



**HÖFLER**

**R 300** THE GEAR NOISE FINDER

CYLINDRICAL GEAR TECHNOLOGY – ROLL TESTING MACHINES

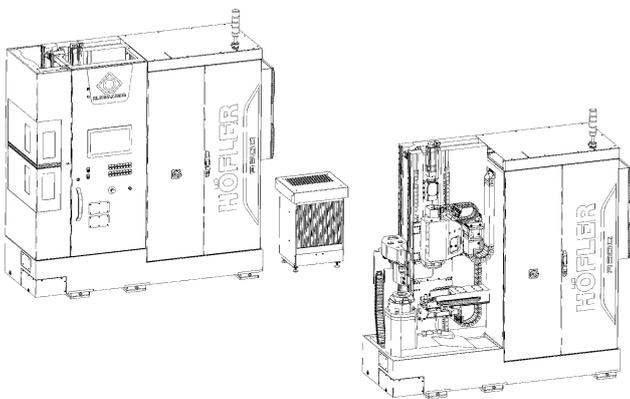


**KLINGELNBERG**

### Maximum Productivity and Flexibility in Quality Control

Productivity and flexibility are key for every production process. Quality control, by contrast, is seen as a "necessary evil" or a "non-added value". The fact is that quality control does not directly help to improve product quality. But without it, a quality product will likely be impossible to manufacture. To avoid the need for a specific test machine for every test parameter, and to keep quality control costs from exceeding the actual value-added costs in the production process, flexibility is of prime importance. In this regard, it makes sense to define productivity and flexibility as requirements in the specifications for a test machine. And this is exactly what we did when developing the Höfler roll testing machine R 300.

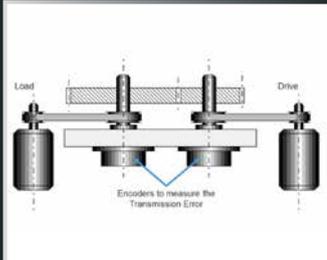
The R 300 roll testing machine provides one-hundred-percent quality control of cylindrical gears. For gears, the main quality control methods are 3D coordinate measurement and roll testing. Whereas the 3D coordinate measurement measures the geometrical accuracy of the gearing, the roll test analyzes the functional properties of the gearing. Compared with the 3D coordinate measurement, the advantage of the roll test is that it allows multiple different components to be tested at the same time. Consequently, the component-related test costs are minimized. The R 300 can be configured with different roll testing slides, making all common roll testing methods available to the customer. Thanks to this flexibility, the R 300 can be optimally configured to suit the relevant quality control requirements.



HÖFLER Roll Testing Machine R 300 schematics

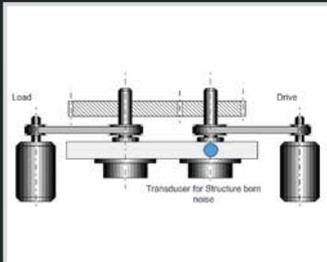
- Compact design with minimal footprint
- Optimal damping thanks to mineral-cast bed
- Workpiece spectrum similar to Speed Viper series
- One test machine for gear and shaft components
- Available roll testing methods: single flank test, structure-borne noise and torsional acceleration test and double-flank roll test
- Direct drives in spindles and test slides
- Test speeds up to 2,000 rpm
- Machine can be used in the Gear-Lab as well as on the shop floor

# Available Roll Testing Methods



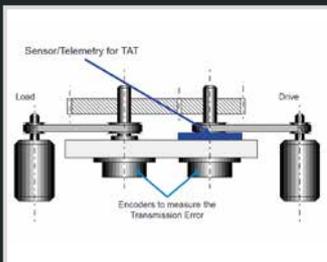
## Single Flank Test (SFT)

Rolling in single-flank contact as installed in the transmission and measurement of transmission ratio fluctuation. Correlates with cumulative pitch error and mesh harmonics in gear noise. Higher harmonics and ghost orders can also be detected at the corresponding amplitude.



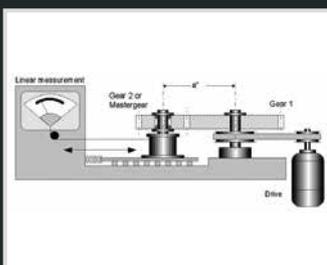
## Structure-Borne Noise Test (SBNT)

Rolling in single-flank contact as installed in the transmission and measurement of structure-borne noise excitation. Correlates with mesh harmonics, higher harmonics, and ghost orders in gear noise.



## Torsional Acceleration Test (TAT)

Rolling in single-flank contact as installed in the transmission and measurement of angular acceleration as a dimension for noise excitation. Correlates with mesh harmonics, higher harmonics, and ghost orders in gear noise.



## Double-Flank Test (DFT)

Rolling in double flank contact. Correlates with concentricity and enables allowance monitoring.

## HIGHLIGHTS



HÖFLER Roll Testing Machine R 300

### Leading-Edge Technology for Optimal Flexibility and Productivity

Only with a flexible test machine can the many quality control requirements for gears be met. The Höfler roll testing machine R 300 is the optimal solution for this purpose. Thanks to its generous axis traversing paths, the R 300 enables roll tests to be performed on the entire component spectrum of the Speed Viper cylindrical gear generating grinding machines. The R 300 is designed for all roll testing processes that are relevant for evaluating the running behavior and noise behavior of gears. These include the single-flank test, the structure-borne noise test and torsional acceleration test, and the double-flank test.



### Modular Machine Design

- Ideal for testing the component spectrum of the Speed Viper series
- Same base machine for gear and shaft components
- Counter support for shaft testing (optional)
- Test slide with fixed installation height or optional manual or automatic height adjustment



### Fast Changeover

- Flexible, easy adjustment of the center distances via HMI input (Human Machine Interface)
- Automatic height adjustment of test slide (optional)
- Easy master gear change via hydraulic clamping mandrel
- Interchangeable workpiece base clamping units, choice of hydraulic or mechanical clamping equipment
- Counter support with electric basic setting and pneumatic clamping



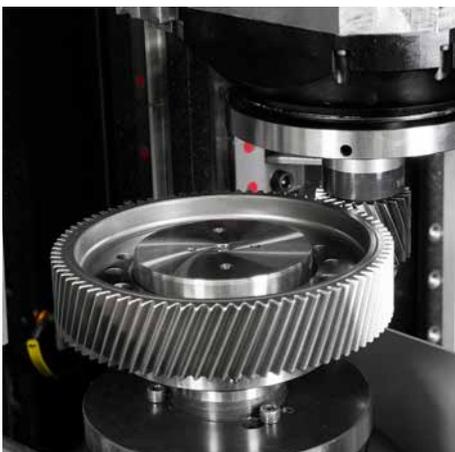
## Flexible Setting Options for Test Parameters

- Center distance for single flank test can be set in line with as-installed position in the transmission
- Variable test force setting in double-flank test for maximum sensitivity thanks to linear drive technology
- Workpiece speed up to 2,000 rpm for fast test times and optimal excitation of the structure-borne noise and angular acceleration sensors
- Counter support with variable clamping force setting, particularly for slim shafts



## User-Friendly Operating Concept

- Safe basic operation through hardware switches, e.g., workpiece clamping/releasing, manual traversing of test slides, etc.
- Innovative touchscreen technology with intuitive graphical user interface
- Clear operator guidance thanks to process-oriented menu structure
- Menu navigation is ultra-easy and requires minimal training thanks to process-based HMI structure
- Production dashboard provides an at-a-glance display of the most important test results for a selectable time window



## Maximum Precision and Accuracy

- High-precision angular measurement systems and 12.4 GHz scan rate for maximum-accuracy measured data acquisition in the single flank test
- Highly sensitive acceleration sensors and 50 kHz scan rate for high-resolution structure-borne noise and angular acceleration measurement
- High-precision Heidenhain linear scales for maximum-accuracy measured data acquisition in the double-flank test
- High-precision linear guides to ensure high mechanical accuracy and reproducibility

## Process Reliability Thanks to a Modern, Intuitive User Interface

Motivated employees are a prerequisite for high quality standards in production. The software is the interface to the operator and has a tremendous impact on an operator's motivation and acceptance of a machine. A major focus when developing the HMI (Human Machine Interface) for the R 300 roll testing machine was the creation of a process-oriented menu structure. As with all Klingelnberg production machines, the following main menu bars are located at the uppermost operating level: „Dashboard, Data, Setup, Process, Production, Service and Info“. The appropriate language can also be selected at any time from a selection dialog – an added plus for bilingual trainings in particular.

Selecting the „Process“ menu bar followed by the „Test Sequence“ menu command provides a clear overview of the individual test steps performed within a test cycle (see Figure 1). From this menu, the operator can directly access the „Parameters“ and „Tolerances“ configuration menus.

Whereas the rolling test focuses primarily on the test parameters of speed, torque, direction of rotation and number of test revolutions as compared to gear grinding, the level of complexity increases significantly when tolerancing the test results. To make the input process easier for the operator, only the characteristic values for which a tolerance must be set are displayed following a preselection. The limiting values for the workpiece and tooth-mesh orders can be defined here. Tolerances for sidebands can also be easily added to the tooth-mesh orders (see Figure 2).

For graphical control of the tolerance entries, a view of the tolerance order spectrum is also available to the operator (see Figure 3).

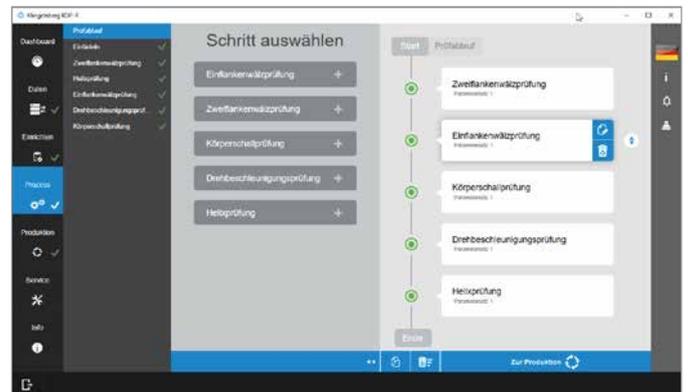


Fig. 1: Testing Sequence / Flow Chart of Testing Steps

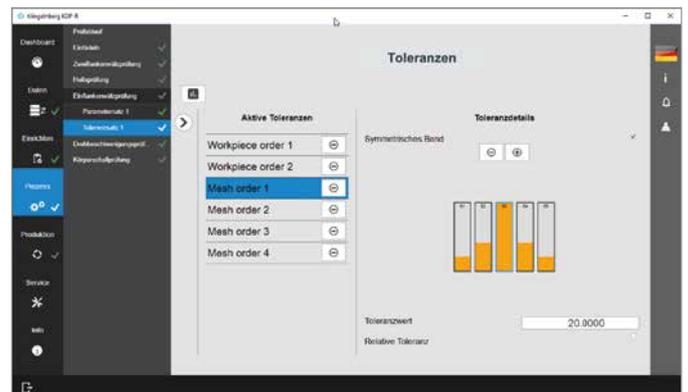


Fig. 2: Tolerance Setting Menu

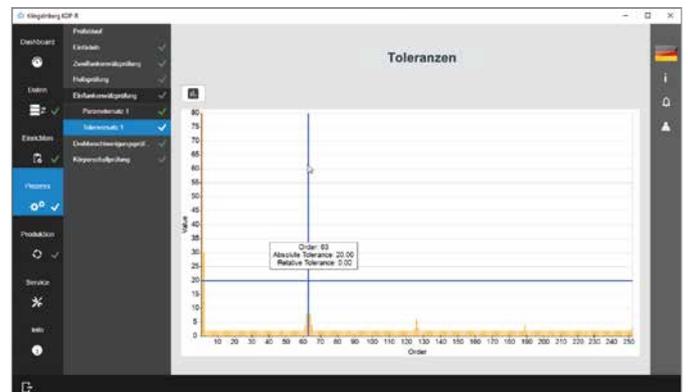
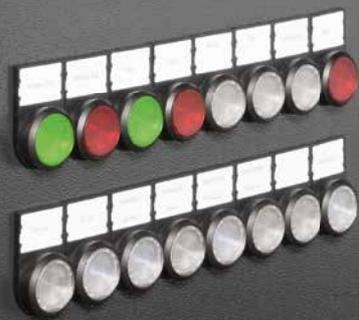


Fig. 3: Tolerance Order Spectra

## Production Dashboard – All Process Data Clearly in Focus

- Production dashboard provides a quick overview of production figures
- Customize dashboard chart colors from a palette of fifteen free selectable colors
- Good/reject statistics per component type
- Good/reject statistics per production period



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### Speed Viper and R 300 – The Ideal Combination for 100% Quality Testing with Optional Partial or Full Automation

The Klingelberg production cell – consisting of the Höfler cylindrical gear grinding machine Speed Viper, the CompactLoader and the integrated Höfler cylindrical gear roll testing machine R 300 – is ideally suited for this purpose. The production cell can be equipped with all machine models in the Speed Viper series – from the Speed Viper 80<sup>2</sup> (dual spindle) to the Speed Viper 300. The Klingelberg production cell is the solution for the manufacture and 100% quality testing of high-precision gears for the electric drive train.



Klingelberg production cell, consisting of the Speed Viper, CompactLoader and R 300

## Flexible Automation Concept for Minimal Non-Productive Time

- Production cell can be equipped with all machine models in the Speed Viper series – from the Speed Viper 80<sup>2</sup> (dual spindle) to the Speed Viper 300
- Direct workpiece spindle loading by integrated swivel loader
- Minimal auxiliary times
- Optimally coordinated interfaces and processes
- Alternatively, partial or full automation with signal interface in accordance with the VDMA standard 34180



Automation concept with KOENIG CompactLoader – alternatively any external automation possible



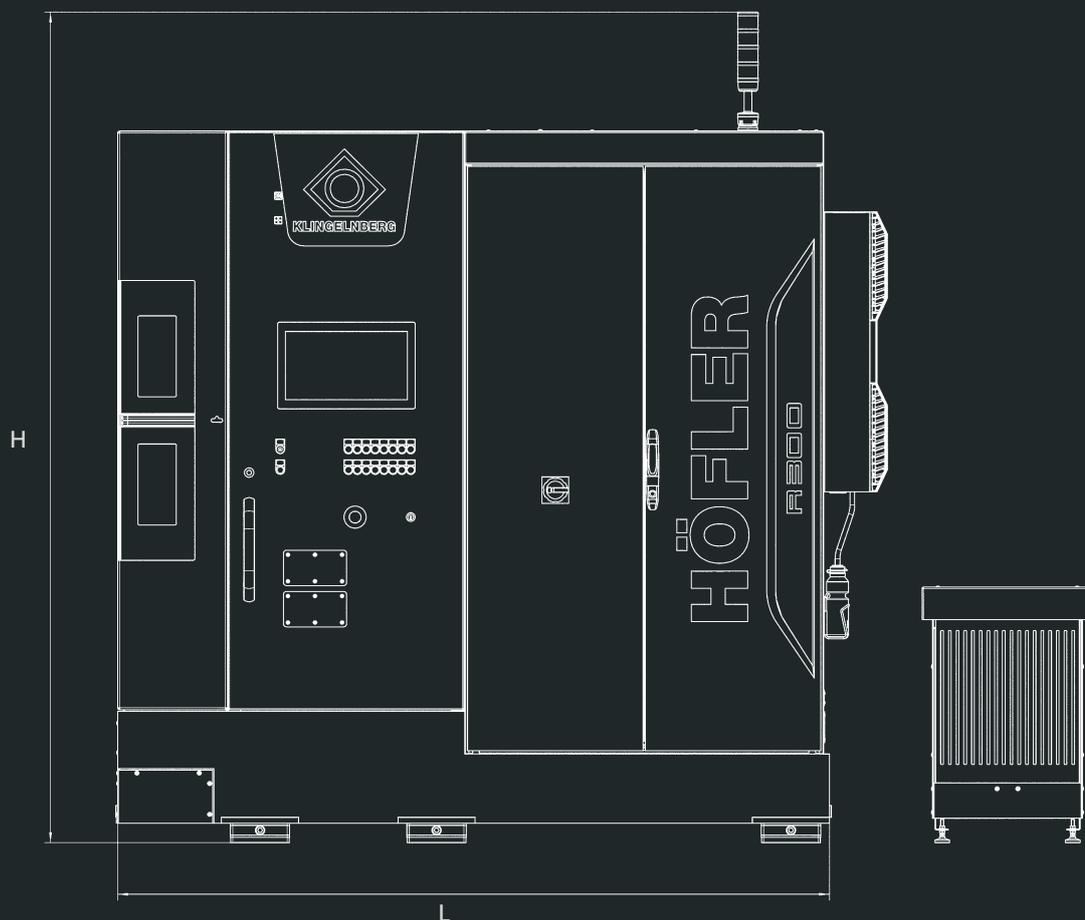
Direct workpiece spindle loading by integrated swivel loader

# TECHNICAL DATA

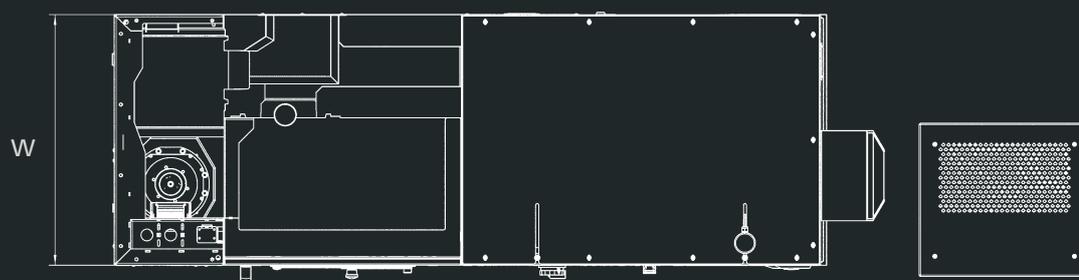
	<b>R 300</b>
Workpiece diameter (max.)	Ø 300 mm
Workpiece spindle rotation speed (max.)	2,000 rpm
Workpiece spindle torque (S1/S6 – 25%)	56 Nm / 97 Nm
Workpiece weight (max.)	50 kg
Workpiece wavelength (max.)	800 mm
Workpiece face width (max.)	150 mm
Tailstock distance between centers over table (max.)	1,090 mm
SFT/SBNT/TAT-Slide-Radial-Force (max.)	80 N
SFT/SBNT/TAT master gear spindle rotation speed (max.)	2,000 rpm
SFT/SBNT/TAT master gear spindle torque (S1/S6 – 25%)	56 Nm / 97 Nm
SFT/SBNT/TAT master gear diameter (max.)	Ø 300 mm
SFT/SBNT/TAT master gear face width (max.)	150 mm
SFT/SBNT/TAT slide center distance without tailstock (min. – max.)	-1 – 325 mm
SFT/SBNT/TAT slide center distance with tailstock (min. – max.)	145 – 325 mm
DFT master gear spindle rotation speed (max.)	150 rpm
DFT slide radial force (max.)	50 N
DFT master gear diameter (max.)	Ø 200 mm
DFT master gear face width (max.)	150 mm
DFT slide center distance without tailstock (min. – max.)	-1 – 275 mm
DFT slide center distance with tailstock (min. – max.)	80 – 275 mm
Compressed air connection	6 bar / 20 l/min
Total connected load	10 kVA
Net weight approx.	4,500 kg
Machine floor space (L x W x H) without water cooler, approx.	2,400 x 850 x 2,820 mm

# Installation Dimensions

## R 300: FRONT VIEW



## R 300: TOP VIEW



All specifications in mm

## KLINGELNBERG Service

The KLINGELNBERG Group is a world leader in the development and manufacture of machines for bevel gear and cylindrical gear production, and precision measuring centers for gearing and axially symmetrical components. In addition to the headquarters in Zurich, Switzerland, further development and production facilities are located in Hückeswagen and Ettlingen, Germany.

The company also maintains a presence with Sales and Service offices and numerous marketing agents. On this basis, Klingelberg offers users a comprehensive range of services for all aspects of toothed 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 transmission manufacturing industry. With numerous R&D engineers around the globe and over 200 registered patents, the company consistently demonstrates its capacity for innovation.

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