

# INNOVATIVE METROLOGY IMPROVES YOUR GEAR QUALITY. THAT IS WHY WE HAVE MARGEAR



The latest information on MARGEAR products can be found on our website:  
[www.mahr.com](http://www.mahr.com), WebCode 20597



▶ | Maximum precision in the production environment is an important factor for a company's success. MarGear gear metrology solutions enable you to perform measurement tasks on gears and gearing tools quickly, simply and precisely in a single setup. The flexible systems – requiring no mechanical alignment or reclamping and combining gear metrology with form and positional analysis – create the ideal conditions to ensure your business remains competitive. Fully integrating metrology into the manufacturing process creates a closed-loop quality control system for gear manufacture.

## ▶ | MarGear. Gear Metrology

**MarGear. GMX 275 C, GMX 400 C, GMX 400 ZL,  
GMX 600**

**17- 3**

**MarGear. Industry Solutions**

**17- 4**

**MarGear. Software Solutions**  
MarLib, Gear CuT, Closed Loop

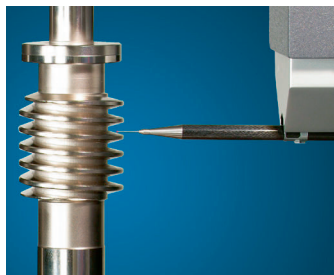
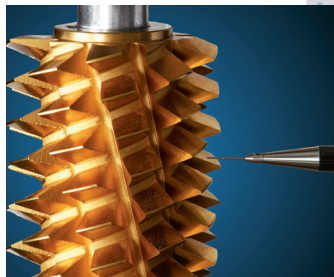
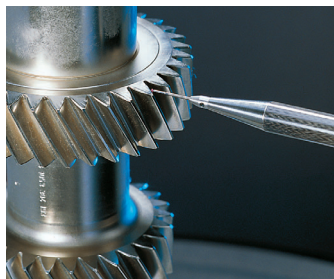
**17- 6**



# MarGear. Gear Metrology from Experienced Specialists

## CUTTING-EDGE GEAR METROLOGY SOLUTIONS

► | The highly precise and flexible GMX systems represent the ideal combination of gear and form measurement in a single system. From highly specialized gear analysis to fully integrated series measurement, MarGear is your perfect partner for all levels of modern gear manufacturing. | ◀



## MarGear. GMX 275 C / 400 C / 400 ZL

Universal gear measurement centers



### Description

For fast and precise measurement and analysis of gears of all types up to an outside diameter of 275 or 400 mm (10.83 or 15.75 in). The ideal solution for both universal and specialized gear manufacturing processes. System solutions ensure maximum flexibility and availability within modern gear component manufacturing environments.

#### Fully automatic inspection of:

- Straight and helical cylindrical gears
- Spiral and hypoid bevel gears
- Crown gears
- Cylindrical worm shafts
- Conical cylindrical gears
- Segment gears
- Hobs
- Shaving cutters
- Shaping cutter
- Pinion-shaped cutters
- Beveloid gears
- Synchronous gears
- 3D geometry, form and positional measurements, diameters and distances
- Special gearing tools upon request

#### Accuracies

Class I accuracy gear measuring machine for gear measurements in accordance with **VDI/VDE 2612/2613 Group 1** at 20 °C ± 2 °C, *rotational axis: formtester accuracy.*



WebCode 20598, 20599, 20600

## MarGear. GMX 600

Universal form and gear inspection system



### Description

The perfect combination for gear and form testing applications in a single setup. This combination saves time as well as investment and maintenance costs.

Full form testing functionality for outside diameters up to 600 mm (23.62 in). The **GMX 600** is a complete solution that can also be used to measure crankshafts, camshafts and pistons.

#### Fully automatic inspection of:

- Straight and helical cylindrical gears
- Spiral and hypoid bevel gears
- Cylindrical worm shafts
- Conical cylindrical gears
- Segment gears
- Shaving cutters
- Shaping cutter
- Hobs
- Pinion-shaped cutters
- Synchronous gears
- Beveloid gears
- 3D geometry
- Form measurements with centering and tilting table
- Camshafts, crankshafts & pistons \*
- Special gearing tools upon request

#### Accuracies

Class I accuracy gear measuring machine for gear measurements in accordance with **VDI/VDE 2612/2613 Group 1** at 20 °C ± 2 °C, *rotational axis: formtester accuracy.*



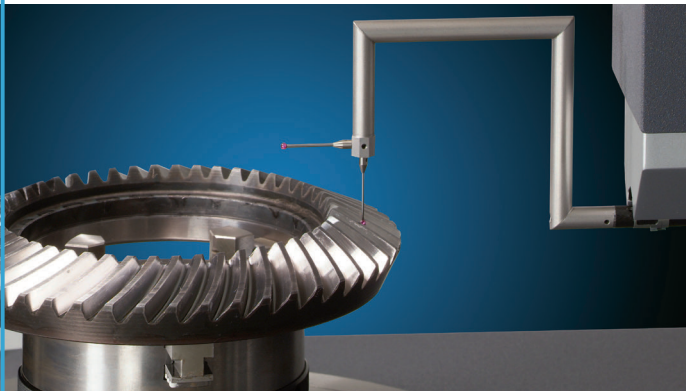
Request a brochure or see WebCode 20601.

## MarGear. Industry Solutions



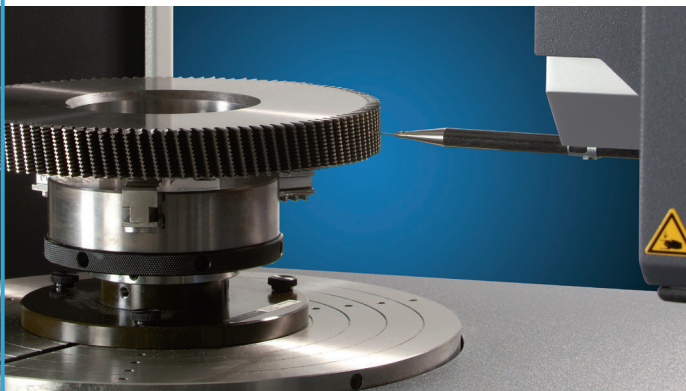
### Measurement of spur gears

- Measurement and analysis of internal and external gears up to a 90° helix angle
- Analysis according to DIN 3962 or free tolerances
- Measurement and analysis of profile, flank lines (lead), pitch, run-out errors, tooth thickness and diameter over balls/pins
- Crowned and conical gears
- Root and tip reliefs
- Tolerance bands, K-charts
- Measurement of twist
- Measurement of tip and root diameter
- Measurement of segment gears
- Measurement and analysis up to modulus of 0.3



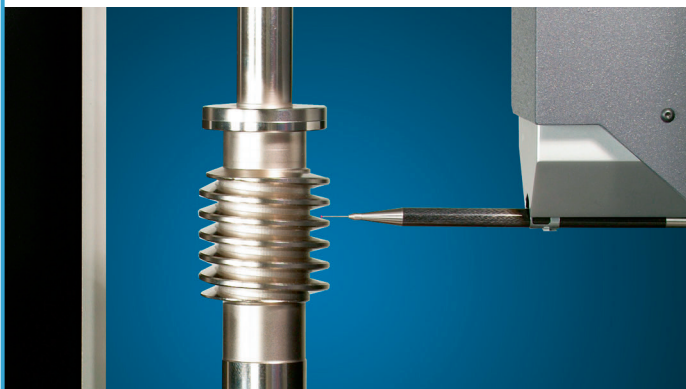
### Measurement of bevel gears

- Measurement and analysis of flank topography based on nominal data or a master gear plus gear pitch and run-out errors
- Topography point matrix definition with up to 20 x 20 points
- Calculation of the average flank form
- Calculation of tooth thickness in normal and transverse section
- Measurement and analysis of tooth depth, face angle and root angle
- Calculation of pressure and spiral angles
- Deviation from flank form measurement
- Calculation of pitch errors according to DIN 3965



### Measurement of shaving cutters

- Measurement and analysis of shaving cutters
- Analysis according to DIN 3962 or free tolerances
- Measurement and analysis of profile, flank lines (lead), pitch, run-out errors, tooth thickness and diameter over balls/pins
- Analysis of crowning
- Automatic adjustment of measurement paths
- Automatic recognition of serration positions of plunge-type shaving cutters
- Measurement and analysis of burnishing cutters



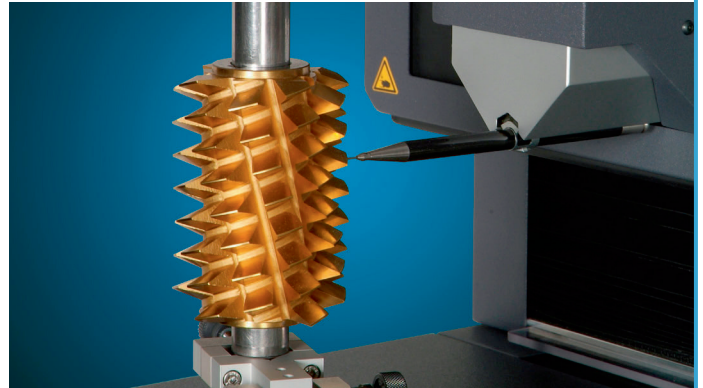
### Measurement of worm shafts

- Measurement and analysis of profile, flank lines (lead), pitch and tooth thickness on worm shafts
- Analysis of worm shafts with A, N, I or K profile
- Measurement and analysis of duplex worm shafts
- Measurement of pitch in axial or transverse plane
- Measurement of twist
- Analysis of crowning
- Analysis based on K-charts
- Analysis based on freely definable tolerances
- $Z_A$ ;  $Z_N$ ;  $Z_I$ ;  $Z_K$

## MarGear. Industry Solutions

### Hob measurement

- Measurement and analysis of axial and radial run-out on the collar
- Measurement of flute spacing and flute direction
- Profile measurement across or behind the cutting edge
- Measurement of thread and contact pitch variation
- Analysis of form and position errors of the cutting edge
- Calculation of tooth thickness
- Analysis conforming to DIN 3968 and other standards



### Measurement of camshafts

- Measurement and analysis of camshafts based on design data
- Analysis of cam form and cam angle position relative to the reference groove
- Analysis of cam curves, angles and diameters and acceleration curves
- Measurement and analysis of unknown cam profiles, which can be stored as nominal or reference data
- Flexible record design
- Mask-based input without the need for time-consuming teach-in processes

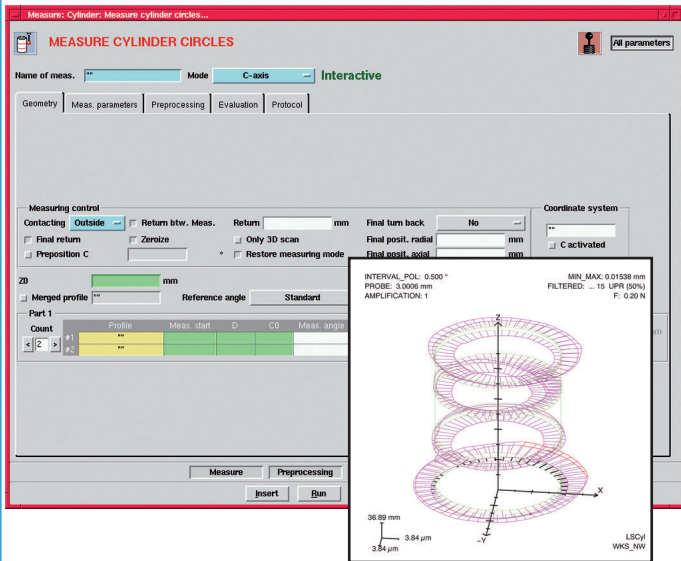


### Measurement of crankshafts (GMX 600 only)

- The software package for crankshaft testing offers a wide variety of functions to measure and analyze parameters on the crankshaft's main and stroke bearings, flange and journals. All form parameters are always measured in form testing mode
- Fully automatic measurement of roundness, cylindricity, parallelism and diameter on main and stroke bearings
- Fully automatic measurement of roundness, cylindricity, parallelism, diameters and distances on the crankshaft flange
- Data input direct from the drawing
- Flexible record design



## MarGear. Software solutions – MarLib. 3D Form and Position Measurements



### Measurement philosophy

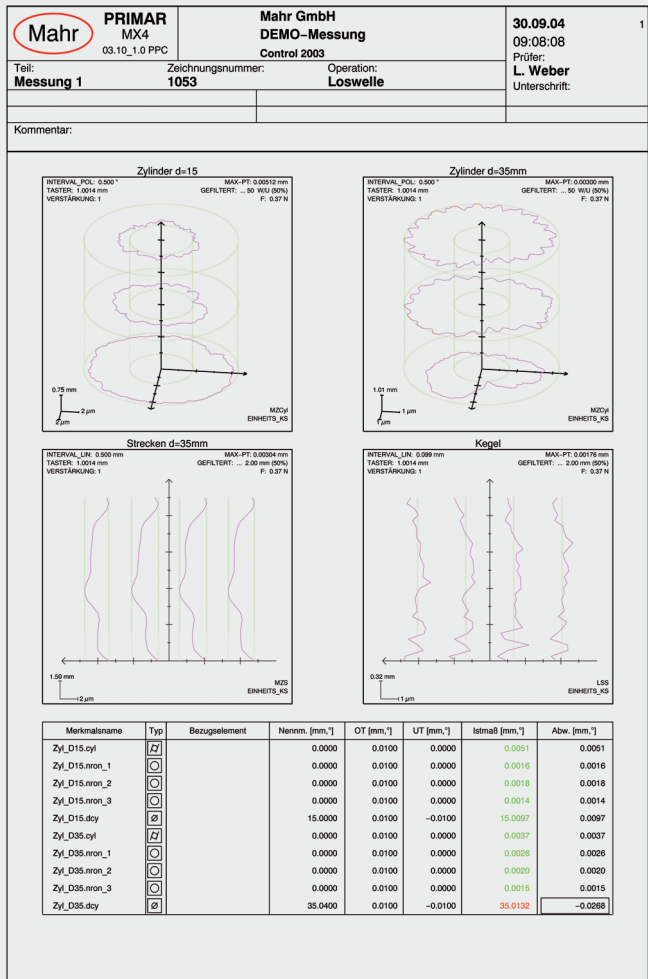
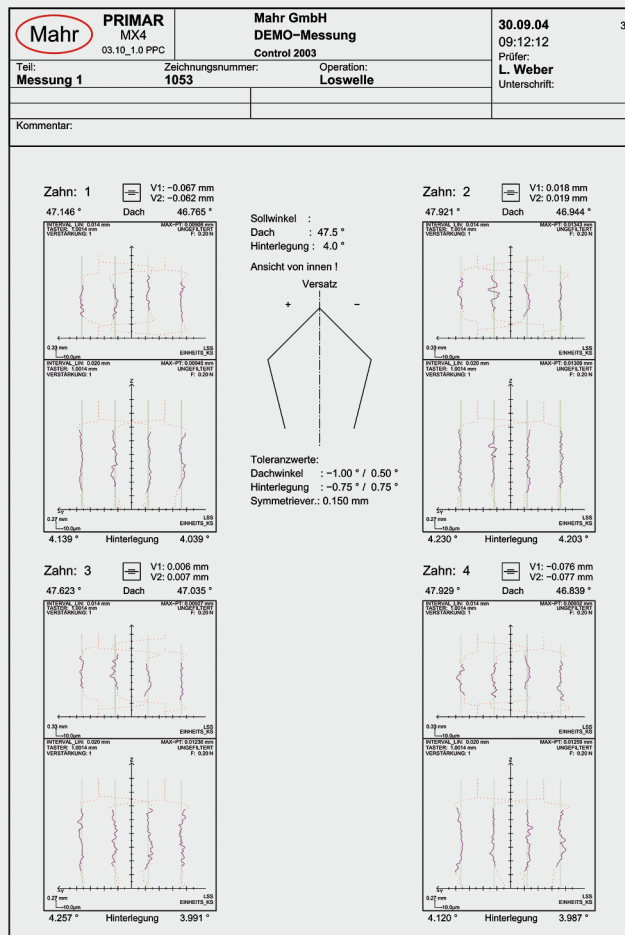
- Includes approx. 30 complex functions defined using parameter masks
- Geometry-oriented programming
- Each module is split into measurement, analysis and recording

### Advantages

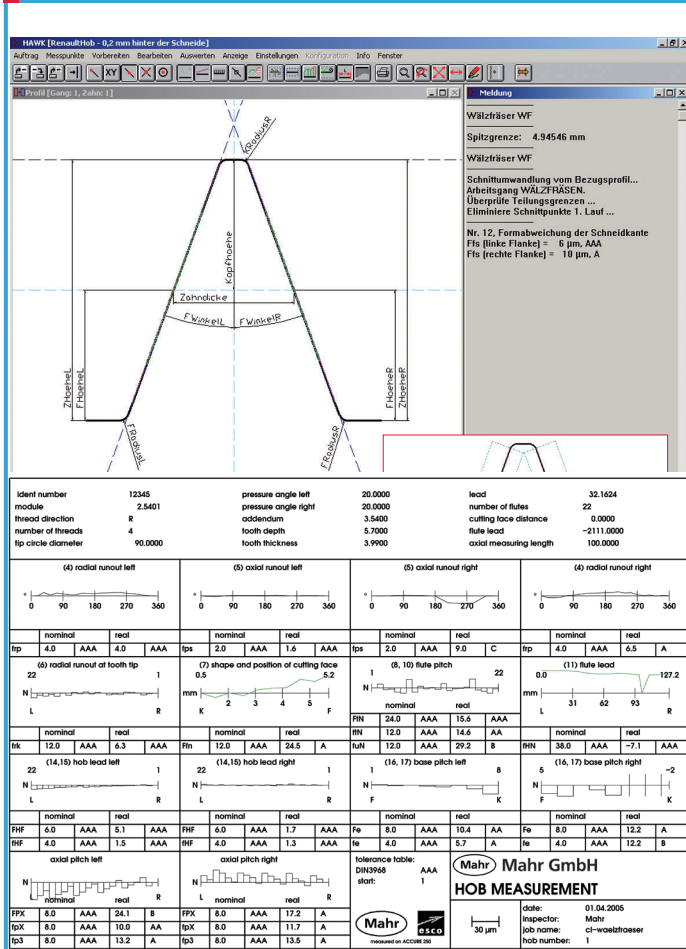
- Short, clear and structured programs
- Quick and easy programming
- **MarLib** modules can be saved as a program
- Analysis of specific parameters such as roundness, cylindricity, diameter, etc.
- Analysis of various parameters from a single geometric element



Below: Sample record for form and position analysis, taking the example of a synchronous gear and camshaft.



## MarGear. Software Solutions – Gear CuT\* Module



**Gear CuT – software for manufacturers of gearing tools for standard and special profiles**

### Measurement philosophy

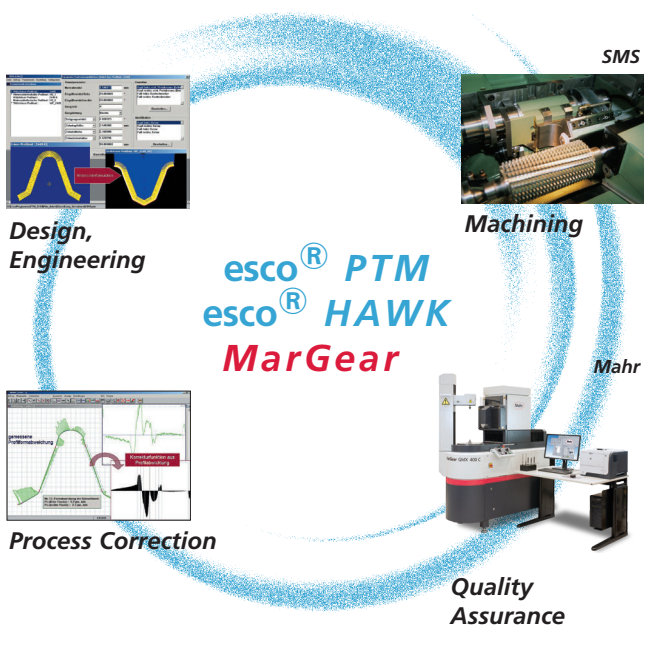
- Tactile scanning of the geometry
- Comparison of nominal and actual contours and analysis for in-process inspection
- Control of the grinding process in gear manufacture

### Advantages

- Measuring machine programmed simply by setting dimensions in the inspection drawing
- Parameterized description of the reference profile
- Choice between analysis in the axial section or reference profile
- Profile measurement across or behind the cutting edge
- Parameter programs for standard hobs
- CAD link

\*Gear CuT: Partner product of Esco GmbH Herzogenrath, Germany

## MarGear. Software Solutions – Closed Loop\*



### Philosophy

- Influencing the manufacturing process
- Measuring machine becomes part of production

### Principle

- Production data available for input via CAx interfaces
- Measuring programs created automatically control the measuring machine and the scanned geometries are directly available in **Gear CuT** for profile comparison
- The high accuracy of the measuring machines and the sheer density of information that can be obtained from the measurements permit precise corrections which result in reproducibly tolerance-compliant workpieces after a single correction run

### Advantages

- Time savings of up to 80%
- Higher manufacturing accuracies
- Operator influence is minimized

\*Closed Loop: Partner product Esco GmbH Herzogenrath, Germany