



HÖFLER

HF 2500–8000

CYLINDRICAL GEAR TECHNOLOGY – CUTTING MACHINES



KLINGELNBERG

Innovative Cylindrical Gear Machining for Flexible Requirements

All around the world, manufacturers of gears and gearboxes ensure their leading edge in gear machining with innovative, advanced technology by Klingelnberg.

The [Höfler Cylindrical Gear Technology](#) division does more than just allow users to manufacture cylindrical gears economically and with high precision. All machines have been perfectly designed to work as a system family, enabling pre-machining and finishing of even the most complex gears. And high research and development standards, a global service network, and an in-house application engineering service ensure a leadership position – now and in the years to come – thanks to our decades-long expertise and high innovation capacity.

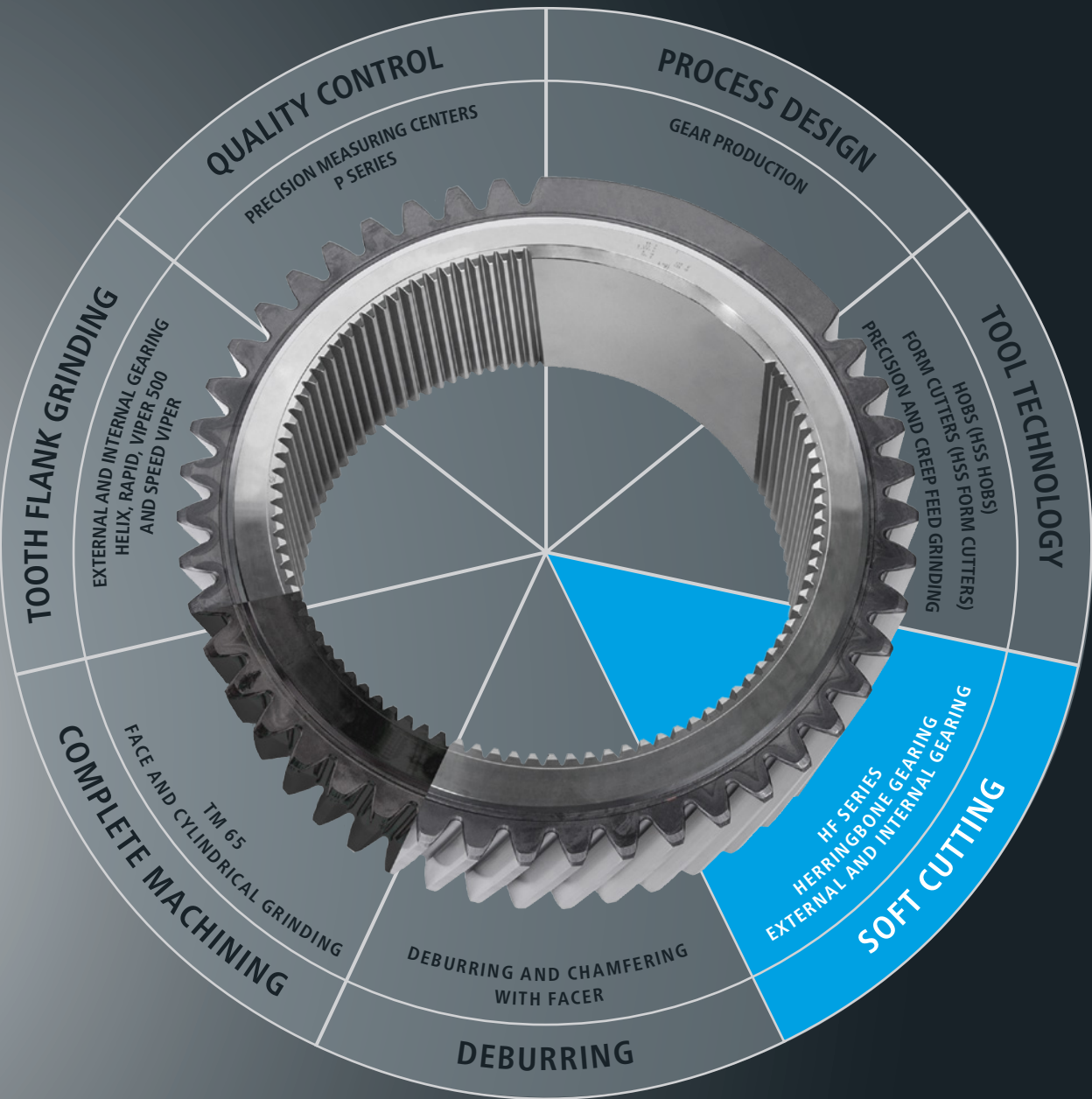
Klingelnberg offers the most advanced technology and the most efficient machines for each and every step in the cylindrical gear process chain: [process design](#), [cutting](#), [measuring](#), [deburring](#), [grinding](#) and [quality control](#). A key factor in the successful completion of each work step is the [Gear Production software](#), providing optimal process control and extreme ease-of-operation to guarantee maximum efficiency in the daily production routine.

Höfler cylindrical gear machines are developed with real-world applications in mind and satisfy a whole host of different industry requirements. Customers include contract gear manufacturers and gearbox manufacturers from the aviation, automotive, mining, construction, industrial gearbox, and wind power industries, among others.



Höfler cylindrical gear hobbing machine HF 6000 for external gears with a diameter of up to 6,000 mm

Exceptional Concepts for
Every Step in the Gearing Process

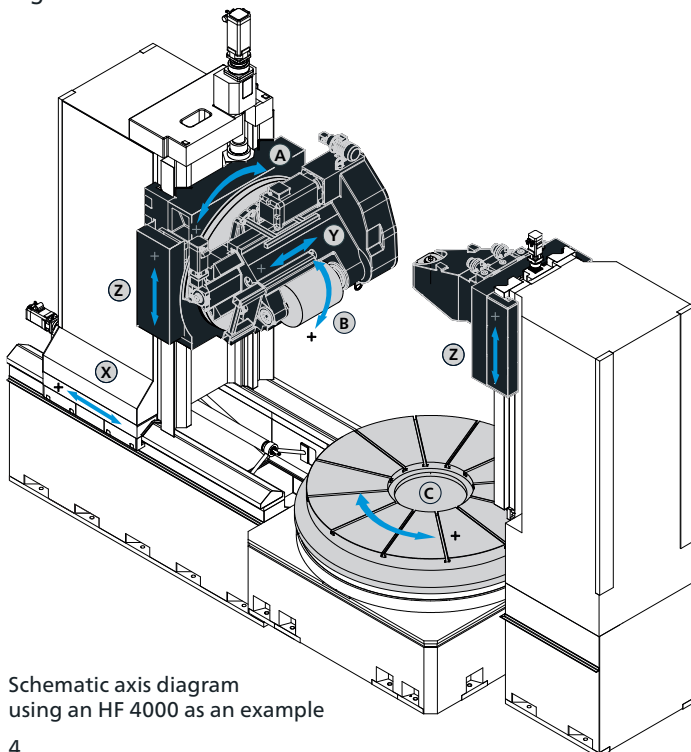


A Technological Advantage Through Power and Reliability

The cutting machines of the HF series for **large workpieces up to a diameter of 8,000 mm** have become firmly established in the market due to their stable and solid construction. The machine series is completely suitable for environmentally friendly dry cutting and can also be provided with wet cutter equipment if desired.

All cutting machines in the HF series have ideal damping properties between the moving housings or slides and the machine bed. The generously dimensioned, precision-ground, and pre-tensioned sliding guides in a V design on all NC axes reliably intercept stimulations from the cyclical cutting forces so that the HF range can be equipped with large tools that have multiple cutting edges and are thus very effective. This allows very short cutting times with large chip sections.

The machine tables with fully hydrostatic bearings, developed and assembled in-house, are driven by a powerful, wear-free torque motor that ensures a quiet and precise synchronism. At the same time, they insure with a fast and very precise positioning movement as well as an automatic inertia compensation every time the workpiece type is changed. This produces even cutting results, low tool wear, and reproducible measuring results.



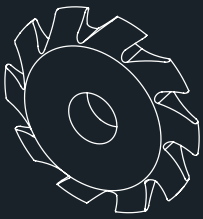
Schematic axis diagram using an HF 4000 as an example

- Environmentally friendly dry cutting as a machine standard
- Solid construction with double V guides on all NC axes
- Very short cutting times with large chip sections, in conjunction with effective tool systems
- Machine table drive with wear-free, powerful torque motor
- Automatic table drive optimization without the user intervening at each workpiece change
- Very short set-up times and cutting technology for economical processes
- Even cutting results, low tool wear, and reproducible measuring results

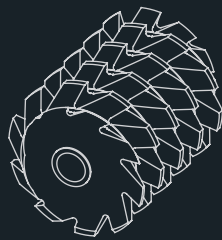
CNC Axes

- A Cutting head swivel angle
- B Cutting spindle axis
- C Rotary table axis
- X Cutting slide axis
- Y Tangential shift axis
- Z Axial stroke axis

The Perfect Machine Configuration for Every Requirement



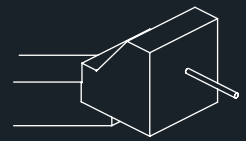
Profile Cutting



Hobbing



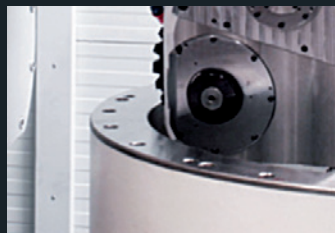
Multi-Wheel Cutting



Integrated Measurement



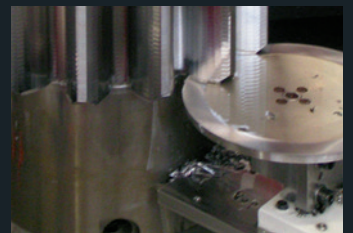
External Gearing



Internal Gearing*



Herringbone Gearing



Deburring

HIGHLIGHTS

Efficient and Time-Saving Production of Gears Through the Innovative Use of Different Tool Concepts

The example of an HF 4000 with integrated five-axis machining system for double helical or herringbone gears illustrates the enormous time savings.

Processing steps:

1. Rough cutting with a standardized disk type gashing tool to remove as much material as possible
2. Secondary roughing process with a cylindrical standard hob or finger mill to produce the tooth form over the entire gear width
3. Machining of the tooth root with a ball end mill
4. Machining of the final tooth geometry of the double helical gear with a standard carbide milling cutter using a finger mill process

Result:

All machining steps are produced on a combined gashing hobbing and milling machine in one part loading with only a single data input is required to complete the entire part. As a result of these combined intelligent methods, the machining is reduced by more than **50 %** in relation to existing and conventional methods.



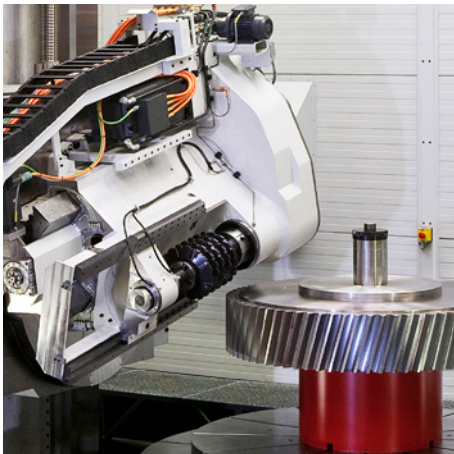
High-tech can be so easy!

“Simplified with Passion” – true to this motto, Klingelberg is driven to provide simple, unconventional solutions to high-tech challenges. A team of engineers and technical experts makes it possible – continually striving to ensure the highest technological standards in application-matched machine concepts while maintaining ease of use.

Case in point: The grinding machines of the HF series are based on established design concepts that are continually under-going further development. Klingelberg’s success factors include:

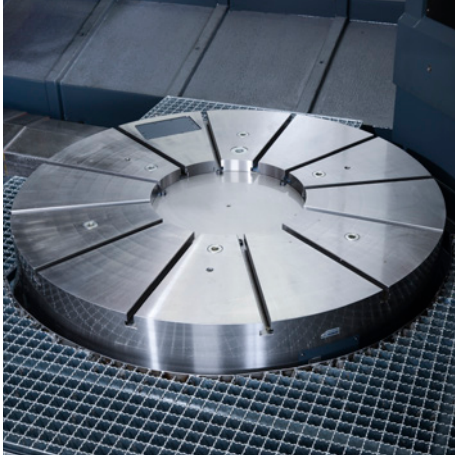
- High productivity with the lowest possible per-piece costs and maximum process safety
- Comprehensive service with a broad service network
- Outstanding technical expertise, which Klingelberg passes on to its customers in professional seminars

Höfler cylindrical gear hobbing machine HF 4000 for external gears with a diameter of up to 4,000 mm



Dry Cutting as an Environmentally Friendly Standard

- Optimum chip clearance through vertical chip flow directly into the chip conveyor
- Cooling lubricant savings
- High cutting speeds with carbide tool machining in comparison to conventional tools
- Low tool wear and high investment security
- Improvement of occupational safety and environmental protection in comparison to wet cutting



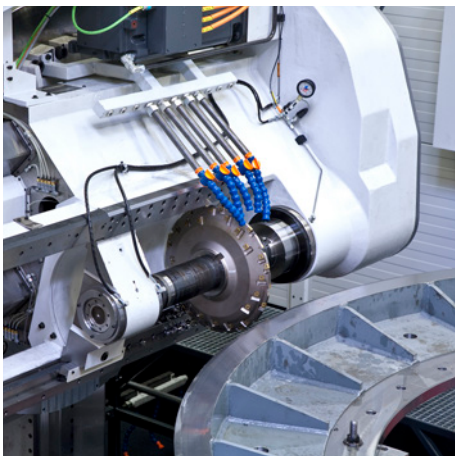
Precise Machine Table Control via Torque Motor Drive

- High engine torque of up to 50 rpm reduces alignment and section times and facilitates the external cylindrical grinding of gear wheels
- Automatic table drive optimization during mass moment of inertia changes, without any user intervention
- Wear-free torque motor ensures high investment security
- Fast, maintenance-free, high-precision



State-of-the-Art Technologies with Finger Mill for Herringbone Gears (Optional)

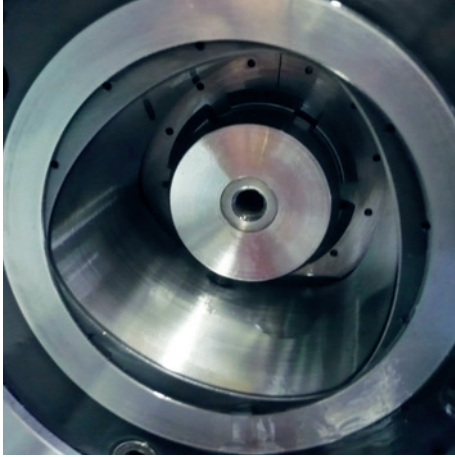
- For double helical components with small or no gaps between the gearings
- Machine-integrated operating unit
- Ideal for workpieces with taper problems
- Slot cutting with low taper possible
- Different process and tool combinations for maximum productivity and flexibility while simultaneously conserving the finishing tools



Wet and Dry Cutting for Maximum Flexibility

- Use of the best method for the respective individual application case
- Increased flexibility of the machine
- Fast change-over of the machine
- Use of all tool types possible
- Complete utilization of the machine stability with environmentally friendly dry method

HIGHLIGHTS



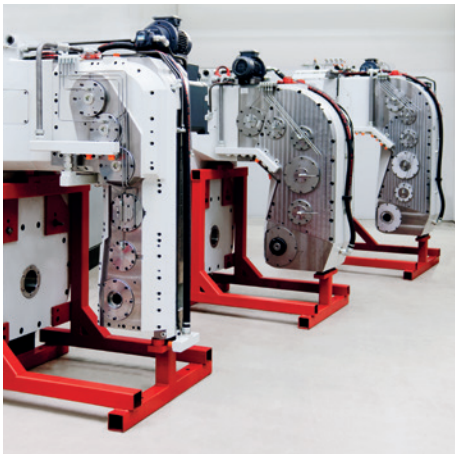
Sturdy Mounting of the Cutting Spindle for Optimum Force Transmission

- Torsionally rigid and series-tested Capto® C10 spindle holder (HF 2500–4000)/steep taper holder SK 60 (HF 6000–HF 8000)
- Ideal dimensionally stable force transmission
- Optimum maintenance of the radial and axial tool position even with high torques or strong heat
- Hydraulic tool clamping for safe, fast and convenient changing of the cutting spindle



Intelligent Production Process for Maximum Efficiency

- Optimally structured process sequences for effective operator guidance
- Maximum torques for optimum utilization of the latest indexable insert tools
- Short downtimes and retooling times
- High productivity and precise production
- Low-maintenance



Internal Cutting Heads for Maximum Flexibility (Optional)

- Expansion of the range of applications for internal gearings
- Different internal cutting arms depending on the required power and workpiece size
- Generously over designed gear drive for heavy use
- Very high stability

Numerous Performance Profiles and Custom Options Provide Greater Flexibility in the Cutting Process

Standard Performance Profiles

- Form cutting
- Various pitch strategies
- Multiple gearing
- Radial/axial cutting
- Centering software
- 1, 2 and 3-cut cycle
- Process display (whole, section)
- Restart wizard
- Enter and exit generation
- Various shift strategies, synchronous shifting
- Dimensional adjustment, flank dimension, ball dimension
- Conical cutting/ball-shaped cutting
- Digressive/progressive feed
- Recess milling

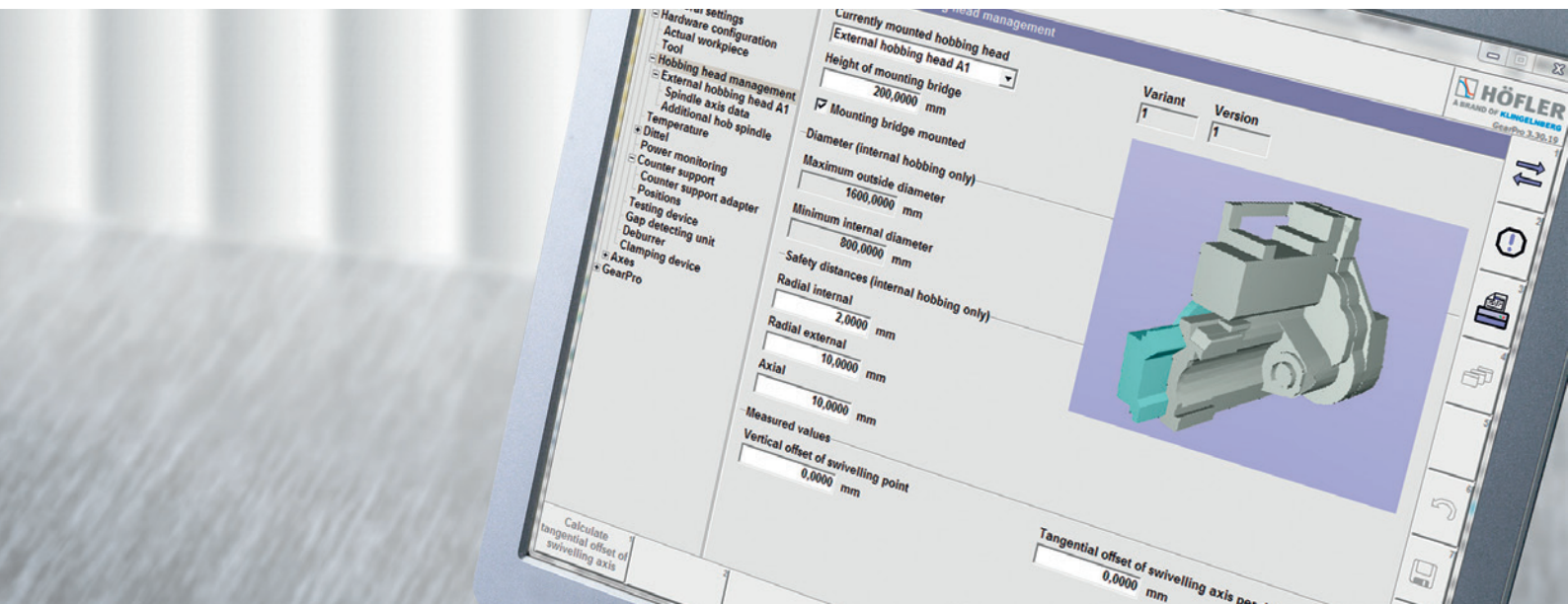
Optional Performance Profiles

- Diagonal cutting
- Tangential cutting of worm wheels
- Fly cutting of worm wheels
- Cutting of double helical toothing
- Chamfer cut
- "Facer" chamfering unit
- Finger milling
- Internal cutting
- Measuring

Further options on request



USER-FRIENDLY SOFTWARE CONCEPT



Real Productivity Gains with Gear Production Software

Höfler cylindrical gear cutting machines do not just stand apart due to their reliable, advanced hardware. The company's own Gear Production software also guarantees convenient machining and ensures maximum efficiency in daily use.

Only Gear Production delivers concentrated knowledge of state-of-the-art machining strategies and process sequences right to the user's hands.

And with its numerous options, the software plays an active role in achieving productivity gains. Software modules with individual components, diagonal cutting, herringbone gearing machining and "Facer" were developed that, together with the extremely powerful hardware, can considerably reduce production times without dispensing with individual flexibility.

Pre-analysis/Job Engineering:

- Exact process time calculation with original machine data
- 3D analysis of the planned process steps with respect to working range and possible interference contours
- Pre-analysis of the tool wear
- Optimum utilization of the tool areas

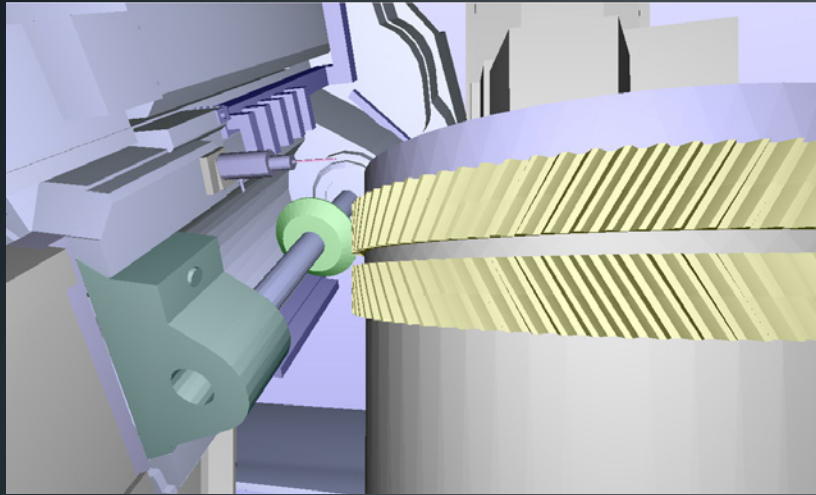
Data Input/Navigation:

- Easy navigation through clearly structured interface areas
- Clear data management similar to Microsoft® Windows®
- Intuitive data input via graphical display
- Clear operator guidance with an automatically generated list of process steps
- Various technology wizards for a range of tried-and-tested process variants

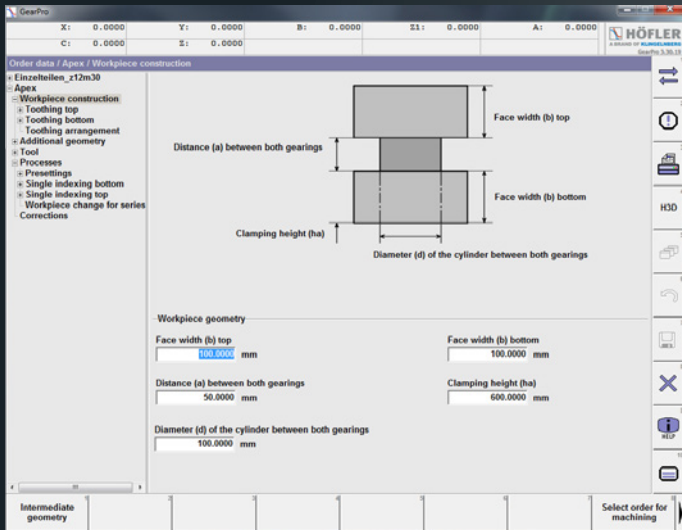
Automatic Archiving:

- Inspection charts of the finished part

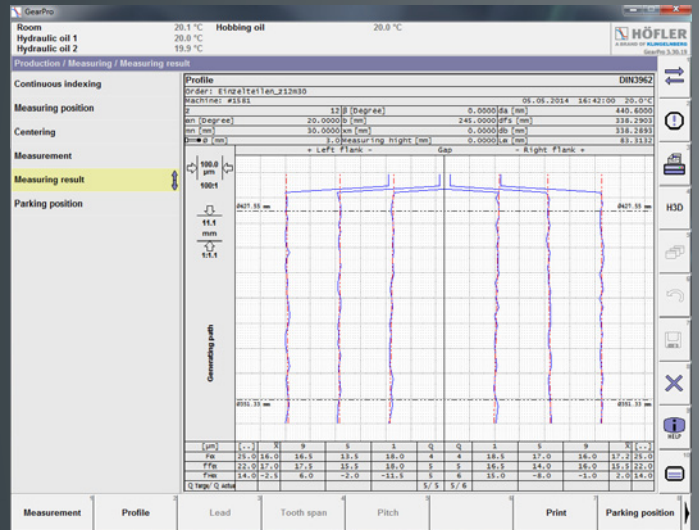
Maximum Process Efficiency with Gear Production Software



3D display of the Gear Production internal machine model



Input of workpiece data



Graphic representation of the measuring result

Optimal Jobbing Performance – A Sure Thing Thanks to Drive Components with Guaranteed Quality

With the cylindrical gear cutting machines from the HF series and the internal gearing options, Klingelnberg has developed a modular technology platform that gives contract gear manufacturers in particular a leg up against the competition with maximum process efficiency and unparalleled production quality.

Like no other company, Klingelnberg stands for intelligent solution concepts for just about every requirement. Thanks to a unique interplay between technology and software, machining jobs are made significantly easier – allowing for high productivity in mass production while also providing tremendous flexibility in small-batch applications.

With its one-of-a-kind machine concept, the HF series provides levels of stability, reliability, and efficiency that are indispensable for contract gear manufacturers and gearbox manufacturers worldwide.



Industrial Gear Units



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



Mining/Material Handling

Gear components used in material handling technology must withstand extremely challenging environmental conditions and service conditions. When used in belt drives, such as those used in coal production, strong temperature fluctuations and vibrations are the order of the day. Moreover, the cylindrical gears used in these gearboxes are subjected to intermittent, abrupt loads. Robustness and adequate load-bearing capacity are thus paramount requirements for these gear components.

Contract Gear Manufacturers



Contract gear manufacturers in particular have to be able to react flexibly to market conditions on a daily basis and produce a whole host of different gear components. From standard solutions to high-tech applications – Klingelberg offers its customers tailor-made machine designs. These are supplemented by comprehensive engineering and other services, including everything from in-house machine certification at Klingelberg, to machine-attendant and software training, right through to production support.

Mill Gears



Employed primarily in the cement industry and in coal-fired power plants, vertical mills are used to grind lime stone, clinker brick, and coal. The cylindrical gears used in these grinding processes are not only subjected to tremendous impact loads and environmental loads, they must also exhibit a high degree of efficiency in order to reliably ensure a continuous power transmission.

Wind Power



Wind power applications contain a wide variety of gear drives for various tasks: part-turn actuators for adjusting the machine housing, drives for adjusting the rotor blades, gearboxes for adjusting the rotor speed to the generator speed. In order to be able to manufacture this variety of toothed gears in a highly productive way, the market requires machines that can optimally utilize the potential of modern carbide tools.

Maritime Propulsion Technology



The cylindrical gears used in shipbuilding must demonstrate great reliability and durability even under the most extreme external conditions. The wide range of component diameters requires extensive expertise for controlling the production process. Klingelberg's many years of experience and its certification by all major classification societies are the customer's guarantee for utmost product quality.

TECHNICAL DATA

	HF 2500	HF 3000	HF 4000
Workpiece diameter (max.)	Ø 2,500 mm	Ø 3,000 mm	Ø 4,000 (4,500*) mm
Axial distance between the workpiece and the cutter axis (min. – max.)	250 – 1,600 mm	250 – 1,850 mm	530 – 2,350 (2,600*) mm
Axial slide distance over table (max.)	1,760 mm		
Cutting head position over table (min.)	350 mm		
Vertical counter support distance over table (min. – max.)	940 – 2,440 mm		
Tangential tool shift distance (max.)	600 mm		
Cutting head swiveling angle (max.)	±45°		
Hob diameter (max.)	Ø 500 mm		
Hob length (max.)	600 mm		
Table diameter	Ø 1,850 mm		Ø 2,350 mm
Table hole (diameter x depth)	Ø 750 x 1,300 mm		
Table rotation speed (max.)	50 rpm		36 rpm
Cutting spindle power	52 kW		
Table load (max.)	20,000 kg		45,000 kg
Machine dimensions (L x W x H) incl. all standard components	approx. 11,200 x 9,000 x 6,100 mm		approx. 11,200 x 10,470 x 6,100 mm
Net weight	approx. 80,000 kg***		approx. 90,000 kg***
Combinable optional internal cutting head*	F2/F3**		

OPTIONAL INTERNAL CUTTING HEADS	F1	F2	F3
Tip circle diameter at 0° (min.)	Ø 800 mm	Ø 800 mm	Ø 500 mm
Insertion depth at 0° (max.)	800 mm	600 mm	500 mm
Cutting head swiveling angle (max.)	±28°	±28°	
Hob diameter (min.)	Ø 500 mm	Ø 500 mm	Ø 460 mm
Hob width	124 mm	124 mm	75 mm
Cutting spindle power (max.)	52 kW	52 kW	37 kW

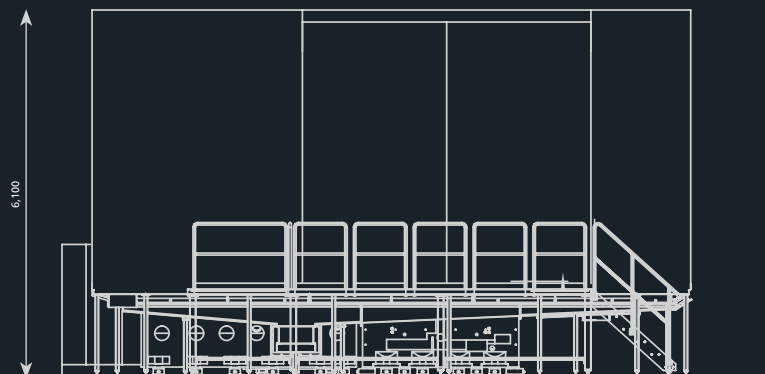
HF 6000	HF 8000
Ø 6,000 mm	Ø 8,000 mm
250 – 3,350 mm	350 – 4,350 mm
1,500 (2,000*) mm	
1,100 – 2,600 (3.100*) mm	
Ø 2,600 mm	Ø 3,200 mm
Ø 750 x 1,150 mm	
20 rpm	10 rpm
100,000 kg	130,000 kg
approx. 16,200 x 15,500 x 8,000 mm	approx. 18,200 x 10,300 x 7,400 mm
approx. 165,000 kg***	approx. 195,000 kg***
F1	

- * Available at an extra charge
- ** Long axial slide distance recommended
- *** Depending on the versions

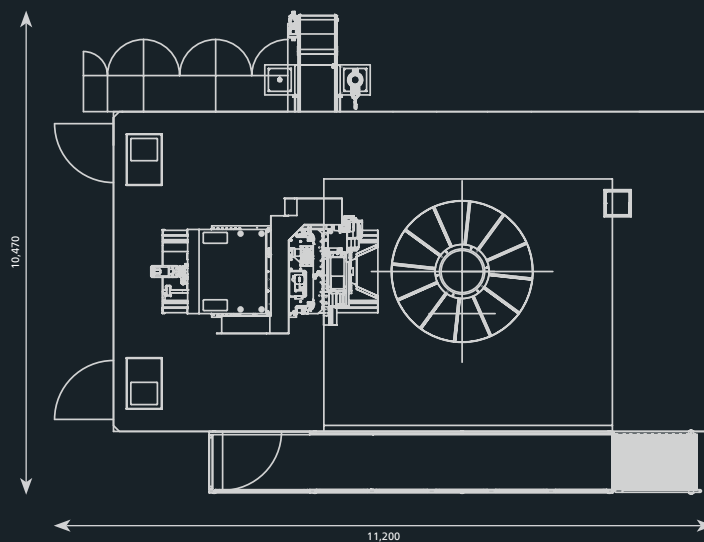
Subject to change without notice

Space Requirements and Installation Dimensions

HF 4000: Front View



HF 4000: 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, 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 Győr, Hungary.

The company also maintains a presence with Sales and Service offices and numerous marketing agents around the globe. On this basis, Klingelberg 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 can be found 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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