



OERLIKON

G 60 | G 80

BEVEL GEAR TECHNOLOGY – GRINDING MACHINES



KLINGELNBERG

Intelligent Solutions for Discerning Users

All around the world, manufacturers of gears and gearboxes ensure their leading edge in gear machining with innovative solution concepts from Klingelberg.

The [Oerlikon Bevel Gear Technology](#) division does not just allow users to manufacture bevel gears economically and with high precision. All machines in the system have been designed to work together to enable pre-machining and finishing of even the most complex gears.

Klingelberg offers the most advanced technology and the most efficient machines for each and every step in the process chain. The production process chain for bevel gears includes [tool preparation](#), [cutting](#), [measuring](#), [hardening](#), [grinding](#) or [lapping](#) and [testing](#), among others. The powerful [KIMoS](#) (Klingelberg Integrated Manufacturing of Spiral Bevel Gears) design software and the [Closed-Loop concept](#) ensure transparency and documented quality throughout the entire process chain.

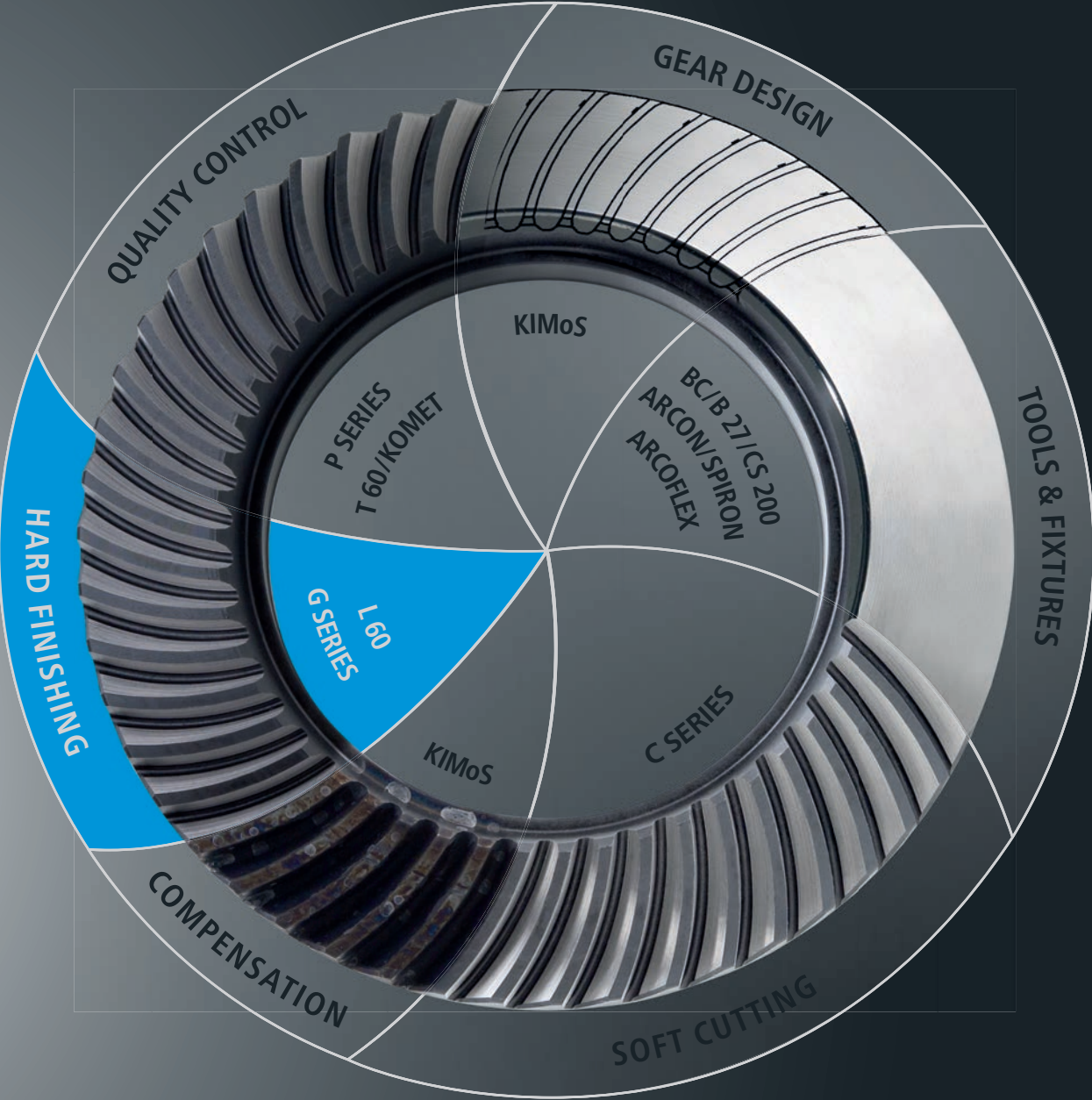
Oerlikon bevel gear machines are developed with real-world applications in mind and meet the varying demands of a whole range of industries. The target markets include the automotive industry, the commercial vehicle industry, the agricultural industry, shipbuilding and aviation, as well as industrial gearbox manufacturing and plant engineering.

As a leading system supplier and in combination with these high-performance tool systems, Klingelberg meets every requirement for flexible, efficient production — for the smallest and the largest batch sizes.



Oerlikon bevel gear grinding machine G 60 with numerous equipment details

For Every Process Step in Gear Technology,
Klingelnberg Provides Exceptional Concepts



OUTSTANDING GRINDING TECHNOLOGY

Leading-Edge Technology for Optimal Flexibility and Productivity

The CNC-controlled Oerlikon G Series bevel gear grinding machines provide outstanding grinding performance combined with high-precision final machining of the spiral hypoid gears and face-type clutches. The machines are available up to a workpiece diameter of 850 mm, depending on requirements. All G machines feature a vertical grinding spindle for optimal swarf disposal. An additional special feature is that drive units are above the grinding area, keeping them free of contamination and grinding swarf. Standard features like the semi-automatic wheel changer provide easy and convenient setup and reduce change-over time. Diamond dressing rolls are used for profiling the grinding wheel to any pre-selected form according to neutral data. An added bonus: The G machines can be equipped with a side door for loading using a handling robot during automatic operation.

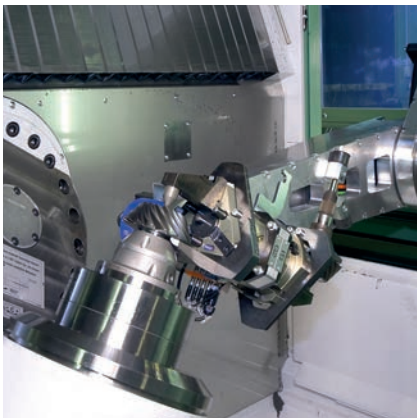


Oerlikon bevel gear grinding machine G 80



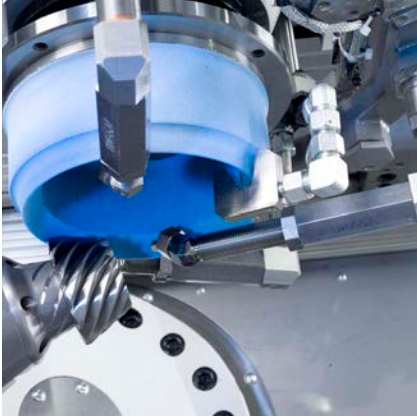
Vertical Machine Concept for Reliable Process Sequences

- Vertical grinding spindle for optimal swarf disposal
- Excellent visual process monitoring during the process positioning, thanks to optimal machining position of vertical grinding spindle
- Workpiece and workholding change in vertical direction are "gravity-assisted"
- Flexible oil nozzle system suitable for high pressure and quick change



High-Volume Production at Maximum Productivity

- Constant machining conditions thanks to automatic adjustment of grinding oil supply over the grinding wheel service life
- Automatic loading option through side loading door
- Loading in parallel with dressing, for minimum downtimes (G 60 depending on component size)
- Blank seating monitoring, stock allowance control and grinding performance for maximum process stability
- Highly dynamic drives for minimum downtimes
- Efficient energy recovery



Minimal Set-Up and Change-Over Time

- Semi-automatic change of grinding wheel with wheel flange adapter for short set-up times
- Quick change of preset oil rings for grinding oil
- Full accessibility of working chamber through front service door, also for automatic loading
- Workpiece spindle with through bore and automatic clamping cylinder for maximum flexibility (G 60 and G 80)



Compact, Intelligent Machine Design

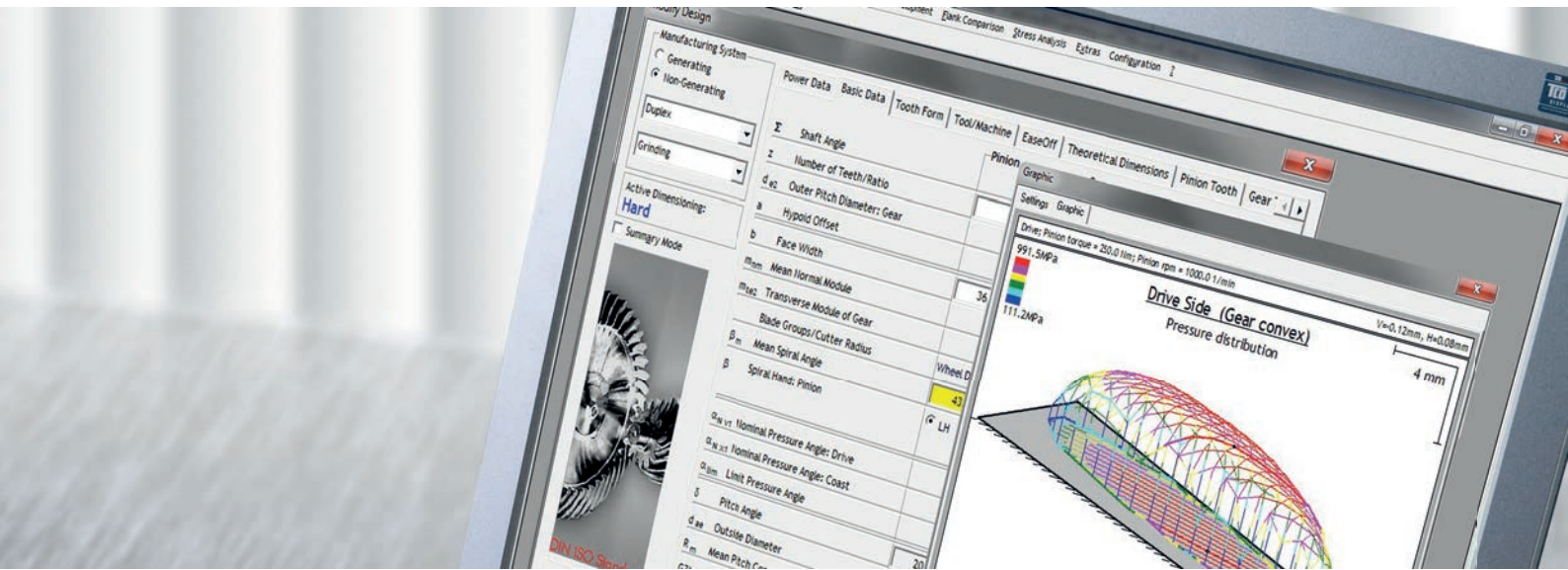
- Easily accessible, drives are located above the grinding area
- Separate working chamber to protect drive components with stainless steel inner panel for a sturdy, clean machine
- Easy service and maintenance due to easily accessible auxiliary components, such as oil mist extraction system, grinding oil return pump and hydraulics
- High-efficiency-class motors
- Integrated CO₂ fire suppression system without additional space requirements (optional)



Maximum Flexibility due to User-Defined Profiling of Tools

- CNC-path-controlled profiling of grinding wheel with diamond dressing roll for any profile modifications
- User-defined programming of dressing ratio and dressing factor
- Maximum precision due to stationary dressing unit
- Efficient grinding wheel pre-profiling with special dressing software

GEAR DEVELOPMENT BASED ON NOMINAL DATA



Design and Optimization of High-Performance Bevel Gear Sets

The **KIMoS** (Klingelnberg Integrated Manufacturing of Spiral Bevel Gears) software package supports every step in bevel gear design and optimization. **KOMET** measures corrections for machine settings and any tool data to minimize measured variations on the ground flanks.

As part of this process, all necessary data for the gear cutting process, tool preparation and quality control of the bevel gears to be produced are prepared in parallel. Convenient data handling provides a way both to make use of freely definable development databases in the development phase and to make production-approved data from the production database available to the production and measuring machines used in the process. The software package thus provides the optimal basis for ultra-modern bevel gear production according to the Closed-Loop method: **The end result precisely matches what was previously designed and optimized on the computer.**

A modular program package, KIMoS provides the user with the whole range of functionality needed to create application-appropriate gear designs for specific applications. All common gear cutting processes, machines and tool systems are supported.

Among the integral components of KIMoS are a gear-cutting optimization feature with easy-to-operate dialogs, analysis of the expected operation behavior of the gearing, and evaluation of the results with a load-capacity and strength calculation.

For gear design, KIMoS provides:

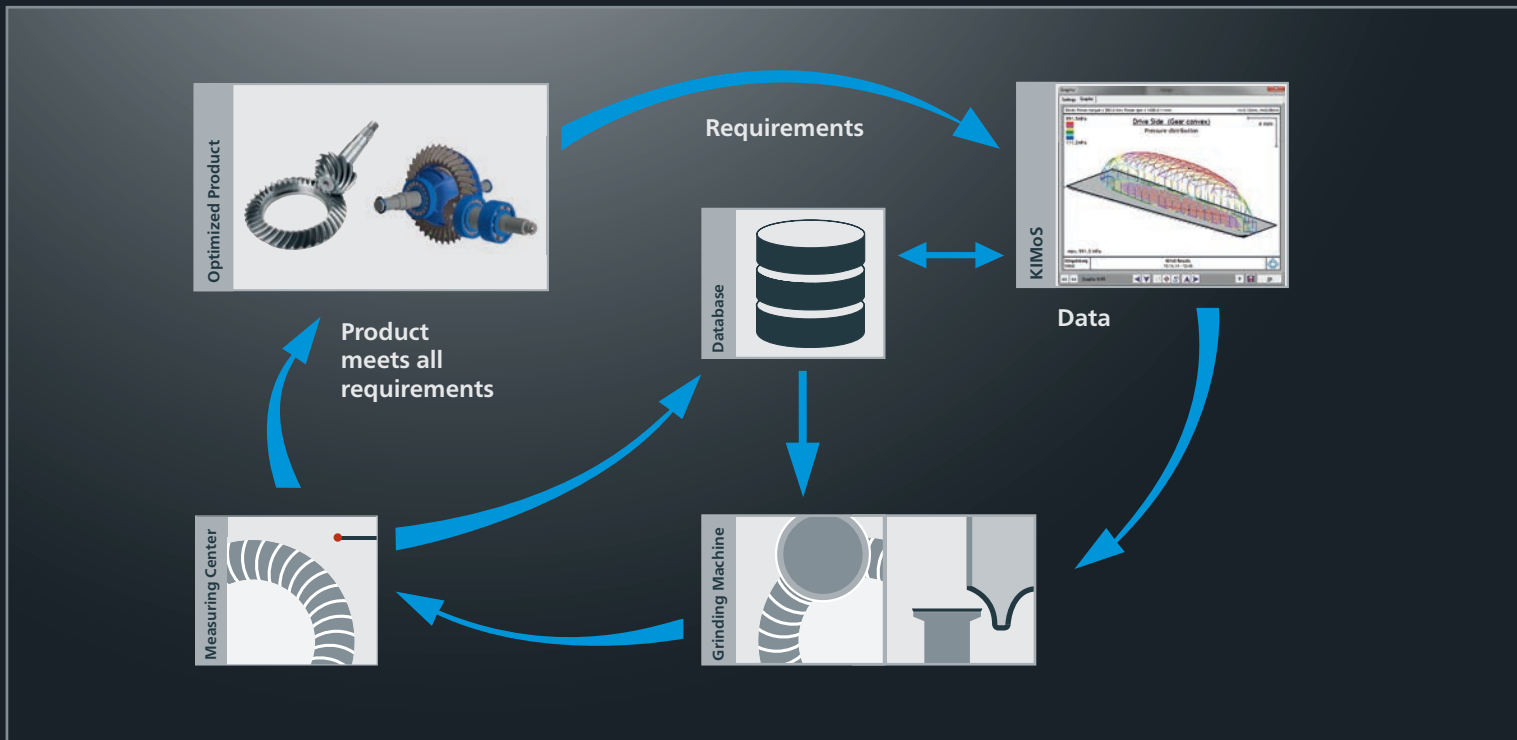
- Independent design with individual production possibilities taken into account
- Cultivation of expertise within the company as a competitive advantage
- Fast, accurate analysis of testing and production results and gear damage

For gear production, KOMET provides:

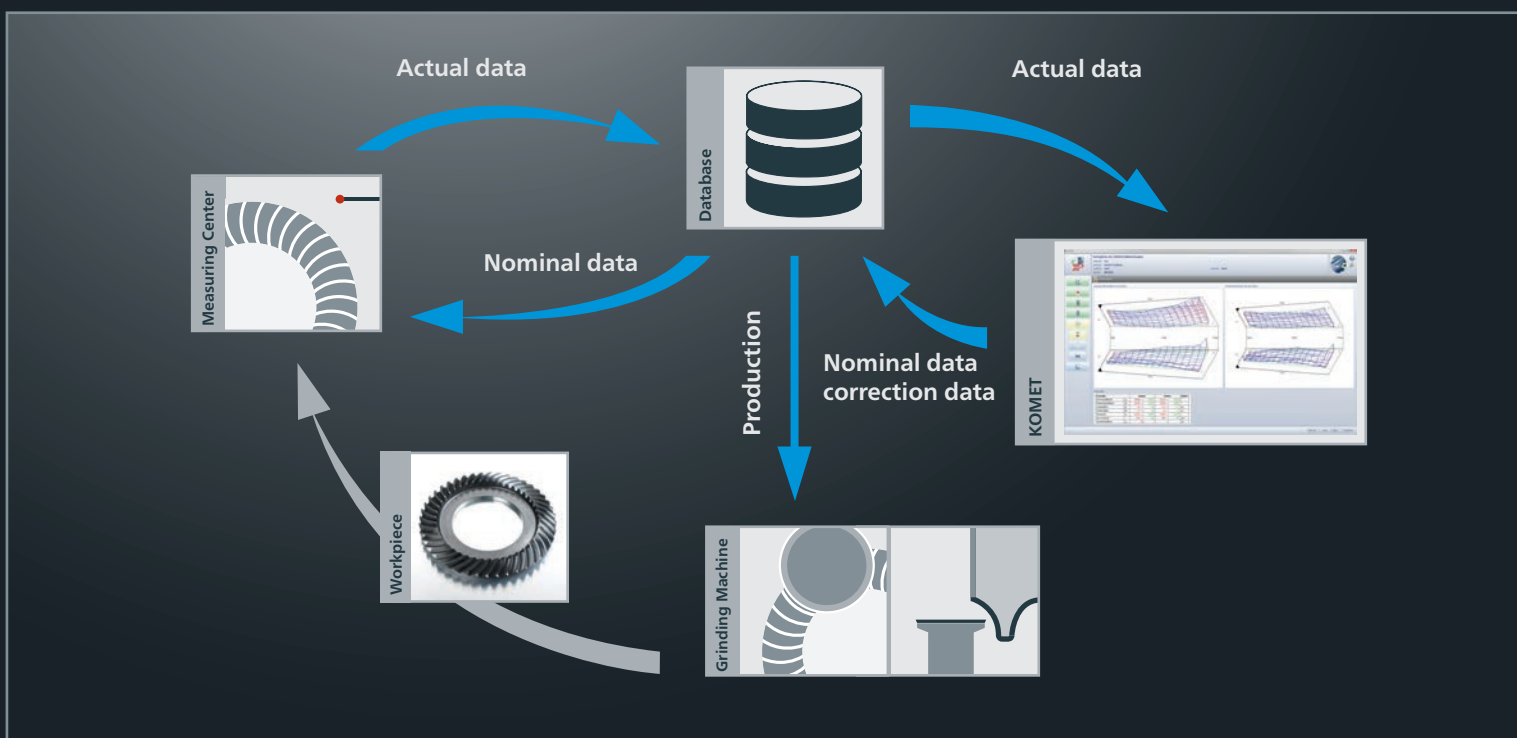
- Reliable calculation of correction data immediately following gear measurement
- Machine-specific correction data for bevel gear production
- Maximum process safety by interfacing with the Klingelnberg database

Advanced Bevel Gear Production in a Unique Closed-Loop Process

KIMoS – for Optimal Design



KOMET – from Design to Optimal Production Result



Drive Components with Guaranteed Quality Provide Optimal Performance

In countless industries, KlingelInberg solutions have become a fixture in the international market. To meet market requirements for high productivity in mass production and flexibility in small-batch production, KlingelInberg offers a range of solution concepts for just about any requirement.

"Simplified with Passion" – true to this motto, KlingelInberg is driven to provide simple, unconventional solutions to high-tech challenges. A team of engineers and technical experts makes it possible – always with the goal of ensuring the highest technological standards in application-matched machine concepts that are also easy to use. Used throughout the world, the "Simplified with Passion" system plays an important part in ensuring that machine tasks are made simple. Moreover, the KlingelInberg system contributes to standardization and quality assurance on a global scale.



Automotive



In cars, spiral bevel gears are used in all-wheel-drive systems and rear-wheel-drive systems to transmit torque "from the transmission to the road". Due to increasing performance requirements, these drives must transmit outputs of over 300 kW in some cases. The bevel gears they use must be efficient, smooth-running, and low-maintenance. Reproducible quality in standard production with the fastest possible production times are key requirements in this industry.

Commercial Vehicles



Commercial vehicles are always rear-wheel-driven. The bevel gear sets they use must transmit power in the range of 500 kW – at extremely high torques. This places high demands on durability and strength. The bevel gears must be efficient, rugged and low-maintenance. Use of the integrated KlingelInberg system makes it possible to mass-produce bevel gears with the quality required.

Industrial Gear Units



The industrial gear unit sector comprises many different applications, all of which place great demands on the reliability of the drive components. The bevel gears for these sectors are often produced by companies specializing in small batch sizes and a variety of products. A rigid machine design and flexible, cost-effective tool systems are the keys to success for ranking among the market leaders in these sectors.

Aviation



Bevel gears used in airplanes must embody the highest quality in terms of pitch and runout (DIN 1–3) and must also execute rotational movements with absolute reliability. Just as important are other geometrical features such as surface quality, root geometry, rotational error, high strength and low weight. Frequently used in this industry are special materials, which place extreme demands on tools and processes.

Maritime Propulsion Technology



The bevel gears used in shipbuilding must demonstrate great reliability and durability even under the most extreme external conditions. The high range of component diameters (up to 2 m) requires extensive bevel gear know-how to master the production process. Klingelberg's many years of experience and its certification by all major classification societies are the customer's guarantee of the utmost product quality.

Agriculture



In agricultural applications such as tractors, spiral bevel gears are built into the rear axles. Harvesters and hay machines use straight bevel gears to enable the corresponding functions. Whereas the bevel gear set in a tractor rear axle drive must transmit up to 400 kW, the loads on straight bevel gears are comparably low. The most important market requirement for straight bevel gears is a modern production and a cost efficient solution.

TECHNICAL DATA

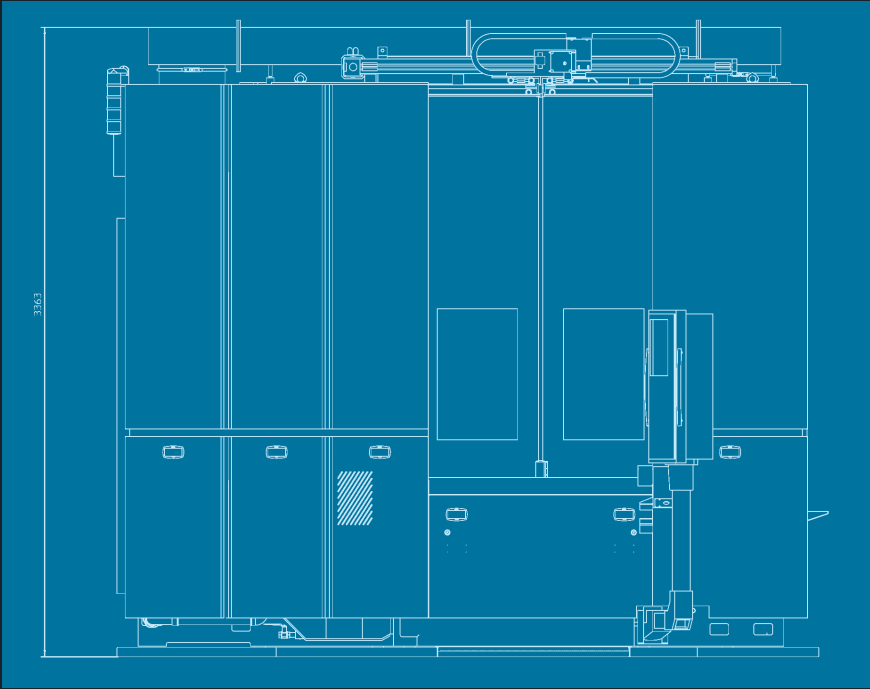
	G 60	G 80
Workpiece diameter (max.)	Ø 600 mm	Ø 850 mm
Normal module range	2 – 12 mm	5 – 20 mm
Basic angle setting range	±90°	
Offset above and below center	±100 mm	
Spiral angle to be ground (in tooth center)	0° – 60°	Depends on configuration*
Seating diameter: Oerlikon inner cone no. 80, 1:16	Ø 203.218 mm (8")	
Grinding wheel diameter	Ø 100 mm (4") – 406 mm (16")	Ø 230 mm (9") – 500 mm (20")
Grinding spindle speed (max.)	4,500 rpm	4,500 rpm
Eccentric speed (max.)	3,800 rpm	
Dresser speed (max.)	6,000 rpm	
Workpiece spindle bore hole	Ø 150 mm, L = 740 mm	
Nominal grinding wheel drive rating	22 kW	27 kW
Workpiece spindle speed (max.)	40 rpm	
Total connected load	55 kVA	60 kVA
Machine dimensions without filter system (L x W x H) , approx.	3,650 x 2,310 x 3,350 mm	3,650 x 2,530 x 3,440 mm
Machine net weight without filter system, approx.	19,500 kg	approx. 21,000 kg

* For large outer diameters, the smallest spiral angle must be checked in conjunction with the axis traversing paths.

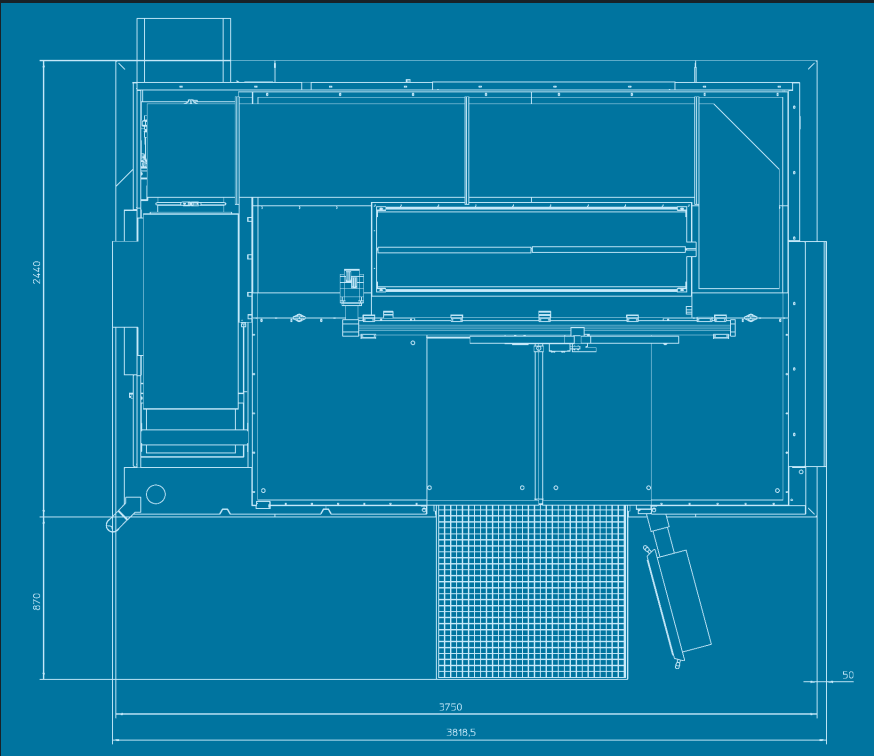
The above-mentioned maximum values were determined for industry-typical gear units. Further testing may be required to determine whether maximum values can be combined.

Installation Dimensions

G 60: Front view



G 60: Top view



KLINGELNBERG Service

The Klingelberg Group is a world leader in the development and manufacture of machines for bevel gear and cylindrical gear production, precision measuring centers for gearing and axially symmetrical components, as well as customized high-precision gear components. Alongside its headquarters in Zurich, Switzerland, development and production facilities are located in Hueckeswagen and Ettlingen, Germany, and in Gyoer, Hungary.

The company also maintains a presence with Sales and Service offices and numerous marketing agents around the globe. On this basis, Klingelberg effectively offers users a comprehensive range of services for all aspects of gear design, manufacturing, and quality inspection. The spectrum includes technical consulting, on-site machine acceptance, operator and software training as well as maintenance contracts.

KLINGELNBERG Solutions

Klingelberg solutions are used in the automotive, commercial vehicle, and aviation industries, as well as in shipbuilding, the wind power industry, and the general gearbox manufacturing industry. With numerous R&D engineers around the globe and over 100 patent grants, the company consistently demonstrates its capacity for innovation.

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