

KAPP NILES METROLOGY

Measuring Machines | Analytical Machines | Contract Measuring



KAPP NILES

precision for motion

CONTENTS

KAPP NILES is a global market leader in grinding machines and tools for finishing of gears or profiles. Complementing highly-accurate metrology makes KAPP NILES the best partner for production solutions. Around 1,000 highly-specialised employees represent the innovative power and expertise of the company which has grown for over 120 years.

The Group's expansion, effective April 1st 2017, operates under the name of KAPP NILES Metrology GmbH. Our new product line of measuring technology is a well-suited extension of the KAPP NILES current product portfolio of grinding machines, grinding and dressing tools, as well as comprehensive technology support. This positions KAPP NILES to offer comprehensive solutions to the gear industry.

Our metrology group includes KAPP NILES Metrology GmbH in Germany and Penta Gear Metrology LLC located in Dayton, OH. Both business units add a long-

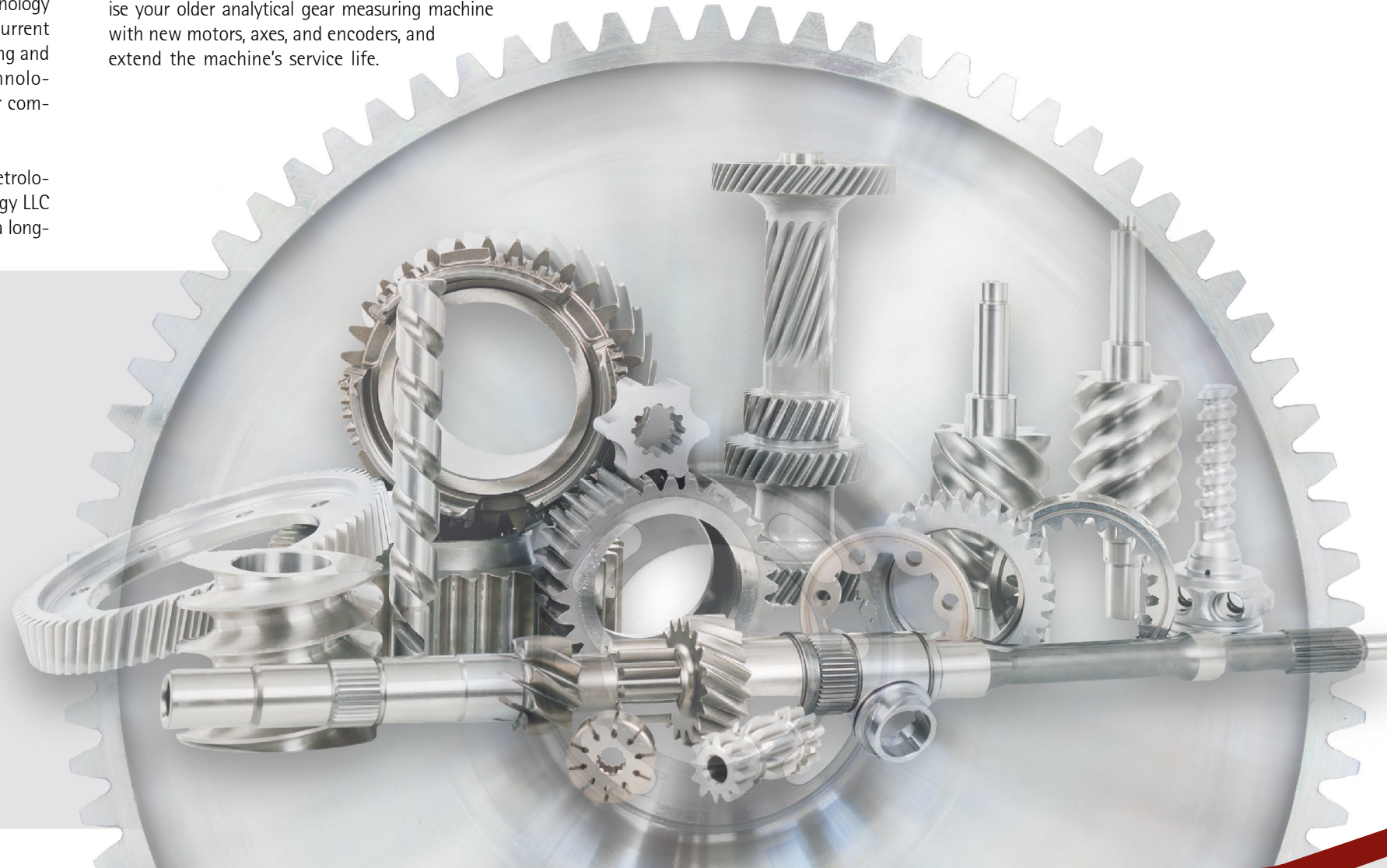
standing and comprehensive wealth of experience from employees of former R&P Metrology GmbH from Großostheim, Germany and Penta Gear Metrology.

The complete measuring technology portfolio includes stationary and mobile measuring machines, measuring instruments, such as DOB gages and double flank roll checkers.

With our Repowered® program we can modernise your older analytical gear measuring machine with new motors, axes, and encoders, and extend the machine's service life.

WORKPIECE RANGE

- Spur and helical gears
- Double helical gears (herringbone gears)
- Splines
- Rotors
- Spiral & straight bevel gears
- Gear worms
- Worm gears
- Sprockets
- Cycloids
- Cams
- Shafts
- Racks
- Bearing rings
- Form and position of rotating parts
- Gear cutting tools
 - hobs
 - shaping cutters
 - shaving cutters
 - broaches



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KNM 2X

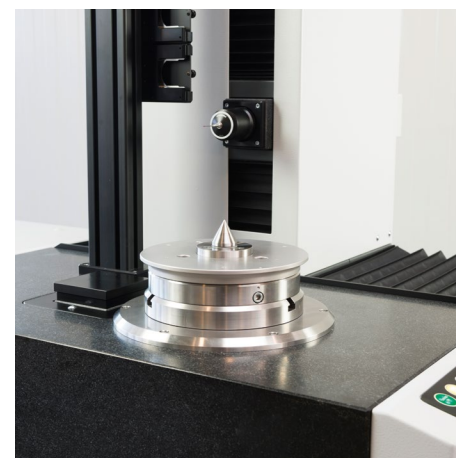
Analytical Measuring Machine



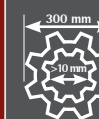
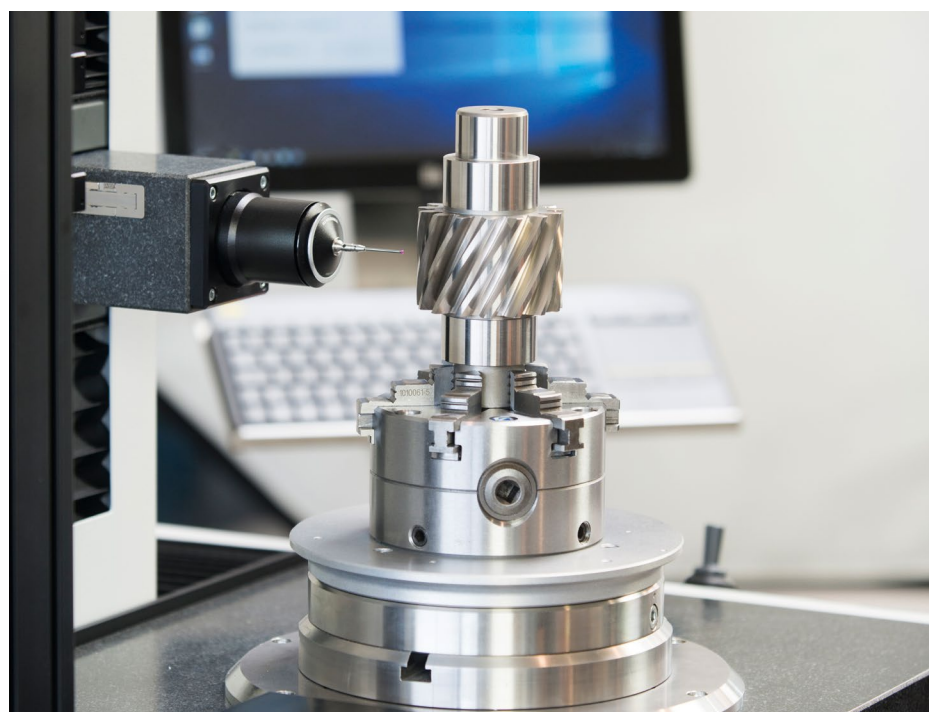
Smart quick change clamping system for reduction of non-productive times



Smart tailstock for optimal loading and to expand the work area



Ultra compact design and quick measuring procedure

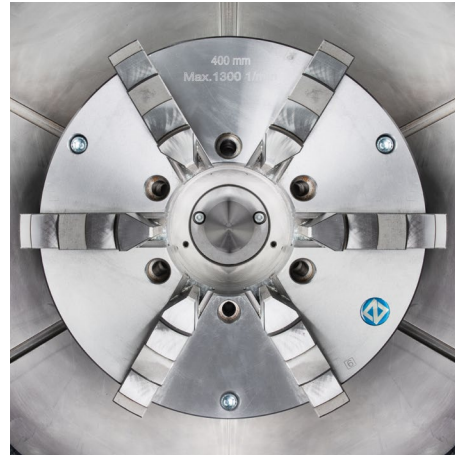


The KNM 2X analytical measuring machine is designed for high-precision measurement of smaller size gears, gear tools and rotationally symmetric workpieces. All guides and base plates made of granite are extremely stable in the long-term and have equally low expansion coefficients. Temperature probes compensate fluctuations. Air bearings with emergency operation properties ensure perfect and wear-free guides without short-term errors. Air spring elements underneath the base plates safely shield from jolts and vibrations.

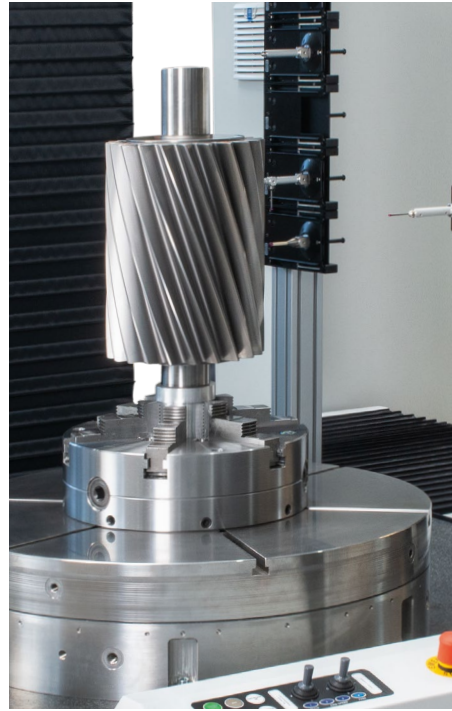
Special foundation is not required. Non-ferrous linear and torque motor of the rotary table ensure ultimate position precision and path accuracy. Despite the compact design, spacious travel ranges ensure a tangential generating motion towards the base circle for any profile. Based on the requirements, different scanning touch probe systems can be used. The machine is equipped with operator-friendly software (clear user interface, plausibility check) such as Pentasoft or KN inspect. The control cabinet can be arranged freely.

KNM 2X

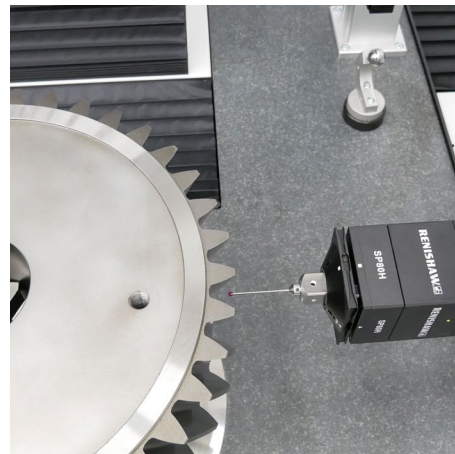
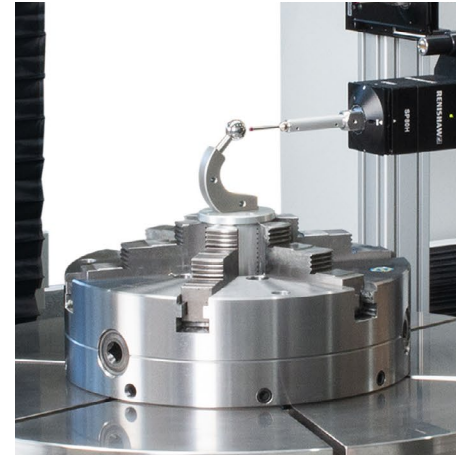
| max. workpiece diameter [mm] | max. measurable workpiece length [mm] | counter support L / D [mm] | max. workpiece weight [daN] |
|------------------------------|---------------------------------------|----------------------------|-----------------------------|
| 300 | 450 | 480 / 300 | 80 |



Innovative quick change clamping system for reduction of non-productive times



Compact design and quick measuring procedure



Smart tailstock for optimal loading and to expand the work area



KNM 5X | 9X

Analytical Measuring Machines



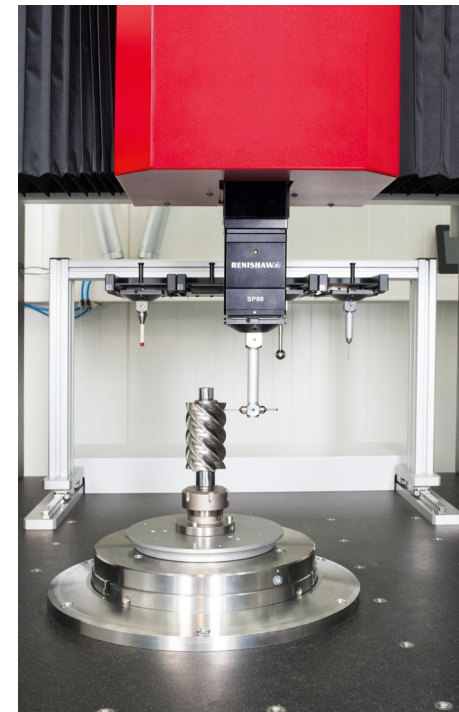
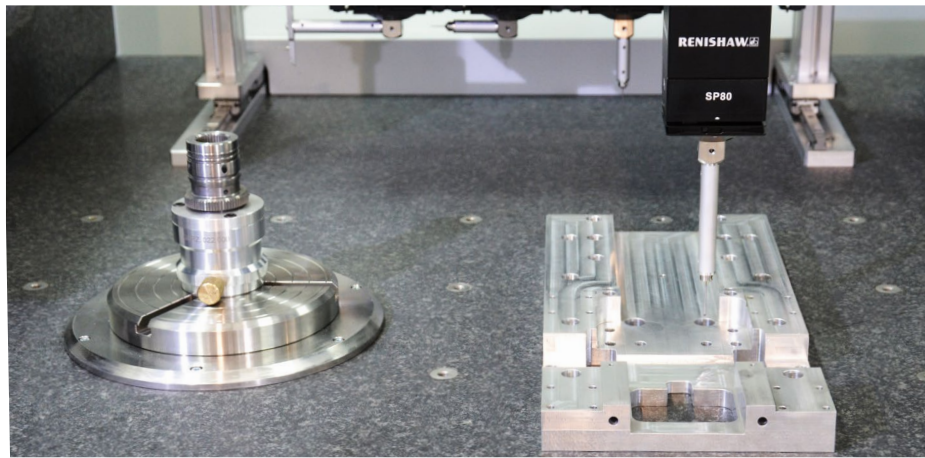
The KNM 5X / 9X analytical measuring machines are designed for high-precision measurements of larger workpieces such as spur and helical gears, rotors, bevel gears, gear tools, shafts etc. The newly proven probes allow ultra-high accuracy scanning using digital readheads. All guides and base plates made of granite are extremely stable in the long-term and have equally low expansion coefficients. Air bearings with emergency operation properties ensure perfect and wear-free guides without short-term errors. Air spring elements underneath

the base plates safely shield from jolts and vibrations. Special foundation is not required. Non-ferrous linear and torque motors of the rotary tables ensure ultimate position precision and path accuracy. Despite the compact design, spacious travel ranges ensure a tangential generating motion towards the base circle for any profile. Based on the requirements, different scanning touch probe systems can be used. The machine is equipped with operator-friendly software such as Pentasoft or KN inspect. The control cabinet can be arranged freely.

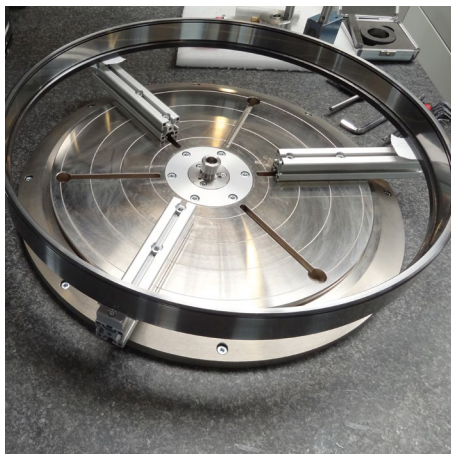
| | max. workpiece diameter [mm] | max. measurable workpiece length internal / external [mm] | counter support L / D [mm] | max. workpiece weight [daN] |
|---------------|------------------------------|---|----------------------------|-----------------------------|
| KNM 5X | 650 | 400 / 800 | 800 / 500 | 500 |
| KNM 9X | 1,250 | 400 / 1,000 | 1,200 | 2,000 |

KNM C series

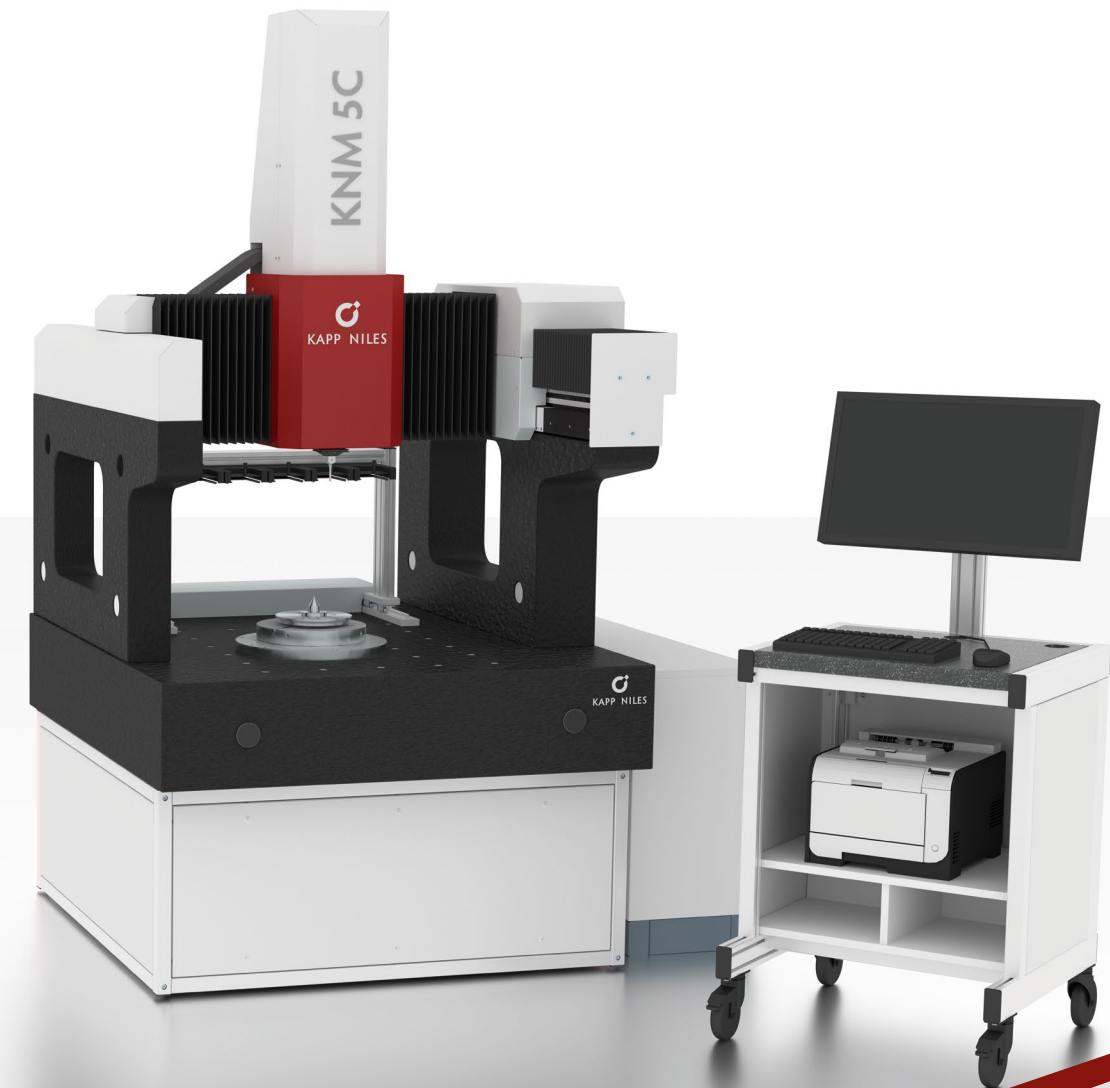
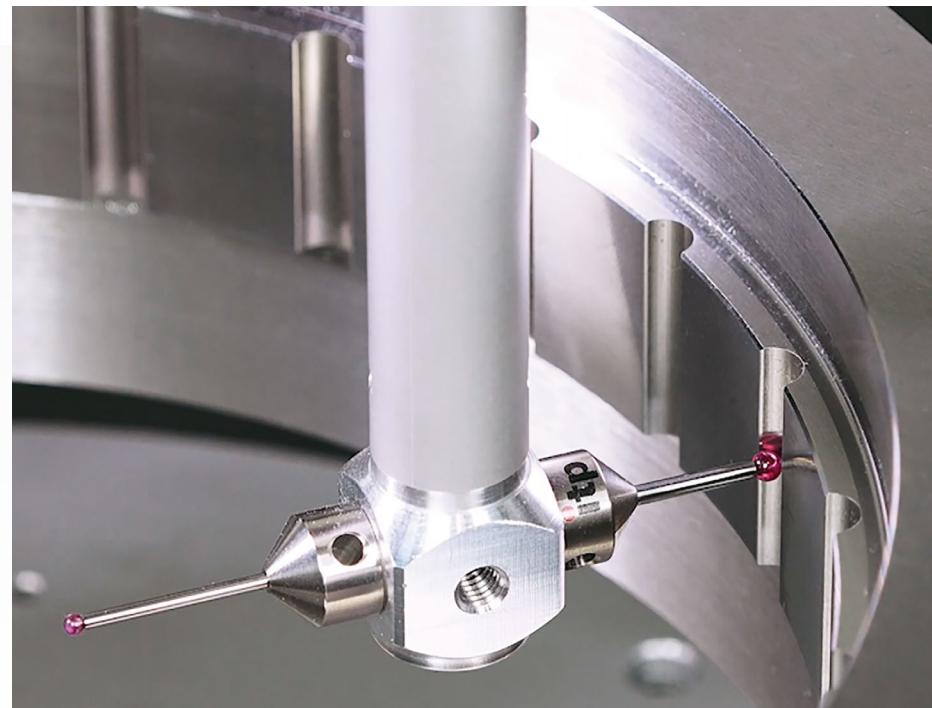
Form Measurement for Complex Workpieces



Air bearing guide elements in all axes for wear-free and smooth operation



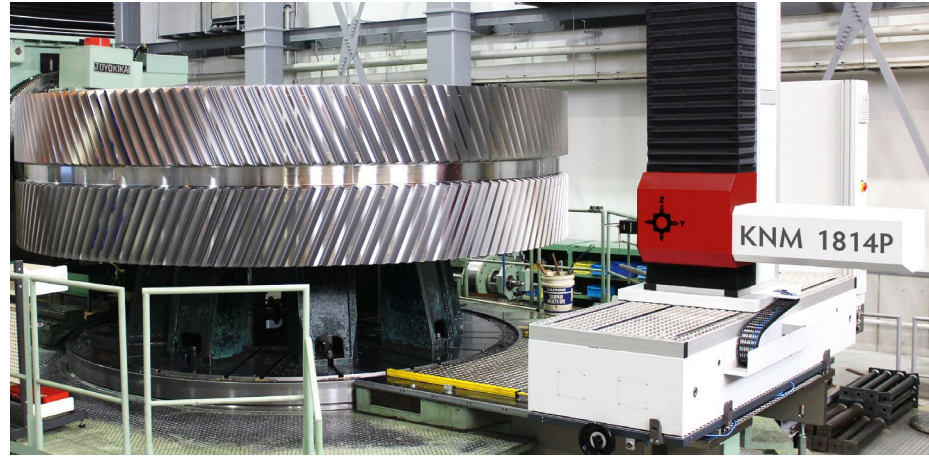
Highly accurate mechanics in special design with perfect accessibility



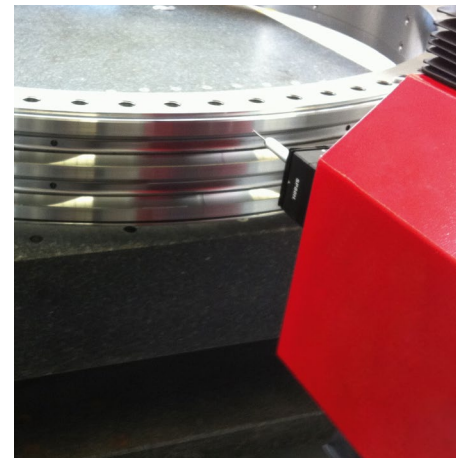
The machine has been optimally adapted for the determination of form deviations for complex workpieces such as bearing rings, race rings as well as cylindrical workpieces. This 4-axis, CNC-controlled machine allows measuring of a larger variety of parts including external and internal gears as well as 3D-measuring tasks on prismatic workpieces. All machines of the KNM C series are equipped with state-of-the-art drive technology (linear motors), and feature generously sized guide cross-sections and large distances between bearing positions.

The base plate, side supports and axes of dark granite offer consistent thermal characteristics. Air spring elements underneath the base plate safely shield from jolts and vibrations. The raised Y-guide and a drive close to the center of gravity reduce the dynamic distortions to a minimum. Measurement uncertainties are at $MPE_E \geq 0.6 \mu\text{m} + L / 400$ | $MPE_{THP} \geq 0.8 \mu\text{m}$. Reliable software for fully automated measurement cycles is available.

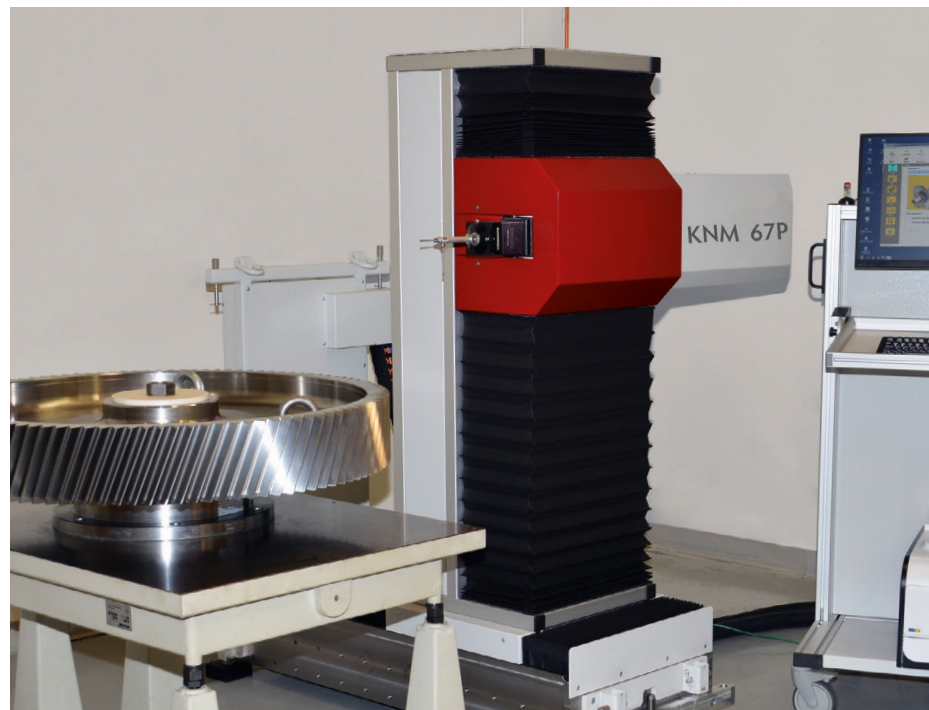
| | max. workpiece diameter [mm] | max. measurable workpiece length [mm] | rotary table diameter [mm] | travelling paths [mm] | | | rotary table load [daN] |
|----------------|------------------------------|---------------------------------------|----------------------------|-----------------------|--------|--------|-------------------------|
| | | | | X-axis | Y-axis | Z-axis | |
| KNM 5C | 500 | 450 | 300 | 500 | 600 | 450 | 500 |
| KNM 7C | 700 | 550 | 300 | 600 | 750 | 550 | 500 |
| KNM 11C | 1,100 | 700 | 800 | 800 | 900 | 700 | 2,000 |
| KNM 16C | 1,600 | 700 | 800 | 1,000 | 1,200 | 700 | 2,000 |



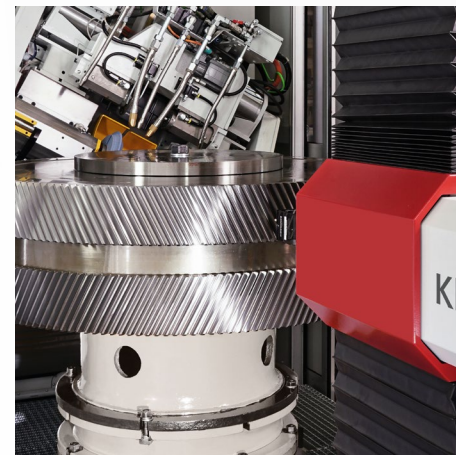
Reliable software
for fully automated
measurement cycles



X- and Z-axes made of granite with air bearing, thus
wear-free operation

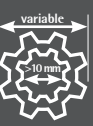


Base plate (Y-axis)
of steel construction
with high-precision
mechanical bearing



KNM P series

Portable Measuring Machines for Gears and Diverse Components



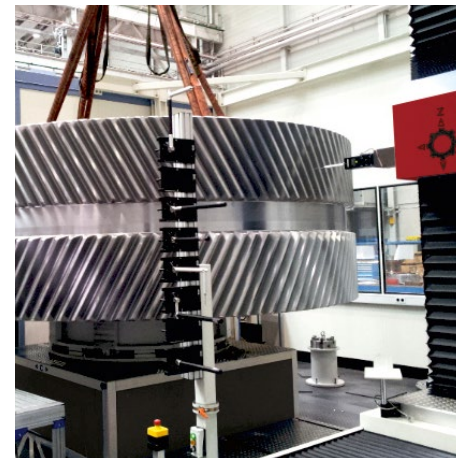
The KNM P series has been optimally adapted to the production machine according to the specific customer requirements and offers autonomous measurement of gears, ring-shaped workpieces such as bearing rings, housings etc. The combination of base plate and rotary table in a customised design (docking station) forms a full-featured 4-axis measuring device. Measurements can even be carried out without rotary table directly in the workshop area. Specially designed high-precision mechanics add to optimal accessibility

with state-of-the-art drive technology (linear motors). The CNC-controlled 3-axis structure allows for checking all gear parameters or general workpiece profiles. A wide variety of workpiece diameters and easy transport are especially worth emphasising. The measuring equipment is placed on a sturdy base connected directly to the production machine or foundation.

| | max. workpiece diameter [mm] | max. measurable workpiece length [mm] | number of axes | travelling paths [mm] | | |
|------------------|------------------------------------|---|-------------------|--------------------------|--------|--------|
| | | | | X-axis | Y-axis | Z-axis |
| KNM 67P | variable | 700 | 3 | 400 | 600 | 750 |
| KNM 1612P | variable | 1,200 | 3 | 700 | 1,600 | 1,200 |
| KNM 2814P | variable | 1,400 | 3 | 700 | 2,800 | 1,400 |
| KNM YZP | variable | Customised designs available | | | | |



No separate foundation required in the measurement or production area



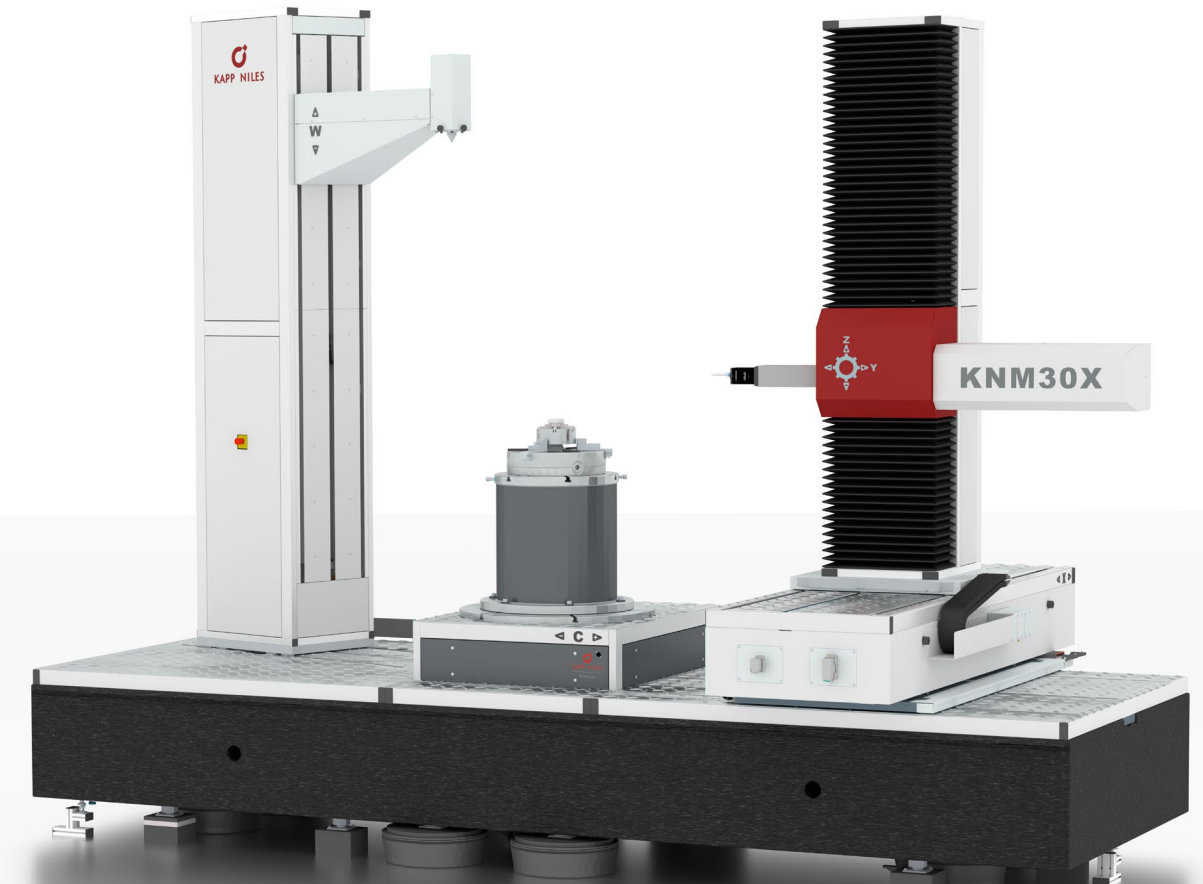
Diverse applications are possible, e.g. spur and helical gears, bevel gears, shafts, gear tools, bearing rings

Motorized positioning of measuring column (V-axis) to the actual workpiece diameter



KNM X series

Measuring Machines for Large Workpieces



According to customer-specific requirements, the KNM X series can be either designed as a stationary machine for medium and larger sized gears, or as a docking station. For this purpose, any size of the machine base can be combined with a rotary table and a transportable 3-axes measuring device. The KNM X machines boast high-precision mechanics with optimal accessibility, laser-based safety equipment, large bearing distances of guides and generously dimensioned guiding cross-sections. Linear motors

are used in all linear axes. High-precision rotary tables (diameter of 800 to 1,800 mm) with air or hydrostatic bearings are equipped with direct drives / through-holes. The solid base of granite provides sufficient stiffness. Controlled air spring elements underneath the base plates safely shield from jolts and vibrations. No special foundation is required. The use of drives close to the center of gravity ensures a low level of dynamic distortions.

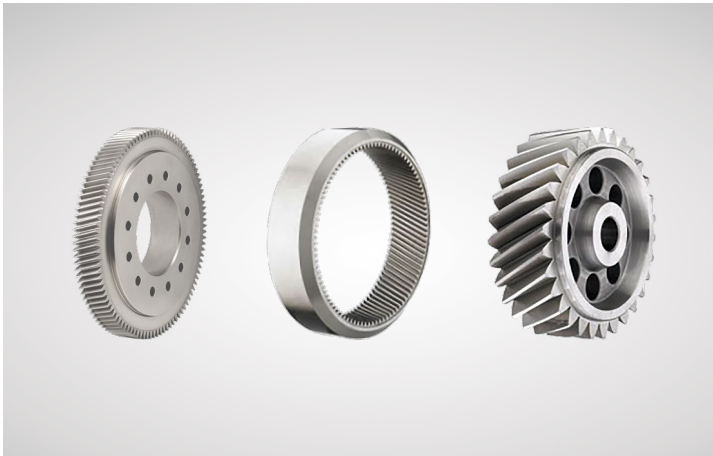
| | max. workpiece diameter [mm] | measurable workpiece length [mm] | number of machine axes | max. workpiece weight [daN] |
|---------------------|------------------------------|----------------------------------|------------------------|-----------------------------|
| KNM X series | 6,000 | 1,000 - 2,100 | 3+1 4+1 | 1,500 - 40,000 |

FUNCTIONAL GAGES

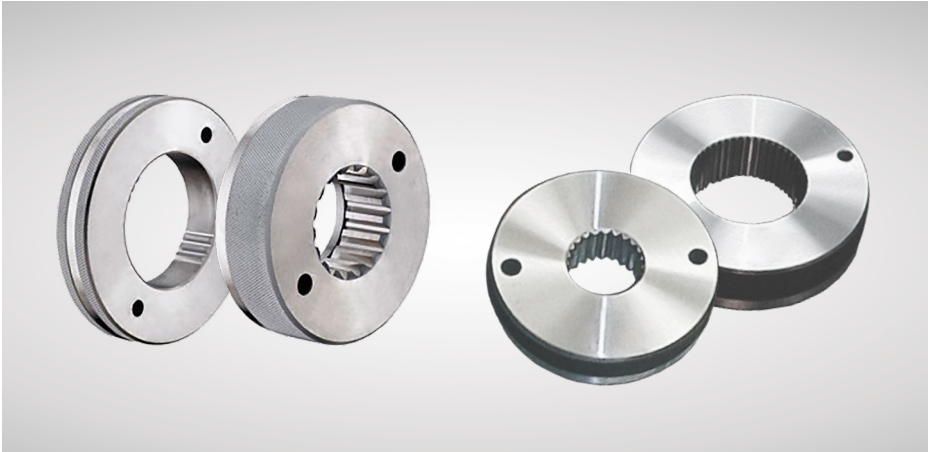
Master Gears | Spline Gages



Production Plug Gages and certified Master Gears



Production Go and No-Go Ring Gages



Variable Spline Gage



Master Gears and Master Worms

We offer a variety of spur and helical master gears and master worms for the purpose of composite gear roll testing and / or to serve as calibration artifacts for your inspection machine. Master gears can be designed and manufactured to meet the customer's specific application requirements, or we can provide standard master gears according to ISO / DIN Q3, AGMA 2015-A3, and JIS quality standards.

Spline Gages

We offer a variety of functional Go and No-Go, composite and variable indicating Spline Gages. These Gages are designed, manufactured and supplied complete with inspection certificates. To verify our inspection system accuracy, we maintain gear artifacts which have direct traceability with the US NIST-Y12 standards laboratory.

FUNCTIONAL INSPECTION

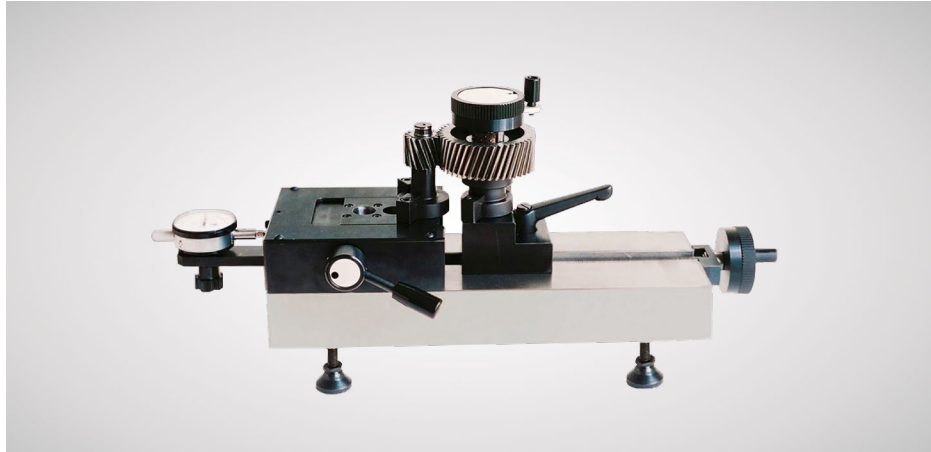
DFT | DOB / DOP



Direct drive rotary motor with encoder



Computer system with double flank analysis for:
AGMA | DIN | ISO



Linear scales with 1 micron resolution ensure exact and repeatable positioning of the slides



Double Flank Roll System

This system is designed for the use on the shop floor. The specifically designed base of the machine ensures stability and longevity in operation. The dual slide rails provide a very robust base for the physical control of the machine components. The precision spindle perfectly meets the requirements of manufacturing conditions on the modern shop floor. Optional load force monitoring ensures measurement at the proper force.

This workshop-ready series is developed to comply with the requirements of production. Linear actuators move the probe into position. A load cell controls the actual pressure of the measurement. The control is available with a PC based software system. The ability to interface with robots enable this gage to be integrated into an automated system.

| | center distance [mm] | linear scale 1 micron resolution | integrated force gage ounces or Newtons | direct drive rotary motor with encoder | Windows 10 Pro 64 bit |
|----------------|----------------------|----------------------------------|---|--|-----------------------|
| DFT 100 | 0-100 | ✓ | ✓ | ✓ | ✓ |
| DFT 200 | 50-250 | ✓ | ✓ | ✓ | ✓ |
| DFT 400 | 50-400 | ✓ | ✓ | ✓ | ✓ |



REPOWERED® - an alternative to extend the life of your gear inspection machines or functional double flank roll tester



Lower investment compared to new capital equipment purchase



Overhaul your existing measuring equipment with modern precision-driven metrology technology

REPOWERED®

Modernize your Analytical Gear Measuring Machines



REPOWERED®

With our REPOWERED® program, you can breathe new life into your outdated Gear Inspection Machine. We remove the X, Y, Z column and replace it with our standard X, Y, Z column from our ND 300 Gear Inspection Machine. In order to increase the height of the column, we install a granite riser. The original rotary table

is used along with the tailstock assembly. All new electronic drives and controllers are installed, and the machine is completely wired as a new install. We equip all inspection machines with the latest gear software, and they are thermally mapped and laser aligned. After passing an accuracy of ± 2 micron repeatability, your re-powered machine is ready for your gear inspection needs.

KAPP NILES

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