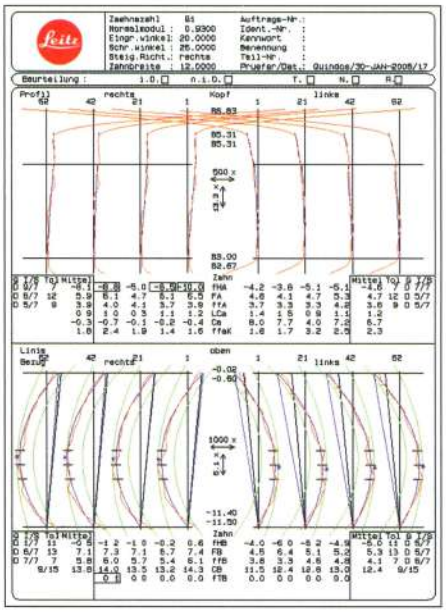
Coordinate measuring machines deliver maximum flexibility for a variety of production tasks and deliver comprehensive inspection solutions for gears of all sizes, without the inherent limitations of a "dedicated" inspection system.

Unlike conventional "Gears-Only" measurement systems, gear measurement on a LEITZ CMM can be accomplished without a rotary table. In addition, LEITZ CMMs can be configured to measure multiple gears or gear cutting tools staged on pallets, increasing throughput and lowering per-unit inspection costs to your decisive advantage.

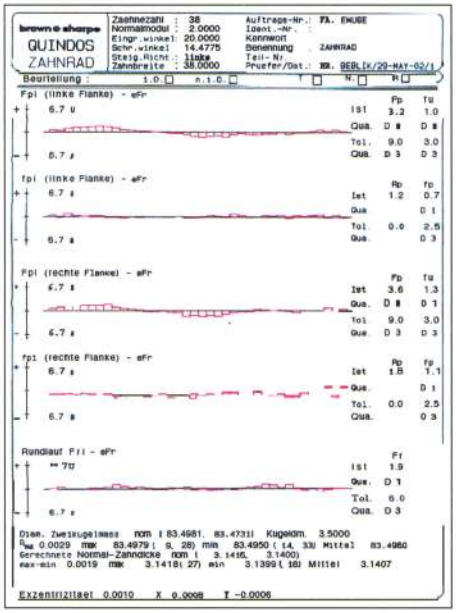
Coordinate Metrology for Gear Measurement

LEITZ Coordinate Measuring Machines optimize the production process by offering several essential advantages.

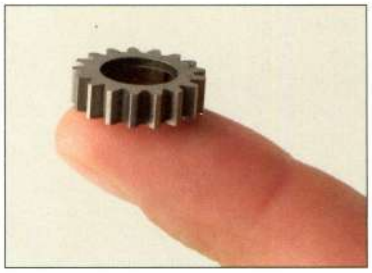
- Ultra-high precision gear measurement
- PTB-certified gear software
- Gear Master Artefacts are calibrated on LEITZ Coordinate Measuring Machines at the PTB and NIST
- Automated pallet measurement allowing lights-out operation
- No rotary table required
- Gear measurement of external diameters 2 mm – 3800 mm and pitch modules of 0.5 mm – 100 mm



Profile and Flank Deviations



Runout and Pitch

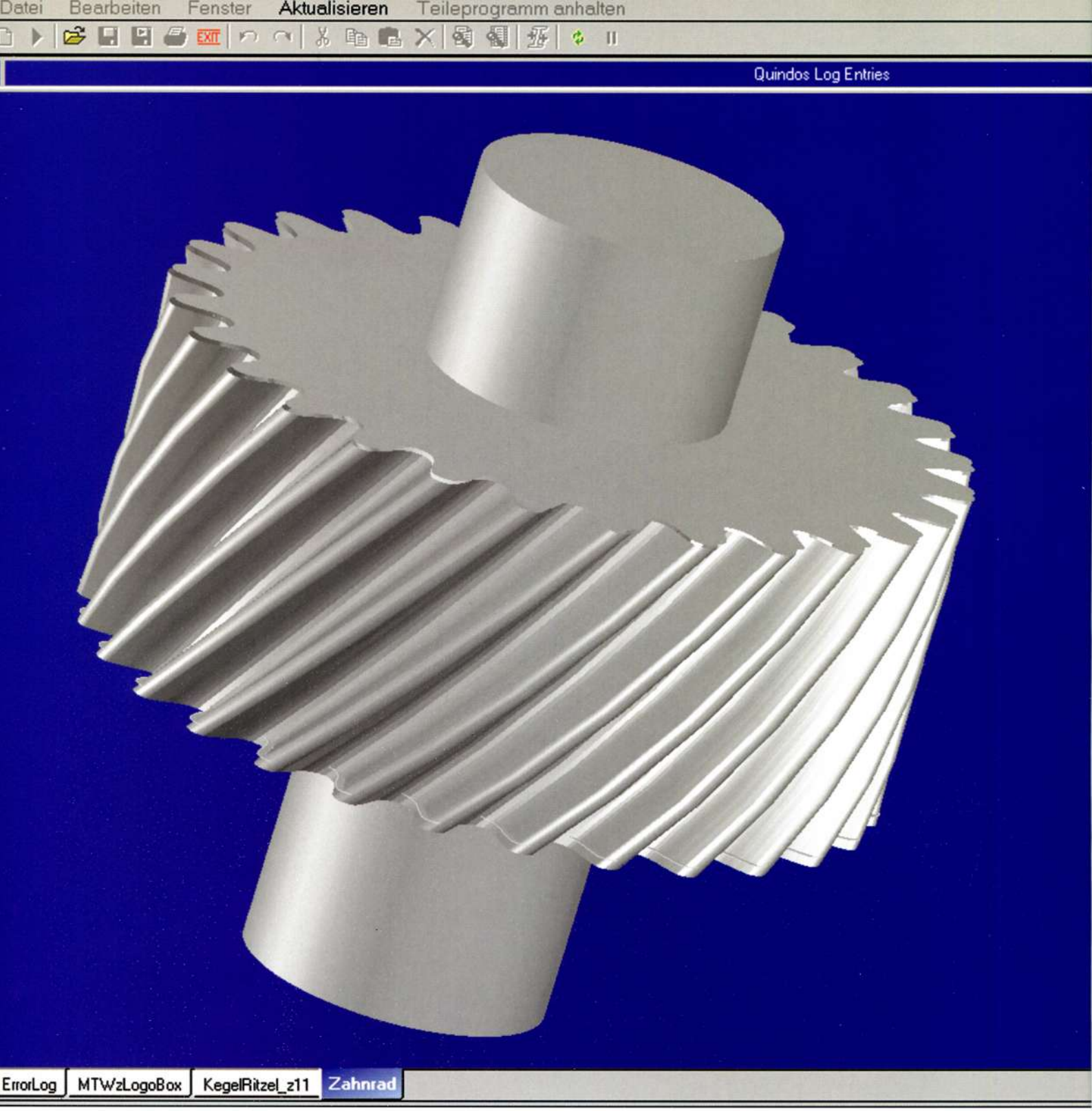


Small Cylindrical Gear

Large Gear Measurement

Pallet Measurement

Ring Gear Measurement



Software – are there "limitless" possibilities?

We offer comprehensive software packages that meet the most challenging requirements for three-dimensional metrology, not just gears. PC-DMIS and QUINDOS software offer a wide variety of standard and specialized geometric inspection routines. QUINDOS alone offers more than 30 options for nearly all types of geometry being produced today.

Selection of the appropriate gear options transforms your LEITZ CMM into a flexible, high throughput gear inspection system.

Programmable routines allow automatic generation of all motion, probing points, and scan lines, as well as evaluation of results and data storage.

Gear Measuring Metrology Software Solutions

Gears

Cylindrical Gears
Reverse-engineering of Gears
Gear Gauges
Straight Bevel Gears
Spiral Bevel Gears
Gleason Gauges 4/Win Format

Gear Cutting Tools

Hob Cutters
Shapers (on request)
Shaving Gears
Broaches

Worms

Cylindrical Worms
Worm Wheels for Cylindrical Worms
Globoid Worms

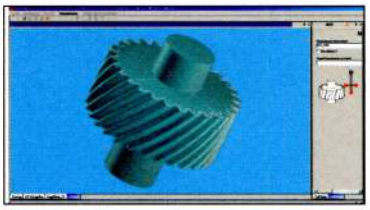
Applications

2D / 3D Curves
Constant Velocity Joints
Statistics
Measuring on Pallets
Feature-based Inspection

Special geometries

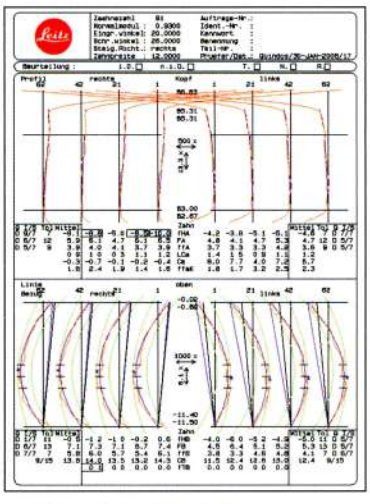
Cylindrical Cams (Roller Gear)
Thread (DIN, API)

LEITZ Coordinate Measuring Machines configured with proven software are capable Gear Measuring Centers.

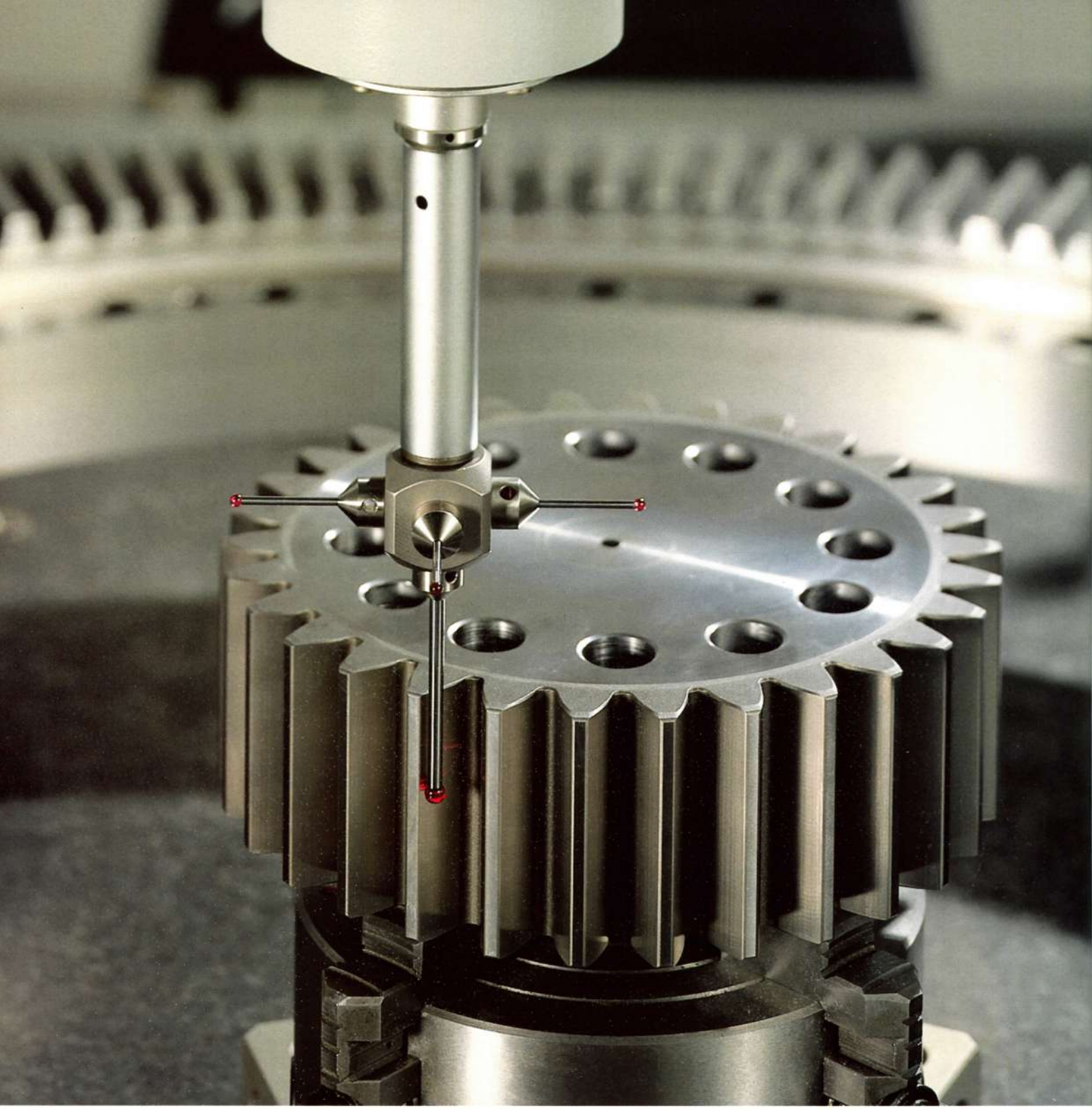


QUINDOS CAD view of a Spiral Gear

PCDMIS Gear



Profile and Flank Deviations



How does flexibility lead to success?

Even though there is an unimaginably wide range of gear types, Leitz CMMs, together with QUINDOS software offer the flexibility needed for achieving the most exacting quality requirements: reliably measuring internally and externally all sorts of straight and helical gears.

The operator simply enters the gear parameters as they appear on the drawing. All motion paths, probing points and scan lines are generated automatically. Gear quality can be evaluated according to AGMA, DIN, ISO, JIS, or CNOMO standards.

It is also possible to inspect gear racks, splines and couplings.

Straight, Helical, Internal or External – Precision without Compromises

Your solutions are achieved through the careful selection of LEITZ coordinate measuring technology and the appropriate software options.

- Simply entering gear parameters is enough to begin measuring.
- All motion, probing points and scan lines are generated automatically.
- Self-Centering-Probing or Single-Point-Probing can be used to inspect Runout and Pitch.
- The manufactured quality can be evaluated according to DIN, ISO, JIS, AGMA or CNOMO standards.
- No rotary table is required, leading to increased ease of use and measuring accuracy.
- Palletized measurement reduces the inspection cost per gear.

Our software packages also offer measurement of:
- Splines, internal and external with a straight profile (DIN 5481)
- Splines, internal and external with an involute profile (DIN 4580)
- Couplings for clutches

Cylindrical Gear with internal Spline

Crown Gear with Pinion

Chevron Gear

Can bevel gears from all manufacturers be measured?

Straight and spiral bevel gears and pinions of each of the well-known manufacturers like Gleason, Klingelnberg or Oerlikon have quite different measurement requirements. LEITZ Coordinate Measuring Machines cover them all and measure them with equal speed and precision. Effective production control is achieved for small and midsized parts with pallet measurement.

Very large gears can be measured individually on a LEITZ PMM-F or PMM-G Gantry-type High Precision CMM.

The production of Gleason gears can be optimized with the interface to GAGE 4/WIN, closing the production cycle.

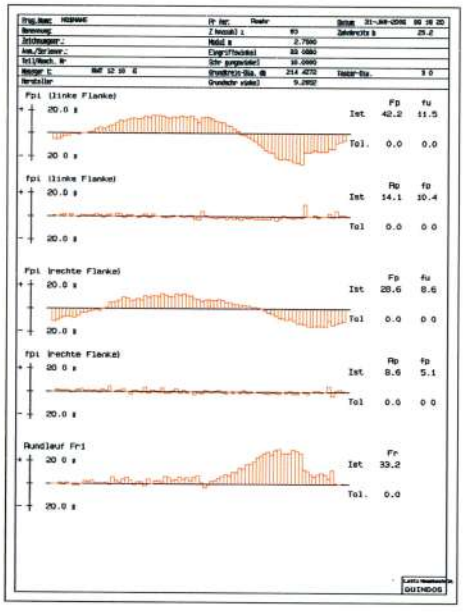
Straight bevel gears can also be measured without master data.

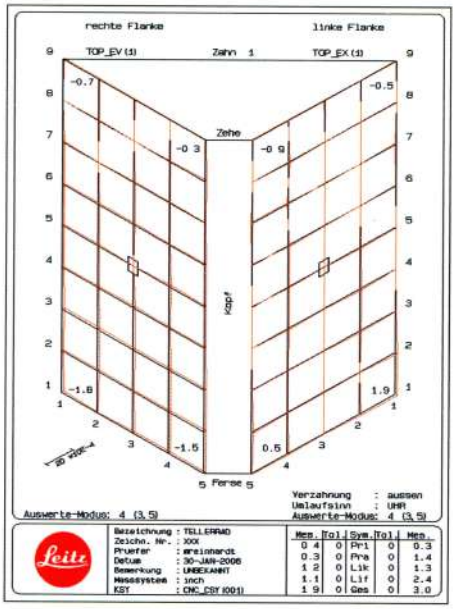
Measuring all Types of Bevel Gears

A wide variety of measuring routines demonstrates the incredible flexibility of a LEITZ system, just within gear measurement.

- We measure both spiral bevel gears (for example Gleason) and straight bevel gears. Including applications for straight internal bevel gears, such as pressing moulds.
- Now, even gears on long shafts can be measured horizontally. NEW
- Straight bevel gears with octoid tooth systems can be measured and evaluated according to DIN 3971. Nominal geometry is determined – as in the case of cylindrical worms, by the parameters entered.
- There is no rotary table required for bevel gear measurement thus making it possible to use more economical palletized measurement.

Our bevel gear software packages include measurement of:
- Spiral Bevel Gears
- Straight Bevel Gears (internal/external)





Measurement of a Bevel Gear Pinion

Differential Pinion

Pallet Measurement

Are there no limits in measuring special gears?

The Ultra-High-Accuracy of a LEITZ CMM is the ideal platform for a stable production process in the manufacture of cylindrical worms, accompanying worm wheels or globoid worms.

When measuring worm wheels for cylindrical worms, the geometry of the worm wheel is generated as conjugated to the gearing of the worm.

It is possible to bestfit the optimum axial position of the worm wheel in order to optimize the assembly position in a Gear box production process.

When measuring globoid worms, the tooth flanks are mathematically generated by an inclined rotating plane (grinding wheel) or by a straight axial profile.

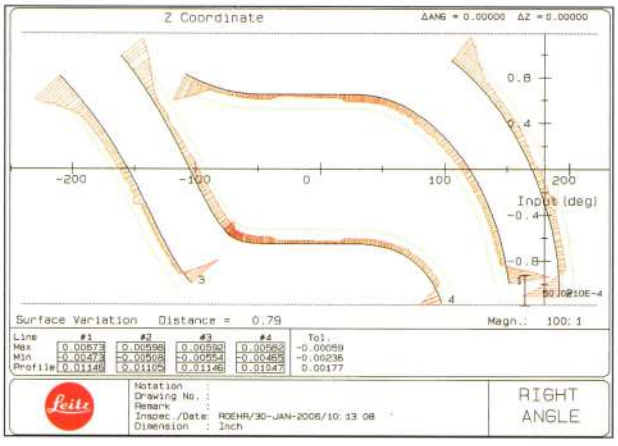
Worms, Worm Wheels and much more

Measurement of worm types, worm wheels and cylindrical cams leads to a wide variety of solutions being offered.

- Cylindrical worms of the types ZA, ZI, ZN, ZK are measured according to DIN 3975. Cylindrical worms ZC are measurable with both right or left handed lead.
- Both simple and multiple right or left pitched worms can be measured.
- Profile and centering line, runout, pitch and topography can be evaluated.
- Since no rotary table is required, a large number of different parts can be measured on pallets.

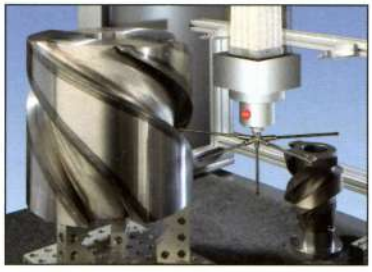
Our software packages include measurement of:
- Cylindrical worms
- Worm wheels
- Globoid worms

The special application for cylindrical or globoid cylindrical cams and cam curves evaluate both the follower kinematics as well as the geometry of mating parts.



Measuring of a Globoid Worms

Cylindrical Cams



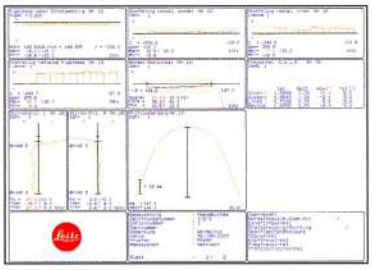
Roller Gears

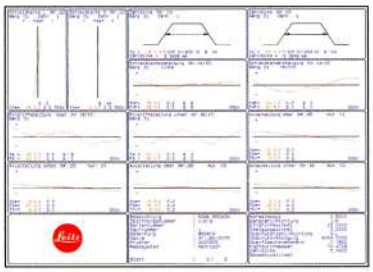
Measuring Gear Cutting Tools with CMMs

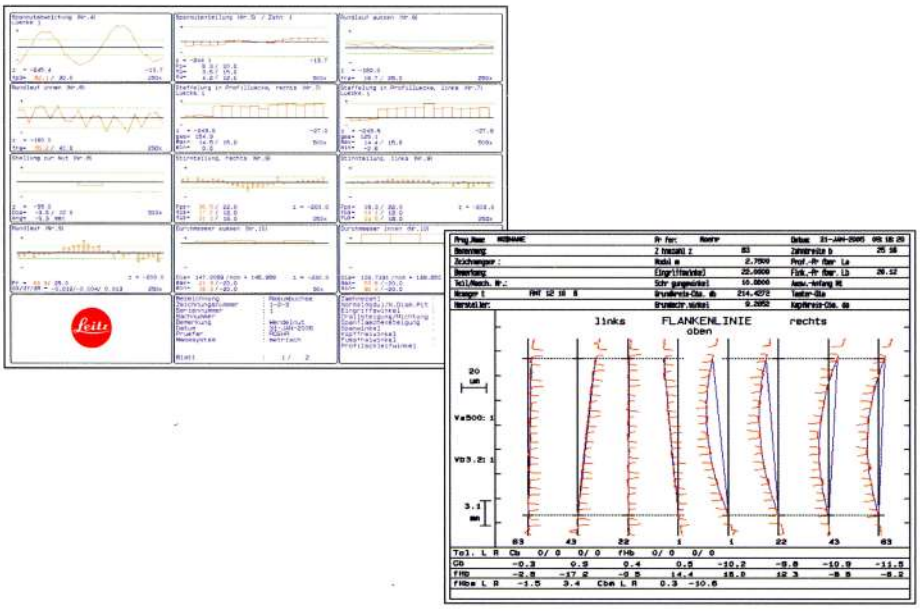
As with gears, accurate and fast measurement of gear cutting tools can also be accomplished.

- By selecting the appropriate software options, the range of applications for Ultra High Accuracy Coordinate Measuring Machines can be extended.
- To measure gear cutting tools, only the appropriate parameters have to be entered.
- All motion paths, probing points and scan lines for the coordinate measuring machine will be generated automatically by the system.
- The actual gear quality is evaluated based on DIN and ISO standards.

Our software packages include measurement of Gear Cutting Tools such as:
- Hobs
- Shaving Gears
- Broaches
- Shapers







Global Presence

LEITZ is Hexagon Metrology's world-renowned premium brand for ultra high accuracy coordinate measuring machines and sensors.

Our customers are ensured of superior service via a global network of corporate locations delivering local support in major manufacturing centers worldwide.

Our goal is to provide solid and practical answers to modern industry's most complex metrology problems.

Close consultation with our customers today keeps us continuously focused on present and future needs of industry, which we deliver through innovative customer-focused metrology products.

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