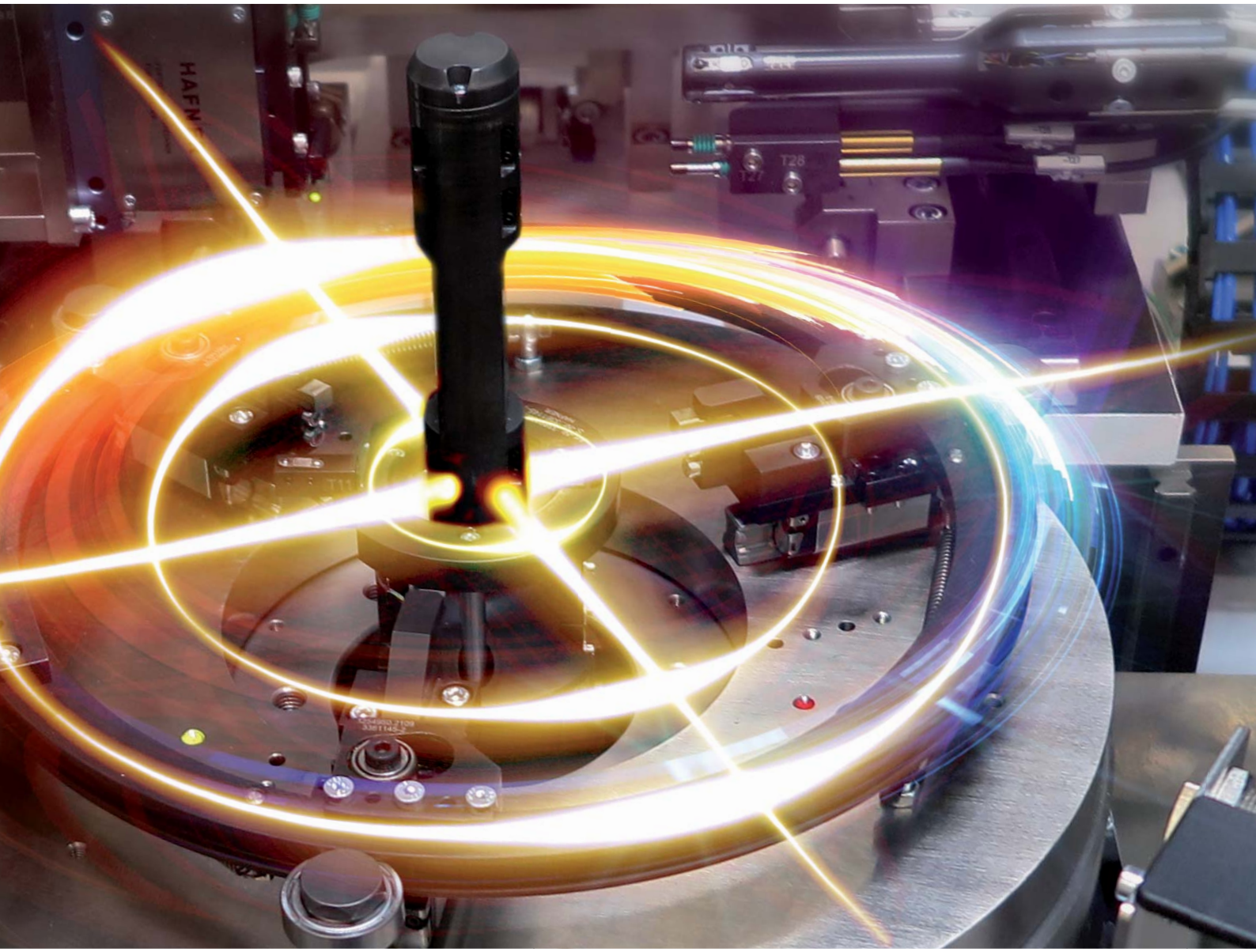
MEASURING TECHNOLOGY
FOR FIRST RATE PRODUCTION



PRECISE, FAST, FLEXIBLE, MODULAR, DIGITAL

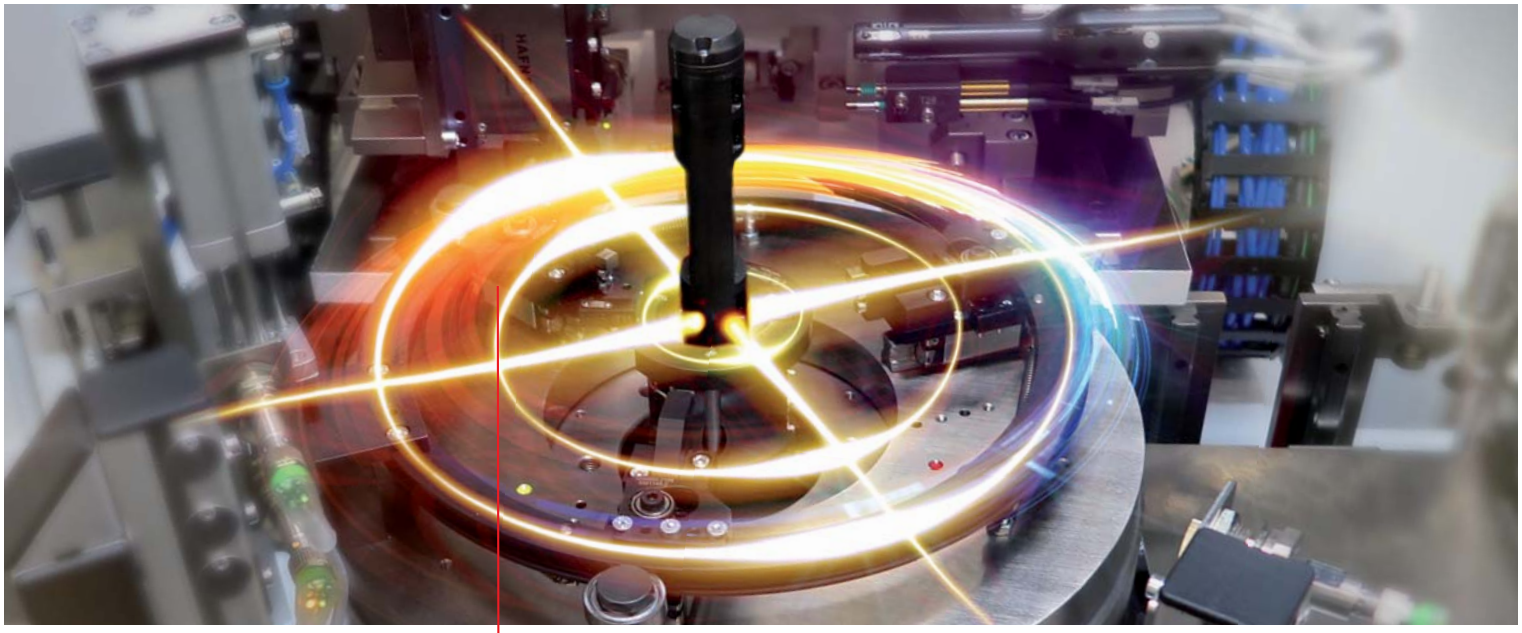
HAFNER

PRECISE

HAFNER measuring machines measure as precisely as necessary, all types of dimensional, shape and position tolerances. We develop your intelligent and compact solution:

- choosing the suitable measuring method and sensor technology for a very high measuring accuracy up to the sub-µm-range
- avoiding and eliminating external influences to ensure a reliable repeating accuracy in the long-term operation
- robust mechanical engineering and measuring technology for precise and solid measurements in the immediate manufacturing environment

HAFNER – precise, fast, flexible, modular, digital



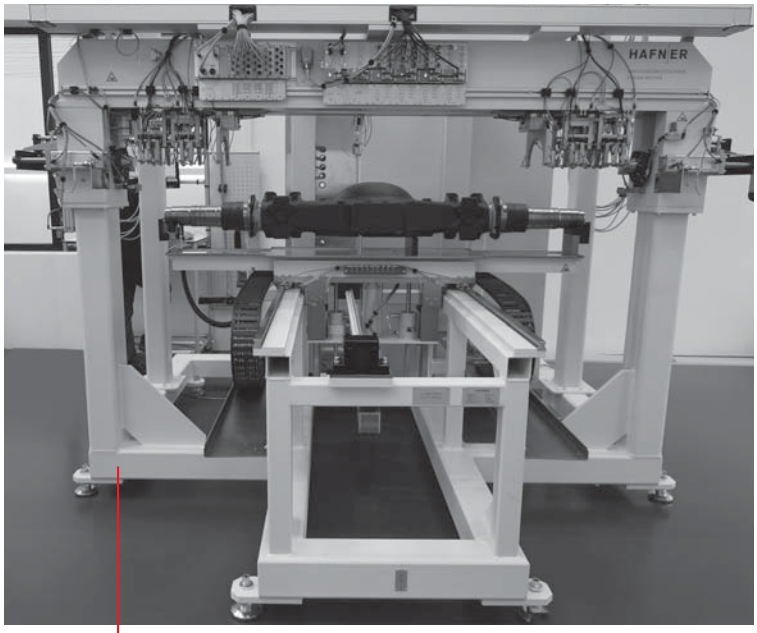
Measuring machine for 100% measurement of differential housings with multi-level test procedure for static and dynamic measuring data acquisition.

Precise can be relative

For your measuring task, we develop a machine concept that enables you to achieve the required precision by optimally combining all elements of the measuring chain. With HAFNER measuring machines, you can always measure close to production, reliably and as precisely as required.

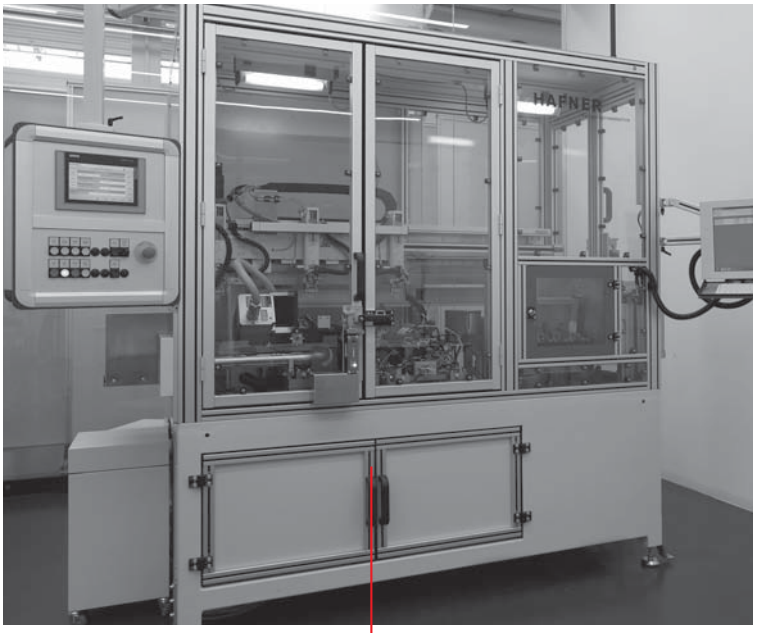
Decisive for the precision is the structure of the entire measuring chain, this is the core of our consulting and implementation expertise:

- Specific workpiece knowledge, the state of machining, evaluation of the effects of previous machining steps and optimal workpiece clamping
- Mechanical engineering - extremely stable and rigid machine construction of all components that can influence the measurement result during operation. This is starting from machine frame to the workpiece clamping and ending with the touch probe extension.
- Measuring data acquisition - selection of ideal probes, sensors, etc., which reliably enables precise, repeatable and reproducible measurements under industrial conditions
- Measuring data processing – the measured values are transmitted to the measuring computer via a coordinated signal chain, taking into account the speed of the measuring data acquisition, the number of data points and the system cycle time.



Measuring machine for post-process measurement of truck axle bridges with automatic calibration.

The length / distance measurement is reliably achieved with temperature compensation over 5 different temperature zones and a special displacement measuring system.



Measuring machine for 100% measurement and classification of turbocharger shafts.

Measurement of diameters, distances and runouts with tolerances of 5 µm, 30 seconds.

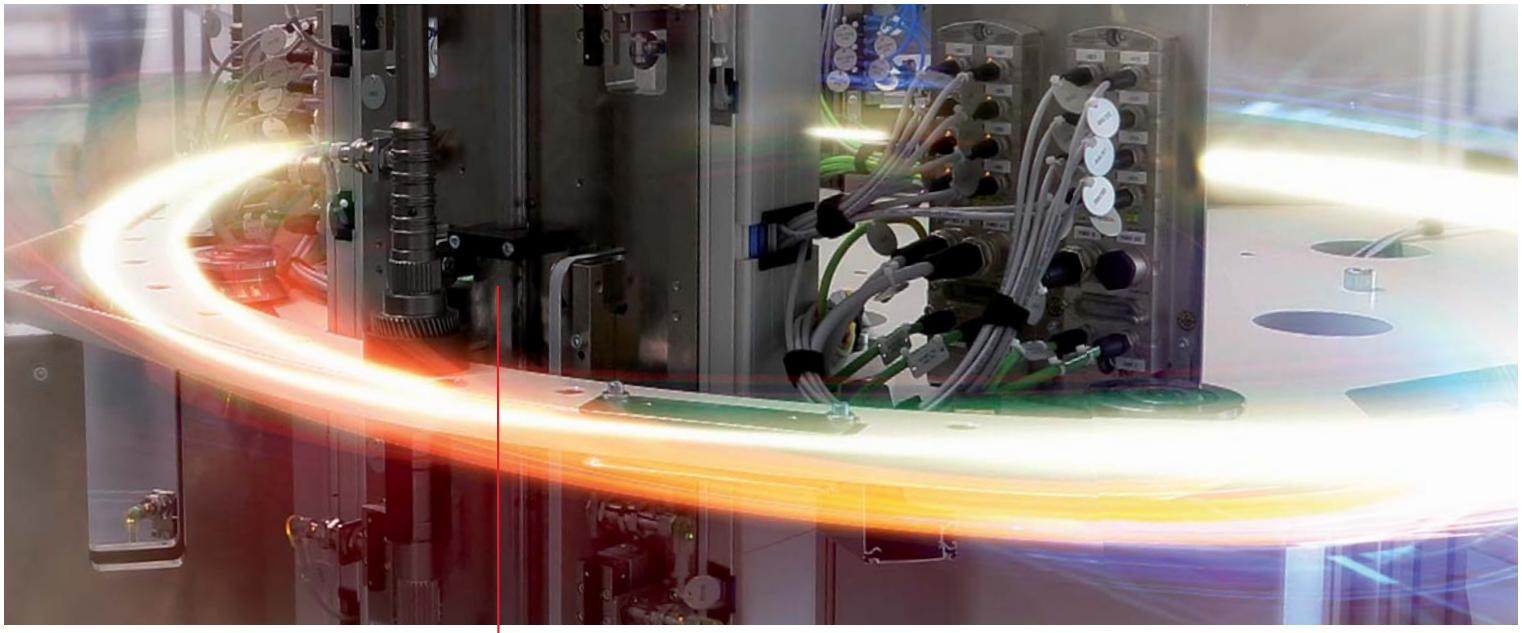
HAFNER

FAST

HAFNER measuring machines measure fast and maximize production volume applying the approach of flexible change-over or no-change-over concepts. We develop your intelligent and compact solution:

- determining the optimal cycle-time, using multi-location measuring technology and appropriate transport and handling systems
- fast systems for workpiece change; from a Poka-Yoke changing system to a highly flexible mixed operation without change-over
- systems which lead to rapid measuring data due to production-related and process-integrated measurements

HAFNER – precise, fast, flexible, modular, digital



Measuring machine for drive shafts with 100% measurement - designed as a rotary stroke system with a combined measuring station and two gauge stations. Without workpiece change over for five different drive shafts kinds, < 30 seconds.

Fast can be relative

HAFNER develops a machine concept uniting time critical factors such as cycle- and change over time in an optimal solution accordingly to your measuring task. HAFNER measuring machines for production close measuring and reliability -as fast as you require.

Your special demand in regards to cycle time are met with multi-point measuring technology and suitable handling systems:

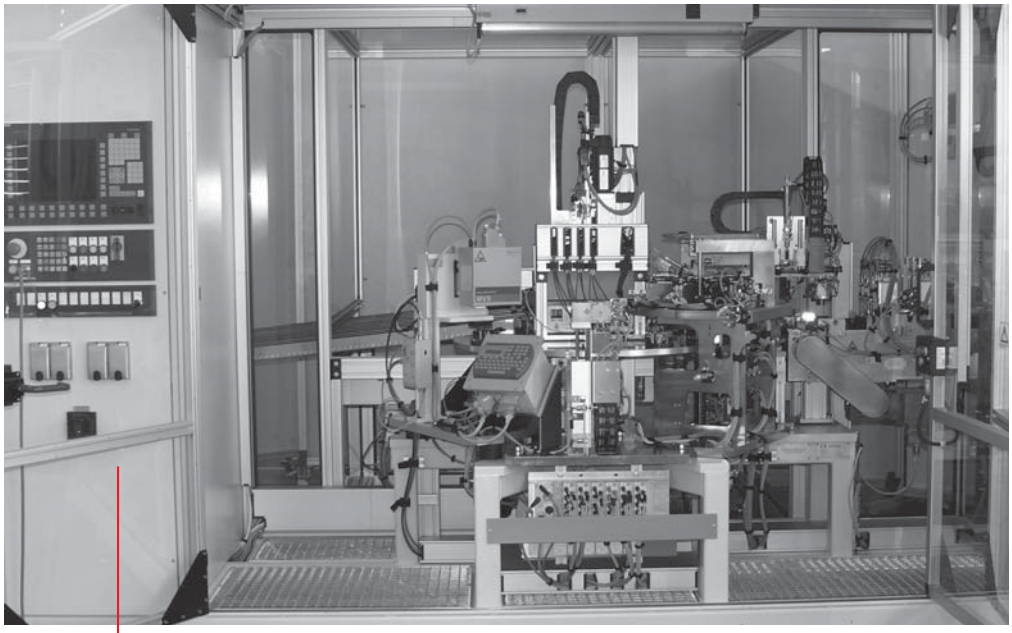
- Measuring machine for car rims in auto mode, 6 seconds
- Measuring machine for 150 different blank brake discs with automatic calibration, workpiece change and workpiece recognition in auto mode, 4.6 seconds

HAFNER measuring machines are without workpiece change over or are designed in a way minimizing effort and time being required for setting up to other workpiece types:

- Measuring machine for pistons with a reduced workpiece change over time of 80%
- Measuring machine for pinion gears without workpiece change over for a part weight range from 3 to 35kg

HAFNER measuring machines can perform time consuming and long-time related measuring tasks in a process integrated or process oriented manner:

- HAFNER POLARIS process closed scanning of rotationally symmetrical workpieces for fast process control, < 120 seconds
- Measuring machine for gears with integrated 100% inspection instead of SPC-measuring in the measuring laboratory, 10 seconds



Measuring machine for 100% measurement and classification of inner race incl. workpiece detection and workpiece marking.
Further increase of production quantity by parallel operation of two workpiece types - without workpiece change over, 6 seconds.

Measuring machine for 100% measurement of diameters, lengths, shapes, runouts and direction tolerances as well as waviness and equal thickness on brake disks, without workpiece change over for up to 500 workpiece kinds. 50 measurement characteristics, < 100 seconds.

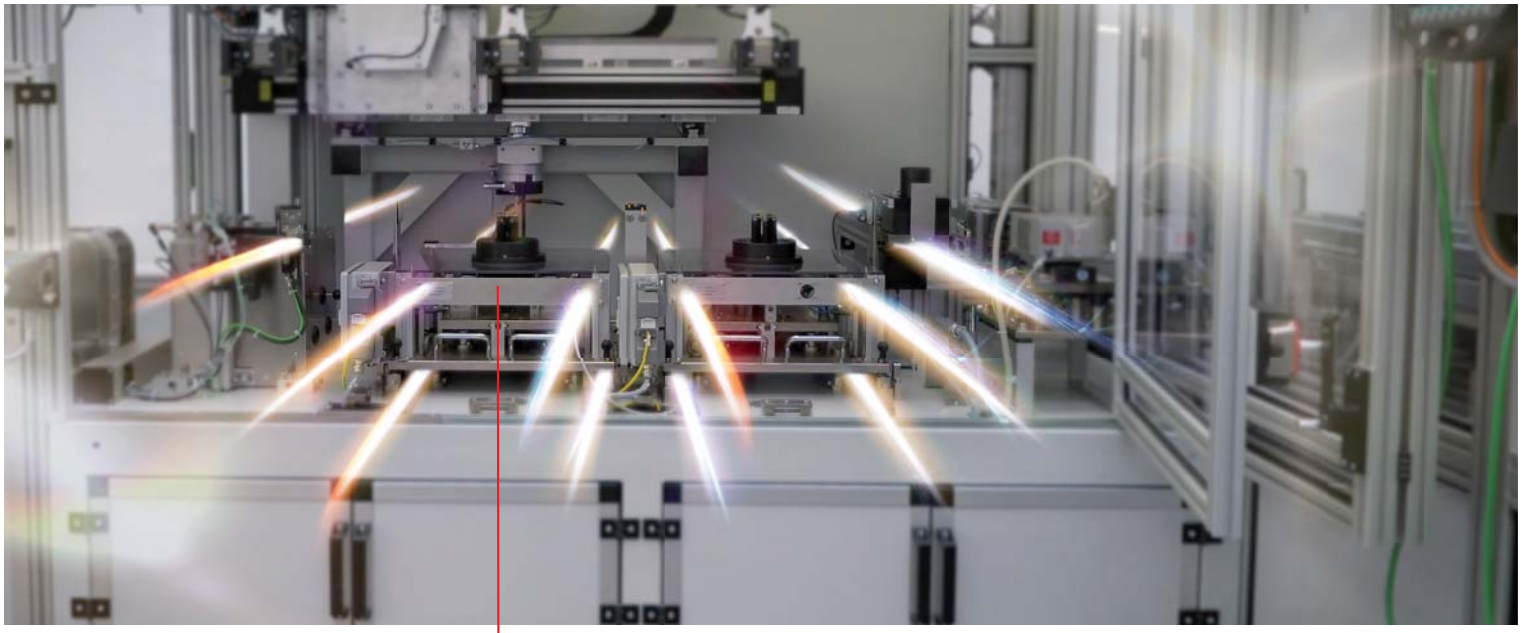
HAFNER

FLEXIBLE

HAFNER measuring machines exactly meet your measuring tasks and offer maximum flexibility. We develop your intelligent and compact solution:

- developing sophisticated multi-position measuring technology with highly flexible workpiece changes without change over
- Plug-and-Play tool changing stations with fully integrated and preadjusted high-precision measuring technology
- changing kit solutions in accordance with Poka Yoke, reducing change over times by up to 80 %

HAFNER – precise, fast, flexible, modular, digital

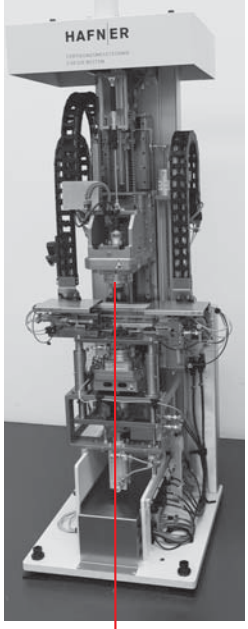


Classifier for joint housing, modular design with flexible plug and play changing stations, for a complete workpieces change over in less than 15 minutes.

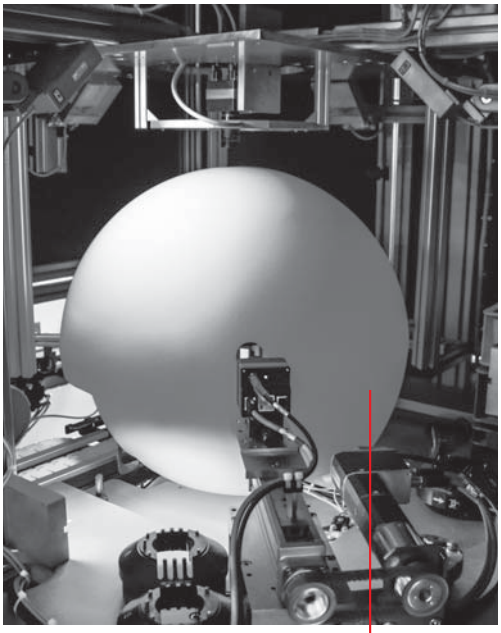
More than flexible

HAFNER measuring machines solve your measuring tasks in an optimal way and future-proof. For your current and future workpiece spectrum, we develop complete solutions that are cost-effective, flexible and cover workpiece change over and change over frequency:

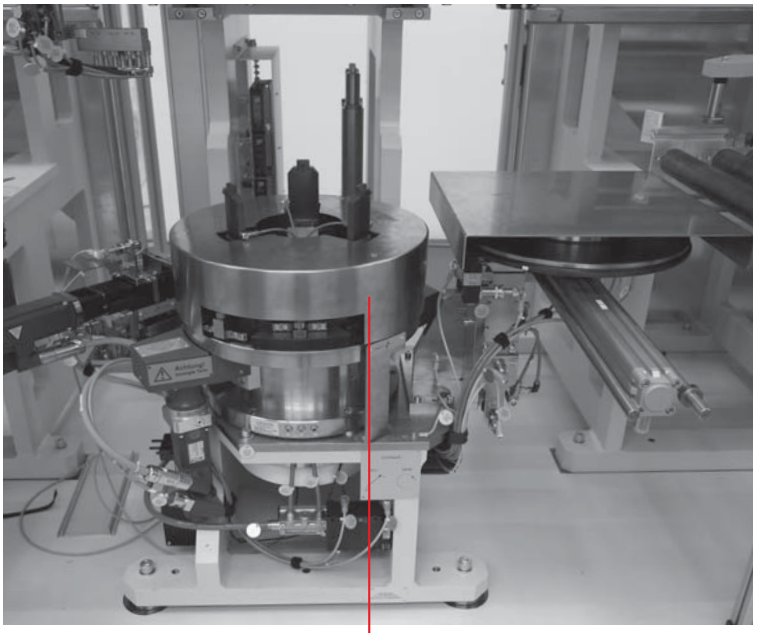
- Workpiece range - your production concept dictates how flexible the measuring machine must be, from batch production through flexible mix operation to high-volume mass production. Everything is possible, even highly flexible measuring machines with workpiece recognition and fully automatic setup of the measuring recipe
- Minimized change over time – allows a maximum of flexibility in your production planning. HAFNER workpiece specific exchange kits and change over stations enable the shortest possible change over time
- Precision built-in - for all systems the adaptation of different workpieces to the measuring machine is ensured. Change over kits are executed according to Poka-Yoke and eliminates time-consuming, operator dependent adjustments



Measuring machine of pinion gears for 100% measurement without workpiece change over for a part weight range from 3 to 35 kg.



Inspection station for pistons for a change over free optical inspection, controlled via RFID chip, including archiving of complete inspection and quality data for each workpiece for 100% traceability.



Measurement of more than 30 different brake disc types without change over and a cycle time shorter than 10 seconds.

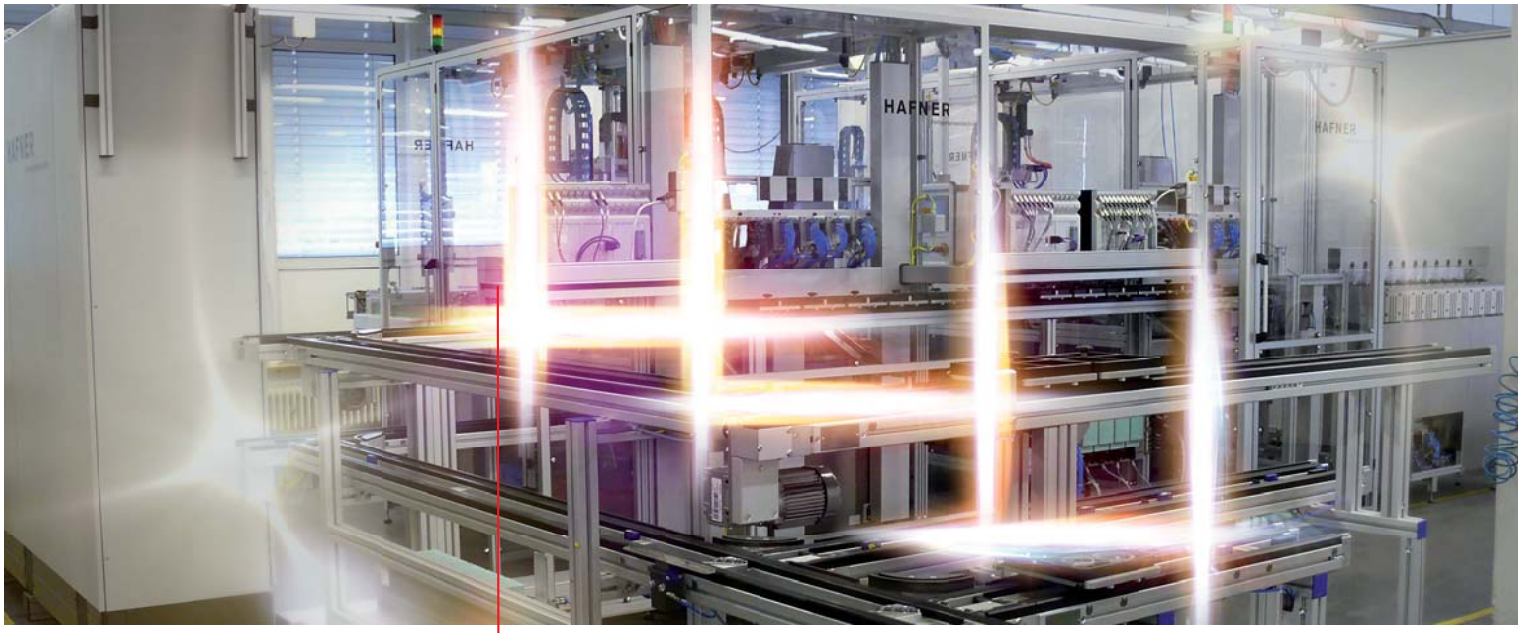
HAFNER

MODULAR

HAFNER measuring machines are configured from ONE modular construction kit and fit exactly to your needs. We develop intelligent and holistic solutions for you:

- modules developed for specific measurement tasks and workpiece properties
- concepts from SPC measuring station to fully automatic 100% measurement with workpiece handling
- modular configuration of the desired functions (detection, measuring, checking, classifying, mounting, labeling, etc.)

HAFNER – precise, fast, flexible, modular, digital



Production line for 100% inspection and classification, consisting of measuring machines for inner race, ball cage and outer race with automatic feeding of classified balls.

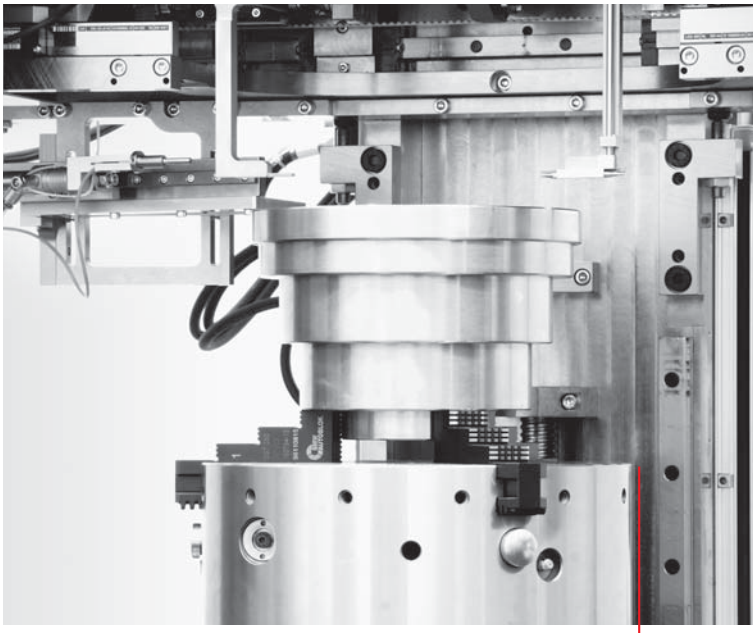
Complete measurement, classification and workpiece pairing, 16.5 seconds.

Modular is fast, precise and flexible

In many areas, HAFNER measuring machines are built on our modular concept in various forms:

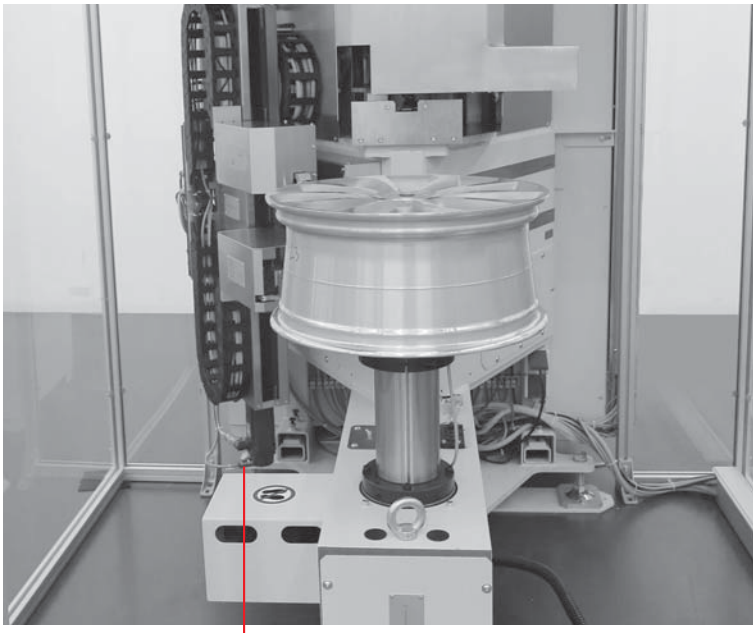
- Workpiece - many workpieces and measuring tasks have individual specifications which can be optimally solved with matched modules. From parts handling to measuring data acquisition to software modules for automation and metrological evaluation
- Measuring concept - depending on the stability of the machining processes, the need for readjustment or classification, statistical models, etc., concepts from the SPC-measuring station to fully automatic 100% measurement or integrated post-process measurements are to be implemented. These build on core measuring modules, which are adapted to the respective tasks
- Complete solutions - for many workpieces, in addition to the core measurement task - additional functions must be integrated in the overall solution. Through modular configuration of the desired additional functions like (e.g. detection, checking, classifying, mounting, labelling, etc.) several tasks can be realized in a space-saving machine frame

From the workpiece-specific modules, a complete solution can be put together quickly, where flexibly matches your requirements and measures precisely and reliably by optimally combining sophisticated elements.



Measuring machine for post-process measuring of all annular workpieces such as gears, synchronous rings, etc.

Modular setup of workpiece transfer (robots, gantries, loading and unloading units, etc.), workpiece clamping (central or alternating mandrel, gripper, jaw chuck), workpiece bearing (turntable or air bearing) and specific measuring modules for lengths, heights, grooves, runs, angles, roughness and splines.



Measuring machine of rims for 100% measurement (static and dynamic).

Applicable as a single station for manual SPC testing or for 100% measurement and as a part of a complete production cell with integrated workpiece recognition, hardness testing, labelling and balancing station.

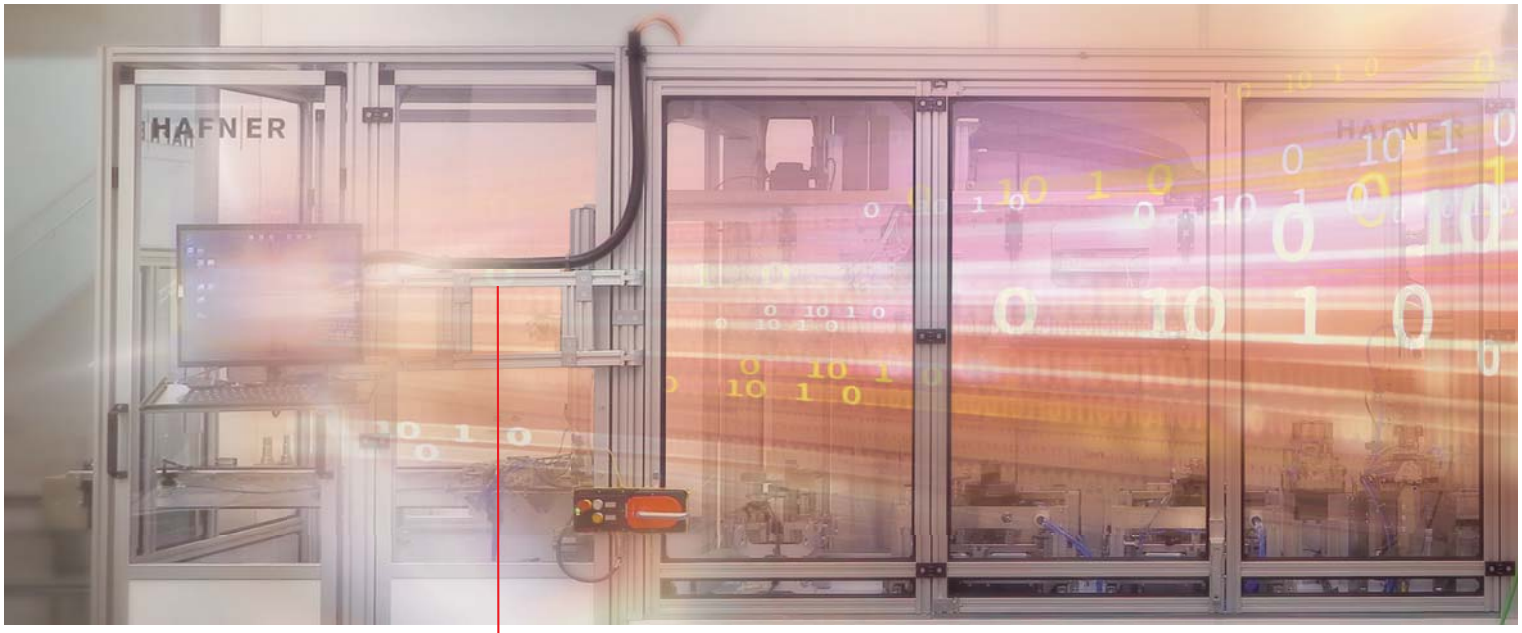
HAFNER

DIGITAL

HAFNER measuring machines are digitized from planning to service and ready for the IOT. We develop intelligent and holistic solutions for you:

- digital twin for planning and design of production systems
- post-process measuring machines for real-time process post-control
- database systems for complete part traceability and their measurement and test data
- bidirectional, visualized support in case of service

HAFNER – precise, fast, flexible, modular, digital



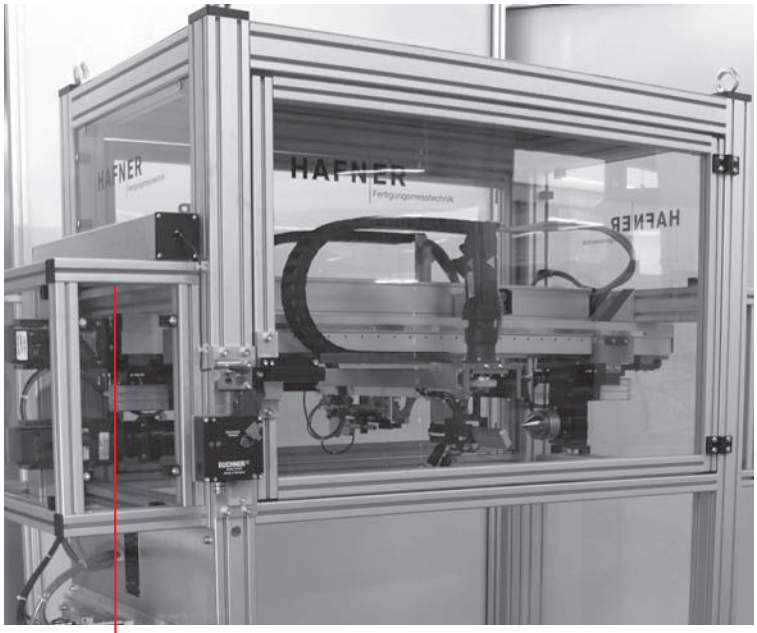
Classifier for constant velocity joints with HAFNER SMART GLASSES assist for bidirectional and visualized online support.

Digital will be more

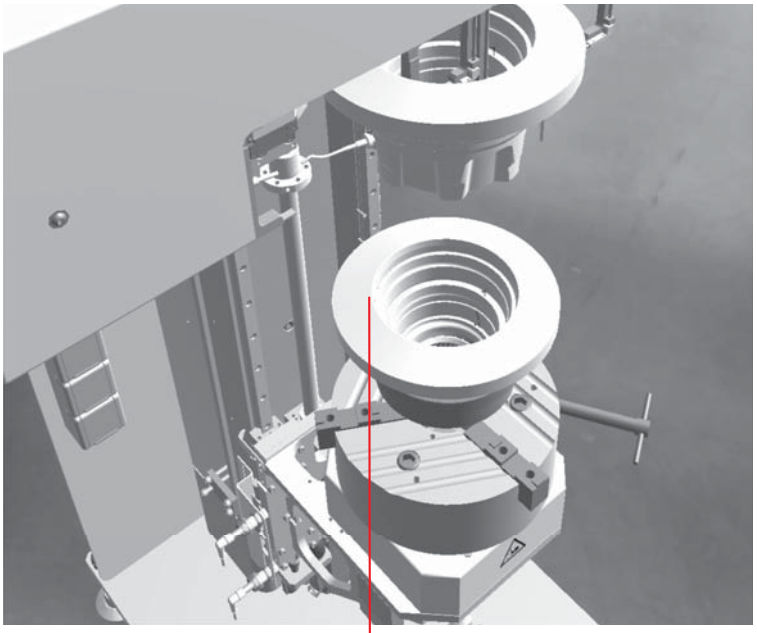
Digitization is deeply rooted in metrology – measuring machines have been controlling the upstream processing machines as post-process equipment for many years, measuring data are recorded digitally, processed and statistically evaluated. Currently - we are just at the beginning of digital transformation.

- Planning – in the future's early planning phase, the measuring machine will be projected onto factory shop floor, processes will be optimized, planning processes and production will be parallelized and thus the realization time shortened. The digital twin HAFNER TWIN makes it happen
- Post-process readjustment – the readjustment of production processes, which has been successfully established for several years, can be used in all quality-critical process steps with new measuring modules. Real-time communication in between machines for quality improvement and cost reduction
- Service and Operational Support - HAFNER SMART GLASSES assist enables fast, real-time communication between your operator at the machine and HAFNER specialists. Verbal and visual feedback of troubleshooting information is possible

Further steps towards digitization are coming!



Post-process measuring machine for measuring tasks like diameters, lengths and temperature compensation with a repeatability and linearity < 1 µm for high-precision post-control of the machine tool.



Digital twin HAFNER TWIN for simulating kinematics as a basis for automation.

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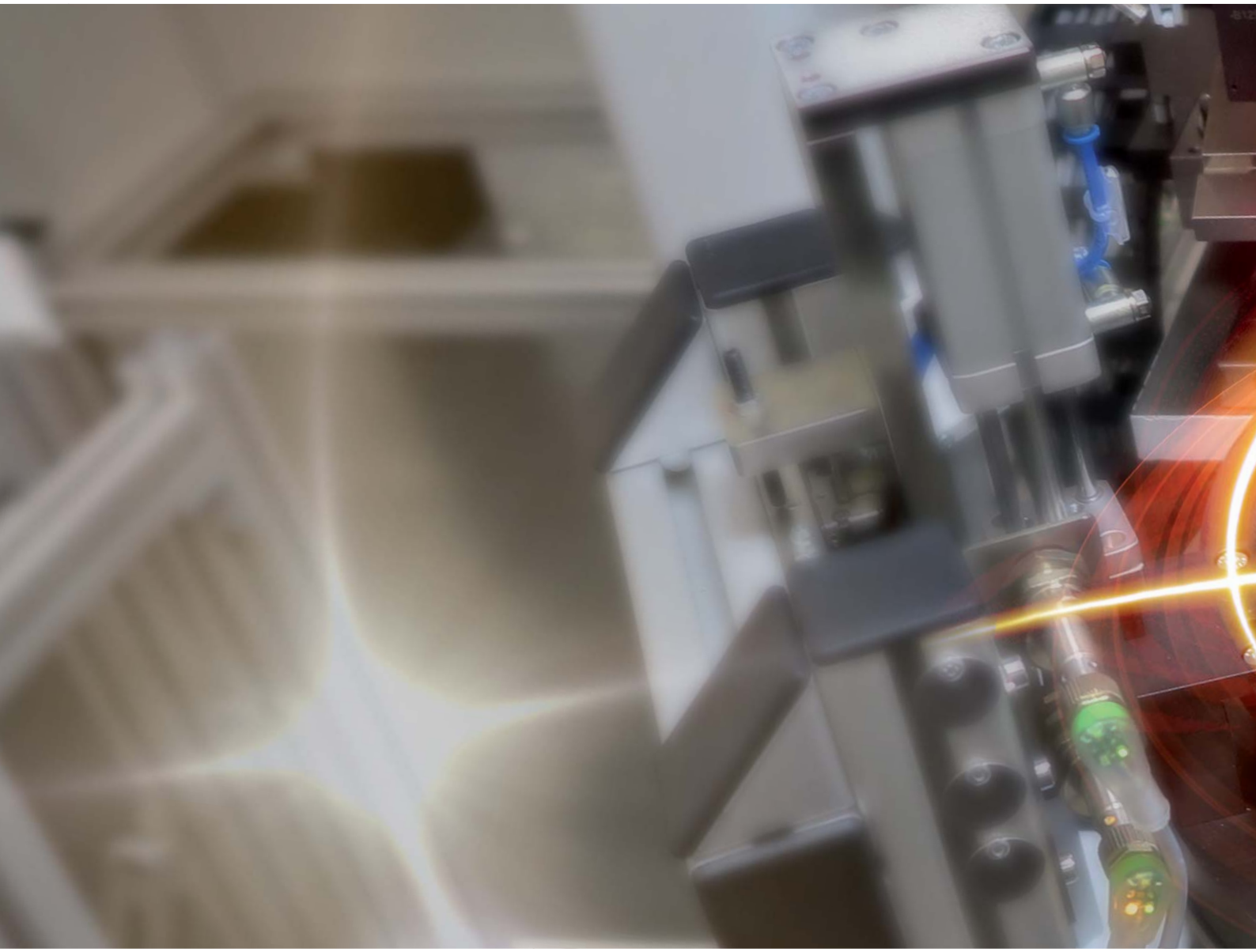

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