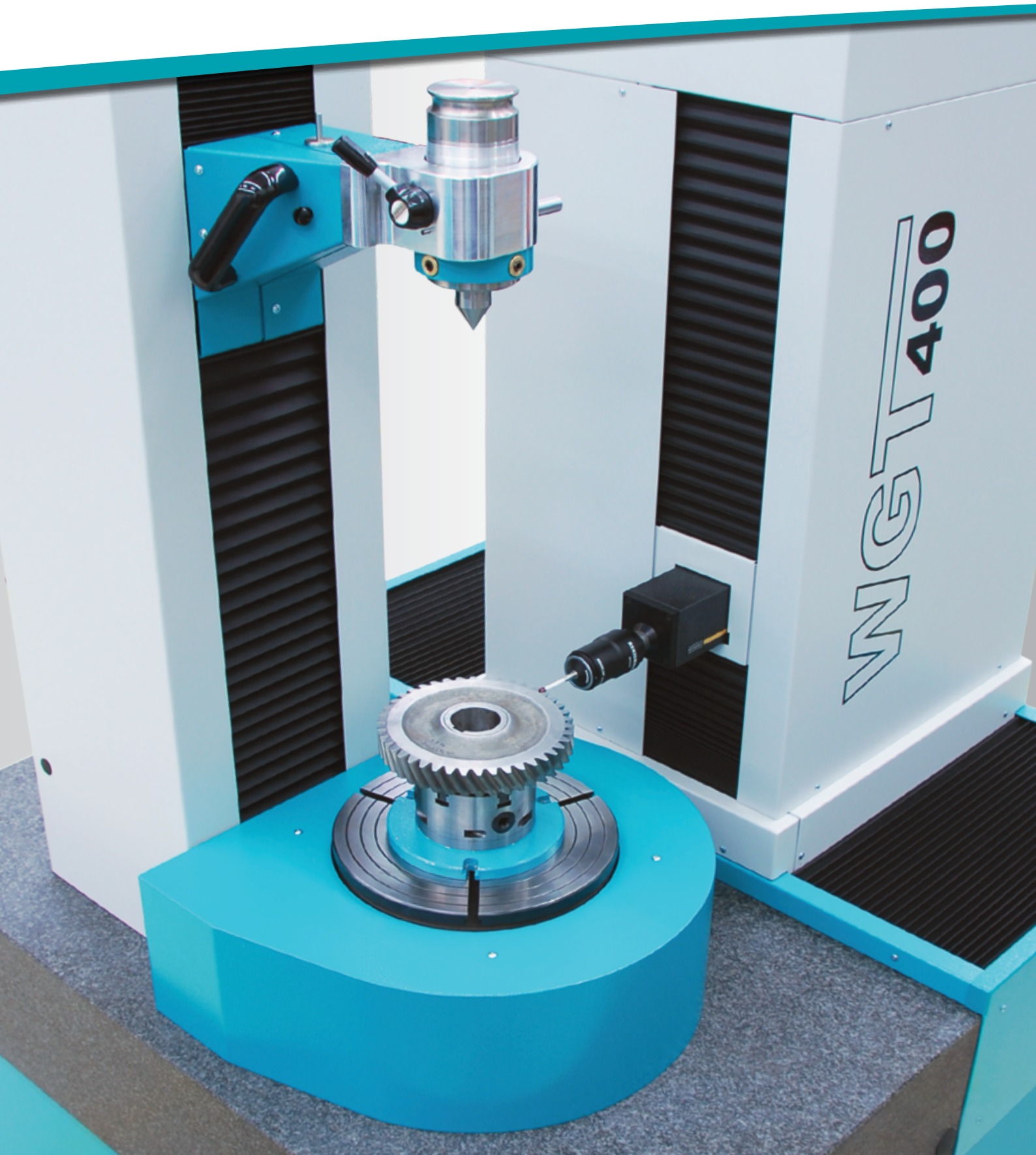


The WGT Series
Top Class Gear Metrology



Page 4-7

Applications



The right solution for your measuring task

- Aerospace
- Commercial Vehicles and Industrial Gear Boxes
- Automotive Industrie
- Machine and Plant Engineering

Page 8-9

WGT Series



Highlights of the WGT Series

- Precision
- Ergonomics and usability
- Robustness and durability
- Serviceability

Page 10-11

Gear measuring machine WGT 400 and WGT 600

For the measurement of medium sized parts –
from car and truck to aeroplane components

- Technical specifications
- Machine data

Page 12-13

Gear measuring machine WGT 850



Gear metrology for aviation and shipbuilding

- Technical specifications
- Machine data

Page 14-15

Gear measuring machine WGT 1200



Large measuring volume for components for large scale machines

- Technical specifications
- Machine data

Page 16-17

Technology



Probe systems and controller

- SP600M
- SP80H
- WENZEL Geco controller – Control for gear metrology

Granite: Metrology material No. 1

Page 18-19

WENZEL Gear-Software



The intelligent software for your application

- Data management
- Modules and options

APPLICATIONS

The right solution for your measuring task



Aerospace

In aerospace the technical requirements on gears concern high efficiency, low noise emission and high durability. These requirements are fundamental. The measurement of these parts needs reliable and precise gear measuring machines. Furthermore the software has to allow an easy and gapless documentation of measuring results according to certified standards. This combination of hard- and software offers the WGT series.





Commercial Vehicles and Industrial Gear Boxes

Gear boxes of commercial vehicles are exposed to extreme mechanic and climatic conditions. However to guarantee a high durability the complex component parts have to be measured exactly and be traceable documented. Besides the measurement of gears, the measurement of geometrical references and their evaluation concerning accuracy to size and form and position is of great importance. All these measuring tasks can be solved with a WGT.

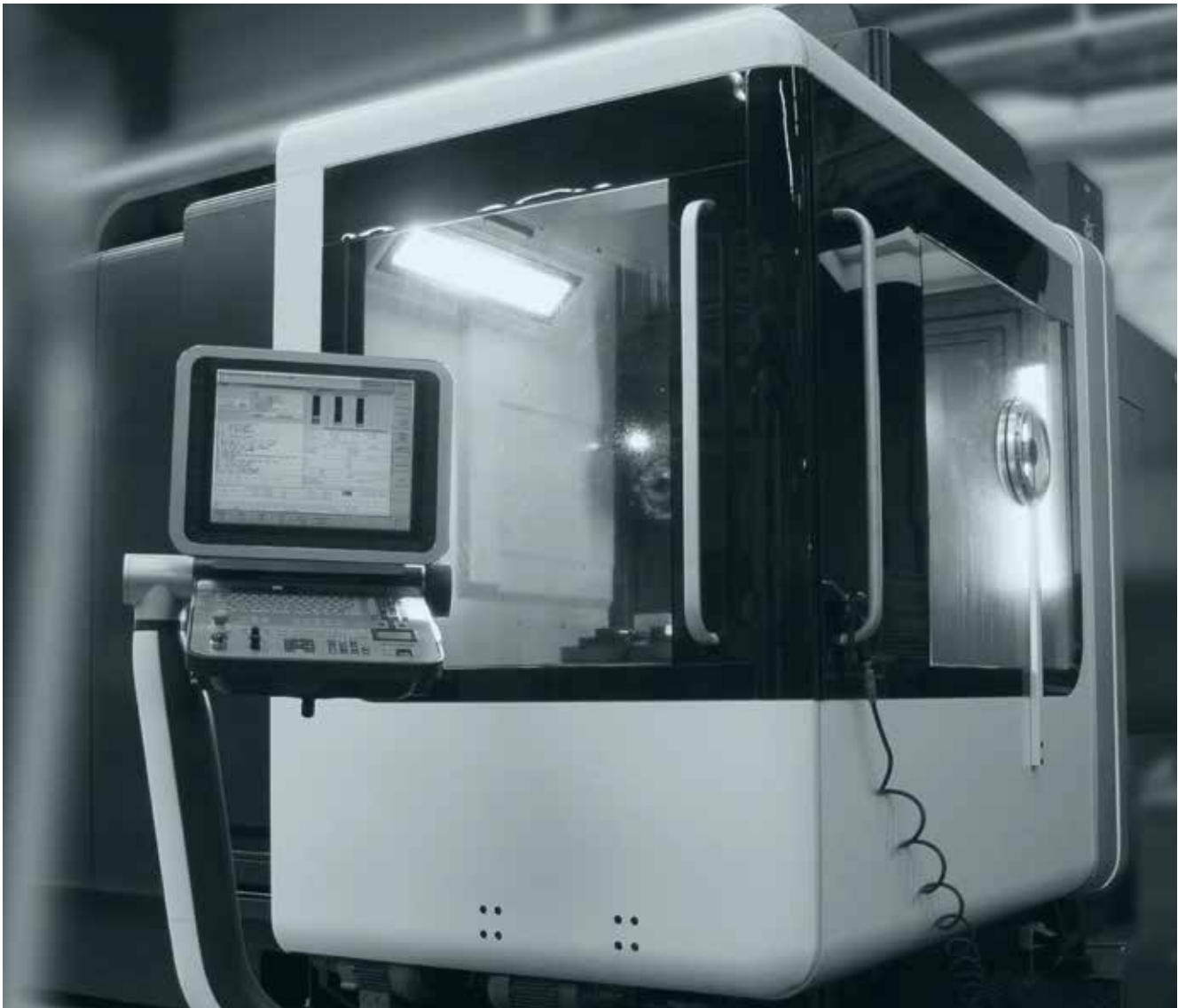
APPLICATIONS



Automotive Industrie

In construction of modern gear boxes high efficiency, low noise emission and weight reduction at highest durability are at very high priority. Precise and reliable measuring systems in quality assurance are essential. Because of its ease of use a WGT can easily be integrated into production for resource saving and efficient measuring procedures.





Machine and Plant Engineering

The requirements in machine and plant engineering are as manifold as their applications. They reach from the measurement of small gears (module 0.3 mm) up to the measurement of high accuracy gears and geometrical evaluation of pump housing. But also the measurement of large bevel gears as they are used in ship propulsion is part of this spectrum. To fulfill these diverse requirements a measuring system with high accuracy and high flexibility is essential. The WGT series offers exactly this precision and flexibility.

WGT SERIES

Highlights of the WGT Series

Precise, easy and fast measurements of different gearing and rotationally symmetrical parts, that is what the gear measuring machines from WENZEL are made for. The WGT series distinguishes itself through excellent ergonomics, easy operability and a comprehensive range of measuring and analyzing possibilities.

Precision

- For highest precision air bearings are used in all axes.
- Baseplate and guides of the linear axes are made of granite; this ensures an identical thermal behavior of the complete measuring system.
- WENZEL Geco Controller was designed especially for the requirements of gear measurements and guarantees an excellent 4-axes-measuring-performance.
- The rotary table is either pneumatic or hydraulic for very high accuracy, depending on the size and configuration of the WGT.
- High-resolution scales provide accurate positioning and precise results.

Ergonomics and usability

- The open construction and the radial movable tailstock allow an easy and uncomplicated loading of the WGT.
- The simple operator interface and graphical input of the parameterized software allow make the creation of complex measuring programs and significant measurement reports quick and easy.
- The optimized ergonomics make the comfortable and secure operation of the gear measuring machine possible.
- Because of its compact construction and small footprint the WGT can be easily integrated into the manufacturing area.





Robustness and durability

- The massive base of the WGT is made of granite and provides the highest level of stability.
- All axes are protected against oil and dust by covers.
- The air bearing technology in combination with the impala granite is absolutely wear-free and stands for long-life cycle concerning material and accuracy.
- The modular system concept of the WGT allows the adaptation to changing requirements and offers security of investment for the future.
- The exclusive use of high-quality components guarantees long machine operating times.

Serviceability

- Maintenance times can be reduced as all replacement parts are easy to access.
- Subsidiaries and agents worldwide ensure high and fast replacement part availability.
- Hotline-support allows quick diagnosis for help.

GEAR MEASURING MACHINE WGT 400 AND WGT 600

For the measurement of medium sized parts – from car and truck to aeroplane components

The gear measuring machine WGT 400 is typically used in aviation, automotive and their supplying industries. It allows the precise analysis of gears and rotationally symmetrical parts up to a diameter of 400 mm. Equipped with a tailstock shafts with a maximum length of 650 or 1200 mm can be measured within a measuring range of 650 mm on this gear measuring machine.

The WGT 600 is especially suitable for the analysis of geared parts and shafts used in commercial vehicles, rail transmissions or construction and agriculture machinery as it allows measurements of maximum diameters of 600 mm. In standard design this gear measuring machine makes the measurement of a maximum face width of 650 mm possible; optionally 800 mm.

Technical specifications

	WGT 400	WGT 600
Axes	4	4
Compressed air supply [bar]	6	6
Air consumption [l/min]	80	80
Operating voltage	110/230 V, 60/50 Hz, 1 Ph	110/230 V, 60/50 Hz, 1 Ph
Power consumption [VA]	1600	1600
Machine weight [kg]	1700	2000
Environmental conditions (for VDI/VDE 26 12/13 Group 1)	17-30 °C, ΔT : 2 K/h, 2 K/m	17-30 °C, ΔT : 2 K/h, 2 K/m
Dimensions [mm]	L	1900
	W	1500
	H	2000



Machine data

	WGT 400		WGT 600	
	Standard	Optional	Standard	Optional
Workpiece diameter [mm]	400		600	
Modul range	from 0,5	from 0,3	from 0,5	from 0,3
Measurable face width [mm]	500	650	650	800
Distance between centers [mm]	20 - 650	bis 900, 1200	20 - 900	bis 1200
Rotary table loading [daN]	180		400	
Helix angle [°]	< 90		< 90	
Measuring rang [mm]	X	400	500	
	Y	220	320	
	Z	500	650	800
Measurement accuracy	Gear inspection according to VDI/VDE 2612/2613, Group I (with a maximum variation of the reference temperature $\pm 2K$)			



GEAR MEASURING MACHINE WGT 850

Gear metrology for aviation and shipbuilding

Whenever engine components for aviation or smaller marine gear units need to be measured, WGT 850 is the ideal gear measuring machine. It is equipped with a movable tailstock. Therefore the measuring machine can be loaded easily. Using the tailstock parts with a maximum diameter of 850 mm can be measured. Are manual chucks used to clamp the part a maximum outer diameter of 1000 mm is measureable. The WGT of this size is equipped with active damping by standard. This assures high precision measurements of big parts even close to production.

Technical specifications

	WGT 850	
Axes	4	
Compressed air supply [bar]	6	
Air consumption [l/min]	90	
Operating voltage	110/230 V, 60/50 Hz, 1 Ph	
Power consumption [VA]	1600	
Machine weight [kg]	7500	
Environmental conditions (for VDI/VDE 26 12/13 Group 1)	17-30 °C, ΔT : 2 K/h, 2 K/m	
Dimensions [mm]	L	2300
	W	2950
	H	2400



Machine data

		WGT 850	
		Standard	Optional
Workpiece diameter [mm]		850, 1000*	
Modul range		from 0,5	from 0,3
Measurable face width [mm]		800	
Distance between centers [mm]		20 - 930	20 - 1200
Rotary table loading [daN]		1000	
Helix angle [°]		< 90	
Measuring rang [mm]	X	950	
	Y	500	
	Z	850	
Measurement accuracy		Gear inspection according to VDI/VDE 2612/2613, Group I (with a maximum variation of the reference temperature $\pm 2K$)	

* Measurement without taistock



WGT 1200

Large measuring volume for components for large scale machines

Components for large scale machines from the field of machinery and plant engineering need a suitable gear measuring machine, the WGT 1200. It is the largest measuring machine of the WGT series and is equipped with a movable tailstock. This makes an easy loading with large and heavy parts possible. When using the tailstock parts with a maximum diameter of 1200 mm can be measured. Parts with a reduced height, whose measurement does not require a tailstock, can even be precisely measured up to 1600 mm diameter.

The WGT 1200 does not need a separate foundation. Active damping absorbs vibrations and assures reliable measurement procedures.

Technical Specifications

	WGT 1200	
Axes	4	
Compressed air supply [bar]	6	
Air consumption [l/min]	140	
Operating voltage	110/230 V, 60/50 Hz, 1 Ph (400V, 60/50 Hz, 3Ph)	
Power consumption [VA]	2600 (4000)	
Machine weight [kg]	10000	
Environmental conditions (for VDI/VDE 26 12/13 Group 1)	17-30 °C, ΔT : 2 K/h, 2 K/m	
Dimensions [mm]	L	3110
	W	3210
	H	3000



Machine data

		WGT 1200	
		Standard	Optional
Workpiece diameter [mm]		1200, 1600*	
Modul range		ab 0,5	ab 0,3
Measurable face width [mm]		1000	
Distance between centers [mm]		20 - 930	20-2000
Rotary table loading [daN]		3000	5000
Helix angle [°]		< 90	
Measuring rang [mm]	X	1200	
	Y	650	
	Z	1000	
Measurement accuracy		Gear inspection according to VDI/VDE 2612/2613, Group I (with a maximum variation of the reference temperature $\pm 2K$)	

* Measurement without taistock



TECHNOLOGY

Probe systems and controller

The WGTs are equipped with probe systems from Renishaw. Approved sensor technology and worldwide spare and replacement part availability guarantee an optimal use of the measuring system. The SP600M or the SP80H are used with the WGT measuring machines as standard.



SP600M

The SP600M is a very reliable scanning probe with an excellent product life. The robust design of the probe withstands moderate collisions. With the corresponding changing rack system SCP600 it is possible to change automatically to different SH600 stylus holders within a measuring procedure. The SH600 stylus holders can be configured with styli in different size and length. The SP600M is used for WGT 400 and WGT 600.



SP80H

WGT 850 and WGT 1200 are equipped with the passive scanning probe SP80H. This high accuracy scanning probe was especially designed to be mounted on a horizontal quill and is therefore very well suitable for the use on gear measuring machines. Using the SCP80 stylus change ports it is possible to automatically change between SH80 stylus holders with different styli configurations.

WENZEL Geco controller – Control for gear metrology

Only a sophisticated control technology turns a gear measuring machine into an efficient CNC gear measuring machine. WENZEL has developed the Geco Controller especially for the use in gear metrology. Geco implements the complete real-time integration of the sensor system into the control procedures. This guarantees an optimal 4-axes-measurement and accurate scanning performance. Continuous, fast and precise does Geco control every measurement.

- All measurement relevant data as position and probe data as well as temperature information are transmitted with high speed (up to 100 kHz).
- The machine compensation is carried out in real-time and makes for precise machine movement.
- The wobble of the measured part is compensated in real-time, even during measurements of completely unknown curves.
- The controller is optimized for the use of scanning probes.
- For technical support via remote maintenance access to the Geco can be permitted.



Granite: Metrology material No. 1

Its physical characteristics makes granite the perfect material for metrology. WENZEL conducts all process steps from cutting to milling and grinding. The first impression that aluminum is much lighter than granite proves wrong. The specific weight of granite is only 1 % above the weight of aluminum. However, the expansion coefficient of aluminum is almost four times larger. All relevant measuring machine parts are made of granite. As the base plate and guides are made of the same material a homogeneous thermal behavior is achieved.

Physical characteristics of materials in metrology

Material	Specific Weight [kg/dm ³]	Expansion Coefficient [1/K]	Temperature Diffusionrate [W/mK]	Elasticity Module [10 ³ N/mm ²]
Steel	7,25	10,4*10 ⁻⁶	42-63	90-180
Aluminum	2,7	23,8*10 ⁻⁶	210	72
Ceramic (Al2O3)	3,85	8*10 ⁻⁶	28	370
Granite	2,8	6,5*10⁻⁶	3,5	NIL

WENZEL GEAR-SOFTWARE

The intelligent software for your application

The WGT gear measuring machines are equipped with extensive modular measuring software. It provides broad functionality for the measurement and analysis of different types of gearing, tools and shafts. This by the German metrology institute PTB certified software is divided into the main menu TMain and in

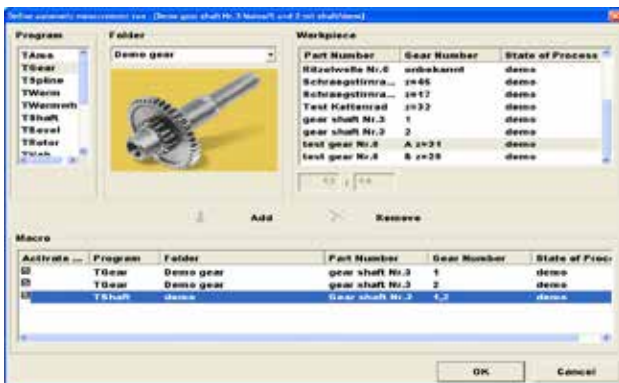
separate application oriented modules. TMain allows a comfortable management of part parameters and measurement results.

Main menu for data management



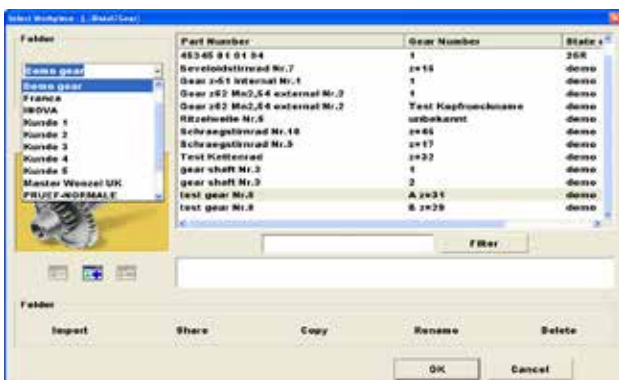
Easy data input

- Intuitive usable masks are used for data input.
- Every input mask covers a logical associated set of parameters.
- Graphics support the user during the exact definition of measurement parameters.



Macro-Programming

- Macro-Programming realizes easy linking of single defined measurement procedures, e.g. straight and helical gears.
- With a linkage complete measurements can be created as they are used e.g. for measurements of shafts with gearing and geometrical elements.



Integrated database

- All parts are managed within the integrated database.
- Measurement results are stored and can be viewed anytime.

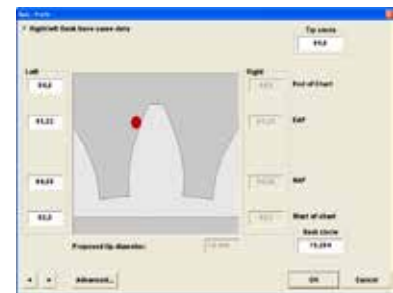
The software modules

Module for the measurement of spur gears

The module TGear is used for the measurement of spur gears. The user is intuitively guided by the software through different masks to enter all parameters which describe the gear definitely. In a further step the user chooses the needed evaluation. The following standard evaluations are possible:

- Profile and lead
- Pitch and runout
- Evaluation of crowned gears
- K-charts
- Tip and root relief, end relief
- Tooth thickness, tooth width, dimensions over one and two balls and over wires
- Topographical representation of flank form

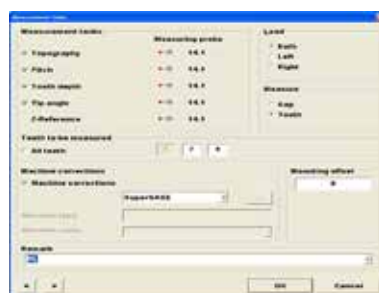
Based on this information an automatic measurement procedure and analysis is generated. Afterwards a complete and significant measuring report is created.

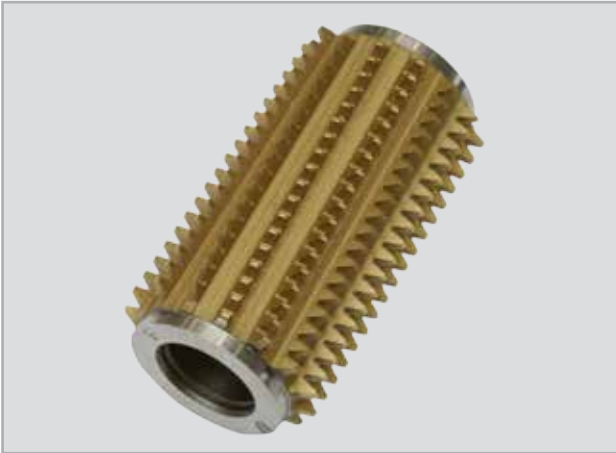


Module for the measurement of bevel gears

Bevel gears can metrological be captured and evaluated with the module TBevel. The determination of flank form, pitch and runout as well as tooth thickness, tooth depth and tip cone are part of this software module.

The results of bevel gear measurements can be transferred to manufactures specific analysing programs. This makes a direct correction of the machine tool according to the closed-loop procedure possible.





Modules for the measurement of gear cutting tools

THob, TShaver and TCut represent the module group for gear cutting tools. Through the input of relevant parameters a complete measurement and analyzing program can easily be created. Pitch, runout and topographical evaluations are just a few of the possible evaluations. This makes a secure and reliable use of gear cutting tools possible.



Module for the measurement of cylindrical worms and worm gears

TWorm is the software module for the measurement of cylindrical worms and worm gears. The measurement of cylindrical gears is according to DIN 3974. Based on nominal data (master gear method) worm gears can be analyzed concerning pitch and runout as well as flank form topography.



Module for the measurement of shafts

For the measurement of shafts and their evaluation concerning form, position and size the module TShaft is used. A complete measurement and evaluation program can be automatically be generated by the input of parameters describing the part geometry.

Module for the measurement of splines

TSpline is used for the analysis of spline shafts and spline bore hubs with straight flanks as well as serrated toothing. The following inspections can be carried out on these kind of parts: Profile, lead, pitch and runout. Tip and root circle diameter are further possible evaluations. Within this software module the measurement and evaluation program is automatically created based on the entered part parameters and the selected analyses.



Option for the measurement of camshafts

The option TCam is especially for the detailed analysis of camshafts. Based on a nominal-actual comparison the calculation of displacement speed progression and acceleration, highest point of the curve as well as rotation error are just a selection of evaluations that can be executed. The results of the measurement can be numerical and graphical be represented.



Module for the measurement of rotors

The measurement and analysis of profile, lead and pitch on male and female rotors is done with the module TRotor. An option of this module contains the calculation and inspection of cycloid profiles.



Other modules and options on request.



RENISHAW

RENEZAR Technology

SP800H

Innovation for success

WENZEL Group GmbH & Co. KG is one of the leading manufacturers of industrial metrology solutions. The wide range of WENZEL products includes solutions in the fields of coordinate measuring machines, gear metrology, computed tomography and high speed measuring and digitizing systems. Founded in 1968 as a family business, WENZEL Group combines tradition

with innovation, relies on values such as reliability, trust and respect for the environment. Subsidiaries as well as sales and service partners worldwide represent the company in more than 50 countries. The WENZEL Group employs more than 630 people worldwide.

WENZEL Präzision GmbH
D-97859 Wiesthal
Phone: +49 6020 201-0
Fax: +49 6020 201-1999
info@wenzel-cmm.com
www.wenzel-group.com

WENZEL PRÄZISION GmbH
Branch office Karlsruhe
Im Mittelfeld 1
D-76135 Karlsruhe
Phone: +49 721 17087-0
Fax: +49 721 17087-200