



Universal Rotating Measuring Instruments with Measuring Circles

Fast Measurements in Shop Floor Areas


*pure
perfection*

FRENCO



About the test procedure

Flexible and universal, can be used for a wide range of workpieces

Universal rotation measuring instruments are coordinate measuring devices for rotationally symmetric workpieces. The measurement is carried out by means of a measuring ball. Diameters, gear and spline parameters as well as ball tracks can be measured. To measure gears and splines or ball tracks, the measuring ball is in double flank contact. The in-house developed software URM-K and RLpro evaluates and displays the measuring results.

The URM series is flexible and designed for universal applications and can be used for a wide variety of workpieces.

With the design being robust and wear resistant, and the software including temperature compensation, the machines are particularly suitable for use on the shop-floor. They can also be integrated into an automatic production line.

What we can offer you:



Client-specific Design:

Optimal adaptation to your demands



Suitable for manufacturing:

Highest precision under toughest conditions



Sophisticated know-how

Special calibration artefacts, low-wear construction, temperature compensation



Own software:

Fast support for questions and problems



Service:

From our FRENCO Specialists carried out

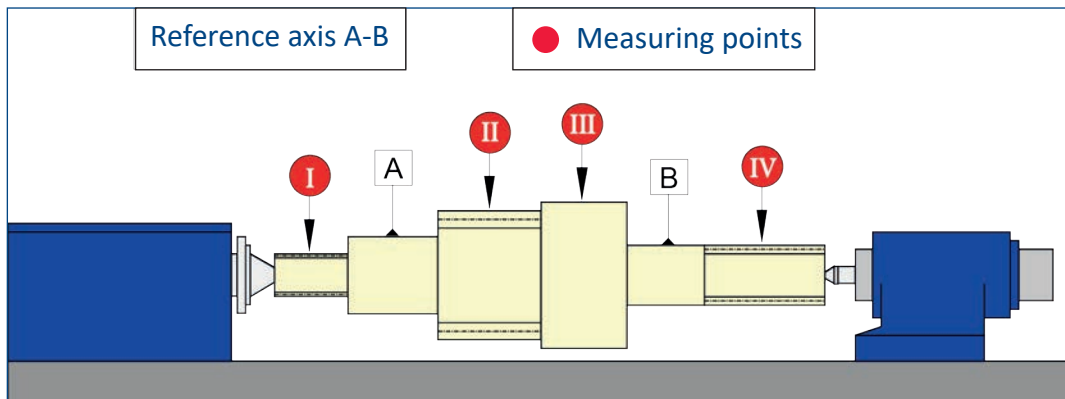


Retrofit:

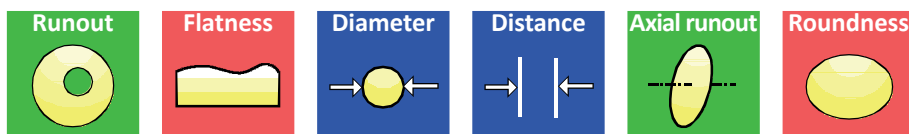
Mechanical and electronic upgrade of older devices



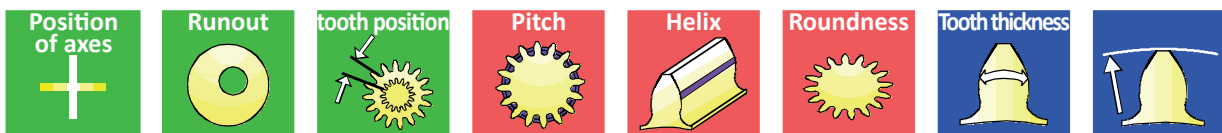
Measurement tasks



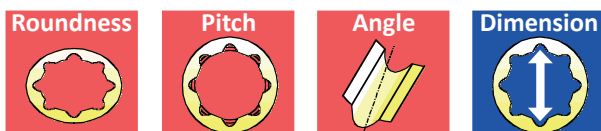
Measurement of cylinders



Measurement of gear and spline features



Measurement of ball tracks



Product range

The right instrument for every application.

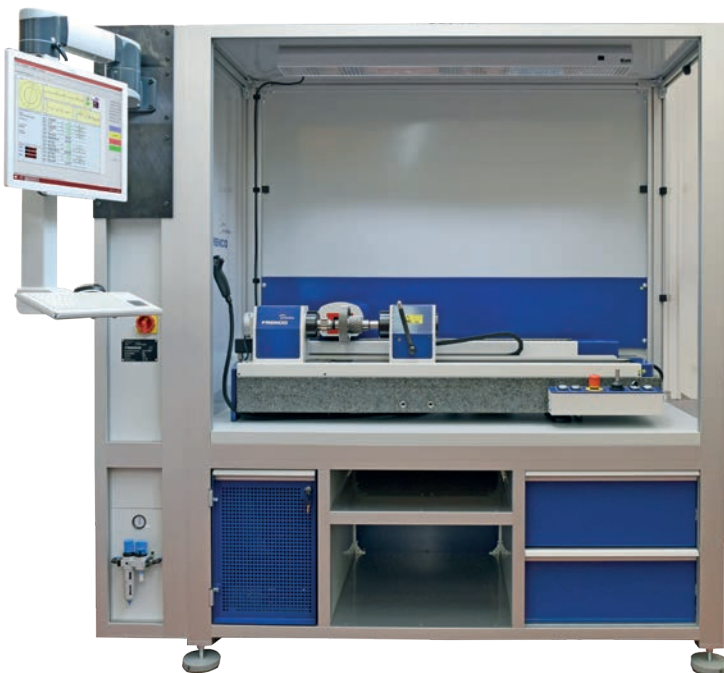
RK HM S 750

horizontal, with tip center, manual



RK HA S 750

horizontal, with tip center, automatic, heavy



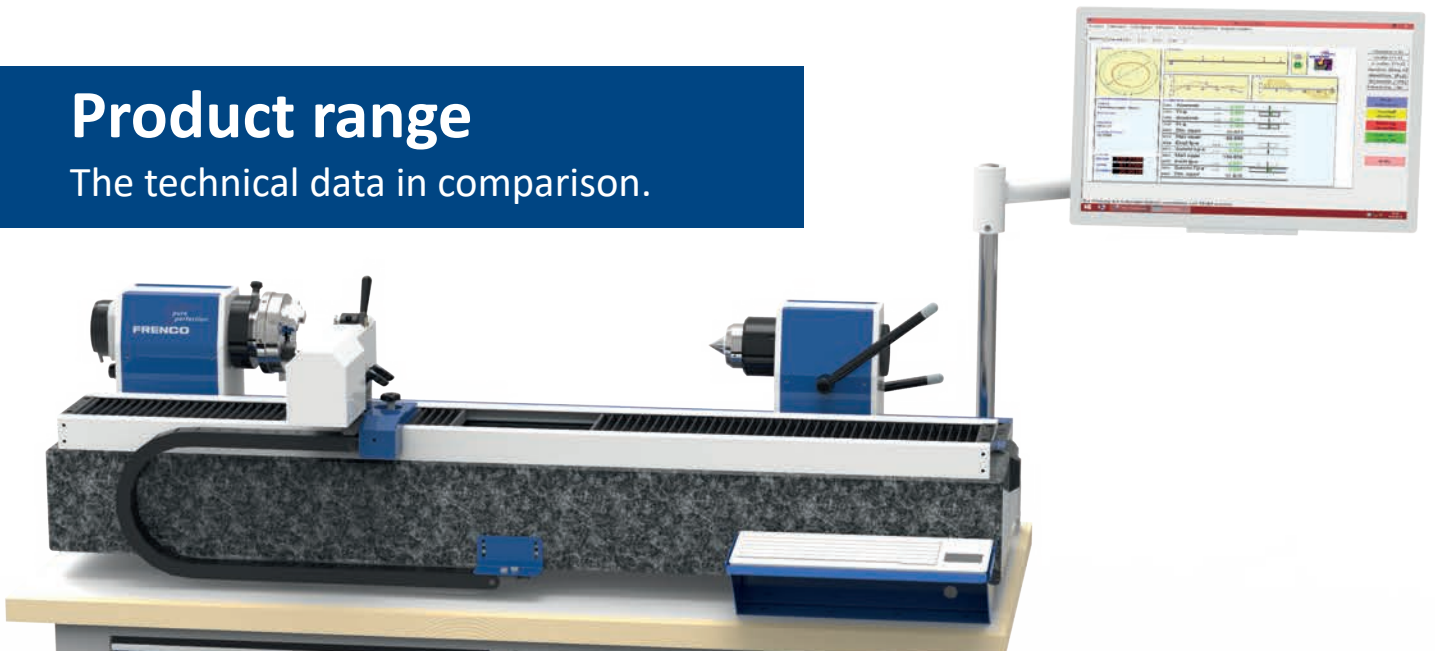
RK VA

vertical, automatic



Product range

The technical data in comparison.



		RK HM S 750	RK HA S 750	RK VA
part	max. length / height	750 mm	750 mm	300 mm
	max. external dia.	230 mm	230 mm	300 mm
	min. internal dia.	-	-	40
	min. pitch circle dia.	20 mm	30 mm	40 mm
	max. weight	15 kg	30 kg	20 kg
measuring range	slide	65 mm	85 mm	150 mm
	horizontal / vertical slide	400 mm	750 mm	300 mm
measurement sequence	manual	●		
	automatic		●	●
clamping	between tips manual	●		○
	between tips automatic		●	
	with triple jaw chuck	○	○	●
calibration	profiled setting master	●	●	●
	ground shafts	○	○	○
change of balls	manual	●	●	●
	automatic with revolver		○	○
	automatic with stilt change			○

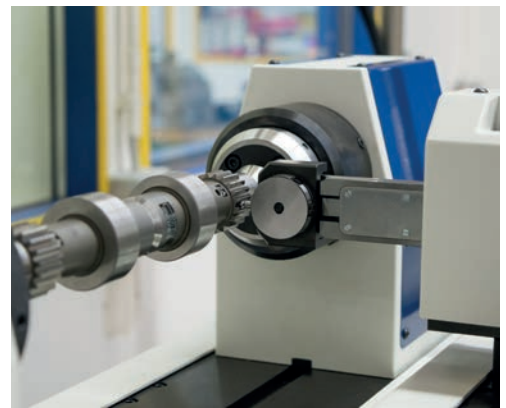
● standard ○ optional

RK HM S750



Manual Measuring Device for Gear and Spline Shafts

- Workpieces:**
- Main shafts, drive axles, axle journals
 - optionally internal splines
- Characteristics:**
- Runout, pitch, size over balls, helix angle
 - Diametrical size and roundness
 - References freely definable i.e. bearing seats
- Measuring time:**
- Approx. 1 minute for a spline and two diameters
- Solution:**
- 3-axis measuring device
 - Manual measurement, hand-guided
 - Double flank contact method for real size over balls
 - Highly precise linear guides for instrument and tailstock
 - Workpieces clamped between two centres or in 3-jaw chuck
 - Changeover turret with up to 6 measuring balls
 - Easy calibration at one location
 - Robust design for the shop-floor use
 - Temperature compensation
- Technical specifications:**
- For workpieces up to 750 mm in length and 230 mm in diameter
- specialities:**
- Very fast inspection thanks to manual operation
 - Computational compensation also for the tailstock
 - Direct control of the results already during the measurement
 - Also suitable for smooth diameters
 - Very simple programming
- FRENCO Software RKpro:**
- Modern software with full graphical support
 - DFQ export, graphical inspection plans, several languages



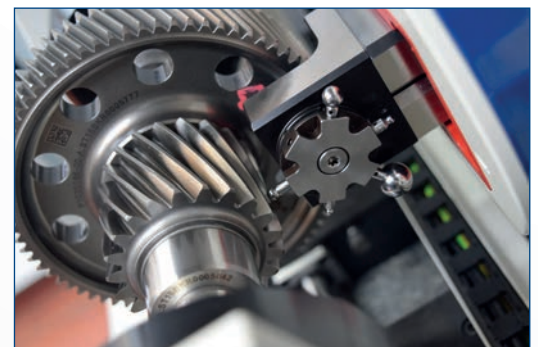
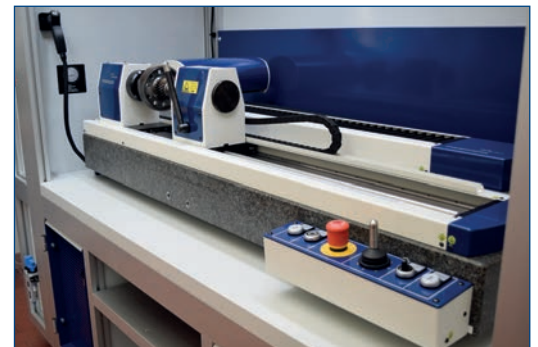
RK HA S750

Universal Measuring Machine with Ball Probes

Quick Inspection on the Shop-floor



- Components:** flexible and universally applicable for a various workpieces
- Components:** fully automatic measurement procedure
- Inspection time:** depending on the number of measuring locations
- Solution:**
- three NC-controlled axis
 - programmable for automatic inspection
 - incl. measuring electronics and PC
- Software:**
- user-friendly URM-K software
 - graphical representation of measuring results
 - numerous options, data export, various languages
- Specials:**
- stable and wear resistant design for the shop-floor use
 - temperature compensation
 - suitable for automatic in-line measurements



Technical Data:

Max. length of specimen	750 mm
Max. diameter of specimen	230 mm
Clamping	between two centres, automatic
Calibration	profiled setting master
Length x width x height	2438 mm x 610 mm x 2245 mm
Weight	770 kg

RK VA

Automatic measuring instrument with measuring balls

Quick testing close to production



Workpieces: Flexible and universal for various workpieces usable

Features: Fully automatic measurement

Measuring time: depending on the number of measuring points

Solution:

- Three axes, NC-controlled, 4 measuring axes
- Measuring program for automatic sequence
- Device with integrated measuring electronics and PC

Software:

- User-friendly software URM-K
- Graphical representation of the characteristics
- Extensive options, data export, many languages

special features:

- Robust and wear resistant construction for the use in production
- Temperature compensation
- Can be integrated into automated production lines

Technical data

max. part weight	20 kg
max. part diameter	300 mm
Clamping	with triple jaw chuck
Calibration	profiled setting master
Length x width x height	1580 mm x 690 mm x 2040 mm
Weight	485 kg



Precisions

The measurement precision in detail

FRENCO measuring instruments are always calibrated with artefacts. The calibration of the FRENCO inspection artefacts is carried out in our own DAkkS calibration laboratory. After calibration, these artefacts are measured 25 times with a FRENCO measuring instrument. Out of these measuring values the following statistical features are calculated.

Repeatability:

The repeatability describes the range of measuring values around their average. It is calculated with this formula:

$$WBK = \pm 2 * k * s$$

k = factor to consider the number of measured values

(for 25 measuring values k = 1,32)

s = standard deviation calculated from the 25 measuring values

Max. deviation of measurement:

The max. deviation of measurement describes the biggest deviation between one single measuring value and the actual value of the inspection artefact. It is calculated with this formula:

$$MA = \pm \text{Max} (|X_{\text{Max}} - X_{\text{Normal}}| ; |X_{\text{Min}} - X_{\text{Normal}}|)$$

X_{Max} = biggest single value out of the 25 measurements

X_{Min} = smallest single value out of the 25 measurements

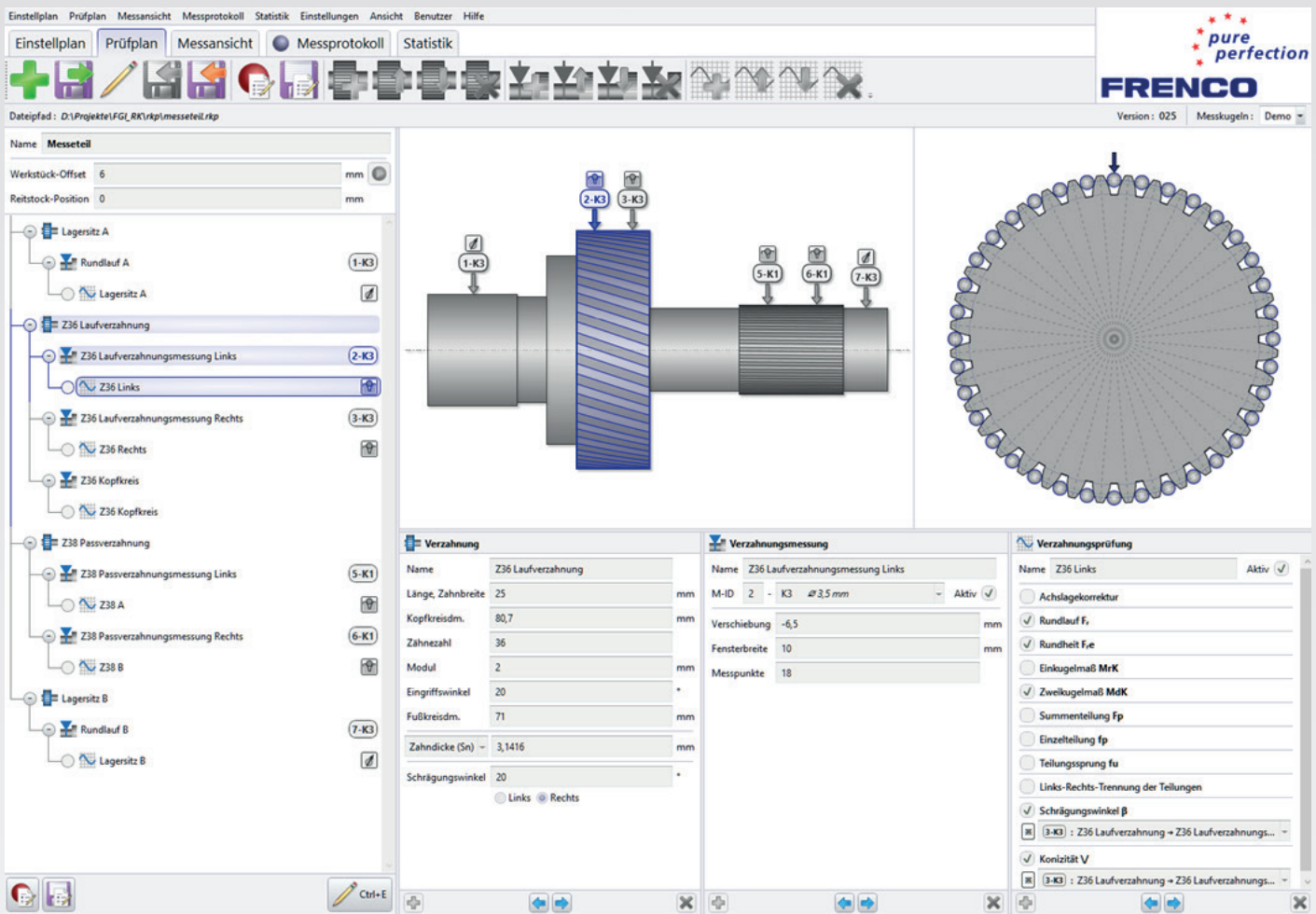
X_{Normal} = actual value of the artefact

Thus the following example accuracies are calculated for a URM-K with automatic measurement process :

Spline feature		Wiederholbarkeit*	max. Messabweichung*
size over/ between balls average	MdK	±0,002	±0,0025- 0,005**
size over/ between balls min/max	MdK	±0,003	±0,004- 0,006**
eccentricity	e	±0,002	±0,002
runout	Fr	±0,003	±0,003
roundness	Fr-e	±0,002	±0,002
total index deviation	Fp / Fp-e	±0,003	±0,003
single index deviation	fp / fp-e	±0,0025	±0,0025
tooth position deviation	in degree	±0,005	±0,006
General features		Traceability*	Max. deviation*
internal or external diameter average	∅	±0,0025	±0,005**
internal or external diameter min/max	∅	±0,004	±0,006**
eccentricity	e	±0,002	±0,002
runout	Fr	±0,003	±0,003
roundness	Fr-e	±0,0025	±0,003
axial distance		±0,010	±0,050

*The coverage factor is k=2. The values are within the associated range of values with a probability of 95%.

**The max. deviation for size over two balls and diameter depends on the calibration.



Evaluation software RKpro for manual rotation measuring instruments



Rotation measuring instruments can be used to measure cylinders, gear characteristics and tripod characteristics. The evaluation is carried out with the RKpro software developed by FRENCO. After determining the reference axis, the desired characteristic values can be recorded at any number of measuring points. The software provides a kind of modular system consisting of components, measuring points, measurements, evaluations and representations.

With the software RKpro you can:

- easily manage your testing options via the menu option Enter inspection plan
- perform simple gearing calculations
- generate online statistics for all parameters
- save data in qs-STAT® format
- monitor the quality of the test specimens over a longer period of time
- Select operating and output language different
- determine the different parameters of a workpiece

The RKpro software supports the following measuring points and features:

Type of measuring point	Features
Characteristics	Run-out F_r , Roundness $F_{r,e}$
Characteristics	Radius r , Diameter D_m , Conicity ∇
Axial runout	Axial runout $F_{r,e}$, Flatness $F_{r,e}$,
Axial measurement	Parallelism $//$, Perpendicularity \perp
Gears, Splines	Radial runout F_r , Roundness $F_{r,e}$, Dimension over balls DoB Dimension over one ball DoB Total index deviation F_p Adjacent index deviation f_p Tooth to tooth index variation f_u Also separated for right and left flank: F_{p-R} , F_{p-L} , f_{p-R} , f_{p-L} , f_{u-R} , f_{u-L} Helix angle β , Conicity ∇

The respective measuring points can be linked together. So axes from different measuring points can be formed, which can be used for run-out error compensation. An existing clocking belt can be used with an additional probe for run-out error compensation of a different spot as well.

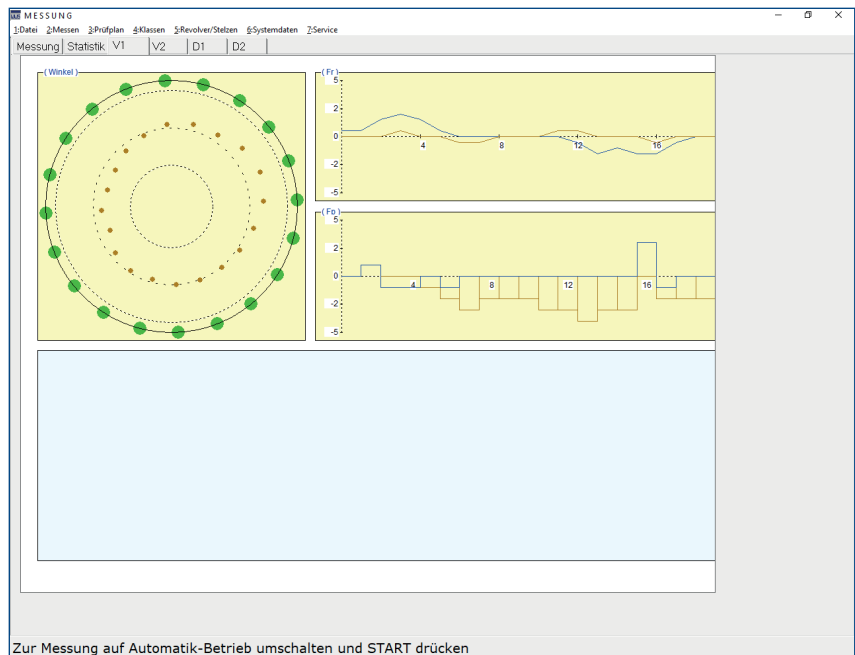
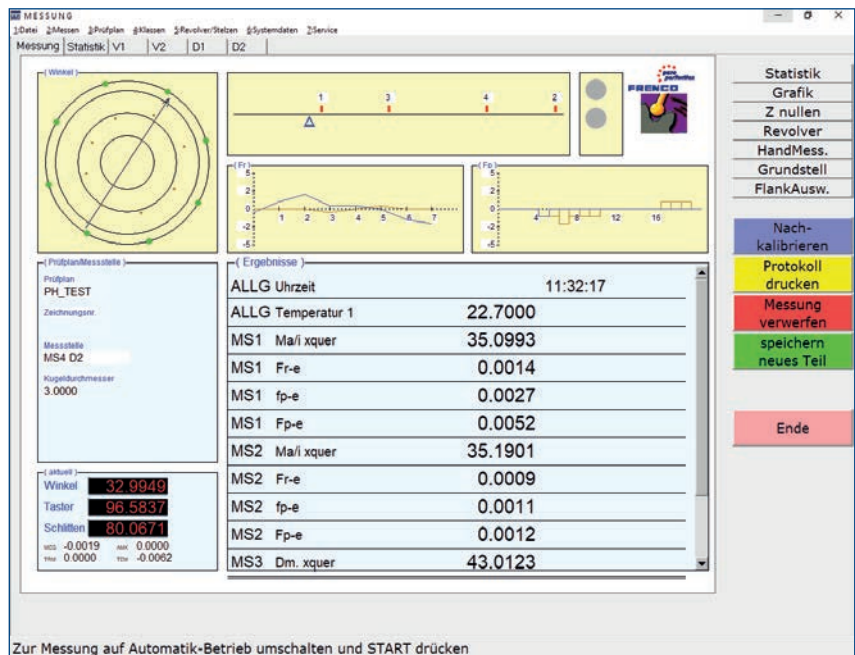
For gears and splines the measurement type Diameter measurement can be used as well. This allows to measure root or tip diameters.

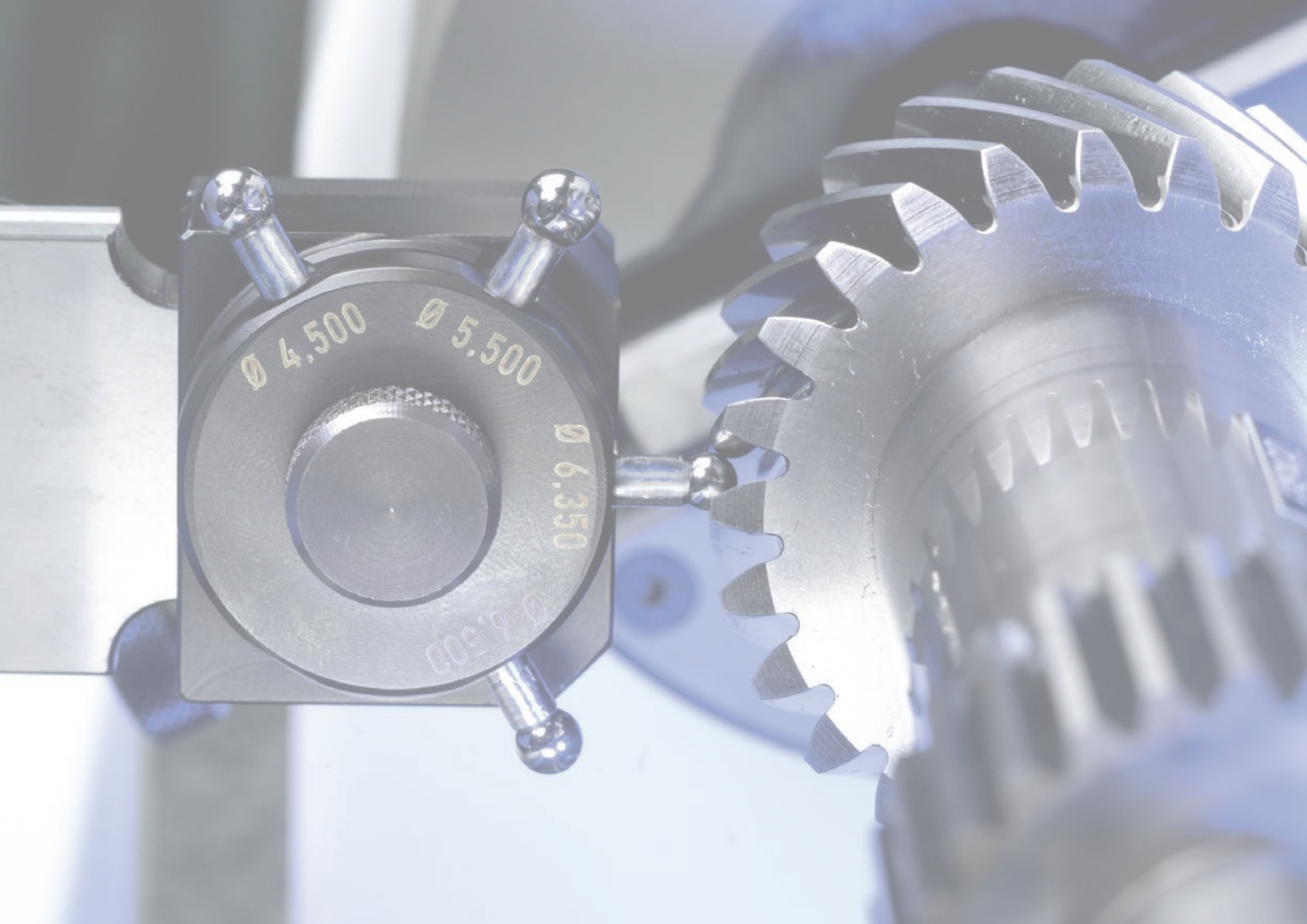
Evaluation-Software URM-K

The URM-K software is designed very functionally. All necessary information is displayed in a clear manner. With the measuring results being marked in colour and a tolerance bar being displayed, the workpiece can quickly be classified as fail or pass.

The helix evaluation is displayed in the usual way.

Likewise, the graphs of the single pitch deviation, total pitch deviation and runout deviation are displayed in the usual way.





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